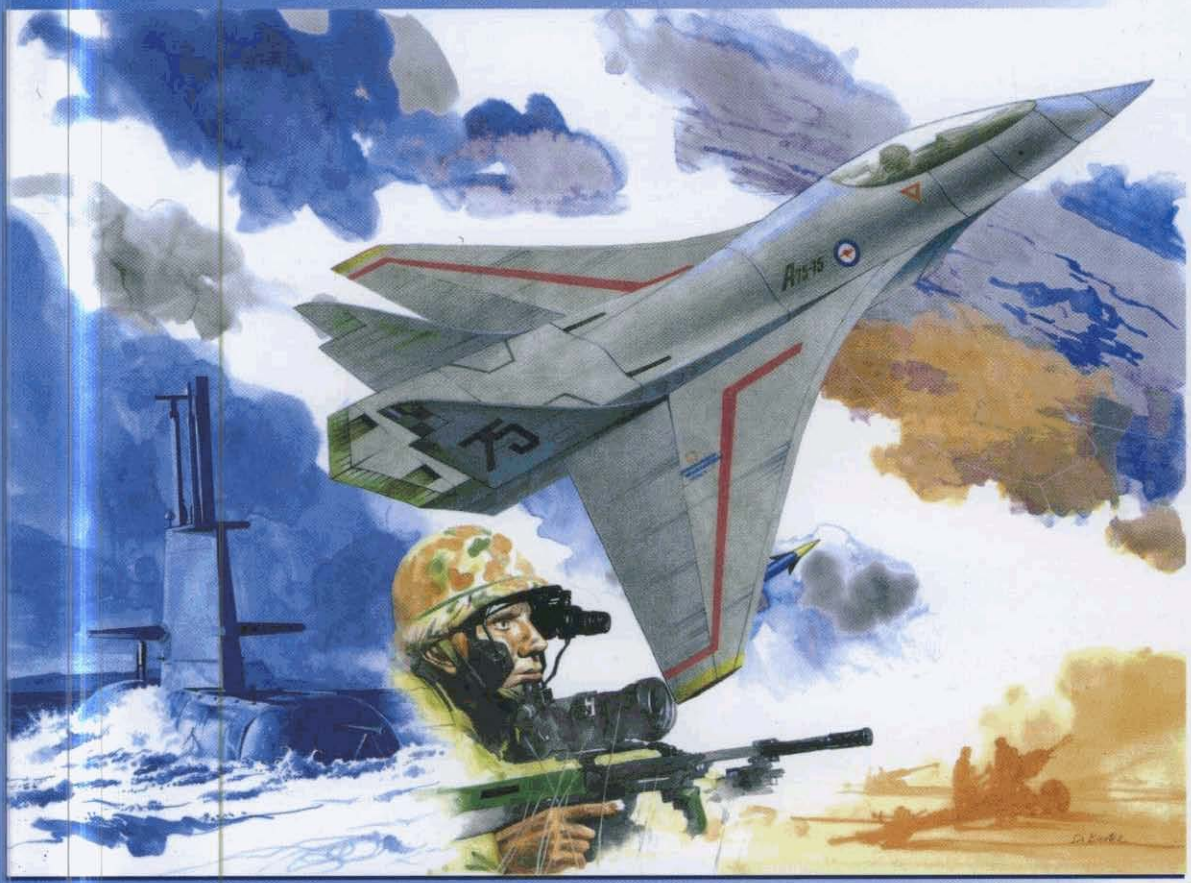
NEW ERA SECURITY



APSC
Air Power Studies Centre

EDITED BY
ALAN STEPHENS

RAAF AIR POWER STUDIES CENTRE

NEW ERA SECURITY

THE RAAF IN THE NEXT TWENTY-FIVE YEARS

THE PROCEEDINGS OF A CONFERENCE HELD BY
THE ROYAL AUSTRALIAN AIR FORCE
IN CANBERRA

JUNE 1996

EDITED BY ALAN STEPHENS

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PREFACE

Papers have been printed as presented by the authors, with only minor changes to achieve some consistency in layout, spelling and terminology. The transcripts of the discussions which followed papers have been edited for relevance, clarity and brevity. Copies of the edited transcripts were sent to authors for comment before publication.

My sincere thanks are due once again to Mrs Sandra Di Guglielmo for her highly professional editorial assistance.

Alan Stephens
Air Power Studies Centre
Canberra
July 1996

NOTES ON CONTRIBUTORS

AIR MARSHAL L.B. FISHER joined the RAAF in 1960. He has extensive experience on maritime operations, including command of the Maritime Patrol Group; while he also commanded the Tactical Transport Group and the ADF Warfare Centre. Senior staff posts have included ACOPS and DCAS. Air Marshal Fisher was appointed CAS in November 1994.

THE HON. IAN MCLACHLAN, MP, was elected to the Federal Parliament in 1990. A graduate of Cambridge University, he was previously President of the National Farmers Federation and is personally involved in one of Australia's largest export industries as a wool grower. While in Opposition Mr McLachlan served variously as Shadow Minister for Industry and Commerce; for Infrastructure and National Development; and for Environment and Heritage. Following the election of the Coalition Government in March 1996, he was appointed Minister for Defence.

DR ALAN STEPHENS is the RAAF Historian, based with the Air Power Studies Centre. Before joining the APSC he was a principal research officer in the Federal Parliament, specialising in foreign affairs and defence; while prior to that he was an RAAF pilot, where his postings included the command of No. 2 Squadron from 1980-81. Dr Stephens is the author of numerous books and articles on defence, air power and military history. His most recent book is *High Fliers: Leaders of the RAAF.*

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GENERAL JOHN BAKER graduated from the Royal Military College, Duntroon, in 1957 and was commissioned into the Royal Australian Engineers. He then completed a degree in civil engineering at Melbourne University. Early regimental experience included a year in Papua New Guinea and an exchange appointment with the United States Army's 25th Infantry Division. He served in Vietnam in 1970. General Baker's senior appointments have included Chief of Logistics - Army; Director, Joint

Intelligence Organisation; and Vice Chief of the Defence Force. He formally assumed the post of Chief of the Defence Force in July 1995.

AIR MARSHAL R.G. FUNNELL graduated from the RAAF College in 1956 and completed flying tours on fighter, instructional and bomber aircraft. Operational commands included No. 79 Squadron at Ubon in 1966; and No. 6 Squadron at Amberley from 1972 to 1975 when that unit re-equipped with the F-111. Appointments at air rank included Chief of Air Force Operations and Plans, Assistant Chief of the Defence Force (Policy), and Vice Chief of the Defence Force. He served as Chief of the Air Staff from 1987 to 1992. Following his retirement, in January 1994 Air Marshal Funnell became the inaugural Principal of the Australian College of Defence and Strategic Studies.

VICE ADMIRAL R.G. TAYLOR joined the Royal Australian Navy as a thirteen-year old Cadet Midshipman in 1954 and graduated from the RAN College at HMAS Cerberus in 1957 as Queen's Medallist and Grand Aggregate Prize Winner. His service afloat includes experience on destroyers, mine counter measures vessels, and aircraft carriers. During a deployment to Vietnam waters as navigating officer and operations officer in HMAS Brisbane, he was mentioned in dispatches. He later commanded HMAS Vampire and the Third Australian Destroyer Squadron. Vice Admiral Taylor served as Assistant Chief of the Defence Force (Operations) and Deputy Chief of Naval Staff before being appointed Chief of Naval Staff in March 1994.

LIEUTENANT GENERAL JOHN SANDERSON graduated as an engineer from the Royal Military College, Duntroon, in 1961. Regimental assignments included active service with construction squadrons in East Malaysia and Vietnam. Senior staff appointments included Assistant Chief of the Defence Force (Policy) and (Development); in the latter post he contributed to the first Defence Force Structure Review. In March 1992 General Sanderson was appointed Commander of the Military Component of the United Nations Transitional Authority in Cambodia. Returning to Australia in October 1993, he became Commander Joint Forces Australian. General Sanderson assumed his present post of Chief of the General Staff in July 1995.

DR ALAN GROPMAN is a professor of history at the Industrial College of the Armed Forces, National Defence University, Washington DC. He teaches courses in the Strategy and Resources Departments and mentors research. He is the book review editor for *Air Power History* and a member of the editorial board for *Joint Forces Quarterly*. A retired USAF colonel whose military career included two tours in Vietnam, Dr Gropman was awarded his doctorate from Tufts University in 1975 and has published extensively on air power, strategy and military history.

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DR BENJAMIN S. LAMBETH is a senior staff member with the Rand Corporation in Los Angeles. A graduate of Georgetown and Harvard Universities, his main research interests lie in the areas of international security affairs and Russian defence policy. Dr Lambeth also is a specialist in air power and has undertaken extensive analysis of tactical fighter operations, training and force development. In pursuit of that specialisation he has flown over thirty different fighter, attack and jet trainer aircraft. In December 1989 he became the first American citizen to fly the Soviet MiG-29 fighter. He has since flown the Su-27, MiG-23 and MiG-21 in Russia.

GENERAL THOMAS S. MOORMAN is Vice Chief of Staff, Headquarters, United States Air Force. General Moorman has served in a variety of intelligence and reconnaissance related positions within the United States and worldwide. He was involved in planning and organising the establishment of Air Force Space Command; and also provided program management direction for the development and procurement of Air Force surveillance, communications, navigation and weather satellites; space launch vehicles; anti-satellite weapons; ground-based and airborne strategic radars; and communications and command centres. He represented the USAF in the Strategic Defence Initiative program. General Moorman has served as commander and vice commander of Air Force Space Command.

AIR CHIEF MARSHAL SIR PATRICK HINE has been Military Adviser to British Aerospace and a director of British Aerospace Defence since January 1992. Throughout his RAF career, Sir Patrick flew fighters, from Meteors through to Harriers. Prior to his retirement from the RAF he was Commander-in-Chief of (Nato's) United Kingdom Air Forces and AOC of the RAF's Strike Command. Air Chief Marshal Hine was Joint Commander of all British forces involved in the Gulf Crisis and War.

MR PETER SMITH is a graduate of the University of Sydney in aeronautical engineering and economics. He has been associated with the Australian defence and aerospace industry for thirty years. He is an enthusiastic proponent for an international and regional role for Australian industry, in addition to its traditional role of contributing to national technology and self-reliance.

PROFESSOR MARTIN VAN CREVELD teaches history at the Hebrew University of Jerusalem. An internationally renowned expert on military history and strategy, he has consulted to the defence establishments of the USA, Canada and Sweden, as well as teaching and lecturing at centres of military and strategic learning all over the Western world. Of his ten books, the most important are *Supplying War* (1978), *Fighting Power* (1982), *Command in War* (1985), *Technology and War* (1988) and *The Transformation of War* (1991). He is currently completing a volume titled *The Rise and Fall of the State.*

AIR VICE-MARSHAL DAVID ROGERS joined the RAAF in 1962 and flew fighters in Malaysia, Singapore and Ubon. He saw active service in Labuan during Confrontation. He was one of the initial F-111 pilots in 1968, an association which eventually lasted twenty-six years and included tours as a squadron commander and as Commander of the Strike Reconnaissance Group. Senior staff appointments have included Senior National Representative on the F/A-18 project; Director-General Air Warfare, Policy

and Plans; and head of the team which developed the plan 'RAAF 2000'. Air Vice-Marshal Rogers was appointed DCAS in November 1994.

AIR VICE-MARSHAL PETER NICHOLSON became Air Commander Australia in April 1996. The first RAAF officer to command Northern Command in 1992 and the inaugural commander of RAAF Base Tindal in 1988, he also has extensive flying experience on fighter aircraft and as a test pilot. He is a graduate of the RAAF Staff College, the USAF Air War College and the National Defence College of Canada.

ABBREVIATIONS

AAA	Anti-Aircraft Artillery
ABM	Anti-Ballistic Missile
ADEX	Air Defence Exercise
ADF	Australian Defence Force
AEW&C	Airborne Early Warning and Control
AFB	Air Force Base
AFC	Australian Flying Corps
AII	Australian Industry Involvement
AMRAAM	Advanced Medium Range Air-to Air Missile
Anzus	Australia, New Zealand and United States
AOC	Air Officer Commanding
APEC	Asia-Pacific Economic Cooperation (forum)
ARDU	Aircraft Research and Development Unit
ARF	ASEAN Regional Forum
ARL	Aeronautical Research Laboratory
ASEAN	Association of Southeast Asian Nations
ASTA	Aerospace Technologies of Australia
ASW	Anti-Submarine Warfare
AUP	Avionics Update Program
AWACS	Airborne Warning and Control System
AWADI	AWA Defence Industries
BAe	British Aerospace
BVR	Beyond Visual Range
C^3	Command Control and Communications
C^3I	Command, Control, Communications and Intelligence
C^4I	Command, Control, Communications, Computers and Intelligence
CAC	Commonwealth Aircraft Corporation
CAP	Combat Air Patrol
CAS	Chief of the Air Staff
CDF	Chief of the Defence Force
CEO	Chief Executive Officer
CGS	Chief of the General Staff
CINC	Commander in Chief
CNN	Cable News Network
CNS	Chief of Naval Staff
COPWIN	Cooperation With Industry
COS	Chief of Staff
CSBM	Confidence and Security Building Measure
CSIR	Council for Scientific and Industrial Research
CSP	Commercial Support Program
DA94	Defending Australia 1994
dH	de Havilland
DSP	Defence Support Program
DSTO	Defence Science and Technology Organisation

EEZ	Exclusive Economic Zone
EHF	Extremely High Frequency
EM	Electromagnetic
EMP	Electromagnetic Pulse
ESM	Electronic Support Measures
FPDA	Five Power Defence Arrangements
GAF	Government Aircraft Factory
GDP	Gross Domestic Product
GPS	Global Positioning System
GSE	Ground Support Equipment
HQ	Headquarters
IAC	Industries Assistance Commission
IADS	Integrated Air Defence System
IAF	Israeli Air Force
ICBM	Inter Continental Ballistic Missile
IFF	Identification Friend or Foe
ISR	Intelligence, Surveillance and Reconnaissance
JDAM	Joint Direct Attack Munition
JFACC	Joint Force Air Component Commander
JSF	Joint Strike Fighter
JSTARS	Joint Surveillance, Target and Reconnaissance System
JTIDS	Joint Tactical Information Distribution System
LANTIRN	Low Altitude Navigation and Targeting Infra Red System for Night
LOAC	Law of Armed Conflict
LRMP	Long Range Maritime Patrol
MEADS	Medium Extended Air Defence System
MHQ	Maritime Headquarters
MRV	Multiple Re-entry Vehicles
Nato	North Atlantic Treaty Organisation
NCO	Non Commissioned officer
NM	Nautical Mile
OCR	Officer Category Review
OOTW	Operations Other Than War
OTHR	Over-the Horizon Radar
OUE	Operational Utility Evaluation
PLO	Palestine Liberation Organisation
PMB	Program Management and Budgeting
R&D	Research and Development
RAAF	Royal Australian Air Force
RAF	Royal Air Force
RAN	Royal Australian Navy
RDM	Revolution in Defence Management
RMA	Revolution in Military Affairs
RN	Royal Navy
ROE	Rules of Engagement
SAC	Strategic Air Command
SAM	Surface-to-Air Missile
SAR	Search and Rescue

SEATO	Southeast Asia Treaty Organisation
SHF	Super High Frequency
SWAPO	Southwest Africa People's Organisation
TAC	Tactical Air Control
TACAN	Tactical Air Navigation
THAAD	Theatre High Altitude Area Defence
UAV	Unmanned Aerial Vehicle
UCAV	Uninhabited Combat Aerial Vehicle
UHF	Ultra High Frequency
UK	United Kingdom
UN	United Nations
URAV	Uninhabited Reconnaissance Air Vehicle
US	United States
USAF	United States Air Force
USAFE	United States Armed Forces Europe
USSR	Union of Soviet Socialist Republics
ZOPFAN	Zone of Peace, Freedom and Neutrality

OPENING ADDRESS

AIR MARSHAL L.B. FISHER

Minister for Defence, visiting Chiefs of Staff, distinguished guests, ladies and gentlemen. It's my great pleasure as Chief of the Air Staff to welcome you to the Royal Australian Air Force's 75th Anniversary Conference. The RAAF is honoured by your presence.

I'd particularly like to express my appreciation, firstly, to the many senior officers who have travelled from overseas to be here; and secondly, to the eminent speakers who in the course of the next two and a half days will review, analyse and, I am sure, challenge the place of air power in the defence of Australia.

I should also like to acknowledge the contribution of the principal sponsors of the Anniversary activities: British Aerospace Australia; McDonnell Douglas; Ansett Australia; and Lockheed Martin. The RAAF has appreciated both the material support of those firms and the spirit in which it has been given.

Let me comment briefly on the conference.

Reaching a seventy-fifth anniversary is a notable achievement for an air force - it's a period which, after all, amounts to more than three-quarters of the total history of powered flight. We have every right to be proud of the achievements of the RAAF in peace and war. As Chief of the Air Staff I am personally proud to stand here today as a successor to such great names in our history as Williams, Hardman, McCauley and Scherger.

But I am certain that those leaders, like the majority of the tens of thousands of men and women who have worn the blue uniform, would not want us to spend our time here mythologising the past. Rather, I believe that they would want us to draw what we can from the Air Force's experience to better prepare our service for future challenges.

In other words, this conference is not an occasion for self-congratulation, it's an occasion for hard work and for looking forward, not back.

That objective is evident in the title we have selected: 'New Era Security: The Royal Australian Air Force in the Next Twenty-five Years'.

The term 'New Era' defines a range of complex and difficult challenges. For example, internationally respected commentators like Martin van Creveld and Samuel Huntington have suggested that the dominant model of conflict for the past three hundred and fifty years - large scale war between sovereign states - is in the process of being replaced by 'low intensity conflict' between essentially tribally-based groups or by a 'clash of civilisations'.

For three-quarters of a century the RAAF has been shaped and trained primarily to conduct the former. How much weight should we place on those provocative post-Cold War theories of conflict?

And to what extent should RAAF planners seek to accommodate such recent phenomena as the so-called 'revolution in military affairs', or operations other than war, or peace operations?

While you, the delegates to this conference, are examining those kinds of ideas, I would like to remind you not to forget the powerful connection which exists in air forces between ideas and technology.

In that context, I would point out that, on present indications, the RAAF's two most important combat aircraft, the F-111 and the F/A-18, will be approaching obsolescence in 2010. What kinds of weapons systems should we be considering as possible replacements, always bearing in mind Australia's special geostrategic circumstances?

And what place will there be in the RAAF of 2010 to 2025 for such technologies as unmanned aerial vehicles, the exploitation of space, information dominance, and so on?

Sensible judgments on all of those difficult questions are possible without indulging in pointless futurology. For example, any new combat aircraft the Air Force might be operating twenty years from now is either already flying or on the drawing boards.

And any revolution in military affairs will be characterised, not by 'Star Trek' concepts, but by information dominance (that is, intelligence, surveillance and reconnaissance; and command, control, communications and computers) and precision weapons. The RAAF of 2020 will probably look much as it does today, but it will do things very differently.

This conference thus has two main objectives.

The first is to discuss and, ideally, improve the ways in which the RAAF can contribute to ADF operations in accordance with Government policy; while the second is to identify sensible concepts and measures which will ensure that the RAAF continues to make a positive contribution to national and regional security in the coming quarter century.

In that spirit, I urge everyone present to participate energetically in the proceedings of the next two and a half days; to take full advantage during the question and answer sessions of the presence of so many distinguished international and Australian military leaders and strategic scholars.

In welcoming you to what is an important occasion for the Royal Australian Air Force, I'd simply like to say: Let's all of us make the most of this unique opportunity.

DEFENCE CHALLENGES IN NEW ERA SECURITY

HON I.M. MCLACHLAN

This is an important conference marking an important event - the seventy-fifth anniversary of the Royal Australian Air Force.

I am delighted to see such a large attendance at this forum and, in particular, to welcome those of you from the air forces of our friends and allies.

At a time when the RAAF has been looking back over its impressive and, by air power standards, its long history, I commend Air Marshal Les Fisher for giving this conference such a forward-looking charter.

We can learn a lot from history, of course, but in an age of massive change we cannot afford to become reliant on out-dated ways of thinking.

THE CHALLENGE TO MANAGE CHANGE

I believe that the Australian Defence Force faces two stern tests over the next few years, and I would like to talk about them in turn.

The first challenge is to manage fundamental changes taking place in technology and warfare. I would like to raise with you the phenomena people are calling the 'Revolution in Military Affairs'.

The second challenge parallels and to some extent, drives the first: For want of a better term we need to think about a Revolution in Defence Management.

The way we manage equipment acquisition; the way we manage people's careers; the planning we make in every area from how we fight to how we feed our people - all these processes need to be revised in the light of the technological and management changes the world has seen in the last decade.

Defence cannot allow itself to become complacent in the face of the enormous changes sweeping through society and sweeping through the region in which we live.

Our task is to become the master of change rather than its servant. Change, be it in technology or in the way we manage and organise ourselves, is something which the Australian Defence Force needs to drive.

Both of these developments need to be managed at a time of budget constraint and in a period, thankfully, of extended peace.

THE REVOLUTION IN MILITARY AFFAIRS

Let me return to my first point which is about the Revolution in Military Affairs (the 'RMA') and the implication this has for the acquisition of new technology in the Australian Defence Force.

Whatever you think about the 'theology' surrounding this revolution, there is no doubt that changes in technology - especially information technology - are having profound effects on the way countries will be able to wage war.

Over time, these effects will have as profound an impact on military organisations as the introduction of the internal combustion engine did in the first decade of this century.

To the layman, the Revolution in Military Affairs was epitomised by the amazing film footage we saw on CNN of precision air and cruise missile strikes against Iraqi forces during the Gulf War.

The increasing accuracy and lethality of weapons; the vast distances over which this force can be projected; the speed of information processing and computing power; the growing capacities to gather intelligence - these are basic elements of the Revolution in Military Affairs.

If you look at each of these developments individually, none of them could be said to be particularly revolutionary. But in combination, these technologies point to a fundamentally different style of warfare. A warfare where there is no real distinction between front lines and rear areas; where distance offers no protection; where if a target can be found it can be destroyed; where the most precious military commodity will be information and the most deadly military weapon will be speed.

My impression is that all of us, Defence professionals and politicians alike, are only just starting to realise the full implications of the Revolution in Military Affairs.

Some of the implications may be discomforting to people who are too closely attached to traditional ways of thinking about defence. But if we are to stay ahead of the game, we need to gear our thinking to the prospect that the Revolution in Military Affairs will fundamentally change the structure of the Defence Force.

We must be prepared to move down the Revolution in Military Affairs road if that is what is needed to increase our miliary capabilities.

AN EXAMPLE - UNMANNED AERIAL VEHICLES

For example - and I use this only as an example - what role will unmanned aerial vehicles (UAV) have in the air forces of tomorrow?

We have seen that unmanned aerial vehicles played a large role in supporting Nato operations in Bosnia. And there is every reason to believe that UAVs have the potential to take on more and more roles which presently are performed by manned aircraft.

For that very reason I imagine that the air forces of the world look on unmanned aerial vehicles as a mixed blessing. But it is clear that they represent a capability which has to be thought through.

At present their main roles are in surveillance and intelligence gathering but it may be that these platforms take on some of the roles of manned fighter aircraft.

Compared to modern fighter aircraft, UAVs are smaller, cost less, are easier to train people to use, and in the end are dispensable once their aim has been achieved.

These factors make UAVs good to have and dangerous to defend against. Commanders will be willing to send them to areas which would be considered too dangerous or too far away to use piloted aircraft.

It will take some time for military organisations to think through the roles and capabilities which unmanned aerial vehicles offer.

But UAVs are just one example of the types of capabilities being thrown up by the Revolution in Military Affairs.

Flexibility is needed to recognise the potential which these new capabilities bring, and to think about the most effective way of linking these systems to what we already have.

In some cases new capabilities - or more efficient and different ways of delivering combat power - will challenge existing orthodoxies about how things should be run. That is fine - so long as we are thinking about the implications.

This will be true for all three services, not just the Air Force. But in every case we should approach the revolution in military affairs with a willingness to challenge accepted practices and an open mind about the need to rethink the types of skills and combat capabilities in the Defence Force.

THE UNITED STATES AND THE REVOLUTION IN MILITARY AFFAIRS

In a few days I will be going to the United States, and one of the aims of this trip will be to talk to my American colleagues about how they are dealing with the revolution in military affairs.

The United States remains an important source of military technology for Australia, but this cooperation is far from being a one-way street.

The Australian Defence Force has had a lot of experience in adapting aircraft to suit Australian conditions and in extending their effective life. As the United States learns to deal with a shrinking defence budget while the unit-cost of aircraft and other platforms increases, we will be able to offer the US a perspective on how we dealt with these problems.

Another point for discussion is that, as the United States adopts RMA technologies, this will have an impact on interoperability with the Australian military.

For Australia this presents a complex problem. We have our own force priorities and our own special operating conditions. We also have a limited budget - unlikely to increase in the near future - meaning we must be careful to pick only those parts of RMA technology that address our needs.

However, keeping the closest operating partnership with the United States is an important goal, and one which strengthens our ability to work together.

I am looking forward to discussing these issues with Defence Secretary Perry and his colleagues in Washington and in Honolulu.

RMA AND THE REGION

Of course our friends and allies in the Asia-Pacific region are also working out how to respond to these technical challenges.

As countries modernise their armed forces, we are seeing an expansion of military capabilities. There is no great mystery about this, it is simply a fact that modern military equipment is so much more powerful than earlier generations of combat systems.

There are potential costs and benefits from this process.

The potential cost is that, should a conflict ever emerge in the Asia-Pacific, for example on the Korean peninsula or in the Taiwan Straits, such a conflict could be enormously destructive of lives and property.

That only reinforces the need to promote security cooperation as a way of building trust and confidence between the countries in the region.

The potential benefit from the region's defence modernisation is that opportunities for cooperation will increase.

The Australian Defence Force is respected in the region for being a competent, technologically sophisticated military. Countries are interested in exercising and training with us precisely because of our professionalism.

Such cooperation underlines the fact that our security is intimately tied to the security of the region. Our defence interests are promoted by the cooperative things we do to strengthen Asia-Pacific peace and stability.

Security in the region means peace in Australia.

The direct defence of Australian territory will always remain a core business, but it would literally be self-defeating if we allowed this to be the only focus of our defence activities.

THE REVOLUTION IN DEFENCE MANAGEMENT

The second fundamental challenge faced by the Defence Force is to bring about an internal revolution in defence management.

Many of you will be familiar with the writings of the American defence commentator Eliot Cohen. In his article in the April 1996 issue of *Foreign Affairs*, called 'A Revolution in Warfare', Cohen compares the structures of large companies, like General Motors, with defence forces.

In the 1950s, Cohen says, the administrative structures of large American companies and the US military looked quite similar. Both were shaped like a pyramid, with small units reporting up to progressively smaller numbers of larger organisations.

In the 1990s, organisations like Microsoft, Motorola, Asian car companies and hundreds of others have changed enormously. Layers of middle management have been reduced, distinctions between management and labour have been blurred, compensation systems and tenure arrangements have changed.

There have been no equivalent large scale changes in the way the Australian Defence Force has been structured.

Now Cohen knows, and I also know that one should not push this analogy too far, defence forces are not companies, they have different purposes and aims. They are not strictly comparable.

But like companies, defence forces need to continuously review their management and be on the alert against inefficiencies and the growth of activities that do not contribute to core functions.

Change of this order is not simply about making savings through trimming each budget area - although at times that strategy is necessary and I acknowledge that Defence is currently doing this to redirect more resources into combat forces.

More fundamental change is possible only by examining the culture of an organisation - looking at basic work practices and asking if they are still relevant to present day needs.

This is not just a matter of having another restructure. Often organisations go about changing their structures as a way of avoiding - rather than addressing - the need for more fundamental changes of attitude and work culture.

For us the focus needs to be on squeezing the maximum amount of military capability out of our budget. Doing that means avoiding turf-battles over who controls what, and instead taking a hard look at how we in the organisation operate.

Just as the key revolution in military affairs technologies are known to us, so too are the driving forces in the Revolution in Defence Management. They include promoting more comprehensive joint service approaches.

While the services will remain separate organisations, it is impossible to imagine future conflict being anything other than a joint force activity. But jointery is

not something which should apply only to combat forces. There are non-combat support and combat support areas which need to promote more joint activities as well.

A second area which will impact on defence management is commercialisation of support functions. I have acknowledged that useful gains have been made through the Commercial Support Program - not least the growth of a widespread acceptance in Defence that the program is necessary.

But there is a long way to go. Five years after the program was introduced it has achieved annual savings of a little over one per cent of the Defence budget - around $116 million a year at present. That is important but slow progress.

CSP needs to move faster and more comprehensively if it is going to free the savings we need to adopt the RMA technologies of tomorrow.

More generally we need to address ways to streamline management both in the services and the civilian Defence bureaucracy.

THE RMA/RDM LINK

Let me sum up by saying that the Revolution in Military Affairs and the Revolution in Defence Management are two sides of the same coin.

In both cases they are about maximising military capability.

The Howard Government chose for very sensible strategic reasons not to cut defence spending. But this does not mean that Defence is immune from the need to review its internal structures and to come up with significant improvements. If anything it increases our obligation to take a hard look at how Defence does business and how we are going to pay for the process.

The need to re-think how we in Defence approach our fundamental task of promoting Australian security is a need made more urgent because of the speed of technological and strategic change.

There is an urgent requirement to look again at how we spend our resources, because it is by using these resources in more clever and innovative ways that we will be able to strengthen our combat capability.

CONCLUSION

I will conclude by saying that I have the greatest confidence that the Defence Force will meet the challenges of the Revolution in Military Affairs and the Defence Management Revolution with the same 'can do' spirit that has been a hallmark of our military since before Federation and of the Air Force since 1921.

We have in the services and the civilian Defence bureaucracy an organisation whose capacity to adapt to new challenges is among the best in the world. We have seen that on many occasions when our forces have been called to serve in military conflicts.

The speed with which we responded to the Gulf War and in recent peacekeeping operations shows a level of flexibility and resilience which has kept the forces at the cutting edge of technological change.

But we need to work hard to make sure we can do these things even more effectively.

In this the seventy-fifth year of the Royal Australian Air Force, we can look back on a history of successfully managing technological change.

The RAAF has, with justification, prided itself in being a high-technology force and one respected by our allies and friends in the region.

That emphasis on maintaining high-technology will continue in the new security era.

It is also our responsibility to make service in the Defence Force rewarding, exciting and vital for those involved in the business of defending our national interests.

This is an exciting period of change in which being a member of the ADF or a Defence civilian will bring challenges and benefits.

I congratulate the RAAF for its achievements over the last three-quarters of a century. I trust you will find this conference a stimulating experience from which to design the next seventy-five years.

SWIFT INTUITION: IDEAS, STRATEGY AND DOCTRINE IN THE ROYAL AUSTRALIAN AIR FORCE

ALAN STEPHENS

Writing almost seventy years ago the great Italian military theorist Giulio Douhet claimed that the war in the air is the true war of movement, in which swift intuition, swifter decision and even swifter execution are needed.[1] General Douhet believed that, unlike land and sea warfare, the art of aerial warfare had not been standardised; that there was great scope for ingenuity in developing ideas, strategy and doctrine; and that air forces would be shaped by 'bold' intellectual deeds.

Douhet's work has enjoyed something of a renaissance in recent years, with a number of commentators suggesting that the 1991 Gulf War vindicated his unqualified belief in the eventual dominance of the air weapon. In the age of joint warfare that is, of course, a politically incorrect thought and so will receive no further attention in this paper.

But the essence of General Douhet's argument regarding the nature of ideas in air forces is an entirely appropriate starting point for an examination of the RAAF's intellectual foundations. Two observations are pertinent. First, any organisation can only be as good as its ideas. No better example of that truism can be found than the military forces of Saddam Hussein. Immensely powerful in terms of numbers and hardware, those forces were defeated as much by the Coalition's ideas, strategy and doctrine as they were by technology. Second, and perhaps more intriguing, is Douhet's suggestion that air fighting is an intuitive business, in which successful practitioners presumably will 'feel' rather than necessarily 'know' what is right. At the level of combat flying there is probably a deal of truth in that proposition, although the implication that a pilot's innate skills are more important than the years of training that go into his preparation has been questionable since at least the 1930s. At the level of building an air force to deliver air power in its fullest sense, the proposition is not only questionable but intellectually dangerous. Yet it is fair to say that in some air force quarters, for many years the ability to fly an aeroplane was equated with the ability to understand and apply air power. Clearly, that has not been and is not the case.

In examining ideas, strategy and doctrine in the RAAF, this essay moves without differentiation between the tactical, operational and strategic levels of organisational activities. The common thread is not so much the nature of those activities, but rather the quality of their logic.

A CONCEPT OF OPERATIONS

For most of the years since its formation in 1921 the RAAF has subscribed to a basic concept of operations for the defence of Australia with remarkable consistency. The persistence with which that concept has been held represents no mean achievement given that, during its formative years, the RAAF existed in a politically hostile

[1] Giulio Douhet, 'Probable Aspects of Future War' in *The Command of the Air* (trans D. Ferrari), Office of Air Force History, Washington, 1983, p 206. 'Probable Aspects ...' was first published in 1928.

environment which must have made independent thought difficult. The Air Force was, after all, established against the express wishes of the Army and Navy, and until the start of World War II was explicitly subordinated to the other services, its primary tasks being fleet and field force support.

Australian defence planning throughout those years centred on the Singapore strategy. Under that strategy Australian forces were expected to deal independently only with small local raids. Should a major threat materialise, the Royal Navy would appear over the horizon, sailing to our rescue from the allegedly impregnable island fortress of Singapore. That was the theory, anyway. Reservations about the Singapore strategy were occasionally expressed, with some officials questioning Great Britain's capacity to dispatch a substantial fleet to the Far East should the mother country be fighting a war in two theatres simultaneously.[2] In general, however, the concept, with its emphasis on the fleet, dominated Australian defence planning. Because naval power was the basis of our strategic thinking about sixty per cent of all defence spending went on the RAN. By contrast, for the first ten years of its existence the RAAF struggled along with less than ten per cent of the defence budget.

Despite that singularly unfavourable environment - or perhaps because of it - a distinctive and innovative operational concept for the defence of Australia was developed within the Air Force. Unlike the Singapore strategy, that concept was based on a belief in self-reliance and a clear-minded understanding of Australia's strategic geography. It turned on the natural defensive barrier which surrounds our island continent, the air/sea gap.

The RAAF's first chief of staff, the waspish, pedantic but intelligent and capable Group Captain Richard Williams, returned to Australia early in 1925 after a lengthy period in England attending staff courses. Perturbed by the sorry state of his service, Williams set about preparing a detailed force development plan based on a concept for the defence of Australia. Accepting that there was a degree of self-interest involved, Williams' analysis of Australia's essential defence needs was nevertheless strategically sound and technically feasible.[3]

The lack of support for the Air Force was, Williams argued, inconsistent with developments in warfare. While geography and moderate aircraft performance combined to make the then-topical theory of bombing an enemy's homeland impracticable for Australia, air power could still provide the key to national security through control of our sea lines of communication. In a neat argument, Williams suggested that the main justification for maintaining an army and navy was to prevent an enemy from occupying 'part or parts' of Australia, yet that was an outlook which more than any other demanded the use of aircraft. Command of the sea would be a prerequisite for any invasion. In view of Australia's immense problems of distance, small population and limited infrastructure, the other two services could never be expected to provide the necessary level of security against invasion. Aircraft, with their speed, range, and reconnaissance and striking power, provided the obvious response. It was also reasonable to assume, Williams continued, that no enemy could expect to secure a lodgment on the continent without first establishing air superiority, and fighter aircraft were the best means of defence against air attack. Each of those points was

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[2] For examinations of Australian defence policy and the Singapore strategy, see John McCarthy, *Australia and Imperial Defence 1918-39*, UQP, St Lucia, 1976; and D.M. Horner, *High Command*, Allen and Unwin, North Sydney, 1982, pp 1-15.

[3] Memorandum Regarding the Air Defence of Australia, RAAF HQ, 21-4-25, RAAF Historical Section (RHS).

illustrated with examples and detail. While the CAS was not overtly putting the case for or against the Singapore strategy, it is noteworthy that his plan was relevant to defence against both raids and invasion.

There was no prevarication regarding which countries might threaten Australia. In listing the numbers of aircraft the RAAF needed, Williams based his calculations on Japan's naval air strength. An appendix to his paper showed that by 1928 Japan would be able to operate between one hundred and thirty to one hundred and fifty aircraft from ships, and that eighty to one hundred of those machines would be fighters whose objective would be 'to obtain superiority in the air'. After taking into account the needs of training, reserve aircraft and the wide dispersion of vital areas to be defended, Williams proposed a force structure of thirty squadrons and three hundred and twenty-four aircraft. Special emphasis was placed on the attack force, which was described as the component of an air force most relevant to Australia's needs.

If implemented over nine years Williams' plan would have involved an annual expenditure of about two million pounds, a four-fold increase over the RAAF's existing average yearly estimate. Nevertheless, it is worth noting that the annual RAN estimate for that period averaged about 2.8 million pounds and the total annual defence vote was about five million pounds.[4]

The CAS's plan was ignored by his senior military colleagues and the government, none of whom apparently was impressed by his inference that Australia should substitute air power for sea power.

Three years later Williams' concept resurfaced, this time following a review of the RAAF by an RAF officer, Air Marshal Sir John Salmond. In passing, and with no reflection on Salmond, it is instructive that the Australian Government felt compelled to invite a British officer to conduct that review. The fact was that as inhabitants of an isolated and very small European outpost, Australian officials often demonstrated an excessively dependent, even timid, strategic outlook.

At the time of Salmond's review the RAAF's total flying strength consisted of two squadrons, one flight and a training school. Even worse, that pitiful strength largely comprised citizen force - that is, non-professional - personnel. Salmond's analysis of the RAAF was astute.[5] He proposed three measures to raise professionalism: increase post-graduate training; establish an Air Force officer college; and replace part-time people with permanent forces. Turning to Australia's strategic circumstances, Sir John saw two feasible responses to the primary task of protecting vital areas around the continent. The first was to secure those areas with garrisons, an option he rejected on the grounds of expense and inflexibility. Instead, he argued that Australia should employ as its primary defensive weapon 'that arm which possesses the greatest mobility, namely Air Forces'. Where feasible, air power could be supplemented by other means of defence 'as and when their inferior degree of mobility makes them available'.

In terms of the future of national defence that was a momentous proposal. As a result of its request for an inquiry into the RAAF, to be conducted at the highest professional level, the government had been advised to substitute air power for sea and land power as its prime combat force in the defence of Australia.

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[4] *ibid,* esp. Appendices I, V and VI. Between 1924/25 and 1928/29 the average annual RAAF estimate was £450,000.

[5] CRS A5954, Box 877, Australian Archives (AA). See also McCarthy, *op. cit.*, pp 67-75; and C.D. Coulthard-Clark, *The Third Brother*, Allen and Unwin, North Sydney, 1991, pp 98-103.

Not surprisingly the other services were unimpressed, with Army in particular presenting a detailed response which among other things examined the place of air warfare in Australia's strategic outlook.[6] Army accepted mechanisation as a means of increasing firepower and efficiency but was sceptical about the extent of those benefits and Australia's capacity to support 'mechanical forces'. More specifically, the Military Board asserted that, given the fighting, administrative and industrial effort needed to sustain an air force, the firepower it was able to generate was not cost-effective. Criticism was also made of the concept of fighting in the air/sea gap, with army strategists, presumably influenced by Clausewitzian notions of warfare, insisting that an enemy's main objective would be the destruction of Australia's armed forces, an aim which could only be achieved by bringing those forces to battle in some 'principle geographic place or area for which we should, by reason of its importance in our national life, be compelled to fight with all ... our main forces'. Thus, rather than giving priority to defending the gap, Army argued that precedence should go to mobile land forces which alone could be concentrated in sufficient strength to combat a massed invasion.

The Army's emphasis on mobile land forces was a curious argument from a service which, at the time, was interested in spending five million dollars - a fortune in those years - to set thirty-six large guns in cement at various ports around the Australian coast.[7]

Questions about the reliability and cost-effectiveness of aircraft were also raised. In fact, while long-range bombing attacks from Australia against foreign territories remained a dubious proposition, by 1928 great improvements had been made across the spectrum of aircraft performance, particularly in range and reliability. For example, that year Bert Hinkler had completed the first solo flight from England to Australia and Charles Kingsford-Smith and C.T.P. Ulm had flown across the Pacific. The capability now existed, at the least, for long-range strike operations against shipping in the gap.

And the odds were that those operations would succeed. Two years previously trials conducted by the Royal Navy had demonstrated the effectiveness of torpedo bombers against fleets. Indeed, Sir John Salmond referred to those trials in his report to the Australian Government:

> The ... results show that the aeroplane can claim a higher proportion of hits than any other kind of torpedo carrier ... It should not be assumed ... that this sort of attack will be invariably successful, but undoubtedly the menace is great, and, with a large explosive charge in the torpedo and higher performing aeroplanes, this menace will increase.[8]

The Military Board could protest, as it did, that the estimate of the 'menace' was based only on trials and not on experience during active service. Nevertheless, Salmond's source was the commander-in-chief of the RN's Mediterranean Fleet, and his assessment was based on the success enjoyed in exercises by the (British) Fleet Air Arm's torpedo bomber units over a lengthy period. The Royal Navy's assessment did not change over the years. In 1935, following exercises in the North Sea, it was still

[6] MP 153/18, AA (Victoria).
[7] McCarthy, *op. cit.*, p 70.
[8] CRS A5954, Box 877, AA.

concluded that 'Aeroplanes are certain to find and locate a hostile fleet ... [and] would probably inflict heavy losses'.[9] And as far as value for money was concerned, it seemed pertinent that at the end of the 1920s it was possible to buy one hundred and fifty-two bomber aircraft for the price of a single 10,000 ton cruiser.[10]

Salmond's review was accepted by the government but not acted upon. However, his work eventually served as the blueprint for the development of the RAAF in the mid-1930s when the threat of Japan could no longer be ignored. More than that, when the war in Europe made it impossible for Great Britain to deploy a fleet to Singapore to counter overt Japanese aggression in 1940, air power - albeit inadequate in both quantity and quality - was substituted for sea power when the RAAF was directed to send four squadrons to the island fortress.

The defeat of the axis powers between 1939 and 1945 was an immensely complex task, involving sacrifice, planning and administration on a monumental scale. Australian strategic planning was largely swept along by decisions taken in London and Washington. The dangers of that arrangement became all too evident when, during the early months of the Pacific war, there were genuine fears of a Japanese invasion. While those fears were justified at the time, in the event they proved to be more apparent than real. Two points should be made. First, when the staff officers at the Imperial General Headquarters in Tokyo did their sums they found that they would need twelve divisions and 'more shipping than Japan could provide' to cross the air/sea gap and make a lodgment in Australia.[11] Second, and at the risk of simplifying the epic events of World War II, if any single event were to be credited with guarding Australia from the direct threat of invasion it would be the battles of the Coral Sea and Midway in May/June 1942. As historians later recognised, those battles broke Japan's capability to project power. Like the Allied Air Forces' stunning victory in the Bismarck Sea in March 1943, Coral Sea and Midway dramatically demonstrated the logic of defending Australia in the air/sea gap.

For the first twenty-five years after World War II Australia's strategic posture was predicated on forward defence. It would be stretching the point to suggest that that posture amounted to defending the air/sea gap by another name, especially in relation to the Middle East, the region which briefly was Australia's main area of strategic interest. Perhaps, though, the suggestion has more substance in relation to the region where Australian forces spent most of that quarter-century, Southeast Asia; that is, on the other side of the air/sea gap. In fact the point is probably academic as Australian defence policy during those years was ineluctably tied to great and powerful friends and formal alliances which, it seemed, made the development of indigenous concepts of operations for the defence of Australia unnecessary.

All that changed at the start of the 1970s when President Nixon announced his Guam doctrine, informing America's allies they would have to assume greater responsibility for their own defence; Britain announced its intention to withdraw its military forces from east of Suez, formalising the end of Empire; and the American-led

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[9] See 'Night Torpedo Attacks Made on the Fleet', in *Aircraft*, 1-1-35, p 22.
[10] See 'RAAF Cinderella of the Services', in *Aircraft*, 1-8-31, pp 14-15.
[11] John Robertson, *Australia at War 1939-1945*, William Heinemann, Melbourne, 1981, p 104.

alliance lost the war in Indochina. Suddenly the development of a concept of operations for the defence of Australia by Australians seemed like a good idea.

The official Defence organisation's early efforts were often characterised by uncertainty and unstructured thinking; by contrast, outside official circles an influential and constructive role was played by a number of academics, notably Desmond Ball.[12] Within the Air Force, Sir Richard Williams' notion of exploiting the air/sea gap quickly resurfaced. The impetus came in the first instance from Air Commodore R.E. Frost; other important contributors included Group Captains K. Tongue, W. Connaughton and H.K. Parker. Frost had been frustrated by his experience with the Department of Defence's Plans and Policy branch in the early 1970s, when the 'core force' concept dominated thinking. Under that concept the Defence Force would consist of a range of 'core' capabilities which could be used as expansion bases if and when a need for more precise capabilities became evident. Frost used his year at the Royal College of Defence Studies in London in 1976 to develop a paper on a force structure methodology for Australia, which he later modified and circulated for discussion within the Air Force.

Frost's starting point was the enduring determinants of Australia's strategic circumstances as identified by Sir Richard Williams half a century previously: geography, population, infrastructure and economy. His paper identified four options for the defence of Australia: deterrence with conventional weapons; pre-emption; attrition; and repulsion. After assessing the relative merits of each Frost concluded that the quaintly named 'repulsion', which rested primarily on defending Australia in the air/sea gap, was the best option.[13]

Like the Williams strategy 'repulsion' was essentially defensive. It thus lacked that essential ingredient of air power, offensive action. The missing ingredient was added in 1977 by the RAAF's Chief of Operations and Plans, Air Vice-Marshal S.D. Evans. Like a number of his Air Force contemporaries Evans had become concerned by the policy vacuum into which the Defence Forces had drifted as a result of relying on others for decades and then being saddled with the intellectually stultifying core force concept. While Evans' strategic thinking also focused on the air/sea gap it did so from a perspective which reflected the full spectrum of air power capabilities. Thus, instead of 'repulsion', Evans proposed a strategy he described as 'anti-lodgment'. In his judgment Australia's meagre defence resources would make it difficult to dislodge an invading force; consequently, the *prevention* of a lodgment had to assume 'superseding importance'.[14] Exactly where an attempted lodgment would be 'prevented' was of course the key. In the RAAF's opinion, the best strategy would be one which deterred aggression, an outlook which demanded the capability to mount offensive strike operations. Specifically, under the anti-lodgment strategy, in the first instance an enemy should be defeated in his mounting and staging bases; if that were not possible then attacks should start during the transit of the air/sea gap.

The anti-lodgment strategy also flagged the significance of the island chain to the northwest of the continent, as the RAAF believed that any attack against Australia would probably come through those territories. That assessment was not related to any particular country but rather to the realities of geography.

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[12] For a summary of the process, see Alan Stephens, *Power Plus Attitude*, AGPS, Canberra, 1992, pp 163-65.

[13] DGOR-AF paper, Force Structure Derivation - An Alternative View, June 1977, p 4, Air Power Studies Centre (APSC).

[14] DAFP, DGOP folder 1944, RAAF Concept of Operations, September/October 1979, APSC.

The subsequent endorsement of the strategy by Chief of the Air Staff Air Marshal N.P. McNamara meant that for the first time in its history the RAAF had a formally approved plan of action for the defence of Australia.

The fundamental premises of the RAAF's concept of operations have been a feature of Australian higher defence planning for the past two decades. Air Marshal Williams may have been indulging in some inter-service opportunism when he first conceived of the anti-lodgment strategy seventy years ago, but the concept's enduring relevance suggests it has rested more on strategic logic than on Douhet's 'swift intuition'.

STRATEGIC AIRFIELDS

Reference was made at the start of this paper to the intellectual bankruptcy of Saddam Hussein's armed forces during the Gulf War. The same comment applies in reverse: just as large forces without good doctrine represent only half of the combat power equation, so too does good doctrine which is not supported by divisions, fleets and squadrons. Of all of the hardware the RAAF has had to acquire to give its military outlook credibility, two cast most light on the quality of Air Force thinking. The first is strategic airfields; the second is the force structure.

If any one location has been the epicentre of RAAF strategic planning it is Darwin. As our northern gateway Darwin has always been crucial for air defence and as the link between our mainland and overseas operations. Its significance was never more obvious than on 19 February 1942 when heavy Japanese air raids devastated our defence forces and exposed Australia's vulnerability. Continuing raids over subsequent months marked the low point of the RAAF's history. Yet curiously, for most of the Air Force's peacetime years there has never been a flying squadron stationed permanently in Darwin: it has been as a transit and exercise post that the base has earned its keep.

Immediately after World War II Darwin resumed its role as a transit post and it was almost a decade before the first serious attempt was made to develop the place. Air Marshal J.P.J. McCauley provided the impetus. During a tour of USAF Far East Air Forces bases the CAS had been impressed by the high standard of facilities he saw, facilities which enabled the bases to handle all aircraft in the USAF's inventory, current and planned. They were, McCauley observed, 'true strategic airfields'. The RAAF needed to follow that example and, as the only base in the north from which major operations could be mounted, Darwin was the logical place to start. McCauley wanted Darwin to become the 'main Australian base for war', both for operations on the mainland and deployments to Southeast Asia.[15]

No. 5 Airfield Construction Squadron had started work on a new main runway at Darwin in 1955 but not to the 'strategic' standards the CAS wanted. On his return to Australia McCauley convinced the government to spend the additional money needed to upgrade facilities.[16] Eventually an international standard runway with associated taxiways, hard-standing, operational readiness platforms, arming areas and technical and domestic buildings was completed.

Still that did not meet the RAAF's definition of a strategic facility. Air Force commanders wanted the flexibility to divert forces and avoid overcrowding, two deficiencies which had contributed to the disaster of February 1942; further, in a major

[15] Air Board Agendum 12902, 24-3-61, RHS.

[16] Air Marshal Sir John McCauley, Interview, 1973, TRC 121/48, National Library of Australia; Works for RAAF Darwin, August 1961, CRS A4940, C3385, AA.

war the capacity of a single airfield might not be adequate. Only a second airfield would provide the answer.

McCauley was succeeded as CAS in March 1957 by Air Marshal F.R.W. Scherger. More than anyone, Scherger appreciated the need for a system of modern, flexible and robust bases in the north. In February 1942, as a group captain, he had been in command at Darwin, and the experience had been salutary and chastening in the extreme. From then on he was committed to establishing a second major air base in the Darwin area. His appointment as CAS gave him the authority to pursue the cause, while his promotion to air chief marshal and chairman of the chiefs of staff committee in May 1961 enabled him to sustain the pressure at the highest levels for an unusually long period.

Scherger began pressing the government for a second major airfield in the Darwin area in 1959, and even before receiving a reply instructed No. 5 Airfield Construction Squadron to start stockpiling materials for the job.[17] His lobbying was successful and, after the usual delays, the former wartime airfield of Tindal was selected in May 1963.[18] Located eleven kilometres south of the town of Katherine and two hundred and fifty kilometres from Darwin, Tindal met the RAAF's main geographic and strategic criteria. It was sufficiently far inland to make enemy incursions difficult and reduce the worst effects of the tropical cyclones which often lashed the coast, while being sufficiently close to Darwin to form a mutually reinforcing connection.

Scherger conceived of Tindal as an 'Un-Manned Operational Base', later known as a 'bare base'. Facilities would be kept to a minimum and would consist only of high quality movement surfaces supported by essential infrastructure such as electricity and water. There would be almost no permanent buildings. In times of defence emergencies or exercises all other facilities and services would be moved in temporarily by air or truck. The concept was ideally suited to a small air force with a vast, largely under-populated and under-serviced continent to defend. Over the following thirty years Tindal was to provide the model for three more bare base airfields across the north of Australia, the last of which fittingly will be named RAAF Scherger.

Those bare bases today serve as the springboard for defence operations across the north of Australia. The fact that their existence owes more to the intuitive foresight and persistence of McCauley and Scherger than to any series of elegant defence reviews and white papers provides an interesting commentary on the relationship between strategy and infrastructure.

Force Structure - Fighters and Bombers

The same observation could be made about the relationship between strategy and force structure. Here, it might be argued that Air Force intuition is at its most passionate. The RAAF's most enduring doctrinal beliefs - namely, the importance of control of the air and offensive action - are entirely dependent on the force structure. 'Doctrinal belief' may in fact not be the correct term: perhaps air power article of faith would be more accurate. The point is a crucial one because that belief has not always been shared outside air forces, at least not with the same degree of fervour. By contrast, the

[17] Air Board Agenda 12814, 10-7-59; 12930, 8-10-62, RHS.

[18] Air Board Agendum 12997, 27-5-63, RHS. The base was named after Wing Commander A.R. Tindal, who was killed during the Japanese bombing raids on Darwin on 19 February 1942.

leaders of advanced air forces invariably have seen themselves and their organisations defined by the hardware and people who prosecute those roles: fighter and bomber aircraft, and fighter and bomber pilots. The RAAF has been no exception. As Chief of the Air Staff Air Marshal Sir Donald Hardman wrote in 1954, an air force without bombers 'isn't an air force', a conviction which was held just as strongly by his successors.[19]

Even before World War II when the RAAF's force structure was so pitiful as almost to defy rational analysis, its leaders were thoroughly imbued with the idea, first, of control of the air as the key to the prosecution of most other land, sea and air actions; and second, of then exploiting that control to make devastating strikes against the enemy.[20] In that instance there was a disconnect between theory and practice. In the absence of adequate government and Defence support to acquire the necessary hardware, Air Vice-Marshal Williams and his colleagues had to make do with so-called 'general purpose' aircraft. A general purpose aircraft was one which, while acquired primarily for the RAAF's endorsed roles of army and navy support, also - in theory at least - had sufficient performance to be effective in the preferred air force roles. At a time when the RAAF was operating Avro Ansons and Lockheed Hudsons the notion of general purpose aircraft bordered on wishful thinking. Nevertheless the basic concept was sound, as excellent versatile aircraft like the Beaufighter and Mosquito demonstrated during the Second World War. In recent times the concept has been more fully realised in the form of multi-role and multi-mission aircraft.

If the pre-war RAAF was too small for meaningful analysis, the wartime force provides an instructive model. When for the only time in our history the defence of Australian territory was a genuine concern, when national survival was at risk, when military necessity was the sole legitimate determinant of force structure, the RAAF's order of battle in the Southwest Pacific Area overwhelmingly emphasised air defence and strike aircraft (see Table 1). Of the planned seventy-three squadrons, fifty-one - that is, seventy per cent - were dedicated primarily to control of the air and offensive action.

After the war and once the turmoil of mass demobilisation had subsided the RAAF settled into a force structure of about sixteen operational squadrons, a number which it has since more or less maintained. Again, priority in numbers has gone to fighter and strike units, which almost invariably have accounted for over fifty per cent of the total, sometimes more.[21]

Whether the priority accorded to fighters and bombers has always represented the correct balance is a contentious issue. From the early 1950s onwards there have been occasional bitter disputes between the RAAF and the other services, particularly the Army, over a perceived Air Force unwillingness to provide adequate support for surface forces. Regrettably, too often the Army has been justified in its criticism. The RAAF's indifference to the Army's legitimate needs in the 1950s and 1960s represented a low point in inter-service relations. It was an unhappy episode which indicated that, at the time, too many senior RAAF officers held only a narrow

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[19] Quoted in Stephens, *Power Plus Attitude*, p 150.

[20] See Air Vice-Marshal H.N. Wrigley, 'Some Notes on Air Strategy', 'Precis of Lectures on Air Warfare' and 'Future Policy in the Air' in Alan Stephens and Brendan O'Loghlin (eds), *The Decisive Factor: Air Power Doctrine by Air Vice-Marshal H.N. Wrigley*, AGPS, Canberra, 1990, pp 29-134.

[21] Force structure considerations for the late-1940s can be found in Alan Stephens, *Going Solo: The Royal Australian Air Force 1946-1971*, AGPS, Canberra, 1995, pp 31-4; and for 1996 in RAAF, DAFP, *Air Force 1996*, March 1996, p 31.

understanding of their profession, an understanding in which fighter and strike operations were important and everything else was second-rate.

TABLE 1
The 73-Squadron Plan
February 1942

Role	*Squadrons*
Air Defence	24
Heavy Bomber	4
Dive Bomber	12
Reconnaissance/Torpedo Bomber	7
Reconnaissance/Bomber	4
Flying Boat	7
Fleet Cooperation	1
Army Cooperation	5
Transport	9
Total	*73*

Source: War Cabinet Agendum 113/1942, 22-2-42, RHS.

There is evidence to suggest that in the past decade RAAF thinking has acquired a fuller appreciation of air power. For example, and again using the force structure as an indicator, the Air Force currently has more fixed-wing transport squadrons on its order of battle than it does operational fighter and strike squadrons.[22] Similarly, through innovative modification programs, the F-111s which equip the strike squadrons and which are the centrepiece of operations in the air/sea gap, have become highly effective in a variety of surface support roles not contemplated when the aircraft were ordered as strategic bombers more than thirty years ago.

In fairness to those officers who promoted fighters and bombers above all else, the point should be made that, because of the priority Western airmen have given to control of the air and offensive action, for more than fifty years - a period which includes the end of World War II and the wars in Korea, Malaya and Vietnam - few Australian soldiers and sailors have been attacked by enemy aircraft; by contrast, their opponents have frequently been subjected to relentless and devastating strikes from the sky. Nevertheless, it is difficult to avoid the conclusion that the RAAF would have been better served had more of its leaders demonstrated a broader understanding of their profession.

LEADERSHIP AND EDUCATION

The fact is, leadership has sometimes been a troubled issue for the Air Force. Men who have excelled at the tactical level of command abound: Williams, Watt and Cobby if one includes the Australian Flying Corps; McCauley, Scherger, Bladin and Garing in

[22] *Air Force 1996*, p 31.

World War II; Cresswell and Susans in Korea, and so on - the list could be extended for pages.

On the other hand, throughout its seventy-five years the RAAF has yet to produce an outstanding operational-level commander (an observation which, it must be said, applies equally to the Navy and with a couple of notable exceptions to the Army). Donald Bennett, one of the great air leaders of World War II, would qualify, but while he earned his wings with the RAAF he won his reputation as a member of the RAF. Air Vice-Marshal Bill Bostock was by far the most experienced and successful leader the RAAF had at the operational level of war, but his considerable achievements in the Southwest Pacific Area were sadly wholly overshadowed by his epic and damaging fight with Air Vice-Marshal George Jones over the control of the RAAF.

Part of the problem seems to have been an inability to seize the moment, to play the political game skilfully and hard. In Europe during World War II and then later in Korea and Vietnam, the size and quality of the war-fighting contribution made by the RAAF warranted senior appointments onto RAF and USAF headquarters and command staffs. Yet only token appointments were made onto the staffs and none into worthwhile command positions. Robert O'Neill has described the RAAF's failure to secure senior assignments in Korea as 'perhaps the most serious defect' of Australia's involvement in the air war there;[23] his observation could be extended to include all major conflicts in which the RAAF has fought.

Some of the blame for that highly unsatisfactory outcome can be directed at the politicians: it was, after all, Prime Minister R.G. Menzies and Minister for Air J.V. Fairbairn who ceded operational control of Australian airmen in Europe to the RAF through the provisions of the Empire Air Training Scheme; and it was their Labor Government successors, John Curtin and Arthur Drakeford, who allowed the American Generals Douglas MacArthur and George Kenney to dominate RAAF activities in the Southwest Pacific. In the latter case, however, the RAAF's internecine brawling was equally at fault.

Presumably political factors have also played a part in the RAAF's failure to secure its statistical share of the most senior appointment in the Australian Defence Force. Since the office now known as chief of the defence force was established in 1958 there have been thirteen incumbents. Based solely on the average strengths of the three services the Air Force should have supplied at least four of those chiefs. In fact it has supplied two, compared to Army's seven and Navy's four. Given that the numbers involved are fairly small perhaps they merely indicate bad luck, that perhaps good candidates were not in the right place at the right time. Nevertheless, there is cause for reflection.

The quality of the RAAF's leadership, and therefore of its thinking, has been overwhelmingly dependent on one group. As Sergeant Jake Newham was told by a 'very senior officer' one night in the bar at Williamtown shortly after getting his wings, 'You're in the pilots' club now mate, and don't you forget it!'[24] The other services may find it difficult to appreciate the extent to which the Air Force has been and is dominated by its pilots, who comprise about twenty per cent of the officer corps.[25] That dominance far exceeds the status enjoyed by, say, infantry officers in the Army

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[23] Robert O'Neill, *Australia in the Korean War 1950-53, Vol II, Combat Operations*, Australian War Memorial, Canberra, 1985, pp 407-8.

[24] Quoted in Stephens, *Going Solo*, p 81.

[25] As at 1 May 1996 the total number of trained officers in the RAAF was 3197, of whom 671 were pilots. Information provided by Directorate of Manpower Planning and Control - Air Force.

and seaman officers in the Navy. It is noteworthy, for example, that the Army Engineer Corps has recently supplied two chiefs of the general staff and two chiefs of the defence force. By contrast, when engineer Air Marshal J.E. Rowland was appointed chief of the air staff in 1976 he was required to transfer to the General Duties Branch. And in any case Rowland was a de facto member of the pilots' club, having had a distinguished flying career on bombers in wartime and test flying in peacetime.

At one level it is difficult to dispute the prominence pilots have enjoyed. Air forces are fundamentally different to armies and navies as to date their warrior class has been restricted to a very small group, namely, those who fly. Combat and operational experience has been almost exclusively the preserve of that small group, which is why operational units almost invariably have been commanded by pilots. However, whether the extension of that operational-level dominance through to most other activities has served the RAAF well is another matter. It is an issue which is likely to come under increasing scrutiny as the RAAF contemplates a future in which unmanned aerial vehicles, information dominance, long-range missiles and the exploitation of space are likely to assume increasing importance.

If the place of the pilots' club in setting the standard for ideas and strategy in the Air Force is worthy of comment, so too is that of the RAAF's premier officer training establishment, the RAAF College/Academy.

Before World War II most RAAF officers came from one of four sources. They might have been former members of the Australian Flying Corps; seconded officers from the Army and Navy; short-service entrants and university graduates who were commissioned after completing flying training; or commissioned airman pilots. Consequently few if any had received training which was intrinsically 'air force'. It was in order to redress that shortcoming that in 1947 the air member for personnel, Air Commodore J.E. Hewitt, proposed the establishment of an Air Force College. If the RAAF were to continue to prosper, Hewitt wrote, it was essential to 'sow the seeds of service' as early as practicable, paying heed to the special technical requirements of an air force. 'It is almost a truism', he concluded, 'that the future RAAF can be no better than the Air Force College'.[26] The RAAF College opened its doors in 1948.

The college's syllabus provides a useful insight into the Air Board's view of the nature of their service. During the four-year course almost 2000 hours of classroom time were spent on physics, pure mathematics, calculus and applied mathematics, chemistry, electricity and radio, and practical applied physics. By contrast, only two hundred and thirty hours were allocated to history, the history of war, war studies and Imperial defence. It seems extraordinary that there was no formal, discrete course on air power: apparently any knowledge of the RAAF's fundamental business was to be acquired by intensive study of its technical components rather than its history and ideas. The RAAF was identifying itself as a narrow technocracy, as an organisation in which an understanding of the technicalities of aviation would create an intuitive understanding of the strategies of air warfare.

A review of the college's performance was conducted in 1955 following the graduation of No. 5 Course. The pass rate of sixty-one per cent was not especially pleasing and nor apparently was the general quality of the graduates. An attempt to assess the standard of the college's product was made by comparing the cadets with

[26] Air Board Agendum 6735, 23-8-45, RHS.

graduates from airmen aircrew schools. Results were analysed from courses which both groups had completed, including basic flying training, navigation, flying instruction, bombing instruction, operational conversions, weapons, fighter combat instruction and test flying. Performance in promotion exams was also reviewed. Disappointingly, the study concluded that the effort being put into the RAAF College was not justified by the overall results, as too many graduates performed below the average and displayed an 'unsatisfactory attitude' once they left Point Cook.[27] A graduate of No. 2 College Course, Air Vice-Marshal R.E. Frost, has argued with some justification that the review was less than objective and that there was little difference between the two groups.[28] Still, given the investment the cadets represented, the Air Force was surely entitled to expect more for its money than a standard of achievement equal to that of airmen aircrew.

Following that worrying review and against the background of the widely held belief that missiles would increasingly replace manned aircraft over the coming decades, in 1957 the air member for personnel, Air Vice-Marshal Scherger, suggested it was time for the RAAF to re-examine the education of its future leaders. Scherger felt that while manned aircraft were unlikely ever to disappear from air forces there would be a growing need for officers who understood both aircraft and guided missiles. His proposed solution was to give all RAAF College cadets a university education in technical disciplines.

That education started when the RAAF College became the RAAF Academy in 1961. Established as a college of Melbourne University, the Academy offered its cadets a science degree with a double major in physics. The highly specialised nature of that course must be questioned. The RAAF's hierarchy had shown some vision and courage in proposing a syllabus which would train their service's future leaders to command an air force they expected to be based on missiles and nuclear weapons. But whether that vision was correct and the courage well-placed was another matter. When British Defence Minister Duncan Sandys attracted world-wide attention in 1957 with his prediction of the imminent dominance of missiles accompanied by the demise of manned aircraft, his logic was reasonable. But by the turn of the decade Sandys' prognosis seemed much less prescient as it was already clear that manned aircraft were not about to fade away. No better example of the fallacy of Sandys' prediction could be found than the RAAF itself, which was embarking on its greatest-ever peacetime rearmament - with manned aircraft. In the decade after the RAAF Academy opened for business, the Hercules, P2V7 Neptune, Iroquois, Mirage, Caribou, Macchi and Orion all entered service in rapid succession and the F-111 was on order.

Yet the RAAF continued to offer its future leaders an exceptionally narrow tertiary education. Minister for Air Peter Howson could see the fundamental problem only a month after his appointment in 1964, noting in his diary that 'the university course at Point Cook needs a lot of revision. We don't need every General Duties officer to be a research physicist'.[29] That revision was never conducted and the RAAF Academy continued to offer only a single, highly specialised degree intended to train young men to command a missile air force. In other words, the RAAF's future executives were being educated to lead an air force which did not exist. That

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[27] Air Board Agendum 12605, 16-8-56, RHS. For a more detailed assessment of the RAAF College/Academy system see Stephens, *Going Solo*, pp 120-29.

[28] R.E. Frost, *RAAF College and Academy 1947-86*, RAAF, 1991, pp 35-8.

[29] Peter Howson, *The Life of Politics*, Viking, Ringwood, 1984, p 102.

extraordinary situation continued until 1986, when the triservice Australian Defence Force Academy opened and offered cadets an education in a range of disciplines.

What of air power education in the broader Air Force? A year after ADFA accepted its first cadets an Army officer, Brigadier J.S. Baker, was appointed to report on Defence Force command arrangements. Baker's brief did not call for him specifically to comment on air power education. However, in addressing the question of the command of air assets in joint operations, he found it necessary to introduce an historical perspective. It was the advent of air power, Baker noted, which was the greatest complicating factor in ADF command arrangements, as it was air alone which had given rise to the 'inexorable trend towards joint operations'. Unfortunately, however, in Baker's judgment, the proper use of air power in contemporary conflict was not well understood. In a telling passage, Baker sheeted home the blame for that failing on past generations of air force leaders:

> In part Air Forces are themselves to blame for any dearth of understanding. There are few scholars adding to the strategic debate; there is little written doctrine ... It is the growing recognition of the central importance of air which fuels the discussions of ownership of assets. The only long-term remedy is for [the RAAF] to provide exemplary support in all its forms; to itself understand the importance of its contribution to success in all forms of operations. Of any of the services, it is Air Force which requires the greatest body of corporate knowledge of all forms of operations on land, sea or in the air. In turn, it must educate others in the effective use of air assets.[30]

The findings of a survey into RAAF air power education commissioned by Chief of the Air Staff Air Marshal Ray Funnell in 1989 confirmed Brigadier Baker's assessment of the RAAF's strategic scholarship. Conducted by Air Commodore Ian Westmore, the survey concluded that, to the extent that air power doctrine was taught to officers in the RAAF, it was ad hoc; largely superficial; and unrelated to career progression, endorsed doctrine and general references. No attempt had been made to educate the enlisted ranks.

Air Marshal Funnell responded to those disturbing findings with three main initiatives. First, he formed a writing team to draft RAAF doctrine; second, he established an air power studies centre (which evolved out of the doctrine writing team); and finally he introduced a service-wide system of air power education. Today that education system covers every level of training in the RAAF, from the most junior enlisted recruit to senior officers on the Command and Staff Course.

A comprehensive review of air power education completed by Squadron Leader James Walker in 1995 found that substantial progress has been made in educating the RAAF, the Defence organisation and the wider community in exactly what air power can and cannot contribute to Australian and regional security.[31] The survey also concluded that more needs to be done and that the task is a continuing one.

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[30] Brigadier J.S. Baker, *Report of the Study into ADF Command Arrangements*, March 1988, p 4-17.

[31] Squadron Leader James Y. Walker, *The RAAF's Fundamental Business: An Evaluation of RAAF Air Power Education*, APSC, Canberra, 1995.

THE LEADING EDGE

Any assessment of leadership in any organisation inevitably will contain a degree of subjectivity. There is less room for personal interpretation when assessments of the organisation itself are made. By any objective standard, for half a century the RAAF has been the pre-eminent air force in our region and one of the most effective in any region. When it comes to actually doing the job the RAAF has performed admirably, as evidenced by its achievements during World War II, the occupation of Japan, the Berlin Airlift, Malaya, Korea, Vietnam, a host of demanding peacekeeping operations, numerous civil emergencies and scores of highly competitive international exercises. In other words, regardless of whether or not one accepts the reservations expressed in this paper regarding some aspects of the Air Force's higher leadership, clearly those leaders must have been doing something right.

The point here is that it would be wrong to judge the quality of the RAAF's thinking solely in relation to its success or otherwise in developing concepts of operations and indigenous doctrine. Perhaps on occasions the Air Force has been too much of a technocracy for its own good, but if that has been the case then at least it has been a very good technocracy. Further, at various times this paper has pointed to the powerful, symbiotic relationship between ideas and technology. That relationship is by no means a one-way street: technology can drive strategic thinking as surely as theory can inspire technical invention.

Three men have dominated the RAAF's technical evolution: Air Vice-Marshals Lawrence Wackett, Ellis Wackett and Ernie Hey. Australia's self-styled 'aircraft pioneer', the entrepreneurial and inventive L.J. Wackett was the driving force behind the establishment in 1924 of the RAAF Experimental Section at Randwick. That section should be seen as the forerunner of the enormously important Aircraft Performance Unit of World War II and the Aircraft Research and Development Unit of modern times. No single unit has been more important in formalising the nexus between technology and ideas in the RAAF than ARDU.

If L.J. Wackett was the innovator of Air Force technology then his younger brother Ellis was the grafter. The RAAF's senior engineer for a remarkable twenty-four continuous years and through five ranks, it was 'E.C.' who in 1948 presided over the establishment of a professional engineering branch and the apprentice training scheme. Those two initiatives have been the foundations of the RAAF's technical excellence.

No one event in Air Force history better illustrates the significance of technological excellence than the acquisition in 1963 of the F-111. When the F-111 was ordered it represented the leading edge of aviation technology. In the ten years before the first aircraft arrived in Australia the project taxed the RAAF's character severely, several times threatening to implode under intense technical and political pressures. Few air forces could have met the challenge. The man who contributed most was the air member for technical services, Air Vice-Marshal Ernie Hey. It was Hey who held his nerve in hard times and took tough decisions; and it was Hey who ensured that the best and brightest from his branch worked on the project and gradually acquired a deep understanding of the problems. When in April 1970 Defence Minister Malcolm Fraser entered what proved to be the critical negotiations on the F-111 with his American counterpart, his strong performance and the highly

satisfactory outcome he achieved rested squarely on the RAAF's profound technical expertise.[32]

Similar episodes could be recounted for any one of the RAAF's major specialist technical activities such as flying training, logistics management, airfield construction and so on.

The question, then, is: which comes first - ideas, strategy and doctrine, or military capabilities? And does the presence of one indicate high quality strategic thinking more than the presence of the other? There is no right answer. To use the example of the F-111 again, it was at the Air Force's initiative that the aircraft was fitted with both the Harpoon missile (a unique Australian modification) and the Pave-Tack precision target identification and designation system. Those modifications were central to transforming the F-111 into the most formidable maritime strike weapons system in Southeast Asia. More than any other item in the ADF's inventory, the F-111 has given credibility to the notion of defence in depth, of having forces capable of 'tracking and targeting the adversary, [of] mounting maritime and air operations in the sea and air gap to our north'.[33] Yet both the Harpoon and Pave-Tack modifications were underway years before the Hawke Government's defence White Paper, *The Defence of Australia 1987*, gave the strategy of defence in depth its most cogent official endorsement since Federation. The modifications were initiated, not in response to some elegantly defined defence strategy, but rather because of the RAAF's intuitive desire to keep its aircraft at the leading edge of technology.

CONCLUSION

There have been two main threads to the RAAF's strategic thinking. First, for almost the entire seventy-five years of its existence, the Air Force has demonstrated a well-developed and rational appreciation of the place of air power in the defence of Australia. Second, there has been an equally strong but more intuitive commitment to leading edge technology and to the pre-eminence of control of the air and offensive action. On occasions the narrowness of that latter commitment has not served the Air Force well; in particular, it has tended to circumscribe the outlook of too many senior officers who have not adequately understood the application of air power in its fullest sense. That narrowness of outlook was also the prime cause of serious shortcomings in air power education.

At the same time, the sheer technical excellence which has perhaps been the RAAF's dominant characteristic has significantly eased the way for recent Defence strategic planning, as has the force structure the RAAF has maintained, sometimes despite the prevailing conventional wisdom.

Australian defence planning has assumed a far more structured character in the past twenty years. While the young men and women who actually prosecute the war in the air will still need to display swift intuition if they are to prevail, the same is less true of their senior commanders. Indeed, the challenge facing those commanders in the new security era may be nothing less than revolutionary.

Since Italian airmen became the first to use heavier-than-air machines in combat in 1911, the man in the machine over the target has been the essence of air forces. Without dwelling on the spectre of Duncan Sandys, it does seem that the age of space, long-range missiles, uninhabited aerial vehicles and information warfare is upon us.

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32 For more detail see Stephens, *Going Solo*, pp 377-86.

33 Department of Defence, *The Defence of Australia 1987*, AGPS, Canberra, 1987, p 31.

How should the RAAF address those extraordinary challenges to its way of doing business, indeed, to its very ethos? The presentations we will hear over the next two days should go some way towards providing some answers.

DISCUSSION

Air Vice-Marshal R.V. Richardson: I was very interested in your comment that right back in 1925 Richard Williams spoke about protecting the air/sea gap. Was that really technically feasible then?

Dr Stephens: Williams was working in a very difficult environment with a pitifully small force, at a time when the technology of air power was very new. The key to the concept he developed for the defence of Australia was a series of trials conducted by the Royal Navy in the North Sea and later in the Mediterranean in the mid-1920s through to the 1930s. Those trials indicated, first, that torpedo carrying aircraft were probably the most effective means of striking against invading fleets; and second, that well organised air reconnaissance forces were highly likely to detect fleets. In other words, it was probable that even the primitive aircraft of those years would detect and successfully attack invading fleets, and of course fleets were the central consideration in Australian defence thinking. People may also be aware of the spectacular trials conducted by the American General Billy Mitchell in 1921 off the east coast of the United States. While admittedly enjoying the favourable conditions of a trial, Mitchell's aircraft sank a number of captured German warships, which according to one report caused watching admirals to weep openly.

Squadron Leader Martin Sharp: You mentioned the RAAF's neglect of surface forces during the 1950s and 60s. Do you believe that was a contributing factor to the Royal Australian Air Force transferring their helicopters to the Australian Army some fifteen to twenty years later?

Dr Stephens: The point I wanted to make in terms of the quality of Air Force thinking was that, in my opinion, too much emphasis was placed on the classic air force capabilities of air defence and offensive operations. Those are core capabilities and they are essential to an air force, but they are not the beginning and end. I believe that the RAAF, like a lot of air forces, excessively promoted the cult of the fighter and bomber pilot: that those occupations rated and the others didn't. A number of people who were not involved in fighter and bomber operations - for example, helicopter crews - believe they were treated as second class citizens by the RAAF hierarchy, and I think that had unfortunate consequences for how the Air Force was perceived to be meeting its obligations to the Army. I also think that the RAAF's professional education system did not give the officers of that generation an adequate understanding of air power in the fullest sense.

Air Commodore Norman Ashworth: Alan, over the years defence rhetoric has been marked by a series of 'buzz phrases'. Singapore strategy, forward defence, core force, and each of these concepts has in turn been thrown out. Today we are talking about the revolution in military affairs. I suggest in five or ten years time people will be

saying: 'That's been thrown out, it is all a fallacy'. You made a comment about the core force concept. It seems to me that as each of these concepts has been thrown out it is a bit like throwing out the baby with the bath water; although there are aspects of these concepts that have been overtaken, there are also aspects that are still quite valid. I believe that a core force concept, right today, has a lot of relevance to the Air Force. The RAAF today is small. Any major operations in the future are going to require an expanded Air Force, expanding on the core that we currently have. I suggest to you that the core force concept should not be thrown out completely. It has got some elements that are relevant.

Dr Stephens: Were you one of the authors, Norm? I can appreciate why the core force concept emerged when it did, as it is very difficult to develop a methodology and to structure a force in the absence of a clear threat. Nevertheless, I do think that the idea of a core force was, as one of its principal authors described it to a parliamentary committee, a 'null concept'. Personally I have difficulty with the term 'null concept'. I don't know what it means. One of the big problems with the core force concept was that it provided carte blanche for everyone in the Defence Force to push their barrow with the excuse that their particular expertise should be retained against the possibility that it might be needed in the future. You could justify whatever you liked for any defence force, let alone a small to medium sized one. That, I think, proved to be a seriously vexed force structure issue. I appreciate why the core force concept emerged and occupied the debate for several years, and perhaps it played a useful role while people sought a more structured way forward, but personally I wouldn't like to see it reappear.

Air Marshal David Evans: The core force really was an admission by the bureaucrats that we had no idea how we were going to defend Australia and it was impossible to have a strategy for the defence of this country because there was no identifiable threat. Clearly if you are going to wait for an identifiable threat it is going to be too late to structure a force, and it was also very clear that we had to have some strategic thinking and adopt a strategy for defending this country and then structure a force for that strategy. The core force didn't do that. It was a real admission that they had no idea what they were going to do so it had a little bit of everything. We then became involved in tremendous waste, putting money into things that were not relevant to the defence of this country. I think it is as simple as that. It was based on nothing; no strategy for the defence of Australia.

Professor Martin van Creveld: The other day I was reading your government's latest White Paper on Australian defence, and I noticed that there was not one chapter devoted to the threat. Since we just talked about strategy, and since the issue has just been raised, I wondered whether you might be able to give us your idea of what the threat to Australia might be in, say, the next ten or fifteen years.

Dr Stephens: The subject of structuring the Australian Defence Force in the absence of a manifest threat has received a great deal of attention in official circles over the past ten to fifteen years. I would think that, had you had the opportunity to be more familiar with the debate, you would be aware that it has been an evolutionary process in which attention has focused on capabilities that credibly might be brought to bear against Australia, rather than trying to invent threats that may or may not exist and may or may

not materialise. So what I am saying is that there is a methodology based on the existing capabilities that the ADF might most feasibly have to deal with. That has been a priority in defence force structuring.

Professor Paul Dibb: We have spent about twenty years in Australia developing concepts to structure a defence force without a threat. There is a methodology available. Most people in Europe and North America were not initially terribly interested in it, but they are now that the Soviet Union has disappeared. As Alan has pointed out, for well over twenty years successive chiefs of staff and senior bureaucrats have signed up to a concept in which we based a force structure without a clear and evident threat on two fundamental planks. The first is the abiding nature of Australia's geography, which gives us both strengths and vulnerabilities in the most likely approaches, the north. We don't think we are going to be attacked by the penguins of Antarctica or even by the Kiwis to the east, and there is a lot ocean between us and South Africa. The other plank, as Dr Stephens has mentioned, is that we identify no country as a clear and obvious threat but we think we would have warning of an invasion, of major war. Short of that we believe we would face credible, lower levels of threat and we base that concept not on any particular country but against the introduction of progressively higher levels of generic military capabilities such as modern high speed aircraft with beyond visual range missiles against which we need to credibly defend ourselves. There is a lot of literature available on this subject.

Air Vice-Marshal David Rogers: Alan let me congratulate you on the new definition of UAV, of uninhabited aerial vehicles. I thought that was a very good non-gender specific description. If I could move to my question which deals with education. You made some comment about the efficacy of the products of the RAAF College and the RAAF Academy. I think Australia is one of the first nations in the Western world to move to a joint Defence Academy and I think that is working quite well. We are about to see the product out in the field. But overall we have to address the education of not just the officer corps but also the airman corps. I think you aware of some of the things we have done in the last four to five years, and I would like your opinion: do you think we are on the right track?

Dr Stephens: I think it was about two or so months ago *Aviation Week & Space Technology* started using 'uninhabited' for UAVs, so they got on the politically correct bandwagon as well.

I don't want to sound like I am beating the Air Force drum because I have a vested interest here, I work for the Air Power Studies Centre. But I must say as someone who has been involved since 1989, in my opinion, the educational quality at all levels in the Air Force from the most senior ranks down the most junior has improved at an exponential rate. One of the activities I enjoy most is going down to Point Cook for the Basic Staff Course, a six week residential course for flight lieutenants. I sometimes go down for their final air power presentation in which those young officers analyse air campaigns. What I find enormously encouraging is the quality of those presentations, especially when I reflect back on the total lack of that education when I was a wing commander, let alone a junior officer. I think the ADF and the Air Force should be very pleased with that.

In my opinion the joint ethos is stronger in the Air Force than ever before, and I see that very much as one of the many positive spin offs from the broad air power

education. And it is not just the junior officers. At the Command and Staff Course I find every year I have to put more effort into the preparation of my lectures because the quality of the questioning becomes more challenging. And as I understand it, every airman course in the Air Force now has some element of air power education, whether it is just a five minute introduction or several hours of lectures. I have attended presentations by senior NCO courses analysing air campaigns that, I've got no doubt, senior officers could not have given ten or twenty years ago. So I think it has been a great success for the Air Force and I believe in the long term the ADF will be the big winner.

Air Vice-Marshal R.V. Richardson: Alan, the first graduates from the Defence Academy are now reaching squadron leader, lieutenant commander and major rank and so we are about to see them entering the areas of supervisory responsibilities. I was struck by your emphasis on the important role of the Aircraft Research and Development Unit in linking ideas and technology. Would you support my view that an ability to link the skills and ideas of the scientist with the practical needs is one of the fundamental requirements of any military force in a high technology environment?

Dr Stephens: No question, and I hope my presentation established the powerful symbiotic connection between technology and ideas in an air force. I think there have been few better examples of that than the achievements of the Royal Air Force during the Falklands War, when organisations similar to ARDU worked to modify aircraft to cope with the extraordinarily difficult and long ranges involved with fighting a war in the South Atlantic.

Let me expand on my comments about education at the RAAF College and the RAAF Academy. While I think the double major in physics was far too narrow and was flawed from the outset, I think in essence it was a good idea and showed a lot of vision and courage. The problem was, the Air Board didn't go back and review that course to see if it remained relevant to the kind of Air Force that was in fact taking shape. The last thing the RAAF would ever want to do would be to lose its profound technical excellence, but what I believe has been missing has been a broadening of more senior people with an education in strategic studies, military history etcetera, and I think ADFA has made a difference in that area. The other initiatives I have just mentioned are also paying dividends. A lot of people believe that the coming decade is going to be the decade of Air Force re-equipment. I would like to think that it will be a decade of outstanding Air Force leadership too, and I am optimistic that that will be the case.

Air Vice-Marshal Brian Weston: Thank you, Al, for your usual forthright address. You tell it as you see it, and speaking as someone who was at the RAAF Academy doing a double major in physics in 1964, I'm sure my colleagues and I would have greatly appreciated the Minister for Air's comments at the time. We probably could have used them as a plausible excuse for a certain number of exam results.

My question concerns your thesis that the Air Force has transmuted ideas and interlinked intuition into force structure and strategic infrastructure rather than strategic thought into force structure and infrastructure. In what way do you think government decision making processes prior to 1974 - that is, when the Air Force had access to a Minister for Air - was a factor in enabling this to occur? Do you think that

in the post-1974 world the Air Force will have to be much more clearly based on strategy than intuition?

Dr Stephens: Very good point. There is no doubt that before the Tange Review and Defence reorganisation of the early 1970s the three services were very much their own masters. I made reference to the difficult relationship between the Air Force and the Army. The fact of the matter was that the Chief of the Air Staff and the Chief of the General Staff were independent commanders. They had their own Ministers, and if one did not like what the other one was saying he could ignore him. There is a fair amount of correspondence on Air Force files from that period showing the Chief of the Air Staff doing just that in response to what I believe were legitimate Army requests for Air Force support. So yes, the organisation pre-Tange made possible in the case of the Air Force a culture I believe was dominated by fighter and bomber pilots, and on occasions that wasn't a productive culture.

At the time of the Tange Review a lot of people found the reorganisation very unpleasant, and relations between the services and the bureaucracy were probably at an all time low, but I find that as the years move on and the full benefits of the Tange Review become apparent, Sir Arthur's work is remembered with more favour than many people may have thought would be the case twenty years ago. From an outsider's view of how the higher defence machinery works now, I would have thought that it is absolutely essential for Air Force officers not to react with swift intuition but to carry the day by the force of their logic.

Squadron Leader Bernard Farley: Dr Stephens you mentioned the predominance of fighter and bomber experienced personnel in the Air Force. Can I ask you to turn your mind to the importance of combat support elements? If I recall what the Defence Minister, Mr McLachlan, said, 'Those areas are potentially the areas that will be subject to as great if not greater review over the next couple of years'. Can I ask you to review combat support over our history and its effect on the Air Force's production of air power today?

Dr Stephens: I don't know exactly what the Minister meant. I presume that he may have been referring to the way in which CSP supports forward-deployed units. And I am not quite sure what you are driving at with the rest of the question. Are you talking about the lack of attention given to combat support activities in the writing of Air Force history? Yes? Okay. I agree with you strongly. As the RAAF Historian I feel it is the major deficiency in the recording of Air Force history. We have largely neglected the huge contribution, often made in extraordinarily difficult circumstances, of the combat support forces.

I should mention, though, that currently the Air Force has commissioned Dr Chris Coulthard-Clark to write a history of the apprentice training scheme which will be released in 1998 to coincide with the fiftieth anniversary of the founding of that scheme. That work was commissioned precisely to redress the neglect you have identified. Further, a history of the airfield construction squadrons - the quiet achievers of the Air Force in World War II - is in the early stages of research. I think it is also noteworthy that several books which have won the RAAF Heritage Award have been on combat support activities. I particularly enjoyed the one on the radar units in World War II. So I would like to think that quite a lot is being done at the moment to redress what has been a neglected aspect of RAAF history.

Group Captain John Harvey: Often we talk about perspective as one of the key factors air power provides; that the ability of being high gives a quite different view of the battlefield than that of people on the surface, be they in ships or on the land. A second factor, as Colonel Phil Meilinger has described in his article 'Ten Propositions Regarding Air Power', is that an air force is an inherently strategic force. To what extent do you think those factors gave the early airmen a view that was inherently strategic, a view that other people didn't have, and it was perhaps that view which gave them much more of a strategic vision of what was required for the defence of Australia rather than just intuition on their part?

Dr Stephens: Thanks John, that's a good point. I think it is very difficult to operate aircraft and not acquire a strategic outlook. It is simply a fact that you cover long distances very quickly and you see the world from a 'strategic' perspective. Even in the 1920s using extremely primitive aircraft, people like Goble and McIntyre, Williams and McIntyre, were staging epic flights around Australia and the Pacific Islands that had to have inculcated within them and their service a strategic perspective, whether they knew they were getting it or not. So I think that your point that air forces tend to have a strategic perspective is true and I think it's in the nature of the business.

Air Commodore John Macnaughtan: Alan, I'd like to ask you to correct the record regarding your statement that none of our officers seized the moment. You mentioned the Coral Sea and the Battle of Midway, which were carrier operations and where we could hardly have seized the moment. But in the Battle of the Bismarck Sea, Group Captain Bill Garing was very instrumental in the tactics used. If that can be put on the record, I think it would be appropriate. The question I might put to you though, is: did Air-Vice Marshal Bostock, as commander of RAAF Command, seize the moment?

Dr Stephens: When I said 'seize the moment' I wasn't referring to those particular actions. Of course, there was no opportunity there. I was talking generally. The fact is, notwithstanding our participation in a large number of major conflicts, we haven't had the successful operational commanders that the quality and quantity of our war-fighting effort warranted.

Of all of the RAAF commanders during World War II, Air Vice-Marshal Bostock was probably the only one who from time to time drifted up to work at the operational level of war, although almost invariably that responsibility was assumed by Generals Kenney and Whitehead from the United States Army Air Forces. Bostock I think could have been an outstanding operational level commander but, as I said, he was generally confined to the tactical level. And as we all know and are sick of hearing about, his career really was irretrievably blighted by his fight with Air-Vice Marshal Jones over the control of the Air Force. Air Commodore Garing's vital contribution at Milne Bay and Bismarck Sea has been well recognised at a number of recent conferences.

INTERNATIONAL SECURITY AND AUSTRALIA

PAUL DIBB

This conference is about 'new era security'. So, I want to begin my address to you by talking about the need for new ways of thinking strategically. I will then move on to global and regional security issues that will affect Australia's security environment over the next ten to fifteen years. Finally, I want to canvass some ideas about the need to change Australia's defence policy.

AUSTRALIAN STRATEGIC THINKING

The main theme I want to leave you with is the dominance of uncertainty in the post-Cold War world. As I shall explain later, I believe this applies particularly to the Asian region where both optimistic and pessimistic trends are discernible.

In my view, uncertainty is itself now *strategic* in nature and this will demand an unprecedented degree of flexibility in our strategic thinking. Policymakers will face a wider range of possible outcomes than they have been used to in the past.

This will also mean that defence planners will want to hedge their bets: in Australia's case this will involve examining if, and if so how, our requirement to shape regional security may inform our future force structure planning. If we are to make what Ian McLachlan, the Minister for Defence, describes as 'a substantial contribution to regional security' then we may have to consider appropriate adjustments to the force structure of the ADF.

The prevalence of uncertainty suggests that we will have to challenge orthodox strategic analysis and straight-line thinking. This applies particularly to our region - Asia - where a self-satisfied view of 'peace in our time' seems to prevail.

The collapse of the USSR and the Warsaw Pact should have taught us to expect the unexpected. And to reflect why we got such a major strategic assessment wrong. Which raises the key question: what major assessment(s) might we get wrong in the Asia-Pacific region in the years ahead? Later, I want to discuss some of the potential shocks and discontinuities that might disturb the peace in our own region.

Much of the woolly strategic thinking that currently prevails about Asia is based on the assumption that Asia has discovered a new model that will ensure a 'Pacific Century'. This assumption is based on the belief that consultation and consensus, which is the Asean approach, will resolve potential conflicts. It is bolstered by the view that economic growth and interdependence will ensure that peace prevails and that war will be avoided.

In my view, these are naive beliefs. Asia is characterised strategically by the following important trends:

- the prevalence of ideological, territorial, ethnic and religious differences as well as historical animosities;
- heavily armed adversaries in potential trouble spots, such as the Korean peninsula, the Taiwan straits, and Kashmir;
- a volatile political mixture of communist, authoritarian and democratic regimes, several of which will undergo an uncertain, if not unstable, transition;
- the existence of a strong sense of nationalism almost everywhere in the region;

- a build-up of arms, including weapons of mass destruction and increasingly sophisticated conventional arms (Asia spends $US135 billion on defence, an increase of twenty-three per cent since 1985 or three times the Middle East's defence expenditure);
- a lack of arms control and conflict prevention measures and a notable reluctance to publish details of orders-of-battle, arms imports, military doctrines and threat perceptions.

This, in my view, is an unhealthy strategic mixture. Of course, there are some important positive strategic trends, which serve to counterbalance the rather pessimistic list of problem areas I have just outlined. Strong economic growth almost everywhere in Asia, a preoccupation with improving the people's standard of living, the spread of democratic institutions in some - but by no means all - countries, and the emergence of multilateral regional bodies such as APEC and the ARF, are all encouraging signs.

The question is, however, whether these more positive trends will prevail in the longer term over the more negative trends that I have identified. Will the strategic architecture of the region in the year 2010 be stable and cooperative or will there be a new regional order that threatens Australia's national interests?

I will return to this question because I think it is the most important strategic challenge facing Australia over the next one or two decades. But first let us examine some broader global issues in the new post-Cold War Security era.

Global Security Trends and Australia

We have clearly entered unchartered waters strategically. Globally, the end of the Cold War and the disintegration of the USSR and the Warsaw Pact have heralded the end to the last fifty years of dangerous ideological confrontation. The risks of global nuclear war are now remote. The liberal model of free enterprise and democracy is now the dominant economic and political paradigm and it is without any real challengers. This has been described as 'the end of history'.

New challenges, however, are emerging. It seems to me that, just as our free-enterprise democratic system has prevailed in an historic struggle over communism, the threats to our system have become increasingly internal ones. A certain sense of economic and social malaise overhangs many Western societies and significant parts of our community are becoming alienated. Unemployment, crime and the disintegration of family values are on the increase.

None of this is to deny the fundamental strengths of our Western society - and, above all, its remarkable innovative impulses. But it seems to me that, at the very least, the West is going through a period of introspection. Our great ally, the United States, is increasingly preoccupied with its domestic problems and it lacks an over-arching grand strategy in terms of its foreign and defence policies. There is no longer a Western strategic community unquestioningly led by the US and there is no common enemy.

Instead, we all face a variety of regional and local threats. Regionalism is on the rise, as are local threats from rogue states, the proliferation of weapons of mass destruction, the rise of ethnic, religious and - in some areas - territorial tensions, as well as terrorism.

A rich new agenda of potential threats is emerging. There is a general perception that environmental pollution, economic competition, mass population movements, and international crime are the new era security issues that should now receive our attention. It is true that some - but by no means all - of these items on the new security agenda may become national security threats. But we must be careful in our analysis. Whilst I have argued earlier that we should challenge strategic orthodoxy, we should not become trendy. By this I mean that, as strategic analysts, we should not succumb to the pressures of the fashionable. For example, it has become fashionable to assert that the utility of military power has declined and that economic power is now the dominant force in international affairs. It is also being argued that a paradigm shift is occurring away from the major use of force to low-level conflict. And there seems to be a growing belief that the environment will be the next source of conflict.

Clearly, these are serious issues and they require our careful attention. But I think that they can be easily overdrawn. As our television sets portray almost every day, the commonly held academic view that economic power has replaced military power as the central element of international affairs is greatly overstated. There is no new international order in which economic determinism is in the ascendancy.

Environmental issues *are* of growing concern globally. But we must be careful not to fall into the trap of the Club of Rome, which in the early 1970s proclaimed confidently that the world would run out of oil, copper, aluminium and other key resources within twenty years. It is clear, however, that in some parts of the world environmental degradation may lead to inter-state conflict (for instance, water resources in the Middle East). But we must avoid accepting that sweeping generalisations (such as global warming) necessarily have any strategic implications for Australia.

The paradigm shift from the declining probability of major war to low-level conflict is something that I take much more seriously. I think that nuclear deterrence and the high economic costs of major war will make the outbreak of serious conflict between the great powers unlikely (but not impossible) over the next one or two decades. But I am less confident of this judgment, as I shall explain shortly, with regard to Asia than I am for Europe. Conflict between China and Japan and Russia and China is *not*, in my view, unthinkable.

Moreover, on the Korean peninsula, across the Taiwan straits and in Kashmir there is the ever-present risk of good old-fashioned conventional war, with in all three cases, the risk of the use of tactical nuclear weapons. So, as with environmental issues, we must be careful not to accept sweeping generalisations and test each case on its particular geographic and military merits.

Apart from these considerations, the major international issues that I see facing Australia in the new era security agenda are essentially the challenges arising from our own region. This must increasingly be the centre-piece of our strategic analysis. The rise of regionalism, and of intra-regional tensions, will have its parallels elsewhere in the world. And, from time to time, as with the cases of the Gulf War and Somalia, we will be asked to make a contribution. If we are to contribute more to alliance solidarity and burden-sharing it will be important that we make an appropriate contribution to such global trouble spots.

But, equally, governments in Australia need to be aware of the limits to our defence capacity and influence. The strategic situation in Asia, and the risks of instability there, must command our priority attention. It would not be appropriate, as

some in our community argue, to structure our defence force for UN peacekeeping. Strategically, Australia is not Canada in this regard.

Australia's defence priorities over the next one or two decades must be the defence of Australia, in a situation where our lead in platforms is disappearing, and shaping our regional strategic environment by making a more substantial contribution to regional security.

THE NEW BALANCE OF POWER IN ASIA

This brings me to my central theme: what are the risks of a major threat to the balance of power in Asia?

Traditionally, the great powers have played a dominant role in shaping international society. Asia is evidently at the beginning of what will be a protracted process of adjustment among the great powers. There are two new powers emerging in the region - China and Japan - with no clearly articulated roles and considerable suspicion of each other and a third country - India - that, so far, has an unrealised potential as an Asian great power. Russia has, at least temporarily, lost its power base in almost every dimension, although it could re-emerge in the longer term as a disruptive power in the Asia-Pacific region. The US is the one actor that truly possesses all the attributes of power but there is questioning in the region whether it will see it in its interests to hold the balance of power.

Any new strategic balance in Asia will likely rest upon the relationships among these five great powers (that is, China, Japan, India, Russia and America). Great change has already occurred to the geopolitics of the region. In the past, there was an unusual and favourable coincidence that made for a stable balance of power in a complex and inherently unstable neighbourhood.

Basically, there was a clear geopolitical divide between the US and its allies (Japan, South Korea, Philippines, Thailand, Australia and New Zealand) and the USSR and its allies (India, Vietnam, North Korea and Mongolia). The Sino-Soviet split, hostility between the USSR and Japan, and distrust between Japan and China ensured that there was no great power collusion and that the US remained the dominant power.

In the future, the regional balance of power is likely to be less predictable. The changing relative power of the five great powers combined with a more fluid and uncertain strategic outlook heralds a new correlation of forces in Asia. In particular, the changing economic power of the Asian great powers will greatly affect the distribution of power in the region.

China may eventually become the dominant regional power and both Japan and India seem likely to play a more active role in regional affairs, more in keeping with their economic clout. Divining Russia's future is most problematic: we could see either a weak, divided Russia leaving a power vacuum for Chinese expansion or a resurgent, anti-Western Russian state challenging the status quo.

In all this, it is important that the US retains its predominant economic and military strength and sees it in its interests to hold the balance of power. An Asia without a strong US military presence to check the ambitions and rivalry of the Asian great powers would be a dangerous place.

It is not possible in this paper to address all the possible permutations of great power interaction. We may well see different patterns of alliances and alignments in 2010 from those that are familiar today. The emergence of strong middle powers - such as a unified Korea, perhaps an independent Taiwan, and certainly Vietnam and

Indonesia as major players - will create new opportunities for the great powers to play the game of *realpolitik.*

What is clear is that the relative strengths of the great powers will be very different in 2010 or 2015 from what they are today. Not least, their strategic potential - that is the capacity to develop and support military forces - will depend directly on their economic strength and technological depth.

The capacity of each of the Asian great powers to build modern defence equipment, and operate it effectively, will grow very substantially in the next one or two decades. For defence planners this will mean that we will have to take account much more carefully of a range of possible policy outcomes in the changing balance of power. It is important to note, in this context, that there is considerable disagreement even amongst experts on the likely nature of the future power of China in particular but also of the US, Japan, India and, especially, Russia. These are key uncertainties and they only serve to compound the unpredictability of our strategic circumstances.

Moreover, several important Asian countries are entering a period of political uncertainty because their leaderships will change or where there is considerable turmoil due to change in the political system (for instance, China, Japan, Vietnam and Indonesia). Political change will add to the unpredictability of the economic and military changes I have already outlined.

RISKS OF STRATEGIC DISCONTINUITY

What then are the risks of a breakdown in the regional order, as a new balance of power is asserted in Asia? The central problem that I foresee is that there is no experience (and certainly not in recent history) in the region of managing a complex, multipolar balance of power.

A balance of power works best, as Henry Kissinger has noted, if nations feel free to align themselves with any other state, or where the cohesion of alliance is relatively low so that on any given issue there can be compromises or changes in alignment, or where there are fixed alliances but a balancer sees to it that none of the existing coalitions or powers becomes dominant. In Asia, however, the strategic situation is in a state of considerable flux and it is thus uncertain what sort of system of regional order will emerge.

But if mounting tensions and tests of strength are to be avoided, some sort of rules-based system of balance or restraint must be devised to facilitate the compromises that are necessary in a rapidly changing, and potentially precarious, strategic environment. Hopefully, we may be moving towards such a mechanism through the Asean Regional Forum. But talking is not enough: mechanisms for conflict avoidance and restraints on the use of armed force will have to be devised.

Otherwise, we will see challenges to the regional order as the balance of power shifts and there is an assertion of great power politics. In theory, there should be sufficient players in a five-sided balance of power to provide for numerous checks and balances to ensure that a dominant regional power, or hegemon, does not emerge. This does, however, require flexibility in alignments and the resolve to resist aggression, territorial expansion, and the use of military force. There has to be some doubt whether these attributes exist yet in the region.

In particular, the region has first of all to deal with some serious and unresolved security problems where the use of force could alter the regional balance of power or undermine its stability. The serious unresolved problems (as mentioned earlier) include the Korean peninsula, Taiwan and Kashmir and also the South China Sea. In none of

these cases are there agreements for conflict prevention or confidence-building measures in place or even any comprehensive and reliable early-warning systems for conflict avoidance.

In each of these examples armed force has been used, or threatened, in the past and generally on more than one occasion. Until these tensions are resolved the prospects of a stable region remain uncertain.

There are a number of other discontinuities or strategic shocks, which appear improbable at present, but which are not unthinkable. Some examples that come to mind are set out in Table 1.

TABLE 1: POTENTIAL DISCONTINUITIES

- the re-emergence of an anti-Western, powerful Russia, possibly aligned with China;
- an expansionist China;
- a unified Korea;
- the US is asked to leave Japan and Korea;
- an isolationist America;
- war between India and Pakistan, possibly involving the use of nuclear weapons;
- war between North and South Korea, involving the US and its allies;
- a Chinese military blockade of Taiwan;
- conflict in the South China Sea, involving China and one or more Asean countries;
- Russian military operations in Central Asia, possibly involving conflict with Iran and, perhaps, China;
- conflict between India and China;
- limited territorial conflict between China and Russia, Russia and Japan, South Korea and Japan, China and Japan, or some of the Asean countries;
- major upheaval in an Asean country, for example, Indonesia.

This is by no means a comprehensive list of various contingencies, but it illustrates a spectrum of potential future events. Such an indicative list is helpful in thinking about, and ascribing probabilities to, the risks of strategic discontinuity in an era of uncertainty. In this way, likely theatres of conflict can be identified, along with plausible objectives and strategies of protagonists. The aim should be to identify potential developments that are quite plausible, but which would never make it onto a list of approved best estimates. The approach here is to encourage a broad view of potential shocks to the regional order rather than one focussed on one or a very few threats. This is especially helpful for breaking out of standard mind-sets and encouraging non-linear, unorthodox strategic thinking.

We also need to think, in our new era security agenda, about the potential for the use of coercive instruments short of armed force. In my view, these may well increase. Patterns of dominance and dependence may emerge, as well as the use of coercive non-military levers, as the great powers accrue more power and multilateral institutions prove to be weak in the face of regional crises.

The most important question here for the middle powers, such as Australia, will be how to avert a slide in regional order. By a slide in regional order I mean not only the use of military force but any tendency to threaten or demonstrate the use of force, as well as the use of coercive economic measures such as blockade or denial of market access. A breakdown in regional order could be heralded by challenges to international norms of behaviour such as these.

It could also be ushered in by one or more great powers becoming used to the idea that, short of the use of force, it can use its political power and economic leverage to effectively make smaller powers comply with its point of view. The denial of market access by China is an example of this sort of policy at work.

The best way to avoid, or at least ameliorate, such potential discontinuities or strategic shocks to regional order is to give priority to *shaping* the regional environment, rather than simply allowing events to unfold. The creation of a more cooperative and transparent strategic community in the region, together with a policy of deterring any overt challenges to acceptable norms of behaviour, should be key elements in any such shaping policy. But, in defence planning terms, the dominance of uncertainty will mean that planners will want to hedge their bets: deterrence against potential shocks to the regional order will mean greater flexibility in devising new bilateral relationships and alignments, as well as the need for robust unilateral defence policies.

Implications for Australian Defence Policy

All this suggests, to me at least, the need for a continuing strong level of defence spending in Australia and for us to continue to give priority to the defence of Australia. Given our declining advantage in platforms, however, we will need to give greater emphasis to information dominance and to precision in our weapons systems.

Two other strands of our defence policy require strengthening. First, we need to look for ways to encourage the US to effectively hold the balance of power. This means supporting America's commitment to a strong military presence in the region, as well as the continuing strength of its alliance commitments. Australia will need to examine how we can share more of the allied burden, particularly in our own region.

Second, and relatedly, we need to strengthen our strategic partnership with Southeast Asia. A confident, stable and unthreatened group of Asean countries (which will eventually comprise ten countries with a population of over 500 million) will be a

strategic shield to our north. Making a more effective contribution to regional security may mean that we have to revisit our force structure plans in some carefully chosen areas.

This does *not* mean that regional security should become our principal force structure determinant but it does mean some fundamental analysis of whether we need 'regional add-ons' to the presently planned force. These would be essentially marginal additions to the force structure but it must be plainly understood that they will be non-trivial in terms of cost. It will be *essential* that a rational methodology be devised to determine priorities for such 'regional add-ons' - otherwise silly force structure acquisitions (such as aircraft carriers) will be the end result.

Finally, and at the broader level of strategic policy, it must be one of our key aims to so manage the regional environment, in company with our friends and allies, that a serious slide in the regional order does not occur in the next century.

DISCUSSION

Air Vice-Marshal D.J.S. Riding: This morning the Minister restated the ADF's core business as being the defence of Australian territory. To what extent should our commitment to regional engagement influence the force structure?

Professor Dibb: We've basically got agreement amongst the senior military and the key policy makers and I don't see any substantial change in this government's policy in that regard. I do not believe that what I term 'regional add-ons' should drive the force structure and distort it. The structure we have for the defence of Australia gives us some options, and we're already using those options in terms of our exercises and deployments in the region. But it means more than that. Let me give you some personal views.

Do we need in-flight refueling for the F-111s? Do we need a better radar detection and electronic warfare suite and better precision weapons, some of which we are starting to acquire? Will we be sharing over-the-horizon radar information and AEW&C information with our regional friends? The former possibility has been raised already by General Baker. In the Navy area, do we need additional submarines for regional patrols? And if so, where's the money going to come from? If we are going to send surface ships into areas of greater potential risk, do we need a significantly more capable self-defence, and indeed, strike capacity, in the surface fleet? With Army, do we need to ensure that we have a credible degree of defence against both air attack and a capacity for close air support? If so, we shouldn't buy platforms that only have one role, such as training.

So you can see here are a number of examples where 'regional add-ons' would not determine the force structure, but neither would they be trivial. Now, two more submarines is a billion dollars and you can cost some of the other items; they're fairly easy to arrive at. I think for at least the next two to three years, there will be no real increases in the defence budget and this must affect the affordability of any 'regional add-ons'. Let me make it very clear, however, if we don't get real increases in the defence budget late this decade then we will face block obsolescence in the force

structure around about the year 2010. And that is just the time frame when my strategic pessimism, if you like, comes to the forefront.

Air Commodore Norman Ashworth: Professor, is it a reasonable interpretation of your points that the key power in the Asian region is going to be China in this coming decade? And could I add to your list of discontinuities the possibility of China breaking up, of doing a Soviet Union in the next ten to fifteen years?

Professor Dibb: I think we have to be careful not to think of China as a self-fulfilling wish, that is, as an enemy. But China inevitably will have the sinews of a great power over the time frame we're looking at. The World Bank and other authorities are proclaiming that China will have the region's largest economy by 2010, and inevitably, great economic power will lead at the very least to great political power, which I believe China is already using as a coercive lever: certainly in Southeast Asia, and more obviously against Taiwan. I also think great powers have a responsibility to explain themselves, and China isn't explaining itself much at all. Where are their White Papers? Where's their statements about their order of battle? How many intercontinental ballistic missiles do they have? They're all state secrets. We're going to have a problem of bringing China into the community of nations and encouraging it to behave in a responsible manner, and abiding by the international rules of behaviour.

The problem is, I think, that China is not a status quo power. It is not satisfied with the current balance of power. It is not satisfied with the historical inequities that it has had to carry. It is a challenging power. And if you want to carry the paradigm further, the sort of balance of power problem we have in the region is not unlike the rise of Prussia and then Germany in the second half of the nineteenth century under Bismarck. That rise was handled reasonably well initially because Bismarck understood the balance of power and norms of behaviour. Then when Kaiser Wilhelm came in, the balance of power was thrown out the window, and what was the end result? Now, I'm not suggesting that what happened in 1914 in Europe will happen here, but I am saying that we have a very substantial new balance of power problem on our hands. Emerging challenging powers throughout history have been disruptive.

Your second question is a very interesting one. Some experts like Gerald Segal from the International Institute of Strategic Studies in London are saying that we may have to handle more than one China, and by that he doesn't mean Taiwan. He means the possibility of China splitting up into warring kingdoms. Frankly that wouldn't give me any more optimism than the previous model of a strong, dominant China, because a China that was going through tremendous disruption and potential secessionist tendencies may force the leadership to look for external adventures. So we need something that is neither one nor the other extreme in China. But we won't be able to control that.

Dr Alan Stephens: A number of respected commentators are currently arguing that the system of nation states by which the international community has more or less organised its affairs for three hundred and fifty years is in some kind of terminal decline. If that were the case, clearly it would have serious implications for defence outlooks. Do you agree with that prognosis? I would take it from your projections for the next ten to fifteen years that in fact that you don't, and specifically you wouldn't agree in relation to the Asia-Pacific region.

Professor Dibb: Yes, I think that is right. I don't discount some of that analysis in other parts of the world but I think the problem with that sort of sweeping generalisation is that it does not necessarily apply to our region. You know it is like the statement that economic interdependence is good. Well, is it? In our own region it has already caused enormous tensions between China and the United States and Japan and the United States. On the nation state: in my travels around the region over the last thirty years, I haven't seen any withering away of the state. All I see in the region, as states become economically more successful and powerful, is if anything an increase in nationalism. Countries that have come from a difficult past are now finding their feet and are quite rightly proud of their increasing economic and technological strengths and are asserting their national sovereignty and independence. That is not a bad thing. It is natural and it is something that we in Australia have been doing in any case. But to say that the nation state in the Asia-Pacific region is withering away because of growing economic interdependence and so on flies against everything one sees and experiences.

Air Vice-Marshal R.V. Richardson: Professor, you mentioned a minute or two ago the possibility of sharing OTHR with friends. Do you see that kind of cooperation as a possible stabilising influence?

Professor Dibb: I think technology is going to mean, by and large, a more transparent region. If we are going to have commercially available one-metre resolution satellite photography, as we are, then that is going to force the Chinese into being more transparent and more cooperative, because the region will know what the Chinese order of battle is. It will be difficult, I think, for any country to hide the basic parameters of its order of battle and sinews of war in an environment where we are all going to be more transparent. So I think that those issues are an important trend. When it comes to sharing particular sensitive technologies, we will have to look at it, I would say, on a case by case basis.

Captain David Connery: You have dwelt a lot on international security and that is quite right for the longer term. In the shorter term though, and particularly in our region, do you think that domestic issues are perhaps more important in looking at where Australia is going to go over the next fifteen years?

Professor Dibb: This was a short address, but yes, I suppose I could have spent more time on those issues. There are some national and nation-building issues in the region that are going to become more important as the tensions of high economic growth, the demands for greater political participation, greater attention to the environment and human rights and so on, increase. As information becomes more available through mediums like the Internet, these things will be very important heralders of change. But I think none of that gainsays the urgent need for Australia to take very careful attention of the long range strategic assessments I have mentioned. Frankly, we are not doing enough in terms of long range strategic assessments. We are not doing enough in terms of bringing together political, strategic and economic analyses.

Mr Hans Roser: Paul, my company does a lot of business in Asia, from India through to China, the area you talked about. So do many other Australian companies, and so do many other companies from many other countries in the world. Could I ask you to

comment on some of the economic and trade patterns, the business linkages, and the other underlying economic factors that will have a bearing on the strategic picture. What kind of an influence would you expect them to have ?

Professor Dibb: Australia has paid the right sort of attention to opening up markets in the region because by and large we believe that trade is not only good for us, but it increases contact and understanding. Further, through comparative trade, the other partner grows economically, and by and large you would rather have growth than the other way around. That is, if countries in our region suffered major economic declines then we might have a serious problem on our hands in terms of domestic political instability, possibly even racial conflict in certain countries. So economic growth and trade and investment by and large is good. My problem is that, again, both in the academic and the official domain, we simply don't do enough intricate analysis. We don't sufficiently challenge the belief that the world, and in particular our region, is one determinist economic model, in which all economic exchange is good. I quoted some examples where economic interdependence has in fact caused tensions in political relations between China and the United States, and between Japan and the United States; where arguably the trade problems have spun off not only into political disagreements but - I would argue - in some areas into security relationships. So I am not arguing that companies, including ones like yours, shouldn't invest in the region, but they need really good advice regarding where the potential shocks and discontinuities are.

Air Vice-Marshal Riding: We've got time for one more question and I think I might take it. Let me talk about air power. The Gulf War and the civil war in the former Yugoslavia have demonstrated the absolute air power dominance of the advanced economies. In effect those advanced states are able to apply air power as and when they choose. Is that dominance, and should that dominance, be a major consideration in Australian security planning?

Professor Dibb: Well, as one of those who helped save the F-111s in the 1991 Force Structure Review, yes! Air power clearly has the range, speed and shock effect that is very important. I think that we are going to come up against some very difficult force structure decisions as we start to think of the follow-ons to the F-111s and F-18s. They are going to be extremely serious decisions. They're not with us here and now, but let me put it to you that it isn't too early to start thinking of them against the sorts of strategic trends I have outlined. In our force structure thinking we need to think increasingly long term.

I am one of those who believe that we need a balanced force structure, but 'balanced' does not mean equal shares for all. These are difficult problems for the three single service chiefs, as long as we have single service chiefs! There will inevitably be a weighting of the force structure, as we specified in the 1994 White Paper, to give some priority to air and naval capabilities. Now that does not mean that there is no priority for Army and I have been very pleased to see the way in which, at long last, Army, with Army 21, is coming to the sort of structure that I think is in Australia's national interest. But it does mean that over the coming fifteen years we are going to have to look at concepts of information dominance and precision strike. We will not have the lead in platforms, whether they are Air, Naval, or Army. We will have to be the smart buyer, the smart manufacturer and the smart supporter. It is therefore crucial that when

we purchase new kit we ensure that we can get into the electronics - into the source code, the software and so on - that will ensure that, not least with air power, we are able to dominate the sea/air gap. And in those areas where the government of the day asks us to make a major contribution to the region, we need to ensure that we remain - as a middle power - the region's major military force.

THE AUSTRALIAN DEFENCE FORCE AND REGIONAL SECURITY

J. SOEDJATI DJIWANDONO

It is important at the outset to determine the scope and parameter of the discussion in this paper. First of all, the term 'regional' is used here to refer to the region of Southeast Asia. While in geographical terms Southeast Asia is never clearly defined, it is hard to consider Australia as part of the region, despite remarks that the future of the country lies in this part of the world.

On the other hand, Australia does belong to the South Pacific, in which it has been engaged in regional cooperation, particularly in the context of the South Pacific Forum, in addition to its obligations under agreements on security and defence cooperation with individual countries of the region such as Papua New Guinea in the form of the Joint Declaration of Principles between the two countries in 1987 and the Agreed Statement on Security Cooperation concluded in 1991.[1]

That is not to overlook the fact that Australia has also been engaged even earlier in a defence arrangement with some countries of Southeast Asia in the context of the Five Power Defence Arrangements (FPDA). And recently it has signed an agreement on maintaining security with Indonesia. In that sense, Australia, and thus the Australian Defence Force or ADF, has a role to play in the security of Southeast Asia. It is not something new at all. It has also been engaged in a variety of forms of security cooperation with individual countries in the region such as joint military exercises and exchanges of military personnel. What form this security role should take to enhance Australia's security cooperation with the countries of Southeast Asia, individually as well as collectively, particularly through the ADF, is the focus of the present discussion.

It is to be noted, however, that the differences in the nature of relations between Australia and the South Pacific on the one hand and that between Australia and Southeast Asia on the other, also affects Australia's security relations and cooperation with these two different regions. With the South Pacific, Australia's security relations and cooperation have been described as 'constructive commitment', whereas with Southeast Asia it is 'comprehensive engagement',[2] and under this term, which is multi-dimensional in character, Australia's security engagement in Southeast Asia goes beyond traditional concerns with threats of an overtly military nature.[3]

In order to further re-define the appropriate nature of the role of the ADF in the maintenance of regional security in Southeast Asia as a manifestation of Australia's continued security cooperation with the countries of the region, individually as well as collectively, it is important to review the current strategic and security dynamics of the region. This includes the prevailing security problems, concerns, and perceptions as well as the growth and development of security cooperation among the regional countries themselves. This will help to make security cooperation between Australia

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[1] *Defending Australia*, Defence White Paper 1994, Australian Government Publishing Service, Canberra, 1994, p 92.

[2] Desmond Ball & Pauline Kerr, *Presumptive Engagement: Australia's Asia-Pacific Security Policy in the 1990s*, Allen & Unwin, Canberra, 1996, p 16.

[3] *ibid.*, p 76.

and Southeast Asia more effective and efficient. It will help to find more appropriate forms and areas of security cooperation for greater mutual benefit. Some of these, of course, have been undertaken. But they may need to be extended, expanded, improved, and intensified, while others are embarked upon. To be sure, Asean does not as yet represent the whole of Southeast Asia, which is its aspiration. But it does not seem too unrealistic to expect that by the end of the present century, which is just around the corner, Asean-10 will be a reality.

STRATEGIC DYNAMICS OF THE REGION

To begin with, for Southeast Asia, the end of the Cold War has merely meant the disappearance of just one dimension of its security problem. With the end of the Cold War, the countries of the region will no longer face the danger of getting embroiled in an East-West confrontation or the threat of great power interference in the context of East-West competition.

From that perspective the end of the Cold War has created a more peaceful international climate in the region. Either directly or indirectly, the new climate has been favourable to the development efforts of the countries of the region. It has provided greater opportunity for the promotion of economic and trade relations among states without political constraints brought about by Cold War bipolarisation.

It does not follow, however, that peace and stability has thus been created in Southeast Asia, for the problem of security in the region has always been complex and multi-dimensional in nature. In point of fact, of no less significance than the Cold War for the security of Southeast Asia was the Sino-Soviet conflict, which burst into the open even while the Cold War was at one of its peaks. And beginning with the Sino-Soviet dispute, the constant re-alignment among Asian communist nations in the past tended only to further complicate the security situation in the region.

To say that for Southeast Asia the Cold War was just one dimension of its security problem is certainly not to underestimate its importance and its impact on the region. The conflicting global interests of the two superpowers of the Cold War in Southeast Asia was epitomised, at least for a time, in the ideologically divided Southeast Asia into communist and non-communist nations. And the then Republic of South Vietnam was regarded as the bastion or the front-line state of the non-communist world in Asia, the importance of which was sustained by the so-called 'domino theory'. One writer has put it that 'the combination of domestic instability caused by communist subversion and insurgency, and the rise of socialist regimes in the region resulted in Southeast Asia being somewhat artificially propped up as one of the key elements in the East-West confrontation in Asia'.[4]

Aside from the context of the Cold War and the Sino-Soviet dispute however, the region has always contained within itself various seeds of potential conflicts, both domestic and inter-state. Indeed, East-West competition of the Cold War had often tended to exacerbate existing conflict situations of both types because of the support given by the two blocs of the Cold War for their respective protagonists in the conflicts to serve their own interests. However, while it was not unlikely that in the interest of their own competition they might encourage such conflicts, they were not always nor necessarily the primary sources of the conflicts themselves.

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[4] Chandra Jeshurun, 'Southeast Asia', in *Regional Approaches to Disarmament, Security and Stability*, ed Jayantha Dhanapala, Dartmouth for UNIDIR, Aldershot, England, 1993, p 49.

The fact remains, nonetheless, that even during the Cold War such conflicts frequently beset Southeast Asia, in addition to various seeds of potential conflict in the future. The continuing conflict situations in Cambodia and Myanmar are among the examples which have survived the Cold War and which are basically domestic conflicts, although the former had from the beginning involved external powers. And examples of inter-state conflicts, actual as well as potential, abound. We may mention the dispute between Malaysia and The Philippines over Sabah.[5] Then there are overlapping claims over a small island (Batu Puteh) between Malaysia and Singapore, the dispute between Malaysia and Indonesia over two small islands, namely, Sigitan and Lipadan, and conflicting claims over the Spratlys in the South China Sea, which involve not only four of the member states of Asean, namely, Brunei Darussalam, Malaysia, The Philippines, and Vietnam, but also China and Taiwan.

Moreover, it may be assumed that despite the end of the Cold War, international politics will continue to be marked by competition among nation-states, especially the great powers, one of its classic characteristics. With the end of the Cold War, the competition is no longer between East and West, and it is likely to be less characterised by military confrontation. It may be more over economic and trade benefits such as access to natural resources and markets for exports of goods and services, as well as over political, cultural, and other forms of influence. It means that the Asia-Pacific region, particularly Southeast Asia, may continue to face a possible threat of external interference, if less military in nature than before.

That is likely to be true whether or not there is to be a 'vacuum of power' in the Asia-Pacific region because of the dissolution of the Soviet Union and the withdrawal, at least in part, of United States military presence in the wake, and indeed even since before the end of the Cold War, which, some may believe, may encourage other great powers, particularly China and India, to fill the vacuum.[6]

As far as the question of external interference concerns the member states of Asean, it may be recalled that the association was established precisely on the basis of their common concern with the threat of external interference as their primary consideration. This can be seen from its various documents since the founding Bangkok Declaration of 1967 to the Kuala Lumpur Declaration of 1971 on ZOPFAN (Zone of Peace, Freedom and Neutrality), the Declaration of Asean Concord, and the Treaty of Amity and Cooperation in Southeast Asia, the last two having been signed at the first Asean Summit held in Bali, Indonesia, in February 1976. Thus the nature of international relations is such that Asean regional cooperation will remain significant and relevant in the post Cold War era.

External interference, however, is made possible or facilitated by existing conflict situations, either of domestic or inter-state nature, in the Southeast Asian region itself. In other words, domestic and inter-state or regional conflicts tend to induce external interference. Such interference may intentionally be invited by the countries involved in the conflicts in search of external support or initiated by external powers for their own ends in the context of their own competition.

Thus the principle underlying the regional cooperation of Asean remains relevant, that is, that the member states bear primary responsibility for the peace and

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[5] See J. Soedjati Djiwandono, 'Intra-Asean Territorial Disputes: The Sabah Claim', paper presented at the *Seminar on Asean into the 21st Century: Dealing with Unresolved Issues*, organised by Asean-ISIS in Manila, 14-15 January 1994.

[6] See the discussion in Jeshurun, 'Southeast Asia', pp 60-61.

security of the region of Southeast Asia free from external interference as stated in the Bangkok Declaration. And while it is the responsibility of each member state to prevent and overcome domestic conflicts in its efforts to promote 'national resilience', it is the collective responsibility of all the member states through regional cooperation to prevent, contain, and settle differences and disputes among them by peaceful means for the promotion of Asean 'regional resilience'.

The end of the Cold War has eliminated the prospect of a world war. But while gone are the days of wars by proxy, the world has continued to be beset by local and regional conflicts. Some of these have been going on since well before the end of the Cold War and others have broken out thereafter. Hence the significance of sub-regional and regional approach and cooperation, or simply regionalism. The countries of various regions of the world should now bear the primary responsibility for the peace, security and stability of their respective regions. The Asean member states realised that responsibility at the very inception of the association. In one of its considerations, the founding Bangkok Declaration of Asean states that 'the countries of Southeast Asia share a primary responsibility for strengthening the economic and social stability of the region and ensuring their stability and security from external interference in any form or manifestation'.

During the Cold War, many nations of the so-called Third World were factors in the strategic calculations of the great powers engaged in East-West competition. For that reason, the importance of such regions as Southeast Asia, which in fact has remained ill-defined geographically, for a long time derived their importance from their strategic significance to the great powers. In the post-Cold War era, however, the great powers would most probably no longer have as great an interest in local and regional conflicts that continue to beset the world. They are no longer interested in either instigating or exploiting such conflicts. Unfortunately, nor is it likely now that they have a great interest in involving themselves in attempts to seek their solution. Hence the greater responsibility of regional powers for peace, security, and stability in their respective regions. And in that sense, the regions will increasingly have their own inherent importance, quite apart from the interests of external major powers.

Furthermore, in regional cooperation, it would be generally much easier to find areas of common interests and common problems among states than in a wider scope. And thus common grounds are easier to find upon which to promote mutually beneficial relationships and cooperation. Regional cooperation would also serve as a cushion or an umbrella that would ensure the maintenance of bilateral relations and cooperation, often dampening existing differences or even conflicts in the bilateral relationship of any two nations involved in regional cooperation. This is true especially after each of them has developed an increasing stake in their regional cooperation.

Asean is a good example in this respect. It continues to flourish despite the fact that disputes are to be found in the bilateral relations of any two of its member states. One lesson to be learned from this experience is that nations can still promote and maintain mutually beneficial relations and cooperation in spite of the existence of differences or even disputes. Without Asean such disputes would have readily surfaced into the open and some may even have developed into armed conflicts. At all events, Asean has succeeded, as it were, in sweeping such problems under the carpet, at least pending their final settlement by peaceful means. A dispute should not be the focus of relations among nations, nor should it hinder the promotion of such relations and close cooperation, which would precisely help to find its solution. In any event, regional

cooperation may help create a climate that would be favourable or conducive to finding a peaceful solution.

ASEAN SECURITY COOPERATION

Cooperation in the security field is not something new to the countries of Southeast Asia, on either a bilateral or multilateral basis. We may recall the Soviet-Vietnamese Treaty of Mutual Defence and Security of 1978, and the bilateral security and defence arrangements between the United States respectively with Thailand and The Philippines during the Cold War. And though never effective, a multilateral security and defense cooperation in Southeast Asia took the form of SEATO, which is now defunct, while the FPDA has remained. As far as the Asean member states are concerned, however, cooperation in the security field has continued to be conducted outside the framework of Asean regional cooperation, be it on a bilateral or multilateral basis. What clearly distinguishes the present security cooperation between Asean member states from any previous security arrangements is the absence of the involvement of any external great power.

In the post-Cold War era, and particularly as far as Southeast Asia is concerned, the name of the game remains 'security' rather than 'defence' whenever the reference is to cooperation between states, whereas 'defence', in addition to 'security', refers particularly to the need and responsibility of the individual countries.[7] Let alone the more specific term 'defence', even the more general term 'security' means different things to the countries of Southeast Asia and the Asia-Pacific region at large. There are differences among them in security perceptions, problems and concerns. There will be different answers to the question of 'security from what?' In Southeast Asia as well as in the wider Asia-Pacific region, as has been discussed above, security is to be understood in a comprehensive way. Hence the concept of 'comprehensive security', which was conceived and formulated well before the end of the Cold War.

'Comprehensive security' is commonly known primarily as the Japanese concept,[8] but later on Malaysia has also developed its own concept of 'comprehensive security'.[9] Under the 'New Order', Indonesia has developed the concept of 'national resilience' and 'regional resilience'. While different terminology has been used, however, or while the same terms, particularly 'comprehensive security' as used by the Japanese and by the Malaysians may be different as regards historical backgrounds and ways of explanation and formulation, on close examination, the essence seems to be basically the same, even if there may be slight differences in nuance and

[7] One consideration in the *Agreement Between the Government of Australia and the Government of the Republic of Indonesia on Maintaining Security* signed in December 1995 says, among other things, 'Recognising that each Party has primary responsibility for its own security' and that the word 'defence' is used once if devoid of any intention of defence assistance: 'Mindful of the contribution that would be made to their own security and that of the region by cooperating in the development of effective national capabilities in the defence filed and hence their national resilience and self-reliance'.

[8] See among others, Robert W. Barnett, *Beyond War: Japan's Concept of Comprehensive National Security*, Pergamon-Brassey's, Washington DC, 1984, and Alan Rix, 'Japan's Comprehensive Security and Australia', *Australian Outlook*, Vol 41, No 2, August 1987, pp 79-86.

[9] See Noordin Sopiee, 'Malaysia's Doctrine of Comprehensive Security', *Journal of Asiatic Studies*, Vol xxvii, No 2, 1984, pp 259-67.

interpretation.[10] Both terms, at least within Asean circles, seem to have been accepted and used more or less interchangeably, although 'national resilience' and 'regional resilience', rather than 'comprehensive security', have found their place in Asean official documents, particularly the Declaration of Asean Concord signed at the Bali Summit in 1976.

A nation's security concerns and perception of its security problems are shaped by both internal and external factors. Paramount among the internal factors, besides neo-political setup and position, particularly the size and nature of its territory and population as well as the wealth of resources and geographic location on the map of the world, a good deal of which are more or less constant, are a nation's historical background and experience. In turn, these internal factors partly determine a nation's perception of the outside world or its view or outlook of the world. This is one of the external factors, if in the main subjectively considered. It helps determine its foreign and security policies.

There is even less in common among them as to the answers to the question of 'defence against what?' Therefore, the term 'security' in this discussion is appropriate. And as far as the Asean member states are concerned, it is cooperation in the security field, rather than in defence, and outside rather than within the framework of Asean, which was first officially recognised and endorsed by the Declaration of Asean Concord signed at the first Asean Summit in Bali, 1976.

The central question is whether in the post-Cold War era security cooperation is still of relevance and significance to the countries of Southeast Asia. And if so, what purposes should it serve, whether it is to be promoted on bilateral or multilateral basis, and how it would be related to external great powers. Although not as yet involving all the countries of the region, if that is the aspiration, Asean may serve as a good model, precisely because its establishment as a regional cooperation was motivated primarily by security considerations, and aimed, if in general terms, at the promotion of peace and security of its member states, individually as well as collectively constituting the region of Southeast Asia.

As mentioned before, security cooperation among the Asean member states has been maintained outside the Asean framework. Not all member states, however, have been involved in such bilateral or trilateral security cooperation. The limited scope of security cooperation within the framework of Asean may be due to these reasons: Firstly, as mentioned earlier, there have continued to be unresolved territorial disputes between certain member states of Asean. Secondly, probably as a remnant of the Cold War, a multilateral security cooperation has continued to give the image of a military pact with the involvement and backing of an external great power. And past experience shows that the presence or involvement of a great power in such a multilateral security cooperation may precisely invite external interference whenever a domestic or inter-state conflict occurs that involves one of the parties to the security arrangement, or a neighbouring state.[11]

Thirdly, member states of a multilateral security cooperation are usually bound together by a common perception of an external threat as in the case of Nato, SEATO, and the Warsaw Pact during the Cold War. As far as the countries of Southeast Asia,

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[10] Muthiah Alagappa, 'Comprehensive Security: Interpretations in Asean Countries', in *Asian Security Issues: Regional and Global*, ed Robert A. Scalapino, Seizaburo Sato, Jusuf Wanandi and Sung-joo Han, Institute of East Asian Studies, University of California, Berkley, pp 50-79.

[11] See George McTurnan and Audrey Kahin, *Subversion as Foreign Policy*, Cornell University Press, Ithaca, 1995.

particularly the Asean member states, are concerned, such a common perception of threat of an external nature has never been, and most probably will never be, developed. There are to be found among the member states of Asean such more or less constant and different factors as geopolitical set-up, size of territory and population, and historical backgrounds, which will continue to shape their different and perhaps unchanging perceptions of threat to their security, especially of external nature.

Fourthly, the nature of security problems between any two member states of Asean in their bilateral relations is almost infinitely different. Between Malaysia and Indonesia, for instance, there is a common problem of illegal border crossing, just as between Indonesia and The Philippines. And Malaysia and Thailand share security problems along their common borders, just as between Malaysia and Indonesia in Kalimantan in the past. Thus, fifthly, common problems and common approaches to such problems are likely to be easier to find on bilateral basis between two states than in a multilateral framework, even if a common perception of external threats remains lacking.

Towards Extension, Expansion, or Multilateralism?

It may be argued, however, that security cooperation in Southeast Asia may be geared towards multilateralism, or at least extended to engage other such regional powers in the Asia-Pacific such as Australia. In Southeast Asia, especially after the withdrawal of the American military bases from The Philippines, pressures were mounting for some time for the promotion of a multilateral defence and security cooperation within the framework of Asean. It seems to point to a recognition, an awareness, or a premonition that the end of the Cold War has not automatically created peace and stability in Southeast Asia and even the wider Asia-Pacific region. On the contrary, the demise of the Cold War seems to have created more complex problems of defence and security for Southeast Asia. And in any event, the end of the Cold War has created considerable uncertainty in the region, though it is true also with the whole world, in that it is not as yet clear what kind of power constellation or world order is likely to take shape in lieu of the Cold War.

The main problem for the countries of Southeast Asia is not whether security cooperation is still necessary. The problem is whether the form of security cooperation that has been undertaken so far among the Asean member states should be continued on bilateral basis, so that eventually there will develop a web of interlocking bilateral relationships or whether such cooperation should be promoted to the multilateral level, within the framework of Asean. If so, how should it relate to external powers, particularly the great powers? The need for the present is the strengthening of security cooperation on bilateral basis, for even this bilateral framework is yet to be expanded so as to involve all the member states of the association, which by the end of the century will comprise all the ten countries of the region. The web is still incomplete.

That is by no means to suggest that the possibility of promoting security cooperation on a multilateral basis is to be ruled out altogether. But present circumstances would not favour such an undertaking for the countries of Southeast Asia. This may be a long term process. And we should move step by step, slowly in that direction with caution. The region is marked by diversity in terms of territorial as well as demographic size and geopolitical make-up, and thus in terms of security problems, not to mention the diversity in historical backgrounds, traditions, cultural values, natural resources and stages of economic development.

Indeed, while strengthening and expanding the network of bilateral security cooperations such as now are under way among Asean member states, certain factors may nevertheless be considered and certain steps taken to pave the way for future security cooperation on a multilateral basis, not only within but also beyond Asean, including Australia. The question of a common perception, particularly of external threats, as a glue that may serve to bind together the parties to a multilateral security cooperation, may be open to debate.

The key to the solution of this problem is the aim of such a multilateral cooperation. A common perception will be necessary, if such cooperation should be directed against a common external enemy. However, one may consider the possibility of a multilateral security cooperation within the framework of Asean and beyond that is not directed against any common external threat or enemy, so that there is no need for such a common perception. It does not mean, nonetheless, that a security cooperation, be it on bilateral or multilateral basis, needs a common perception of an internal threat. Although in the Declaration of Asean Concord mention is made of an internal threat in the form of subversion faced by the members states of Asean, the source or nature of such a threat of subversion may vary from one member state to another. Furthermore, even in the event that the source or nature of such a threat of subversion may be the same for all Asean member states, the problem of domestic security should basically be the sole responsibility of the individual member states concerned. Any cooperation in this field would perhaps be limited to an exchange of information and ideas, by which the member states may learn from one another's experience.

If not directed against any common external threat or enemy, an Asean multilateral security cooperation should then serve as an extension or expansion of regional cooperation to reduce mutual suspicion and to build mutual confidence. In other words, it will be a form of confidence-building measure (CBM). Therefore such a cooperation will have no need for a formal structure of its own, but it may form an integral part of Asean regional cooperation as a whole and in its cooperation with external powers. What is most important will be its common program of activities. These may cover coordination in the procurement or manufacturing of weapons and other military equipment that may lead to some form of balance in the field among the member states, which in turn will increase transparency and enhance confidence building; coordination in training, education, and exchange of military cadets and their teachers; military exercises; exchange of information and coordination in the formulation of strategic concepts and planning as well as military operations; search and rescue operations (SAR); exchange of intelligence, etc. Cooperation in such fields will also result in greater efficiency in human and financial resources for the development of skills and the advancement of weapons and military technology.

Of greater importance, however, is that such a multilateral security cooperation will not be a military pact in the traditional or conventional sense of the word that we normally understand, and will not be directed against any nation. Nor will it involve or need the backing of any external great power. Apart from confidence building, such a cooperation will help prevent and contain possible differences or conflicts among member states. And in that sense it will help prevent any possible threat of external interference, a preoccupation that has strongly motivated the establishment of Asean in the first place.

The reluctance indicated or expressed by many countries in the region is towards the idea of moving too fast towards a definite structure or organisation for a

multilateral security cooperation, especially as mentioned before, when 'security' means different things for different countries. Their security problems, concerns and perceptions vary.

THE NEED FOR CONFIDENCE-BUILDING

In other words, confidence building is what the countries of Southeast Asia need most at this stage, especially in relation to external powers. In the meantime, areas of common interest should continue to be sought, identified and expanded, on which multilateral cooperation in many fields may be founded and promoted for common benefit. This would eventually create an atmosphere that may be conducive to the peaceful settlement of existing disputes. Only then would hopefully the countries of the region be ready to embark on a more structured security cooperation on a multilateral basis.

A regional or sub-regional approach is also likely to facilitate interaction in a multilateral framework. It will ensure greater intensity in the relations and cooperation among states and areas of common interests and common problems, and thus common grounds upon which to promote mutually beneficial relationships and cooperation. Here lies, in the meantime, the importance of confidence-building measures (CBMs), or confidence and security-building measures (CSBMs), or trust-building measures.

As mentioned before, traditional forms of security cooperation, particularly in the military field, which were germane to the Cold War, with the backing of a superpower and directed towards more or less a well-defined external enemy are definitely no longer relevant. In the meantime, in search of an appropriate form of security cooperation in the light of actual and potential conflicts, ill-defined security concerns and perceptions, mutual suspicions, and other forms of uncertainty, CBM is the most appropriate form of security cooperation, especially as applied to a wider region such as the Asia-Pacific region. The concept of CBMs understood in Europe within the context of OSCE has a strictly military content such as the prior notification of major military manoeuvres on a basis to be specified by the Conference, and the exchange of observers by invitation at military manoeuvres under mutually acceptable conditions'.[12] For Southeast Asia and the larger Asia-Pacific region, CBMs may be broadly understood as including 'both formal and informal measures, whether unilateral, bilateral, or multilateral, that address, prevent, or resolve uncertainties among states, including both military and political elements'.[13]

Such measures are aimed at contributing to a reduction of uncertainty, misperception, and suspicion and thus helping to reduce the possibility of armed conflicts. The intent is to alleviate tension and reduce the possibility of an armed conflict. A CBM is not to be conceived as an institution, but rather as a stepping-stone or a building block. It represents a means to an end. And by laying the groundwork, it may serve as a useful precondition for effective institution-building.[14]

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[12] Victor-Yves Ghebali, 'Confidence Building Measures within the CSCE Process: Paragraph-by-paragraph Analysis of the Helsinki and Stockholm Regimes', *Research Paper No 3*, Unidir, New York, 1989, p 3.

[13] Ralph A. Cossa, 'Confidence and Security Building Measures: Are They Appropriate for Asia?', *Summary and Analysis of the Council for Security Cooperation in the Asia-Pacific's Confidence and Security Building Measures Working Group Seminar*, Pacific Forum CSIS, Honolulu, Hawaii, January 1995, p 6; see also *Asia-Pacific Confidence and Security Building Measures*, ed Cossa, CSIS, Washington DC, 1995.

[14] Cossa, *Confidence and Security Building Measures*, p 7.

CBMs help manage problems and avoid confrontations between states. But they do not include mechanisms for conflict resolution or other attempts to redress or deal with ongoing crises, for which preventive diplomacy is needed. Thus the concept of confidence building measures is used to convey the idea that a regional security consensus can be developed through a less formal approach, built upon a base of (personal) political contacts and relationships, taking into account the security situation that prevails in each region or subregion. The approach, however, should be a graduated one and aims at: reducing tensions and suspicion; reducing the risk of war by accident or miscalculation; fostering communication and cooperation in a way that helps to de-emphasise the use of military force; bringing about a better understanding of one another's security problems and defence priorities; and developing a greater sense of strategic confidence in the region.

THE ADF'S ROLE ?

On the basis of the above discussion, therefore, it seems clear that, FPDA notwithstanding, Australia, particularly through the ADF, is to play a security role in Southeast Asia to the extent that it is engaged in various forms of security cooperation, either on bilateral or multilateral basis, or both, with the countries of Southeast Asia. Thus in playing a role in the regional security of Southeast Asia, in which understandably Australia has a vital interest, the ADF is definitely not to defend or help defend the countries of the region, neither individually nor collectively, against an external source of threat, except perhaps in the old context of FPDA, even if the term defence often continues to be used in referring to security cooperation.[15]

The term 'cooperation' can also mean 'coordination', especially in view of the fact that cooperation between Asean states in the security field is not as yet promoted within a definite structure. This, in my view, precisely provides ample opportunity for Australia to engage itself in a security cooperation with the countries of Southeast Asia, either on a bilateral or multilateral basis or both, as mentioned before, without impeding its role and engagement in another region, particularly the South Pacific, on a bilateral or multilateral basis, in the framework of the ARF (Asean Regional Forum), nor its international commitment in the context of ANZUS or the United Nations. Indeed, these may even be complementary and sustaining one another.

It is important, however, that there should be no perception in Australia of any of the countries of Southeast Asia as a potential threat to Australia's security in the future, as has often happened with regard to Indonesia, particularly on the part of some circles. On the other hand, it may be argued that closer cooperation in the security field between Australia and the countries of the region may precisely help overcome such a perception.

It is also to be noted that the ADF is just one of the instruments by which Australia plays its role in its security cooperation with Southeast Asia. This particularly refers to security cooperation in various forms of CBM, which still seems to be lacking,[16] although there has been a rapid increase involving different government

[15] It is said, for instance, in *Defending Australia*, that 'We will continue to give the highest priority in our regional defence approach to the pursuit of our interest with the countries of Southeast Asia' (8.7 p. 86); and 'Our defence relationship with Indonesia is our most important in the region and a key element in Australia's approach to regional defence engagement' (8.11, p 87).

[16] Ball & Kerr, *Presumptive Engagement*, p 17.

agencies. And the ADF can certainly perform a role in these various forms of CBMs, especially of a military nature.

Two important factors, however, are to be taken into serious consideration. One is that Australia's security cooperation with the countries of Southeast Asia, and thus its security role in the region, especially involving the ADF and sustained by an agreement, bilateral or multilateral, should never create the impression of 'containing' a third country, especially a major external power like China, nor should it easily give room for such an interpretation. Otherwise it would run counter to the current policy of Asean to engage external major powers in a regional structure. The other is that in the event that Australia enters into a security arrangement or agreement with any one member state of Asean on a bilateral basis, such as the one with Indonesia concluded recently, not only certain external major powers with great interest in the region such as China, but also the rest of the Asean states need to be kept well-informed so as to avoid unnecessary misunderstanding, which would make such an arrangement, no matter how well-intended, counter-productive.

DISCUSSION

Air Vice-Marshal D.J.S. Riding: Could you comment on the general and future capabilities of the Indonesian defence forces ?

Dr Soedjati Djiwandono: That is a difficult question to answer because it may be embarrassing. Not because we have something to conceal, but because it might be embarrassing for some countries to reveal their capabilities, especially in terms of conventional weapons. So, rather than being embarrassed, sometimes they just keep quiet about it, even in the face of international criticism, and don't reveal their various capabilities.

But I would think that in contrast to countries like Australia, with external engagement, with external commitments, in Indonesia, I think the Army will continue to be the most important service. Whereas in Australia, my impression anyway, is that the Air Force may be more significant than the Army or the Navy. In Indonesia, I believe the Navy should be stronger, because Indonesia is the largest archipelago in the world.

Air Vice-Marshal R.A. Mason: Could I ask Dr Soedjati to expand a little on the China policy of his country? We hear in the West a great deal about Chinese policies of non-aggrandisement, but there is a certain element of ambiguity because of the differences in opinion about exactly where Chinese territories extend, and listening to Dr Soedjati just commenting then about the primary position of the Army, I wonder if he could answer two questions? The first is, bearing in mind your country's wish not to give an appearance to China of creating an anti-Chinese alliance, how do you propose to respond to physical Chinese possession of islands around the Spratleys, which they claim are in their territorial waters, but which you also claim are yours; and secondly, how would your army respond in such a situation?

Dr Soedjati: Well, I think on the second point, we hope that the Chinese territorial claims in the South China Seas, or the Spratleys, or some of the Paracels, will not

develop into an armed conflict, and that is the idea underlying the Indonesian initiative to organise a series of workshops on the South China Sea. I don't think we expect an armed conflict, and we try to do what we can, so as to avoid the conflict that is feared because of the claims and counter claims to the Spratleys. So I don't think there is special preparation done by the Army.

As far as Indonesia is concerned, if you talk about our concern with security, it is not with external factors, it is with internal security, especially at this stage. Very few Indonesians really believe that we face an external threat in the form of an invasion and occupation. Indonesia is just too big for any country to invade and to occupy. We have seventeen thousand islands, three thousand of which are inhabited, so that if there is a concern about China and so on, the concern, the perception, is never well defined. It is always ill-defined. I believe that our concern with China is due also to our lack of success in fact, with the domestic problem of Chinese citizenship. Regarding your first question, if I understood correctly, it's on China's attitude towards Australia?

Air Vice-Marshal Mason: No, Sir. The first point of the question was how you imagine your country can maintain a policy of non-confrontation, if at the same time China is insisting on what it asserts are its Fifteenth Century territorial claims to islands in the South China Sea. There appears to be a potential conflict there, regardless of any position which you take.

Dr Soedjati: Well I still don't believe that we are preparing anything for that kind of possibility. The Chinese attitude in fact has mellowed. For a long time China refused to raise the issue of the Spratleys at the international level. But now, the Chinese are open to, not international, but multilateral regional discussions, and these were held some time ago for the first time. So I think we can make a distinction between a bilateral approach, regional and international. But the regional approach to the problem in the South China Sea does not conflict with the bilateral approach, because the bilateral approach is also used by China with Vietnam, also with The Philippines, so that the two kinds of approach may even be sustaining each other, may even be complementary to one another. As far as Indonesia is concerned, in fact we have some concerns about Natuna Island. But from what I understand the informal response from China: is 'Natuna Island is yours'. That's what the Chinese said to the Indonesian Government.

This is my personal view: I think to speculate on a possible conflict with the Chinese is unrealistic. China is just too big, not only for Indonesia, but for the whole of Southeast Asia. It is counter-productive to perceive China as a source of threat. As I said before, it may be a kind of a self-fulfilling prophecy, so why waste out energy?

Dr Richard Brabin-Smith: Dr Soedjati, could I ask you to speculate for us on the role the non-aligned movement might or might not play in regional security in, say, ten year's time?

Dr Soedjati: I don't think the non-aligned movement has any future. Personally, I never believed in non-alignment. It's just too large to be manageable, and the differences among the non-aligned countries sometimes are more serious than the differences between the non-aligned countries and the developed nations. What has the non-aligned movement done anyway? Well, the non-aligned countries wanted to be a moral force, but a moral force without the backing of economic and military force just doesn't make sense. The non-aligned movement has never been able even to cope with

the conflicts within the non-aligned movement itself - the Iran-Iraq War, the Pakistan-India War, whatever. Many of these conflicts were dealt with by major powers external to the non-aligned movement. As far as Indonesia is concerned, I think it is wrong to describe Indonesia's foreign policy as non-aligned. Officially it is never called that. It is called independent and active. But in the non-aligned movement, many countries with different foreign policy orientations find themselves in a similar position; find they have interests converging. If that is the case, then the non-aligned movement may have some relevance. But I think whether a movement is relevant or not in international politics is proven by its ability to deal with problems, and the non-aligned movement has never been able to do anything.

Major M.A. bin Hj Adkaa: I have a question following your statement about the Spratley Islands. You mentioned that China is too big for all of the Asean countries to fight if China is serious over the Spratley Islands. Are you suggesting that if China really wants the whole of the South China Sea, then the Asean countries just do nothing but worry?

Dr Soedjati: I don't think China will rush to take violent action. In fact, China's policy is now ambiguous; for instance, the words used by Chinese officials are 'no peace, no war'. What does that mean? I don't know. China, I think, has a great interest in continuing to open its doors to the world, for its modernisation program.

Speaking from the point of view of the neighbouring countries, I didn't suggest that if it's too big to challenge, then we shouldn't do anything. But we have to learn. I think we have to learn that a big power like China is entitled to play some regional role. It is a lot easier for Singaporeans, for Bruneians to say so, but for Indonesia it is not easy to say that there is a regional power that deserves an important regional role. I think the Chinese will mellow on this score. My personal view is that the Chinese are open to negotiations on joint exploration, on cooperation between littoral states, to exploit the natural resources that may be available, the deposits of natural wealth there. So why do we have to worry about sovereignty?

But perhaps my thinking is too simplistic. Like between Malaysia and Indonesia, we have seventeen thousand islands, and why do we have to worry about two small islands? Two rocks? Why not just take one each, for instance? But I have made myself unpopular because of that. Most of the countries in Southeast Asia are newly independent countries. We are so jealous about sovereignty and so on. Whereas in western Europe, well, you are still jealous about sovereignty, but at least the process is the reverse. In Europe, economic development has reached a certain level among the majority of the countries; now they want to unite again. Perhaps it won't happen in another century, but at least the political aspiration is there. Whereas amongst Southeast Asian nations, this kind of aspiration is never entertained. That's why we quarrel about rocks and so on.

Air Vice-Marshal Riding: Dr Soedjati, you mentioned the territorial dimension of the conflict, but would you like to explore some of the resource implications of the energy issues relating to the Spratleys?

Dr Soedjati: Well, one or two committees have been established and have held I think, six workshops now, but it hasn't resulted in anything consequential. But you know, no one is really sure now if, and how much, deposits of natural wealth is found around the

Spratleys. And I don't think it is inconceivable that some day it will be discovered that there was nothing, then the dispute about the territories would diminish. But, as an Indonesian, I think the kind of agreement between Australia and Indonesia in the Timor Gap, at least the principles, can be applied to the South China Sea. I think that this idea also came into the minds of our officials when they were initiating this series of workshops.

We have a lot to learn, so many lessons to learn. I remember, after the signing of the Timor Gap agreement, for instance, there was one professor, who has now passed away, who criticised the Indonesian Government for giving way to the Australians, because he though the Australians would benefit more than the Indonesians. But in any multilateral cooperation, of course, one country would benefit more than another, but it is compensated by its relations with another country. That's the principle of interdependence in the modern world. In a bilateral relationship, the benefit is not necessarily symmetrical. It may be asymmetrical. But it is compensated by the multilateral approach to cooperation. And, again, if there are any deposits of natural resources - gas, oil or whatever, around the Spratleys - there shouldn't be too much difficulty dividing the benefits. All of us can enjoy the fruits of this joint exploration. Why bother about sovereignty? That's my hope, anyway. Of course, public officials, politicians and so on always have domestic constituencies to think of. I am a private citizen: I have no constituency, so perhaps I can think more coolly about it.

Wing Commander T. Choocheepwattana: As you mentioned on Confidence and Security Building Measures (CSBM), from the last Asia-Pacific Security dialogue, held in Thailand last March, the topic of transparency in arms procurement met with less enthusiasm from the participants. The idea of sharing information about spending plans, certain plans to promote trust, was rejected by delegates from some countries, because their constitution did not allow them to reveal military information. How would you see the future of the CSBM process in the Asean Regional Forum?

Dr Soedjati: Well, of course, there is no complete transparency. Every state has the right to keep some of its military secrets confidential information. But I think there is plenty of room for improvement towards greater confidence building. Transparency is always relative. But there is always an improvement, because confidence is something unquantifiable. I believe, as far as the ARF is concerned, it is talking, a lot of talking, but among Asean nations, even that talking is very important. The process is very important.

There is, I noticed in various forums, always this tension between the so-called Asian approach and the Western approach. The Asians are reluctant about what they see as rushing towards a structured security cooperation. We - what I mean by 'we' doesn't include me, of course, but Asean member states - are more prone to what they understand as an incremental, gradual, step-by-step approach. I think it is because Asean nations are, in comparison to many other nations in the Asia-Pacific, infants. Indonesia has been independent for fifty years; that's an infancy for a nation state with more than 190 million people. So that the process itself is very important, and it may be slow, but it is a lot better than the absence of that kind of measure.

Air Vice-Marshal Riding: I'd like to wrap up the session with one further question which relates to a particular announcement by our Chief of Defence Force, General

Baker, some short time ago, where he said that there would be a sharing of information from the Jindalee over-the-horizon network for surveillance, and that would be shared with Indonesia. I wonder how you perceive the reception to that proposition from Jakarta, and whether there are any other opportunities that you might see for mutual cooperation in that regard?

Dr Soedjati: Well, my guess is it would be welcome. I think it is quite welcome. But let me add one more point about transparency. Looking at the list of countries that have been prepared to publish defence White books or papers or whatever, and that have registered their conventional arms and so on, I notice that those who do not fully participate in this kind of process are seen to be countries with special political systems. I have to admit that I include my own country, because in this group are countries like North Korea, countries like Indonesia. Because the political system is not open. It is a very closed system, so that, even to their own people they are very secretive. The political system is so ossified; ossified and very closed. So I think there is some link between, not only a state's external relations, but also the domestic developments of the countries concerned. But at least with Australia, the way I see it, Indonesia has been more and more open to dialogues, to contacts, even this Australian-Indonesian Agreement was a surprise to many Indonesians, including people like myself.

THE AUSTRALIAN DEFENCE FORCE BEYOND 2000

GENERAL J.S. BAKER

Air Marshal Fisher, distinguished guests, colleagues, ladies and gentlemen. CAS, thank you for the opportunity of joining with you in this seminar and the opportunity to participate in recognition of the seventy-five years of the Royal Australian Air Force. Congratulations CAS on what I think is a fitting way to celebrate the distinguished history of our Air Force; the history of one of the oldest Air Forces in the world; one which started from very modest beginnings and with some antipathy from its fellow services, and which grew to operate about 6000 aircraft at the height of World War II. It did that as an all volunteer force. It is something that we can all be proud of. If there is one flaw, it is that many men and women in Australia don't recognise fully the dedication, the commitment and the valour of their Air Force, not only in World War II but in every conflict since.

The Air Force of today, as with the ADF as a whole, is one of quality rather than quantity. It is that characteristic which will be important as we move to the year 2000 and beyond. It is a characteristic that arises because of our favourable strategic circumstances here in the southern hemisphere; because of the advantages of being an island continent and because of the forethought of our predecessors, in serious and thoughtful military planning. Yet it is one which will be challenged as we move into the next century by the uncertainties and the complexities that confront us all. Looking at the ADF in the year 2000 and beyond, it is necessary for us to examine the strategic environment, both external and internal that we will face; to review the strategy we will use to respond to that environment; and to discuss some of the great challenges that lie ahead of us. If I can touch on each of those subjects briefly, I am sure I can stir enough thought to generate some useful discussion. And I would welcome that discussion, because I think that this is a time when wisdom does not rest in one service or one individual - instead, we can use the collective knowledge and wisdom of us all to great advantage.

There are a few points that should be made to put our strategy in context. The key issues, I believe, are the rate of change, the uncertainty and the complexity of the future. There was a period of euphoria with the end of the Cold War and with the success of Gulf War, but that has rapidly evaporated. Indeed, the speed with which that euphoria came and went is an indication of the rate of change, and if any of you think back over the changes of the last decade, the main characteristic is speed. There were those who saw the growing economic interdependence of nations as a factor for stability, yet we are still in the situation where trade pressures and economic pressures could easily be a cause of conflict and there are many signs of that today. There were those who thought that the United Nations might finally achieve the charter which its founding fathers had set out for it. But the lack of success in some conflicts and the time taken to resolve others has caused us all to think again. Not that we should not continue to support the United Nations wholeheartedly, but we need to tailor our expectations of what it can achieve. The stability that was a feature of the Cold War has changed into instability. We all of course welcome the easing of global tension that has been a feature of the last decade. But the easing of that tension has been accompanied by a rising of new tensions, albeit of a lesser scale and nature, be they

religious, ethnic, commercial, economic or even long-suppressed historical pressures. We see that today there are just as many conflicts throughout the world, albeit of a different scale and nature, as there were during the Cold War. And although they are different, to those in the front line they are no less lethal. And to those trying to solve the problems they are no less complex. But we are thankful that the prospects of global nuclear exchange and even global conventional warfare is somewhat reduced.

Our own region is not free of those pressures. Indeed, on the periphery of our region we have some of the hot spots of the world. It is true that there are forums for strategic dialogue emerging, but they are not yet mature. And unless they address some of the hard issues there is a danger they will lose momentum and become moribund. But not everything is adverse. As we go into the next century - the era of the Pacific - I think there are some positive signs of economic prosperity and perhaps of stability in our region. So we should not assume necessarily that all changes are adverse or more threatening. Some could be beneficial. The point we need to make is that no one can predict that future, certainly not with the confidence that we military planners like to have in shaping our forces and strategies for the future.

This is not a time for military fervour or for complacency. Rather, it is a time of opportunity, because one thing stands out: that the future of this region will be shaped more by the actions of those within it than has been the case in the past. So there is an opportunity; an opportunity we should grab with both hands, and we would be deficient if we failed to do so. We can, if we are serious, help shape our own future.

Domestically we are also going through a period of some difficulty and change, and for the Defence Force it is necessary to recognise those changes.

First of all, we, like many other countries, have been through a period of economic downturn and a period of reduced defence expenditure. Certainly not to the level of some of our friends from the northern hemisphere, but for a force our size, significant nonetheless. And our Minister made it clear this morning that the Government's priorities are to fix the national economy in the long term; an objective which I applaud in terms of defence spending because it is only with a healthy economy that we can expect to sustain real growth in defence. But on the other hand it means all those changes that we want to make in the few years ahead will have to be funded from our own efficiencies. And given the number of changes and the conditions that we want to achieve, there is no doubt that our efficiency drive will continue unabated and even afresh in the next few years.

Secondly, there is the paradox that, as we succeed in our aim of keeping this country secure, the community's interest in defence inevitably wanes. It is necessary to understand that we are a country that has not been under direct military pressure now for fifty years. The movers and shakers of this country have not experienced warfare except at a distance. We have, I think, a challenge in preserving community interest in defence, a challenge not easily met in times when there are so many other demands for priorities, whether it be for health, education, welfare and so forth, but a real challenge for us.

And thirdly, we will be influenced by societal change at large, in which the expectations of youth are diverging from our expectations of military service. It is unrealistic to expect us to change society, rather, we need to adapt to what is happening in society and reach a happy balance. Failure to do that will result in the defence force that we can staff, rather than the defence force that strategic thinking tells us we deserve and need.

Against that very simple background of our strategic environment let's then turn to look at the strategy we need to have in place to deal with those uncertainties and complexities. Clearly in the absence of any single, driving pressure which dictates your strategy, we need a strategy which can deal with a great range of circumstances, some of which are unpredictable. So it is a strategy which needs a number of layers, interlocking layers, each dependent upon the other, but none a substitute for the other. There are five elements in all, and I would like to make some comments on each of those.

The first component of our strategy is that we will structure our defence force for the self-reliant defence of Australia. By self-reliance, of course, we do not mean self-sufficiency. But we do mean that we should be able to deal with all of those circumstances which arise at short notice without the direct combat assistance of anybody else. And that is our aim, recognising the limited circumstances which we are likely to face in the immediate future. There is a second dimension to the defence of Australia which is often not recognised, and in these times of strategic uncertainty that second dimension is the ability to adapt and if necessary expand the defence force quicker than the strategic circumstances can change. It is that second dimension which we must never neglect, and yet it is a dimension in which we need to do a lot more work. Just as the Royal Australian Air Force in World War II went from a strength of 3000 to a strength of 180,000 in a couple of short years, I doubt we could do that today for a number of reasons.

The next point I would like to make is that it is a habit in this country to look at the defence force only in times of threat and to measure the defence force in terms of how it deals with threat. Let me tell you that that is an inadequate basis for measuring the capacity, the size and the nature of your defence force. We are just as important to this community in peace as we are in war. It is because the Australian community feels under no external military pressure that it is able to get on with its business, whether it be social, political, economic or trade development. Without a defence force the Australian community would not feel so free to go about its business.

Our standing as a nation also depends largely on the reputation of the Australian Defence Force, particularly within our region. Our military heritage does a lot to put Australia on the map and our influence, growing I am pleased to say, in the region, is due in no small measure to the way people look at the Australian Defence Force.

Finally, because we are beholden to no one for our defence we can have a very independent foreign policy; an independent foreign policy that allows us to stand up and be counted in the international community on a whole range of issues. Therefore it is important to look at the defence force as an important part of Australian society at large in peace as well as in war.

The second dimension of our strategy is regional engagement. Many people say to me, 'That's new.' Let me tell you, it is not. We have been engaged in the region from World War II and beyond; in Korea, in Vietnam, in the Malayan Emergency, and we will continue to be engaged. What is changing is the nature of our engagement. We will move from that central core of exercising and training with our friends in the region in two directions. On the one hand, we will engage in serious strategic dialogue, to identify common strategic interests; interests which can shape what we do collectively, bilaterally and in due course perhaps multilaterally. But more importantly, that process can help us move away from an aid-based relationship into a relationship of mutual gain and advantage, in which we share the costs and benefits because we

have common interests. We are moving in that direction. And in that process of identifying common strategic interests and promoting responsible military planning, we will achieve confidence building and transparency in the region that can only add to the security and opportunity to avoid misunderstandings.

On the other hand we will also continue to look for opportunities for material and logistic cooperation, both as a material indication of our commitment, but also to achieve the economies of scale for our defence industry. Economies which I believe we can share with the countries of the region, none of whom has defence forces big enough for self-sufficiency in isolation, but collectively I think we can make some real gains. We can include defence industry in the growing involvement of Australian industry at large within the region.

The third element of our strategy is of course the continuation of our alliance and traditional relationships. The traditional relationship with the United Kingdom, which has done much to establish the professional basis of the Australian Defence Force. Our relationship with New Zealand because I am confident that if ever this country got into trouble the New Zealanders would be the first to come to our assistance. But most of all our alliance relationship within Anzus with the United States - a relationship incorporating all the traditional benefits you get from an alliance of that strength and resilience. More than that, because we believe that a continued US presence is vital for the future stability and security of this region, it offers us the opportunity to talk directly and positively with the United States about what we can do to preserve their presence and their commitment to the region, and we are grateful for that opportunity and for the US's commitment to do so. As CDF, it also gives me great confidence to see the Australian Defence Force exercising with the most powerful, most advanced defence force in the world and doing it well. Because that gives us confidence in our force development processes; in our own training; in our own ability to participate in modern warfare. And our ability to hold up our head in that company does our regional standing no harm at all.

The fourth feature of our strategy is of course global engagement and this has two dimensions.

The first, although largely a matter for the Department of Foreign Affairs, is that we will do everything we can to help the future of non-proliferation regimes. It is in our direct interest to do so, because the penetration of weapons of mass destruction and their delivery systems into this region would so fundamentally change our own security that we would need to start again. So we will continue to do all we can to assist prevent proliferation.

The second dimension is our support for the United Nations and peacekeeping. We do this, not simply to be good international citizens, but for the benefits we get out of it. Those benefits have many dimensions. In peacetime, it is the nearest thing to operations, which is invaluable for our own training and experience, particularly for the training of our junior leaders. I have taken particular note of our contingents which I have seen depart and return. And the one feature that strikes me in all of those is how our junior leaders have grown in stature and confidence. It also does much for the reputation for the Australian Defence Force internationally. It has demonstrated that all of that effort and all of that investment in our training systems and individual developments has paid handsome dividends. I am proud of the achievements of the men and women of all three services of the Australian Defence Force over the last five or six years. Even beyond that, but particularly in the last five or six years. It also does us no harm with the Australian community and we win their support when they see

their defence force at work, in humanitarian operations, and we need that support. And last of all, if ever we do get into strife, hopefully there might be some credits out there on which we can call.

The fifth dimension of our strategy, and by no means the least, is the move towards what I call national defence, and this has a number of dimensions.

First of all and importantly it has the dimension in the modern security era of pulling defence policy and other forms of national policy together into a cohesive whole. You can see over recent years how the defence organisation and the defence force have been leaders in Australia's move to participate more fully in the region. From my viewpoint one of the great achievements over recent years has been our ability to pull defence and foreign policy together in a way that we would have only dreamed about fifteen years ago.

The second dimension of national defence is to make best use of national attributes and particularly our industry in every practicable way, so that those few of us who wear the uniform can be warriors. So that we as a nation get the maximum combat benefit and capability out of a relatively small defence force by relying more and more on the community for our support. I think that we have started down that path, and the Minister this morning mentioned CSP. We need to continue that process. It should not be seen simply as a cost cutting measure. Part of that strategy of maximising the combat capability of the Australian Defence Force, is to put us in a strong position so that if ever our strategic circumstances change, we have the ability to adapt and expand the Australian Defence Force. That is a key part of our strategy which we need to give rather more attention.

You can see from that brief outline that we have a comprehensive strategy, with many layers. I have collected them into five. None of those layers can be taken in isolation, none substituted for the others. The strategy's greatest strength is that it is a collective whole which will allow us to deal effectively with the uncertainties of the future.

In dealing with those uncertainties, there are a number of great challenges we face: some peculiar to Australia; some genuine challenges for defence forces everywhere. Let me just talk about some of them, perhaps seven or eight as I see it.

The first one is technology. For a country like Australia - a continent of vast size with a sea and air space around it which is even larger, and a population of just eighteen million, technology has to play a part in our defence. Clearly, as an island, the maritime gap between us and anybody else is an important element of our security thinking. And hence our preference, our interest, in naval and air capabilities, because I believe modern technology makes it more and more difficult to get sizeable forces across a sea and air gap in security and safety, and the risks of doing so are rapidly growing. So our circumstances as an island are an important feature of our defence. But on the other hand we clearly can not afford to be at the top of the technology tree in every aspect. We need to be selective. And how to decide on those technologies which will give us the greatest advantages in the year 2000 and beyond is one of the great challenges.

There is another challenge we need to face in this time of constrained defence expenditure and no growth. That is: how to preserve the level of investment, at a time when we are under economic pressure. Because unless we preserve that level of investment, our capabilities will inevitably diminish over time. It concerns me in particular with the Air Force about how we can sustain that level of capabilities against escalating costs. How we need to minimise, in future, the number of aircraft types we

have, so that we can concentrate our resources into fewer, multi-roled aircraft. Whether or not the aircraft of the future will be within our reach. Certainly I think the selection will be fewer. So we need to think seriously about some of those issues of technology for the future.

The second related challenge is that of achieving a battlefield advantage. We traditionally in Australia have relied on our technological edge. Given the state of the world arms market today and the way it is likely to be for the next five years, we should assume, in the future, that it will be difficult to maintain and preserve an across-the-board technological edge. We must assume that any foe will have access to modern weapons. Indeed, while the Russians and others sell so freely on the world market that will be the case. Whether that changes in ten years' time, as defence manufacturers shake down at the end of the Cold War, remains to be seen. But certainly for the immediate future it will be impossible to preserve an across-the-board technological edge. The edge in capability in future will come not from the technology itself but from our ability to use it better than the other fellow. And that is interesting, isn't it? Because it requires more to be spent on operations and training, so that we can be confident in our own ability and experience to use technology. The challenge is that of preserving a high level of investment but at the same time seeking to increase our experience level. We need to find ways for technology including simulation to help us through that contradiction.

The third challenge is the changing nature of warfare. I don't care whether you call it an evolution or a revolution. The fact is, the nature of warfare is changing. It is changing from the raw application of brute force towards the selective application of precision, highly lethal weapons at the point and time that really matters. That needs totally different concepts, control and doctrine. You might ask yourself, why was the Coalition victory in the Gulf War so overwhelming? So extraordinary? Was it because the Coalition forces were so much larger? No, they were not. Was it because they were so much better equipped? They were certainly well equipped, but the Iraqis also had access to the latest Soviet and some European equipment. The Coalition's success depended on knowing what was happening on the battlefield; on getting that knowledge to the commanders in the field; and on the development of doctrine and techniques to make best use of that knowledge and technology. It was a combination of intelligence - its assessment and distribution - command and control, and doctrine. Any of us in uniform who think we can take short cuts to that in any future conflict would need to think seriously again.

The fourth challenge is the future command and control arrangements. In a force of our size we need to avoid any duplication, and we need a command and control advantage on the battlefield. We will go much further down the joint path. Why? It is not simply a fad, it is a necessity. Because commanders in the field in the future will depend more and more on resources from outside their own direct command for success in war. Just look at the intelligence issue for a start: where a commander in the field now depends upon national systems, theatre systems and his own tactical systems to get all the information he needs for success. And the balance is shifting I suggest towards those systems outside his direct command. And as the range and lethality of weapon systems increases, more and more for fire power he will rely on resources from outside his direct command. Therefore we have no option but to go down the joint chain, to develop those processes. But you do not develop jointery by edict. You develop it by practice, practice, practice, practice and then more practice so that we all have confidence in our fellow commanders and we can be confident that the

support we are promised will arrive as and when it was promised us. Failure to achieve that will result in inefficiency and duplication on the battlefield which forces of our size cannot afford.

The fifth challenge we face is one of organisation. We need to continue to change our organisation and to pull together the military and civilian elements of the defence organisation even further than we have. We are probably ahead of most other people in the world in that regard, and we are well poised under our new joint command arrangements to take that further. But in these new joint command arrangements we are not just looking at organisational change, we are looking at cultural change, in which the whole staff process will change to make use of information technology. We will command from top to bottom in the Australian Defence Force by the component method. Not the components as they are presently defined, which consist of a Joint staff, a Navy staff, an Army staff and an Air Force staff; four staffs together and in the American case a Marine staff. We will have one staff, so that CDF's joint planning staff will consist of a joint staff officer, plus the senior planner from Navy, Army, and Air Force, who will together act as the staff. Where CDF, if he wants advice on submarine or any other form of warfare, does not get it from his own staff but gets it from the man who knows most: the Chief of the Navy, or the Chief of the Air Force, and so on. And we will take out complete layers of staff. We will do simultaneous planning at the joint and single service level: to get our decision cycles faster and inside the decision times of our opponent.

So you should not look on it simply as an organisational change. It is much more a change in culture and philosophy. And the J5 on Headquarters ADF responding to the Chief of the Defence Force will be the Deputy Secretary Strategic and Intelligence. Why? Because he is the man with greatest knowledge and the greatest experience and it would be silly not to use him. But we will go beyond that. We cannot afford any duplication between the services. We will go further down the path of single service management. In future in the ADF, although all three services have their own aircraft, we will have one airworthiness authority. And who should that rest with? The Chief of the Air Force, because he is the best adviser and the most experienced airman we have got. Jointly staffed, but the Chief of the Air Force will control it for us all. Similarly, in future we will move to the situation where all air traffic controllers in the Australian Defence Force will wear a light blue uniform. Because the other services have neither the size, nor the capacity to train and develop those people and offer them a reasonable career. There are many other examples that I could quote that will give us the mutual confidence in each other that allows us to take that forward onto the battlefield.

The sixth challenge we face and probably the biggest of all, is the challenge of personnel. As I mentioned before, as the expectations of youth versus the demands of defence service diverge, we can't expect to change society. We need to change our own culture, not in a way that denigrates those characteristics which people in uniform require and indeed the nation deserves of us. We need to think laterally about how best to do it in the future. And there are five aspects that we need to think about.

The first is manpower planning, or to be more politically correct, work-force planning, in which we assume we have got total control of our work-force, when, in an all-volunteer force, of course we have none. We are subject to market forces. Yet we plan as though we can control to the last man. Once upon a time the defence organisations used to be held up as the model for personnel management. Today I

suggest that we are twenty years behind the world and we need to recover that process in theory as well as in practice.

The second area is conditions of employment. Young people these days do not expect to spend fifty years in one job, but expect to have four or five separate working lives within one career, and we need to accept that. We need to make it possible for people to come and go in and out of the defence force so that we make best use of their life and their skills gained in the civilian world as well as in the military.

The third is conditions of service. Of course we are all interested in getting adequate remuneration and recompense for the demands that we make of people. And we need to do more, if for no other reason than the overhead of managing conditions of service in the ADF at the moment is getting out of hand. We can't afford the overhead of managing it. We need to simplify it; to make it much easier for everybody to understand.

The fourth area is family support. Achieving the right direct balance between the responsibility of the individual to look after his own interests and the responsibility of the service to look after the families of those who put up with great disabilities.

The last area is how to make better use of reserves. And that is also my seventh challenge. Clearly for a country of this size, a force of between fifty and sixty thousand can not hope to adequately defend this country for even minor situations. So if we are serious about self-reliance in the defence of this country in even short notice contingencies, clearly the reserves have a role to play as an integral element of our combat force, not as a secondary element. Yet our reserves over recent years have been a diminishing asset and we need to turn that around and revitalise our reserves. And believe you me that will be a challenge, financially, culturally, and spiritually I suggest.

The eighth challenge we face is that of national defence. How can we get our planning consistent with the requirements of Australian Industry? How can we, even in this time of uncertainty, lengthen our planning horizon to give industry a basis for forward planning and investment? We want to avoid the situation we have had in recent years where we are switching from a very heavy emphasis on Navy, on ship building to, in the next decade, a very heavy emphasis on aerospace, with consequent disruption to industry. How we can get our act together, so that we can equalise our workloads on industry? Because it is inevitable, in my view, given the nature of the Australian continent, that we need to continue to invest in the Air Force. I think that we have let that slip a little in years gone by and we need to recover. Whether it be the lead-in fighter, the P-3 upgrade, the replacement C-130, the improvement of the F-111, the upgrade of F/A-18 and so on. But the most pressing need of all for the Australian Defence Force, not just the Air Force in my view, is the introduction of airborne early warning aircraft. You can see from that simple list alone, the level of investment that we need to make in our Air Force in the years ahead, in times of economic constraint. There will be for us there and for industry a real challenge.

Those eight challenges are but enough to give you a feel for the ADF towards the year 2000 and beyond. None of those challenges has black and white solutions. They are all matters of balance. Balance between investment, operating costs and personnel. Balance between preparedness versus investment. Balance between full-time and part-time forces. Balance between what we do in-house and what we do in industry, and so on and so forth. Balances that can only be addressed if we have comprehensive planning well understood by everybody, and strong leadership. And that for all of us is a real challenge that lies ahead.

Should we be concerned about those challenges? In my view, no, because we are starting to address them from a position of strength, from the military heritage given to us by our forebears. We do have a comprehensive strategy for dealing with those uncertainties in the future. We do have a strong link between the military and civilian parts of the organisation that allows us to best use the talents of the military and civilian staffs. We have made some start down the new command arrangements which will put us at the forefront of military thinking of command into the future. We have demonstrated as a defence force that we are ahead of the game in engaging in our region and the community will follow us for the good of the security not only of Australia but of the region. We have shown that we have the ability to harness efficiency gains to preserve our capabilities and to enhance them in selected areas. And most of all, over recent years, we have demonstrated that the men and women of our defence force can stand up head and shoulders above any other defence force anywhere. I say that as a proud CDF. So we should not face the future dismally, but as a challenge to be met, and I am sure we will. So that our alliance partners can see that we will share the burden. So that our regional neighbours can be confident that we will work with them to meet common strategic interests. And all Australians should feel confident that we can defend Australia.

DISCUSSION

Air Marshal S.D. Evans: General Baker, you very sensibly pointed to some rationalisation and jointery. You mentioned in particular that the Chief of the Air Staff would be the principle authority on airworthiness, and air traffic controllers would wear a blue uniform. Why do you stop there, and not state that pilots, aircrews, aircraft maintainers and the logistics support of Air Forces should wear blue uniforms? It was a good start.

General Baker: I stopped there David simply because they are the two that we have decided on, but I think I also said that we have a long way further to go. And I think all services, as we look for further efficiencies, will be expected to seriously address those issues. I think the measure I will take as to the decision of who does what will be effectiveness in combat. I think we can make great savings in common training, for example, under single service management. I think we haven't exhausted that. And in the world of logistics I think there is a long way to go. We might even finish up with one common air logistics organisation for the whole of the ADF, jointly staffed but under single service management. And there is no need, I think, in those circumstances, to have that sort of staff on Headquarters ADF because I see CAS, CGS and CNS and their staff as being part of my headquarters just as much as they are part of the headquarters of the commanders of their own services. We need to take out those unnecessary layers of staff in the system and speed up the process. I think we have a long way to go.

Wing Commander J.H. Benjamin: Sir, you mentioned that we have to not only sharpen our own abilities, as a defence force, but that we also have to keep the community on side particularly in times of peace. The dilemma arises that with the diminishing budget, most of the effort goes into sharpening our skills. Do you think

that there is still room to perhaps include the community in the same way in our force development? While we shape the force to defend Australia, we are quite prepared to go and do our UN duties. Is there any scope in your plan for, whilst sharpening our own skills, still assisting the community a little more than we do at the moment?

General Baker: There is a large number of dimensions. One of my concerns is that, as we go north, and west, and further away from the major capital cities, we will disappear from sight. I think we need to be conscious of that and we need to do more with the community. But it goes beyond just dealing with the community. It really gets to the heart of drawing on the community's assets as a whole. The more people that are out there, who have contact with us day to day in their workplace, the greater the understanding will be of us and the more we can draw on community skills and assets.

Let me just give you an example, as we go down the path of commercial support for aircraft maintenance. In future we will find it increasingly difficult to generate within the services, skilled engineers who have the background and experience to meet the demands we make of them. In future they will need to spend more time as part of their careers out on an industry exchange program. Similarly we need to devise ways, through reserves and others, of picking up the skills of those maintainers in civil industry as part of our reserve forces, and so on and so forth. In all of the professional fields in future we will rely more and more on part-timers. In medical, dental, legal and so forth, we can rely a lot more on some of the goodwill and some of the real knowledge that is out there in the community in areas which we cannot hope to generate and sustain in peace. So there is a whole range of things that we need to do.

To me, one of the best advertisements for defence was the recent tour of the Red Arrows, that was priceless publicity, I think, for air power. We might see our own Roulettes a little more visible in future, if we can find the resources to do it. On Anzac Day in future, I would be keen to see the ADF in uniform play a much more prominent role throughout Australia. So there are lots of things we can do, we cannot afford to disappear from view.

Air Marshal R.G. Funnell: General Baker, along the same line, I was thinking of the area of project management. Why do we need to have so many people in uniform employed in that area, and for many of them employed only briefly within a full career, when there are a range of folk out there who have expertise that has been developed over decades?

General Baker: Again it is time for a little lateral thinking. There is a lot we can do. We are demanding of people involved in the acquisition and logistics processes, skills which their military training hasn't really given them in terms of project management. We do have to find different solutions which make compatible the interests of effective project management and those of the Chiefs of Services and the force development process. It seems to me the area we have not explored enough is the use of retired service officers. Where you get experience in service and understanding of the service culture and an opportunity for ten, fifteen or even twenty years constancy to develop the project management and engineering skills necessary for success. That said, we have to move towards an acquisition process which involves industry earlier in the process and seeks from them wider, better solutions rather than we dictate to them to

the last dotted 'i' and crossed 't' what it is we want. So that there are two elements to that and we can do better in both.

Dr Alan Stephens: You mentioned the command and control and organisational challenges facing the ADF. In each case you suggested that, before the ADF can make the most of those opportunities, there is going to have to be a culture change effected. What kinds of mechanisms do you envisage using to generate the kind of culture change that you are thinking about?

General Baker: There will be both the carrot and the stick. Anybody who knows me knows that I have been working on command and control arrangements for about the last decade. I think no one was surprised when the recent decisions were made. What pleases me is that the defence force was ready for those decisions, and welcomed them, and I am greatly heartened by the approach of the ADF into putting them in place. The big thing that we have got to do is give people a total view of what we are trying to do and how we are trying to do it. The calibre of the people in the defence force today is that they will not blindly say 'yes sir', but they will question and probe and push. But the greatest strength of the Australian Defence Force is, once a decision is made, if it is seen to be sound, the defence force irrespective of what they thought about it will get in behind and do it. I think it is a question of explanation and leadership as much as anything else.

Brigadier General Toh (RMAF): In your presentation you emphasised only having close alliances with the US and the UK. My question is: what is the Australian Defence Force's view on the future of the Five Power Defence Arrangements? And is it that Australia wants to use that as the platform to develop your skills training? My second question is: what do you think of the future of HQ IADS ?

General Baker: I think the Five Power Defence Arrangement is a very important arrangement for a number of reasons. First, it has its historical connections, which are worthwhile, because it reflects the relationship between the Australian Defence Forces, the defence forces of Malaysia, Singapore, UK and New Zealand, which we shouldn't easily give up. Secondly it is the one multilateral forum we have that allows us to have some discussions on strategic developments in the region. And, indeed, to conduct some worthwhile exercises of growing sophistication from which we all benefit. I think the very fact that it allows us to talk seriously amongst ourselves about some quite touchy and complex issues at times is something that we should not readily give up. We will do everything we can to preserve the FPDA albeit in a form that changes to meet the wishes of all the participants.

IADS is the one physical continuous demonstration of the Five Power Defence Arrangement and as a training and development basis it is valuable and worth preserving. But that is not something for us alone. I think that is something for all participants to seriously consider, and to consider whether it needs to go beyond the pure training organisation, and where it fits should the strategic circumstances start to change. I think there are some worthwhile subjects there we can debate at length.

Air Commodore Norman Ashworth: General, I was very heartened to hear in your address your comments concerning the much neglected area of force expansion to meet contingencies that might arise if our strategic circumstances change. You also

pointed to the, I think quite magnificent, expansion of the Royal Australian Air Force during the Second World War, from 3,500 up to 180,000. You made comment though that you didn't think we could do that sort of thing again, and I would like to challenge that. It seems to me that we have an Air Force today which has vastly greater depth and capabilities than it had in 1939. We have a nation with the population three times the size we had in 1939 and we have an industry which is far more sophisticated. Perhaps you would like to comment on that ?

General Baker: I think, Norm, we would have trouble getting to that size because of the very sophistication of what it is that we would need to do. My concern is not whether or not that is possible. My concern is that I don't know whether it is or not, and that is where we need to do more work. Because to be confident about the size of the force in being, you need to have a good understanding of how quickly and how far you can adapt and change that force structure in time of need. I think that is our real weakness: that we don't know enough about it. That is what I want to do. I am hoping that we never need to do it, but knowing how to is a comfort and one that we all ought to have.

Air Commodore N.A. Smith: General, I would like to pursue the airworthiness bit again if I may, because that is my job. I agree with you that it is one of the challenges. We tend to think of airworthiness in two separate elements - operational airworthiness, and technical airworthiness. I wonder if you could confirm for us that you are actually talking about the whole of airworthiness, and not the just technical airworthiness, that we might delegate to CAS as single service manager? And secondly, with respect to the technical airworthiness side, in your response to Air Marshal Evans, you indicated that the logistics or total logistics support concept might be a little bit further off than just the technical airworthiness concept, and that concerns me somewhat, because we tend to think of integrated logistics support as all those elements that encompass the supply and airworthiness aspects. Would you care to clarify that for us, please, sir?

General Baker: I would hope eventually that when we talk about airworthiness, we are talking not just the technical but the whole lot. But you have got to recognise that in that process there are, for example, in helicopters at sea, some unique capabilities required by the Navy, and what we have got to do is get together the requisite expertise that meets not just my requirements, not just CAS's requirements, but also CNS's requirements for the operation of helicopters at sea. And that is where we have to grow this mutual confidence between us all. It means also that that organisation clearly will have to be jointly staffed, although I would hope we could get to the situation that all had the faith, as I have, in CAS to meet that, not simply for a joint, not simply for an Air Force, but also to meet the single service requirements of Navy and Army. In similar ways I expect in future the Air Force will rely on either CNS or CGS to do other things to support the collective good.

Now if we can't get to that stage, it means we are unnecessarily duplicating staffs and diluting responsibilities, and I suggest to you that a defence force of sixty thousand full-time strength is not big enough to afford that. The only reason why I see delay in reaching a much more comprehensive logistic organisation is that we are not far enough down the track of some very sophisticated and complex studies. I think there is a lot of work to done. But the aim should be clear, as where it is that we want to go, in all of those areas where we can achieve efficiency. And I include in that, not

just between the services, but also between ourselves and industry. Some of those areas are complex. We do not wish to put at risk our capabilities, our preparedness or our sustainment capabilities in that process. So it does need careful study. But the greater the financial pressure that comes upon us, the easier it will be to get into those complex issues. There is a long way to go but we need to do it if we are to achieve the capabilities we presently have in mind for the defence force.

NATIONAL SECURITY AND THE RAAF

AIR MARSHAL R.G. FUNNELL

I was delighted when I was asked to present a paper at this conference. I was also somewhat apprehensive for I knew that the Chief of the Air Staff would expect me to produce a paper that was at least interesting - and better than that - perhaps even important. With that in mind, I was glad of the topic allocated to me, 'National Security and the RAAF', for it allowed considerable personal interpretation.

My way of interpreting it - and this is the way the paper is constructed - is to give my views of national security and the RAAF in the past, national security and the RAAF at present, and national security and the RAAF in the future. Now that requires me to be historian, analyst and strategist, and I am none of those and certainly not all of those. In a way, therefore, I should be embarrassed - but I am not. Let me tell you why.

I am here among distinguished people. At this conference we have historians of reputation and talent; and we have analysts and strategists of similar characteristics. All of them are better equipped than I to offer well-researched and reasoned accounts of, respectively, the RAAF's past, present and future contributions to Australia's security. I, however, have some characteristics that they do not, and can never have. I have been closely associated with the RAAF for nearly fifty of its seventy-five years, since in fact I joined the Air Training Corps in January 1949. I have spent most of my adult life - from age seventeen to fifty-seven - in Australia's air force and I commanded it for more than five years. That gives me a knowledge of the service that can rightly be described as visceral. It gives me a feeling for its people, its culture, its way of being, that only those of a similar experience would have. And so the opinions I offer on the RAAF's past, present and future benefit from (but may also suffer from) my long and close association with an organisation which has in material, social and psychological ways defined Ray Funnell.

With that by way of long introduction, allow me now to define my subject. I was delighted that the term, 'national security', rather than 'national defence' was chosen for it gives both greater breadth and greater depth to the topic. Moreover, as you will see when we come to look at Australia's strategic future, it is our security rather than our defence on which we must concentrate. Security encapsulates all of the elements, financial, industrial, technological, political, social, cultural, environmental, diplomatic, military and others, that combine to bring about continuing national well-being. It is multi-dimensional. With security, you are constructing a hologram rather than a picture.

Defence, on the other hand, sharpens our focus, and rightly so if we are in a condition of realistically perceived threat to the nation. When we are not, however - and I consider that the great majority of Australians realistically believe that we are not - security is a more effective concept for helping us to conceive what we should be doing now and in the future. In fact, concentration on the defence of Australia rather than its security is, for military men (and also others) almost an invitation to conceive of military threats. Once you begin to conceive threats, even for an exercise, you had best be careful for people may (at least to some extent) confuse the imaginary with the real. Kamaria does not exist but, if you are not especially careful, some people who

exercise and develop their professional expertise by combating Kamarian aggression may begin to apply names of real countries to it. Believe me, it happens.

On the other hand, to concentrate on security impels all of us to expand the canvas of our thoughts and bring on to it the effects that non-military as well as military influences will have in shaping our views. How then, you might ask, should the Australian military exercise its talents and develop its ability to enhance the security of Australia? My answer is: by doing those things which contribute to greater security. What those things might be is a question to which I will return. For the moment, my purpose is to set the stage for talking of Australia's security rather than its defence.

The second part of my topic is the RAAF, the Royal Australian Air Force. This year it is seventy-five years old. Seventy-five years is a very good age for an independent military air service. Whether the RAF was or was not the first and whether the RAAF was or was not the second is of no great importance. What is important is that the RAF was the first independent military air service of any substance and the RAAF, which was founded with the RAF as its guiding example, is one of the oldest independent air forces in the world. As air forces go, it has a long history.

In looking at its history and at the contribution the RAAF has made to this nation's security, the seventy-five years divides easily into three periods, namely: from its formation in 1921 until the beginning of the Second World War in 1939, the war itself (1939-45), and the post-war period from 1945 to the present.

In the first of these periods, the RAAF was, as Chris Coulthard-Clark described it in his book of that title, the third brother.[1] It was the youngest and smallest brother and a somewhat unwelcome addition to the family. For the Australian Army and the Royal Australian Navy, air power was seen as an adjunct to land and sea power. For the older services, an independent air service was not seen to be necessary; rather an air service was seen to be an auxiliary service, supporting but not independent of the primary service. On that the Army and Navy agreed; where they disagreed was in determining in which primary service it should be placed. In the period immediately after the end of the First World War, both the Australian Army and the RAN drew up plans for air services within their respective administrative boundaries. In one of those ironies of which history abounds, the establishment of the newest service had much to do with old-fashioned inter-service rivalry and almost nothing to do with a well-formulated and developed rationale on the best means of creating, developing and applying this new element of warfare. With the Army and Navy unable to agree and with Australia in those times being predisposed to following British examples, the RAAF was formed in 1921 as, in most substantial respects, an antipodean copy of a British model.

To my knowledge, no mention of national security or national defence exists in the documentation related to the RAAF's foundation. To a large extent this is not remarkable. It has been only in quite recent times that our habits of thought have caused us to formulate our planning and development in such terms. In 1921, politicians, public servants and military officers shared a stock of assumptions that included the need for military forces. Those forces were needed both for national defence and as a contribution to imperial defence. Explicit doctrinal reasons for establishing the RAAF are difficult to find so ingrained were those assumptions in the minds of those charged with its establishment. Having been established, however, the

[1] C.D. Coulthard-Clark, *The Third Brother, The Royal Australian Air Force 1921-39*, Allen & Unwin, Sydney, 1991.

RAAF was determined both to develop its skill and expertise in aeronautics and to maintain its separate existence. Neither was to be an easy task.

The RAAF's early planning was anything but grandiose. It envisaged a permanent force of one hundred and fifty officers and one thousand other ranks supported by a reserve, the Citizen Air Force, of thirty-six officers and three hundred other ranks. The flying units envisaged and their roles indicate the thinking behind the service's formation: two squadrons for Corps Reconnaissance (in other words, Army cooperation), two squadrons of seaplanes (Navy cooperation), two squadrons of fighters (air defence) and one squadron of flying boats (coastal patrol). Even these modest planning goals were not achieved, with recruitment being difficult and the formation of effective flying units even more so. In fact, in its first few years the RAAF numbered little more than three hundred and fifty men, one flying unit and twenty-five aircraft.

Its early flying activities involved a considerable amount of survey work as well as the roles it had envisaged such as Army and Navy cooperation. The emphasis on survey is interesting. Aviation was in its infancy but already far-sighted Australians could see its potential for a nation that was so large and so sparsely populated. The flying organisation that was best equipped in all senses to undertake the exploration of what might be feasible with aviation in Australia was the Air Force which Australia had recently formed. The RAAF was anxious too to demonstrate what aviation could do and what it as a service could do. Wrigley's trans-continental flight to Darwin, Goble and McIntyre's circumnavigation of Australia, Williams and McIntyre's survey flight to the Southwest Pacific, the aerial survey of the Great Barrier Reef, and numerous lesser tasks were all part of that imperative. The associated imperative was the need to demonstrate that the separate existence of the RAAF was warranted.[2]

Throughout the pre-war period, and especially in the 1920s, the separate existence of the RAAF was under threat. Most nations did not operate a separate air force but included aviation as part of its army and, with some, its navy as well. Even in Britain, which operated probably the best-known and most prestigious independent air service, the separate existence of the RAF was frequently challenged by the other services. In such circumstances, the amount of effort that the RAAF's first chief, Richard Williams, had to devote to maintaining his service's existence is not surprising. He played the political game hard and well and he took pains to emphasise in both word and deed that an Air Force can undertake tasks that the other services could not. Of interest here is that the RAAF placed considerable importance on its fighter force and on air defence. The air defence role was the one that truly differentiated the Air Force from the other services.

Although, as indicated above, there is little evidence of an explicit relationship between the RAAF and the security or defence of Australia, the years leading to the outbreak of the Second World War show that such a relationship was a strong element within the thinking of the service. In the five years from 1934 onwards the RAAF prepared itself for what was seen to be coming. The service expanded; new equipment was ordered and acquired; considerable sums were expended on infrastructure development; and the gathering of intelligence on Northern Australia and the areas to our north (the Netherlands East Indies, Papua, New Guinea, the Solomon Islands, the

[2] Although these survey activities may not have been seen explicitly as security related, I have little doubt that, given the way in which people such as Richard Williams conceived of aviation and the RAAF, security would have been a strong influence in their emphasis on survey.

New Hebrides, Norfolk Island) was accelerated. The consequence was that, although the RAAF was no better prepared for war in 1939 than were its brother services, it was better prepared by a considerable margin than it was in 1934. Moreover, what was done showed a keen appreciation of what was needed for national security and defence even if the reality of what it achieved did not match the requirements.

My summary comment on national security and the RAAF in this pre-war period is that although the connection between the two is anything but explicit in documentary form, the actions of the RAAF (and this applies also to the other services) demonstrate a strong underlying presumption that it had to be prepared to defend Australia and to contribute to Imperial defence.

Let us now move to the war. It is the most significant period of the RAAF's seventy-five years but it is a most difficult period to place neatly into our history. The RAAF of 1939-45 was an unusual force. It was just so different from what preceded it and what has succeeded it. It was large - eventually it was very large - it was structurally different and it was organisationally complex. To be blunt, it was in many ways organisationally irrational. It was created through rapid expansion and destroyed (or all but) through an even more rapid contraction. It was staffed by men (and men were the great majority) almost all of whom were in 'for the show' as it was termed and who had no intention of remaining in the service beyond that.

The expansion of the RAAF from September 1939 to January 1943 was a magnificent effort. It expanded in personnel terms fifty-fold. For the serving RAAF members amongst us I point out that a similar expansion would take the RAAF of June 1996 to an RAAF of 900,000 men and women, trained, equipped, and conducting large-scale operations against powerful and operationally expert enemy forces by October 1999. Think about it and you will have nightmares, but that is what the RAAF of 1939 did.

The response of the men and women of Australia, especially the young, was extraordinary. This was particularly so after Japan entered the war and the threat to Australia was ominous and very real. The performance of the Australian people, servicemen, servicewomen and civilians, was extraordinary. For the RAAF, its contribution to national defence and security took many forms: the contribution to home defence, the contribution to the Allied effort in the Southwest Pacific, and the contribution of trained air and ground crew to the war in Europe are just the most noteworthy. There were many others.

As I pointed out above, the RAAF of that period was very different. Its differences were, however, primarily those of size and capability. In most other major respects it was just a greatly expanded version of what had gone before. It was led and administered at a senior level primarily by regulars. Its culture and its practices were those which had been developed within the RAAF (which were in turn derived in the main from the RAF), and its achievements - which were many - owed much to the capabilities of that small band of regulars who were the RAAF of 1939.

The people they recruited were not like the people who were already there. They had joined but they had no intention of staying. They came in for the war and then they left. Their contribution was magnificent, but equally and perhaps even more so was the contribution of those who were already there when the war began. In just eighteen years the men of the pre-war RAAF had established the organisational, training, operational and perhaps most importantly the cultural base that could support the force that they developed. In the war, they were promoted rapidly and their jobs changed constantly. The pressure on them to perform was extreme but perform they

did. By way of illustration I offer one example from thousands that I could have. I chose Dick Cresswell because it is not only a good one but also Dick is well known and he lives not a long way from here. At the beginning of the war he was a nineteen year old pilot. At the age of twenty-one he was a squadron commander given the job of raising, training and taking into combat a newly-formed squadron, No 77, which he did with distinction. At the end of the war, aged twenty-five, he was commanding an operational wing, No 81 (Fighter) Wing, at Noemfoor.[3] As I said, extraordinary, and there are many other such stories.

To return to the topic of this paper, the RAAF and national security were intertwined from 1939 to 1945, and the RAAF's performance was excellent. It is true that there were many actions and events of which the service could not be proud. They exist and we must acknowledge them, but the service must be judged not on the worst of its actions any more than on its best. It must be judged on the total, and no one could doubt the substantial contribution that the RAAF made to Australia's national security in World War II. It was the service's response to the gravest emergency this country has ever faced. Above all else it was focused completely on real threats to national existence and on actual operations. Its response was direct; it was effective; and it was seen as such by both its own personnel and the Australian people. It is the finest contribution the RAAF has made in its history to date.

The period since 1945 constitutes the greater part of the RAAF's history, fifty-one years, and it differs considerably from the two previous periods. The service as a separate entity has not been under threat and neither has the nation; at least, in both cases, not the direct threats that existed in those previous periods.

I do not wish to dwell on the history of the period. It is recent and it is well known to most Australians. Also, the first twenty-five years of the period has been covered splendidly in a work commissioned by the Chief of the Air Staff for this seventy-fifth anniversary year. I refer to Alan Stephens' recently published work, *Going Solo*.[4] Instead, I will make some general comments and then pick out what seem to me to be the most significant continuing influences acting on the RAAF during the period.

The planning of the RAAF in the immediate post-war period was more explicit than it had been before the war. In conceptual terms, however, the continuities were strong: the RAAF had to be capable of contributing directly to the defence of Australia and to providing forces which could be deployed to join other forces in what was now termed Commonwealth rather than Imperial defence. Also, with the formation of the United Nations, it was acknowledged that collective security entailed the possibility of deploying forces in support of that organisation. And that is how the history of the period has worked itself out for the RAAF operationally.

Under the rubric of collective security but in support of a variety of organisations or arrangements, the RAAF has engaged in operations in the Berlin Airlift, the Malayan Emergency, Korea, Confrontation, Thailand, Vietnam, Kashmir, the Middle East, Zimbabwe, Namibia, the Persian Gulf, Cambodia, Somalia, Rwanda, and perhaps some others that I cannot recall. Some of the involvement has been both minor and indirect. Other involvements have been direct and brutally savage. In all of

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[3] Dick Cresswell's distinguished operational and command record was further enhanced during his command of No 77 Squadron in Korea in 1950-51. To have commanded the same squadron with such distinction in two such entirely different wars is a most unusual achievement.

[4] Alan Stephens, *Going Solo, The Royal Australian Air Force 1946-71*, Australian Government Publishing Service, Canberra, 1995.

them the RAAF has performed with distinction. The security of Australia requires that Australia contribute to collective security endeavours, especially in our region or in support of the United Nations. This has been a continuing feature of Australia's approach to security and the Australian services have responded splendidly. In doing its part, the RAAF has established its credentials as a modern, effective force which, though small, is well-equipped and well-trained and which can fit smoothly into the operational structure of combined forces.

Also of significance in this period has been the way in which thinking of defence and security has developed in Australia and in the RAAF. The Australia of 1996 is so different from the Australia of 1945. The nation has developed greatly and its thinking about itself - what it is and what is its place in the world - has developed even more. As the nation as a whole has changed, developed and questioned its place and purposes, so too has its military.

By way of confirmation of that statement I offer the contrast between the modes of defence thinking in 1945 and 1996. In 1945, each of the Australian services were thinking in terms of defence and the RAN, defence and the Australian Army, defence and the RAAF. Today, it would be national defence and the Australian Defence Force.

The term, Australian Defence Force and its abbreviation, ADF, deserve our attention. When I joined the RAAF in January 1953, I do not believe that the term was used. Even if it was used in certain high-ranking circles or in defence planning, it was not one that was known at the working level. As I recall, it began to enter circulation only about twenty-five years ago. Its development and acceptance has been both rapid and highly influential, so influential that the title of this presentation as we move to discuss the present and the future should be changed from National Security and the RAAF to National Security and the ADF, and within that, the role of the RAAF.

The ADF as a term and as a concept has been a defining construct for the Australian military over the last twenty-five years. It has been both the spur that urged us towards joint approaches and joint structures, and the beneficiary of the attitudes that have been changed as people began ordering their thinking in joint-service terms. In this, the RAAF and its *raison d'etre*, air power, have played a central part. Above all else, it has been air power and air forces that have created joint-service issues and inter-service difficulties.

Were it not for the advent of air power, the whole issue of joint-service operations would be a side-show - and it has all happened so rapidly. There are people alive today who were born before Orville Wright took off from that beach in North Carolina. There are many more who were born before Lieutenant Gavotti began pitching grenades onto his Turkish opponents in Libya in the first use of offensive air power. Those events really did put the air power cat among the military pigeons. In the eighty-five years since then, we have had to change our thinking about warfare in quite fundamental ways. We are now at the point that no commander or planner can hope to succeed in his operational designs unless he thinks very carefully about the air power he has at his disposal and how he will use it, about the air power that his opponent has at his disposal and how his opponent will use it, and finally how he will counter his opponent's air power. This should not, however, be air power and air forces acting alone. The fundamental change that air power has occasioned is the now almost universal acceptance that military effectiveness requires, indeed demands, jointness. The integrated and holistic nature of modern combat power demands that those who

plan for and direct its use construct their thoughts in a joint-service conceptual environment.

The extent to which this line of thinking has gone in Australia is demonstrated in the most recent publicly available document on Australian defence policy and planning, *Defending Australia*, the Defence White Paper of 1994.[5] That document is all about and couched in terms of defence, security and the ADF. The only specific references to the RAN, the Australian Army and the RAAF are in the small appendix to the paper which devotes four and a half pages to a factual description of what each comprises. The 159 pages of the main document read as if the single services did not exist.

This leads me to offer some thoughts on national security and the RAAF of the present. The Defence Mission as set out in documents such as the Defence Annual Report[6] and the Defence Corporate Plan 1996-2000[7] is 'To promote the security of Australia, and to protect its people and its interests'. The RAAF Mission as set out in Air Force 1996[8] is to 'prepare for, conduct and sustain effective air operations to promote Australia's security'. These are broad statements that, with the obvious changes, could apply to almost any nation. For more specific information on defence policy and planning, we need to go to the White Paper, specifically Chapter Three, 'Australia's Defence Policy'. There we find that 'Our highest defence priority is ... to build, maintain and support forces for the defence of Australia. ... we should be capable, without combat assistance from other countries, of defeating any attack which could credibly be mounted against Australia.'[9] This is in some ways unremarkable. It has been the central pillar of defence policy for decades. Its corollary, and it is one that has received strong emphasis since the publication of the 1987 White Paper, is defence self-reliance.

The emphasis given in the 1987 White Paper to self-reliance struck a receptive chord with the Australian people.[10] Who after all could argue with the proposition that we really should be able to look after ourselves? The difficulty I have with the concept is that we seem to be developing our self-reliance more by continued assertion than by creating changes to objective facts. We need to accept the fact that, if the ADF is engaged in sustained combat operations of other than the lowest conceivable level of intensity and the USA is unable or unwilling to support the ADF logistically, our real level of self-reliance would very quickly be revealed. I think that we should acknowledge that and plan accordingly. Realism is always a better base on which to construct vitally important structures such as defence postures than are eloquent but empty words.

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[5] *Defending Australia*, Defence White Paper 1994, Australian Government Publishing Service, Canberra, 1994.

[6] *Defence Annual Report 1994-1995*, Australian Government Publishing Service, Canberra, 1995.

[7] *Defence Corporate Plan 1996-2000*, Directorate of Publishing, Defence Centre, Canberra, 1995.

[8] *Air Force 1996, 75th Anniversary*, Directorate of Publishing, Defence Centre, Canberra, 1996.

[9] *Defending Australia*, p.14.

[10] Much has been made in recent times of the fact that 'self-reliance' was a concept put forward in the last Defence White Paper prepared by a Coalition Government, *Australian Defence*, Australian Government Publishing Service, Canberra, 1976. While that is true, it was a qualified form of self-reliance and it was not at all prominent in the paper, nor was it used frequently in subsequent discourse on defence. The 1976 White Paper used such expressions as 'increased self-reliance' and 'self-reliant posture'. On the other hand, the 1987 White Paper used the expressions 'self-reliant' or 'self-reliance' 12 times on its first page. That was more times than I had seen or heard those expressions used in the previous 11 years.

The other major conceptual difficulty I have with our present policy for national security is our other central pillar of defence policy, namely, that the defence of Australia is the primary basis for our defence capability planning. Its corollary is that the forces developed for that purpose are sufficiently versatile to fulfil a wide range of tasks, in particular those we conduct in cooperation with neighbours, allies and international organisations such as the United Nations.[11] Our total national history suggests strongly that the most likely operations in which the ADF will be engaged will be the latter not the former. Only for a period of about eighteen months from February 1942 has this nation been the subject of a substantial direct threat. Even the so-called low-level contingencies of which so much has been made in the defence planning of the last twenty years were only credible for a year or two thereafter, that is, until August 1945. On the other hand, since federation, the Australian military has been involved in scores of conflicts in support of neighbours, allies and international organisations.

For those who might be worried about the direction in which my thinking seems to be taking us, I would ask of them the following question: 'How would Australia's security have been jeopardised if those planning priorities had been reversed?'[12] My point is that the development of capabilities to integrate with those of neighbours, allies and others would have given us, or could have been made to give us, capabilities that were sufficiently versatile to fulfil all the tasks required for the defence of Australia. It would also have made much more sense to our near neighbours. No matter what sort of spin or gloss you put on it, the continuing build-up of forces and capabilities in our north in the name of national defence against a non-existent threat is a tough concept to sell to those friends whom our forces are facing and on whose continued friendship our security depends.

Here is where I am starting to move from the present to the future. Just as the present is the outcome of the past, so too is the structural, intellectual and doctrinal base on which the future is built. If the future is merely to be an extension or development of what we now have, then I believe we should think again. At the very least, we should hold open the possibility that what we are doing might not be right and that alternatives exist that should be seriously considered.

To return to the point which I made at the beginning, in thinking about the future, the concept of security, broadly defined, will serve us well. Thinking of security impels us to think beyond defence and beyond military means alone. An example taken from our recent past will help me affirm my point. I start by asserting that nothing so ensures the security of Australia as a strong and friendly Indonesia. The recent security agreement with Indonesia and all the work going back over decades that preceded that agreement are some of the most important actions we have taken to ensure our future. We must now build on that. We must work with Indonesia and other near neighbours and regional friends to develop our thinking, our structures and our capabilities so that regional cooperation and the stability that it will bring become realities. Australia's military forces then become and will be seen to be our contribution to multi-national forces that will emerge as required. Depending on the circumstances, a multi-national force might be in one case, the forces of only two or three nations, in another, the

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[11] *Defending Australia*, p 15.

[12] At the conference at which this paper was delivered, Dr Ben Lambeth asked: 'Why talk in terms of reversing the priorities? Why not talk of a change in emphasis?' That is worth considering. The other important question that surfaced was 'how do you structure for coalition warfare?' It is a question to which I have devoted considerable thought but it really is the subject of a separate paper.

forces of a considerable number of regional nations, and in yet another, forces from both the region and beyond.

This is not to say that such multi-national forces are likely to develop in the near term. To get to the position I am suggesting will take time, energy and commitment; but, if you know your destination, you can begin the work needed to get there. You can begin to think in terms of the security of Australia rather than the defence of Australia. With the military, you can place primary emphasis on the capabilities the ADF needs to contribute to regional security and multi-national forces rather than those needed to defend Australia against a yet-to-be-determined aggressor operating from or through the archipelago to our north. As well as and also because of those actions you can begin to influence others to think in a similar way. In broader terms, you can develop social, cultural, educational, economic and other initiatives that assist in promoting shared views and cross-cultural awareness. Then a true and realistically based notion of regional consciousness and concern can develop.

Now some will think that old age has caught up with me; senility has set in, the outcome is what I am putting before you; and my connection with the real world has become somewhat tenuous. This is not so. I am not advocating that Australia disregard the possibility that it may have to defend itself at some time in the future. That must always be a primary concern, but it should not be the primary determinant of our force structure, our force disposition or our organisational arrangements. Moreover, I believe it is well within our intellectual and doctrinal capabilities to devise a force structure and organisation which can roll back smoothly from that required to support a set of possible multi-national arrangements to that which is required to combat direct aggression against this nation. Such a set of arrangements has the distinct added advantage of being realistic. It is not constructed against a non-existent threat and it will not stretch the credulity of the very neighbours on whom so much of our future security depends.

Where in this context, which relates quite explicitly to our subject, the security of Australia, does the RAAF sit? To be brief, it sits centrally and well. Air power, of which the RAAF is Australia's prime custodian, will be of central importance both in Australia's contributions to multi-national forces and in the force required to combat direct aggression against the nation. The force elements which comprise the RAAF of today are almost certain to be required in the ADF and the RAAF of the future. Strike/reconnaissance, tactical fighter, maritime patrol, airlift, operational support and the logistics, training and administrative elements to support them will be essential in any defence force as far into the future as we can reasonably be expected to see. However, what I do see in that future is a continuing development of the ADF and a continuing blending of the RAAF into the ADF until such time as the blending is complete and the RAAF, and the Navy and Army too, cease to be independent services and become part of a single, truly integrated ADF.[13]

Now why do I say this? First, I consider that an *a priori* argument, the clean-sheet approach, will lead you there. Assume that with all that is now known about the elements of military power and their application in the pursuit of national security you were given the task of creating from scratch the optimum force arrangement for the

[13] Also at the conference Air Marshal Barry Gration (Ret'd) suggested that my idea would be better served by not using the term 'integration'. Words are important, and certain words bring with them a load of intellectual baggage that obscure ideas and generate unnecessary emotion. The debate on issues such as this needs to be conducted dispassionately.

security of Australia. I believe that you would arrive at the conclusion that a single defence force with air, sea and land elements was the best arrangement. Moreover, I believe that the present set of arrangements would not even be a serious contender as an alternative. The aim should then be to move from where we are to that optimum position in the best way possible.

A second approach is not to argue from first principles but from using the trends and influences of the past and the present to predict the likely future path of the ADF. The development of military air power over the last eighty-five years (that is, since it was first used in Libya) points inevitably towards the development of a single integrated defence force as being the most appropriate organisational and command arrangement for the development and application of modern military force.

In thinking about this, let us not dwell on the past and what served us well then. Let us look at where we are today. I spoke above of how the notion of a single ADF defines the Australian military of today. That defining power acts its way out in numerous examples throughout the ADF. Headquarters ADF, Commander Australian Theatre, the Component Headquarters of HQ Australian Theatre, Northern Command, joint-service recruiting centres, joint defence centres across Australia, the Australian Defence Force Academy, the Joint Services Staff College, the Australian College of Defence and Strategic Studies, the ADF Warfare Centre, the proposal to collocate the single-Service Staff Colleges; none of these existed thirty years ago and most are initiatives of the last ten to fifteen years. Moreover, most of them were opposed when first mooted but most of them are now regarded not with resignation because they were foist on us but with real pride because they are both appropriate and effective.

Where, however, is this line of development taking us? My answer is: to a place where many people who have been part of and inspired by the individual services to which they now belong feel most uncomfortable. However, I will put to you that all of our halting attempts at joint-service doctrine, procedures, institutional and administrative arrangements have been but examples of our two-step forward, one-step backward progress along the path that leads inevitably to a single, integrated,[14] national, military force. Many, almost certainly most, will disagree; many will cite the example of the Canadians and their ill-fated attempt at integration. However, I believe that all that has happened in the history of the development of air power leads to the conclusion I offer.

The genie is out of the bottle and there is no way of stuffing it back in. There is in the modern world a powerful set of forces that is moving all of us inexorably and inevitably towards the acceptance of a single, integrated national military force in which land, sea, and air power are coupled as required to produce desired results. It does not matter if you are a superpower (USA), a large to medium power (UK), a medium to small power (Australia) or a small power (New Zealand), the forces acting on you are the same or similar and the resolution will be the same. What each nation will do depends on history, tradition, national political processes, leadership, size, the capacity to think clearly, and the national predisposition to accepting new ideas and new organisational arrangements but, in the end, integration will occur.

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[14] That word again. Another question raised at the conference that indicates how the debate on this issue may develop was that of the uniform of the combined force. That and similar issues are relatively unimportant. A properly combined force in which the operating elements wear different uniforms is less of a concern to me than a force of any structure in which operational competence and administrative efficiency are obstructed along service lines by bias, prejudice and bitterness.

On none of these counts is Australia likely to lag behind, save one. We have become accustomed to change, even accepting of it, though many still find it disconcerting. However, with organisational arrangements, the Australian military has been reluctant to adopt the new. To be fair, once new arrangements have been accepted, there has been no reluctance to make them work. Considerable opposition followed by eventual acceptance is almost certainly the way it will act out, and that is no bad thing. It ensures that what eventuates has been thought through very carefully.

Some other points need to be made lest you think that I am consumed by and my good sense distorted by evangelical zeal. I am offering a prediction and a general direction in which to head. I want to get the idea out into the marketplace of ideas so that people can think about the issues, even if the initial thinking is designed mainly to oppose it. It is an idea that must develop and, to a major extent, it must develop at its own pace. Pushing it, especially from above, against strong opposition will not only delay the process but also divert energy and other resources to unproductive endeavours. That sort of push and the fact that it was initiated thirty years ago, before all the influences of the last three decades had emerged and strengthened, were the factors that caused so much trouble for the Canadians.

Another point I wish to make here is that an integrated military force will be a less costly and more cost-effective force than one comprising three single services. That should be regarded, however, as an outcome of integration not as a primary reason for instituting it. If cost is a driver, the operational imperatives which are its true driving forces are likely to be overlooked, at least in part, with all the potential for subsequent disappointment with the outcome.

Integration should also not be driven by a desire to reduce inter-service rivalries and their consequent dysfunctions for again those who would advocate that approach will be disappointed with the outcome. An integrated force will not be one in which the rivalries among its various groupings will be removed. It should, however, be one in which those rivalries are less influenced by service prejudice and less prone to the distortions that bitterness can bring. One has only to look at the various groups within the current services to see that contest and rivalry are endemic within them. It is, however, of a different type and has different consequences than that which has on many occasions created significant inter-service difficulties.

To move beyond the challenging and fundamentally interesting question of the basic structure of the ADF, I will raise some other issues that will confront our national defence force. Some will be relevant no matter how that force is structured. However, I will place my remarks in terms of an integrated ADF whose primary focus is on providing forces for collective security endeavours. For such a force the issues of funding, recruiting, motivating, training and staffing will all be important.

With funding, a question for which an answer is difficult to determine is, will the Australian people be happy to fund a force whose relationship to their security is indirect? Defence of Australia has a rough logic to it that is easy to defend in the pub or around the barbecue. Sending Australians in harm's way to far-off places whose problems are often peripheral - or seem to be - to the direct defence of this nation is a more difficult concept to sell. Fortunately, Australians are a more worldly-wise and more intellectually sophisticated people than many, including politicians, give them credit for. I believe that, with preparation, such an approach can be put to and accepted by the Australian people.

Demographic trends suggest that Australia, like many other Western-style democracies, is confronting a diminishing recruitable population. A parallel and, for us,

an offsetting trend is the major - some say revolutionary - change that is affecting both the way in which wars are fought and the technologies of the weapons used in modern warfare. Australia is better placed than most nations to accept and use the new ways and the new weapons. The so-called Revolution in Military Affairs (RMA) may or may not be a true revolution. However, it does heighten the awareness of the characteristics of modern technology and the capabilities that technology possesses for substituting machines and weapons for men and women. That technology will be of significant assistance in compensating for our diminishing recruiting base.

Of equal importance is that modern technology is offering a real possibility that the conflicts of the future will use technologies, especially information technologies, that will not only remove the need for many personnel but also reduce the risks to those who still must be involved in combat. To a nation like Australia which, for good reason, is reluctant to send its military personnel in harm's way, the substitution of technology for personnel is a positive trend.

This new technology - and again it is especially so with information technology - demands high levels of intellectual and conceptual skills. Once again, Australia is well-placed in this regard. A comment frequently made about Australia is that, as a nation, we are very willing to take up, experiment with and use new technology effectively. Our technology base, our education systems, our national culture, combine in ways that predispose us to quickly acquiring the skills needed to put technology to good use. Our Defence Force benefits greatly from this.

A recruiting issue for an integrated force is whether the attracting of recruits to a Defence Force rather than an Army, Navy or Air Force will be difficult to achieve or merely require a different approach. I suggest the latter, but it will demand both skill and commitment. Once you have recruited, you must then train and motivate. I do not see that the training of recruits in an integrated force will be at all difficult. What is more, it is that very training that will be so influential in the forming of attitudes towards the new style of organisation the recruit has joined. Consequently, it is here that so much of the benefit in broad terms that can come from an integrated force will be based. Also, as with recruiting, I believe that the motivating of a recruit to pursue professional excellence in a Defence Force will be different from motivating a recruit in an Army, Navy or Air Force, but it will not be difficult.

So, what does this portend for the RAAF of the future? It indicates that those who think about and plan for that future must think and plan in expansive terms, seeing clearly the trends and influences of the present and where they are likely to lead the force in the future. Perhaps, like me, they will accept the direction in which air power has led us all and conclude that inevitably the service will be integrated into a single military force. Perhaps, they will also begin to think about how that outcome can be facilitated. If they do, they will need to think about how to maintain the professional focus on air power and the technical expertise of the practitioners of the air power arts. This will not be easy for it is not obvious how to do it. It is, however, essential. Military combat power is a single entity but it requires the integration of three forms of combat expertise. Military power divides naturally into land, sea and air components and those who think most clearly and with greatest effect about each of those components are those whose expertise has been developed therein. The best air power planners and practitioners of the future will be those who are both knowledgeable about it and skilful in its practice but whose thinking and whose practices are cast within an integrated doctrinal and operational frame.

To summarise, which is my way of ensuring that you have really grasped what I have been trying to put before you, I am advocating that security planners look seriously and with an open mind at re-orienting the Australian Defence Force. The primary force structuring determinant of the ADF should be collective security with particular emphasis on our own region. The proviso is that its ability to reorient itself for the direct defence of Australia is retained. At the same time - and it will be done best as a parallel planning activity - our security planners should look seriously and with an open mind at the re-formation of the Australian Defence Force as a single integrated force. The consequences of these two changes are profound. They will affect the very fundamentals of the way in which we think about security and defence, how we establish and locate commanders and the forces they command, how we establish headquarters and how those headquarters plan for and conduct operations, which technologies we acquire and how we use them, and the ways in which we recruit, train, equip, organise and use our personnel.

Will this occur? I think it will. The forces acting upon us will ensure it. When will this occur? I know not. It will not be soon but I have serious doubts about the RAAF being a separate service on its one hundredth birthday in 2021. However, no matter what occurs in organisational terms, I have no doubt that the airmen and airwomen of the future will be as dedicated and as proficient in the application of air power for national security as those of the past. Moreover, as I have emphasised in the body of this paper, their dedication and their proficiency in the use of air power will continue to be of central importance to the security of this nation.

The RAAF can look back on its seventy-five year history with considerable pride. It has served the nation well in both peace and war. Today, it occupies a place among the world's air forces which is a testament to the quality of its thinking, its practices and its personnel. The future is unknown and unknowable but nothing within the RAAF's history or its present disposition is likely to change its quality or its reputation. To adopt a distinctly personal stance, I want to be able in 2021, when celebrating the foundation of the RAAF,[15] to look back at the previous twenty-five years' history of the Australian Defence Force and say: these were its best years; this was when the Australian military came of age and gave this nation what it sought from its defence force, a safe environment and a secure future.

As for the Royal Australian Air Force, the security of the nation has been its charge since it formed on 31 March 1921 and it will be so in whatever form the service takes for as long as it exists. It has been my good fortune to have been part of it for a very long time. I offer my thanks for all that it has given me and wish it the very best for the future.

DISCUSSION

Air Vice-Marshal R.V. Richardson: It seems to me that there is currently a rare opportunity for the RAAF to seize the moment in terms of the range and endurance of some of our key vehicles. New aircraft such as airborne early warning and control, air-to-air refueling and so on are likely to be in service for forty years or more. We should therefore be seeking the maximum possible range and endurance to fully exploit our region's enduring strategic features. Would you agree that we really need to look a

[15] I hope to be there but my actuary tells me the odds are no better than even money.

little beyond what we have been considering in the last few years in relation to the requirements for these vehicles?

Air Marshal Funnell: I believe that those characteristics of range and endurance should always have informed our force structuring discussions and considerations. Unfortunately that hasn't always been the case. I have always found it extraordinary that it has taken us so long and it has been such a tortuous path to get to air-to-air refueling. One would have thought that we would have been one of the first nations to pick up on that, rather than one of the last. So yes, I accept your point about range and endurance. It is an important characteristic in any air power vehicle but especially so for a nation located as we are and with those features of geography that are so important to our security.

Air Vice-Marshal Pingale: At the outset on behalf of the Chief of the Air Staff of the Indian Air Force may I convey our heartiest greetings to the Royal Australian Air Force and all its personnel, present and retired, and their families on their seventy-fifth anniversary.

Sir, my question relates to the dominance of air power. At various forums like this one, we emphasise that although it is the youngest service amongst the three, air power plays a dominant role, and will play a dominant role in any future conflict, be it in the air, on the land or at sea. Yet in terms of a joint organisation, this issue does not get reflected.

If I may elaborate, you have rightly brought out that the role of the RAAF is related to national security and not national defence. For example, air power can play a part in diplomacy. The age-old gunboat diplomacy that the Navy used to be able to effect can be done very effectively by air power today. And you have rightly mentioned the emergence of air power at Tripoli. About seventy years later in operation El Dorado Canyon, air power was able to establish very vividly that it could transgress neutral international borders and take effect thousands of kilometres away, at a far away place like Tripoli. Since then there has not been that much vociferous criticism by the Libyan Government and they have been a little intimidated by air power. When we talk of joint organisations are we equal partners, the Army, the Navy and the Air Force? Should it not be related to the relative effectiveness of each? And when it comes to the allocation of funds, should it not be related to what part is more effective in ensuring national security? May I have your comments on this?

Air Marshal Funnell: Sir, you won't have any argument from me on the importance of air power in constructing thoughts about national security. However I think that we have to be careful that we don't beat the air power drum a little too hard. I think it is most important that as well as accepting and putting before others the ubiquitous nature of air power, we are also realistic. There are many occasions on which air power will be dominant; there are many occasions on which it will not. We have to be careful because the history of air power warns us not to overstate our case. Tony Mason, who will be speaking this afternoon, and who has contributed to all our air power conferences, has written a marvellous book on air power called *Air Power - A Centennial Appraisal.* In his last chapter - a chapter that I believe anyone interested in air power should read - he exhorts us to excise zealotry from air power discussions.

So yes, I do want to see a place for air power in all the thinking that leads to all the structures associated with national security or defence, but above all else let's make sure that our thinking and the structures that emerge are those that are realistic.

Air Chief Marshal Sir Patrick Hine: Ray, I wonder if I could tempt you to sketch out an organisational structure for this single, truly integrated force of the future? From the Ministry of Defence downwards, and of course embracing operations, logistic support and training. And say whether or not you see this single force wearing a single uniform. Or whether the three component parts to which you referred, maritime, land and air, would retain their identity within this single structure.

Air Marshal Funnell: Thank you, Sir Patrick. I must admit that I would prefer to think about a whole range of things other than what uniform people are going to wear. I think that is the sort of thing that will be an outcome, rather than one that should be an input. In all these matters I believe if we get our thinking right and prepare the ground well things like uniforms will fall out by themselves.

It is going to be difficult. How do you construct a force for contributing to multi-national forces that are yet to be determined? I don't know. How do you go about the force structuring of an integrated defence force? I don't know that either. But I would like to try these ideas out. As I said, there is a market place of ideas out there and I have thrown a couple in. Let's see if those ideas survive. If I could change the imagery, my paper is not some sort of pipeline down which my ideas flow to some logic-tight conclusion. I think of it more in terms like this: there is a big pool out there and I have thrown my ideas in, let's see if they swim or not. I think probably what will happen is that my minnows will go in there and the barracuda and sharks that are already there will be after them. But we shall see.

What I would like to do is, in thinking about new era security, get some new era thinking going. But it is going to require a lot of thought by people much more skilful at doing those sorts of things than I, but I hope that I can contribute to new era thinking by raising some of these ideas for further consideration.

THE ROYAL AUSTRALIAN NAVY BEYOND 2000 AND ITS REQUIREMENTS FOR AIR SUPPORT

VICE ADMIRAL R.G. TAYLOR

It is a daunting prospect for a sailor to find himself in the midst of so many airmen, but I am grateful for the opportunity to address you today.

I begin by congratulating, formally, the Chief of the Air Staff and the Royal Australian Air Force on a proud and distinguished first seventy-five years, and Air Marshal Fisher for convening this conference. May the next seventy-five years be even more successful than those past.

I have been asked to talk about 'The Navy beyond 2000 and its requirements for air support'. To assist me, I read some notes which were provided to explain the general theme which the conference was expected to follow, and I propose to set my remarks against that background.

I was interested to see that the notes observed that the next twenty-five years would present challenges that the Australian defence force has never previously experienced, and that our success in meeting those challenges will depend on our ability to deal with new ideas, new technologies and social and institutional change. Those changes are embodied in the concept known as 'new era security'.

As I reflected on what I had read, I wondered what our predecessors - of say twenty-five and fifty years ago - might have said about the new challenges they were to face. I am sure they would have recognised the need to deal with new ideas, new technologies and social and institutional change. Certainly, the types of challenges we face today are different from some of those of the past, but the consequences of getting the answers wrong were probably just as serious then as they could be now.

Apart from the nature of the challenge, the only other difference is probably the rate of change. Technology and society are certainly changing faster now, and I guess that demands faster changing ideas. In any case, I am sure our predecessors faced their equivalent of the challenges of 'new era security'.

So, how do all these challenges affect the Navy beyond 2000 and its requirements for air support?

You heard yesterday from other speakers something about our likely future security environment, so I will try to set out what I see as:

First - the implications of that environment for maritime forces generally;
Secondly - the sorts of roles the Navy is likely to be asked to fulfil;
Thirdly - the capabilities required; and
Finally - what the requirement will be for air support.

Last month at a security conference, the Minister for Defence announced that 'an effective defence policy cannot concern itself with protecting the shoreline. Our defence begins with the security of the region'.

The security of the region was, of course, very much a feature of *Defending Australia 94*. A stable and peaceful region simplifies the defence of Australia and its interests. An important factor in stability will though, be the sea. I'm talking about how the sea is used, and how that use is monitored and, where necessary, regulated.

Let me explain further, this is a region where governments in many countries are redirecting the focus of their security efforts outwards, away from internal security and towards the security of their offshore resources. This is occurring at a time when three other important factors converge. First, economic growth in many regional countries is providing them with the means to improve their ability to safeguard their offshore interests. Second, the international arms market is making available capabilities which have not been widely available in the past. And finally, wide ranging changes in international law, as it affects the sea, are being implemented.

All of this is resulting in not just a quantitative increase in naval forces in the region at a delicate time, but a qualitative step-up as well. I also draw to your attention the fact that when the Economic Exclusion Zones for each country are taken into consideration, there is little of the oceans which can be described as 'high seas'. That explains why most regional nations are more concerned (in a maritime sense) with offshore economic zones and archipelagic waters than with the traditional freedom of the high seas. (Note the difference between this situation and that which might apply in the Atlantic, for instance.)

In this environment, I submit that there is bound to be some potential for disagreement from time to time. We have evidence of such disagreements already. This is a classic example of good news and bad news.

The bad news is that with highly capable forces available to regional nations which might have a falling out, the potential for conflict is obvious. The good news, though, arises from the inherent characteristics of maritime forces, which render them flexible and able to control escalation, and also able to keep any conflict away from populated areas ashore.

The aim, of course, is to ensure that conflict is avoided.

What then, are the implications for the defence of Australia and its interests and thus for our Navy beyond 2000?

The short answer, in my view, is that the three tenets of our defence policy which have been fundamental to our strategy in recent years are likely to continue, but the emphasis may change. There will still be a focus on the defence of Australia and its interests and the pursuit of defence self-reliance, but we are likely to see an increasing involvement in regional engagement. This, though, I submit, is unlikely to mean much change for the naval element of the ADF, because we have been heavily engaged in the region for as long as I have been in the Navy.

My first deployment to Southeast Asia was in 1960, when the RAN always had at least two ships in the Far East Strategic Reserve, but to give you an idea of our current commitments, here are the statistics for 1995:

	Southeast Asia	Southwest Pacific
Combined maritime exercises	11	1
Port visits	108	54
Total days at sea	247	122
Regional ports visited	32	18
Regional countries visited	8	14

In summary then, let me say that the implications for Navy of the likely regional environment beyond 2000 are that security will have a most significant maritime dimension. Navies of the region will have a major role in ensuring the stability of the region.

As far as roles are concerned, I see little change for the RAN, at least in the shorter term.

In peacetime, I anticipate a continuation of the need to be suitably prepared for contingencies which might arise, while at the same time conducting deployments into the region to further regional partnerships and cooperation. The need to conduct surveillance and response tasks in support of civil authorities will, of course, continue.

Preparedness will continue to dictate a heavy training load. Regional engagement will demand a level of deployments at least equal to our present circumstances, although I see at least the possibility of cooperative involvement in regional constabulary roles - for example, anti-piracy operations or even maritime peacekeeping.

Neither do I see any major change in the roles required of the RAN in the event of contingencies affecting the defence of Australia and its interests. We will still need to be ready to conduct surveillance, maritime patrol and response, protection of maritime trade, protection of offshore territories and resources and strategic strike.

It follows that the capabilities needed beyond the year 2000 will be pretty much those that we require now. The Australian fleet of the early twenty-first century will need to be a balanced and highly capable force, tailored to meet the strategic imperatives of defending Australia and its interests and flexible enough to meet wider operational tasks which might emerge.

At this point, however, I want to emphasise that when I talk about capabilities, I try not to focus exclusively on platforms and systems. Capability is for us a three-part equation, comprising platforms and their systems, support for those platforms and systems, and people to operate and support them.

As far as the platforms are concerned, we know already what we will have, not only in three and a half years at the year 2000, but (subject to no change in broad plans) pretty much what will be in our orbat in the year 2010. I do not think we are seriously in a position, as far as platforms are concerned, to engage in the 'leap-frog' exercise advocated by some commentators, of investing now in the platforms of the generation after next. Perhaps the Royal Australian Air Force will be in a better position to do this around the year 2010, with replacements for the capabilities of the F-111 and the F/A-18 force.

To cope with the roles to which I have already referred, I expect the Australian fleet of the year 2010 to consist of:

- A destroyer force made up of four Adelaide class guided missile frigates and at least eight Anzac class frigates. Both classes will, I hope, have been upgraded from their present configuration to enhance their capabilities and their ability to cope with warfighting in the twenty-first century. Our guided missile destroyers will have passed into history - just how their capabilities will have been replaced is an open question;
- An offshore patrol combatant force of nine to twelve ships, much more capable than the Fremantles they will replace. The requirement calls for a helicopter capability and self-protective systems as well as a surface-to-surface capability;

- A naval aviation force of sixteen upgraded S70B helicopters and twenty to thirty intermediate helicopters. The former would operate from the guided missile frigates and the latter from the Anzacs and offshore patrol combatants. In each case the helicopter will represent an integral element of the ship's systems;
- A submarine force of at least six Collins;
- Two amphibious ships (known now as training and helicopter support ships);
- Two underway replenishment ships;
- A capable mine warfare force centred around the Huon class minehunter; and
- Two hydrographic ships.

So much for the platforms. As to the systems, much will depend on the upgrades selected, but I expect that we will constantly be looking for ways to progressively enhance our capabilities to keep pace with the capability environment and any emerging role changes, if my forecast is proved wrong. Certainly, underpinning all of this is our need for capable, secure communications and computer systems to support our ever increasing demand for information.

Turning to the second factor in our capability equation - shore support - I envisage much more significant change by the year 2010.

At the turn of the century the fleet will be homeported on the east and west coasts in accordance with the two ocean basing policy, but thereafter we are likely to see a major rationalisation of our shore facilities as we address the needs of:

- a new concept of class-based in-service support;
- personnel stability; and
- the forward basing of at least the hydrographic ships and the offshore patrol combatants in the north.

We have studies in progress now which are examining all these issues. The in-service support concept is likely to revolve around class-based in-service support centres, with uniformed and civilian defence personnel working alongside contractors to provide all forms of support, including operator and maintainer training, stores support, software development, software support, configuration control and so on.

With respect to personnel stability, we have been grappling with this aspect of two ocean basing now for some time, and it is clear that we will need to relocate some of our shore billets from the east coast to the west to achieve it. This is not something which can be done quickly or cheaply. An alternative (or perhaps something to be done as well) is multiple crewing of some of our platforms.

The need to base some classes in the north further complicates our problem.

Having mentioned personnel stability, this is probably a good time to say something more about the important capability factor of people.

Much has been written and spoken recently about the importance of people in the ADF. From Navy's point of view, I see this as our most critical issue, since it is the one which has the greatest potential to enhance or imperil our capability. Last year's report on a personnel strategy highlighted many of the areas where change is likely. Later this year we expect our *Navy Personnel Strategy 2010* review to be complete. I expect it to reflect a very different way of doing business from what is presently the case.

So far, I have talked about likely roles for Navy beyond 2000, and how we might expect the necessary capabilities to be provided. Before I address our requirement for air support, I should say something about Navy's organisation and command and control.

Each of the changes to which I have already referred will have an impact on our organisational structure. The changes in command and control and administration foreshadowed by CDF will also be a powerful influence. Right now, Commodore Mick Dunne is engaged in a study which aims to inform our strategy for coping with all this change. Certainly, I expect that Commodore Dunne will be looking at:

- The impact of the new collocated headquarters at the operational level. Some elements of the present Maritime Headquarters organisation will need to remain at the waterfront. In this respect, it is sometimes forgotten that in Navy, MHQ staff perform not only the equivalent functions performed at Land Headquarters, but also those performed at the divisional headquarters;
- Dunne will also examine the impact of the new in-service support arrangements to which I have already referred (this is likely to affect both support and training commands); and
- The impact of the evolution of our basing policy.

Separately, here in Canberra, we are already well advanced in examining the shape of a new Navy headquarters, to accommodate the changes that CDF has identified for the strategic level.

Before I pass on from organisation and command and control, I want to say a word about the importance of maintaining in each of our services a distinctive identity, ethos and single service professionalism. CDF has recognised and acknowledged this, but I am aware that, in some quarters, I am criticised for emphasising this aspect.

I can state publicly that I support rationalisation between our three services and a joint approach where this is sensible and practical, and where it results in benefits. But, I see no point in doing it just for the sake of doing it. In fact, I see real dangers in that. Because, in my view, the essence of jointery is the mixture of single service attributes which each of our services brings to the table. I would not like to see us as ADF stereotypes. In my view, the valuable differences between our services are sometimes overlooked.

Let me move onto Navy's requirement for air support beyond 2000. I begin by emphasising that so far today I have talked, as requested, only about Navy. I prefer to talk about maritime matters, which of course encompass the vital element of capability which I have not addressed - maritime fixed-wing air!

For simplicity, I will address our requirements in the following categories:

- Air support required for preparedness, or fleet training if you like;
- Air support associated with peacetime surveillance tasks;
- The support associated with regional and other deployments;
- That associated with our contingency roles of surveillance, maritime patrol and response, protection of maritime trade, protection of offshore territories and resources and strategic strike; and
- Support associated with possible new basing and personnel concepts.

Fleet training. This has always been a heavy burden for Air Force since we disposed of our own fixed-wing aircraft. Despite increasing use of simulation, we will always have a requirement for live training with LRMP aircraft and fast jet aircraft of various types. The load is increasing right now, as we add the test and trials requirements of bringing new platforms into service. New Zealand has been able to assist in recent years with the A4s, but the Air Force's new lead-in-fighter should have a useful role to play in the future.

Peacetime surveillance tasks. I see little change in the requirement for LRMP hours to meet the current tasks.

Naval deployments. It seems likely to me that as the ADF increases its involvement in regional engagement, we are likely to see more of the Starfish/ADEX and other combined exercises, where fixed-wing maritime air in all its forms will be a necessary ingredient.

Contingency roles. Even with the upgrades and enhancements which we will be pursuing in the fleet, I cannot see that there will be other than an increased requirement in contingencies beyond 2000 for:

* LRMP and AEW&C support for surface and sub-surface surveillance and coordination, OTHR and ASW;
* Fighters for CAP in certain circumstances where this is feasible; and
* Strike aircraft to contribute to the maritime strike role.

Fleet basing and personnel concepts. I simply note that there is a real possibility of an increased requirement for service air transport.

I have covered a fair bit of ground with some pretty general remarks. With Australia's security very much dependent on a stable region, I have attempted to highlight the distinctly maritime flavour that is likely to dominate our region beyond the year 2000. This has obvious implications for our Navy, which will, in my view, play an increasingly important role in regional cooperation and a continuing vital part in the defence of Australia and its interests.

We are already well and truly embarked on the self-reliance journey in Navy, with Australian-built ships and submarines and new concepts of support for them. I forecast no major changes to the roles required of the RAN in the short to medium terms, either in peacetime or in contingencies.

We know what we can expect the fleet of 2010 to look like. The future is less clear with respect to the details of our shore infrastructure and our workforce. We are studying these.

In all of Navy's business, I see a continuing need for fixed-wing air support from the Royal Australian Air Force, and plenty of it in peacetime and in contingencies.

A few final comments if I may. All of my remarks are based on the assumptions which are necessary when trying to look into the future. We must have plans and it is right and proper that we should attempt to forecast our environment and then structure and plan accordingly. But I am mindful of how wrong we have been in the past. I quote just two examples. First, when I was employed in force development in the early eighties I recall recovering from the archives a long-range plan for Navy from 1956. The two conclusions which stick in my mind were that neither submarines nor mine countermeasures represented capabilities Australia would need in the life of that plan.

More recently, I note that a study of Navy's manpower requirements in the early eighties identified a need for 21,000 uniformed personnel in the RAN in the nineties. Today we have less than 15,000.

Of one thing I am certain. The RAAF and the RAN have similar histories, influenced very much by first, the Royal Air Force and Royal Navy, and later, their American counterparts. We are natural partners in the maritime environment. Together, we have provided a capable maritime element of the Australian Defence Force and I know that will continue well beyond 2000.

DISCUSSION

Air Commodore J.B. Macnaughtan: Sir, would you share with us the concept of operations for the use of naval platforms beyond 2000? Do you envisage single ship deployments, or are you contemplating convoy duties with multiple platforms and perhaps battle group deployments?

Admiral Taylor: It is impossible for me to cover a total concept of operations, but the one thing I don't envisage is single ship deployments. We would in my view be pursuing the sort of concept we practise for right now. We would be tailoring the maritime forces available in the total Australian Defence Force into task groups to cope with whatever the particular contingency might be, ranging from the protection of shipping to support for land forces.

Air Commodore Norman Ashworth: Admiral, you are no doubt aware that the cooperation between the Royal Australian Air Force and the Royal Australian Navy goes back a long way. The Royal Australian Air Force has been supporting the Navy and its operations virtually from the start. In 1939 the Air Force had only twelve operational squadrons. Of those, five were general reconnaissance. Their role was what we now call long range maritime patrol. Another squadron the Air Force had at the time was fleet cooperation, and that particular squadron provided the on-board aircraft to the Royal Australian Navy, and did so throughout the Second World War. It did that in the form of providing the aircraft to the cruisers and the pilots for the aircraft. Could you envisage a return to the concept of the Air Force providing you with your on-board aircraft crews?

Admiral Taylor: I have no difficulty with the colour of anyone's uniform. If I can get aircraft embarked on ships then it is immaterial to me what colour uniform the crews wear. At the moment of course, we are very happy with the arrangement we have got, noting that the total Naval aviation force is comprised of helicopters, for which we have specially trained helicopter crews. But certainly I have no difficulty with people in light blue uniforms flying helicopters from naval ships.

Professor Martin van Creveld: Coming from a country [Israel] where we have had an integrated defence force for almost fifty years, in fact from the first day, both your remarks and those of Air Marshal Ray Funnell sounded strange - Air Marshal Funnell because he kept emphasising the need for something which to us has been self- evident almost from day one, and you because you were so much opposed to this. Would you

perhaps care to explain your position regarding an integrated defence force at somewhat greater length?

Admiral Taylor: It depends on what we mean by integrated. What I tried to say is, I am very much an advocate of retaining a single service ethos, professionalism, and identity, because it is those ingredients which in my view when brought together by each of the three services represent the real value of jointery. Now that is not to say that I don't support rationalisation wherever there is an efficiency or a real benefit to be gained. I hate to harp back to the example Ray Funnell quoted, but I wouldn't like to see us go down the Canadian track. I think we can get all the benefits of efficiencies without throwing away the very real attributes of single service identity.

Group Captain J.W.C. Baker: CNS, you flagged the use of increased fixed-wing fleet support. You currently use UAVs for fleet support activity, namely the Jindivik. Do you see an increased use of those types of vehicles, and therefore Navy becoming self-sufficient in the future?

Admiral Taylor: Yes, I think there is a real possibility of that in the longer term. But I don't think that they are going to totally replace some of the forms of fleet support we require right now. There are lots of things you can do with unmanned vehicles as targets and so on but there are other things that, if we are to have some realistic training I think can only be done, in at least the medium term, by manned aircraft.

Captain Wendy Deluca: You made some comment about contingencies and deployment. Could you comment please on Army support?

Admiral Taylor: I mentioned that the fleet in the year 2010 will include two amphibious ships, which are in the process of being converted from tank landing ships. When those modifications have been completed those ships will be ideally suited to the movement of a battalion group, wherever that may be needed, but particularly in the north of Australia.

Squadron Leader D.G. Millar: My question is about ethos and tradition. We have heard the intellectual argument for jointery. It's a winning argument for the mind but it's a very cold argument for the heart. How much emphasis should we place on motivating soldiers, sailors and airmen with traditions of service and customs?

Admiral Taylor: I think that is terribly important, and not just in wartime or in a contingency situation. Don't get me wrong, I must make it clear that I am not opposed to increases in jointery. What I am suggesting is that we don't need to go down the integrated path in order to achieve that. My proposition is that too often we fail to recognise the essential and valuable differences between the services. Simply integrating the whole lot could undermine distinctive and important service values.

Group Captain John Harvey: Sir, two weeks ago I had the pleasure of going to CGS's exercise. While I was there a US Marine general suggested Australia could model its forces on the Marine Corps. I think most people would agree that the Marine Corps have a very strong ethos and are inherently an integrated force. What is your opinion on that sort of approach to integration?

Admiral Taylor: Well, I see the US Marine Corps as very much a distinct identity within the US services, certainly part of the Navy but very much with its own identity. So I don't really see the parallel you are trying to draw.

Mr Peter Rusbridge: Do you envisage that command of the air will be necessary over future operational deployments of the Navy? And if so, how do you see it being supplied?

Admiral Taylor: Control of the airspace within the area of a naval task group is certainly required. And what's required there is bringing together all the elements of anti-air warfare, or air defence if you like, which includes the ship on-board and off-board systems as well as any fixed-wing manned aircraft that might be involved. All of that is a coordination challenge for which there is well documented doctrine at the moment, and I see that being achieved by the local task group commander. If there are fixed-wing assets involved, he will need to have expertise on his staff to advise properly on the employment, coordination and safety of those fixed-wing aircraft.

Mr Bob Howe: Admiral, I would like to ask you a question about the future integration of Naval and Air assets in the context of strategic strike missions. Would you care to comment on the relative utility of the Collins Class submarines and the F-111s and the potential to use long range cruise missiles?

Admiral Taylor: I see long range missile for the Collins as a logical progression of our capabilities. As far as coordination of the strategic strike assets is concerned, there is absolutely no reason why the F-111 and the Collins Class submarines, and indeed any other platforms capable of firing long range weapons, shouldn't practise coordination.

Dr John Cashen: Could you comment on the cooperation and coordination of Air Force assets and Navy assets in creating a real time air and sea surveillance picture within the operation of the fleet?

Admiral Taylor: Provided the platforms involved have the appropriate links or communication systems there is no problem. Right now we work very well between the surface force and, for instance, the LRMP force in presenting a real time picture. To do that on a wider scale obviously involves more and more capable links. And that is an area that is being looked at in the force development area right now.

Wing Commander M.A. Toia: One of the things I have noted during my time in Air Force Office is the notion of the Air Force in support of the other services. My limited understanding of Navy operations leads me to think that in the past we had large platforms because we needed big guns and big bullets to put in them. As we have become more sophisticated weapons have become smaller and more lethal. Could you comment on the possibility that Navy may in future be required to support air operations in that the sensor and targeting systems would be packed into a surface vessel while the weapons platform would be a longer range and faster moving aircraft.

Admiral Taylor: I think that is a valuable description of jointery. I think that is a real possibility in the future and it is precisely the sort of concept that we are trying to develop. That is, better cooperation and mutual support between the three arms of the Australian Defence Force.

Air Commodore Stewart Bach: Sir, we are looking at the Air Force retaining hulls, if I can call them that, for in excess of fifty years. We are continually updating their systems. You have had your DDGs now for thirty odd years. What is the prognosis for keeping your hulls longer and continually updating the systems in them, with the prospect that if you don't, you might be forced to a patrol boat sized Navy which we thought about in the mid -70s?

Admiral Taylor: I think that is a good point. We have just gone in for the progressive upgrade notion as opposed to the half-life refit concept we used to follow. There is a new concept which is embodied in the Anzac Class which are designed on modular lines, and are very well suited to the progressive upgrade concept, in that you can pull modules out and put new ones in. If you want to change the basic capability of the ship, you can simply take out an anti-submarine warfare module and put in an anti-surface warfare one. All that, of course, depends on ensuring that the hulls are maintained in sound condition. So, we have taken a leaf out of Air Force's book and are trying to pursue the same kind of concept.

ARMY BEYOND 2000: AND ARMY REQUIREMENTS FOR AIR SUPPORT

LIEUTENANT GENERAL J.M. SANDERSON

Air Marshal Fisher, Distinguished Guests, Ladies and Gentlemen, let me begin by saying what a very great pleasure it is to be here at the Air Power Conference to speak to you on 'Army Beyond 2000' in this, the 75th Anniversary year of the Royal Australian Air Force. Let me join my colleague the Chief of Naval Staff in congratulating Air Force on seventy-five years of illustrious history reflecting the very best of Australian military tradition. In saying this, I acknowledge that we share a tradition fundamental to the RAAF and that is the Australian Flying Corps.

The Australian Army is approaching its centenary in 2001, having been created with the issue of a proclamation to transfer state military forces to the Commonwealth just two months after Federation in 1901.

At the same time Army is about to undergo its biggest transformation since its inception as we prepare to meet the challenges of this complex era that is emerging around us. I welcome this opportunity to explain to you the considerations behind the changes we are proposing to Government. At the risk of repeating some of what has been said to this point, I am going to wallow in history for a while to explain where we are and some of the pitfalls we must avoid in the future.

In this past one hundred years, the Army has evolved through what I would characterise as three distinct strategic eras in our history. The first was the era from Federation, when we were engaged in the South African War, to the end of the Second World War, during which we were essentially a militia force for the defence of Australia and a volunteer expeditionary force for the defence of the Empire.

These were the Anzac years in which we were blooded in Europe and Asia, and in which our diggers earned a formidable reputation as fighting troops. Although the Army was important to the security and well-being of Australia in these years, our continental security was largely determined by the naval balance of power in the Pacific and Indian Oceans. This was one of the key considerations which made us loyal members of the British Empire and then willing allies of the United States.

From the birth of the Army at Federation, it was only thirteen years to the bloodshed and carnage of World War I. And yet, in those thirteen years we anticipated little of the nature of the impending conflict. The Army of the era, greatly influenced by Kitchener following an inspection tour in 1909, was essentially designed to defend the major population centres in the south with a militia force which was based on the rural social order. The Kitchener Army consisted mainly of volunteer *part-time* forces with the permanent forces serving as an instructional cadre, and providing small coastal artillery and fortification engineer elements.

As the nineteenth century had neared its end, the presumption that the Colonies were secured against attack by an omnipresent Royal Navy had begun to look increasingly doubtful. Japan was modernising and becoming a cause for apprehension. During the years following the Meiji restoration Japan had set about building a powerful navy and army, and had surprised the world with its success against the Russians in 1904-5.

In retrospect, the Russo-Japanese War should have provided a clear indication of the form that the First World War would take, involving as it did combinations of entrenchments, barbed wire, machine guns, intense artillery fire, massed attacks and heavy casualties. The only defence then available against machine guns and artillery fire was to dig in, later leading to the popularisation of the term 'digger' among the troops in France.

Yet despite these examples, the 1st AIF was quite unprepared for the slaughter which followed. What we did not learn from an analysis of the battles between the Russians and the Japanese, we had to learn from bitter and personal experience at Gallipoli and the Somme.

Still, by the end of the war the AIF was a bold and innovative force that had pioneered many of the concepts which were later to reach their full development in blitzkrieg. The potential of machine age warfare had made a strong impact on some members of the Army, but this understanding dissolved back into the civil community, or was lost from the Army with the loss of the Australian Flying Corps and the foundation of a new service, the Royal Australian Air Force.

What knowledge and inventiveness remained dissipated as severe budgetary pressures limited the scope for innovation and experimentation. Unfortunately, the Kitchener structure and its attendant reliance on outmoded constructs of war existed right up until the end of World War II.

During the Cinderella years of the 1920s and 1930s, as Air Force attempted to overcome limited resources and a general lack of understanding to develop air power, Army returned to the horse. As late as 1936, the Australian Army was still conducting mounted manoeuvre exercises. It was easy to use the Army to re-enact the feats of the Light Horse in Palestine in the film 'Forty Thousand Horseman', because the militia remained essentially unchanged.

The development of armoured warfare was slow and virtually came to a halt with the Depression. A limited level of familiarity was maintained by a tank cadre in the permanent forces, which then operated in an instructional capacity. But the implementation of various proposals for the expansion of our armoured capability were deferred, and in 1937 our total inventory of four aging tanks was replaced by just eleven newer models.

Thus, at the outbreak of World War II, Australian units sent to the Middle East were unprepared again, this time for armoured warfare coordinated with close air support. Their early experience against the Italian Army lulled them into a false sense of security for what was to come in Greece and Crete, and at the hands of Rommel.

Only the Germans fully developed Liddell Hart's theoretical framework for the employment of aircraft in conjunction with tanks and motorised infantry as part of an air-land team for armoured warfare.

But it wasn't only Australian military planners who showed such a lack of foresight. Most air theorists and practitioners of the era - such as Douhet himself - emphasised aircraft as an instrument of strategic bombardment in the mistaken belief that it was capable of causing such destruction on enemy centres of population and industry that wars could be won by air power alone. Few appreciated that following the end of World War II, the advent of long range pilotless missiles fired from ground launchers and silos would eventually lead to an erosion of the role for manned aircraft in the strategic arsenals of the great powers. These signs were already in Hitler's order of battle.

Not only were we ill-prepared for the First and Second World Wars, it is worth noting that our operations in both had to be conducted, initially at least, by expeditionary forces raised outside the prevailing structure of the time. As late as 1938, when it had been decided that there was an urgent need for an infantry unit on a full-time basis to protect the port of Darwin against raids, there was no provision under the then-existing law for such a unit. A unit entitled the 'Darwin Mobile Force' was formed as part of the Royal Australian Artillery of the Permanent Military Forces. This unit was in effect the first regular infantry unit to be formed in peace.

The second era was the era of forward defence from the 1940s right through until the early 1970s. As part of the Western alliance system, and indeed in our own interests, we created a Regular Army in 1947. The Regular Army was born in response to the Asian contingencies of the time. It was based firstly on the need to maintain occupation forces in Japan, and subsequently on the need for expeditionary forces for Korea, Malaya, Borneo and Vietnam.

For most of its early days the Regular Army was kept overseas. When it returned to Australia, it was housed in temporary World War II accommodation. There was clearly a view that the Regular Army would go away and we would return to the old construct of the militia, but by then the world had changed for ever. But at least we had a Regular Army, with a viable professional base, that was able to analyse and generate appropriate doctrine.

The third era was one which stretched from 1976 until the 1990s and which saw us become closely concerned with the defence of Australia and with joint procedures inside a modernised ADF. The overarching reality for much of this third strategic era was the Cold War, but we did realise, perhaps earlier than many others, that the 1969 Guam doctrine required us to develop an intellectual and practical framework for defence self-reliance. It was recognised, of course, that the major players would come into play for extra-regional issues, but within our own region we had to be responsible for our security. Perhaps because of this, we have been able to adapt somewhat better than some others to the uncertainty of the post-Cold War era.

We had never looked at our security in that context before. We had always looked at it in the context of imperial defence or the alliance with the United States. We should have changed our outlook after the collapse of Singapore and made changes after the Second World War. But immediately following the Second World War we were swept up in global, bipolar confrontation where our whole structure was designed for our part in containing the spread of communism. In the late 1950s, we came close to a point of departure, but Vietnam put paid to that.

So, we near the end of the twentieth century with an Army designed for contingencies somewhere between raids on Northern Australia and Vietnam. It is not a truly total force. There is a backlog of outmoded equipment and organisations that needs to be overcome. We carry in our current equipment and structure the baggage of different eras and earlier views of the Army.

In each of the earlier three strategic eras the problems of balancing technology with doctrine and organisation were acute. In the era from Federation to 1945 we witnessed the coming of machine age warfare. The problem which confronted strategists during the First World War was that of overcoming the defensive tools of industrial age warfare before mechanisation provided the tools for a breakthrough.

During the Second World War we saw how mechanisation and air power restored movement and tactical and operational flexibility to the battlefield. Again,

Australian forces proved adaptive and creative in their response to these new requirements of war.

In the era of forward defence we faced the problem of low intensity warfare, itself an outgrowth of the nuclear age. The Army had to come to grips with the upward spiral of technological change. In Malaya and Vietnam we had to adapt our experience of jungle warfare doctrine to the new requirements of counter-insurgency operations.

When we began to look at self-reliance and the defence of Australia from the mid-70s we were forced to place emphasis on surveillance, mobility and strike.

This brings me to the central issue I wish to address - the Army of the future, the Army which I see developing in what will be an era characterised by uncertainty, by growing regional engagement and by a closer interaction between defence, foreign policy, economic policy and rapid technological transformation.

In order to enable you to understand how we are approaching the problem of structuring for the next century, I would like to explain our approach in two essential parts. First, I will address the business we see ourselves in; and second, I will define how we are going to do business.

The Business We Are In

Firstly, what business are we in? Well, in a superficial sense, we all know that we are in the defence business. But what will that mean in the 21st century? And I know that you have been discussing this earlier in the conference. We do know that the era of emerging uncertainty is going to be the subject of intense and instantaneous scrutiny. Everything will have to be engineered with this in mind. How will this input on our operations and structure?

The simple fact is that there are no longer any absolute outcomes possible from war. If you pursue absolute outcomes, there is a fair chance that you will pursue them to the point of your own destruction. And yet conflict goes on about us in many forms while everyone knows that the best inducement for prosperity is the absence of conflict - witness the growth of Asia since the end of the period of revolutionary war in 1975.

The essence of these more favourable circumstances is reconciliation between and within nation states and between other global forces. Armed forces and a willingness to use them are a legitimate part of this process of reconciliation.

There was for a time a temptation to assert that the utility of military force is declining in what has now becoming known as the information age. Regrettably, this assertion has already been demonstrated to be premature. But the context in which military force is used has been changing.

If your national interests are in danger of being threatened to an unreasonable extent by other forces, then the application of armed force as part of the bargaining process is an internationally accepted option. The power of your position in this respect depends to a large extent on the perception of your actions in the prelude to the use of armed force, and of course in the way in which you use it. This is part of the process of strategic manoeuvre. It is the process by which states use all aspects of national power, of which the military is only a part, in a concerted way to achieve national objectives.

We, in the defence business, have to understand that the information age is going to lead to increasing scrutiny of the application of force by all armed forces. There is now the capacity for instant global coverage by the media of the use of force.

Recently, I was struck by the impact of the Israeli artillery strike, accidental or otherwise, on refugees in southern Lebanon. The strike was part of an Israeli attempt to isolate and eliminate the Hizbollah threat to northern Israel. But the immediate global awareness of this one incident had a profound strategic effect - not simply on Israel - but on the United States and its peacemaking activities in the Middle East. Israel's options in achieving its strategic aim of isolating and neutralising the Hizbollah as a political and military force were dramatically narrowed. Israel's room for 'strategic manoeuvre' has become much more limited as a consequence.

This is not the first case of a single tactical incident having massive strategic repercussions. I am sure that we can all think of many. Are we moving to an era where *not hitting* the wrong target is profoundly more important than hitting the right one? I believe that force has to be applied today with absolute discrimination and precision. This is a development that was in no way apprehended by the pre-war air power theorists. What does this mean for armies, air forces and navies in the future?

My view is that you cannot find the answer to these questions simply in tactics or technology. It lies far more profoundly in the sociological impact of the technological revolution that is going on about us. That revolution lies not simply in television and radio which are now crossing boundaries instantaneously. The Internet and the World-Wide Web is an exploding reality.

Seekers of knowledge and information now have access to a rapidly expanding global network of ideas and data bases. This cannot be stopped, or even slowed down. It is virtual anarchy and a whole new set of laws will have to emerge to control the intellectual property which is abroad. It will undercut the power of nations to act decisively. A lot of military action will be designed to buy time while decisions are made and new alliances are formed. The object will be not to have your options pre-empted while you seek to consolidate the way ahead.

How Are We Going To Do Business?

The next question is: how are we going to do business? I have five points that I want to bring out on this.

Values and Ethos

First, let me address the strategic issue of values. It is clear that whatever we do it has to reflect the values of our nation. The commitment of the nation to the military task, and to the Army, will depend on the Australian people's conviction that we reflect, and operate in accordance with, their perception of what we should be. In this respect, I have no intention of risking a drop in standards in a process of reorganisation. I am convinced that it is possible to change without dropping standards and, indeed, we can raise our standards even higher as we restructure by bringing our doctrine into line with our force structure. In any case, I am determined that we should present the Army to our people as lean, capable and crystal sharp and appropriate for Australia's defence, while at the same time being discriminating and compassionate in its application to international action. Peacekeeping has already offered us something of this.

ECONOMY OF EFFORT

This also leads to the fact that Australia must have an Economy of Effort Strategy. Two elements of this are:

- firstly, the joint application of military power, bringing Army, Navy and Air Force into harmony; and
- secondly, generating power from the military civil infrastructure.

With respect to jointery, I observe that capability is not defined by how many ships, units or airframes you have. Capability is the ability to achieve an effect at some future time, in some appointed place for some sustained period. Once you accept this you begin to understand the importance of unity of command and jointness. You also begin to understand the importance of both using and generating power from the civil infrastructure. The military-civil construct becomes a vital part of the Economy of Effort Strategy and allows the generation of more cost-effective combat power.

MOBILITY AND MANOEUVRE

Given our emerging strategic task, it is clear that we must be an Army of manoeuvre. There are two forms of manoeuvre we must consider at the operational level of war:

- wide area manoeuvre to assert control over large spaces, and
- close manoeuvre in the face of the enemy.

Certain organisations allow you to contemplate doing both effectively. For Army mobility is the key - *both* air and ground mobility. If we can conduct timely manoeuvre to concentrate forces over great distances we can also manoeuvre with great speed on the closer battlefield provided we have the right balance of protection and firepower. Once again, jointery and effective C^3I are critical in this endeavour. Much of our fire power must come from the air, and it must come on time and precisely where it is required.

DISCRIMINATION AND PRECISION

Discrimination and precision are two related terms that are critical, and are within our grasp. To be able to discriminate in the identification and acquisition of targets, and then to hit them with great precision, is not only essential in the emerging global media environment, it is also the secret to effective and flexible logistics. Therefore it is the key to manoeuvre. Clearly we need to be very, very clever about this because the penalties for being wrong are severe.

COALITIONS

It is clear that anything we do for the defence of Australia will be joint (it may also be combined) and everything we do outside Australia will be combined (it may also be joint). There is abundant evidence that, more and more, the concept of coalition activities will be a generator of both international power and domestic consensus. The capacity to operate together through shared understanding, doctrine and interoperable systems will contribute to that potential.

These five realities will dictate how we must change to face the future. It is now passé to talk simply about change. It is the *rate of change* that really concerns us and determines the magnitude of the management problem. If change is the norm in society, it must be the norm in the Army. We really must get to a dynamic state that at least matches that *rate of change*, and stay there. The risks in not doing so are very high. It must become part of everyone's comfort zone.

METHODOLOGY

The methodology which we have used in developing the plans for our Army of the future allows for the rapid redevelopment of the force structure and our doctrinal base in response to changes in the global and regional security environment. We are designing the Army to be developed continuously over a period of fifteen years, as some of the concepts required for the new force structure are yet to be tested and evaluated. We are comfortable with the possibility that the force we have in 2010 may not be the force we had planned for 2010. Our development process needs a vision of where we are going but must remain dynamic and responsive to change.

The use of the test bed/battle lab/technology demonstrator for both evolutionary development and training represents the way ahead, and we will be using this approach to implement Army's proposed structure. The question is, 'how do we keep force structure and doctrine aligned and converging as we move into the next century'?

We must organise for change by creating clusters of engaged and dynamic areas of responsibility which will allow us not only to be responsive to the future, but also allow us to get ahead and take control. How easy would it be in this process for force structure and doctrine to disconnect if we don't do this?

People are the key in all of this. The fundamental material remains the same frail, fragile, fearful human beings - who can achieve remarkable things if they understand what is at stake and believe in both the justness of what they are being asked to do, and in each other. The ability to imagine and share *vision* is our great gift. Because it is about human beings, war will remain an art form.

The game is about vision and access to the tools to change things. Vision and knowledge create certainty and confidence. Lack of vision and ignorance create fear and uncertainty.

At the outset of the review, I gave two simple instructions to the working party. One was that the methodology had to be pure, and the second was that the outcome had to be bold and innovative. Some philosophical decisions were made early.

We adopted a *first principles* approach to analysing Army's structure. Our analysis had to be transparent to decision-makers without a military background. In the longer term, our analysis had to be persuasive to the interested lay reader, to reassure the public that we are squeezing the greatest possible value out of public spending on defence.

The development process was to be *inclusive*. It had to ensure that we drew on the best advice that each of the three services had to offer We had to cultivate a sense of collective ownership of the final product. We did not want implementation to be impeded by a lack of understanding of - or confidence in - our longer-term goals and objectives.

Furthermore, we wanted to establish clear *linkages between endorsed strategic guidance* and detailed equipment and force structure decisions. No matter what

emerges, these linkages must be maintained. Army's proposed force structure is a substantial improvement on what has been achieved in the past in tailoring Army to Australia's particular strategic circumstances.

Finally, Army's proposed force structure is to be affordable within current financial guidance at the Defence portfolio level.

In the absence of an identified threat, it was not possible to base the force structure on the capabilities of any single country. Rather, we developed a notional adversary capability spectrum, based on a generic list of the capabilities resident in the region. None of the capabilities in the spectrum is unique to any single country.

No country is assessed as having either the current interest or capacity to launch a full scale invasion against us. An adversary attacking Australia would have to project and sustain forces across our sea and air approaches where hostile ships and aircraft are relatively easy to detect and attack, and will become increasingly so as new technologies are developed. So our focus for the foreseeable future is on countering the more realistic levels of threat which might penetrate our air and maritime defences.

CHALLENGES

Some significant challenges for the Land Force were identified during assessments of the tasks the Land Force would be required to perform in the defence of Australia; the nature of conflict that could emerge in the region; and the operational environment of the north. These challenges include:

- dispersed population and infrastructure;
- adverse weather and geographic conditions;
- vulnerability of communications;
- low force to space ratios;
- difficulties in detecting and identifying small adversary groups;
- provision of adequate and timely response to adversary incursions, often at great distances from possible deployment bases;
- logistic support to dispersed operations, and the remoteness of offshore territories and resource extraction platforms; and
- the wide range of options available to an adversary.

GENERIC MISSIONS

From a consideration of the regional capability spectrum and the unique challenges of the Australian operating environment, we have developed a range of generic mission statements or task objectives for the combat force. The force structure has been designed to provide the force elements required to perform each of these missions as indicated here:

- protecting population and infrastructure,
- detecting incursions and lodgments,
- defeating incursions and lodgments on the mainland,
- securing the offshore territories,
- conducting strategic strike,
- conducting special recovery,
- maintaining a strategic reserve,

- enabling the combat force, and
- reinforcing and rotating force elements.

The options for the core concept for the Army encompassed a spectrum of means by which Army could contribute to joint ADF operations in order to achieve the government's strategy of depth in defence. The Army contribution forms only a part of a broader ADF and national effort, and the options were considered in the context of a well coordinated and joint response.

The object was to design a broadly balanced and cost-effective Army, with a mix of capabilities to achieve the generic missions derived for the defence of Australia. The force is designed to be balanced in the sense that it will enable a commander to develop a range of credible options for the conduct of successful military operations.

The concept is not intended to restrict the freedom of operational commanders who must use their military judgment on the day to employ the combat forces that are assigned to them.

CONCEPT FOR OPERATIONS

Land Force operations in Australian conditions have been characterised in strategic guidance as having three operational dimensions. These are:

- detection by surveillance and reconnaissance,
- protection of assets and infrastructure, and
- response in order to intercept and defeat hostile forces.

Land Forces could be structured to maximise performance in any of the three operational dimensions: detection, protection or response. But any Land Force which is overly specialised for operations in a specific operational dimension would be susceptible to failure in other areas.

Still, low force to space ratios and the great difficulties involved in conducting reconnaissance and surveillance in the north mean that the capacity to detect adversary activity underpins all Land Force employment options.

CORE CONCEPT

The Army structure is designed to operate in concert with the other services in the execution of a joint strategy for the defence of Australia. The Land Force relies on maritime and air elements dominating the air and sea approaches to prevent large scale conventional operations against Australian territory. Increasingly, we are seeking to align maritime, land and air strategies into a single strategy for the defence of Australia. A strategic level reorganisation and plan is now directed to this end.

Still, our concept recognises that those air and sea approaches are not impermeable, and indeed, that the introduction of a single new technology could make it very permeable, perhaps for limited periods of time and at very short notice. For the short term it is assessed that a determined adversary would be able to penetrate the gap to conduct dispersed special forces operations or rapid attacks, possibly with small or lightly equipped units or forces.

Consequently, the organisation accords a priority to detecting an adversary and then mounting a timely response. Traditional protective operations will be replaced by

highly mobile and proactive detection and response operations. The proposed force will be more capable, with enhanced equipment and improved overall readiness.

This concept is achievable because the force makes better use of available manpower by concentrating our resources in fewer but better equipped units, allowing the entire force to be mobilised and deployed quickly if necessary.

In the transitional phase between peace and conflict, the force structure provides the flexibility for government to respond to widespread incursions, while avoiding a disproportionate response which might undermine diplomatic efforts to resolve the underlying dispute, and therefore limit our room for strategic manoeuvre.

If a contingency is sufficiently demanding, the force structure will be at a level of readiness which will allow army formations to be deployed concurrently to all threatened areas.

PRINCIPLES

So, while I cannot speak of the actual force structure changes we are proposing to government, I can tell you that the review proposes a number of fundamental changes. These changes have been based on the following principles which guided the development of the force.

Adaptability, Versatility and Deployability. The proposed force is adaptable to the demands of more substantial conflict, and sufficiently versatile to perform other tasks which the government has indicated it may require. The proposed force is capable of being deployed on a wider range of missions than the current force. The proposed force structure would, for example, make it easier for Army to deploy on United Nations missions. Although the force is not an expansion base, it has been developed according to a range of principles which increase its adaptability. It can be expanded systematically to meet the needs of more demanding conflicts, and to make more substantial deployments in support of our alliance obligations.

Integration of Full and Part-Time Personnel. The proposed force will be a mix of full and part-time personnel. The part-time component of the force will be better equipped and trained, and wholly integrated with full-time personnel. What we are seeking is fully trained part-time professionals. The proportion of full and part-time personnel in a unit will depend on the task that a unit was designed for, although essentially all units will contain some part-time personnel. As a general rule, units at higher readiness will include a higher proportion of full-time personnel to allow their deployment without call-out of the part-time members.

Joint Task Forces with Embedded Capabilities. The core concept requires the creation of a self-reliant force with force elements capable of performing a range of tasks. The current brigades will be developed into joint task forces with supporting units. Units will be structured with greater firepower and manoeuvre assets permanently embedded, as opposed to the current practice of regrouping assets across specialised corps boundaries. This concept, of course, will be extensively trialed to confirm doctrine and develop confidence in the new force structure.

Preparedness and Mobilisation. A significant principle is that units should be permanently staffed and equipped to an operational level of capability, with a view to

raising the overall preparedness level of the Land Force. This, of course, is a resource issue, but it remains an objective. Our capacity to mobilise will be fundamental. Army is developing concepts and plans for mobilisation, including the expansion of the current force for higher levels of conflict.

Mobility. The mobility of the force will be enhanced to deal with dispersed operations. This will be achieved through the acquisition of additional helicopters for troop lift and the support of special forces, and through the provision of new vehicles with improved cross-country mobility, better protection, and improved levels of comfort to ensure that the occupants emerge fit and ready to fight. Importantly, both the Air Force transport assets and Navy amphibious lift ships will contribute to Army's tactical mobility as well as its strategic mobility. Once again, joint command and control is the key.

Enhanced Command, Control, Communications and Intelligence. A priority has been attached to the provision of a C^3I system. This system will be developed to enable adjustments to the rate of effort in the three operational dimensions (detection, protection and response) and to manage and to reallocate scarce assets, and to conduct civil liaison over the vast distances of the north. The command, control, communications and intelligence system and the combat service support structure both draw extensively on existing civil infrastructure. While many of the Land Force's communications needs can be satisfied by commercial telecommunications providers, the degree of dependence will have to be engineered so as to limit the vulnerability to adversary operations against the civil system.

Key Implementation Considerations

I have mentioned that we wanted to establish linkages between strategic guidance, financial guidance and force structure. Having established these linkages, we have sought to ensure that, during the implementation period, the Army's force structure will remain:

- appropriate to prevailing strategic circumstances,
- balanced and capable, and
- affordable within the Defence budget.

During the implementation period, we plan to maintain a force structure which can accommodate changing strategic circumstances and guidance. This will include the capability to surge or fall back as required. New capabilities will be introduced progressively, with a view to keeping the force structure balanced and affordable, able to successfully contribute to the government's defence requirements.

Conclusion

In conclusion, the new analytical tools employed during the Army review process were not used as a substitute for creative thinking. Effective planning machinery does not remove the need to make judgments about the future security environment and our priorities for dealing with planning uncertainties.

The process has identified areas of Army's structure and doctrinal base that are sensitive to changes in the future security environment. We have not proposed a static

structure which will serve our national interest without further adjustment. Rather, we propose to start a process for developing an Army which is responsive to the pace and direction of strategic change, an Army in which doctrinal, structural and technological change is regarded as normal and desirable.

Of course, some things will not change, such as our commitment to the values and ethos of Australian society, and the need for intelligent and resourceful people. At the same time I am confident the proposed force represents a vision of Army's future that will inspire confidence in our people and generate a determined belief in our commitment to the self-reliant land defence of Australia and an adaptable and versatile Army employable in the wide variety of future security roles that may be required by government.

DISCUSSION

Air Vice-Marshal G.J.J. Beck: I want to pick up on your point about the fully trained part-timers. I think it is an important concept. I can see some real problems with us going to part-time, if only from tax concessions and the problems that presents in part-time employment versus training time. I'm thinking of the differences between Air Force and Army part-time fully trained people. Most of ours are former service people, because we don't need them as young as Army does. Your problem, it would seem to me, for part-time fully trained people, is very much a high-cost, up-front problem. Could you comment on the numbers involved, and also on what this means for the twenty-six thousand people in the reserves. How many of them might fit that future model?

General Sanderson: Thanks for that question, Gary. That of course hits right at the nub of the issue. Firstly let me observe that we don't have any choice in this matter. Frankly, as we move into the next century, we are going to generate our national security capability by sharing the talent of this country. Already we know that we are not keeping up with some areas of technology which are moving very rapidly in the civil community. We are going to have to draw on the people who are engaged in those areas of technology for our defence capabilities. That's the difference between the future and the past, when we didn't need to rely on such a highly capable and trained military personnel base.

There is no escaping the fact that in order to have a part-time professional you have to have full-time training up front, and we have been experimenting with some of the approaches to this. The best source of part-time trained professionals is the full-time professional, and I think we will be looking for commitments of people beyond their period of full-time service into periods of part-time service. Increasingly we have access to training methods and technologies which we have never had before. We can conduct distance education and training; we can even test using these systems. But there will have to be a bit of hands-on stuff and eyeball-to-eyeball testing of people.

Let me make the observation that the Israeli Defence Force mobilises something like about half a million people out of a population base of about four million, by a clever combination of up-front full-time training and training technology. There are a lot of lessons to be learnt from this. We are not talking about mobilising anywhere near those sorts of numbers out of a population base that is approaching

twenty million. There are many methods available to us to do this. Personally I think that Army is going have to rely more on the part-time force than it has in the past, and that part-time force will have to be more fully trained. I believe that Navy and Air Force will have to do the same, like it or not. And institutions like yours [ADFA] are going to have to play a very important part in it. I can't tell you exactly how the balance within the part-time/full-time construct is going to change, but it will depend upon our work in the next few years in developing the employment practices which will allow us to have a more effective part-time force.

Air Chief Marshal Sir Michael Graydon: Thank you for a very thoughtful presentation, if I may say so. In developing your way ahead, you will have had an eye on recent conflicts such as the Gulf War and Bosnia. I wonder if I might have your observations on what you learnt from those conflicts, and whether you consider either to have been a properly joint activity or not ?

General Sanderson: Let me say that we are talking about two different operations. I think that the Bosnian 'control' type of operation which we do in coalition while governments negotiate is going to become an increasing part of our future. The Bosnias, the Cambodias, are going to be very much more a part of our future. My own experience of this is that the greatest problem for commanders is actually to hold the coalition together, a task which turns on selecting and maintaining the aim - a red hot problem in an active media environment. And this very closely flows into the issue of the discriminate and precise application of force.

I don't believe that the Gulf conflict was truly joint. But what it did was to identify the essential dimensions of unity of command and joint application of force in the emerging environment. I think there has been a great surge in the understanding of joint warfare since the Gulf. I suspect the Americans will be the first to acknowledge this. I think we saw in the Gulf conflict some risks taken in the application of force, which impacted on the strategic outcome, with long term strategic repercussions. In other words if there had been more effective control over the application of force then the outcomes might have been moderated in a more effective and successful way. One of the things that comes to mind is the massive operation against the Iraqi force that was caught on the road north of Basra. There were a number of lessons there about the effect the instantaneous coverage of these sorts of issues has on people's perceptions and future strategic outcomes. All those things are extant in Bosnia it seems to me.

In some recent operations we have seen people actually playing to the media, and succeeding. I suggest that Saddam Hussein attempted this but failed, but some of the Somali warlords succeeded quite effectively. And quite recently I think the Hizbollah succeeded in doing that as well. So unity of command and tighter controls over the application of force I think are the game that we are in.

Air Marshal S.D. Evans: General, I know you can't divulge your ideas on the force structure until the government has seen them, but how do you see the provision of close air support ? Do you see it being provided by RAAF fixed-wing aircraft or do you see it being an integral Army capability?

General Sanderson: I see it being both, David. The firepower that comes from very long distances will be Air Force, and the firepower that is organic and more immediately available to the operational commander who has responsibility for

immediate outcomes and the security of his own people will come from Army. And the platforms will reflect that fact, but I see the totality being a joint whole under a unity of command construct.

If I might just add to that, I hinted in the early part of my presentation at the need for the Army to be able to manoeuvre in at least three dimensions. I think that we have been tied to the ground for too long. We did actually have some concept of manoeuvre in a third dimension in the First World War but as I said, it went away and joined the Air Force. But I certainly see in the next century that we need it organic to our combat capabilities.

Dr Alan Stephens: You mentioned the anarchy that is one of the characteristics of the information revolution. I am interested in the scope you see in Army beyond 2000 for exchanging information through networks instead of hierarchies. There has already been instances of networking on the battlefield, such as private soldiers taking their own cellular phones to Panama in 1986, and numbers of people going down to Radio Shack and buying GPS sets five years later for the Gulf War. In the next conflict, every Army unit which has a mobile phone and a laptop will be able to access the Net and exchange information, not just between units but with the whole world on a near real-time basis. Have you had an opportunity to think about how you will manage that and, indeed, whether you will encourage information networking in the Army beyond 2000?

General Sanderson: I don't think there is any question of actually stopping this business. In fact I will tell you a story. The other day one of my brigade commanders said to me, 'We have just been on the Internet looking for lessons of the Gulf War and while we were on the Net an advertisement came up which said, "Are you tired of waiting for a UNIX-based command and control system? Send ninety dollars to the above address and you can have a ninety day trial."' Which they did. And I said, 'Hey, wait a minute. I've got a UNIX-based command and control system coming down the line for you guys.' And they said 'This is only an interim user trial, sir.' At the end of the ninety days another add came up on the screen and said, 'Are you happy with this command and control system? Send a thousand dollars to the above address and you can keep it.' And they've done that, too! I have got my information policy people hanging around the door with grim looks on their faces saying 'You didn't let them do that, did you, sir?' But it is a fact of life.

When I talk about the test-bed technology demonstrator approach I am talking about getting ahead of the game. I am talking about going down to Radio Shack and buying the stuff and inserting it into the test-bed, ahead of the soldiers doing it themselves to make sure that this stuff has high utility; and where it has high utility building it into the process, and where it's got fundamental flaws, making sure that everybody is aware of those. Frankly I applaud people going off and doing the sorts of things that you suggested. It's a fact of life and it is only a reflection of the fact that there is too much inertia in the system that people have to do those sorts of things.

Wing Commander W.D. Ivory: We heard from the Chief of Naval Staff that he had no problem with people in blue uniforms flying aircraft from his ships. I wonder if you have any problem with people in blue uniforms flying those aircraft that are under the immediate command of your operational and tactical commanders?

General Sanderson: I have no problem with people from other services flying aircraft in the land battle environment. I don't think that they should be in blue uniform, I think they would stand out against the background. The fact of the matter is that the main outcome for us is the land battle. I don't mind who is in the land battlefield as long as they are imbued with the essence and nature of the land battle. And I think probably more and more we will see people blending together from the three services in that regard. The joint task forces that I am talking about are exactly that. That is the way we deliver results on the land battle and I suspect that we are going to call them joint task forces at sea as well, and wherever else we operate. But the way in which these things blend together will depend upon the training and background of the people concerned. So I have no problem with Air Force providing manpower to come and train with the Army, at the individual as well as the collective level.

Air Commodore Norman Ashworth: One of the terms you used throughout your presentation was 'joint'. The term goes back a long way. My understanding is that its origins are probably the Desert campaigns of the Second World War. 'Joint' tends to imply those actions that involve more than one service. You also made the comment that all operations in the future will be joint. What we have though is air power, maritime power, and land power, all with their own concepts and ideas, and we have joint actions. If we are going to move along the line Air Marshal Funnell suggested towards an integrated force, we need a set of concepts for combat power. Would you care to comment?

General Sanderson: I hope that nowhere during my presentation did I use the expression 'land power'. I used land force, and I was talking about a generic description of the organisation, but I never used the term land power.

Of course our operations must be joint, and it is essential that we apply forces in accordance with the aims of the responsible commander. I am fully committed to the idea of unity of command. I think the so-called joint operations of the past have not been based on a unity of command construct that's as fundamental as I am suggesting. As an instructor at the British Staff College I used to go across the Channel on the battlefield tour on June the 6th each year, and we would land on a beach and move inland with guys who'd been young men at the time. Now you could say that the D-Day landing was the greatest joint operation of all time. It was very carefully planned with people having specific responsibilities, and it was very precise. I think it was at Gold beach that, inadvertently, in the twenty-four hours preceding the landing, an RAF bomber had dropped a bomb on a main exit route from the beach, and this had created an enormous crater which was going to delay them on the beach and probably cause a lot of loss of life. So they devised a fascine from air photographs and dropped it straight in the hole. And it fitted perfectly and they drove over the top of it. A remarkable operation.

The battalion that I went with took us inland to the scene of a battle where they had actually run into the corner of a German division. They had no way of knowing it was a division. There was enormous air superiority overhead but they had no way of contacting it or bringing it to bear on their situation and they lined up in First World War fashion, and marched into the German machine guns and were virtually wiped out. And it happened time and time again. They weren't joint operations; they weren't joint operations. This has to be part of our being; when we call the Air Force it has to come, and only command can allow that to happen.

AIR POWER IN OPERATIONS OTHER THAN WAR: THE CASE AGAINST INVOLVEMENT

ALAN GROPMAN

Conflict has proliferated with the end of the Cold War and the demise of the Soviet Union. While the vital interests of the United States and Australia, and many other states here today, have not been threatened since 1991, there have been demands put upon the militaries of these countries to engage in operations other than war. Let us define these undertakings.

Military operations other than war 'encompass a wide range of activities where the military instrument of national power is used for purposes other than the large-scale combat operations usually associated with war'. These endeavors 'usually involve' joint forces and also the efforts of other governmental and non-governmental agencies and organisations (the International Red Cross for example). In these activities the foreign ministry is usually the 'principal player'.[1]

What kind of activities are involved? The following list is not meant to be exhaustive: 'Arms Control, Combatting Terrorism, ... Support to Counterdrug Operations, Nation Assistance, Noncombat Evacuation Operations, Civil Support Operations, Peace Operations and [paradoxically] Support to Insurgencies'.[2]

'Arms control' can mean the use of the military to 'dismantle or destroy weapons with or without the consent of the host nation'. Combatting terrorism can involve 'offensive' military actions. Counterdrug operations can entail 'interdiction' of drugs. Nation assistance, civil support operations, and noncombat evacuation need no

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[1] United States Joint Publication 3-0, *Doctrine for Joint Operations*, 1 February 1995, p V-1. See also for greater detail Joint Publication 3-07 *Joint Doctrine for Military Operations Other than War*, 16 June 1995. The United States is rapidly producing doctrinal manuals of considerable size and complexity to assist United States forces involved in peace operations. For example Joint Pub 3-07.3 *Joint Tactics, Techniques, and Procedures for Peacekeeping Operations*, 29 April 1994. See pages I-5 to I-7 for the role air operations can play in peacekeeping. See also Joint Pub 3-07.2 *Joint Tactics, Techniques, and Procedures for Antiterrorism*, 25 June 1993. See also *Joint Tactics, Techniques, and Procedures for Foreign Internal Defense*, 20 December 1993. I believe from perusing the library that there is more written on this subject by the United States Joint Staff and other military organs than by the United Nations itself and any other country. How such operations fit United States national security strategy is being explored. See Antonia Handler Chayes and George T. Raach, *Peace Operations: Developing an American Strategy*, National Defense University Press, Washington DC, 1995. President William J. Clinton's *A National Security Strategy of Engagement and Enlargement*, Government Printing Office, Washington DC, February 1996, has 10 paragraphs on the subject on pages 22 and 23. His previous two strategies also covered the matter in about the same amount of depth. There is much 'on-the-one-hand, but on-the-other-hand' writing here about command arrangements, the link between such operations and true national interests, and an air of reluctance to engage in such activities comes through clearly. *The National Military Strategy of the United States of America: A Strategy of Flexible and Selective Engagement*, Government Printing Office, Washington DC, 1995, divides peace operations into two subsections: peacetime engagement for the peacekeeping, along with such titles as military to military contacts, nation assistance, security assistance, humanitarian operations, counterdrug and counterterrorism. Peace enforcement comes under deterrence and conflict prevention along with such areas as nuclear deterrence, regional alliances crisis response, arms control, sanctions enforcement. Two principles regarding peace enforcement are instructive: 'Commit sufficient forces to achieve clearly defined objectives'; and 'plan to achieve those objectives decisively', p 12.

[2] *Doctrine for Joint Operations*, p V-7. *Joint Doctrine for Military Operations Other than War*, p III-1 is much longer. The former has 8 operations, and the latter has 16 including 'strikes and raids'.

elaboration, recognising that the last mentioned has involved fighting. Support to insurgencies, the last listed, is almost anomalous.

Picture a government not doing its job of maintaining law and order, or not meeting the needs of the people politically, economically, etc., and an insurgency develops that, for lack of a better term, is on the side of the angels. If the national command authorities decided thusly, and in the United States the Congress supports such proceedings, then the military may support such movements either overtly, or with low visibility, clandestinely or covertly. The military's principal mission would be to train and advise 'insurgent forces in unconventional warfare tactics, techniques, and procedures'.[3]

Now the category called peace operations. Peace operations encompass four areas: peacemaking (diplomatic actions); peacekeeping (noncombat military operations); peace enforcement (coercive use of military force); and peace building.[4]

Now that we have an idea of what types of activities we are talking about when we say 'operations other than war', we need to see how one goes about executing in those circumstances. We will see that it is not an uncomplicated or elementary task.

In American doctrine there are six principles of operations other than war, three of which will be very familiar, and three probably new: objective, unity of effort, security (all familiar), then restraint, perseverance, and legitimacy. Restraint may be foreign to warriors, perseverance may be very demanding, and legitimacy begs the question, of course, to whom. Each of these six principles is elaborated upon, but I want to clarify the last three. Restraint: 'Apply appropriate military capability prudently'. Not easy to do with bombs and bullets and air vehicles moving at 'warp' speed. Further: 'Rules of engagement will often be more restrictive, detailed, and sensitive to political concerns than in war. Moreover, these rules may change frequently ... The use of excessive force could adversely affect efforts to gain or maintain legitimacy and impede the attainment of both short- and long-term goals'. But on the other hand: 'This concept does not preclude the application of overwhelming force, when appropriate, to display ... resolve and commitment'.[5] Clear?

Perseverance: 'Prepare for the measured, protracted application of military capability in support of strategic aims'. The United States culture and Australia's are very similar. That is why Australians are so comfortable in the United States, and Americans are so fond of Australia. Both societies are results-oriented, and neither is known for its patience, and both have frequent elections, and continual partisan politics. I wonder, as a life-long soldier from a results oriented culture, how these words fit the character of those trying to make them work. 'Peacetime operations may require years to achieve the desired effects'. Further: 'Underlying causes of

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[3] *Doctrine for Joint Operations*, pp V-7-13.

[4] *Doctrine for Joint Operations*, 1 February 1995, p V-11. The literature on military operations other than war is proliferating. See William J. Durch (editor), *The Evolution of UN Peacekeeping: Case Studies and Comparative Analysis*, St. Martin's Press with the Henry L. Stimson Center, New York, 1993. This study compares twenty peacekeeping operations. It does not deal with peace enforcement because the United Nations record on peacekeeping has been spotty. 'This study is closely focused on peacekeeping and does not address peace enforcement, the UN's term for the coercive use of force, although it is increasingly fashionable to do so. In our view, the UN needs to walk before it can run. Peacekeeping is primarily a political task that uses military symbols and some military tools, including force in certain circumstances (self-defense, for example). Its material requirements, while substantially less than the requirements for war, still tax the Organisation to the utmost; the costs and risks of enforcement operations would be greater by orders of magnitude', p xii.

[5] *Doctrine for Joint Operations*, 1 February 1995, pp V-2-4.

confrontation and conflict rarely have a clear beginning or a decisive resolution'. Therefore: 'It is important to assess crisis response options against their contribution to long-term strategic objectives'. This passage is followed by another on-the-one-hand but-on-the-other hand statement: 'This assessment does not preclude decisive military action but does require careful, informed analysis to choose the right time and place for such action. Commanders balance their desire to attain objectives quickly with a sensitivity for the long-term strategic aims and the restraints placed on operations. Therefore patient, resolute and persistent pursuit of national goals and objectives, for as long as necessary to achieve them, is often the requirement for success'.[6]

But, one must ask, what executors are the authors writing this for? No question the authors are correct in describing the nuances of the potential problem, but I am not sanguine the authors will find enough subtle thinking operators with the quantity of equanimity and forbearance needed to execute these sound ideas. And, just as importantly, all of these rules apply when the 'national goals and objectives' are remote, or with troops operating in an 'operation other than war' where there is clearly none.

The last of the three principles we are exploring is 'legitimacy'. Here United States warriors are told to: 'Sustain the willing acceptance by the people of the right of the government to govern or of a group or agency to make and carry out decisions'. That does not sound easy, does it? We saw above that one of the operations other than war that is sanctioned is 'support to insurgencies'. Legitimacy as a principle might become paradoxical. The manual continues: 'This principle focuses on internationally sanctioned standards, as well as the perception that the authority of a government to govern is genuine, effective, and uses proper agencies for reasonable purposes'. Thus military operations 'need to sustain the legitimacy of the operation and host government'. But when a government does not exist, for example in Liberia for about the past six years, 'extreme caution should be used when dealing with individuals and organisations to avoid inadvertently legitimising them'.[7] This manual does not make it easy for the trooper on the ground (or in the air for that matter). It also presumes two sides - pro- and anti-government - but that is not usually so.

I recite these passages, and those to follow, not cynically, ironically, or skeptically, nor because I believe I could write better ones. As one elaborates on this intricate, elusive and delicate human activity, the guidance of necessity becomes cryptic. I cite these passages to note the challenges and the potential dilemmas of such operations.

What must planners consider when involved in operations other than war? The United States manual has common sense considerations:

- interagency coordination,
- (flexible) command and control,
- intelligence and information gathering, (numerous) constraints and restraints,
- (advanced) training and education,
- post conflict operations which include:
    - * transition to civil authorities,
    - * support to truce negotiations,

[6] *Doctrine for Joint Operations*, p V-3.
[7] *Doctrine for Joint Operations*, p V-4.

* special operations forces activities (especially civil affairs support to reestablish a civil government, training for host-nation military, psychological operations to foster continued peace, and intelligence),
* public affairs, and
* efficient - and, for lack of a better word, ecological - redeployment.[8]

By now my point should be clear: operations other than war are complex, difficult to comprehend (especially in a remote part of the world, where practically none of the troops understands the history, politics, or culture into which he has been deployed), and demand discretion, tact and shrewdness on the part of the operator.

I realise how air power can help in all situations from full scale conflict to these baffling operations. I have been involved in these operations. I have carried and dropped supplies to the desperate, and have also bombed the enemy. I have been an air power advocate for more than thirty years. But given what I have related above, I would appeal to the audience's sense of wariness. Air power is at the high end of the military-technical spectrum and, while we gathered here are generally technologically adept and favor technology's expansion and believe in technology, its utility in these operations may not be substantial.

Now let us delve more deeply into so-called peace operations, especially peace enforcement. The United States Joint Warfighting Center produced a *Joint Task Force Commander's Handbook for Peace Operations* which gets into the detail we need. It defines all four peace operations but I will focus on peace enforcement, defined as the 'Application of military force, or the threat of its use, normally pursuant to international authorisation, to compel compliance with resolutions or sanctions designed to maintain or restore peace and order'.[9] We must focus on peace enforcement because our debate is on air 'power' not simply on aviation, and air power implies force.

The Commander's Handbook acknowledges that there is 'no standard peace operations mission' because each is 'conducted in a unique setting with its own political, diplomatic, geographic, economic, cultural, and military characteristics'.[10] It also concedes that 'Peace enforcement missions define new ground' for the United Nations because that organisation's 'Charter does not expressly address those peace operations focused on internal political conflict (for example, Somalia, Bosnia/Herzegovina)'.[11]

The handbook details how a commander receives his or her mission from a 'mandate' from the United Nations or some other similar body and then delineates how this mandate is created: 'Mandates are developed by politicians and diplomats during

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[8] *Doctrine for Joint Operations*, pp V-4-6. See David S. Alberts and Richard Hayes, *Command Arrangements for Peace Operations*, National Defense University Press, Washington DC, 1995, for a clear eyed look at the complexities of peace operations and some of the problems one might expect in the command and control of United Nations forces from cultures quite different from that of the United States.

[9] Joint Warfighting Center, *Joint Task Force Commander's Handbook for Peace Operations*, 28 February 1995, p EX-1. The United States Army has published a doctrine manual on this subject too. *Field Manual 100-23: Peace Operations*, Headquarters Department of the Army, Washington DC, 30 December 1994. This is a manual of 131 pages, about as thick as the joint publications cited above and below. It deals with the fundamentals of peace operations, command, control, coordination and liaison, planning considerations, and logistics. It also contains an appendix on the United Nations, one on training for such activities, and sample rules of engagement and a sample campaign plan.

[10] *Joint Task Force Commander's Handbook for Peace Operations*, p 1.

[11] *Joint Task Force Commander's Handbook for Peace Operations*, p 2.

the negotiation phase of a peace operations mission. They are often collections of compromises developed to influence the negotiation process. Because of ambiguities, purposeful or otherwise, in the accords finally signed, the commander who receives the mandate may find it difficult to put [it] into operational terms'. And if the commander seeks to alter the mandate to eliminate ambiguity, the handbook says: 'Normally, changes to mandates will require the consensus of all participating countries'.[12] The mandate, in other words, will probably be a burden.

The handbook warns that commanders must avoid 'mission creep,' but this may be impossible if the civilians who control the military demand it. It also calls on the commander to be able to 'recognise when the mission is not achievable' but this may be equally futile when the action is 20,000 kilometres from the nation's capital and the national command authorities want the mission pursued. The handbook reminds military commanders that the concept of traditional military victory or defeat is inappropriate in peace operations.[13]

Added to fuzzy mandates and admonitions regarding mission creep are similarly supple instructions on the end state. 'End state refinement is a continuous process'. But that is not true in war. The end state may change, for example from unconditional surrender to something less than that, but in war it surely is not a 'continuous process'. The handbook asserts that even though end state refinement is continuous, it is 'an important step in the mission analysis process ... to be sure there is a clearly definable end state(s)'. Once you clearly define it, recognise, one guesses, that it is continuously being refined. Of course there are subordinates who need to know the end state because 'without a clearly defined mission statement' from the commander 'which includes the end state,' component 'commanders and other multinational members cannot develop or define their implementation and supporting tasks'.[14]

Wing Commander Ric Casagrande wrote a study, 'Peace Operations: The Air Force Contribution' in late 1994. He defines peace operations. He notes when the United Nations was founded the idea of enforcing a peace in a single country - such as Somalia, Cambodia, Rwanda, Liberia - was a very foreign idea indeed.[15]

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[12] *Joint Task Force Commander's Handbook for Peace Operations*, p 3.

[13] *Joint Task Force Commander's Handbook for Peace Operations*, pp 6-7.

[14] *Joint Task Force Commander's Handbook for Peace Operations*, p 11.

[15] Ric Casagrande, *Peace Operations: The Air Force Contribution*, Paper No. 27, Air Power Studies Centre, Canberra, November 1994, p 2. Wing Commander Casagrande refers on page 2 of his study to a draft pamphlet titled 'ADF Peace Operations which will be 'promulgated by the ADF Warfare Centre, when it is approved by the Chief of the Defence Force, and will be Chapter 35 of Australian Defence Force Publication I'. At the moment of this presentation, this paper is a combination of United Nations general guidelines on peacekeeping operations, and specifically does not deal with peace enforcement. The rest of the draft is a part of a briefing on peace enforcement which begins to delve into the subject, but not deeply. At this point the United States has several complete doctrinal guides. Since the whole field is new, one cannot yet tell whether these handbooks are of any ultimate value. Australia has also published at least one other brief pamphlet on the subject, see Department of Defence, *Peacekeeping Policy: The Future Australian Defence Force Role*, Canberra, June 1993, pp 1-14. One should note the use of the definite article in this booklet's title. The most recent defence White Paper, *Defending Australia: Defence White Paper, 1994*, Australian Government Publishing Service, Canberra, 1994, has five pages (pp 103-108) on peace operations. The basis for engagement by Australians seems to be to support the United Nations, a constant in Australian foreign policy. Engagement in peace operations 'benefits our international standing, including our influence on efforts to reform the United Nations in its role in maintaining international peace and security' (p 104). And: 'Australia attaches high priority to providing Defence contingents to UN and other multinational peace operations' (p 105). Sometimes engagement in peace operations benefits Australia directly, for example when men and women served in Cambodia, but '[i]n some cases, such as in Somalia in

Wing Commander Casagrande supplies a list of military capabilities necessary for such enterprises borrowing from Washington's Center for Strategic and International Studies. Under aerospace power he and the Center call for aerospace control, precision munitions delivery, survivable deep attack and theater missile defence. [16] (Of course land combat power and sea combat power are also treated, but we are less interested in those today.) Peace operations, when one envisions such capabilities, sound like war.

Casagrande then lists air power missions that are derived from work done at the Air Power Studies Center that can be offered to a peace operation:

- enforcement of a no-fly zone
- surveillance for breaches of peace agreements
- airlift, reconnaissance and surveillance in disaster relief or humanitarian assistance operations
- strategic and tactical airlift support of peacekeeping forces
- surveillance and reconnaissance in support of peacekeeping forces
- precision strike against key targets
- airborne command post or liaison platform
- airlift and surveillance to combat border
- airlift and surveillance reconnaissance in maritime observations (especially) in enforcing economic embargoes
- survey (aerial photography)
- search and rescue
- provision of a specialist staff
- operational logistics support
- specialist observers, including people who could command specialist missions
- air-to-air refueling
- aeromedical evacuation
- close air support of United Nations forces engaged in peace enforcement missions[17]

Wing Commander Casagrande recognises that the United Nations has not called on air power often because of its limitations. To be sure air power has superlative advantages: flexibility, swiftness of application, ubiquity, range, and shock effect.[18] But it also has handicaps: air power is dependent on air forces that have secure air bases; it is an expensive force to buy, maintain and operate; this expensive force is vulnerable to inexpensive weapons; its effects are frequently impermanent; and it attracts a high degree of political control. For United Nations operations, Casagrande argues, 'it has probably been the impermanence, security and cost limitations' that have 'dictated the limited use of air power ...'[19]

1993-1994 and Rwanda in 1994, Defence has participated in operations which had little or no direct strategic significance for Australia, but which supported important international humanitarian objectives' (p 104).

[16] Casagrande, *Peace Operations: The Air Force Contribution*, pp 11-12.

[17] *ibid.*, pp 18-19.

[18] *ibid.*, pp 15-16.

[19] *ibid.*, pp 15-16.

Let me build on Ric's beginning. Air power has all the limitations in these operations Casagrande cites, and it has more. Precision strike of key targets is a listed mission. Precision weapons are hyper expensive. The aircraft that carry them are even more expensive. The crews that fly the aircraft are also very expensive, but in these operations the targets are rarely worth the expenditure.

Close air support of United Nations forces is also a listed mission, but this is hard to do even with the forces of one's own nation. In the United States the battle over command and control of close air support forces has been going on for about eighty years. This conflict did not end with Air Force independence in 1947, it intensified. It did not end with the support the United States Army got from the United States Air Force in the Vietnam War - no United States Army unit was ever destroyed or captured by an enemy force during that war from the mid-1960s in the Ia Drang Valley to Khe Sanh in 1968 and 1969 to An Loc in the spring offensive in 1972, but the friction between the services only grew. During the Gulf War in 1991 the Air Force pushed hundreds of ground support sorties into the kill boxes where they were needed to grind up Saddam's army in record time with minuscule friendly losses - fewer than one American death per Iraqi division destroyed - but the fight goes on. Why? Because the United States Army does not believe that the close air support cooperation between the Army and Air Force is acceptable. And, in the Gulf War, as in all other American wars, friendly troops were killed by their own air forces. Close air support by any air force working with forces from another country in a peace enforcement operation is delusionary.

The major problem with asserting air power's capability in peace enforcement, etc. is this: operations other than war are not what the military was designed for - by definition. The most technological of the forces, that branch that moves most swiftly - and when dealing with operations other war since speed is relative this is hyper velocity - is less suited for such activities than other forces. Not unsuited, mind you, less suited.

I worry about those who think there is a military solution to every political problem, and I fret most about those who think that technology is the answer to distressingly complex political, social, and ethnic problems. I have seen it before.

In the early 1960s many thought that air power was either the solution or a major part of it to the counter insurgency problem. Rand Corporation and others published studies demonstrating how air power had worked to help win the counterinsurgency in Malaya and the Philippines, and extrapolated these successes to Vietnam. But both of these 'victories' were unique - insurgencies like peace enforcement operations, etc., are indeed singular and therefore lessons learned from one - strategic hamlets for one example - are not likely to be appropriate in another. The Philippine insurgents had difficulties resupplying and replenishing their force because the enemies of the government did not control the seas around the islands. In Malaya the insurgents were ethnically identifiable, did not control the seas, and had a narrow land bridge to sanctuary that was vulnerable and eventually closed. Even then it took the British (with much help from Australians, many of whom are buried in Malaysia) twelve years to win a war against an insurgent force outnumbered twenty-four to one.

During the early days of the American portion of the Vietnam war pundits noted the success of interdiction in several insurgencies, close air support in Algeria, of bombing in the Philippines and with less success in Malaya, but practically none of this had any relevance to Vietnam. Too many politicians in the United States were too

confident of victory in Vietnam because the United States was so much more technologically superior.[20]

I am concerned that air power advocates today, especially those searching for missions in a less threatening world, will advertise technological capabilities that convince decision makers that operations other than war conflicts and especially peace enforcement will yield to an air power resolution.

[20] See for example A.H. Peterson, G.C. Reinhardt, E.E. Conger (eds), *Symposium on the Role of Airpower in Counterinsurgency and Unconventional Warfare, The Algerian War,* Rand Corporation, Santa Monica, July, 1963, pp 12, 26, 71, 72. A.H. Peterson, G.C. Reinhardt, E.E. Conger (eds), *Symposium on the Role of Airpower in Counterinsurgency and Unconventional Warfare, The Algerian War*, Rand Corporation, Santa Monica, March 1964, p 9. A.H. Peterson, G.C. Reinhardt, E.E. Conger (eds), *Symposium on the Role of Airpower in Counterinsurgency and Unconventional Warfare, The Philippine Huk Campaign*, Rand Corporation, Santa Monica, July, 1963, pp 38, 43, 45, 50-52. There were also many other writers, not counting those who filled the pages of the *Air University Review* and other professional military journals, who were convinced that the United States had an answer to insurgency, and that response was technologically based. And why not? The United States' edge in such a fight would be its technical prowess. See James E. Cross, *Conflict in the Shadows,* Doubleday, Garden City, 1963; David Galula, *Counterinsurgency Warfare Theory and Practice,* Praeger, New York, 1964; Maxwell Taylor, *The Uncertain Trumpet,* Harper, New York, 1960; John S. Pustay, *Counterinsurgency Warfare,* Free Press, New York, 1965. Let me quote one passage that, while more boisterous that others to be found above, sums up my thoughts. 'The proper utilisation of air power by a government beset with insurgency can significantly aid the incumbent forces in the attainment of the three principal objectives of counter-guerilla warfare. Air power properly coordinated with surface power can insure the defeat of the insurgent guerrillas in military combat'.

AIR POWER IN OPERATIONS OTHER THAN WAR: THE CASE FOR INVOLVEMENT

AIR VICE-MARSHAL R.A. MASON

In the spectrum of uncertainty which extends into air power's second century I interpret 'operations other than war' to include peace inducement, humanitarian and constabulary roles.

Peace inducement includes peacemaking, peacekeeping and peace enforcement. Such activities are not quite the same as those envisaged in Strategic Air Command's sentiment, 'Peace is our Profession'. These are associated with internal conflict, largely within the boundaries of a previous political entity, where central government has collapsed or has been rejected by one or more belligerents. In traditional language: civil war.

There may be occasions when other states decide to become involved impartially to bring about a negotiated settlement between the belligerents. This is an important distinction from intervention in a traditional insurgency conflict when intervention is likely to be in support of the government or the insurgents.

GROUNDS FOR INTERVENTION

There are several reasons why a third party may wish to stop a civil war. National interests might be at risk if, for example, the conflict zone contains significant essential natural resources or provides access to them. There might be a risk of conflict spilling across frontiers, bringing expansion and escalation. Cold War risks of uncontrollable escalation which induced caution among would-be sympathisers have been replaced by the potential for regional conflict, clearly evident in the Balkans. On other occasions, instability may tempt intervention from a potentially hostile power which should be forestalled.

We must be just as cautious in generalising from Bosnia and Somalia as, at the other end of the spectrum, from the Gulf. That said, unless the intervening state has identified a vital security interest, there is likely to be a considerable difference in approach to the conflict between the belligerents themselves and the intervening state or states. This contrast presents problems for military operations generally but, contrary to what has been written elsewhere, creates circumstances particularly suitable for the application of air power.

HESITANT INTERVENERS

Assuming a vital security interest is not threatened, a government will have an option whether to intervene at all or to what extent, how and for how long. Previously, in both World Wars and the Cold War, the commitment among the participants was total.

This optional nature of peace inducing intervention introduces several sensitive political considerations. Among the first will be costs. Intervention will increase defence costs at a time when most Western governments are seeking to reduce them. The cheapest method will be attractive. Open ended commitments will be unwelcome; short duration and as small a scale as possible will be preferred. Because core interests are not at stake, political consensus cannot be guaranteed. Opportunist political

opposition may make capital out of costs, casualties, apparent lack of success and mistakes. Should interventionist forces ever be compelled to withdraw by indigenous opposition, the ignominy may well have severe political repercussions.

Inevitably, the media will play an influential role. It will highlight equally the tragedies which provoke a demand for intervention and any shortcomings disclosed in the response itself. It will happily publicise any collateral damage and suffering inflicted by forces dedicated to peace inducement. It will influence public opinion and aggravate political pressure on the government. Public opinion itself will be volatile: moved by scenes of horror but sensitive to casualties incurred by its own forces.

If the intervention forces are working in a coalition, every member of the coalition is likely to have its own national priorities and sensitivities. There may be a common desire to bring the belligerents to negotiation, but there is unlikely to be a common evaluation of the price to be paid or the commitment to be made. Under such circumstances, it is hardly surprising that successful coercion took so long to be imposed on Bosnia, or that it is programmed for only twelve months.

The Determination Of The Belligerents

The contrast with the commitment of the belligerents is stark. Theirs is likely to be deep and heavily influenced by intangible factors of culture, ethnicity or religion. Conversely, their objectives are likely to be tangible and precise: territorial occupation and political domination. Had peaceful compromise been a preferred option, there would be no need for peace inducement by external intervention. Coercion will be the preferred instrument of at least one of the belligerents. The currency of coercion is intimidation, destruction, brutality, weapons and ammunition.

But the belligerents will not have unlimited military resources. In most scenarios the resources of the original state or other political entity will have been divided between them. Military command, control, and logistic organisation will have been split. Air defence cohesion will be particularly weakened by fragmentation. All belligerents are likely to seek external military assistance and political support.

The dependence of the belligerents on coercion in a civil war is at once their strength and their vulnerability.

In these contrasting and complex circumstances, air power offers an unusual combination of advantages. It can reduce the difficulties faced by the interventionists, facilitate the operations of friendly ground forces or agencies and exploit the weaknesses of the belligerents.

The Operational Environment

The future operational environments of peace inducing may bear little topographical resemblance to Bosnia but other features are likely to reoccur. Four phases of activity are probable: preventive diplomacy, peace making, peace keeping and peace enforcement. UN definitions of each phase may be paraphrased as follows.

Preventive Diplomacy: To prevent or contain disputes from arising or escalating. Coercion or intimidation may be present between the belligerents. Threat of coercion may accompany external diplomacy.

Peacemaking: Action to bring belligerents to agreement. In practice to induce belligerents to choose negotiation rather than coercion. Peaceful pressure as envisaged

in Chapter VI of the UN Charter is preferable, but external military force may be threatened or applied.

Peace Keeping: Hitherto this phase has assumed the presence in the field of UN or other neutral forces, with the overall consent of all parties. Various measures, including force, may be used to reinforce peace agreements and to prevent the renewal of conflict.

Peace Enforcement: By inference, one or more of the belligerents has failed to abide by a peace agreement. Action under Chapter VII of the UN Charter may include armed force to maintain or restore peace and security, when authorised by the UN Security Council.

In all four phases there is a consistent objective for intervening powers. It is to make a negotiated peace agreement a more attractive and profitable option to the belligerents than continued reliance on armed force. In the first three phases, there may be varying degrees of consent from the belligerents. In the last, by definition, at least one of them has not accepted a proposed or previously agreed settlement. Consent here is therefore unlikely, but widespread overt hostility to intervening forces highly probable.

In all phases, the operational environment will be permeated by the fact that the belligerents have hitherto been unable or unwilling to resolve their disputes peaceably. Its features will include deeply rooted suspicion, highly subjective perceptions, a reluctance to make concessions, fragile cooperation with neutral forces and local intransigence or hostile action even when overall consent to intervening presence has been given by the belligerents' leadership. When, in Bosnia, the territory was mountainous and heavily wooded, and the belligerents had a long reputation for effective and violent irregular warfare, it is not surprising that Nato army commanders were reluctant to commit their troops unless they enjoyed overwhelming numerical superiority.

MISCONCEPTIONS

In retrospect, the potential contribution of air power to peace inducing operations was either underestimated or wildly exaggerated as the crisis in Bosnia developed and the fiasco in Somalia ensued.

The contrasts between the Gulf and Bosnian scenarios were heavily emphasised. In the former there was a clear cut political objective, a conventionally armed and deployed opponent, open terrain conducive to air operations, comparatively favourable weather, overwhelming numerical and technological superiority and a high degree of coalition unanimity.

In Bosnia there was little agreement among interested powers about the political outcome or military strategy, the belligerents were seldom deployed in conventional formations, the weather was typically European, while topography and scattered civilian communities inhibited free ranging offensive air attacks.

In the Gulf, Saddam Hussein released potential hostages before Desert Storm began. In Bosnia, the UN international ground forces had an impossible mandate to escort humanitarian relief supplies, demilitarise districts, restore indigenous government and repatriate refugees. They, and UN civilians, were scattered in penny

packets across the disputed territories, vulnerable to any localised concentration of superior force the belligerents cared to amass. Inevitably, therefore, the intervening forces came to rely heavily on consent rather than coercion to discharge their mandate. The greater the price exacted for consent to unimpeded UN movement, the greater the benefits of intransigence became to the belligerent.

A US preference for the use of air power, with a command, control and planning structure similar to that used in the Gulf was consistently opposed by Britain and others with troops on the ground who had now become, to all intents and purposes, hostages. Consequently, those who confidently claimed that air power could swiftly resolve the problem were regarded, at best, as politically naive. A disproportionate US reaction to the loss of one aircraft did not enhance the debate.

The denouement in Bosnia came in September 1995. Heavy, sustained, precise air attacks after the extraction of hostages were the catalyst on diplomatic pressure, Croatian and Moslem counter offensives and an arms embargo which brought the Bosnian Serbs to a negotiated settlement.

That combination of circumstances may or may not be repeated elsewhere. Nor is there any guarantee that the Washington Accords will hold when UN ground forces are withdrawn later this year. Nonetheless, some confident assertions can be made about the future potential of air power in broadly similar circumstances.

The Attraction of Air Power

Air power offers several political attractions to hesitant governments. Aircraft can deploy to countries adjoining the troubled territory, thereafter operating from secure bases. There are no concerns about vulnerable logistic support, lines of communication or even routine replenishment. The total manpower bill will be greatly reduced. Provided that there is a manifest determination to commit them to operations, their deployment may of itself reduce bellicosity, particularly during preventive diplomacy.

If neighbouring countries are unwilling to accept such deployments, they are equally unlikely to facilitate the passage of ground forces. That suggests that neighbouring support, or at least compliance, is important for any kind of peace inducing intervention, unless a carrier task force is to be deployed, which raises very different questions of costs, total force capacity and duration before rotation.

Air power may not only be swiftly deployed, it may equally swiftly be removed from a theatre, without the military penalties and costs of extraction of ground forces. Its characteristic of impermanence, usually categorised as a weakness, in these circumstances becomes an advantage. In between times, it may be held at various levels of readiness, responding in cadence with diplomatic pressure but without the problems inherent in sustaining ground forces during a ceasefire in hostile country. It can remain within range on its bases indefinitely, which, in long term peace keeping or enforcement, becomes a most cost effective attribute.

Air power will not remove the possibility of casualties, but they will be far fewer than those at risk among ground forces: a further attraction to sensitive politicians.

In sum, air power offers the advantages of minimum commitment, high visibility, low casualties, reduced costs, residual influence and ease of extraction in a possibly unrewarding and unpredictable peace inducing environment. These are appealing attributes to electorally challenged politicians and to volatile public opinion.

To influence the outcome of a civil war however, political attraction back at home is insufficient. Air power must have operational substance in theatre. That substance must be focused on and constrained by the primary objective: to deny any belligerent the opportunity or capacity to impose his terms, by coercion, on a political settlement. After a settlement has been reached, air power's objective is to persuade the belligerents to adhere to it.

Such objectives call for a reappraisal of the use of air power. Persuading a belligerent that negotiation will produce a better deal than coercion does not require his destruction, nor large scale devastation of his assets. Indeed, such a policy would risk transferring supremacy, and intransigence, to a competitor while leaving a legacy of bitterness and revenge which would, in the longer term, risk making the entire peace inducement process counter productive.

In peace inducing operations, air power is unlikely to deflect hatreds and determination accrued over generations by attacks on 'will' or 'morale', but it can render ineffectual the capacity to translate them into military action. The objective is to create a level killing field: not by arming the weaker side but by reducing the military power of the stronger. From that assumption, air power's contribution, and its constraints, may be identified in detail.

THE ROLES OF AIR POWER

From the advent of preventive diplomacy to the long term enforcement of a settlement, surveillance and reconnaissance will be essential. Revelations about belligerents' political and military intentions and capabilities will be sought. Knowledge of the extent and location of their weapons, ammunition, fuel and other stocks will influence intervening inclination and strategy. Is any country resupplying or reinforcing any of the belligerents? Will an embargo be required?

In peacemaking, tactical reconnaissance can locate fortifications, command posts, observation points, road blocks and heavy weapon positions as well as much of the belligerents' movement.

In peace enforcing, adherence or otherwise to territorial agreements on force withdrawals and other redeployments must be monitored. As a result of barbarity in Bosnia, reconnaissance should, in future, be swiftly engaged to investigate claims, or even rumours, of massacre and other atrocities, thereby contributing both to deterrence and retribution.

All those tasks will be required, whether ground forces are deployed or not. They will demand considerable multi-mode, all weather satellite and UAV systems as well as highly responsive manned aircraft.

When friendly ground forces or agencies are deployed, tactical airlift can enhance their mobility when roads are mined, blocked or otherwise obstructed. Remote units can be rapidly resupplied or reinforced. Belligerent forces can be outflanked or vertically enveloped.

In many environments there will be a need for combat air patrols. If the belligerents have inherited an air force, its contribution must be neutralised. As events in Bosnia illustrated, a combination of AWACs and combat air patrols can enforce a no-fly-zone for most of the time. It should be reimposed, if broken, by closure of airfields, destruction of aircraft on the ground and demolition of hardened shelters. Inherent shortage of fuel, spares and training opportunities for the belligerents will simplify the counter air task.

A greater threat to friendly aircraft will probably come from surface-to-air defences. All air defence radars, C^3 links and SAM systems should be directed to close down. Any subsequent emissions should be regarded as hostile, to be followed by precise and complete destruction. Mobile and hand held autonomous surface-to-air weapons on the other hand, are unlikely to be eradicated. Ambush from the ground will remain a threat and all coalition aircraft should carry defensive systems.

It is, however, unlikely that the neutralisation of local air power will have much impact on the civil war on the ground, except relieving some communities of the further horror of indiscriminate bombing. Air power's primary contribution to force reduction will be air-to-surface attack.

Ideally, the presence in theatre of strong air-to-surface air power would itself constrain a belligerent from continuing to fight. In practice, he is likely to require convincing that the intervening authority is prepared to use force against him, and that such force could be overwhelming, leaving the military advantage not to the intervening authority, but to the rival belligerent. Air power cannot control territory, nor can it enforce twenty-four hour observance of peace agreements. But it can severely penalise and therefore discourage, infractions and intransigence.

All air attacks should be preceded by unambiguous statements of requirement; for example 'cease fire at ...', 'withdraw to a position at ...', 'disperse forces at ...', 'do not cross the line of ...' 'release prisoners/hostages by ...'. No details should be given of the precise consequences of noncompliance, to retain the maximum surprise and flexibility of attack. Potential targets would then include weapon, ammunition, fuel and logistic stocks, command posts and observation posts and, when directly relevant to belligerent expansion of territorial control, bridges and other transport infrastructure.

Sometimes only one belligerent may be intransigent. Rules of conduct and requirements should, however, apply to all and be imposed even handedly. Such a policy still allows for only one side to be hit if only one side is breaking the rules. Impartiality does not imply equality of response to different levels of acquiescence and infraction.

It may be possible to respond in time with close air support to a beleaguered and comparatively innocent belligerent or to friendly ground forces. Ideally, reconnaissance will have provided a timely warning of an impending attack. In practice, the attack is more likely to have taken place or the attackers dispersed before the arrival of close air support. If so, the flexibility of air power can be exploited by punitive attacks on any belligerent asset.

In every case, offensive air power can deny a belligerent the ability to concentrate his own ground forces or to move them confidently into excluded territory. Thereby, air power confers escalation dominance on the coalition.

Some traditional targets will be either off limits or unproductive. Snipers or light mortars operating from populated built up areas, even if precisely located, are unlikely to be neutralised by air attack without surrounding civilian casualties or collateral damage. Both will be exploited for propaganda in circumstances where perceptions among belligerents, the general public back home and among the uncommitted, are particularly important. There is also the other issue of women and children being killed or rendered homeless in a campaign designed to improve their quality of life.

Attacks on social and economic infrastructure targets - power stations, oil refineries, industry etc - will increase the discomfort of all concerned but will prolong and complicate economic reconstruction essential to cement the peace making process,

without necessarily advancing it. They are just as likely to stiffen resolution as undermine it.

Similarly, while the character and intransigence of some belligerent leaders may tempt personal targeting, their removal is as likely to induce martyrdom as concessions. *Discrediting leadership by military failure is likely to be more effective* and permanent.

To reduce a belligerent's military capacity to a point where he can no longer impose his own solution by force but, conversely, does not confer overwhelming advantages on competitors calls for fine military and political judgment. It also demands revision of some popular air power principles.

Gradualism, the controlled escalation of military pressure to achieve political ends, was discredited, especially in USAF eyes, in Vietnam. Heavy, simultaneous parallel attacks at several depths as in Desert Storm are now the preferred solution. The peace environment is, however, as already explained, very different. For example, no military targets should be off limits because of fears of escalation. Any threatened attack should be made with devastating force against any target or target array. A potential for further attacks should be demonstrated beyond doubt, to threaten reduction of the belligerents' military strength below that of his competitors. Such an attack should be coordinated with enforcement of embargos, if necessary by interdiction. All attacks could still be limited in duration, weight and targets.

Learning From Bosnia And Somalia

For such a contribution to be successful, some hard lessons need to be learned from Bosnia and Somalia. Before any forces are committed, the intervening authority or coalition should clearly establish and agree on their objective. It may be to induce a specific peace agreement or it may simply be to bring all belligerents to the conference table by denying any of them intimidatory alternatives.

There must also be consensus on the impartial use of force and rules of engagement. Among the first decisions to be made, before any ground forces or civilian agencies are deployed, must be whether and how to use air power. If it is to be used, the implications for ground force and civilian deployment should be identified. From the outset a single chain of command should be established, with one theatre headquarters. Composition of the headquarters would reflect the contribution of the lead service. If humanitarian operations were to take place, they should also be under the unified command. Some casualties must be expected in the air and on the ground. Politicians and public opinion should be prepared for them.

In sum, the application of air power to peace inducing operations should be based on well proven military structures and principles which may be modified to meet the particular circumstances. It may be argued that in Bosnia the unusual circumstances were allowed to dominate well proven principles until very late in the day. For example the concept of consent, certainly important in peace inducement, was ruthlessly exploited by belligerents on all sides. Too often the pursuit of consent became an obstacle to conciliation rather than a facilitator.

Humanitarian Opportunities

The presence of ground forces deployed for humanitarian tasks in Bosnia complicated subsequent military operations. In a civil war, it is virtually impossible to disassociate humanitarian relief from the perception that one side or the other is being strengthened.

Inevitably, priorities will conflict when humanitarian and coercive activities are under separate authority.

Air power can make a considerable humanitarian contribution provided that two quite different environments are clearly identified at the outset. The first is benign, occurring for example after a natural disaster which is proving beyond the capacity of the responsible government. Earthquakes and flooding are sadly familiar. Here, swiftly responsive delivery of medical supplies, food, shelter and mobile communications combine high profile political credit with valuable practical assistance, often in operational circumstances which provide realistic training for airlift crews.

The second environment will be potentially or overtly hostile. The first air force casualties in Bosnia were an Italian transport crew on a humanitarian mission. Subsequently, humanitarian flights into Sarajevo were frequently threatened or attacked. The local UN ground force commander was loath to invoke air-to-surface retaliation because of fear of even greater disruption of the relief tasks. Unified command should reduce conflict between priorities but must also identify the degree of protection required by highly vulnerable transport aircraft. Airhead defence, for example, could be a major task for deployed ground forces.

Nor should humanitarian operations be regarded as somehow of less importance. Arguably the most decisive single contribution by air power to the Cold War was the Berlin Airlift. It was protected by fighters and backed by deployment of nuclear capable bombers to Europe. The result changed the face of Europe and the course of the Cold War, without a bomb being dropped.

On a much smaller scale, humanitarian operations will provide opportunities for political credit, international goodwill and public approbation which should continue to be grasped by air forces who may have fewer combat opportunities to demonstrate their value and professional competence. Conversely, moves to allocate humanitarian airlift to civilian commercial organisations should be resisted. Military skills, combat awareness, the need for protection and unqualified willingness to enter threatening environments will remain prerequisites for the discharge of the full range of humanitarian tasks.

Constabulary Operations

More controversial is the allocation of air power, by professional air forces, to international constabulary tasks, including operations against drug smuggling and piracy.

Surveillance and reconnaissance could facilitate interception of aircraft and ships on a larger scale than at present. Drug crops and processing plants can be identified and destroyed by air. Palatial residences and other highly visible material benefits from illegal profit, beyond the reach or inclination of local law enforcement, could readily become vulnerable to aerial destruction. Such activities would not stop international crime but they would disrupt the market flow and depress the material advantages to be gained from it. Similarly, should a serious campaign ever be envisaged against piracy, surveillance and identification of home ports could precede precise destruction of boats and harbour facilities, when local authorities had proved ineffectual.

Such constabulary operations might raise delicate questions of sovereignty but would introduce sanctions commensurate with the scale and brutality of the illegal activities themselves.

COSTS

Peace inducing, humanitarian and constabulary activities cannot, on their own, justify the existence of a nation's air force. That must be predicated on its contribution to core security and protection of vital interests. Fortunately, much of the equipment procured for higher intensity 21st century conflict may be drawn down for operations other than war. Surveillance; reconnaissance; all weather multi-mode target identification and precision munitions; air superiority; defence suppression; self-defence and airlift will be required in many environments.

Air power can offer cheaper and more politically attractive options in many circumstances other than war, but none will be cost free. Either such operations are flown in addition to peacetime training and exercises or in lieu of them. If the former, aircraft fatigue life, engines and spares are consumed more rapidly. Either peacetime aircrew and groundcrew manning levels must be increased, or workloads must be expanded, risking overstretch and personal disenchantment.

Some of the operations may replace peacetime operational training, especially for surveillance, reconnaissance and transport forces. Thereby additional costs and penalties may be reduced. Combat training, on the other hand, may be impeded by 'deterrent' flying such as patrolling exclusion zones with only periodic enforcement action. Nor are 'operations other than war' likely to prepare all personnel for the intensity and attrition of conventional conflict between peers conducted in the dense fog of electronic warfare.

There is an uncomfortable historical precedent of an air force preoccupied with low intensity operations in 'peacetime'. The Royal Air Force made a very significant contribution to 'Imperial Policing' between the wars and sustained its independence in a period of international uncertainty and defence resource constraints. In doing so, it failed to prepare for modern large scale warfare until the eleventh hour, with tragic consequences in World War II.

CONCLUSION

We can avoid that mistake. In our future, air power can and must contribute to national security and the protection of interests wherever coercion is required to sustain policy. It cannot be kept in its shelters and wheeled out like some 19th century coastal defence cannon only when a hostile air fleet appears over the horizon.

On the contrary, politicians must be reminded constantly of its attractions and utility as a cost effective, highly flexible instrument in support of national interests and international responsibility.

Contributions to operations other than war are not an optional extra for tomorrow's air forces; they are an essential complement to preparation for 21st century uncertainties and continual justification for investment and public support.

DISCUSSION

Colonel Don Murray: I understand that the United States has retained the term 'operations other than war', as late as last week, by a very close vote. My question is to both gentlemen. Rather than perhaps applying an air power template to every category in the spectrum of conflict, may it not be better to consider these operations as military support operations, because they may not necessarily be campaigns in their own right? Australia has not yet adopted the term, 'Operations Other Than War' in its joint doctrine, and perhaps the argument is eased if we do not adopt such a term, but rather consider the notion of military support for a particular end state as the objective.

Dr Gropman: The term is not the problem. It may be defining the problem away. I don't care what you call it, it is still the same thing. It's a muddy, subtle, difficult operation where the connection to the interests of the state are vague if they are present at all; where politicians, because of CNN, decide that they can't stand the heat any more. Look also at the UN, the main advocate of such operations: for ten critical years the Secretary General was a certified war criminal, who was preceded by a gentleman from a harsh dictatorship, and the current Secretary General comes from a military dictatorship. I wonder about that institution's values. There are about twenty countries in that institution that share your values and mine and there are about one hundred and sixty that don't. I have no problem when Tony [Mason] talks about getting involved in these operations when one's interests are involved, or when it could spread to an area where one's interests are involved.

Air Vice-Marshal Mason: I have little to add to that, other than to say that I hope I indicated that 'Operations Other Than War' is a meaningless expression. I was one of those who four years ago over-emphasised, I now believe, the differences in the environment between the Gulf and Bosnia to the exclusion of the similarities, the military principles of which I tried to point out today. I believe that, rather than look for a catch-all of 'Operations Other Than War', we should accept the fact that peace support operations may involve fighting, and if fighting isn't war what is it? If you don't want to get involved in fighting don't send British armed troops to Bosnia, send a bunch of traffic wardens. What I think we are doing is peace inducement. I think we are inducing people to come to the conference table, we are inducing people to make peace and we are inducing people to stop fighting. We are doing that by the use of armed force as in war.

Air Marshal R.G. Funnell: Before asking my question, I would like to say how wonderful it is to have Alan Gropman and Tony Mason back in Canberra. Both of them have had an extraordinary effect on me over the last ten, fifteen years. And anyone who needs to know anything about air power, and in particular, to learn about it in a balanced way, can do far worse than read anything that either of these two gentlemen has penned.

I acknowledge what Dr Gropman has to say about concentrating on the area closest to us, on our own region. That's where there is going to be the greatest spin-off for us; that's where so much of the work that we are going to be called on to do in the next fifty years will occur. I also acknowledge that there are only twenty folk who think in like-minded manner to us in the United Nations. But in places like Rwanda and

Somalia and Namibia, if the Western democracies are unwilling to get involved, who will? Do we just let it go completely?

Dr Gropman: I realise that it is tough when you look at the Rwandas and the Somalias. But looking at the real world, you can't stay long enough to make a difference. The antipathy between the Hutus and the Tutsis in Rwanda and Burundi is completely lost in the mists of time. It goes far back, far beyond the colonial powers moving in and making one group dominant over the other. The antipathy was there before the colonials arrived in East Africa. You can't stay long enough to make a difference. You can put a lid on the top, that's all. The question I would ask is: we have so many fundamental problems in the United States - homelessness; parts of the population who don't get medical attention; parts of the population that are actually become useless to us - so why we are taking this interest on the other side of the world? And another thing, we don't recruit our people on the basis that they are going to solve the problems of Rwanda. We pay the politicians to protect the national interest and not be swayed by what they see on CNN and we pay our chiefs of staff to resist using our troops when our national interests are not involved.

Squadron Leader John Oddie: You mentioned the term 'gradualism'. It seems to me that gradualism implies ongoing rational behaviour by the leaders of any group involved, and a certain amount of sanity. Can I ask you to expand on that? Does in fact history show that gradualism will continue and be realistic?

Air Vice-Marshal Mason: You have picked on a very important point, a point which I concede is probably the weakest in the case for intervention. Because on the face of it, it's the complete opposite to what we achieved in the Gulf War, where we brought maximum force to bear in the interests of brevity and minimising bloodshed and causalities. I have come to the conclusion that there is a fundamental difference between the operational environment in Vietnam and the one, for example, in Bosnia. We can now be clinical. We should be able to be more clinical and more rational and, indeed, it seems to me it is much easier to be clinical and rational from fifteen thousand feet than when you are being shot in the back outside a village or in downtown Belfast or wherever on the ground. When you are flying you don't need to worry about local customs and traditions, you are given a precise target.

First of all you have got to decide, 'What's it all about?' What exactly do we want to achieve by force in the first place? I have tried to answer that by saying that in the case of Bosnia it was not a political objective, it was to bring people to a conference table at which a political objective could be reached. The second thing that we have to do is to decide whether, in these circumstances, air power can reach and destroy or neutralise any target array, which will have a reasonable chance of affecting the behaviour of the belligerent. And that is relatively easy to measure. If your intelligence and surveillance are correct, you should know what his resources are. You should know whether he's got any external sources and you should know what it is that he is trying to do. And finally you should be able to destroy a particular target array, showing at the same time that you can return and do it many more times if necessary. At the same time the intervening powers should be talking all the time. As bombs are being dropped in Bosnia, talking is going on in Geneva. So you have, it seems to me, very different circumstances in this environment, which we are still

thinking through. So my short answer is: I think so. The jury is still out. But I think there is sufficient evidence now to indicate that it's worth another go.

Wing Commander J.H. Benjamin: What are the altruistic rules for getting engaged in these sorts of operations? My understanding is that Mozambique was just as deserving as Somalia, but CNN weren't there. Is that being cynical, or are there some rules for when we get involved and when we don't?

Dr Gropman: Well, that was the point I was making a few minutes ago. We elect our politicians to withstand that. You are absolutely right. What was happening in Somalia was no worse than what was happening in Liberia, but CNN wasn't there. It was much too dangerous for CNN to be in Liberia. Altruism doesn't play in this game. Altruism is something between you and your neighbour, it doesn't play in the international game. It would seem to me that if we were going to do that, if we were going to use our troops where our interests are not involved, we would completely have to change the way we go about bringing the people in to serve. We are constrained by how much money we can give to solve those difficult international problems because we have domestic problems of our own. But you are absolutely right, while we were engaged in Somalia there were much worse depredations going on internationally and we did nothing about them.

TECHNOLOGY TRENDS IN AIR WARFARE

BENJAMIN S. LAMBETH[1]

INTRODUCTION

The past decade has seen many air power instruments evolve from advanced development to operational use. These have aggregated mainly in the areas of stealth, precision standoff attack, and enhanced information availability. Such capabilities were brought together for the first time in a combat setting five years ago in Operation Desert Storm. In an unprecedented harmonic convergence of technology, doctrine, concepts of operations, and bold leadership, they enabled the prompt achievement of virtually uncontested control of the air by the allied coalition. That, in turn, allowed the latter to control the subsequent course of fighting, made the job of land forces almost painless, and yielded an outcome that kept casualties on both sides to a minimum, despite the sustained high intensity of allied force employment for more than five weeks.[2]

That still-remarkable achievement has prompted a wide-ranging debate over the question of whether the Western powers are now at the brink of a 'revolution in military affairs' presaging a qualitative change in the way future wars will be fought and won. The debate has gained added impetus from new technologies now in train whose eventual deployment and integration into a useable repertoire promise to widen ever further the disparity in capability between those who possess them and those who do not.

At the same time, the end of the Cold War, the disappearance of a peer competitor with the demise of the USSR, and the emergence of new military tasks like humanitarian aid and peacekeeping have raised a countervailing question whether the Soviet-American competition was not in fact an historical aberration rather than the norm and whether Desert Storm should more properly be considered the last example of a dying form of warfare rather than a harbinger of things to come. What matters here is whether continued refinement of the technologies wielded to such great effect in the Persian Gulf War will yield anything but a misdirection of resources in the post-Cold War era - in effect, a packing of bags for a future military trip that is unlikely to take place.

This paper will speak to those contrapuntal themes and try to adjudicate them within the context of an overview of current technology trends as they relate to aerospace warfare. Since we cannot usefully discuss technology developments in isolation from strategic context, the paper first considers the defining features of the newly emerging operational arena in which American and allied forces may be called upon to perform during the first decade of the next century and beyond. It next reviews the major new technologies either in hand or on the horizon which, if properly nurtured, promise to enhance further the effectiveness of Western aerospace forces. After that, it considers the operational implications of these technology developments

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[1] Any views expressed herein are solely those of the author and do not necessarily represent the views of RAND or any of its US government research sponsors.

[2] For elaboration on this point, see my 'The Winning of Air Supremacy in Operation Desert Storm', *Cockpit*, October-December 1993.

and whether they amount to an incipient 'revolution' in the nature of warfare - and, if so, how it ought best be understood. Finally, it highlights some policy challenges and near-term pitfalls to be avoided if Western defence planners are to extract the fullest value from this promised technology in an era of uncertain threats and reduced budgets.

The paper's main focus is necessarily on developments in the United States, since that is where most of the cutting-edge work is being done. To note but one example, although investment in stealth technology is way down from just a few years ago as a result of declining funding support, only the United States can afford upper-end stealth applications today. Russia claims to be at the threshold of flying a stealthy new fighter which its air force leaders have begun calling the MiG-37.[3] However, this aircraft will most likely not have the low-observable features of the F-22. Russia further lacks the money to put such an aircraft into series production.[4] Japan also is reportedly working on a stealthy fighter to follow its F-2. Beyond that, nobody else is playing this game seriously, at least yet.

Such a focus would seem at first to give short shrift to the concerns of allied air forces, whose more modest budgets and operational requirements will make them observers more than participants in the leading technology trends now in train. Yet many, if not most, of the prospective aerospace technology payoffs described below can be shared as needed with America's partners once those technologies reach maturity. My title refers to 'air warfare' because of the paper's predominant focus on aerospace instrumentalities and the aerospace medium of delivering force - and because the topic of the sponsoring conference is air power in new era security. As the discussion will make clear, however, we are moving more and more into a period of history in which extracting the fullest leverage from new technologies will require seamless joints among the force elements of *all* services in combined-arms war. I approach this topic not with a narrow fixation on technology per se, but with a view toward explicating what is, in the end, a supremely important policy problem.

The Emerging Operational Setting

The defining feature of the current international security scene has been the end of our long-term competition with Soviet communism, along with the unrelenting urgency that went with it. With the USSR's disappearance, there is now an absence of a known adversary to threaten global security. No peer competitor yet looms on the horizon, although some worry about a resurgent Russia. China is also becoming a source of growing concern. Beyond those candidates are more remote possibilities which we do not even speak of today, because to do so would at best be strategically feckless and at worst risk nurturing a self-fulfilling prophecy. For the moment, however, the United States is the world's sole surviving superpower, with a defence budget twenty times that of its former Cold War rival. There is a certain comfort to be drawn from that. The question is how transitory it may be.

Second, with the passing of the Cold War, the world has moved from global to regional interactions, and challenges to Western security have become more diverse. It used to be that all international conflicts were, in one fashion or another, part and

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[3] Simon Saradzhyan, 'Russia Spending Scarce Funds on Futuristic Warplanes', *Radio Free Europe/Radio Liberty Report*, 22 April 1996.

[4] For amplification, see my 'Russia's Air Power at the Crossroads', *RAND MR-623-AF*, 1996, forthcoming.

parcel of the overarching ideological competition between the United States and the USSR. Today, there are many players and a whole profusion of potential troublemakers. This means profound problems for a military culture whose strategy was, for more than two generations, founded on the assumption of a single enemy.

At the same time, we are moving increasingly from state to nonstate threats. The predominant engines of conflict today are no longer ideological and geopolitical, with their built-in rationality and risk-aversion, but worldwide terrorism and religious and ethnic fanaticism. There has also been an emergence of extranational forces such as drug cartels and organised crime with potential access to instruments of mass destruction and few inhibitions about threatening to use them. These new actors are less bound by traditional rules of conduct. Accordingly, they may be less deterrable in the classic sense. The same can be said of rogue and desperate states like Libya and North Korea.

During the Cold War, alliances were firmly rooted, with little confusion about who was for whom. Today, those same alliances (including Nato) are bereft of their former rationales and beset by new prospects for coalition formation and marriages of convenience. Change rather than constancy is now the dominant factor, putting the force planner somewhat in the position of a chameleon on a scotch-plaid kilt. As the 1991 Gulf experience showed, we are likely to see less collective defence and more coalition operations under UN auspices in coming years. But we cannot assume that coalitions will invariably form up behind us as occurred in the aftermath of Iraq's invasion of Kuwait in August 1990. There will be times when the United States and its core partners will have to go it alone. Moreover, as Andrew Krepinevich has noted, future challenges to Western security will not be updated versions of Saddam Hussein's Iraq so much as the 'consequences of failed great power relationships and the inability to block the proliferation of weapons of mass destruction and advanced military technologies'.[5]

The sharp decline in the number of available American bases around the world has increased the likelihood of major military operations being mounted directly from the continental United States. This has clear implications for American power projection and mobility needs. USAFE is already down to two fighter wing equivalents. PACAF is down to three, including its assets in Alaska. We are out of the Philippines, with Okinawa and other locales possibly to follow in due course. The base infrastructure we enjoyed in Saudi Arabia for Desert Storm was a conspicuous exception to this emerging reality. In the main, we simply no longer have the bases we used to have around the world. This means that for the United States at least, future wars will be fought over increasingly great distances. Of course, we now have the ability to fly from Barksdale AFB or Whiteman AFB and deliver precision ordnance anywhere in the world. But we have little by way of numbers or sustainability in that respect.

Throughout our long competition with the USSR, an appropriate analogy was football. We knew the name of the game, the other team, the likely field of play, the probable axis of attack, the rules of engagement, the other side's strategic plan, and his principal strengths and weaknesses. It was just a matter of being in place in sufficient strength to deter an attack or leverage our known strengths against his known weaknesses in the event deterrence failed. Today, there is less predictability in the post-Cold War world. It has become more difficult to anticipate likely arenas and modes of

[5] Quoted in 'Reporter's Notebook', *Defense Week*, 29 April 1996, p 4.

conflict that might involve allied forces. Not only is the football analogy no longer appropriate, we do not even know the name of the new game. It may be one game in one arena and a different one in another.

In this regard, the United States can now borrow a page from Australia's experience. Australia has long appeared to be blessed, in the eyes of its North American friends at least, with the virtue of being the most unthreatened nation on earth. Yet each year, its military chiefs must justify to their political masters a force plan without benefit of any concrete operational challenge to point to. The United States is now much in the same boat, although because of our global commitments, we still have such tangibles as Iran, Iraq, and North Korea to fall back on.

Furthermore, the end of the nuclear standoff between the two former Cold War rivals has opened up new opportunities for conflict. The Soviet-American confrontation was marked by a highly stable military balance. At the edges where armed conflicts did occur, there were overarching forces that kept the overall superpower relationship in equilibrium. Today, in contrast, the arenas of conflict are everywhere. A good example was Iraq's attack on Kuwait in 1990. That was a contingency for which we had little prior expectation or planning, yet which led to the most high intensity, high-technology use of American military power since the end of World War II. Who can honestly say today that he predicted it more than a month or two before it occurred, if at all?

As a result of this change, we are moving into an era in which our ability to achieve desired military goals will depend on quality information to an ever-increasing degree.[6] There is now a much higher premium than before on detailed, relevant, and timely intelligence. That is already a precondition for pulling the fangs of a renegade country bent on making nuclear trouble. In the new global jungle, it will no longer suffice to rely on the rationality of some angry ayatollah who might threaten to use a nuclear weapon against our interests somewhere. When such a potential calamity arises, we are going to want to preempt or actively defend against weapons of mass destruction. Nothing but a first-class set of real-time intelligence capabilities is going to permit that. It is a cliche now that modern technology allows us to kill anything we can see. It is much less appreciated that we can kill *only* what we can see.

We are also moving from a world of traditional battlegrounds, such as the north German plain and the Iraqi desert, to one in which future confrontations may take place in jungles, mountains, or urban settings. There has been a concurrent growth in the incidence of peacekeeping, peacemaking, and humanitarian operations in areas in which our forces will find themselves in harm's way but unable to react in classic fashion. Somalia offers a showcase example of this new category of challenges to Western policy. There has also been a growth in the multiplicity of threat systems confronting our forces. These include improved SAMs and air-to-air missiles, cruise missiles, tactical ballistic missiles, and new information weapons, starting with computer viruses. Thanks to the aggressive high-technology offerings of a cash-starved Russia, to say nothing of other able players in the arms sales arena, low-cost SAMs and air-to-air missiles available to future threat countries will be as good as those available to the West. There is also the spectre of avionics and weapons upgrades to aging aircraft such as the venerable MiG-21, which will make them lethal point defenders that cannot be ignored. Access to GPS, high-resolution satellite imagery, and high-speed information processing will soon be available to any threat countries willing

[6] This point was noted to me by my former RAND colleague John Arquilla.

and able to pay the price, since these are driven by the commercial sector rather than by state-funded defence programs.

Finally, we face two new constraints on the domestic front. The first is lower budgets and thus a higher premium on making right choices the first time. For more than two generations, American defence planners fixated mainly on the Soviet threat. In fact, there was much in our defence posture that could not be easily explained by what a strict counter-Soviet requirement would drive us to fund and deploy. But from a planner's perspective, the Soviet challenge offered the virtue of being so seemingly capable and so global in its potential for troublemaking that just about anything we wanted to do could be justified by invoking it.[7] We now lack the reserves and flexibility to reach into our pocket and simply pull out whatever may be needed, as we did as recently as in the Gulf War in 1991. Not only do we have to know *what* we want to do, we have to be better when it comes to deciding in advance what kinds of capabilities we will need. And we will have to do this in a more exacting and unsympathetic domestic setting. Today, the emphasis is on affordability and cost reduction. Accordingly, we must exercise greater self-discipline and make harder choices.

A second domestic driver is the rising public intolerance of casualties. The single most powerful statistic from Desert Storm attesting to the new-found leverage of air power was the fact that the coalition lost fewer lives to hostile fire during the five weeks of actual combat than it did during the previous five months of in-theatre workups due to mundane accidents. Unfortunately, one of the less auspicious results of the Gulf War was that this happy ending became the norm against which Americans will evaluate future global commitments and their worth. This raises a profound question whether the United States will be able to muster the moral fortitude to face up to core threats and make the sort of sacrifices we did in World War II when put to a more demanding test. Like it or not, reduced public tolerance of casualties is forcing an increasing need for technology to substitute for human life. The good news is that technology is making it increasingly possible to apply decisive force with a minimum of both friendly and enemy losses.

The Promise of New Technology

The list of the emerging technologies that will largely shape the face of future war is not long. It speaks mainly to the closely interconnected categories of projecting power, putting lethal effects on target from a safe distance, and enhancing situation awareness.

The most widely discussed of these force employment categories is the third one, notably those developments falling under the general heading of 'information warfare'. These aggregate predominantly in what recently retired Vice Chairman of the US Joint Chiefs of Staff, Admiral William Owens, has called ISR (or intelligence, surveillance, and reconnaissance) and C^4I (or command, control, communications, computers, and intelligence). The much-debated military 'revolution' portended by these developments offers changes more in degree than in kind when it comes to the nature of weapons and support systems. Nevertheless, the extent of change it foreshadows for the character of war is decidedly qualitative, thanks to 'the ability to

[7] I am indebted to my RAND colleague Kevin Lewis for this observation.

tie these developments together and build the doctrines, strategies, and tactics that take advantage of their technical potential'.[8]

The most thorough and reflective single-volume treatment of the outlook for aerospace technology available today is the summary report of the US Air Force Scientific Advisory Board's recent *New World Vistas* study, which was issued in December of last year.[9] As one might expect of such a forward-looking endeavour, some of its projections invite scepticism, at least with respect to near-term practicality. Indeed, the study concedes this up front in its acknowledgment that among its forecasts may be 'ideas that will be notable as humorous objects for future generations rather than notable as accurate visions of the future'. The study is on solid ground, however, in predicting that the air force of the 21st century will experience changes 'as profound as those experienced by the Army in moving from the horse to the tank or by the navy in converting from sail to steam'. Among other things, it outlines a future in which armoured forces will have long gone the way of the dinosaurs, if they have not already, and in which today's surface naval fleets will have suffered a similar fate, to all intents and purposes, as tanks of the sea. The discussion below draws mainly, though not exclusively, on that report as a source of example in offering a snapshot overview of current technology trends.

The new aerospace technology options now at hand or within foreseeable reach can be divided into current-generation systems which will come on line within the next ten to fifteen years, and next-generation systems which are now in basic or applied R&D but will see operational service only after perhaps the year 2020.[10] In each case, they fall into four categories: (1) Combat and combat support platforms; (2) munitions and other disabling mechanisms; (3) sensors and related situation awareness aids; and (4) information processing and communications systems.

Combat and Combat Support Platforms

The current vector of technology development is occasioning a progressive shift in emphasis from platforms to systems. One must be careful, though, not to make an absolute of this. For example, AWACS and Joint STARS work nicely on an almost four-decade old Boeing 707 airframe. However, we will need stealthy air vehicles, manned or unmanned, to carry killing systems into harm's way.[11]

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[8] Joseph S. Nye Jr., and William A. Owens, 'America's Information Edge', *Foreign Affairs*, March/April 1996, p 21.

[9] Gene H. McCall et al., *New World Vistas: Air and Space Power for the 21st Century*, Summary Volume, Washington DC, Headquarters United States Air Force, 15 December 1995. For a synopsis, see Peter Grier, 'New World Vistas', *Air Force Magazine*, March 1996, pp 20-25.

[10] A continuing constraint in looking ahead to the implications of new technologies, of course, is that it is hard to speculate about what may be under development in the black world. An outstanding illustration is the case of stealth in the mid-1980s. Who then could have confidently foreseen the extraordinary leverage the F-117 would give the coalition in achieving prompt control of the air through non-traditional (that is, other than classic offensive counterair and airfield attack) means in Desert Storm?

[11] To recount a point I argued at a previous RAAF air power conference, '"platforms vs systems" is a false issue... Although the trend of the day is for fewer platforms at longer intervals and for greater stress on subsystems, it does not follow that the development and deployment of these subsystems is necessarily going to be any less painful... What is needed is an acquisition system that views platforms and systems complementarily, with the latter expressly pursued so as to help expand the capability of the former as operational tasks become ever more demanding'. Benjamin S. Lambeth, 'Trends in Air

The F-22 air superiority fighter, a prototype of which flew in 1990, is the first of the current-generation combat aircraft now at the threshold of series production and deployment. The first engineering and manufacturing development (EMD) article will fly next year, with a planned IOC date of 2004. The USAF plans to procure four hundred and forty-two of these to replace the aging F-15. Once the F-22 comes on line, the Joint Strike Fighter (JSF) now being developed to replace the F-16, F-18, and Harrier will see initial deployment during the second decade of the next century.

The first generation of unmanned air vehicles (UAVs) is also either in or near deployment. These reconnaissance platforms offer the advantages of lower cost and greater endurance. They include the stealthy Darkstar, the one ton payload Global Hawk, and the medium-altitude, long-endurance Predator.[12] These platforms offer up to a fifty hour loiter time without risking aircrew lives. They may eventually replace the U-2, whose days of service life are numbered because of age and overuse.[13]

Successor-generation platforms which will not come on line until the year 2020 at the earliest are led by what the SAB report calls 'uninhabited' combat air vehicles, or UCAVs. These will be designed from the ground up as unique aircraft. UCAV combat pilots will sit in an execution center in the United States and fly uninhabited aircraft possibly half a globe away through high-speed fibre optic and satellite communications links.

In contrast to today's unmanned air vehicles, UCAVs will be more mission-effective than their manned counterparts because they promise levels of performance unattainable from manned aircraft. For example, uninhabited combat aircraft will be capable of new manoeuvres and flight attitudes. They will not be bound by the limits of human tolerance and can be built to accelerate in any direction immediately. A UCAV with a plus-or-minus twenty 'g' capability will be able to defeat nearly all missiles.

Getting man out of the machine will also permit new options for signature reduction. Air vehicles can be made smaller through the absence of displays, ejection seats, manual controls, life support equipment, and other necessary appurtenances of manned aircraft that add up to weight and size. This enhanced design freedom will allow an increase in stealth to the limit of passive radar cross section reduction.[14]

Stealthy UCAVs, together with a low-observable long-range standoff missile, will lessen the need for manned aircraft to penetrate lethal defenses. Such platforms might entail large lifters carrying smaller UCAVs for point operations to allow intercontinental standoff attack capability. They can extend aerodynamic performance into the hypersonic range, flying at Mach 12-15, from 85,000 to 150,000 ft. This will permit direct attack of high-value targets from the continental United States in just minutes. Because they will be uninhabited, higher skin temperatures can be tolerated. With their ability to transition from hypersonic to subsonic speeds and back, their onboard weapons can be released subsonically, without any need to develop a new capability for hypersonic release.

Power: New Systems, Old Platforms?' in Alan Stephens, (ed.), *Smaller But Larger: Conventional Air Power Into the 21st Century*, Air Power Studies Centre, Canberra, 1991, pp 145-146.

[12] David A. Fulghum, 'ACC Weighs Plans for New Technology', *Aviation Week & Space Technology*, 29 April 1996, p 39.

[13] The U-2 is flying three times its Cold War sortie rate today because of deployment commitments. Michael A. Dornheim, 'U-2 Runs at Frenzied Pace in New World Order', *Aviation Week & Space Technology*, 29 April 1995, p 55.

[14] David A. Fulghum, 'Stealth Investments Worry ACC Planners', *Aviation Week & Space Technology*, 29 April 1996, p 42.

Finally, UCAVs will be less expensive than manned aircraft of similar capability. The SAB report foresees that they eventually may serendipitously help accommodate the steadily growing American unwillingness to tolerate casualties in future wars.[15] Supplementing UCAVs in the second and third decades of the next century may be uninhabited reconnaissance air vehicles, or URAVs. These low-observable platforms can be positioned over orbit points at 50-100,000 ft within 200-300 nautical miles of a region of interest and can carry monitoring sensors permitting returns at a few centimetres resolution.

These technologies are still in their infancy and will have to be developed in bite-sized portions. In particular, the use of unmanned aircraft in the strike role will take years to bring to fruition. The current Vice Chairman of the Joint Chiefs of Staff, General Joseph Ralston, has stressed the need to concentrate on one problem at a time, proceeding from the easy to the more complex and demanding. This will mean starting with reconnaissance and only then moving in sequence to ground attack, boost-phase missile intercept, and finally air-to-air, each of which will involve increasing orders of magnitude of difficulty.[16] As the SAB report has counselled, mastering technologies like these at a cost we can afford will demand 'a program culture that generates continuous improvement from humble beginnings rather than ultimate initial performance'.[17]

No less important than UCAV and URAV technology for the coming century is the promise of a more capable and versatile airlifter. The growing prospect of remote low intensity conflicts such as Bosnia, as contrasted to Desert Storm-like scenarios, has underscored the heightened importance of such aircraft. Although not glamorous, airlift offers the only mode of transportation that can react to global force commitment needs in days. Higher operations tempos permitted by the information revolution will require a more rapid resupply capability.

Today, airlift depends on a complex infrastructure which includes not only the air vehicles themselves, but embarkation and debarkation facilities, refueling capability, cargo handling equipment, and storage capacity. These can be dispensed with in the next generation by mobility improvements which will not depend on increased numbers of aircraft.

In particular, the next-generation airlifter promises global reach without refueling, as well as a point-of-use delivery capability through precision airdrop as a standard operating procedure. Such an airlifter will be made possible by a large, high lift-to-drag ratio wing and improved engines. It will be capable of carrying 150,000 lb of cargo at a maximum takeoff gross weight of 1,000,000 lb, flying 12,000 nautical miles to any point in the world, delivering cargo, and returning without refueling. With a GPS autoland system at a demonstrated accuracy of thirty centimetres, such an aircraft can also taxi in zero-zero weather conditions. It will be able to operate anywhere in the world without ground navigation equipment.

Point-of-use delivery of cargo will mean an end to any need for approach and landing delays, airport traffic bottlenecks, trucks, warehouses, cargo handling equipment, and land transport through hostile territory. This will reduce intratheatre infrastructure requirements for both the Air Force and the Army and will offer a significant force multiplier with respect to Army manoeuvre effectiveness. Cargo can

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[15] *New World Vistas*, p 60.
[16] Fulghum, 'ACC Weighs Plans for New Technology', p 39.
[17] *New World Vistas*, p 13.

be delivered without landing from up to 20,000 ft altitude at a ten to twenty metre accuracy, with the cargo extracted in random order as needed. This will permit the delivery of munitions directly to shooters, medical supplies directly to hospitals, food directly to the soldier, and weapons and reloads directly to weapons in their firing positions.

Many might be inclined to dismiss this projected capability as a good example of the SAB report's tendency to wander off into the realm of science fiction on occasion. Yet the report has a persuasive point in insisting that in the future, 'the problem of airdrop should be treated as seriously as the problem of bomb drop'.[18] Airlifters of tomorrow mounting directed energy weapons or carrying UCAVs can become survivable offensive weapons platforms, not just transporters. Today's lines separating combat and mobility will accordingly blur.

Munitions and Other Disabling Mechanisms

Precision-guided munitions (PGMs) largely swung the outcome of the Persian Gulf War by shutting down Iraq's integrated air defence system (IADS) and keeping its air force out of the fray. Such munitions already have offered an increase in high-explosive destructive power by as much as a factor of 1000 over unguided bombs. Procured in enough numbers, they will render aircraft like the F-16 operationally effective at medium altitude in a way they were not during Operation Desert Storm. As we approach near-zero miss-distance accuracies, we have the opportunity to design and build smaller munitions and maintain fewer stocks. As munitions become ever smaller and more accurate, they can retain high lethality while permitting internal carriage aboard stealthy aircraft.[19]

New destruction systems now in train include PGM upgrades and the Joint Direct Attack Munition (JDAM). Next-generation sensor fused 'smart' munitions will have the ability to do target recognition, identification, assessment, and sorting while guiding, achieving accuracies in centimetres rather than metres. Also under development are anti-tactical ballistic missiles and the airborne laser to deal with theatre ballistic threats.

Technology is further changing the way in which military forces impose combat effects on an enemy by taking us away from primary reliance on the familiar device of hot iron on target toward the application instead, or in addition, of such disruptive measures as heat (lasers and high-power microwave bursts), electrons (directed radio-frequency energy), and deception.[20] Other next-generation disabling systems now in development include microexplosives for kinetic kill. Along with increased accuracy will come reduced size, permitting explosive effectiveness per unit mass to grow by a factor of at least ten over today's PGMs. Microsensor-directed microexplosive bombs will be able to kill moving targets with just grams of explosive. Other guided munitions with less than a foot accuracy will be able to alter their lethal effects through various detonation modes, searching for the most vulnerable point on a target and selecting a

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[18] *New World Vistas*, p 32.

[19] The development of conformal weaponry for external carriage has been abandoned. The limited RCS reduction it promised was not sufficient to justify the investment. See Fulghum, 'Stealth Investments Worry ACC Planners', p 42.

[20] Colonel Samuel H. Clovis Jr., USAF, Inspector General, US Space Command, 'Deep Battle: One Airman's View', briefing delivered at RAND, 15 May 1996.

shaped charge, say, for armour penetration or a more uniform fragmentation pattern for softer targets.

Multispectral and hyperspectral sensors offer new options for cruise missile engagement. Among the options currently in contention are an enhanced AIM-120 AMRAAM radar missile on Air Force and Navy fighters and the Medium Extended Air Defence System, or MEADS. The improved AMRAAM aims to use a multispectral sensor for infrared and radio frequency signatures, such as radar altimeter emissions and small engine exhaust heat.[21] If the sensor works, the fighter solution may be the one accepted. The fighter option will also include an AWACS upgrade, with the AWACS comprising a fusion centre for information coming from a ship, aircraft, or satellite and being passed to the intercepting fighter.

In addition, concept development is now under way to produce 'information munitions'. These will entail methods for attacking information systems both to destroy and to confuse or deceive enemy computers. This portends capabilities for entering a command's computers and destroying or distorting files. Improved real-time intelligence will be a critically important subset of information warfare, however, since we will need to know precisely where the enemy's information targets and critical nodes are located in order for such techniques to be effective.

During Desert Storm, Iraq's IADS computers were reportedly penetrated offensively by first-generation American information warfare techniques. According to a senior USAF official, there was a 'revolutionary effort' during that war 'to use information warfare in the esoteric way that people speculate about'.[22] More recently, Air Combat Command has activated the 609th Information Warfare Squadron at Shaw AFB, South Carolina, to protect computers in an air operations centre. Once up and running, this will be a deployable combat unit.[23] One of its challenges is deciding on what to protect, since if one seeks to protect everything, one may end up protecting nothing. A related challenge is detecting and stopping intruders in real time. Information warfare techniques will be defensive before they become offensive. They promise eventually, however, to be able to ferret through an enemy's e-mail, discover the sources and locations of his weapons, and scramble his IADS and other essential C^3 and force management computers.

Nonlethal, or 'less than lethal,' weapons make for yet another category of successor-generation imposition techniques. These will include both anti-personnel and anti-equipment weapons. High-power microwave and laser weapons can disrupt or degrade enemy personnel and systems, offering a downstream possibility of being able to replace many traditional explosive weapons. They may, to offer but one speculative example, enter an enemy fighter cockpit in the air, illuminate the fire warning light, shut down digital engine controls, or make other surreptitious inputs like penetrating the flight control system and forcing an uncommanded break turn. At the least, this will destroy formation integrity and make the enemy predictable. It will also surprise his socks off the first time it happens. Some of these 'less than lethal' weapons produce undesirable byproduct effects, however, like causing permanent blindness. This raises a question whether they will ever be compatible with Western scruples.

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[21] Detecting reflected radar altimeter emissions over water is easy. It is more difficult over jungle. See David A. Fulghum, 'AMRAAM Sensor Mods Pace Missile Defense', *Aviation Week & Space Technology*, 29 April 1996, p 59.

[22] Fulghum, 'ACC Weighs Plans for New Technology', p 39.

[23] David Hughes, '609th Squadron Pursues New Realm of Combat', *Aviation Week & Space Technology*, 29 April 1996, p 52.

Finally, improved anti-satellite technologies are looming on the horizon. Most countries will not be players in this game because of the high cost of developing and deploying anti-satellite systems. According to the SAB report, the most promising and feasible avenue for those who can will entail ground-based directed energy weapons aimed by space-based mirrors.

SENSORS AND OTHER SITUATION AWARENESS ENHANCEMENTS

'Situation awareness' is a term much in vogue these days. It is anything but new, however. Fighter pilots have used it for decades in describing the crucial difference between winning and losing in aerial combat. As the AMRAAM operational utility evaluation (OUE) resoundingly showed more than a decade ago, it determines engagement outcomes over all other factors combined, including total flight time, time in type, and previous combat experience. On a larger scale, it determined the outcome of the 1991 Persian Gulf war. And it lies at the heart of what we mean when we speak of 'information warfare' and the associated 'revolution in military affairs'. Its promise is information integration aimed at achieving global awareness and reduced cycle time to permit the prompt and effective execution of operational plans.

As the SAB report defines it, 'global awareness' is the ability to acquire appropriate information about one or more areas or points of interest after a short enough delay to underwrite operational needs at an affordable price. Current global awareness systems and those near at hand begin with high-resolution mapping and weather sensors. Space-based and ground-deployed systems will, in combination, allow worldwide weather monitoring in real time. Ground weather sensors can be delivered by small UAVs aboard larger UAVs.

In addition, each aircraft and mission planning system will include a map of the world to one metre accuracy. Once created, that database will require only periodic updates to accommodate new information. This 'onboard world,' as the SAB report calls it, will be the ultimate in moving map navigation and internal, undetectable terrain avoidance. It can be tied to worldwide airport information and will offer an onboard navigation database to fly anywhere in the world without the need for external data. This means a looming end to TACAN and charts in the cockpit.

There are also upgrades in train for AWACS and Joint STARS, which operate in the region where friendly and enemy airspace come together. The E-3 will gain a doubled radar range against fighter-sized targets and an improved ability to detect and track cruise missile-sized targets. Technology promises high-speed processors exceeding today's capability by a factor of 10,000 for AWACS and 1000 for Joint STARS. Ultimately, such improvements will allow continuous monitoring of the entire world at a high enough resolution to permit targeting.

Some capability now provided by AWACS and Joint STARS can eventually be moved to space, although continuous global coverage will require a large constellation of satellites whose cost could be prohibitive. Moreover, aircraft, possibly large URAVs in the future, will still be needed for finer-grained monitoring of an objective area. The use of AWACS as a filter for intelligence and reconnaissance data will probably decline, since these functions are increasingly moving over to ground facilities.

Synthetic aperture radar will be incorporated in a multiplicity of sensors aboard distributed satellite constellations, URAVs, munitions, and ground stations. Eventually, satellites will be able to locate an emitter with enough accuracy to permit the delivery of GPS-guided weapons even if emissions cease. Such space-based high-resolution

sensors will require antennas with diameters of a mile or more. These will have to be protected somehow. Such a sensor network will also need a system for fusing and correlating data rapidly and automatically from diverse sources to enable building a complete picture of the operational area. And it will require seamless operation across internal and, as necessary, other service and allied organisational lines.

Global awareness will include not only threat-related information, but information as well on one's own and allied forces, such as individual aircraft maintenance status, location, availability, mission status, crew availability, munitions and other stores location and availability, and so on. At the same time, it may include comparable information from an enemy's databases if these can be covertly penetrated. This suggests that preserving an enemy's C^4I net can often be more useful operationally than destroying it, since we can take advantage of surreptitiously knowing what the enemy knows about his own assets. It also suggests, however, that we will have to protect our *own* equities along these lines against similar penetration efforts by an enemy. In both cases, a major collection challenge today entails identifying all relevant databases worldwide, developing a way to access, analyse, and correlate them, and building the needed internetting and distribution architecture.

Information Processing and Communications

We already have systems that provide capability-enhancing digital links to fighters. The Joint Tactical Information Distribution System, or JTIDS, now offers an F-15 flight leader a God's eye view of his tactical situation. This has greatly driven up kill ratios in peacetime air combat training. It permits real-time data exchange between aircraft and, accordingly, new tactics. It shows the position of all aircraft in a formation or strike package, as well as the location of enemy aircraft and ground forces. Fighters can receive this information passively, without highlighting themselves through radio frequency emissions. In addition to JTIDS is the smaller Multifunction Information Distribution System (MIDS) going into Navy and allied fighters. This system will have terminals aboard Joint STARS, E-2, and AWACS. All of this portends a substantially reduced cockpit workload.[24]

In addition to more kills, JTIDS will mean greater survivability and less chance of fratricide in beyond visual-range (BVR) fights. It allows an exchange of digital information on relative positions, IFF, weapons availability, and fuel states, among other things, thereby reducing to a minimum the need for intraflight voice communications. Because of the clear situation awareness picture it offers, it will permit the use of daytime tactics at night, such as a wall of fighters spread out line-abreast over several miles on an offensive sweep. It indicates when other friendly fighters are being illuminated by threat radars. Its 'buddy lock' feature designates other fighters that have radar locks on hostile aircraft to prevent multiple conversions on the same target. This allows for quicker and better sorting. What it still needs, according to its users, includes secure offboard data reception from sensors, integration with GPS, real-time intelligence fed directly into the cockpit (including surveillance pictures from space), and fused sensor data displays in the cockpit.

Other systems offering real-time joint connectivity include advanced data fusion software, interlinked but physically dispersed databases, and high-speed, large-capacity communications nets, all of which will enable the prompt and precise application of

[24] See William B. Scott, 'JTIDS Provides F-15Cs God's Eye View', *Aviation Week & Space Technology*, 29 April 1996, p 63.

force. As retired USAF General Charles Horner has indicated, such techniques will allow faster processing and delivery of critical data directly to the people with their fingers on the trigger.[25] Some of this capability also can eventually be moved to satellites. However, a URAV at 60,000 ft can transmit line of sight to a fighter at 20,000 ft from over four hundred nautical miles away, possibly offering a cheaper solution in the near term. Once operational, such an awareness net should help greatly to ease the problem of real-time intelligence fusion. Captain Scott O'Grady's F-16 went down over Bosnia in June 1995 in part because although threat information was available and in the theatre, the right hand knew not what the left was doing. The crucial facts were not passed to where they mattered most when they could have made a difference.

IMPLICATIONS FOR THE WARFIGHTER

What do these and related trends promise for changing the image of future war? The first and most crucially important payoff area entails maximising our own situation awareness while denying it to the enemy. If pursued to fruition, the new systems and capabilities outlined above will provide users at all levels with complete and current knowledge of an operational situation. This is key. It is 'information dominance' by another name.

There is nothing new about this in and of itself. As early as the mid-17th century, the English philosopher Thomas Hobbes was on to it in his comment that in the land of the blind, the one-eyed man is king. 'Information warfare' has been with us since the days of sticks and stones. It is just that now we are at the threshold of understanding its importance and mastering it.

Gaining what Admiral Owens has called 'dominant battlespace knowledge' is more important than any other single development vector in air warfare, because it is the sine qua non for extracting the fullest value from the new imposition options that are becoming available. Admiral Owens has spoken of a 'system of systems' which will provide awareness of all pertinent activity inside a 200-by-200 mile box, irrespective of whether the operating arena is a desert, an urban setting, or triple-canopy jungle.

The situation awareness and force employment advantages accruing from this synergistic fusion of ISR, C^4I, and precision attack capability will strengthen the hands of warfighters up and down the chain of command, from the CINC and JFACC through the operational level to individual shooters working within tactical confines. At the same time, information warfare technology can help confound enemy awareness and capacity for collective action from the national leadership level all the way down to the individual combatant. Digitisation, high-speed computer processing, precise worldwide positioning information, and the integration of complex systems are the essence of the progress being made in this realm. This is a capability we can share with allies and coalition partners.

A second big payoff area is the synergism that will come from greater efficiencies though seamless joint operations aimed at ensuring that the right assets are used in the right place at the right time. Technology is finally forcing a long-overdue movement toward true combined-arms and multinational operations. Global awareness neatly typifies the jointness demanded by the information revolution. Most of what applies to air forces in this respect will apply equally to land and naval forces.

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[25] Fulghum, 'ACC Weighs Plans for New Technology', p 39.

This does not mean that differing individual services or force elements will no longer perform as soloists in a combined-arms orchestra, to use John Warden's apt metaphor, with the soloist of the moment varying with the tactical and operational situation.[26] However, traditional service lines are more and more being forced to break down under the pressure of the continuing integration of systems and capabilities. In future wars in which air activity will be a precursor to any land operation, and naval weapons can engage a wider range of land targets, the overarching interests of mission effectiveness will require a breakdown of narrow and retrograde parochialism and greater professional cross-communication as a matter of routine peacetime business. This does not mean role sharing, but simply knowing better what the other combatant communities do in the interest of greater force-wide efficiency.[27]

We now live in a world in which joint force employment has become the rule rather than the exception as a result of capabilities now in hand for comprehensive systems integration. For example, we are approaching a near-term future in which 'an Air Force sensor operator and coordinator might be directing a Navy platform to release an Army weapon in direct support of Marines'.[28] A big challenge for policy will involve making the right choices and avoiding needless redundancies just so each service can claim a piece of the action.

A third payoff area is the broadening of air power's ability to do things it could not do before. For one thing, better information availability and directability means reduced cycle time, a force multiplier in itself which creates a larger apparent force from smaller numbers by permitting a higher operations tempo. The next generation of combat aircraft will also embody significant improvements in reliability, maintainability, and sustainability, making possible even greater leverage from fewer numbers of fighters. Technology enhancements like these allow both greater concentration of force and a reduction in the amount of time it takes to perform an operational task. Six F-117s can enter an objective area unobserved and put a dozen bombs on target accurately within two and a half minutes if everything works.[29] As Desert Storm showed, that is an attention-getting capability. The F-22 and JSF will broaden it considerably.

Other new options for air power include maintaining air supremacy over hostile territory and enforcing no-fly and no-drive zones. On the first count, allied control of the air over Iraq after the first week of Desert Storm was so secure that inflight refueling operations inside enemy airspace were possible. As for the second count, even if we had had the ability ten years ago to look deep with platforms like AWACS and Joint STARS, we could have done little with the resultant information because we lacked the needed reach, standoff capability, and precision.

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[26] See Colonel John A. Warden, USAF (Ret.), *The Air Campaign: Planning for Combat*, National Defense University Press, Washington DC 1988, pp 146-147.

[27] For example, it is a little known fact that every Marine pilot has first been through a six-month basic infantry school course - not to learn to do the infantryman's job, but to understand fully the problems of the man on the ground he is supporting so he can do his own job better. There is a case as well for professional cross-communication between fighter pilots and submariners because of the many tactical similarities between air-to-air and sub-on-sub engagements. For a development of the latter point, see Benjamin S. Lambeth, 'Air to Air, Meet Submarine Warfare', unpublished manuscript, June 1996.

[28] Captain James H. Patton Jr., USN (Ret.), 'The New 'RMA: It's Only Begun', *Naval War College Review*, Spring 1996, pp 23-32.

[29] See William B. Scott, 'F-117's Precision Adds Lethality to Strike Packages', *Aviation Week & Space Technology*, 29 April 1996, p 43.

Air power can now make effective use of the middle and upper air to avoid enemy infrared SAMs and AAA. Ironically, just as it has reached near-perfection as an operational tool, the low-altitude capability afforded by LANTIRN may have been overtaken for most combat scenarios by the new attack options provided by long-range standoff capability and precision guidance, which now enable combat aircraft to work effectively from the safer medium-altitude environment. This new operating window also permits easier target acquisition. With the reduced risk of attrition it affords, numbers of aircraft needed in attack packages can be commensurately smaller.

The F-117's stealthiness was a key factor in enabling the coalition to achieve air superiority early in Desert Storm. Stealth in the F-22 and Joint Strike Fighter will further change the existing rules of aerial combat. It is already forcing a complete change in tactics, both in air-to-air and in surface attack, for the possessor as well as for the side that lacks it. It will allow air power to operate virtually at will. Bistatic radar will cue the stealthy F-22 without revealing its location by putting the active transmitter on an offboard platform like AWACs and a passive receiver on the fighter. Closely related in importance are the emerging advantages in reach in air-to-air combat (more commonly called first shot with impunity) and survivability to kill heavily defended ground targets which low observability offers.

A fourth major operational payoff area is situation control from the outset of fighting - and even before. This was once called gaining and maintaining the initiative. The significance of this breakthrough is that the first blow can now decide the subsequent course and outcome of a war. Before long, the initial attack may even be surreptitious - for example, into computer systems, to pave the way for fire and steel to follow. As Desert Storm showed, the ability of independently-applied air power to own the air and shape the battlefield eliminated any urgent need to commit ground forces. The only factor driving a demand to wrap things up quickly was the certainty of approaching summer heat, which would have made operations by all forces difficult, if not impossible.

These payoffs allow their possessor to keep an enemy at arm's length indefinitely by providing the wherewithal to conduct deep battle as a rule rather than the exception. (Such combat entails operations to destroy, degrade, or neutralise an enemy's forces before they are brought to bear against friendly forces.) Among other things, this foreshadows an end to any need for armies to prepare and plan for close-manoeuvre ground combat, and thus an end to any need for air forces to plan and train for close air support other than as an emergency mission of last resort. Better yet, as retired RAF Air Vice-Marshal Tony Mason has pointed out, direct strategic attack may in the future 'remove the need for friendly surface forces altogether. Elsewhere it may reduce their required numbers and risks considerably'.[30] The near-free ride that allied ground forces got in Operation Desert Storm thanks to the contributions of air power in destroying the fighting capacity of Iraq's army offered a telling prototype of this new prospect.

All of this means a reduced incidence of casualties for friend and foe alike. Indeed, possibly the single greatest impact of the technology revolution on air power and its effectiveness relative to other force components is its capacity to save lives - enemy lives through the use of precision attack to minimise noncombatant fatalities, and friendly lives by the substitution of technology for manpower and the creation of

[30] Air Vice-Marshal R.A. Mason, RAF (Ret.), 'The Future of Air Power', address to the Royal Netherlands Air Force, Netherlands Defense College, 19 April 1996, p 4.

battlefield conditions in which land elements, once unleashed, can do their jobs without significant resistance because of the degraded capabilities of enemy forces.[31] This effect can keep casualties low enough to preserve popular support for the use of force.

Viewed differently, modern technology offers today's and tomorrow's air forces a means of gaining their operational goals through cleverness rather than brute force, in a manner reminiscent of top-scoring Luftwaffe ace Eric Hartmann's injunction that the good fighter pilot flies with his head and not his muscles. Remarkably, there were no Serbian complaints about noncombatant fatalities or other collateral damage when Nato finally stopped dithering and used air power with determination and a clear goal last September in Bosnia. One can make a strong case that the use of precision air power in Operation Deliberate Force was the swing factor in producing the subsequent Dayton accords that finally stopped the fighting.

Increased weapons effectiveness means that we may no longer need to obliterate a target or target system, but merely to render it ineffective by destroying its ability to function. As Williamson Murray has noted in this regard, 'military forces reflect their creators. The death of such an organisation occurs in a biological fashion. For example, in a heart attack, death occurs not at some precisely calculable point when thirty or forty or fifty per cent of the heart muscles, heart nerves, or heart valves lose their ability to function, but rather at some inexplicable threshold when the degrading synergies between the damage to different interrelated systems cause the general and complete collapse of the whole'.[32]

Finally, the promise of new technology offers a windfall byproduct in enhanced deterrence. Enemies will be loath to challenge such demonstrated capability if the performance asymmetries are well and widely known. In this sense, Desert Storm provided clear handwriting on the wall for other potential mischief-makers who would risk a similar fate to that visited on Iraq.

The downside, of course, is that such technology application can also spur a race by have-nots to develop countermeasures. Indian Brigadier V.K. Nair set the tone in this respect by describing what determined Third World countries might do 'on the cheap' to negate the superior technology shown by the coalition in Desert Storm. Options could include dedicated attacks on high-value soft targets such as Joint STARS, AWACS, and tanker aircraft.[33] Attacks on airlifters moving materiel into a theatre and special operations against rear area terminals and other bases offer additional options. And, of course, there is the ever-present possibility of desperate resort to a counterdeterrent based on nuclear and other weapons of mass destruction. In sum, as capable as they may be, the new technologies outlined above promise their

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[31] This holds notwithstanding a just-released US General Accounting Office critique of the effectiveness of individual precision weapons employed during Operation Desert Storm. That report scores some valid points at the margins, but it in no way refutes the overall impact of stealth and precision bombing in achieving air supremacy, destroying Iraq's armoured forces and capacity for collective action, and minimising friendly losses. See Tim Weiner, "Smart' Weapons Were Overrated, Study Concludes', *New York Times*, 9 July 1996.

[32] Williamson Murray, *Air War in the Persian Gulf*, The Nautical and Aviation Publishing Company of America, Baltimore, 1995, p 322.

[33] V.K. Nair, *War in the Gulf: Lessons for the Third World*, Lancer International, New Delhi, 1991, pp 225-228. Following a seminar at the Zhukovsky Air Force Academy in Moscow in 1992, a Russian Air Force general assured me that had he been running the Iraqi Air Force, allied AWACS, Joint STARS, tankers, and airlift aircraft would have been at serious risk - to high-speed ramming attacks, if necessary, to achieve the desired operational and political effect.

possessor no 'end of history' with respect to the enduring dialectic between offence and defence.

UNDERSTANDING THE MILITARY REVOLUTION

Whether the West is on the brink of a 'revolution in military affairs' is being widely debated today, as affirmed by the proliferation of scheduled conferences on the subject from Australia to Israel just this year. The question was posed initially in almost forgotten Soviet military doctrinal writings during the mid-1960s with respect to the impact of nuclear weapons and ICBMs. A decade and a half later, the chief of the Soviet General Staff, Marshal Nikolai Ogarkov, surfaced it anew in connection with what he saw as the looming promise of high-accuracy conventional weapons. Since then, the idea has been given currency in Western defence deliberations mainly through the relentless effort of Andrew Marshall and his Office of Net Assessment in the Pentagon.

Before engaging the question, it makes sense first to revisit the classic Soviet writings that prompted it in the first place and recall what they had to say. The notion of a 'military-technological revolution,' alternatively called 'revolution in military affairs' in Soviet discourse, was put forward initially not long after the publication of Marshal V.D. Sokolovskii's landmark *Military Strategy*. Declared by one writer in 1965 to be 'an accomplished fact,' this revolution was said to have taken place in three stages. The first was marked by the advent of nuclear weapons. The second centred on ballistic missile delivery systems of intercontinental striking power. The third comprised a 'cybernetic' breakthrough in command and control, lending a useable operational capacity to these revolutionary new weapons.[34]

The essence of the revolution, according to its Soviet forebears, lay in the capacity of what were then called 'new in principle' weapons to 'radically change the nature of modern war'. That changed nature, according to Soviet Air Force Lieutenant General N.A. Sbitov, boiled down to the ability of modern weapons 'to achieve strategic military and military-political goals at the very beginning of a war,' without obliging combatants to go through the classic sequence of methodical plodding from tactical through operational to strategic goals at an exorbitant cost in lives, forces, and national treasure. Sbitov stressed that such a revolution required three preconditions: (1) A high level of economic and technology development capable of producing and sustaining the changes; (2) a political leadership smart enough to understand the implications of the new capability and take appropriate action to convert it to reality; and (3) military leadership astute enough to apprehend the operational implications and master the technology quickly, with a view toward achieving practical results.

Although couched in what now comes across as antediluvian phraseology when read in its entirety, this early Soviet characterisation of the impact of nuclear weapons and ballistic missile delivery systems comes remarkably close to capturing the essence of the concept of 'revolution in military affairs' as it is articulated by its leading Western proponents today. Andrew Marshall defines it as 'a major change in the nature of warfare brought about by the innovative application of new technologies which,

[34] This line of thought was first encapsulated in Soviet military discourse in a symposium volume edited by Colonel P.M. Derevyanko, *Problems of the Revolution in Military Affairs*, Voenizdat, Moscow, 1965. For a translation of some of its key entries, see William R. Kintner and Harriet Fast Scott, (eds.), *The Nuclear Revolution in Soviet Military Affairs*, University of Oklahoma Press, Norman, 1968.

combined with dramatic changes in military doctrine and operational and organisational concepts, fundamentally alter the character and conduct of military operations'.[35]

Marshall's careful inclusion of soft factors in this formulation is crucial to a correct understanding of the impact and promise of new military technologies. A 'revolution in military affairs' cannot be spawned merely by platforms, munitions, information systems, and other hardware equities. These necessary but insufficient preconditions must be backstopped by an important set of intangibles that have determined war results since the days of Alexander the Great: Clarity of goals backed by proficiency and boldness in execution. All the magic employed in Operation Desert Storm put together would still have yielded thousands of body bags coming home in the absence of the latter. In the so-called 'RMA debate,' too much attention has been devoted to the magic at the expense of the organisational, conceptual, and other human inputs needed to convert the magic from hardware into combat outcomes.

James Patton has described the military-technological revolution as 'the ability to see, appraise, and respond quickly by striking ... as needed with precision over great distances, while using optimum but overwhelming and survivable force'.[36] I would put it at least one level of aggregation higher: *It is to achieve strategic consequences through force employment from the very outset of fighting.* That is the payoff that Soviet theoreticians like General Sbitov had in mind more than three decades ago. Patton describes a crucial factor in the equation, but it is only the means, not the essence. A revolution implies a nonlinear or step-function change in the way wars are fought and won. As the Soviets dimly foresaw in their early nuclear doctrinal ruminations, it involves achieving strategic goals *ab initio* through simultaneity rather than sequential force application. We can now do this, and with a minimum of friendly losses.

Air power has been pivotal to the revolution in military affairs. Ever since World War II, it has provided US land forces the freedom to operate essentially unmolested from above. Today, through a combination of technology developments, some unique to air power and others applying to military forces across the board, it has become the swing factor in determining combat outcomes as well - but not without help. As Andrew Marshall has noted, air superiority alone will not guarantee happy results in future wars. The winning side will also need 'information superiority' - another way of saying situation awareness dominance - by taking out or fooling an enemy's sensors and computers while making the most of one's own.[37]

This is very different from what Giulio Douhet and the later air power classicists envisaged. True, air power now has the ability, in what is often too loosely called 'strategic' application, to cause near-instant destruction of an adversary's war-making capability by striking directly at his center of gravity. However, the critical objectives of such application are not the familiar ones of leadership, infrastructure, economic potential, and so on invoked by strategic bombardment proponents, but rather key nodes and assets that make up the enemy's capacity for collective action - a supremely *military* objective. The 'strategic' portion of the Gulf air campaign that eventually produced such a stunningly successful military outcome had little in common with what

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[35] Quoted in Colonel Richard Szafranski, USAF, 'Peer Competitors, the RMA, and New Concepts: Some Questions', *Naval War College Review*, Spring 1996, p 118.

[36] Patton, 'The New 'RMA': It's Only Begun'.

[37] Art Pine, 'Military Nears Revolution in Weapons, War Strategy', *Los Angeles Times*, 20 March 1996.

Douhet and his latter-day disciples had in mind with respect to the 'strategic' use of air power.

If a revolution in military affairs is indeed at hand as a result of new technology possibilities, the question of greatest moment is how to nurture it from promise to reality. The most recent edition of *Strategic Survey* posits two schools on this issue in the United States, which it broadly calls the 'platform traditionalists' and 'information modernists'.[38] This entails a bit of a false dichotomy, however, since those in the former school are no less committed to modernisation than those in the latter. The main difference is that members of the second school have little institutional stake in current programs. Those in the first, by contrast, have abundant programmatic interests. Their alleged 'traditionalist' heel-dragging has had more to do with a natural bureaucratic desire to protect ongoing programs in which they have vested equities than with any refusal in principle to recognise and accept the implications of the information technology revolution.

Another difference in outlook that divides these two schools concerns whether the United States and its allies can safely afford to take advantage of the Cold War's end and the disappearance of a peer competitor to skip a generation of expensive platform development and deployment in the interest of getting on with the information revolution. The imponderable here, of course, is how much time we would need - and have - to gear up for the next round of global military competition when it occurs. It now takes a generation or more to get a new military posture into place from concept definition to enough operational capability to make an impact. How much are we willing to gamble that a peer competitor will not emerge before then? Adversaries need not necessarily match the West in capability. They can threaten to deny the West the utility of much of its capability, since so much of what will suffice to do so is readily available in the commercial sector.

Rather than waste further intellectual energy in academic discourse over whether or not a 'revolution in military affairs' is upon us, there may be merit in simply acknowledging the final appearance of what used to be called, in a different context, strategic superiority. The Soviet progenitors of such thinking were prescient in addressing the revolution in military affairs. Yet they had little clue as to what they were really foreseeing. Their best attempt to capture its meaning was the notion of 'military-strategic superiority,' which they offered as the key to victory in high intensity nuclear war. This concept was articulated most forcefully in 1966 by a Lieutenant Colonel V. Bondarenko as a means of end-running an adversary by relying on the creation of a new weapon, 'secretly nurtured in scientific offices and design collectives,' which would 'abruptly change the correlation of forces ... and deprive the adversary for a long time of any possibility of applying effective countermeasures against the new system'.[39]

Bondarenko argued that a precondition for gaining superiority was rising above what he called the 'excessive practicalness' of focusing R&D mainly on the

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[38] *Strategic Survey 1995/96*, International Institute for Strategic Studies, London, 1996, pp 32-34.

[39] Lieutenant Colonel V. Bondarenko, 'Military-Technological Superiority: The Most Important Factor in the Reliable Defense of the Country', *Kommunist vooruzhenykh sil*, No. 17, September 1966, pp 7-14. A full treatment of this article is provided in Benjamin S. Lambeth, *The Argument for Superiority: A New Voice in the Soviet Strategic Debate*, Institute for Defense Analyses, N-419R, Washington DC, January 1967. See also my 'The Evolution of Soviet Party-Military Relations Since Khrushchev', in Alexander Shtromas and Morton A. Kaplan, eds, *The Soviet Union and the Challenge of the Future*, Volume 2, New York, Paragon House, 1989, pp. 523-525.

improvement of existing weapons. He saw this 'narrow approach' as a major impediment to developing and fielding 'basically new types of equipment'. To underscore his point, he invoked the authority of a prominent Soviet aircraft designer, S.A. Lavochkin, who, he maintained, 'correctly asserted that while it is necessary to improve existing designs, it is also important to deviate more boldly ... [and] combine development of old types of equipment with a truly revolutionary break from former view and notions'.

Granted, these Soviet writers were thinking of superiority exclusively in nuclear terms. In so doing, they were addressing an asset that was practically unusable unless one was willing to risk the downside consequences which 'winning' a nuclear war would almost surely have entailed, even in the best of starting conditions. In the West, the concept was rejected by all but the most diehard nuclear Cold War warriors because of its threat of fuelling an arms race at a time when the sole perceived purpose of strategic forces was deterrence and stability through arms control, not the achievement of military victory. Henry Kissinger summed up such thinking in a nutshell when he once asked, all but rolling his eyes in exasperation: 'What in the name of God is strategic superiority? What is the significance of it, politically, militarily, operationally, at these levels of numbers? What do you do with it?'[40]

Yet at bottom, a case can be made that the United States has achieved 'strategic superiority,' to all intents and purposes, without its even having made the pursuit of it a conscious policy goal. The fact that we have not expressly recognised this tacit accomplishment offers a telling reflection of our long and deeply habituated association of the word 'strategic' with 'nuclear'. Language has powerful compulsions in driving the way we think about things.

Nevertheless, the concept of strategic superiority in the conventional arena was soundly vindicated in Desert Storm, thanks to the combination made possible by technological surprise and a step-function increase in air power's operational leverage. This was all foreshadowed in the Soviet doctrinal literature of the mid-1960s. The Soviets even anticipated 'black' programs of the sort that gave birth to the crucially important F-117. Only it was stealth, precision attack, and a complete asymmetry in situation awareness, not nuclear force majeure, that swung the outcome of the Gulf war. All the same, just as the Soviets foresaw in a different context, allied superiority enabled strategic goals to be obtained from the outset of fighting. One can forget the quibbling countercharge that Operation Desert Storm was 'one of the most one-sided campaigns in military history'.[41] That is precisely the point. It should be a fundamental goal of Western security policy to preserve that one-sidedness through aerospace and information warfare superiority.

In the face of all this, my RAND colleague Carl Builder has pointedly asked whether in our quest for a 'revolution in military affairs,' we are not in fact barking up the wrong tree.[42] Builder charges that analysts are seeking a new paradigm 'that could leverage or counter our notions of how to fight the big wars of the past' at a time when there is no peer competitor to warrant such a pursuit. He characterises this search as analogous to that of a drunk looking for his keys under the lamppost because that is where the light is best. That is, it has us looking for a revolution in the kind of

[40] Henry A. Kissinger, *Years of Upheaval*, Little Brown, Boston, 1982, p 1175.
[41] Thomas A. Keaney and Eliot A. Cohen, *Revolution in Warfare? Air Power in the Persian Gulf War*, Naval Institute Press, Annapolis, 1995, p 211.
[42] Carl H. Builder, 'In All the Wrong Places?', *Armed Forces Journal International*, May 1995.

wars we would *like* to prepare for, rather than in the messier conflicts of more recent years which we would just as soon forget.

Builder rightly notes that ethnicity, theology, and special interests have increasingly displaced geography, nations, and political ideology as defining factors in the emerging conflict system. He further points out that the use of military equities designed for large-scale wars has been on the decline since Desert Storm, while force employment in operations short of war is increasing. He concludes from this that future conflicts will 'call for "eyes in the sky" more than a battle for air superiority, for constabulary duties more than a massive armoured assault, for the evacuation of noncombatants more than control of the seas'. He adds that an 'RMA' is staring us in the face, but that we are averting our eyes because we do not like what we see - namely, a newly-emerging conflict system that threatens to force 'the half-century dominance of fighter wings, carrier battle groups, and armoured divisions [to] give way to the "support" systems like AWACS, helicopter carriers, and military police'. He cites Vietnam and Afghanistan as 'wake-up calls' for this new reality, and Bosnia and Somalia as further evidence yet of an 'RMA' that we wrongly continue to treat, with vain hope, as a passing anomaly.

Builder has hit the nail on the head in insisting that the new pattern of global conflict that has taken shape in the post-Cold War world has drawn combat support forces out from under the shadow of the combat forces and into a deserved light of their own. I would argue, however, that this has occurred, in the main, for a very different reason: Not that combat support forces now *displace* combat forces in importance, but rather that they now have the ability to play a central role in their own right in helping to determine the course and outcome of wars. Among other things, they allow us to enforce no-fly and no-drive zones through their ability to look deep and detect any violators, to maintain comprehensive command and control, and to blind enemies from a distance through jamming and other electronic support measures. The size of our forces can diminish as their diversity and leverage grow as a result of such support systems. True enough, transport, intelligence, surveillance, communications, military police, civil engineering functions, and psychological operations are on the rise and have new applications today. The question, however, is whether, as Builder charges, 'the next RMA probably arrived as the Soviet Union imploded, but we didn't like its face or its implications'.

In fact, Builder is not really talking about a 'revolution in military affairs' at all, insofar as this has to do with what technology and people can do in creative combination to change the ways wars are fought. Rather, he is talking about a change, possibly a transitory change, in the nature of the post-Soviet international conflict system and the additional kinds of response requirements it has come to levy on the United States and its allies. He is right to point out that we have new challenges that need facing up to. He is on shakier ground in depicting as 'the new reality' what may be only a lesser included case in a post-Cold War conflict system that continues to evolve - and that has not yet, even as Builder concedes, put the era of big wars behind us for good. There is no question that microwars are becoming more and more the norm. And insofar as what can lick the cat cannot always lick the kitten, this implies a growing importance of mission support needs we once paid comparatively little attention to. Builder offers good counsel in reminding us that we need to work constantly to ensure that air power remains relevant to the new world. The danger lies in so concentrating our attention on the most plausible wars that we could end up shortchanging ourselves with respect to the one we could lose.

POLICY CHALLENGES AND PITFALLS

In a sense, the West today is once again where it was at the end of World War II, facing a world of undefined and uncertain new challenges. The big difference is that we no longer have the freedom of choice we had then. In 1950, with the onset of the Korean war, the American defence budget quadrupled in one year.[43] We will not be able to replicate that experience in the future. This puts a large premium on methodical planning and getting big choices right the first time.

In light of this, there is a good case to be made that air force leaders in the post-Cold War era should worry more about force modernisation than about force structure. Pursuing the latter suggests a primary motivation by organisational and bureaucratic rather than operational interests. Carried to an extreme, it can mean losing sight of the mission. Of course, one needs adequate numbers to get the job done. The danger lies in getting so focused on defending programmatic details that entire programs become jeopardised as a result of misdirected attention. To illustrate, one can make a powerful case that the USAF should draw an uncompromising line on the absolute need for going ahead with the F-22 to replace the F-15 and maintain American air combat dominance. Whether the USAF should draw a similar line on the need for four hundred and forty-two F-22s, however, is a question of a very different sort.

Clearly the F-22 is, in principle, the right way for the USAF to go in next-generation fighter development. The reason why has nothing to do with the legitimate observation of some critics of the program who scan the world's horizon and ask, not unfairly, what potential challenger threatens the highly capable air-to-air assets we currently maintain. These critics are entirely right in insisting that the combination of the F-15C with JTIDS, AIM-9M and AMRAAM missiles, AWACS, and the world's best-trained fighter pilots is head and shoulders above any would-be air-to-air competitor in the world today. However, the F-22 is not scheduled to come on line in enough numbers to make a difference until around 2010. By then, almost fifteen years from now, the F-15 will be a truly antiquated platform, and we will be living in a different threat environment whose outlines are only dimly discernible today. Not only that, the success of JSF will depend critically on the prior development of key airframe, engine, and avionics technologies now being pioneered for the F-22.

In the end, the USAF may or may not get its desired 442 F-22s because of the vagaries of bureaucratic and congressional politics. However, at a bare minimum, a more modest production run of at least several wings' worth, if that should be the program's ultimate fate, will commit the technology to procurement in useable numbers and ensure a fifth-generation successor to the F-15, albeit one more in the form of a 'silver bullet' force like that currently reflected in the F-117, F-15E, and B-2 inventories. The United States has never been in the business of simply seeking to maintain parity in air combat capability. It has always striven for uncontested air dominance. Should the F-22 be forced to go the way of the Navy's A-12 because of uncontrolled cost growth or any other reasons, the United States will have forfeited, probably for the rest of our lives, the lead in air superiority which we have aggressively sought to maintain throughout the history of fighter aviation.[44]

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[43] For details, see Samuel P. Huntington, *The Common Defense: Strategic Programs in National Politics*, Columbia University Press, New York, 1961, pp 33-64.

[44] For more on this, see Benjamin S. Lambeth, 'To Dominate the Skies: Why the United States Still Needs the F-22', *Armed Forces Journal International*, November 1995, pp 35-37.

The Joint Strike Fighter now being designed to replace the F-16, F-18, and Harrier makes for a more complicated question of choice. Its planned production run of over 2000 aircraft will definitely help the services maintain force structure. But it may do so by replacing three platforms that were of limited value in Desert Storm and that remain of limited force employment utility today, despite the dramatic increase in versatility offered by the Block 50 F-16 over previous models and the extended range-payload capability of the redesigned but very costly F-18E. The capability which needs preserving most in the surface-attack role is that now provided by the F-111, F-117, and F-15E. JSF promises to fill none of these crucial roles. The B-2 most definitely *can* fill them, but with only 21 aircraft now planned for production at a price of nearly $2 billion each in overall sunk cost, that will make for little more than a token, and decidedly inappropriate, stopgap capability. Apparently serious talk of using the B-2 in the defence suppression role as the ultimate Wild Weasel indicates the tightness of the corner into which the USAF has been pushed by the recent retirement of the aging and hard-to-maintain but still uniquely able F-4G.

In addition, the US Navy is looking for an aircraft to go beyond the F-18E and fill the vacuum created by the cancelled A-12. Among other things, it wants JSF to carry 2000-lb bombs internally to meet this requirement. The Air Force and Marines are not insisting on that capability. This could foreshadow a replay of the abortive F-111A/B scenario unless some of these conflicting requirements are reconciled. In the interim, simple fixes to existing aircraft can go a long way. For example, if we give the F-16 and F-18 a precision bomb capability, they can become effective ground-attack aircraft in the medium-altitude environment.

Whatever the case, a lesson we should have learned from Desert Storm is that we can no longer afford to produce single-mission combat aircraft. After the first two weeks of fighting, the F-15C had little to do but convert jet fuel into noise because control of the air had been firmly established. It had no flexibility to be swung to a ground-attack role. As such, it was essentially unusable by those who were still fighting the unfinished part of the air war.

That said, midstream changes in requirements and designs can be the death of programs because of the enormous cost increments they invariably entail. Considering that it now takes upward of twenty years for a capital weapon program to advance from initial concept to line service, it is imperative that operational needs be set right the first time. We no longer have the play room that we had in simpler times, when an entire century series of fighters could be developed and deployed within just a few years of one another during the mid-1950s. Changing the complexion of an air force today is more like making a major heading correction in an aircraft carrier.

Yet another policy challenge will be to ensure that air power retains the vitality and versatility to meet new challenges. In the aftermath of Desert Storm, some wags suggested that the right bumper sticker for air power should read: 'We do deserts. We don't do mountains or jungles'. Technology application needs to find a way to ensure that this assertion is proven wrong. Today, it comes all too disturbingly close to the mark. Although tellingly effective when finally used properly, air power application in Bosnia proved to be a greater challenge than it was in Iraq. And there will be more, not fewer, cases like Bosnia in the future. Finally, the problem of targeting Libya's reported new underground chemical weapons plant indicates that air power, as presently constituted, does not invariably offer the right answer.

Perhaps the mother of all 'revolutions in military affairs' lies on the affordability front. If we cannot control exponential cost growth, we will price ourselves out of the

defence business altogether before long. In 1982, Norman Augenstine produced his famous chart predicting that if the rate of cost growth in capital weapons continues uninterrupted, by the year 2054 it will take the entire US defence budget to procure a single aircraft.[45] Today, fourteen years later, he is said to maintain that that prediction remains on track. This trend *must* be broken. Fortunately, we are now at a point with the demise of the Soviet threat where we can afford to take most programs out of the black world, where compartmentation needs have imposed often exorbitant cost increments that contribute nothing to system performance.

On the question of whether defence planning should be threat-based or something else, 'something else' makes great sense, because we can then choose what we want to do and configure our forces accordingly rather than waste time trying to second-guess future threats. So far, however, our tendency has been to rely on old habits and persuade ourselves that with the Soviet Union gone, we can get by simply by creating a surrogate threat and calling it a 'major regional contingency,' or something comparable that will justify X number of forces or Y units of equipment.

Abstractions like these offer poor guidance regarding our real-world challenges and needs. Worse yet is conjuring up a 'resurgent Russia' to fill the gap. This works at cross-purposes with our desire to try to forge a cooperative security relationship with Moscow. We need to plan and prepare against post-Soviet global contingencies that are real, not conjectural. When a military establishment is at a loss to state confidently what it is expected to do and against whom if called on to fight, this makes it all the more vulnerable to arbitrary budget cuts.

Of course, a problem with 'bad guy' lists before the fact, especially if they become generally known, is that they can create self-fulfilling prophecies. An adversary needs a name in order to be planned against intelligently. Yet there are many places in the Third World with deep suspicions and doubts about the West. We must be careful not to drive these countries into adversarial postures simply because of uncertain or poorly-informed perceptions on our part.[46]

It will be important for Western air forces to keep their eyes on the ball if the promise of new technology is to yield the greatest payoff for operators. A continuing dilemma for policymakers in this respect will be where to invest and what choices to make. The toughest tradeoff lies in supporting the commander who may have to fight tomorrow's war without mortgaging the future by shortchanging investment in 'new in principle' systems which, by definition, cannot be clearly foreseen.[47] Allowing R&D to pursue wild ideas that may have great promise without running amok and becoming the driver will be a supreme test of defence leadership.

On this point, RAF Air Commodore Andrew Vallance has noted that 'technology will have a key enabling role to play, but it will essentially be that and no more'. He rightly argues that the desired goal of letting technology provide greater force leverage with fewer people and hardware items will be attainable 'only if doctrine drives technological development rather than the reverse. The penalties to be paid for continuing to pursue technological opportunism are unacceptable and unaffordable. In the future, the choices will be far too wide and the resources far too few to allow the

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[45] See Norman R. Augustine, *Augustine's Laws*, Penguin Books, New York, 1986, p 143.

[46] I am indebted to my RAND colleague David Ochmanek for calling this important point to my attention.

[47] An instructive metaphor harks back to Benjamin Franklin's early attempt to discover electricity by flying a kite in a thunderstorm. When asked by an onlooker 'what use is electricity?' Franklin answered: 'What use is a baby?'

technologists a free rein; their efforts will need to be carefully focused if precious resources are to be well spent'.[48]

Air Commodore Vallance is right to insist that technology development must be disciplined. But this is a delicate and difficult balancing act which requires astute judgment. Analysis can illuminate alternatives, tradeoffs, and opportunity costs within limits. But ultimately, sound investment, development and procurement policies will be the result of good judgment calls. They will turn first and foremost on best guesses about the nature of the strategic environment and the key operational challenges that may confront decisionmakers once the planned weapons and systems have attained operational capability.

As for the good news, the absence of a peer competitor has taken the edge off the need to push the state of the art aggressively in an effort to leapfrog some opponent in a struggle for qualitative superiority. Russia today is down for the count, at least for the near term. China is beginning to show troublemaking propensities, but little sign of becoming a technological peer competitor any time soon. This means we now have more latitude to set requirements right the first time and then work systematically toward them in quest of economies of scale. There is less excuse now for major program failure than there was when we were in an intense technology competition with a determined peer adversary.

If Western defence professionals are to succeed in institutionalising and growing the revolution in military affairs that is now within their grasp, they will be helped greatly by remembering at all times General George S. Patton's caustic warning about how ignorant people can so easily persuade themselves that wars can be won by some wonderful weapon rather than by hard fighting and superior leadership. As a thoughtful Russian general put it to me in Moscow not long ago, technology without good brainpower behind it is little more than a lump of coal in the hands of a savage.

As a case in point, Desert Storm was hailed by many after the fact as an exemplary demonstration of the technology revolution. Yet there was nothing foreordained about its outcome. In lieu of pulling out all the stops by starting the war with a decisive air campaign, the Bush administration could have applied a Vietnam-type strategy of graduated escalation and quite likely generated 20,000 or more body bags homeward bound, plus a chance that we could *still* be trapped in a slow-motion, bleeding war of attrition on Saddam Hussein's terms. Conversely, the United States could have done with its second- and third-generation equipment over North Vietnam in 1965 what it did eight years later in Linebacker II and possibly saved 50,000 American lives in the process. Whether the latter would have been wise national strategy is another question. But the capability to do more than we did, and to telling effect, was definitely there all along.

Fostering the military-technological revolution will also require embracing squarely the need for a military culture change. It will demand more jointness, more noncombatant officers in positions of leadership, new approaches to capability assessment, and greater synergies with allies, among other things. In particular, a relentless and aggressive campaign must be waged to break down the walls that continue to separate operations and intelligence. The fullest exploitation of information warfare will demand that operations and intelligence work as players on the same team.

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[48] Air Commodore Andrew G. B. Vallance, RAF, *The Air Weapon: Doctrines of Air Power Strategy and Operational Art*, St Martin's Press, New York, 1996, p 185.

Relatedly, for all the complaints voiced in years past about excessive civilian meddling in military operations once the decision to use force has been made, the information revolution now bodes to create new opportunities for equally meddlesome *military* micromanagement of combat operations. Expanded situation awareness will make it far easier for top uniformed leaders to look over the shoulder of the JFACC directly into cockpits and thereby supervise force employment from as far as half a world away. It will take supreme professionalism, self-discipline, and trust in the system for military leaders to resist giving in to this pathology.

It may not be for some time yet that 'information warriors' will replace combat pilots and other operators in the top positions of military aerospace leadership, as Eliot Cohen has recently suggested. But it is beyond question that operators will have to become more fluent in the instruments of information warfare if they are to become truly effective in their use. It is also beyond question that our very conception of the term 'operator' will have to be rethought from the ground up in the face of the information revolution.

In this latter respect, Cohen rightly notes that emerging ISR technologies have occasioned a perceptible decline in the number of classic warfighters in senior leadership positions, along with a parallel rise of what he calls the space general and the electronic warfare wizard. He goes on to suggest that 'the cultural challenge for military organisations will be to maintain a warrior spirit and the intuitive understanding of war that goes with it, even when their leaders are not, in large part, warriors themselves'.[49] I would think it more correct to say that the challenge will be to maintain these mission-oriented virtues even when the traditional warrior ethos becomes obsolete. For the indefinite future, I believe, military leaders will continue to be generals and admirals with unambiguous credentials as force employment professionals, even if their later career development leads them into pursuits increasingly away from having a direct hand in the trigger-pulling business.

Finally, air forces will have to become more closely integrated within themselves, breaking down internal stovepipes and community barriers, as well as becoming better integrated functionally with land and naval forces if this is all to work. This will require not just paying lip service to jointness, but a true team spirit on a daily basis, with a minimum of interservice friction and petty jockeying for bureaucratic position. Bringing that to pass may entail a more imposing challenge than building and integrating the new technologies. It will require a daily mindset throughout the defence establishment that says we are all in the same boat and that if my end sinks, yours does too.

Any such evolution will require resisting the temptation to allow defence planning to devolve into an intramural cat fight, in which the real enemy is seen as down the hall in the Pentagon rather than across the ocean or in some remote jungle.[50] We saw this with a particular vengeance in the immediate wake of the Gulf War as each service scrambled to stake out and protect its perceived share of the credit. Unless there is decisive intervention from the top leadership in all services to halt such misdirected energy, it can lead to a needless waste of valuable effort and resources.

The operational promise of UAVs and their uninhabited combat aircraft successors offers one example of the growing need for a more open-minded view

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[49] Eliot A. Cohen, 'A Revolution in Warfare', *Foreign Affairs*, March/April 1996, p 49.

[50] I recall being in an Air Force intelligence vault years ago and seeing a poster on the wall that said: 'Know your enemy'. It was a picture of Admiral Hayward.

among airmen understandably wedded to the conviction that airplanes without pilots are like days without sunshine. As Air Vice-Marshal Mason has incisively pointed out, 'the expression "there ain't no careers in UAVs" may be apocryphal, but it is a recognisable sentiment. Air power is about the exploitation of the third dimension *by* man, not necessarily *with* man'.[51]

Another needed culture change has to do with the ongoing extension of air warfare into space. If one views space from an operational rather than an organisational perspective, one will naturally be driven to see it as simply an extension of the vertical dimension from blue to black, which we should exploit to the extent of our ability and resources in pursuit of abiding goals of air power that have been with us since the first days of military aviation. After all, just as air power was the cradle of space exploration, so exploiting space as a part of the vertical dimension will be crucial to the continued maturation of air power. There is great merit to the proposition that space is merely a place, not an independent mission or function of air power.

Those at the leading edge of military space exploitation have, to date, been much like modern-day equivalents of the early pioneers of the Air Corps Tactical School, who struggled hard to earn a place at the table for air power in the development of national military strategy and capability. Among the many tangible indicators of this, one could cite the emergence of 'space' as a career field, the issuance of space badges, efforts to formulate a military 'space' doctrine, calling Desert Storm the first 'space war,' and ultimately the formation of Space Command. These have been inevitable but, in all likelihood, transitional milestones in today's still-unfinished process of making the leap from air power to aerospace power. As such, they will become more and more vestigial over time as the seams between air and space ultimately dissolve.

Once that happens, airmen of the 21st century will be as comfortable with operations in and around space as they are today with the lower altitudes of the vertical dimension. Such a future will also see a gradual dissolution of the current organisational lines that separate 'space' from the more familiar world of air-breathing aviation, much as TAC and SAC disappeared as separate entities with the dawning realisation that distinctions between 'strategic' and 'tactical' have become artificial with the changed nature of aerospace warfare. The most telling confirmation of the latter was the spectacle of F-117s performing supremely strategic operations during the opening hours of Desert Storm and B-52s providing de facto direct fire support to friendly ground forces during the endgame of the Gulf War. There is every reason to expect a similar withering away of today's demarcations between 'air' and 'space,' both conceptual and organisational, as working in the medium of space toward the application of aerospace power becomes second nature to operators, whether or not they wear wings.

On balance, air power (or aerospace power), coupled with information power, has become the dominant force element in most circumstances of war. As the great enabler, it has every chance of becoming even more so if the possibilities now before it are properly cultivated. The promise of these possibilities, as Edward Luttwak has rightly pointed out, 'is not a stronger United States - it is strong enough - but rather a greater ability to use force remotely, yet accurately and with discrimination'.[52] That

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[51] Air Vice Marshal Tony Mason, RAF (Ret.), *Air Power: A Centennial Appraisal*, Brassey's, London, 1994, p 276.

[52] Edward N. Luttwak, 'A Post-Heroic Military Policy', *Foreign Affairs*, July/August 1996, p 43.

said, military professionals will continue to live in a combined-arms world for the indefinite future. Honest recognition and acceptance of this by USAF airmen, if not those of other colours of uniform and other countries, will be essential if they are to embrace that future in the nation's interest and not just that of their own service.

The challenges outlined above promise to place a threefold burden on airmen. The first will be to apprehend the future correctly and lay the groundwork for it with foresight, rather than to continue clinging to familiar and comforting but obsolescent thought and behaviour patterns of a simpler past.[53] The second will be to draw a line mercilessly between the essential and the merely nice to have in the presence of ever-declining resources. The third, and perhaps most difficult, will then be to stand firm on professional principle in the face of politicians and other budget cutters who would pursue their own agendas at possibly the expense of rational strategy. The first of these challenges will require a displacement of parochial instincts by unusual open-mindedness and vision. The second will call for unnatural bureaucratic and organisational self-discipline. The third, and most difficult, may at times demand uncommon professional courage. On all counts, having led the way and been the main beneficiaries of the technology revolution to date, airmen have it within their power and reach to set the example.

DISCUSSION

Air Vice-Marshal R.A. Mason: Thank you for that exposition of what I would call enhancement technology. Very comprehensive. I think there may be three other kinds of technology which we have got to give some recognition. One is defensive technology, which you mentioned fleetingly. Sooner or later somebody else is going to catch onto this stealth idea and put it on his fighters. We are already into cheap and nasty SAMs and significantly they are one particular piece of high technology kit which, as we have seen, can be handled very efficiently by the Mujihadeen. And unfortunately we do have aerospace companies all over the world, particularly in the ex-Soviet Union, who can see a very important Third World market for that. So we have got defensive technology. We have also got alternative technology: chemical, biological and, as you said, info-infection added to traditional things like concealment.

But it seems to me that perhaps the thing that is going to give us the greatest need to concentrate our thoughts on in the near future is the third kind of technology, which I would call competing technology. Again you touched on both aspects of this. One is in the capacity of missiles, whether they be surface-to-surface missiles or cruise missiles launched from other-than-airborne platforms; and the other is UAVs. How do you see the impact of competing technology?

Dr Lambeth: It's a very pointed question and I could approach it from several avenues. Maybe the first step toward the realisation of a proper grasp of the new technologies and some of the surprises that could be on the horizon for us would be to try and reinvent, in our own minds, something like what the US Air Force first pioneered back in the mid and late seventies, namely a project Checkmate that forces

[53] For a further development of this point, see Carl H. Builder, *The Icarus Syndrome: The Role of Air Power Theory in the Evolution and Fate of the US Air Force*, Transaction Publishers, New Brunswick, 1994.

us to think point, counter-point; measure, counter-measure. I make the point in my paper that, for all the technological magic that we see on the horizon, there is no assurance that there is any end of history with respect to the enduring dialectic between offence and defence.

One should also be a little careful in not taking too literally what I just outlined as a prediction of a happy future for those who possess such technology. I remember years ago the American comedian Bill Cosby had a routine where he wondered what it would be like if major military showdowns were decided the way football games are started; where you have Captain Jones of the British and Captain Smith of the Settlers. Captain Smith of the Settlers, meet Captain Jones of the British. Here comes the toss. Jones, you lose. What are you going to do, Smith? Well, Smith says, Air Vice-Marshal Mason and his men have got to wear red coats and march in a straight line. We get to wear camouflage and shoot from behind trees. There is some of that, I think, in between the lines of your question, when you allude to the power in the hands of have-nots around the world, who can see the same handwriting on the wall we do and who will not sit still for it. They can take counter-measures on the cheap, not necessarily reciprocal, but on the cheap that would negate much of the effectiveness of our high-tech forces.

I will leave you with a final example from when I was in Moscow in October of 1992 at an air power symposium at the Russian Air Force's Zhukovsky Academy. Afterwards a Russian general in a side conversation said to me that he could assure me that if he had commanded Iraqi forces in Desert Storm, there would have been JSTARS, AWACS and tankers taken out by mach three suicide attacks if necessary. This is not to say that the Coalition could not have adequately protected against that. But it raises the kind of question that we must never lose sight of: there is no free lunch.

Dr Alan Gropman: Ben, you talked about 'we can kill what we can see'. Sometimes what we see isn't real, which leads to the topic of situational awareness. The thing about situational awareness is that it works to our [US] strength. We are very good at software enhancements and so forth. AWACS is our invention, JSTARS is our invention. If we don't build the F-22 but we continue to improve our situational awareness, who is going to dominate the air?

Dr Lambeth: As I understand your question, it is really about whether or not we need to go ahead with a fifth generation fighter. Let me not refer here to the F-22, but just talk generically about a fifth generation fighter. The F-22 happens to be the airplane that we have in hand. If it were cancelled, and the requirement were regenerated three or four years down the road, my sense says that what we would come up with would look pretty much like an F-22.

I think it's important to maintain the stream of technology development. And it is important to stay at the leading edge. As I have written elsewhere in the past year, the United States has never been in the business of maintaining parity in the air-to-air business. We have always sought to be the biggest gorilla in the sky. The primary reason the Israeli Air Force bought the F-15 in the late 1980s was precisely to be the biggest gorilla in the sky. You don't want to settle for fighting fair in that arena. Who is the competitor on the horizon? The Soviet Union is gone, but there are fourth generation platforms available around the world that give the F-15 and the F-16 a run

for their money. There are Russian air-to-air missiles coming on line that give even a weak pilot in a MiG-29 cockpit a capability that commands respect.

The reason why I demurred in my formal remarks about whether we should strive for this or that specific number of aircraft was precisely because of my sense that we don't have the urgency that we did even five years ago. What I worry about is that if we stop altogether, we will lose the capability simply because the skilled engineering talent will walk away to do other things, and it will take a generation to rebuild it. I don't think we can afford to wait a generation to decide to get back into the game again. So whether four hundred and forty-two F-22s is the magic number, I don't know. But I do believe that if we're serious about maintaining what I've called air superiority dominance, or unchallenged control of the skies, it's time to get on with replacing the F-15. By the time the F-22 is scheduled to come on line in unit strength in 2004, our F-15 that is adequate enough today will be an old and outmatched airplane.

Professor Martin van Creveld: The most important single technology of our age, some people would say by far, is nuclear technology. And I noticed that you did not waste a single word on that. You did not even mention the concept. And I wonder why that is. Is it because the United States in the future intends to fight only opponents who do not have nuclear weapons, such as Iraq? Or is it because maybe the United States, in the future, expects to fight opponents even *though* they have nuclear weapons?

Dr Lambeth: You've raised a fundamental question for which another conference could be convened. I did mention the word 'nuclear' a couple of times with respect to the looming need to deal with non-rational states whose leaders might use such a capability for what we would regard as non-rational ends. I suggested that all of the theories of deterrence that we grew up with for twenty or thirty years may be totally irrelevant for these situations, and that we will have to deal with these new situations proactively. Let me try and address your question with two points. First, if I didn't say it, it was only because of oversight. I believe that the time has come, certainly for the United States at least, as the sole surviving superpower, to start thinking less in terms of non-proliferation and more in terms of counter-proliferation, on the premise that proliferation, sooner or later, will be an accomplished fact and a new reality in the international security scene that we have to deal with.

The second and more fundamental point about which another conference could be convened concerns what we do with all the nuclear baggage of the Cold War now that the primary reason for it has gone away. I've got a wall of books, as many of you do, that we all grew up on, that developed constructs like deterrence, and second-strike stability, and assured-destruction retaliation, and so on that have just become no longer pertinent to the world that we live in. To take the case of the Russian-American bilateral relationship, we live in a strange world in which we use old language to deal with new problems. Russia is our principal Partner for Peace in Nato. Despite the troubles that we have had in the last several years, we remain still a declared strategic partner with Russia. And yet we still talk about deterrence and arms control in the Russian-American relationship. These are terms that are appropriate for a conflictive relationship, not a relationship amongst would-be partners.

So we are in a transition phase now, where I think it is becoming as important today as it was after Hiroshima and Nagasaki, to ask with great intellectual rigour what the purpose of nuclear weapons is now that their main reason has gone away. Let me stop at that, but if I understand your question correctly, I think you've touched the

heart of an issue that I would like to see become the central focus of the next wave of strategic studies in the West.

Group Captain A. Lambert: From the wealth of good information that you have set out today, you have posed a number of challenges, I suggest, to our command and control relationships. When I spoke to General Horner just after the Gulf War, I recall that he was invited to suggest how many phone lines he would like to have between Riyadh and CINCCENTCOM's headquarters, and he was offered about four. Whereupon he turned around and said, 'I really think about four thousand is what I had in mind!' We now have a multiplicity of command chains, of links, where you can have decisions taken, which are very much tactical decisions taken by junior officers but which in sum have strategic outcomes. For example, bomb fuses may or may not have been deployed to the particular area of operations. Then there's a second challenge we are looking at in the command and control area, such as AEW technology and JSTARS. Finally, I would argue we are moving from a geographical construct of war - a Clausewitzian style of war - to a more functional construct. And it seems to me that also will pose challenges to our command and control. How should we orchestrate our command and control for future war?

Dr Lambeth: I'm not quite sure how to reply. I take your points and I find them valid. I might offer one variation on your point about departing from the Clausewitzian age to a different one. I think, with regard specifically to command and control and information management, that we are moving more and more from the Clausewitzian stress on judgment intelligence - on having the big picture - to something more like Sun Tzu's stress on the crucial importance of maxims. With regard to the point you mentioned from General Horner, the challenge in that realm is the management of information overload, such that the warfighter at all levels gets what he needs, and only what he needs to get the job done. That suggests that, in the end, we are not really talking about information warfare at all. We are talking about knowledge warfare.

Squadron Leader Chris Westwood: I want to talk about the computer weapons that you were initially discussing - the viruses and things like that - and note the increasing dependency that all military forces, in fact all nations in the West, have acquired on their information systems over the last decade. Most nations right now are incredibly vulnerable to information attack, and you see that on a day-by-day basis with non-nation groups attacking US systems. The military response to date has been to attempt to defend our own systems as a priority, and then more recently try to use those weapons in pursuit of military objectives. Most military forces will use the national information infrastructure to support any application of information weapons in the future. What role do you see the US military having in defending the US national information infrastructure in the future, and what role are military forces in general going to have in ensuring the integrity of the international information infrastructure?

Dr Lambeth: You have stated the essence of a problem that is new on the scene and that is going to require attention. After all, what is good for the goose is good for the gander. Just as we have increasing access to adversary information systems and the means of tapping into them, we are going to be exposed ourselves. And you see once again the continuing dialectic between offence and defence at work in this area. The best I can say is that the United States will take the lead to the extent that it can, as

reflected by the formation of the 609th Information Warfare Squadron. The problem is, you are talking about something that involves equipment available around the world on the commercial market. It's going to be a very difficult dynamic for any country to control.

Mr Dana Pierce: You've talked about a lot of advanced technologies that we're developing. One of the issues that we continue to struggle with, even with today's weapons, is the exportability of those, not only for the hardware itself, but the important source codes that countries like Australia needs, to be able to develop their own tactics and so forth. I wonder if you could comment on how you see our ability to export the technology you've talked about and, more specifically, the issue of software and source codes?

Dr Lambeth: I can't speak to your specific question about software and source codes, but I remember some years ago when Ben Rich was still running the Skunk Works, he was asked in an interview what he thought about the exportability of the F-22, and he said, 'Not only no, but hell no!' And then he thought for a second, and said, 'Well, you know, on second thought, if we do eliminate some of the treatment and don't include the canopy, maybe I'd consider it'. He was asked that question at a time when we were still in an intense competition with the Soviet Union. And his answer raised a fair question about who in the world would want to buy a destealthified F-22 at those prices. But I think the issue of exportability is at least one worth debating now that the primary source of the restrictions that we had in recent years past has gone away, ie, the long-term Soviet military challenge. Perhaps some of the constraints on exportability that made very good sense in a different age might make less sense today. That's about as far as I'd feel comfortable going on that.

Wing Commander Steve Huckstepp: Military forces traditionally don't structure for operations other than war. Hence we often find ourselves involved in operations using technology that's been adopted for different purposes. Should we be pursuing different types of technologies and different adaptations of technologies for these peace-inducement operations, if I can use that term? For example, non-lethal weapons?

Dr Lambeth: It's certainly true that many of the capabilities that worked so remarkably well in a high intensity, very clearly-defined combat situation like Desert Storm have been of less clear-cut utility in the messier situations we've had to confront since then. Rather than advocate chasing a will o' the wisp by running off in all directions at the same time with technology development, and trying preemptively to deal with every conceivable circumstance of conflict from a neighbourhood fist fight all the way up to a global thermonuclear confrontation, we should inform our political masters as to our strengths and limitations, so that the very versatile but still limited capability that we have will not be misused.

Going back to the case of Bosnia, I believe that some of the frustration that we have experienced over the past year has had less to do with the inappropriateness of the technology than with attempts to use it without clear guidelines. I concur with a point made earlier that it was probably the very effective precision use of air power last September that brought about the Dayton Peace Accords. It is remarkable that there were no Serbian complaints about collateral damage - for good reason; because there was none to speak of - but that only happened after Nato's political masters decided

what it was that they were trying to accomplish. If you take a contrapuntal case only several months earlier, when Captain Scott O'Grady's F-16 was shot down, my first reaction was to ask, 'What on earth was he doing there in harm's way in the first place?'

One of the worst mistakes, it seems to me, that national leaderships can make with air power - because of assumptions about its mystique and dazzling capability - is to reach for it reflexively at any and every time, even in the absence of clear political goals, simply to project an appearance of 'doing something'. That is worse than doing nothing at all, because it squanders a capability that has been built through hard work. So rather than scramble to get every widget that technology might provide to deal with every conceivable contingency, let's first put our thinking caps on and find smarter ways to use what we have already, to better effect.

THE CHALLENGES OF SPACE BEYOND 2000

GENERAL THOMAS S. MOORMAN

Thank you for that kind introduction. It is wonderful to be in Canberra again. It is especially meaningful to be here at this time to speak at this conference and to participate in your celebration.

Before saying anything more, I want to congratulate the Royal Australian Air Force, the world's second oldest Air Force, on their 75th anniversary of service to Australia. It is an extraordinary milestone indeed. As your somewhat younger ally, I have been taking notes on how to celebrate a birthday. In a phrase, this has been a class act. I was particularly moved and enjoyed last night at the Parliament House. Making the event all ranks was the perfect touch and I applaud you for that. It was a first rate evening and one I am sure the participants will not soon forget. By the way, I want you to know that you've given me a number of ideas for next year, 1997, when we celebrate our fiftieth anniversary. I also want to especially thank my friend Air Marshal Les Fisher for his gracious hospitality.

Before moving to the text of my formal remarks, I feel compelled to say a word about the strong bond the United States Air Force and Royal Australian Air Force have enjoyed for many years. While both of our countries flew in World War I, our strong ties with the Royal Australian Air Force were forged in World War II at the Battle of the Coral Sea and continued through that war until Air Vice-Marshal George Jones stood on the deck of the *USS Missouri* during the surrender ceremony. The Royal Australian Air Force was with us in Korea, flying P-51s, Meteors, and Dakotas. And later, in Southeast Asia we again stood side-by-side against a common foe. Royal Australian Air Force Caribou transports served with US Seventh Air Force and later helicopters and Canberra bombers distinguished themselves in that conflict. In the Gulf War, the Royal Australian Air Force was with us again flying in the C-130 exchange program. In fact, one of those aviators, Squadron Leader David 'Haggas' Sutherland, from the Pope AFB, NC, exchange post is with us today.

Today, we share common weapons systems, train and exercise together, and of course we cooperate in space operations conducted in this country. Our partnership is strong and no doubt will endure.

We also share a similar desire with all our friends and allies in the region to promote a stable, peaceful, and economically vigorous Pacific Rim. The United States Air Force is committed to building excellent relations with the air forces of the Pacific region. Shoulder-to-shoulder with our friends and allies we've participated in exercises and operations, and events like the gathering this week. Personally, I relish the opportunity to meet with other airmen from the greater international community in events like this to share ideas on the employment of air power .

We've heard a great deal over the past two days about the changing environment, technology developments for 2000 and beyond, and regional security issues. It is obvious, but bears repeating - warfare is changing to meet the demands of the new environment, and air power in the 21st century will be significantly different than we have known in this century. As air power continues to evolve, the impact it will bring in the future places it squarely in the middle of the revolution in military affairs. A subject which clearly has been touched on by several speakers.

AIR AND SPACE POWER

Today, when I speak of air power, I am talking about more than just air superiority, global mobility, and bombs on target, this afternoon I am adding space power to that equation. As we witnessed in operation 'Desert Storm', air and space power are a 'system of systems' for prosecuting the potential conflicts of tomorrow.

This 'system of systems' begins with a comprehensive suite of accurate and pervasive intelligence, surveillance, and reconnaissance sensors carried by manned platforms, unmanned aerial vehicles and a variety of spacecraft. These increasingly sophisticated sensors will produce the information which in the future will have the capability to provide total battlefield awareness or knowledge. This intelligence will then be communicated, rapidly, reliably, securely, by joint military and commercial terrestrial and space borne communications systems to commanders, targeteers or even directly to weapon systems.

The combination and integration of accurate and global situational awareness, available on demand to the shooters who employ precision guided munitions, will be our answer to the warfighting commander who demands access to the capability to act and react within the enemy's decision time. Add these capabilities to the natural characteristics of aircraft and space systems, speed, range, flexibility, and freedom of action, and you can see that a strong case can be made that air and space power may well be the dominant warfighting capabilities of the 21st century.

USAF RESTRUCTURE AND INVESTMENT

Let me spend the next few minutes and review how the United States Air Force is posturing itself for '2000 and beyond' with a special emphasis on space trends and what this means for the world's air forces.

As all of you realise, general budget reductions are taking place within most of our air force's programs. We are attempting to cope with budget reductions and downsizing by a combination of far reaching management initiatives - such as base closing, acquisition reform, and privatisation and outsourcing. To a degree, these measures are our approach to that second revolution that the Defence Minister mentioned - the revolution in defence management.

People, programs, force structure, and bases have been reduced substantially. From a high in the mid 1980s, our air force's budget has declined thirty-three per cent. We've reduced major commands from thirteen to eight. We've eliminated all intermediate headquarters - air divisions - and will close or realign forty installations by the turn of the century. And, active duty fighter wings have gone from thirty to twenty. Our Air Force will shrink from over 600,000 members to about 370,000 by 2003 - fewer than at any time since World War II. That brings us to today's total air force budget of about $60 billion. Some predict that absent the rise of an overriding threat to our future national security we could be on a glide slope to a budget of $55B by the end of the century.

Given the reality of reductions, we have focused investments through the turn of the century on two key themes: readiness and modernisation. These are bridge investments that will close out twentieth century programs by retiring the EF-111s, C-141s, DSP satellite system, F-16As and F-15A/Bs and provide the seed money for '2000 and beyond'. So, to provide our source baseline from which to take the excursion into the future, let me review a portion of our programmatic investments - to put things in context - and then move into emerging 21st century trends.

We are currently engaged in over ten major hotspots around the world. In fact our operations tempo is four times what it was during the Cold War. Said another way, aircrews and mobility teams, both active duty and reserves, are spending up to one hundred and thirty days a year on temporary duty away from home.

Over the foreseeable future, it is clear global mobility will remain a cornerstone of our Global Reach-Global Power strategic vision and a key element of US force projection. Our strategic and theatre airlift fleets of modern C-17s, KC-10s and C-130Js will provide unparalleled reach well into the new millennium by hauling outsized cargo, refueling in flight and operating out of unimproved runways.

Air superiority will remain an operational competency into the 21st century and we are committed to an F-22 initial operations capability in 2004 and a procurement of around four hundred F-22s through the 21st century. The F-22 is an extraordinary aircraft with stealth, manoeuvrability, supercruise, and avionics that will accept all-source intelligence directly to the cockpit. And essential to advancing air superiority will be new AIM-7, AIM-9s and advanced medium range air-to-air missiles.

Our bomber force will remain constant - seventy-one B-52s, twenty-one B-2s and ninety-five B-1s. We will configure the bomber fleet for smart conventional weapons that can clearly deliver a debilitating punch within a few hours notice anywhere in the world. Our B-52s first flew in the 1950s and the B-1 in the 1970s, and we are not projecting a requirement for a follow-on bomber at this time. So all of these aircraft will undergo life extension improvements to prolong operational capability well into the 21st century. It is interesting to point out that bomber serviceable life is now measured in half centuries.

Weapons programs, particularly smart munitions, are essential to modern warfare. As the horror of war is made instantaneous by modern communications and television, the world community is increasingly unwilling to accept large numbers of civilian or military causalities, especially when more precise capabilities are available to cripple an adversary's military machine. So, we are funding a host of satellite guided, precise weapons which can be used in a stand-off mode and against hardened targets. Our strategy is to improve lethality, precision and autonomy of our weapons while reducing risk to the manned platform and minimising collateral damage. It is interesting to note that in Vietnam only two per cent of our weapons were 'precision'. Even with all their notoriety, Desert Storm was prosecuted with only nine per cent of the bombs being precision-guided. However, because of the unique demands inherent in taking down the Bosnian Serb communication system and the extreme demand to avoid collateral damage, sixty per cent of the weapons used in Operation 'Deliberate Force' in Bosnia were precision guided munitions and many of our allies had this capability as well.

Modernisation of space systems is also a priority for the United States Air Force and space is my topic today. I note that I am the only one on your agenda who has been asked to address the significance and future challenge of space. I applaud your including space on the agenda - not just because as a senior space guy in our Air Force it has given me a chance to return to this country; but, more significantly, because space is becoming increasingly important to the prosecution of all forms of modern warfare.

Moreover, I believe that as the medium of space is an extension of air, it is an area about which all professional airmen should be familiar. In the case of my Air Force, this growing importance and dependence on space is captured in our mission

statement developed earlier in this decade: 'To defend the United States through the control and exploitation of air and space'.

SPACE TRENDS

I believe that there are several trends which are discernible today that will shape how military space systems are employed in the next century. Many believe, and most of the speakers here have spoken to the fact that we are at the beginning of a new age - the Information Age - and that access to and control of information will be dominant characteristics of military power. In fact, the well known futurists Heidi and Alvin Toffler have called the Information Age the third wave of development, the first two waves being the agricultural and industrial waves.

Commercial Information Technology

In this light, the first trend I want to highlight which directly bears on space is that commercially produced information is outpacing military requirements and to some extent military technology. It used to be that the military dominated the electronic spectrum with portable tactical communications systems, high bandwidth communications satellites, computers and signal processing. Now, in many respects, it is the commercial information and entertainment industry that is leading us into the 21st century. Let me offer an example, hopefully without lapsing into techno-speak.

Communications Systems

Communications bandwidth used to be limited and at a premium, but with the onset of digital compression and multiplexing bandwidth is exploding as we begin to work in the upper SHF and EHF bands exploiting frequencies in bands with data transmission rates in the gigabit range. Advances in cross linking for example will allow satellites to talk to one another without ground stations.

Another example which I think will affect us all is the Direct Broadcast Satellite - a largely commercial endeavour which is poised to revolutionise high capacity military communications. For a very modest investment - a home version is currently available for $600 dollars in the states - a lightweight, 16' antenna hooked to a window in your home or on a HUMVEE can tap into the full 28 megabit downlink of a Direct Broadcast Satellite. This means TV, imagery, data and encrypted information are at your finger tips with unprecedented speed and clarity.

As the space service within the US military, the Air Force will be bringing a Global Broadcast System on line about the turn of the century. Now, before you conclude that this may not be especially relevant to your experience, let me put a Global Broadcast System in context. As many of you know, we had serious bandwidth problems in Desert Storm trying to transmit five hundred page air tasking orders and imagery over UHF circuits. It was sometimes taking hours to complete a single transmission, but with direct broadcast transponders we can push the same data through in a matter of seconds. So, we can look to a future where we are not bandwidth limited.

Information Management

Clearly, a tougher task than building a Global Broadcast System will be information management. Imagine all this data available to our Operations Centres, Wings, and

Squadrons. We would be swamped. Consequently, we in the United States Air Force are developing a concept called 'information on demand'.

One can visualise this as a large information archive and terabit data base fed directly by improved space, airborne, and terrestrial sensors. This all-source data base - the mother of all data bases - can be accessed and the information retrieved in real time by command centres, planners, and shooters. Let me give an example. I envision air planners 'channelsurfing' through several different data bases, building mission folders by selecting and inputting imagery of roads and bridges, current weather information over the target area, and maybe multi-spectral environmental analysis of runways and heat producing facilities. All done 'on-demand' and probably manipulated at locations other than air operations centres. The requested data is then flashed instantly over communication systems during peace and crisis. By definition this information will be available on demand, based on need, and thus potentially available to joint as well as coalition users.

Commercial Communications Systems

A byproduct of the explosion of information is the migration of our communications needs away from dedicated military satellite communications to commercial transponders. Consequently, we are earnestly looking at commercial systems to handle more wideband high data rate needs. Some communications were off-loaded to leased systems in Desert Storm, and leased transponders on commercial satellites are being used for Bosnia support today. Commercial systems have reliability, high capacity, anonymity - and they are cost-effective. I would predict that seventy to eighty per cent of our future space communications needs will be handled by commercial satellites.

In addition, I can see an emerging use of low orbiting communications systems, like the ones I've mentioned, to provide instantaneous voice and messaging connectivity in the field. Just as we provide troops with GPS receivers, it would be no stretch to have wireless communication devices issued as well. This would do two things for the military. First, it would assure communications connectivity at all levels of command; and second, it would enhance survivability through proliferation. It raises some interesting management concerns, as well.

Small Satellites

Many people believe that another trend will be the proliferation of small satellites. Generally, the US space community has lived by the adage in military and commercial world that a bigger satellite is a better satellite. I fully expect to see constellations of low earth orbit, small satellites become more the norm in the next century. There is no shortage of competitors in today's small satellite business - established and new companies are investing billions of dollars in satellite constellations which will ring the earth.

In our planning, we are exploring opportunities to pipe this capability throughout the Pacific Rim. Interconnecting these systems by a worldwide net of gateways will preserve redundancy while providing uninterrupted communication services from the barren outback to the carpeted hallways in Canberra. To date, proposed constellations range anywhere from forty to fifty satellites to nine hundred low earth orbiting satellites, and deployments are planned using a variety of United States, Russian, European Space Agency, and Chinese launch vehicles.

Imaging Systems

I think it is important to note that industry is not stopping with communications. Let's look at imagery from space. Potentially, upwards of one hundred commercial and civil imaging systems could be launched within the next several years to provide subscribers with electro-optical, radar, multi-colour, multi-spectral imagery with one metre resolution or better. In some cases, customers will be able to receive their precision planning and targeting capability digitally.

No longer the sole purview of the military and intelligence communities with accompanying classification restrictions, earth observation systems in the 21st century will fundamentally change the way our air forces plan and conduct operations.

Meteorological Systems

Because of technology and for cost considerations, I expect to see a trend toward greater blurring of distinctions between our civil and military satellite environmental monitoring programs. The precedent has been set with our current National Polar Orbiting Operational Environmental Satellite System (NPOESS) which combines US military and civil systems. And a meteorological satellite from Europe, EUMETSAT, will also be included in the United States' environmental satellite program. In addition to considerable cost savings, about $1.3 billion over the life of the systems, technical and operational synergies with the commercial, civil and international communities will be realised as well. An ability to predict, track, and monitor worldwide meteorological events with extraordinary accuracy is a noteworthy feat considering that just a few years ago we relied only upon balloons and weather observation planes.

As you know, weather satellites have become integral for planning and targeting precision weapons. This linkage was clearly underscored in 'Desert Storm'. Many of the seekers on these weapons are infrared or visual and need to be 'flown' to the target. So, this linkage will profoundly change the way we plan missions.

Space Launch

Another area where profound change is taking place is space launch - that is, getting satellites into orbit. While it may not directly affect Australia or the Pacific Rim countries, nevertheless, I think it is worthy of mention.

As the agent for space launch within the US military, we have budgeted considerable funds to develop a new unmanned launch vehicle, the Evolved Expendable Launch Vehicle, which will be fielded in the year 2001. This will be a family of medium and perhaps heavy launch vehicles, evolved from existing designs with enhanced operability and reliability. The Evolved Expendable Launch Vehicle will be the workhorse for the US Department of Defense and the commercial sector well into the 21st century. We are building it because we must drive down the cost of getting to space. It is expected to lower operating costs at least by twenty-five per cent by reducing infrastructure, adopting commercial practices and standardising interfaces. I also expect the Evolved Expendable Launch Vehicle to be competitive in the international market.

Many believe - and here is the futuristic aspect - that the right way to launch satellites in the future will be to fly manned, reusable launch vehicles. These vehicles will be different than the current space shuttle program with its enormous infrastructure and costs. NASA's Reusable Launch Vehicle technology development program envisions putting a man and cargo into a vehicle, taking off from a runway -

or austere launch pad - flying into space, delivering its cargo, and returning to base ... routinely. Its a great concept and the United States Air Force, NASA's technology partner, brings thirty years of transatmospheric experience, from Dynasoar, X-15 and the National Aerospace Plane, to the table. However, there is a considerable technology challenge in building a reusable launch vehicle, particularly in the area of engines, fuels, materials, payload capacity, and cost. Nevertheless, our goal remains affordable, reusable access to space using routine operations - just like an airplane. I personally believe there is a certain inevitability that ultimately we will have a reusable launch vehicle sometime in the next century that will routinely place satellites in orbit.

Application and Education

Now, the picture I've been painting suggests a more interdependent alliance, at least in the United States, of commercial, civil, and military space systems, supporting military and national operations for a host of US and perhaps allied missions. But that won't happen without the effective application of these trends in daily and combat operations by people. And that takes an educated and trained war fighting force.

Seeds for the application of space in daily and combat operations beyond the year 2000 are being planted today in efforts such as a targeting system that sends prepared imagery directly into the cockpit, or radios that send a Global Positioning System, or GPS, location of downed aircrews to rescue crews without giving away their position to the enemy. Another, and very current, example can be found using the global broadcast capability I mentioned earlier. Operations in Bosnia are providing a laboratory to explore enabling warfighters to reach back to processing facilities in the United States, or outside the theatre, for information. And, letting warfighters receive the information injected into theatre via direct broadcast. All of us need to become a better and more informed customer for space if we are going to take advantage of space's contribution to the Revolution in Military Affairs. To me this has two components. First is education.

In our country, the operational power of space systems was obscured in the first two decades of the space age by classification, dominance by the research and development community, and a strategic Cold War emphasis. Our growing dependence on space in the late 70s and early 80s, plus 'Desert Storm', changed that forever. To broaden the understanding of space, we have been working hard over the last decade to introduce space into our commissioning programs as well as our professional military education. Particularly important are warfighting courses to include those for Component Commanders and their planning staffs. We must create an environment and ethos where people understand and are comfortable with space. I believe this applies not just to the United States, but to many countries.

That is the education side. On the training side, we have established a Space Warfare Center in Colorado Springs and a detachment at Nellis AFB Red Flag facilities to train people on the applications of space systems to help answer the question - how do I use the bitstreams from the variety of space systems to do Air Force missions better? The Army and Navy are doing the same thing in their respective Space Commands. We have also developed Space Support Teams which travel to our major commands and train our warfighters.

While our model may not work for all of you, I would suggest that space education and training is an area that we all need to pay attention to.

INTERIM SUMMARY

The operational leverage that accrues from space systems, in '2000 and beyond', knows no geographical boundary. Rather, the call will be for even more pervasive, worldwide situational and battlespace awareness. And this comes with a price, the potentially greater use of space systems by those countries who do not share our common ideals and values for peace, liberty, and economic security. Because the technological revolution knows no boundaries, hostile countries will take advantage of available space-based communication systems, navigation signals, and observation products to improve their own military lethality.

These trends will inevitably force the US and some of our allies to field systems for theatre missile defenses, space control, space weapons, and information warfare. So, let me share my comments on these topics for a few minutes.

Theatre Missile Defence

First, let me talk about Theatre Missile Defence, an issue that has concerned us all I believe, since 'Desert Storm'. It is projected that by the turn of the century some twenty countries will have roughly 12,000 short and medium range ballistic missiles. Now our experience in 'Desert Storm' showed that some missile designs are not necessarily accurate or stable in flight, witness the Scud. But most are, and they are improving all the time. Fast burn, low trajectory, GPS guided ballistic missiles will find themselves into the inventories of our adversaries. As evidenced by the hit on the Army barracks in Dhahran during 'Desert Storm', death and destruction can be expected, especially on soft targets hit by just missile debris. Sound defensive strategy says it is far better to destroy an adversary's missile over his country or his troops, than wait until it is over yours.

We have embarked on an airborne laser program that is carried on a 747 aircraft. This system will deploy in-theatre and destroy ballistic missiles in the initial boost phase with a laser beam. It is eminently logical to destroy these missile launches early in their flight. Missile intercept is much tougher to do in the final crucial minutes prior to impact and, of course, destruction in the terminal phase is likely to cause more casualties.

Our Army and Navy are developing systems designed to destroy mid-course and terminal phase warheads. The Army Patriot advanced capability-3 and theatre high altitude area defence system, and navy lower-tier and upper-tier defensive missiles will be available just after the turn of the century. These systems will be keyed by an improved early warning satellite system with faster revisit time and greater sensitivity known as the space based infrared satellite system. I know the Royal Australian Air Force is especially interested in this follow-on system to the defence support program. The space based infrared satellite will operate together with our airborne laser, and coupled with improved attack operations - strike aircraft with better sensors and weapons to kill theatre ballistic missiles before launch - is an absolute necessity. This integrated theatre missile defence system is a high priority for us in the United States early in the 21st century.

Space Control

As the importance of space grows and other countries begin to exploit the advantages of operating in the high ground, the next trend - controlling space - will become as important as controlling the seas or air. Eventually, an ability to protect, deny, disrupt,

degrade, and destroy space assets must be pursued if the US and its allies want to ensure freedom of access and action in space. Twenty countries are expected to have space based capabilities by the year 2000 and many others will purchase space derived information - for example, the readily available commercially derived imagery that I mentioned earlier.

The next century will see international flotillas of satellites populating space with military, intelligence, commercial, and civil systems conducting a host of missions from the most benign navigation to manned space missions and interplanetary exploration. To ensure these operations proceed unperturbed, accurate and timely space surveillance is needed to detect, track, identify and monitor the up to eight thousand items in space today.

The question we need to address is will satellites become subject to hostile denial, degradation, or disruption in a crisis? I believe the answer is yes because of the growing importance of space to not only the US and our allies, but to our adversaries as well. This means that we must continue investment in anti-satellite technologies. Consequently, we are continuing research into ground based lasers at our Star Fire Optical Range at Kirtland AFB, NM and the United States Army continues a low level effort to develop its kinetic energy anti-satellites. All of this means that as countries develop or acquire a capability like imaging our troops, we may well be driven to an anti-satellite capability in the future.

Space Weapons

Undoubtedly the most provocative subject in any discussion of the future of space is the subject of space weapons and the likelihood of their use. Here I am referring to the broadest categories: space based lasers to shoot down hostile ICBMs, space weapons which attack other satellites, or weapons released from space platforms that destroy terrestrial targets. Today, these kinds of systems clearly break the current thresholds of acceptability and introduce ABM Treaty issues, social and political reservations. But the 21st century could well see a change. If there is a change, I believe it will be driven by the proliferation of greater and greater range ballistic missiles. If this threat materialises, space weapons will probably be considered as they are cost effective, accurate, and less vulnerable than terrestrial options.

In that light, space based laser research continues as does basic research into reentry warhead vehicles. The capability to deliver non-nuclear, hyper-kinetic weapons on targets like hardened bunkers, munitions depots, underground command and control centres and other highly defended areas could fundamentally change the way we think about air and space power.

Information Warfare

In addition to space, I wanted to touch briefly on information warfare which is getting a lot of play in Washington and consequently we briefed it a few weeks ago at the Pacific Air Chiefs Conference at Hickam AFB. We've also heard a lot about it at this conference. It is a fast emerging arena that has the potential of turning the tide of conflict without firing a shot. We are no longer in a four dimensional environment of air, land, sea and space. Information operations introduces a fifth dimension of warfare - as the importance of information to military activities will transcend all that we can do.

My Chief, General Ron Fogleman, has said that, 'dominating the information spectrum is as critical to conflict now as occupying the land or controlling the air has been in the past'. The future battlespace will not be geographically confined, and if there is a message in the evolution of warfare, it is that an adversary will always seek to maximise his operational advantage by moving to a medium that is undefended.

Increasingly, the future heart of power projection is the microchip used to power processors, communications, integrated circuits, computers and optics. This information technology is the brains behind our weapons and the connectivity between the shooter and the sensor. Disrupt that linkage and the advantage of precision, timeliness, and coordination is lost. But the commercial information technology explosion, as I've said, knows no geographical boundary. It is available to virtually anyone.

Intrusion into data links, data bases, and local area networks can significantly inhibit an adversary's ability to plan, execute, and coordinate military operations. Equally important will be the ability to protect ones own capabilities. One of the areas that needs protection is the frequency spectrum. And, we appreciate Australia and the UK's strong support as evidenced by your jointly endorsing the need to protect the frequency spectrum of 225-400 MHz for military use. It is important because of a move both in the United States and internationally to sell off military spectrum. We must fight that trend to preserve these frequencies for our warfighting capability.

So we have a new battlespace that transcends all others ... the virtual battlespace. How do we protect those many sources of information and communications paths critical to US and allied operations and at the same time 'exploit, corrupt, or destroy the enemy's information and its functions?' 'Desert Storm' was a precursor to information warfare as we were able to take away Saddam Hussein's eyes, ears, and voice. His troops were left leaderless and unconnected. But, our next enemy has watched this process and has studied its dramatic results. Consequently, he will not be as vulnerable. We must be able to protect our information capabilities and thus, we are beginning to put considerable resources towards information defence.

FINAL SUMMARY AND CONCLUDING REMARKS

Well, the 21st century is almost upon us and I believe the trends I've spoken about will probably become realities. An integrated air and space program that combines total battlefield awareness and knowledge with rapid and dependable communications to get information to the decision maker or shooter, fully integrated with highly capable, survivable manned aircraft and a fleet of unmanned aerial vehicles (both with precision munitions) is the wave of the future.

This capability, which merges the third and fourth dimensions of warfare, will be augmented by that fifth dimension, information. I believe that these new capabilities promise to usher in a new century which, if you will forgive a bit of parochialism, may very well be known as the aerospace century. Much as the Roman age was defined by the legions which conquered the known world and the European age of discovery and exploration was dominated by great naval fleets that secured trade and commerce well into the modern era, the 21st century could well become the age of air and space power. And air and space power in the hands of democratic nations will be used to help secure the peace, provide humanitarian assistance, and deter aggression throughout the world. Thank you.

DISCUSSION

Squadron Leader G.G. Wren: How do you view future Australian-US cooperation in military and civil space activities? And secondly, to what degree do you see UAVs, especially the higher tier UAVs, blurring the interface between aerial and spaceborne platforms?

General Moorman: Well, with your first question, the United States and Australia have a very long history of cooperation in the space area, and I alluded very briefly to space operations in this country. I believe that cooperation will continue, and I think it will continue to be very close. I think the access and availability of information derived from US space systems will, of course, be available to one of our closest allies, the Australians.

Your second question is very perceptive, and I'm not sure I have a precise answer to it, and that is: to what extent do UAVs blur the distinction between air and spacecraft? One of the things I did not cover here, because of time - and Ben Lambeth briefly touched on it - is: to what extent can you take missions that are currently done by manned aircraft - surveillance for example, and systems like JSTARS and AWACS - and put them in space? I think that's a case where we will look at space-based solutions as well as UAV solutions. The AWACS mission is interesting. For example, the advantage of surveillance systems is that you want them available all the time, and you want them to surveil the area that you're interested in. What that means, from a space perspective, is that you must develop a global system to have sufficient revisit rates to be useful. Additionally, if you are putting a radar capability in space, it has to be at low altitude because of a power aperture problem: you can't get the resolution at geosynchronous or something like that. As a consequence, the combination of having to have a global capability with a high revisit rate, and power for resolution, means that you have to buy a large number of satellites. Depending on the altitude, it could be between twenty-five and forty satellites. That may be a very expensive way to do the AWACS job. So you may look into doing that job with proliferated UAVs. I'm not saying we have done that, only that those are the kinds of trades you would have to address.

Squadron Leader D.G. Millar: As you are aware, sir, EMP has a major effect on all our data transfer systems, and small electromagnetic devices are very vulnerable to EMP. Could you give us your risk assessment of a lower-order power attempting to level the playing field by use of thermonuclear devices to blanket the EM spectrum?

General Moorman: That is a real issue, and that threat dominated our thinking, certainly in the late '70s and mid-80s. And it led to the development of the current highly-survivable system that we have called Milstar, which is EMP hardened. Milstar also does an incredible amount of other things, consequently it is incredibly expensive. I think we will continue to fly Milstars for that absolutely assured connectivity, for the threat that you speak of. But I think we will gravitate more and more to commercial communications, while having 'X' percentage of our communications capacity in Milstar-type of capability.

Air Vice-Marshal R.A. Mason: I think back to the early days of air power when the Royal Naval Air Service and the Royal Flying Corps duplicated a great deal of activity. They wasted an enormous amount of resources because of duplication. They drove up the prices of aircraft and made a bunch of French aircraft engineers and designers very happy. I wonder, when I listen to you explain how the United States Air Force has this program, and the United States Army has that program, and the United States Navy has that program, if there is a slight risk of reworking history; of losing a certain amount of efficiency, losing a certain amount of cost effectiveness which a unified space effort would remove. Because it seems to me that there is already somebody hard at work in the game - in the third dimension. Doesn't it make sense to put the continuum into reality, into structure, and have one aerospace force?

General Moorman: Implied in your question is that there is significant duplication in the development and operation of space systems in the United States and that is not necessarily true. The Air Force is regarded, and actually has been assigned to be, the developer of common-user systems - and virtually all new systems, because of their cost, will be common-user. Other than some leased communications, and communications in the UHF spectrum, the Air Force builds virtually all the satellite systems that are flown by the military. We of course don't build the intelligence satellites. So, I don't believe that's necessarily a problem.

Now, if I expand that, however, to talk about space in its broadest context, and put missile defence in that context, there continues to be an issue as to whether we need all the theatre missile defence programs that we have. I sit on a body called the Joint Requirements Oversight Council, and we debated that at some length and cut that program back to remove some redundancies. I think that will continue to be looked at. The areas covered by THAAD and Navy Upper Tier, for example, are very similar, and the distinctions end up being concepts of operations, primarily.

I think the last question gets to the issue: do you combine an aerospace or space force? The way I've always answered that question is I'm not sure there is a need yet for that. Frankly, I'm reading from history in my own service. We got an independent air force primarily because of a weapon - the atomic bomb - combining with a delivery system - the B-29 - that made continuing subordination to the Army counter-intuitive. Why I use that analogy is that space now is in the service realm. It's much like mobility, if you will. If you got into an era where your national security, in a warfighting context, was more and more dependent upon space, you may look at a different organisational structure.

Air Vice-Marshal D.N. Rogers: As I understand it, General, it comes down to a division of responsibility between the services - that the Army gets the defensive requirements, in terms of ballistic missile defence systems, and the Air Force has the exploitation of space as far as military use is concerned. Would that be right?

General Moorman: Not exactly. There continues to be a roles and missions debate on responsibilities for theatre missile defence. The shooters other than the airborne laser are both Army and the Navy efforts, and those are in the Ballistic Missile Defence Program. Interesting to note, the airborne laser is in the Air Force Program.

Air Marshal R.G. Funnell: My question, General Moorman, concerns a matter that has been raised several times in this conference, namely, information. And in particular, the handling of information. You mentioned how you can now get a huge ATO across to a commander in a matter of five seconds or so. My question concerns swamping people with information. If I can remind people of a piece from Professor Martin van Creveld's highly acclaimed work on command in war, he pointed out that on the first day of the battle of the Somme, General Haig received something in the order of several thousand messages and yet, at the end of the day, he was probably the least well-informed man at the battle. Are there some guiding precepts that can help us at all levels of command to decide what it is that the person at that level should get, and what he should not get?

General Moorman: That's a perceptive question, Ray. Too much information at the wrong time is worse that none at all, as you pointed out with the World War I example. Consequently, what I would say about the guiding principles is that we must design an architecture that is based upon the user requirement. And the user must participate in that process and not let the technologists take the ball and run with it. And the system must be based upon the premise of a time-phased concept of operations - what information the individual needs at any particular time. He will have the menu to call for the data, but not the data. That's what I meant by the 'channel-surfing' kind of thing.

Let me give you some examples. I'm getting ready to plan my mission in a broad, theatre context. I want today's - this instant's - weather. So I call up a weather satellite picture that is direct downlink; it is what you see now. Or am I interested in these particular targets - what is the latest information? What is the latest reconnaissance photo? Take the case of a peacekeeper who is interested in monitoring the status of certain evacuation zones. He would call up his Predator UAV picture that is real time - Predators going back and forth, etc. And there are all kinds of examples. The secret is that you are accessing a huge database maintained some other place and you're not swamped. And someone else is not telling you what you need. Instead you're telling the database and pulling from the database. That's the main principle, and I think that concept is not that far away. We will get DBS capabilities after the turn of the century, and I think what we will do is exercise. And we will develop an architecture based on that principle. We will probably make some mistakes, but the secret is: the joint force commander will dictate how that architecture looks.

Squadron Leader Ray Press: You mentioned Alvin and Heidi Toffler and I draw your attention to their book *War and Anti-War*, where they talk about space being the new high ground. They mention that whoever controls space will control the earth, and whoever controls the moon, L4 and L5 will control space. In light of those comments do you see a role for the moon in the future?

General Moorman: Ben Lambeth began his presentation by talking about new world vistas and he said that there is a lot of good things in our Scientific Advisory Board study, and then he said there are some things he wasn't so sure about. I quoted from Heidi and Alvin Toffler because I happen to believe in the information age. However, I am perhaps too short-sighted and I have not yet thought about using the moon for defence. And for all of you who didn't get the techno-speak, L5 is the place where the gravity of the earth and the gravity of the moon cancel themselves out, so that may be

where you station something. That is also a theory of the Tofflers' concerning L5 control and what that means.

Group Captain John Harvey: Sir, you talked about the importance in the future of space, UAVs and information warfare. If you were preparing a chief for the Air Force of the future, what sort of characteristics should he or she have? What sort of training do you think the chief of the future needs?

General Moorman: That's a good question. Let me take that broader. Rather than a question about training a chief, I want to talk about training the leadership. One of the things I think we are going to need in our particular service - and I might commend it to others although I'm not sure our model is exactly applicable to everyone - is that we need to have a broader flexibility of thought and an ability to do longer term thinking in our senior leadership. Frankly - and I think the Chief would agree with me on this - for the past ten or fifteen years the United States Air Force primarily has trained leaders who were very competent in their weapons systems, very competent in near-term air power theory. What we have not done as well in, because we have eliminated organisations that do these things, is long range planning and strategic thinking. And we are in the process now, in the United States Air Force, of changing that. Twenty-five years ago we all believed that the best strategic thinking was being done in the United States Air Force, at least more than the other services. We've lost ground there, and we need to put a lot of emphasis on long range and strategic thinking, and I commend that to you.

INDUSTRY IN PARTNERSHIP WITH THE RAAF: AN INTERNATIONAL PERSPECTIVE

AIR CHIEF MARSHAL SIR PATRICK HINE

Air Marshal Fisher, distinguished guests, ladies and gentlemen. First, let me say how delighted I am to be once again here in Australia taking part in this intellectually stimulating air power conference.

Air power has been very much part of my life for forty-five years. A personal highlight was the Gulf War when, as Joint Commander of the British Forces, I was able to witness the effectiveness of modern air power, properly applied, in decisively defeating Iraq's large military machine in only six weeks. Some of you may remember that I spoke on this subject at the RAAF's air power conference two years ago.

The Gulf conflict occurred in the immediate aftermath of the ending of the so-called Cold War and shortly before the collapse of the Soviet Union. In the intervening years defence budgets in the West have fallen very significantly and a harsh discipline has been imposed on both the armed forces and industry to achieve greater value for money - or bang for the buck in slang parlance. There can be no doubt that air forces the world wide now need to work in growing partnership with industry to define and procure their major equipment needs at a time when the pace of technological advance shows no signs of slackening - quite the reverse - but when governments see less need to spend money on defence.

The theme of your conference - New Era Security - is particularly apposite, for the geopolitical scene has changed, security threats have become multifarious and unpredictable, and the nature of warfare is evolving with technological developments that offer potential for new operational concepts - and all while costs are having to be even more tightly controlled.

The challenge for industry is immense and some painful nettles are having to be grasped. But new opportunities are also being presented and defence industrial rationalisation is taking on an increasingly international dimension. New strategic alliances are being created, and events in the United States and Europe will understandably impact, in a defence industrial sense, in the Far East and here in Australia.

In addressing the subject 'Industry in Partnership with the RAAF', I will focus more on a global perspective, while leaving Peter Smith to concentrate on the Australian scene. But you will appreciate that much of what is happening world-wide will have at least some read-across to Australia. Indeed, such is already the case.

I will couple industrial change with a brief examination of the probable nature of future wars and the technologies that are likely to be available for their prosecution. That will, I believe, serve to illustrate the need for partnership between the defence aerospace industry and the RAAF.

For most of the forty years of the Cold War, the Soviet threat drove the Nato nations to devote major resources to defence. The alliance's strategy of deterrence - based on the triad of conventional, theatre nuclear and strategic nuclear forces - drove the pace of technological progress, with each successive generation of aircraft and other major weapon systems being more costly than its predecessor. Indeed, cost

growth in some areas was almost exponential and there was talk about 'marching down the road to absurdity'.

Under President Reagan, the West stepped up its expenditure on defence in response to Soviet expansion and modernisation in the 1970s. Defence was big business by any standards. Cost-plus contracts abounded, there was a healthy flow of funds for R&D, there was high employment in the defence industry, and production lines were busy.

By 1985 the arms race had bankrupted the Soviet Union and Gorbachev began the process of accommodation with the west and launched his 'Glasnost' and 'Perestroika' at home. Indeed, it would probably be fair to say that the Reagen security policies won the Cold War.

But the downturn in Nato defence spending and the quest for getting better value for money in defence procurement began in 1985 and, certainly in the UK, was already well established when the Cold War ended.

This process was interrupted but briefly during the Gulf crisis, and when the war was won, continued as nations cashed in their peace dividend. The defence industry has been forced to adapt to a very different commercial world to that which prevailed throughout most of the Cold War when the military/industrial complex - an Eisenhower term - enjoyed a lengthy golden era. The winds of change are still blowing and I shall return to that later. But first let me say a word or two about wars of the future.

Wars of the Future

First, we must retain the capability to defend ourselves against a well-equipped enemy. For us in Europe, this means retaining and expanding the role of Nato and defending against any major global threat, but I an conscious that here in Australia it means something much more regional. However, we must all be able to contribute in some way to United Nations coalition operations such as those in the Gulf.

Looking at smaller conflicts, air power has been used by the US in Somalia, while in Rwanda all the initial humanitarian relief was deployed by air. In Bosnia, air power fulfilled similar humanitarian roles, including the parachuting of supplies to beleaguered Moslem communities in the safe havens, while the air policing of Bosnian skies by Nato air forces neutralised the Serbian Air Force, thereby helping to limit the level of conflict.

Last year, Nato air power de facto forced the Bosnian-Serbs back to the negotiating table. But there were constraints. Nato and UN forces were there with the consent of the parties, and the transition from peace-keeping to peace-enforcement was made in a doctrinal vacuum. Moreover, the omnipresence of the media, together with Western sensitivity to casualties, placed a premium on low collateral damage in the selection of targets.

With the re-emergence of ethnic and religious tensions so long suppressed by communist ideology, such conflicts may increase in the near term. Our participation in 'wars of choice' - as Professor Lawrence Freedman has characterised them - is likely to be circumscribed and to place heavy demands on our people and equipment. Political sensitivities will call for timely and detailed intelligence, and for accurate target discrimination and weapon delivery, for which high technology systems will be required.

It would, however, be myopic and dangerous to focus solely on peace support operations in the belief that high intensity wars are passe. They are not, as the recent Chinese sabre-rattling over Taiwan clearly indicated that even members of the Security Council believe that international differences can still be settled by the use, or threatened use, of force. And if the Chinses were to invade, then the first line of defence would be air power from US aircraft carriers.

So, what does air power offer in tomorrow's uncertain and unpredictable world? And where will technology and industry fit into the scheme of things? The answers to these questions lie partly in the lessons we learnt in the high intensity conflict of the Gulf War when air power played such a decisive role. Precision guided weapons, stealth, a twenty-four hour capability and advanced C^3I systems were all real force multipliers and gave clear pointers to the future.

THE YEAR 2000 AND BEYOND

So, what of the next millennium? How can the continued rapid advance in technology be exploited to ensure that air power remains effective for both high intensity war and peace support tasks?

The continued cost effectiveness of air power will depend on a number of factors. Expensive, single-role aircraft and weapons will give way to multi-role aircraft like Eurofighter 2000, with weapons designed to offer maximum flexibility in terms of target selection and release profiles. The utility of these systems will depend heavily on lowering the risk of using them, for which - as I said a moment ago - precision accuracy, stand-off capability and stealth will be key. Moreover, the acquisition and dissemination of timely intelligence and information in near real time will be essential to achieving maximum operational effectiveness. And new technologies will be needed to exploit yet further the key attributes of air power - speed, range, flexibility, precision and lethality. The concept adopted by the US Air Force, viz., Global Power, does, I believe, encapsulate the need well.

What kinds of new capabilities are likely to emerge? I will cover briefly what I see as the main ones.

First, weapons. For certain target categories precision guided weapons have improved destructive power by a factor of one thousand. We already have weapons that can provide three metre accuracy against static targets, even at night; and a virtual all-weather capability with accuracies in metres is only a few years away. But stand-off weapons will also become stealthier and thus extremely difficult to detect until it is too late to engage them. Such weapons are already in design and, with different warheads, will be capable of destroying a wide variety of targets, including well-hardened command and control bunkers.

We must also expect the introduction of non-lethal weapons with the ability to incapacitate without killing, to embrittle metallic machines or to turn tarmac into glue. But we must beware that the use of non-lethal systems is not seen by potential enemies as a lack of resolve which they can exploit.

Effective crisis management will call for the rapid deployment of forces to distant places and their prompt build-up with proper logistic support. In time I believe we will see very large military airlifters that can fly 20,000 kilometres, deliver their cargo (up to 65,000 kilograms) and return to base without refueling.

On combat aircraft I expect a continuing debate over the respective range and stealthiness of the launch aircraft and its stand-off weapons. There is little doubt that

we shall also see the introduction of unmanned combat air vehicles (UCAV) to complement manned aircraft. Without the need to accommodate a human body, the designer will be able to reduce the UCAV's radar cross-section by comparison with stealthy manned aircraft and also to maximise manoeuvrability performance.

Unmanned Aerial Vehicles (UAV) have, of course, already been used successfully. The Israelis used them in 1982 to detect and locate Syrian SAMs, and US Predator UAVs have been used in Bosnia for recce missions into dangerous locations where there was risk of losing a pilot. Future UAVs are likely to become progressively more capable, and will carry all or many of the sensors currently fitted in manned aircraft. For example, the 'Dark Star' UAV will have radar and infrared sensors, automatic data linking of pictures and be able to stay on patrol for up to eighty hours.

Conventional jet engines can offer speeds up to mach 3.5, and mach 5 can be reached with ramjet engines that cool the incoming air, turbo-charge it, and then feed it to a low pressure rocket chamber where it is mixed with hydrogen. Much higher speeds should be attainable (perhaps up to mach 25) if the engine can be switched to an internal supply of liquid oxygen to provide rocket-like performance in a vacuum.

Space-based systems are of course already synonymous with air power. For the next generation the possibility exists to obtain a 'global awareness' with a refresh rate of once per hour or, for more concentrated looks at, say, just one per cent of the earth's surface, at a rate of once per second. The clarity of view provided by such systems offers the potential to revolutionise command and control. A new paradigm - Control Warfare or Information Warfare - is in prospect and it will have a very significant effect on the future conduct of air warfare. A real challenge, however, will be to guarantee immunity of friendly systems to enemy misinformation or deception, while acquiring a capability to infect his.

For the future we can expect constellations of satellites, each optimised to provide detailed coverage of part of the electromagnetic spectrum. They will produce vast quantities of data that once analysed, sorted and fused will produce an awareness of the environment that constitutes virtual reality.

Another major break may be in the field of directed energy or particle beam weapons that can achieve a soft-kill. Powerful lasers, initially mounted in large aircraft but eventually in satellites, are likely to be able to destroy ballistic missiles as they rise above the horizon in the boost phase.

A further field of great potential lies in Nano technologies. Ultra-small, highly intelligent machines are becoming available for commercial use and it seems only a matter of time before some are developed for military use. At their most simple, model cars barely visible to the naked eye can be made to travel considerable distances and invade sensitive areas. One military application might be the release of a swarm of small autonomous bodies which have the ability to sense multiple vectors in the environment and either to send back intelligence or take offensive action. This is not just science fiction!

The difficulty for military planners, of course, will be to decide which of these emerging technologies are likely to give the best return for investment and provide what the Americans term a 'discontinuous change' in the nature of air warfare. In short, the most useful technologies will be those which confer a quantum advantage and enable the adoption of new winning concepts of operations.

CHANGES IN INDUSTRY

These new technologies will have to be developed and deployed at an affordable price. Industry accepts that and the need to adjust to the downward trend in defence budgets. In the US, for example, defence expenditure has fallen over the last decade by over twenty per cent in real terms - but is still over four per cent of GDP; while in Europe the average figure is now around two and a half per cent of GDP - a fall of about twenty-five per cent since 1985.

IMPACT ON INDUSTRY STRATEGIES

The response by US industry to this downward pressure on defence spending has been quite dramatic. After a number of consolidations and takeovers, the mega merger of Lockheed and Martin Marietta to form Lockheed Martin, the largest aerospace and defence company in the world, took place last year. And early this year saw Lockheed Martin grow even stronger with its acquisition of Loral, making it a $US30 billion sales turnover company. An even more recent merger involved Northrop Gruman paying $US3 billion for Westinghouse's defence electronics interest.

If Boeing and McDonnell Douglas eventual merge, as I believe they will, an even bigger giant will be created than Lockheed Martin. British Aerospace, my own company, comes third in the global listing for defence and aerospace companies but with revenues of only about half that of Lockheed Martin and a third of a combined Boeing and McDonnell Douglas.

It is relevant to note at this point that these changes have been to the defence industrial base. It is also interesting to contrast the relative defence industrial positions taken up both in the United States and in Europe which, for the purposes of this comparison, includes the UK, France, Germany, Italy, Spain and Sweden.

The US position is that they will have no more than five military aircraft and helicopter companies, four if the McDonnell/Boeing merger takes place; five missile companies; two military vehicle (tank and armoured personnel carrier) companies and four shipyards. While in Europe, the present position is that there are ten military aircraft and helicopter companies, eleven missile companies, ten military vehicle companies and no less than fourteen shipyards.

So why this disparity? One reason is that all US companies are in the private sector. The need to satisfy shareholders has driven their efforts to obtain a larger piece of a smaller but still enormous defence procurement cake. And because the US defence companies operate within a unitary set of financial, legal and security frameworks, the impediments to mergers have been relatively few.

Moreover, US companies have become increasingly active in the global marketplace, especially in Europe, the Middle East and Asia. While US export initiatives are more company led than was the case five years ago, there is still very considerable US governmental support for aerospace and defence sales, involving even the president himself.

Such support flows on almost by the natural consequence of the US being the only real superpower left in the world. Its strongly bilateral security relationships endows it with an enormous customer base. Its foreign military sales and military assistance arrangements, coupled with a still large domestic market, make US industry a very formidable competitor in world markets.

THE CHALLENGE FOR EUROPE

In Europe, the situation is very different. Many industrial companies are still state owned and the larger nations have sought to retain as wide a range of capabilities as possible. European companies also operate within different financial and legal systems and differing industrial and procurement policies. The challenge for Europe, against the backdrop of what is happening in the US, is to create an environment for change which virtually matches that of the US. Despite some will to do so, there are real difficulties in rationalising European industry across national boundaries. At present there is only one world class European Aerospace group competing with the US on a global scale which is Airbus, a largely non-military based company. The experience of Airbus provides a precedent but not a blueprint for the development of the defence industries in Europe. I say not a blueprint because Airbus is not a plc and it may be a year or two yet before it becomes one.

Born in the mid-1960s, Airbus was created from the civil aircraft industries of France, Germany and Spain, and later the UK. Each of those countries had sustained a civil aircraft business consisting of two or more companies, each of which lacked critical mass. Their collective export achievement was limited and diminishing.

But having brought together the aircraft design, engineering and manufacturing skills of the four partner companies, it allowed the development of those skills to the extent that few would now argue that Airbus is not a serious competitor, even to Boeing.

But the civil aircraft industry is not necessarily a good model for defence, and there are those who argue that a consolidated European defence industry cannot properly be created without the umbrella of a common foreign and security policy. While there is some logic to this argument, I believe that the key factor which will drive Europe's defence industries to consolidate along US lines will be the hard-nosed commercial recognition that there is simply no other option if Europe is to retain its prime contractor and systems integration skills and upon which present success in global markets largely depends.

THE WAY AHEAD IN EUROPE

So how should Europe proceed? Certainly in the UK, defence procurement policy is similarly based to here. 'Value for money' is paramount and competitive forces are used to drive down capital procurement costs.

However, the 'value for money' concept has been used in the UK as a reason for the Ministry of Defence to buy off-the-shelf. And from where? Because expensive R&D can be amortised over lengthy production runs, the US has been a natural first choice. The continued application of a rigid competition policy would have an increasingly damaging effect on UK defence industrial capabilities. A balance is therefore called for and there is the need for government and industry to work together in formulating a defence and aerospace industrial strategy.

Does all this sound familiar in Australia? If it does, then probably industry here has also had its problems in adapting to the need to rationalise and restructure. In Europe certainly, it is essential that major restructuring takes place quickly to allow the economies of scale necessary for industry to properly compete and collaborate with the US on an equal footing.

The best way, in my view, of achieving this is for governments and departments of defence to encourage industry to undertake structural alliances - mergers not just

joint ventures - based on the consideration of relative capabilities and other aspects of industrial logic. Industry must lead this rationalisation process but it should do so because it knows that procurement will be opened up to the most efficient producers in Europe. All existing competitors will then seek to form lasting alliances to secure for themselves and their chosen partners the greatest chance of being just that - the most efficient producer.

For those who believe that Europe can never hope to challenge the growing dominance of the Americans in the defence and aerospace market, that it is unrealistic to aspire to the same levels of technological capability, and that it should therefore procure US products on the best possible terms, let me counter by once again citing Airbus as an example. Twenty-five years ago the US dominated the market for large commercial aircraft, far more thoroughly than anything currently achieved by US defence companies. Since that time Airbus has risen from nothing to achieve a world market share of around thirty-five per cent.

It could yet go on, once a plc, to challenge Boeing for market leadership. And it has achieved this position in spite of the formidable barriers to entry associated with such a business.

PARTNERSHIP WITH INDUSTRY

The need for departments or ministries of defence and industry to work more closely together than in the past is, I have argued, now self-evident. This 'partnership' should begin with the formulation of staff targets and operational requirements and include the identification of technology and other risk reduction programs, cost/performance trade-offs, and the harmonisation of resources spent on research. As much emphasis must be given to designing-in reliability and maintainability to new equipments as to satisfying cardinal point performance criteria. Cost of ownership of life cycle costs is a fundamental driver, and both sides of the partnership have a role to play in forcing these down to a minimum.

Part of that process will be to determine the best interface between the service and industry in terms of providing the most cost-effective integrated logistic support of new weapons systems. This need is as important for the RAAF as it is for the RAF or any other advanced air force. Perhaps the main difference here is that the home market is much smaller than in the US or in Europe, and thus perforce your industry will need to create strategic alliances or joint ventures with companies from other parts of the world. This is all part of the partnership and interdependence process, which in my view still has a long way to run. Certainly my company, BAe, intends to extend its industrial relationships well beyond the boundaries of Europe and the US, and in this context, many of you will know that we have recently added to BAe Australia both AWADI and the armoured vehicles business of Shorts.

If the partnership between the services and industry is to thrive, the supplier has got to know and understand the 'customer' - in this case the RAAF - better than he has in the past. There will, of course, always be an element of conflicting interest in the relationship, but both sides will benefit from the mutual understanding and respect that should flow from constant dialogue and closer cooperation. One of the five values underpinning our vision and mission in BAe's corporate change program is 'customers', not just external but internal as well. We are dedicated to improving customer support for our products, and we have identified the behaviours, actions and

measurements to implement the important 'customer value'. We shall, of course, apply this process here in Australia, with the RAAF hopefully a prime customer.

SUMMARY

Let me briefly summarise. The future is both exciting and challenging, in terms of exploiting existing technologies and developing new ones, within budgets that are likely at best to remain constant when allowing for inflation. The changing geopolitical situation - from the relatively stable and clearly defined Cold War scenarios to a multiplicity of potential threats in an unpredictable world - calls for armed forces that are more mobile and flexible, and capable of fighting at any level between high intensity war and peacemaking. It also calls for such forces to work more closely than ever before with their partners in industry.

Air power, with its ubiquity, responsiveness, reach and punch, is ideally suited to this new world order. It has, I believe, already become the natural first instrument of power, and it is a truism, whether sailors and soldiers like it or not, that he who controls the air can dominate the battlefield and ocean as well. It is not too fanciful to suggest that historians will look back on the year 2000 as a watershed marking the beginning of the aerospace power millennium. It may well also mark the point when air forces formed a true partnership with the defence and aerospace industry, for they will have a growing interdependence. That can only be to their mutual benefit.

INDUSTRY IN PARTNERSHIP WITH THE RAAF: AN AUSTRALIAN PERSPECTIVE

PETER SMITH

Air Marshal Fisher, distinguished guests all, thank you for this opportunity to contribute on behalf of the Australian aerospace industry to this conference which commemorates the seventy-fifth anniversary of one of the world's most distinguished air forces.

Air Chief Marshal Sir Patrick Hine has very ably traced the trends in international aerospace, so it is my turn to talk about the relationship between the Royal Australian Air Force and the Australian aerospace industry. This is a relationship that really started as the storm clouds gathered just prior to World War II, so it spans sixty of the seventy-five years of RAAF history. As a personal aside, I am stunned to realise that after thirty-two years in the Australian aerospace industry, I have been around for more than half the period of partnership!

My purpose today is threefold: first, to talk about the past relationship, tracing its history and illuminating its lessons; second, to outline the present relationship and its strategic policy basis; and third, to look to the future and the continuing changes we may expect to see to the benefit of both partners.

AN OVERVIEW OF THE RAAF/INDUSTRY RELATIONSHIP

The partnership between the Royal Australian Air Force and the Australian aerospace industry has been both constant and constantly changing. For the industry's entire existence, the RAAF has been its primary customer, and the main reason for the industry's existence has been to provide an appropriate measure of indigenous self-reliance.

What has changed over the years has been the nature of industry's role in the partnership and its contribution to self-reliance.

The late 1930s and the years of World War II saw industry gearing up for the first time to produce military aircraft. It did so as an essential partner, producing aircraft for the RAAF at a time of great international peril when overseas sources of supply were sorely tested by their own air forces needs, and it is arguable that the RAAF simply would not have been able to obtain the aircraft it needed without an indigenous industry.

The latter part of the 1940s was a period of contraction and transition from the huge employment base of wartime, but one in which the RAAF on its side of the partnership recognised the need to maintain the core of an Australian aircraft industry to provide assurance of supply and self-reliance as the Cold War loomed.

The 1950s, combining the Korean War and the Cold War, were a period in which the partnership was a close and productive one, with the industry producing a wide variety of aircraft including trainers, fighters and bombers in the considerable quantities required by the RAAF

The 1960s continued the golden age of local aircraft production with a new generation of fighters and trainers of greater sophistication and capability. The relationship continued to involve the total production of aircraft, engines and most

systems in this country, with the industry totally committed to production to the RAAF, and by implication totally dependent on it for its economic health and continued existence. Changes were occurring in terms of project structures, with companies being required to team on projects rather than undertaking them entirely in-house.

The 1970s were a time of famine for the industry in manufacturing terms, caused by the fundamental changes in manufacturing economics, with the high costs of establishing production simply not affordable when measured against the smaller number of more capable aircraft required. In defence terms, the local industry turned increasingly to a maintenance and modification role, an essential but unglamorous role which did not sit well with the manufacturing tradition of the industry.

The 1980s saw a return to large scale manufacturing and assembly, but on a more selective basis with the economics of local involvement becoming a major consideration and the concept of appropriate Australian Industry Participation (AIP) becoming a dominant theme, focused on developing ongoing indigenous support capabilities. In addition, improvements in maintainability and reliability of aircraft and systems changed the interface between RAAF in-house maintenance and industry's overhaul role.

The 1990s have seen dramatic change. The traditional manufacturing base for defence purposes has undergone a 'swords into ploughshares' transition, and now occupies a significant civil airliner niche, while the industry's defence role focuses on systems integration, life extensions, upgrades and long term support, reflecting the needs of the RAAF in the contemporary strategic environment.

The change is continuing, as is the partnership. It is arguable that the current relationship between the RAAF and the Australian aerospace industry is moving to a new stage of maturity which will see industry's defence role defined on a longer term basis than has traditionally been the case. The longer term nexus between initial Australian industry involvement and long term comprehensive support, when combined with clearer statements of strategic industry priorities and a philosophy of contracting out non-core support activities, has the potential to minimise the workload peaks and troughs which have traditionally bedevilled the aerospace industry.

EARLY DAYS

There have been people building aircraft in Australia since Duigan and Taylor around 1910, and Australian-built aircraft joined the RAAF within a year of its formation. Six Avro 504K trainers were assembled at Mascot by the Australian Aircraft Engineering Company in 1922.

There was then a considerable gap until the early 1930s before any other types started to enter RAAF service. The early types were almost invariably training or light transport aircraft of wooden construction, and the majority of them came via the Australian subsidiary of de Havilland Aircraft, located on Mascot aerodrome. De Havilland also assembled and part-manufactured civil aircraft in Australia at the time, and civil and military types were almost indistinguishable.

Others came from the initiatives of Australian aviation pioneers intent on developing an indigenous industry capable of design and development. Lawrence Wackett was a leading light, as was Bill Air, and supporting many of them was Sir Charles Kingsford Smith.

Thirty-two DH60 Gipsy Moths built by Larkin in Melbourne in 1930-31 represented the first substantial production run for the RAAF by Australian industry. The only other notable production run was a total of six Wackett Gannets built by Tugun and CAC under Wackett.

None of the other enthusiastic efforts ever reached series production, and the names of most of the companies are known only to aircraft history buffs - Tugan Aircraft, Codock, the Australian Aircraft and Engineering Company, Kingsford Smith Aviation, and Larkin Aircraft Supply Company. They stand today as a monument to the early and continuing enthusiasm of Australians to develop indigenous aircraft designs.

PREPARATIONS FOR WAR

The year 1936 stands as a watershed in the partnership between the RAAF and Australian industry. It was in that year Essington Lewis, Managing Director of Australia's largest company, BHP, saw Germany's military industrial complex and became convinced that war was inevitable and that Australia needed an aircraft industry.

In a far simpler world than today's, he convinced the Prime Minister and Defence Minister of the need, assembled a consortium of backers, and founded Commonwealth Aircraft Corporation (CAC), with a launch order from the RAAF for the Wirraway trainer (based on the Harvard).

The Commonwealth Aircraft Corporation was set up at Fisherman's Bend with a combination of Australian, British and US companies as shareholders, and soon had developed significant capabilities for both aircraft and engine production. Headed by Laurence Wackett, an indefatigable proponent of indigenous design, it was soon working on its own designs and adaptations.

In Sydney in the same year, de Havilland started preparation for its transition from manufacture and assembly of general aviation DH Moth aircraft to light military trainers and transports which were to see service in both the RAAF and the Empire Air Training Scheme. The Moth Minor trainer was the first product of these activities. Initially based at Mascot, de Havilland was soon to move to Camperdown and Bankstown to work on the Mosquito.

In the following year, the Wimperis Report into aeronautical research and education in Australia recommended the establishment of an aeronautical research organisation and a university degree in aeronautical engineering. Both recommendations were adopted. The research organisation set up at Fishermen's Bend was run initially by CSIR, but ultimately became Defence's Aeronautical Research Laboratories. The degree course was set up at the University of Sydney, and became an important source of aeronautical engineers, including one RAAF Chief of the Air Staff and several Chiefs of Air Force Technical Service.

By 1939, the government had decided that it should set up a government aircraft factory to supplement the private establishments, and the Government Aircraft Factory was initiated at Fisherman's Bend, adjacent to CAC.

THE DESPERATE YEARS - WORLD WAR II

As was the case in virtually every other nation involved in the conflict, Australian industry performed extraordinary feats during the period 1939-45 to provide aircraft and support services for the Royal Australian Air Force and for other allied air forces.

Not surprisingly, given the threats that existed to Australia's supply lines, it was also the period in which a desire for defence and aerospace self-sufficiency became deeply ingrained in the minds of many Australians. In fact, although there were threats of disruption to supply because of conflicting priorities in the industries of major allies, no disruption ever actually took place.

The level of self-sufficiency achieved in Australia was remarkably high, considering how little capability had existed pre-war. While aircraft quality aluminium ingots were imported, the production of alclad took place in Australia as did the production of aluminium and magnesium castings, and ultimately a great majority of all airframes, engines and most instrumentation was produced in-country.

At the Commonwealth Aircraft Corporation in Fisherman's Bend Melbourne, Essington Lewis's vision had become a major aircraft production operation, starting with the Wirraway. Over seven hundred of these aircraft were produced between 1939 and 1946, primarily for training. A small number were used as fighters, particularly to defend Darwin, but they were underpowered and met only limited success.

From the time CAC was established, Wackett and his team were working on original designs, and the first to come to fruition was the Wackett Intermediate Trainer. About two hundred of these smaller Wackett trainers were produced between 1938 and 1942, adding to Australia's capacity to train pilots for the Empire Air Training Scheme.

Some creative work by the design team at CAC came up with the concept of the Boomerang fighter, sharing about sixty-five per cent commonality of parts with the Wirraway, but with much higher performance. Some two hundred and fifty Boomerangs were produced, adding an important element to the allies' fighter and anti-shipping capability in the South Pacific.

Alongside at the newly established Government Aircraft Factory, production was rapidly established on the British sourced Beaufort and subsequently the Beaufighter. A significant number of improvements were made in the Australian version, including the incorporation of new engines to replace the unreliable originals. Over seven hundred Beauforts were built, followed by three hundred and sixty-five Beaufighters.

Late in the war, production began at the Government Aircraft Factory of the Lincoln bomber, a four-engine aircraft adapted from the Lancaster which remains the largest aircraft produced by the Australian industry. Post-war production ultimately extended the run to seventy-three aircraft.

In Sydney, de Havilland Aircraft focused primarily on the production of aircraft with wooden structures. Over one thousand Tiger Months were built for the RAAF and the Empire Air Training Scheme. Almost one hundred Dragon light communication transport aircraft were built. The most ambitious wooden aircraft production effort of de Havilland was the construction of the Mosquito fighter/bomber, commenced in great secrecy and necessitating the adaptation of native Australian timbers in place of European originals. Including post-war production, over two hundred Mosquitos were built.

To supplement the prime aircraft manufacturers, a wide variety of Australian firms were coopted into the manufacturing effort. The car companies, particularly General Motors Holden, played a major role. The railway workshops from New South Wales, Victoria and South Australia figured prominently. When it came to wooden aircraft production, piano makers and even coffin manufacturers came into their own.

Substantial engine manufacturing business was built up, largely within Commonwealth Aircraft Corporation, which at its Melbourne and Sydney plants produced single and twin row Pratt and Whitney Wasp engines along with the Rolls Royce Merlin. Amalgamated Wireless Australasia was the principal Australian manufacturer of instruments, electrical and electronic equipment, coordinating a host of smaller companies.

In addition to the Wackett and Boomerang, there were a number of other Australian aircraft design initiatives during World War II which did not reach volume production. These included the CAC Woomera Bomber (two built), the CA-15 fighter (one built, the world's fastest piston engine aircraft to the time), and the de Havilland Glider (six built, but made obsolete by the Arnhem debacle).

At the peak of production during World War II, employment in the Australian aircraft industry exceeded forty thousand people. Today, there would be hardly one tenth of that number. Recruitment was difficult during the war, when the demands of the defence forces and other essential industries made skilled labour almost impossible to get. Some of the recruiting techniques owed much to the 'press gangs' of a previous century, but with good supervision and close quality control, the ends justified the means.

Early Post-War Years

Although there was a general phasedown of the Australian aircraft industry once the war had ended, it was not completely closed. Government listened to the arguments put by industry leaders that the capability had to be retained and the industry had to keep abreast of the rapid changes evident in aeronautical technology overseas.

To maintain capacity, the three major factories continued limited rate production, CAC on the Mustang, dH on the Mosquito and GAF on the Lincoln. Manufacture of the Rolls Royce Merlin continued at the CAC engine factory.

Of even more fundamental importance to the industry's future capability was the decision taken as early as 1946 for it to become involved in the licensed production of jet aircraft which had made their appearance in the dying years of the war.

De Havilland was authorised to commence planning for the production of the dH Vampire fighter. As had happened earlier on the Mustang and would later happen on the Sabre and Wessex, an alternative engine was fitted to provide improved performance in Australian conditions. As has been the case in other defence procurements, short term budgetary constraints meant that the Vampires were purchased in two lots, causing diseconomies of production and procurement.

Overall, the second half of the 1940s saw the Australian aircraft industry much reduced in capacity, but planning to take its capabilities to support the RAAF into the jet age.

The Golden Years of the 1950s

The next twenty years represent the golden age of aircraft production in Australia, with almost constant production encompassing licensed manufacture, major adaptations and indigenous designs. There were occasional disappointments when Australian design proposals were not accepted but, with the exception of a hiatus around 1960, a relatively constant stream of aircraft and engines came from Australian industry production lines for the RAAF.

At CAC, planning with the RAAF for a new basic trainer had begun as early as 1948, and the Winjeel entered RAAF service in 1955 and remained there for more than twenty years. The Winjeel was an early instance of shared industry production, with the wings being built by de Havilland.

Concurrently, CAC was contracted by the RAAF in 1951 to produce a much modified version of the North American F-86 Sabre, continuing the NA relationship which started on the Wirraway and continued on the Mustang. The CAC Sabre was fitted with the more powerful Rolls Royce Avon engine, necessitating major fuselage modifications. A total of one hundred and eleven were built, finishing in 1961. The Avon was also used in the GAF Canberra, improving the economics of engine production by CAC.

The GAF production of the English Electric Canberra followed soon after Lincoln manufacture finished, with an order for forty-eight aircraft placed in 1950 and production continuing to 1958.

The Government Aircraft Factory also embarked at this time on the design and development of one of the longest running aircraft projects - the Jindivik pilotless target aircraft which first entered service in 1951 and continues in production today.

At de Havilland, production of one hundred and ten Vampire trainers followed Vampire fighter production from 1952 to 1961. Some efforts were made to sell the aircraft to regional nations, but these were not successful

Although records are scarce, it appears that local production involved little in the way of cost premiums, with the dH pricing for export Vampires understood to be within five per cent of the UK version.

More Golden Years - The 1960s

Production of the Dassault Mirage III fighter brought the Australian aircraft industry into the supersonic age, and confirmed the 1960s as the decade of shared production among the three major Australian firms.

The Mirage III was chosen as the RAAF's new fighter aircraft in 1961 after a fierce competition, and a series of orders ultimately totalling one hundred and sixteen aircraft were placed. GAF was the prime contractor undertaking fuselage manufacture and final assembly, with CAC building the wings and the Atar engine. Hawker de Havilland was a minor participant, producing the auxiliary power unit. Production was largely complete by 1968, but continued at a low rate to 1973.

The Macchi 326H jet trainer was originally selected in 1965 to be the RAAF's all-through training aircraft, but this concept was later dropped and the aircraft was used mainly as an advanced trainer. A total of ninety-seven aircraft were ordered, eighty-seven for the RAAF and ten for the RAN.

Commonwealth Aircraft Corporation was designated prime contractor, producing the fuselage, carrying out final assembly and building most of the engine. Hawker de Havilland built the wing, the landing gear, hydraulics and some engine components. GAF's contribution was limited to the canopy.

Production of the Macchi 326H ceased in 1972, but a significant Lotex (Life-Of-Type Extension) took place in the early 1980s to extend the fatigue life. The type continues in service in a lead-in-fighter role, limited by the fatigue criticality of the airframe and necessitating a replacement by 2000.

The winds of change were already starting to blow in the Australian aircraft industry in the 1960s. Projects were shared, and particularly at HdH manufacturing workload was increasingly supplemented by maintenance and modification activities.

The re-engining by HdH in the late 1960s of RAN Wessex helicopters to improve performance in Australian conditions followed a long tradition of such modifications, but this time took place on an aircraft originally supplied from overseas.

FAMINE AND CHANGE IN THE 1970S

By the early 1970s, the change was clearly evident. Both the Mirage and Macchi production lines finished and no replacement programs were in prospect. The major procurements of the late 1960s and early 1970s were the F-111 strike aircraft, later versions of the P3 Orion ASW aircraft and the C-130 Hercules transports, none of which was bought in quantities which made local production viable.

Unsolicited proposals were made for Australia to purchase aircraft such as the F-15 fighter and the Hawk trainer in order to join international production programs, but these were rejected as premature from the viewpoint of operational requirements.

The only military procurement to generate an Australian production program in the 1970s was the Army's Kiowa observation helicopter. After endorsement by government of an ambitious mixed civil/military project in 1971, this was cut back to a purely military program of fifty-six aircraft, completed in 1977. CAC was prime contractor, and both GAF and HdH were subcontractors.

The GAF Nomad project was endorsed by Cabinet as a modest contribution to retention of local design and production capability, although its economic viability was adversely affected by small funding releases by the government and GAF/ASTA's[1] inexperience in managing an essentially civil project. The Ikara missile for the RAN, RN and Brazil provided some workload, but it was evident that a major review of the industry's role was essential.

A series of studies was initiated, commencing with one by Sir Charles McGrath in 1971 which recommended industry rationalisation, a solution that the government was not willing to impose and industry shareholders were not willing to undertake voluntarily.

The most comprehensive review was undertaken by the Industries Assistance Commission in 1974-76. After two years of hearings and studies, the IAC recommended a rationalisation which designated GAF as military aircraft prime contractor, CAC as military engine prime, and HdH as primarily a maintenance organisation and manufacturing subcontractor. With no significant military programs in prospect, the rationalisation was given little more than lip service within the industry, and was largely ignored when the next round of procurement commenced in the 1980s.

Probably of more consequence to industry development and its ability to support the RAAF was the decision in 1970 to institute an offsets policy for both civil and military aircraft purchases.

In both cases, the underlying principle was that manufacturers of overseas sourced aircraft would provide Australian industry with opportunities to bid for manufacture of components and sub-assemblies for world markets, in quantities greater than those required for Australian needs, thus improving economies of scale and providing longer term production runs and stable employment. No subsidies were to be

[1] Aerospace Technologies of Australia (ASTA) took over the operations of GAF in July 1987.

paid, unless desirable ongoing support capabilities were set up, in which case some modest premiums on non-recurring costs might be considered.

Military offsets commenced on the RAAF Boeing Vertol Chinook purchase in 1970. This involved some particularly complex machined assemblies, and justified company funded upgrades to ageing machine shops, taking the Australian aerospace industry into the age of numerically controlled machining. In fact, some of these Chinook offset contracts continued until the early 1980s, developing and maintaining Australian expertise which was subsequently used on the F/A-18 project.

Civil offsets also proved a boon. Again, these were offered on a strictly competitive basis, and Australian industry demonstrated its ability to find important technology niches in which it became a significant international niche supplier.

Much of the multi-axis numerically controlled milling and carbon fibre composite manufacturing technologies applied to the F/A-18 were first developed on civil offset contracts.

In hindsight, the time had been reached by the 1970s when industry could no longer expect defence and the RAAF to take total responsibility for its continued existence and workload. Shrinking defence budgets and changing procurement cycles made this impractical and uneconomic.

The steps towards industry self-sufficiency in the 1970s were modest, and focused primarily on using mechanisms like offsets to reduce dependence on local production projects. The major industry firms remained on a cost-plus basis on defence projects, and to a first order the unutilised capacity costs of the industry were also paid by Defence and the RAAF. More fundamental change to the commercial and financial relationships were to wait another decade.

Another Golden Era - The 1980s

By the late 1970s, the Tactical Fighter Force project to replace the Mirage was gathering full momentum, and the RAAF and Australian industry were once again in full partnership exploring the industry redevelopment and self-reliance benefits to be gained from the contending fighter aircraft being evaluated as Mirage III replacements.

As a very active participant in the Tactical Fighter Project, I must say that it was typified by a high level of trust on both sides, clear objectives in terms of industry outcomes, and regular, confidential consultation.

The result was an Australian Industry Participation package on the F/A-18 which surpassed anything for many years. The government, recognising the need for a major upgrade of the Australian aerospace industry's technology base, allowed a premium of almost ten per cent on the total project cost in order to allow local content and offset participation by a wide range of larger and smaller Australian firms

The overall industry participation package was a complex one, with Australian industry, Defence, the RAAF, the overseas fighter contenders and their OEMs working together to achieve a careful balance of cost-effectiveness, contribution to ongoing support potential and industry workload.

The F/A-18 was Australia's first systems-intensive fighter, and the industry participation package focused heavily on the electronic systems, sensors and other role equipment, recognising that the ability to support and upgrade these was an essential element of self-reliance.

The F/A-18 AIP package announced in October 1981 formed the backbone of industry workload until the final aircraft was delivered in 1990. It resulted, as intended,

in a major upgrade of industry capability, but in terms of other industry objectives it fell short of expectations due to unpredicted changes in circumstances.

For a start, the export offsets were at a much lower level than anticipated. This was not because Australian industry was uncompetitive, but because peace had broken out in the late 1980s, and declining defence budgets worldwide meant smaller, slower purchases of F/A-18s.

Second, the much higher levels of reliability and lower maintenance requirements promised by the airframe, engine and equipment suppliers were actually realised, and maintenance workload was far lower than experience with earlier generation equipment had suggested.

This was further complicated by the blurring of the traditional lines between operational and intermediate level maintenance undertaken in the RAAF and depot level maintenance done in industry. It quickly became clear that more work could be done in RAAF facilities than anticipated, and industry facilities rapidly became starved for work, causing serious problems of retention of competence.

Now, little more than five years after the completion of F/A-18 deliveries, less than ten per cent of the support facilities set up under the initial AIP program are working on F/A-18 maintenance. The F/A-18 is being ably supported now, but there must be significant questions about our industry's capabilities to undertake deeper maintenance and repair activities as the aircraft pass into the second half of their life cycle and greater demands are inevitably made on industry.

Let me stress this is not a criticism of RAAF or of the Defence planners who set up the F/A-18 AIP program. None of us had the vision to recognise the fundamental changes which were quietly underway at the time. The important outcome is to learn the lessons of the F/A-18 and apply them in future.

The other significant aircraft and helicopter projects of the 1980s also fell short of their objectives in some way, despite the best efforts of all concerned, and there are lessons to be learnt from all of them.

The first of these was the A-10 Wamira turboprop training aircraft, cancelled just before first flight after major cost and schedule overruns. I will not go into detail about a project which still raises emotions beyond saying that the inexperience of all participants - Defence, RAAF and industry - in development projects led to under-estimates, micro-management and overdesign, an almost certain recipe for failure.

The follow-on project for licensed manufacture of sixty-seven Pilatus PC9/A turboprop trainers proceeded more smoothly under HdH's prime contractorship with ASTA as a major subcontractor (CAC was by then part of HdH). It demonstrated Australian industry's ability to undertake a prime contract role on a fixed price basis, reflecting the new contractual relationships which came into the industry in the mid-1980s. After an initial assembly period using components largely imported from Switzerland, virtually full airframe manufacture took place in Australia.

However, when it came to industry support for the PC9, there appeared to be a significant gap in the intended linkage of initial industry participation policy and support contracting. The competition to support the PC9 seemed to be based on criteria which meant that the knowledge gained by the initial manufacturing participants was not an advantage, quite the contrary of the original intent of using production to set up expertise in Australia for ongoing support.

The result was that the PC9 support contract went to a company with low man-hour rates, those rates being low not least because it did not have the engineering overheads associated with in-depth knowledge of the PC9 and its systems. Virtually

none of the people who worked on PC9 production subsequently became involved in support, and the considerable majority were made redundant at the end of the production program and left the industry.

Later in the decade, there were two helicopter programs which essentially reflected the new approach to Australian Industry Participation which was emerging with a primary focus on using the initial involvement to acquire skills and facilities required for long term support.

The RAAF/Army Black Hawk project involved the assembly by HdH of some thirty-seven helicopters in Australia and the installation and testing of all systems. The only Australian production was of change-prone items such as electrical harnesses.

The RAN Seahawk project involved similar assembly, installation and test activities, this time at ASTA, but also involved Australian engineers working at Sikorsky on design of the Australian specific role systems in order to gain knowledge to be used on later engineering support.

Once again, however, the linkage between initial involvement and ongoing support did not occur on these helicopter projects. The nature of the support contracts resulted essentially in a bodyhire arrangement where labour man-hour rates were the deciding factor, and few of the people involved in the original assembly and engineering subsequently transitioned to support.

Let me say that this particular problem has now been addressed. Recent initial procurement contracts have contained an ongoing support element covering a minimum of five years and up to ten years of operational service.

In addition to the major aircraft and helicopter projects, there were advances made in other areas of the partnership between RAAF and industry, particularly in areas reflecting the need to keep equipment in service longer while maintaining it at appropriate levels of operational capability at affordable prices, and adapting operational capabilities to suit changing needs.

The project to give RAAF Boeing 707 transports an aerial refueling capability was a significant example of Australian industry working with an overseas partner to provide the RAAF with a new capability. The core technology came from overseas, but all of the aircraft modification, installation and testing work was done in Australia.

The project to upgrade the avionics of the F-111C fleet involved a similar mix of overseas technology leadership and Australian industry involvement in a way that provides an ongoing support capability in-country.

An even more ambitious systems upgrade project that started off at the end of the 1980s was the upgrade of the ESM systems in the RAAF's P3C Orion maritime surveillance aircraft. In this project, an Australian prime contractor is managing Australian and international subcontractors in a challenging combination of hardware and software changes.

As the project nears the completion of testing and certification, substantially behind its original schedule, it contains some interesting lessons for the future as well as laying some groundwork for forthcoming upgrade projects. It seems in hindsight that the RAAF and industry (both here and overseas) did not fully comprehend the magnitude of the task, particularly in the software area. This is not a unique experience, as a look at experience on the Collins submarine combat systems and Seahawk role systems will demonstrate. Both the RAAF and industry in Australia have backgrounds primarily focused on hardware, and perhaps were not fully aware of the rate at which software was assuming a major role in systems performance.

To take a positive view, the lessons of the P3C ESM upgrade and similar projects have been learnt by both sides, and are already being applied on new projects such as the A/P3C upgrade. Australian industry is changing its skill mix to recognise the future needs of the RAAF.

To summarise the 1980s, they marked probably the final phase of aircraft manufacturing in Australia in the traditional fashion. For the first time, this manufacturing took place in a more arms-length contractual fashion with an emphasis on fixed price contracts and financial premiums only when clear ongoing support benefits were evident.

By the end of the decade it was obvious that the role of the industry was changing, with an increased emphasis on systems and away from platforms. This had implications for industry structure and skills which became even more obvious in the first half of the 1990s

FUNDAMENTAL CHANGE - THE 1990S

The first half of the 1990s have accelerated the trends which were becoming obvious late in the 1980s. There are at present no defence aircraft manufacturing projects underway in Australia, and none is likely for the remainder of the decade. We can expect that there will be local assembly and systems integration activities associated with the RAAF Lead-In Fighter, and perhaps the RAAF's Caribou replacement, the RAN's Anzac Ship helicopter and the Army's battlefield reconnaissance helicopter, but the level of local airframe content will be low, and the emphasis will be on systems integration.

With the emphasis on using initial assembly and systems integration to set up ongoing support facilities, these activities are increasingly likely to take place in facilities on the bases from which the aircraft will ultimately operate. We are moving to a point where it is possible to contemplate an Australian aircraft industry virtually without aircraft factories.

This systems integration role is already evident in the major current workload of the industry on such projects as the F-111C AUP, P3C ESM and A/P3C upgrade. It also forms the primary focus of the Australian Industry Involvement (AII) objectives of major new projects such as the proposed Airborne Early Warning and Control aircraft.

The focus is not only on systems in the airborne platform. There has been a considerable, and appropriate, recent emphasis on the ground based facilities to support the airborne systems including mission interpretation facilities, simulation for operational development and training, and systems engineering laboratories. Australian industry has played an increasing role in the development and operation of such facilities, with the development of the Invitation to Register Interest for the A/P3C being the latest and most ambitious of these activities.

The role of Australian industry in systems development and support has become more standardised on recent projects. Under the overall co-ordination of a prime contractor (usually but not necessarily from overseas), Australian industry has participated in the hardware and software development of the Australian specific systems, has participated in the systems proving, installed the systems in most of the aircraft after the prototype, developed, installed and operated the ground mission support facilities, and increasingly undertaken logistic support and training activities. Where appropriate, it has also developed specific hardware, particularly sensors optimised to regional conditions and defensive systems with indigenous source codes.

As the emphasis has changed from platforms to systems, the differentiation between the aerospace industry and other elements of defence industry has lessened. Increasingly, the systems work being done for the RAAF parallels the work being done for the RAN on ships' systems and for other elements of the ADF. This brings about desirable economies of scale and parallels the move to 'jointery' evident in the ADF.

Another major change in the early 1990s has been the increasingly widespread contracting out of non-core activities by the ADF under the impetus of the Commercial Support Program. This has added a wide range of on-base support activities to industry's traditional depot level maintenance role. It has also inevitably led to increasing geographic dispersion of company operations, changing the nature of the interface with the customer and modifying corporate structures.

Another current trend discernible at a policy level but not yet fully implemented in practice is viewing generic technologies across groups of projects rather than on a single project basis in order to seek economies of scale and continuity of expertise. This generic technology approach is particularly emphasised in areas regarded as of high strategic priority for self-reliance, such as C^3I, electronic warfare, combat systems and simulation.

This generic technology approach requires significant changes to planning and procurement both in Defence and industry. It requires industry to be involved in capability studies at an earlier stage and implies continuity of involvement for a single Australian organisation or grouping. This in turn requires industry to accept that involvement in early studies does not guarantee major local industry involvement in subsequent solutions and also necessitates long term contracting arrangements whereby value for money can be assured.

CHANGES IN INDUSTRY STRUCTURE

Sir Patrick Hine has already spoken about changes in the international aerospace industry, so I will refer only to Australian changes. It is little more than ten years ago (1985) that Australia had three large airframe manufacturers - CAC, GAF and HdH, mainly Australian owned, each employing between 1,500 and 2,500 people, and all bent on continuing in that role ad infinitum. We also had a thriving engine manufacturing and military engine maintenance activity.

Today, CAC has long disappeared, HdH concentrates almost entirely on civil airliner manufacturing with a modest military aircraft modification role, and Rockwell ASTA is much the same. Both have shrunk significantly.

Engine manufacturing has virtually disappeared, and military engine maintenance in Australia runs at a fraction of its previous levels.

Many of these changes were, in my view, inevitable, a consequence of a combination of changing procurement patterns, with smaller numbers of more reliable aircraft and engines staying in service longer. This pattern is world wide.

Set against this platform and propulsion decline is the rise of the electronics, systems and software houses. There are few, with the exception of Norman Augustine, who would have predicted a decade ago that the largest aerospace companies in Australia would be systems houses. That this is now the case reflects the changing nature of the needs of the air elements of our defence forces.

There are implications for employment, education and training. For instance, the most critical shortage facing our defence and aerospace industries today is in software engineers.

The emphasis on systems houses in Australia is in line with world trends.

Similarly, the increasing rate of integration and rationalisation of defence companies in Australia mirrors the world trend. Larger companies integrating complementary capabilities encompassing platform adaptation, systems integration, project management and long term support are a logical structure to meet the strategic defence priorities of the ADF, and reflect on a smaller scale the integrations which have taken place in North America and Europe.

In aerospace, and in other priority defence sectors in Australia, we are inevitably seeing a trend to a smaller number of more capable firms who will act as the principal Australian contractors and industry leaders on major projects.

This reduction in the number of potential Australian bidders on projects causes concern among some customer representatives who see competition as the logical way to assure value for money, but other nations have long since accepted that the benefits of increased depth of capability in fewer national firms justify the development of other forms of contracting to assure good value.

Unless we develop larger, more capable firms in Australia, we will not be able to maintain a cost-effective level of self-reliance in areas of strategic priority. Nor will we be able to take a defence industry leadership role in the region.

The Future RAAF/Industry Partnership

Let me now try to provide a perspective of the future partnership between the RAAF and Australian industry.

I have no doubt that on its side, the RAAF will continue to be one of the most professional air forces in the world, achieving demonstrable superiority against any credible level of threat by utilising relatively small numbers of constantly updated, high technology platforms fitted with state-of-the art systems and weaponry tailored to the Australian environment, flown by highly skilled pilots, utilising C^3I systems and defensive systems superior to any potential adversary.

From consideration of this future perspective of the RAAF emerges a matching industry profile to meet the strategic self-reliance needs of the RAAF. This will be a longer term perspective, with the increasingly capable Australian industry involved in capability studies at an earlier stage in defence planning.

The industry will continue to increase its emphasis on an ability to enhance Australian defence self-reliance by improving its capability to develop, adapt, update and support airborne systems, weaponry, and defensive systems. In doing so, it will increasingly focus on systems integration, acquiring hardware and software from the best worldwide sources, tailoring it into systems matched precisely to RAAF needs.

It will continue to develop hardware when this can be done competitively or when available options are sub-optimal for Australia's operating environment. Such hardware will increasingly be marketed internationally, particularly into nations with operating environments similar to Australia's. This marketing will be facilitated by increasing strategic alliances between Australian industry and major international defence firms.

Its platform focus for the ADF will increasingly be on adaptation, systems installation and testing because the quantities of platforms acquired are unlikely to justify economic Australian manufacture.

This situation could change if regional cooperation moves to the point where Australia and regional air forces are able to harmonise procurement to the point where

the quantities justify collaborative regional industry programs. To achieve this desirable goal will require close cooperation between Australian defence industry and government.

It will provide comprehensive capabilities for continuing maintenance and upgrading of platforms and systems, both hardware and software. Increasingly, these activities will take place integrated with the RAAF's operational units. Large defence aircraft factories will be a thing of the past, and the typical firm will be more geographically dispersed with single project activities increasingly located on customer bases. Generically common activities will be located at the corporate core, and increased use of multi-media, broadband interactive communications will allow remote access to common data bases.

The role of industry in taking over support activities from the RAAF, initiated by CSP, will continue to gain momentum. Increasingly, there will be integrated RAAF/industry teams working together.

There will be a continuing increase in industry's role of providing and operating simulation facilities for training, operational analysis and systems development. Increasingly, the simulation will include networking of individual simulators in order to allow inter-operative training.

Industry will also take an increased role in providing logistic support to the RAAF. In addition to improving its integrated logistics support capabilities, it will increasingly acquire and hold inventory, reducing RAAF investment.

The need to maintain competitiveness in an internationalised industry will lead to further integration and rationalisation of the Australian aerospace and defence industry. A smaller group of larger firms will emerge capable of acting as prime contractor and project manager on major projects, leading appropriate groupings of specialist Australian organisations (including, very importantly, DSTO) and overseas partners. In some cases, those overseas partners will be shareholders, committed to allow the Australian firms to meet Australia's defence needs and willing to make the investments necessary to achieve this.

The major Australian industry firms, with their increased critical mass and greater depth and breadth of strategic technologies, will play an enhanced role in major defence project management, increasingly as prime contractor. This will both reduce the project management load on Defence in-house resources and increase the effectiveness of comprehensive, long term support within Australia.

These larger firms will enter into longer term, strategic relationships with the RAAF, with their specialist Australian subcontractors, and with their overseas strategic partners. These strategic alliances will provide improved assurances of continuity of industry workload in priority technologies in return for industry guarantees of continuing competitive performance.

As Australia deepens its political and defence relationships with regional nations, the Australian industry will increasingly form regional industrial linkages, not just as a supplier but as a partner in defence industry development throughout the region.

The partnership between the RAAF and the Australian aerospace industry has been the foundation of the industry since it was formed. The nature of the partnership has changed, and will inevitably continue to change as Australia's strategic environment and RAAF's needs change. I am confident that Australian industry will increasingly demonstrate its ability to be an efficient, innovative and responsive partner to the RAAF into the future.

DISCUSSION

Air Chief Marshal Sir Michael Graydon: Listening to the two presentations, I got the impression that Sir Patrick Hine was asking for an industrial strategy to emerge, while Mr Smith believed it was going to happen anyway; that there would be some form of integration between the Royal Australian Air Force and industry. Could you comment, please?

I would also like to focus on the three issues that I feel the services need to pursue with industry. These are the three. A nation needs strategic capabilities; needs to guarantee that it can do certain things. Whilst I would accept the increasing interdependence between some nations, at the end of the day, you must have some core strategic capabilities. For example, if you are a nuclear power, then surely you need to retain nuclear design capabilities. What in your view are those core strategic capabilities in the aerospace world?

My second point concerns logistic support. There are two extremes to this: at the one end, total support from industry; at the other, a service doing its own thing. What, in your view, is the appropriate balance between a service retaining capabilities in logistic support - for example, having to deploy long distances and support itself for long periods of time, rather than relying on at-home support?

And the final area concerns what I call third-line. You talked, Mr Smith, about how you see that developing, but I would confess to some concerns in the face of the monopolies which are building up today. An air force faced with a monopoly is, in fact, increasingly at the mercy of that company. Now, that is not to say that the relationship cannot be a good one, but I personally am a lot more comfortable with retaining a certain level of third-line support. What, in your view, is the optimum level?

Air Chief Marshal Sir Patrick Hine: Let me take the industrial strategy first, Mike. If we narrow it down to the UK for one moment, there are really only two ways that we can go in the longer term. One is to accept that we will never have the length of production runs, even in Europe, to compete successfully with the megagiants that we are seeing formed in the United States. In which case, I think the Ministry of Defence and the nation has to accept that in the longer term, the prime contractorship, systems integration skills, the ability to update major weapon systems, is likely to wither on the vine. And combat aircraft is one of those areas, incidentally, where I think we in Europe need to keep those prime contractorship systems, integration skills and the ability to update major weapon systems. The alternative to becoming increasingly reliant on the Americans is to do far better in Europe in terms of rationalisation than we have so far. And the best way that I can see to do that is through a process of horizontal-type integrations, sector by sector - one of those sectors being military combat aircraft, another being weapons, another could be military aero engines and avionics, and so on.

Now, the problem is we have to get from where we are today with an industry that is not well coordinated across Europe, to where we see we need to be in, let's say, ten years' time. I think we in the UK have made ourselves pretty lean and mean as a result of all the pressures that have come on industry from the Ministry of Defence over the last ten years. So we are in a good position to lead that process, if you like. But it can only be done around programs, because you have to take something to the table if you are negotiating with French, German and Swedish companies, all of whom

have got their domestic customer on-board in terms of one or more major programs. And that is the difficulty we have. If you have a long term policy in the UK to maintain a really healthy defence industry, there will perhaps be a premium to be paid. I don't know what that is - ten per cent, fifteen per cent - one would need to set a maximum in order to go through this rationalisation process, of merging sector by sector, in the way that I have described.

Mr Peter Smith: We're a double act here. Sir Patrick is talking about the macro view and I keep barreling in at the micro level. Let me say, Sir Michael, that in fact there has been a robust and I think very constructive debate in the Australian environment about the strategic priorities of those essential enabling technologies by which industry will support the Australian Defence Force. This goes back to the early 1990s, and there is an agreement on focusing on areas such as surveillance and intelligence, command and control, electronic warfare; all areas where Australia wants to have an indigenous capability, because these technologies are the heart of the sensor developments of your defence posture. Once you go from there, you start looking at the ability to modify and update combat systems, the ability to modify the platforms themselves, but particularly the ability to modify those operating systems and role systems on aircraft, helicopters and, increasingly, similar systems on ships. I would have to pay tribute to those in the Air Force who've just put out the Airborne Early Warning and Control invitations to register interest to industry, because there is a very well constructed set of priorities for industry contained in that.

The challenge that still faces both industry and defence, and the air elements of the defence forces, is to link together the generic elements of capability, project by project, so that you have a totality which gives depth and continuity to industry's activities. But in terms of the strategic priorities, I think that the debate in principle is over. The debate is now about the implementation in practice.

Sir Patrick Hine: Can I come back to the integrated logistic support issue that you raised, Mike? In Eurofighter 2000, you'll be dealing with a very different kind of weapon system than that represented by Tornado. It is probably the first truly fully integrated weapon system that the RAF has ever had, with something like 1.3 million lines of software code, for example. And incidentally, on a Nimrod 2000, it would be over two million, and on the follow-on offensive aircraft, about four million. So the whole concept of in-service support, and the most cost-effective in-service support, and the division of effort between the service and industry has got to be worked out with considerable care. There are, for example, some very expensive items of ground support equipment - including, in the case of the Eurofighter, the mission support centre - which we have developed at Warton, and which you can duplicate, certainly as another static system in-service - but at considerable cost; perhaps as much as sixty million pounds for that one particular system. So I think we need to sit down together and identify where these major expensive pieces of GSE should be, and whether it wouldn't be best for your people involved with mission support to be collocated with ours at Warton where the facility already exists. It is a question of dialogue, and we're a long way yet from identifying what is the most cost effective overall integrated logistic support system for that particular product.

Linked in with that is your question of third-line. It does seem to me that the Royal Air Force, particularly on fighter combat aircraft, which have to deploy at short notice around the world, will need to retain their first and second line capabilities.

There may be some way in which industry can help on-base with second line capabilities, but by and large you're going to need to retain that level of capability. Third line, I think, is arguable. There it really is a question of, once you have ensured you've got sufficient manpower to bring the squadrons up to a wartime establishment level, whether you need additional blue-suiters, or whether the third line function can be fulfilled more cost-effectively by industry. I think you have to do some kind of value-for-money analysis.

Air Vice-Marshal E.M. Weller: Could I just tease a little more out of the strategic bit with Peter? I think we owe a lot to Mr Price and Mr Dibb for the guidance they've given us, in terms of providing a base for self-reliance in this country, in modifying, updating, maintaining. I think where the services and industry have got to do a lot more is to come below that level and establish just what we do need, in a unique sense, within our industry here, for a self-reliant base.

Mr Smith: That's a very fair comment, Mac. You will find in my written paper that I talk about what is becoming an increasingly standardised participation role by industry in the major systems oriented projects, where you're talking about bringing an aircraft like AEW&C into service, or where you're talking about a major upgrade, such as on the AP3-C. And those roles involve a substantial participation by Australian industry in the development of the specific role architecture, whether indigenously in Australia, or in cooperating with an overseas partner.

But if you're going to modify that system in future, you must understand the architecture of it. You will want a substantial role in the development of the specific Australian software to drive that system, because that is going to be the thing that will change first. You will want a substantial involvement in the development and the operation of the ground-based facilities which support that system, whether for training, or for mission interpretation, or for operational development. You will want a substantial role in the physical installation of the equipment into the aircraft, so that you have the capabilities to both maintain and to change that system physically in future. And you will want a significant role in the testing of the ultimate system, in order to assure that you understand where the sensitivities are and where the critical elements of performance lie. So there is, I think, falling out of the programs, almost a standard role which will contribute in those initial activities and establish a capability for ongoing support from within Australia, of both the hardware and the software. Our experience has been that that is achievable with very little, if any, cost premium involved.

Lieutenant-General A.M. DeQuetteville: Gentlemen, I'd like to invite your comment on a couple of themes from your presentation, and ask you whether they might be in competition with one another. I'll use a Canadian perspective to illustrate my point. On the one hand, about four years ago we embarked on a program called COPWIN - Cooperation With Industry - which was designed very much, Sir Paddy, along the lines that you'd discussed, of developing generic requirements: inviting industry to get involved much earlier; trying to be less prescriptive (for example, not to describe the glass but simply say that you wanted something to hold water); and encouraging industry to be innovative. On the other hand, like most air forces, my own has been involved in the last two or three years with contractorisation, and there industry has been very much interested in taking work that can be better done in industry. My sense

is that the second one is easier than the first; that as industry has had to rationalise itself, it has tended to go down the second path, because it's easier to pick off the low-hanging fruit than to invest the intellectual firepower in helping us with the longer-term generic objectives. Would you care to comment?

Sir Patrick Hine: I can only comment from the perspective of my own company here. We are far more interested in the former issue that you raised, of discussing requirements very early on, at the conceptual stage, and then working out with the Ministry of Defence where their money on research should be spent, and where we, in industry - not just British Aerospace, but other major companies in the UK - should be spending our private development funds, so that we're not duplicating each other, which, at the moment, I'm afraid, is the case. That's where our main focus would lie.

As far as the sort of arms and legs work is concerned, providing engineering and supply support on individual stations, and this sort of thing, we really aren't very well constructed to do that, and the engineering skills that we have within the country are much more related to the design and development of new weapon systems, and manufacture, if you like, than to the servicing of aircraft. So we have not got deeply into the arms and legs business. We're certainly looking at it, but there are a number of companies in the UK who do it far cheaper, with lower overheads and so on and so forth. But I would hope that, more and more, industry, the major industrial companies, can be involved in the innovative process that you mentioned, because I think that's crucial. And we need to know if we should design to cost; if air forces can tell us roughly how much money is going to be available for a new system, then we can look at that, and come up with some proposals and cost-trade-off performance options and so forth, to enable us to get the best value for money. I think that is very much a partnership thing, rather than industry standing off until you've got a very clearly defined staff requirement.

I would add one thing to that, if I may, and that is, I still think that the military procurement process is a very bureaucratic one, and costly. For instance, I listened to a lecture in the United States only about a month ago where the speaker claimed that about half the money that was allocated in the US defence budget to the capital equipment program was actually being expended on the procurement system operated by Washington. Half the money. Now, that cannot be right. And when you look at the different procurement processes by, let's say, airline companies and ministries of defence, they're like chalk and cheese. What tends to happen with an airline company is that you agree to a specification, and that's very often a tailor-made specification, you agree to a delivery time, you agree to a price, and then industry gets on with it. Once that contract is signed, it's a hands-off approach to the delivery of that system. And as you look around the world, more often than not, probably about ninety per cent of the time, you get the deliveries on time, to spec, on cost; whereas, as you know, the step-by-step approach that's grown up over the years on military procurement programs is very bureaucratic, and there's a price to be paid for that, not just in terms of cost but in terms of late delivery. So I think we've got to make major improvements in that area.

Mr Smith: If I could just comment from the Australian perspective, it's also the case here that although the Australian industry has picked up a lot of commercial activity, my rough, top-of-the-head figures would indicate it still would represent only fifteen or at the most twenty per cent of the total workload of the Australian industry.

But it is interesting to look at the total workload and understand what is happening in the other eighty per cent. It is moving very strongly in the direction of what I would call intellectual property. If you look at the work that is being done in the industry, probably fifty per cent of the total involves the development of intellectual property and systems, either indigenously or in cooperation with overseas companies, tailored to the self-reliant needs of the ADF, with that heavy emphasis I mentioned before on C^3, on combat data systems, and surveillance and intelligence. About thirty per cent of the industry's workload would be more related to hardware for the defence forces, and about twenty per cent would fall in those support areas. Now that is not to demean that twenty per cent, because it does provide an important element of predictable base workload for the company, and the profits generated by that can be invested in new intellectual property activities. So low-hanging fruit is useful to take, but not fundamental to what I would regard as our strategic contributions to the ADF's self-reliance.

AIR POWER 2025

MARTIN VAN CREVELD

The purpose of the present paper is to try and divine the way that air power may look in the year 2025 or thereabouts. It is not intended as a prescription for policy-makers; on the contrary it assumes that, globally speaking and disregarding local variations, history will march in the direction indicated regardless of whether individual policy-makers agree or not. To accomplish its purpose, it is divided into four parts. Part I discusses the relationship between air power and the political organisation by which it is owned and which it has been used for the conduct of war, that is, the state. Part II, based on work previously done by this author,[1] looks at the direction in which future war will probably develop. Part III attempts to understand the likely fate of air power within the context provided by these developments. Finally, Part IV represents our conclusions.

I

The most fundamental single fact about air power - so fundamental that it is seldom even noted, let alone questioned or investigated - is that it is owned and operated by the *state*. From the beginning of the twentieth century, which is when it all began, to the present day no organisation other than the state has ever fielded an air force; conversely, no other organisation *could* have done so even if it had wanted to. Political organisations that are not states - for example, city-states, independent militias of the kind that used to battle each other in Somalia and Bosnia, guerrillas, and terrorists - do not air forces own. Thus the PLO has long been one of the most important and richest twentieth century terrorist organisations; yet the closest it ever came to owning an air force was when one or two attempts were made to reach Israeli targets by flying motorised hang gliders across the border with Lebanon. When the Lebanese civil war came to an end and the various militias that fought it were disarmed, the one commanded by Samir Jaja was found to own two light helicopters. The Syrians apart, these machines represented the sum total of air power employed by all sides - numbering some fifty different militias all told - in that long and extremely bloody conflict.

The reasons why no political organisations except the state have ever been able to develop air forces are obvious enough. First and foremost is the sheer expense and complexity of such a force.[2] A single modern attack aircraft, such as the F-15I, can

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[1] M. van Creveld, *The Transformation of War,* Free Press, New York, 1991, particularly Chapters 1 and 7; also *idem, Nuclear Proliferation and the Future of Conflic,* Free Press, New York, 1993. See also E. Luard, *The Blunted Sword: the Erosion of Military Power in the Modern World,* Tauris, London, 1988.

[2] The most comprehensive analysis of the rising cost of weapon systems, both absolute and relative to GNP, remains F. Spinney, *Defense Facts of Life,* Westview, Boulder, CO, 1986. For the cost of military aircraft see also M.A. Armitage and R.A. Mason, *Air Power in the Nuclear Age,* University of Chicago Press, Urbana, IL, 1985, pp. 252-53; for that of operating them N. Brown, *The Future of Air Power,* Holmes & Meier, New York, 1986 Chapter 12. K. Hartley, 'The Affordability of Air Systems', in Ph. Sabine, ed., *The Future of United Kingdom Air Power,* Brassey's, London, 1988, p.

cost almost one hundred million dollars if we include the kit - accessories and spare parts - with which it comes and without which it would be unable to operate. The price of an F-117 fighter, a B-2 bomber, let alone a JSTARS, is much higher still, running into several hundred of millions of dollars each. The machines in question are enormously complicated. The control system of one F-15 fighter engine (it has two) is said to consist of five thousand parts; whereas the number of different spare parts and items of equipment that have to be kept in store by a single air force base can easily run into the hundreds of thousands. Thus each aircraft must be supported by a vast organisation consisting of logisticians, technicians, air controllers, meteorologists, communicators, and so on, to say nothing of the billions upon billions of dollars that must go into the physical structures and equipment required. It goes without saying that such complexity can be managed, and such sums raised, exclusively by the organisation known as the state. In fact, so expensive and so complicated are modern air forces that they cannot be afforded even by the majority of states. Some three quarters out of the one hundred and eighty-five or so now existing on this planet do not have such an air force; and would not be able to construct one even if, for one reason or another, they wanted to do so in any kind of foreseeable future.

The other reason why air forces can only be fielded by states is the amount of space taken up by air bases, the vulnerability of aircraft, and the length of the runways they need in order to take off and land. Once in the air a combat aircraft is a potent instrument of war. It may be capable of flying at up to twice the speed of sound and of making the power of its weapons felt both against other aircraft and against ground targets; all this regardless of geographical obstacles and in some cases even if those targets are located thousands of miles away. So long as they remain on the ground, however, aircraft are extremely vulnerable owing to their relative immobility, the fragility of their structure (considerations concerning weight put strict limits on the amount of armour that can be provided) and the comparatively enormous quantities of fuel and explosive that, when ready for combat, they carry.[3] To be sure, history shows that airfields can continue to operate even when subjected to heavy air attack. For example, the Royal Air Force went on flying out of Malta throughout the period of the strongest German offensives in 1941-42; although, at times, the capacity of the airfields in question was greatly reduced, they were never quite shut down. On the other hand, no air base in history has been able to operate for long while subject to persistent artillery or rocket bombardment; which of course explains, if an explanation were needed, why such bases are normally located well in the rear where enemy forces cannot reach. In other words, any organisation which wishes to operate an air force in war will first of all have to exercise sovereign control over a considerable territory measured in hundreds if not thousands of square kilometres. That in itself is no mean feat, and indeed it is suggested that any organisation capable of accomplishing it would be a state or something very much like it.

Finally, the third reason why only states are able to operate air forces is because states have *borders*. During much of their short history the firepower which air forces were able to deploy was fairly indiscriminate. Either pilots were unable to locate their targets because the latter were mobile or because they were obscured by night, cloud, fog, or rain; or else they failed to hit them because the aiming devices with which they

109 shows that, after almost a decade of steady rearmament, the number of RAF operational squadrons was actually twenty per cent smaller in 1986 than it had been in 1977.

[3] For some figures and calculations see Brown, *The Future of Air Power*, p. 89.

were provided were simply not up to the job. During the strategic bombing campaign of World War II only one in eight of all bombs dropped reached its target; not seldom misses could be measured in kilometres. Thus, to be on the safe side, air power was best employed across some state border or, at any rate, on the other side of some bombing line laid out in advance. In other words, in such a manner that a miss, whether large or small, would affect the enemy rather than friendly forces.

Though modern sensors on the one hand, and precision-guided weapons on the other, have gone a fairly long way towards solving the problem of identifying targets and hitting them, that of separating friend from foe remains. That is particularly true if the targets in question are not sophisticated; in other words, if they do not carry the transponders necessary for answering a friend/foe query. Under such circumstances it remains true that air power, especially that represented by the fastest-flying and most powerful systems (attack aircraft, bombers, and cruise missiles) is best employed across some kind of border line or, at the very least, inside a clearly-marked zone which is guaranteed to contain nothing but people and property belonging to the enemy forces. Otherwise its use is likely to be counterproductive or, in plain words, to result in friendly casualties. This happened very often from the time of the Normandy Invasion in 1944 (when no less a personage than the commander of the US Service Forces, General Leslie McNair, was killed by friendly B-17s carpet-bombing the area which he was visiting) all the way to the 1982 Lebanon War (when an Israeli battalion was demolished by its own Air Force) and the 1991 Gulf War.

The above paragraphs already indicate why air power, besides being capable of being built, deployed, and operated solely by states, is useful primarily in the wars that those states wage against other states. Without exception, this basic condition applies to all the great air campaigns of history. For example, the various blitzkrieg offensives conducted by the Germans in 1939-41; the early Japanese offensives against Pearl Harbor, the Philippines, etc.; the allied campaigns against the German and Japanese forces; the Korean War; the 1967 and 1973 Arab-Israeli Wars; the Falklands War; the 1982 Israeli-Syrian War in Lebanon; and of course the Gulf War. Depending on the strength of the anti-aircraft defences and on numerous other factors, the usefulness of air power in each of these wars and its ability to affect ground operations, productive capacity, and civilian morale varied. By and large it was largest where the terrain was open and the ground forces mechanised; smallest, where it was closest and ground combat conducted by infantry assisted, perhaps, by artillery. Still there is no denying that all were greatly influenced by it. Not only did victory *always* go to the side that was able to obtain and retain air superiority, but some campaigns were decided by it.[4]

On the other hand, where the opposition with which air power is faced does not consist of states with territories that are comparatively large and borders that are clearly defined; when it consists not of regular, state-owned armed forces but of militias, guerrillas, and terrorists operating in a decentralised manner; where combat takes place in close terrain, as in jungles or mountains, and where the belligerents mix with the surrounding civilian populations so that friend and foe are virtually indistinguishable; under such circumstances the use of air power is, as experience shows, much more limited.[5] Had air power been decisive or even very useful, then the Nazis ought to have succeeded in putting down the partisans in Yugoslavia, Greece,

[4] 'In twentieth-century war defeat will almost always be avoided (and outright victory very likely gained) by the side that has secured air superiority', Brown, *The Future of Air Power*, p. 17.
[5] See also A. Gropman, 'Operations other than War', in this volume.

and many other places. The French ought to have defeated the insurgents in both Indochina and Algeria; the British, those in places such as Kenya, Cyprus, and Aden; the Americans, the guerrillas in Vietnam (where, in Operations Linebacker I and II, they *did* succeed in beating back the North Vietnamese attempts to invade South Vietnam by conventional means) and Somalia; the Soviets, the Afghanistani Mujahideen; the Indians, the rebels in Sri Lanka; the South Africans, SWAPO; the Israelis, Hizbollah in Lebanon; the Turks, the Kurds; and the Russians, the Chechnyan rebels. These cases only represent a small selection of the dozens and dozens which have taken place and could be cited. All have this in common: that command of the air was in the hands of the counterinsurgent power and was about as complete as one could wish it to be (although, in places such as Angola and Afghanistan, the insurgents had fairly effective anti-aircraft defences). In many of them it was employed ruthlessly, even to the point that, during the Vietnam War alone, the quantity of bombs dropped by the US Air Force was almost three times as large as that dropped on both Germany and Japan during the whole of World War II.[6] Even if we grant that the US Air Force could have done more to win the war in Vietnam if it had been given a free hand - which, contrary to the claims of its commanders, is by no means self-evident - the same does not apply to the Soviet use of air power in Afghanistan where there were few, if any, holds barred. In this case, as in others, air power did not lead to victory. Nor, by most accounts, did it even bring the Soviets close to victory.[7]

The long and the short of it is, the one organisation capable of a building a modern air force is the state; whereas the ability to use it effectively in war is critically dependent on that war being waged by one state against another. To put it in a different way, of the three services the air force is the one that is most closely associated with the state. Historically speaking many organisations that were not states have been able to conduct operations on land and were sometimes highly effective in doing so; as the recent revival of piracy in several parts of the world (particularly Southeast Asia and West Africa) reminds us, a few have even been able to operate sea power on a small scale. However, and with very minor exceptions such as the handful of hang-gliders, helicopters and light aircraft that are sometimes possessed by guerrillas and drug-traffickers, to date it is only states which have succeeded in developing air power, deploying it, and using it. Having done so, invariably they found that its main use was in fighting other states, whether in the air or on the ground; employed against organisations of a different kind it was found to be much less effective if not counterproductive. The principal reasons behind this situation are the cost of air forces, as well as their size and complexity. Next in line is the difficulty that they often experience in hitting their targets; especially if those targets are located in difficult terrain or among friendly forces and civilian populations.[8] Should air forces some day be able to do without the vast ground

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[6] The figures are: Europe, 2,000,000 tons; Japan, 153,000 tons; and Vietnam, 6,162,000 tons. R. Overy, *The Air War 1939-1945,* Europa, London, 1980, pp. 100, 120; E.H. Tilford, Jr., *Setup: What the Air Force did in Vietnam and Why,* Air University Press, Maxwell, Al, p. 282.

[7] For a short appreciation of the role that air power can play in war as waged against organisations other than states see O. Erez, 'The Role of an Air Force in Counterinsurgency', in M. Hugh and M van der Merwe, eds., *Contemporary Air Strategy,* Institute for Strategic Studies, Pretoria, 1986, pp. 19-26.

[8] The most recent demonstration of the problem was given by the Israeli Air Force in April 1996 when over a thousand strikes by the most sophisticated combat aircraft and attack helicopters fielded

facilities with which they are associated; should the vulnerability of stationary aircraft decrease and their ability to identify and hit targets from the air improve; in that case, perhaps, the situation will change. As of the present, however, the facts have spoken for themselves.

II

Given that air power is much more useful in some wars than in others - in war between states than in wars that take place between, or against, other kinds of organisations - which one of the two kinds represents the wave of the future? Obviously there can be no single answer to this question; from one part of the world to the other much will depend on geography, politics (both domestic and foreign) as well as economic, religious, and cultural factors. While this paper cannot presume to look at each region separately, it *can* take a global approach and look at the post-1945 period as a whole. Once the question is put in such a way it is capable of being answered. The answer that emerges is as clear as any that we are likely to obtain by looking at history, employing the historical method, and assessing historical trends.

The facts, then, are as follows. By my count, since 1945 there have taken place approximately one hundred wars.[9] Of these wars, fewer than twenty were full scale conventional affairs fought by states against other states with the aid of their regular, uniformed, armed forces. Of those that did fall within this category, the majority took place in just two regions: namely, the Middle East and South Asia. Depending on the way one counts, the former witnessed six conventional interstate wars (1948, 1956, 1967, 1969-70, 1973, and the three day clash between Israel and Syria in June 1982). The latter saw three wars between India and Pakistan (1947, 1965, 1971). These regions apart, conventional war has become a comparatively rare phenomenon. I count the Korean War (1950-53), the Indochinese War (1961), the Chinese Invasion of Vietnam (1978), the Falklands War (1982), the Iran-Iraq War (1980-88) and the Gulf War (1991). There have been numerous other cases when the armed forces of two states engaged in shelling or skirmishing as between China and Taiwan, China and the former Soviet Union, as well as India and Pakistan; however, few if any which led to full scale war. Given that, during the period in question, the number of states has increased almost four times over, these are astonishing figures. At the time of this writing in early 1996, out of approximately thirty wars that are being waged all over the world, *all* are fought either between organisations that are not states or against them.

As the names that are often applied to them - subconventional war, low intensity war, and the like - show, the members of regular, state-run, armed forces have long had a tendency to look down upon non-state conflicts, belittle them, and denigrate them. Given that the most powerful organisations and the most powerful weapon systems - including, specifically, air forces and their high performance combat aircraft

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by any country in history failed to prevent the Hizbollah guerrillas from firing their *Katyusha* rockets at northern Galilee.

[9] Definitions of what constitutes a war, and hence the number of wars, vary greatly. However, all observers are agreed that since 1945 wars between states have been greatly outnumbered by those that are fought between, or against, other organisations. See eg, K. J. Holsti, 'War, Peace, and the State of the State', *International Political Science Review*, 16, 4, 1995, p. 321 table 1; also P. Wallensteen and R. Axell, 'Armed Conflict at the End of the Cold War, 1989-1992', *Journal of Peace Research*, 30 (3), 1993, pp. 331-46.

- are usually absent from these wars such a tendency is understandable; objectively, though, nothing could be more mistaken than to regard the wars in question as small and harmless. In point of fact, they have proved far more destructive and far more bloody than the conventional ones; even to the point where there can simply be no comparison between the two. For example, Israel in all its wars combined only suffered some 18,000 dead; by contrast, and in spite of the fact that the Lebanese Air Force in 1982 consisted of a mere half dozen obsolete Hawker Hunters, the number of dead during the Lebanese Civil War has been put at 151,000. Depending on which side one decides to believe, the Algerian War against France cost the lives of perhaps 300,000-1,000,000 people. The Soviet campaign in Afghanistan is supposed to have caused the deaths of another 1,000,000 - how many have died in internecine fighting since the Soviet withdrew cannot even be estimated - whereas the independence and unification of Vietnam were bought at the cost of anything up to 2,000,000 dead. These are large figures indeed, but even they are exceeded by those of the Nigerian Civil War of 1967-69 which is supposed to have resulted in 2-3,000,000 dead. In fact, from 1945 on the only two conventional conflicts that even came close to matching subconventional war in terms of bloody casualties were the Korean War and the Iran-Iraq War. Judged by the standards of so-called subconventional war most of the interstate wars that did take place - such as the 1956, 1967 and 1973 Arab-Israeli Wars, the 1982 Falklands War, and even the 1991 Gulf War - have been mere skirmishes. The reason being that, in subconventional war, it was not only combatants but entire populations which were considered legitimate targets and, consequently, often butchered in large numbers.

Wars, though, are neither games nor sporting matches. Although casualties do matter, wars are not judged in terms of the number of points gained or lost; nor is it a question of counting the number of rounds fought as in boxing and various other competitive sports. Instead, to quote a dictum so famous that it is known even by those who have never read its author, war is the continuation of politics by other means.[10] This point of view obliges us to plan wars, prepare them, wage them and judge them by the political effect which they have on the international system. Take any other approach, and one risks reducing it to a game, a senseless thing, without an object.

Judged from the political point of view, the gap which separates conventional interstate war from subconventional war that is waged by, or against, other kinds of organisations is nothing short of momentous. Since 1945, the year when the Soviet Union took for itself chunks of German, Japanese, and Czechoslovak territory, there has not been a single case when an interstate war has caused an international border to be moved by as much as a single inch; which, considering that the UN Charter as the most subscribed document in human history explicitly forbids any such action from being taken, is perhaps not as surprising as it appears at first sight. Of the above-listed conventional wars *none* has led to territorial changes, at any rate such as were recognised by the international community as well as the belligerents themselves. Even the one apparent exception, ie, the 1948 Arab-Israeli War, is not really so. The borders of Palestine were fixed in 1920 by Winston Churchill in his capacity as Britain's Colonial Secretary. The 1948 war led to the country being partitioned; approximately one quarter of the total territory was occupied by King Abdullah of Jordan (Trans-Jordan, as it then was). However, the change was only ever recognised

[10] C. von Clausewitz, *On War*, M. Howard and P. Paret, eds., Princeton, NJ, 1976, p. 87.

by two countries, Britain and Pakistan. For the rest, no international border was affected by that war - or by the remaining Arab-Israeli Wars - and indeed the precise location of one of those borders is even now being contested by Israel and Syria.

Whereas conventional war has singularly failed to bring about territorial change, the results of subconventional war during the same period have been momentous. The largest, mightiest, and most sophisticated empires that ever existed have been brought down; causing hundreds of millions if not billions of people all over the so-called Developing World to change the regimes under which they lived. Contrary to what one might expect, the defeat and retreat of the empires in question were not brought about by vast fleets of tanks, naval vessels, and aircraft. Instead it was the handiwork of militias, guerrillas, and terrorists many of whom went barefoot and some of whom - notably in places such as Afghanistan - could not even read. The various movements that accomplished these feats did not amount to regular armed forces. Though often supported from outside they did not own large quantities of modern weapons, especially heavy ones, nor would they have been capable of operating such weapons even if, by some miracle, they had come to possess them. Above all, given that they did not possess large stretches of sovereign territory and often depended on stealth for their operations they were neither capable of running air forces nor desirous of having them. It would thus be no exaggeration to say that the most important wars fought since 1945 have been waged and won without the benefit of air power and, in a very great number of cases, in the teeth of everything that it could do.

The reasons behind the shift from conventional to subconventional war are, once again, not difficult to find and indeed they were foreseen with some clarity by several people active during the years immediately following World War II.[11] The period since 1945 has seen the introduction of nuclear weapons, first by one country and then by several others. As bombs and their delivery vehicles proliferated, for the first time in history the link between victory and survival was cut.[12] It became possible for a state to win a war and still face the risk of being annihilated; indeed the more decisive the victory the greater the danger that the vanquished, like Samson, would either press the nuclear button or, with his command and control system in ruins, fall on it. Under such circumstances any attempt to wage full scale war against an opponent who possessed, or was even strongly suspected of possessing, nuclear weapons and their delivery vehicles became tantamount to suicide. On both sides of the former Iron Curtain rivers of ink were spilt, esoteric doctrines designed, and countless wargames held, with the objective of finding ways to fight a nuclear war without necessarily blowing up the world. In the end, though, it became apparent that the one way to win this particular game was by not engaging in it.

With nuclear weapons slowly spreading to additional states it is no wonder that large scale interstate war tended to disappear and indeed the larger and more powerful any state the earlier and the more pronounced the inhibiting effect. Notwithstanding the very strong differences that separated them and the pronounced asymmetries that existed between them the US and the USSR never came to blows; by some accounts, particularly those written by former officials concerned to show how deeply responsible their own behaviour had been, they never even approached the point

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[11] See above all B. Brodie, *The Absolute Weapon*, Columbia University Press, New York, 1946, Chapter 1; also J. Viner, 'The Implications of the Atomic Bomb for International Relations', *Proceedings of the American Philosophical Society*, 90, January 1946.

[12] Much the best explanation of what becomes of strategy under such circumstances continues to be Th. Schelling, *Arms and Influence*, Yale University Press, New Haven, Ct, 1966.

where they were about to do so.[13] In both Europe and the Far East the superpowers' close allies, coming under the protective umbrellas offered (or, in some cases, imposed) by Washington and Moscow were almost as safe against all out military attack as were the superpowers themselves. Precisely because the armed forces fielded by those superpowers were the most powerful in history they took very good care not to engage each other directly. At most it was a question of doing so by means of allies or, as they were sometimes known, 'proxies'. Usually the proxies were Third World countries, located in parts of the world where nuclear weapons had not yet penetrated, and notable for nothing so much as their extreme military weakness compared to their patrons which handled them like puppets on a string.

As the example of both China and Israel shows, from the 1960s on any state capable of fielding reasonably large, reasonably modern conventional forces and weapon systems was also capable of producing nuclear weapons if it wanted to. First China and the USSR, then China and India, then India and Pakistan, and finally Israel and its neighbours were compelled to resolve their differences; if not to the extent of concluding full peace and engaging in brotherly love, then at any rate to the extent of refraining from full scale war against each other.[14] As a result, what conventional wars could still be fought anywhere around the world tended to be extremely limited, as the 1973 one between Israel and its neighbours was; or else had to involve third and even fourth rate military powers on at least one side. Put in other words, a strong argument can be made (and has been made) that the proliferation of nuclear weapons has been a boon to mankind. While clearly incapable of putting an end to all wars, at any rate they have prevented World War III from taking place. As of the last years of the twentieth century they seem to be well on their way to pushing large scale, conventional interstate wars under the carpet.[15]

When it comes to wars waged by organisations other than states, however, nuclear weapons are simply irrelevant. Though differing greatly among themselves, all such wars have this in common: that they tend to be waged at relatively close quarters. As Bosnia illustrated very well the enemy, instead of being separated from us by some international border and firing at us with the aid of long range weapons, is represented by our neighbour; he is located in the next town, the same town, the next neighbourhood, the same neighbourhood, even the same street, the same house, and the same room. Under such circumstances the use of nuclear weapons becomes preposterous - and the same is only slightly less true of the majority of heavy weapons and weapon systems, airborne ones specifically included. There thus exists a sense in which the spread of low intensity war simply represents the sound tactician's reaction to nuclear proliferation. Since the enemy, assuming he is in possession of nuclear bombs and missiles, is capable of annihilating any opposition provided only it is sufficiently far away, the logical method is to get as close as possible to him without being observed.

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[13] See above all Mcg. Bundy, *Danger and Survival; the Political History of the Nuclear Weapon*, Random House, New York, 1988, *passim*.

[14] For the effect of nuclear weapons on war in the two regions in question see M. van Creveld, *Nuclear Proliferation and the Future of Conflict*, Free Press, New York, 1993, chapters 3 and 4.

[15] Among the first to suggest that proliferation might be a blessing was K. N. Waltz, *The Spread of Nuclear Weapons: More May be Better*, Adelphi Paper No. 171, International Institute of Strategic Studies, London, 1980. His views, as well as those of his opponents, have been summed up very neatly in S. Sagan and K. Waltz, *The Spread of Nuclear Weapons: A Debate*, Norton, New York, 1995.

As has been stated in the opening paragraph of the present section, these developments affect various parts of the world to a very unequal extent. Partly because the proliferation of nuclear weapons is more rapid in some regions than in others, partly for other reasons, some countries are more likely to engage in conventional wars whereas others find that the main threat to their existence comes from organisations other than states. Globally speaking, nevertheless, the direction of change seems to be both uniform and easily understandable. Slowly, unevenly but inexorably nuclear proliferation is causing interstate war and the kind of armed forces by which it is waged to disappear. The future belongs to wars fought by, and against, organisations that are not states. Indeed in most parts of the world this form of war has already taken over. Recognising the fact, in March 1996 thirty-one heads of states assembled in the Egyptian town of Sharm al Sheik in a meeting formally dedicated to finding ways of coping with it.

III

In view of the ongoing changes in the nature of war, what has happened to air power and what can be expected to happen to it in the future? The answer to the first of these questions is loud and clear: compared to what they were fifty years ago, the majority of air forces have already all but disappeared. During a recent meeting at the World Economic Forum in Davos this author was on a panel with General (Ret.) Joseph P. Hoar, the officer who replaced Norman H. Schwarzkopf as COS, US Central Command, and who was consequently in charge when President Bush ordered America's armed forces to rescue the Kurds in northern Iraq from Saddam Hussein's clutches. In the course of a debate the general pointed out, quite rightly, that in the Gulf the allies possessed approximately 2000 aircraft and carried out as many as 2000 combat sorties per day without suffering a single collision.[16] Undoubtedly doing so represented a very great achievement; what the general forgot, or perhaps had never known, was the fact that on D-Day in 1944 the number of aircraft used was six times as large. In fact, during the period of the most intensive air operations in 1943-44, any day which saw *only* 2000 allied sorties over western Europe would have been regarded as a day wasted. To look at it in a different way, during each of the four years 1941-45 the US produced 75,000 military aircraft on the average. By 1995 the number purchased by all three services combined was down to exactly one hundred and twenty-seven - including helicopters and transports - and still falling.[17]

Though the details vary from one case to another, by and large the experience of the US Air Force has been shared by its counterparts in other developed countries. With few exceptions the story of air power during the last half century is one of constant downsizing; albeit that some services, particularly those of the USSR, China and Israel, latched on to the trend much later than others. The rest of the story may be found in any set of data being published around the world. The USSR, which during much of the Cold War retained a comparatively enormous air force (as part of an equally enormous military establishment) ended up by collapsing under the financial burden and is now reduced to offering its most advanced aircraft as tourist attractions.

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[16] For more detailed figures on allied air strength in the Gulf see P. Hine, 'Air Operations in the Gulf', in A. Stephens, ed., *The War in the Air 1914-1994*, Air Power Studies Centre, Fairbairn, 1994, pp 308-9.

[17] World War II production figures from Overy, *The Air War*, p. 150; 1995 figure from D.M. Snider, 'The coming Defense Train Wreck', *Washington Quarterly*, 19, 1, Winter 1996, p 92.

Though technically less advanced, the air force which Communist China built up during the fifties and early sixties also counted several thousand aircraft; however, it has since been cut back very sharply to the point that, as of the time of writing, the sum total of modern attack aircraft that it possesses is fewer than one hundred.[18] During the last decade or so even Israel, for a long time perhaps the most beleaguered single society on earth and one that always gave priority to its air force, has felt sufficiently secure to begin cutting back on the number of the military aircraft that it keeps operational.[19] To anyone who is at all familiar with the cost of acquiring and operating modern air forces these cuts do not represent a mystery. Looking back, and taking into account the overwhelming power of nuclear weapons only a few of which are needed to devastate any country, the mystery is rather why they were delayed for so long.

Nor is the diminishing number of major weapon systems produced simply a function of growing capabilities, as has often been claimed. It is true that, thanks to increases in power and also in accuracy - the latter, the direct result of developments in electronics - the destructive capabilities of air power have grown by leaps and bounds. However, this only applies to operations which are directed against undefended targets; or perhaps one should say that the various calculations that have been made ignore the strength of the opposition that is likely to be encountered. For example, much has been made of the fact that a modern attack aircraft can destroy a bridge, a headquarters, or a depot by means of a single laser or TV-guided 'smart' missile instead of the hundreds or perhaps thousands of 'dumb' iron bombs that were needed to achieve the same purpose back during the Vietnam War.[20] On the other hand, if the targets in question are of any importance they are likely to be defended. Regardless of whether the defensive system consists of missiles or guns (or, *a fortiori*, interceptor aircraft) it is certain to rely on electronic guidance and contain circuitry very similar to, if not identical with, that which is incorporated into the attacking aircraft. In spite of the successes booked by air power in the Gulf War, it remains to be shown that, when confronted with each other, present-day air forces have grown more capable *vis a vis* a well-organised anti-aircraft defence system, ie, one that is run by forces other than Iraqis, than they were in 1939-1945. Let alone that, given the lessons from that war, they will retain their superiority in the future.[21]

As to air-to-air combat, had weapon systems really grown more powerful in relation to each other then by conventional military logic the resulting high attrition rates ought to have led to larger air forces, not smaller ones. This is what usually happened in the past, eg, before 1914 when France and Germany raced each other to see which of them could field the largest number of artillery barrels; this, too, is what happened during the adolescence of air power between 1919 and 1939 when, against

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[18] See International Institute of Strategic Studies, ed., *The Military Balance 1995-96*, IISS, London, 1995, p 178.

[19] For the current balance of forces in the Middle East see A. Karp, 'The Demise of the Middle East Arms Race', *The Washington Quarterly*, 18, Autumn 1995; and A. Hashim, 'The State, Society and the Evolution of Warfare in the Middle East: the Rise of Strategic Deterrence', *ibid.*

[20] See Brown, *The Future of Air Power*, p 88; J.A. Warden, III, 'Air Theory for the Twenty-First Century', in K.P. Magyar, ed., *Challenge and Response: Anticipating US Military Security Concerns*, Air Force University Press, Maxwell, AL, 1994, pp 313 and 328; also D.T. Kuehl, 'Air power vs. Electricity: Electric Power as a Target for Strategic Air Operations', *Journal of Strategic Studies*, 18, 1, March 1995, pp 250-60.

[21] For some comparative figures on lethality see Brown, *The Future of Air Power*, pp 123-36; also J. Clemens, 'Air Defence Mythology', *RUSI Journal*, 127, 3, September 1982, pp 27-32.

the background of galloping technological progress, the size of air forces grew and grew. This, no doubt, is what *would* have happened after 1945 if nuclear weapons had not appeared on the scene and overshadowed anything that mere conventionally-armed aircraft could do.

Once nuclear weapons were introduced and proved capable of turning the globe into a radioactive desert, however, the age-old rules of the game changed. The question as to 'How Much is Enough?' took on a new and menacing aspect and, in the long run, admitted of only one answer. Though the process required time and was not without its fluctuations, in one country after another it caused orders of battle to shrink and armed forces, including specifically air forces, to melt away; in the same way that the escalating cost-quality cycle of suits of armour after 1525 marked the imminent demise of knightly warfare in favour of others that were cheaper and more effective.

While the number of manned aircraft has tended to decline almost to the vanishing point, other systems which did not even exist in 1945 but which were equally the responsibility of air forces underwent spectacular growth. On the one hand there was everything connected with space. This included long range ballistic missiles which in most countries were entrusted to the air force; as well as anti-missile defences and satellites of every kind. By the late twentieth century the latter in particular had become vital to the conduct of conventional operations of the most advanced kind. Their usefulness for reconnaissance, surveillance, targeting, damage-assessment, communication, and navigation was brought out very strongly by the Falklands War and the Gulf War.[22] Yet the fact remains that most states, including specifically those which are in the forefront of military-technological development, do not possess them and are unlikely to acquire them in the foreseeable future. As in the case of aircraft, this is partly a function of escalating cost - to develop, launch, and control a satellite that is militarily useful may easily involve an outlay of hundreds of millions of dollars and is entirely beyond the means of all but a very small number of states. On the other hand, one reason why failure to incur those costs could be justified was precisely because the threat of large scale conventional interstate war seemed to be receding in any case.

Another reason why most countries have failed to do much about the military aspects of space is the latter's marginal utility in respect to the most important threat with which they are confronted, ie, low intensity conflict. To say that space is altogether irrelevant to the kind of war that we saw in Somalia and Bosnia - let alone to guerrilla and terrorism - would be going too far; satellites have been known to photograph terrorist training camps, intercept their radio-communications, help commando teams navigate to their targets, and the like. On the other hand, there are clear limits to what can be done. The fact that the US possesses the most advanced space-warfighting systems of any country did nothing to prevent the World Trade Center and the Federal Building in Oklahoma City from being bombed, nor are such systems at all likely to prevent such incidents from taking place in the future. Whatever military capabilities which France, or Britain, possess in space are entirely irrelevant to the bombing campaigns that both have witnessed and are still witnessing

[22] For the latest on the capabilities of satellites for these purposes see V. Gupta, 'New Satellite Images for Sale', *International Security*, 20, 1, Summer 1995, pp. 94-125; as well as I. Lachow, 'The GPS Dilemma', *ibid*, pp. 126-48; for the future, see T.S. Moorman, 'The Challenges of Space Beyond 2000' in this volume.

in their own capitals. As one Intifada-related Israeli joke has it, why did Israel launch its satellite, Ofek I? Answer: to take pictures of Arab kids picking up rocks in real time.

While the fundamental irrelevance of space to low intensity conflict is obvious, the same is not true of some other airborne platforms such as unmanned aerial vehicles (UAVs), light tactical transports, and, above all, helicopters of every kind. Not having to provide for a human operator, UAVs are relatively affordable. Their usefulness for reconnaissance, surveillance, and certain kinds of combat operations is evident and their employment in these roles growing all the time.[23] Given that the ground installations that they require are not nearly as extensive or as expensive as that needed by combat aircraft or heavy transport, light transport aircraft represent an eminently suitable way for bringing troops into battle during a low intensity conflict; and this will be all the more the case if the aircraft in question can be provided with a vertical takeoff and landing capability, as the American Osprey is. Above all, the usefulness of helicopters in various types of low intensity war has been demonstrated time and again. They can bring troops and supplies to the spot, serve as flying command posts, locate targets from the air, and evacuate the wounded; being both much slower and more manoeuvrable than combat aircraft, they can also deliver devastating quantities of very accurate firepower at selected targets. During the last decade or so helicopters such as the Apache have been provided with highly sophisticated optronic gear, enabling them to locate those targets on a twenty-four hour basis (although heavy vegetation on the one hand, and meteorological phenomena such as fog, rain and sandstorms on the other, still represent a problem). All of which may explain why several countries, particularly in western Europe, keep on procuring them at a time when their air forces are rapidly shrinking or, as in the case of Belgium, being more or less shut down.

IV

Looking into the future from the vantage-point of the present, the age of manned aircraft which opened during the early years of the present century is almost certainly drawing to its end. In particular, today's high performance attack aircraft and bombers, which for a long time constituted the backbone of any air force worthy of the name, are unlikely to have successors. This is because their cost is staggering and their usefulness in fighting both the most dangerous kind of war - namely, a nuclear one - and the most common one - namely, low intensity conflict in its various forms - is marginal. By the year 2025 the missions that used to be entrusted to them will almost certainly be divided between missiles (including also cruise missiles) and space-based platforms on the one hand and UAVs and helicopters on the other. Everything in between is likely to disappear. Judging in quantitative terms, it has already all but disappeared as orders of battle in virtually every country are being cut, cut, and cut again.[24]

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[23] An excellent analysis of what UAVs can do in war is S.M. Shaker and A.R. Wise, *War without Men; Robots on the Future Battlefield*, Pergamon, London, 1988, chapter 4; updated by M. Hewish, 'Sensor Payloads for Unmanned Aerial Vehicles', *International Defense Review* 12/1995, pp 53-8.

[24] The latest country to announce cuts is France. When the reorganisation of the forces - including a switch from conscription to an all volunteer force - is completed in the year 2015 the number of combat aircraft will be down from almost nine hundred today to a mere three hundred, plus perhaps forty maritime aircraft. Source: Ministry of Defense, quoted in *Le Point*, 24-2-1996, p 55.

At the high end of the spectrum air forces, here understood as autonomous parts of the armed services, are likely to survive in those countries - no more than a handful - that possess the economic muscle and technological expertise that are needed for the purpose. Possibly they will come to represent some kind of cross between the former Soviet Strategic Missile Command and the US Space Command. Their principal weapon systems will consist not of manned platforms but of missiles, cruise missiles, satellites, and possibly anti-missile defences of the kind currently under development in the US and Israel (the only two countries that seem to take them seriously); all combined with satellites used for communication, navigation, surveillance, reconnaissance, damage-assessment, and the like. Although, technologically speaking, these and similar systems are very sophisticated, they only require a very small number of people to operate them. Hence, in terms both of personnel and of the order of battle, whatever air forces remain in existence are likely to shrink very drastically.

At the low end of the spectrum the UAVs, helicopters and light transport (long range heavy transport, being too vulnerable to approach the battlefield, is likely to be civilianised) that are useful for fighting low intensity war will also survive; and, in terms of both budgets and numbers, prosper. However, and given the fact that they will operate in very close cooperation with the ground forces, it is not at all certain that they should be organised in a separate service as is still the case in many countries. Instead a very good case can be made for the need to group them in air cavalry regiments of the kind used by the Americans in Vietnam and the Soviets in Afghanistan; this, too, is already the road taken by the Australian armed forces.

Beyond these generalities, much will depend on the nature of the threat, the size of the country, and the extent that it wants to project its military power beyond its borders. A country which is threatened mainly by subconventional conflict will naturally tend toward the low end of the spectrum and, with the possible exception of satellites, may well end up by more or less abolishing its air force. A country with large spaces and far-away interests will lean to the high end of the spectrum and put its faith in various systems that are either designed to operate in space or based in it. To provide a faster reaction capability than is provided by helicopters such a country may also want to maintain a few squadrons of attack aircraft, whether land- or sea based. And the same is also true for heavy transport.

Finally, the electronics on which modern weapon systems, airborne ones included, rely work better in simple environments than in complex ones. Hence logically countries whose primary defensive concerns consist of protecting their sea-lanes should be among the first to put greater emphasis on missiles and space-based systems for surveillance, target-acquisition, and guidance. This movement is well under way in many places; in the long run it is likely to put an end to sea-borne air power as we know it.[25] One replacement currently under consideration is the so-called 'arsenal ship', an entirely new kind of vessel which will carry not aircraft but perhaps a hundred or so missile launchers of various kinds including sea-to-air, sea-to-sea, and of course cruise missiles. Conversely manned platforms in the form of light transport

[25] Once again, in quantitative terms the movement is already well under way. Only one navy around the world still possesses global capabilities; the rest are being reduced to coast-guards. Out of almost one hundred aircraft carriers which that navy possessed in 1945 only twelve remain. The total number of aircraft that they can carry has also fallen, from perhaps 4,000-5,000 to fewer than 1,000.

and attack helicopters will prove most useful to countries whose main concern is with low intensity operations on land.

While the details will have to be worked out by each national defence establishment separately, the overall direction in which change will move appears reasonably clear. Unless some yet to be designed system enables states to *reliably* defend themselves against nuclear weapons - which may very well prove to be a contradiction in terms[26] - the writing for large-scale, interstate, conventional war, as well as the armed forces by which it is waged, is on the wall. If present trends persist, thirty years from now most air forces will have dissolved into space commands on the one hand and some form of air cavalry on the other. In between, most major combat aircraft will have disappeared. Like dinosaurs, they will be confined to musea where they will no doubt be admired by gaping crowds. Pilots will have hung their pressure suits in the closet, never to put them on again. An age in military history will be gone. It was glorious while it lasted.

DISCUSSION

Dr Alan Stephens: Thank you for a provocative talk. It was characteristic of the breadth and depth of knowledge, and innovative thinking, that those of us who have admired your work for so long have come to expect. However, I do think, with respect, that some of your main theses were simplistic. First, to compare the figures of World War II with those today is simply not credible. It's capabilities that matter, not numbers, and I don't believe I need to elaborate on that. Second, your presentation turned very heavily on the perceived terminal decline of nation states. In my opinion, in the Asia-Pacific region nation states are flourishing, as are air forces. Since World War II a large number of highly capable air forces have started from scratch in the Asia-Pacific region. At the moment they are expanding significantly. And in particular they are expanding in the area which you suggest is in decline, and that is manned combat aircraft. My understanding is that some three thousand fast jet aircraft are scheduled to enter service in the next ten years around the world, with a large percentage in the Asia-Pacific region. They will be complemented by large numbers of modernised aircraft like MiG-21s and F-5s.

Finally, you described air power as useless against groups like Hizbollah. Again, I would suggest that is simplistic. The point is, as the terrorists know, the Israeli Air Force can strike at Hizbollah when, where, how, and as they choose. I acknowledge the IAF can't stop Hizbollah - who can? - but they can give them serious pause for thought. The same observation applies universally to terrorism.

The fact is, for fifty years offensive air power has been the West's decisive combat advantage, and I think your presentation missed that point. It would be regrettable if the important challenges you have posed to air forces were rejected because of the extremes to which you took your argument. Thank you.

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[26] According to the would-be manufacturers, anti-ballistic defences now at the 'concept exploration stage' will be able to shoot down ninety per cent of incoming missiles: M. Hewish, 'Providing the Umbrella', *International Defense Review*, 28, August 1995, p. 33. Should those missiles be armed with nuclear warheads, though, 90 per cent is simply not good enough.

Professor van Creveld: Let me take up your three questions in a somewhat different order from the one that you presented. First, Hizbollah. To the extent that air power has been useful in the fight against Hizbollah it has consisted almost exclusively of UAVs and helicopters. The fighter-bombers are very precise, but what do they hit? A tent? This was actually the kind of target that our F-16s were sent to hit and did hit during the recent Operation 'Grapes of Wrath'. In which, to remind you, the Hizbollah had the last word, because they were still firing rockets after sixteen days of some of the most intense bombardment the world has ever seen. So air power I think is useless, and to the extent that it is useful, it is only helicopters and UAVs.

Next, your first point concerning figures. I deliberately took those figures. I could have taken others. But it really doesn't matter which ones I used. Almost any look at the history of any air force - Western at least, and I will come to this region in a moment - since World War II, will show decline, decline, decline. It is only a question of how much. Including, as I said earlier, the glorious Thatcher years in Britain which promised rearmament, and during which the number of RAF squadrons actually went down by twenty per cent. So it doesn't really matter. I used these figures because they were easily available. Also there is something else. My point was to show among other things that this type of large scale war is disappearing.

As to this region, I feel myself at a disadvantage because obviously you know it much better than I do. But let me try and share a couple of thoughts with you, ladies and gentlemen. One is that, yes, it is true that there are some powerful states in this region, and some of them are as we heard the other day fiercely nationalist. But is it not true that many of those states are fighting rebellions on their own territories, and that many of the fiercest nationalisms - and I won't name names - are directed *against* the state? In this region as in others it is the people who are fighting against the state who are most fierce, most determined, most prepared even to commit suicide if necessary. If there is anybody here who is prepared to commit suicide on behalf of his state, let him stand up. Well, these organisations have people who are prepared to commit suicide on their behalf, in this region as well as in others.

Then, the other reason why air forces in this region are still becoming more powerful is because this part of the globe is not nuclear. However, should there be a serious threat to any one of the representatives of any of the countries here, then countries like Australia and Indonesia and Malaysia and Korea and Taiwan and a great many others would be able to build nuclear weapons, and it is anybody's guess how long it would take. My guess is not long. In other words Dr Stephens I would argue that yes, you are right of course. But the nuclear question only shows that it doesn't matter anyhow. Thank you.

Air Vice-Marshal R.A. Mason: Thank you, Professor van Creveld, for that brilliant and provocative argument.

I don't think any airman since the days of the zealots would claim that military force, least of all air power, was an answer to a political problem. A point that has surfaced, not just in this conference but in other areas too, is that air power, like any other kind of military force, can facilitate a political solution in some circumstances and I don't think most people would claim more than that.

I found your comment on empires intriguing. I think one of the things that my Soviet colleagues and my British Imperialist friends would agree on is that perhaps financial exhaustion and geopolitical over-stretch are at least as significant as military

defeat. And I find it very difficult indeed to identify any military defeat which actually brought down the Soviet empire, contrary to what you allege.

My third point: you repeatedly mentioned the weakness of air power. Well, again, I would argue the weakness of any kind of military force against those people who are prepared to die for their cause. The intriguing thing to me is: what is the cause for which they are prepared to die? Unless I am very wrong, the aspiration of Hizbollah is to establish a state. Their aspirations are to establish with coexisting and contingent boundaries a nation and a state. One of the inevitable trappings of that aspiration has been the search for an air force, and it is continuing here on the Pacific Rim. And far from indicating a decline in that tendency, I would argue that since 1945 a concomitant of the breakdown of empire has been the growth of the nation state and the expansion of air forces, albeit, naturally, on a smaller scale than that required to wage the world wars to which you have been referring.

Let me finish with nuclear weapons. I wonder, how valid are nuclear weapons against Hizbollah? I don't see Israel's security being advanced one jot, nor do I see it continuing to be enhanced one jot by the presence of nuclear weapons. Conversely, since 1945, since the days of the leadership of Ezer Weizman and his colleagues, I have seen air power provide the basis of the security of the Israeli state, being used consistently to counter the massive numerical ground force superiority of your neighbours, and your geopolitical weakness. Thank you.

Professor van Creveld: Thank you, Tony, for asking only four questions. I will do my best to answer each one, but not in the order they were presented.

Number one: Israeli security and nuclear weapons. In my view, the role of nuclear arms in the Middle East conflict has been vastly underrated by ninety-nine per cent of the literature, for all kinds of reasons that I don't have time to go into. I would argue, however, that it is nuclear weapons that have finally created a situation whereby Egypt and Jordan are at peace with us and even President Assad has been making some peaceful noises over the last few years.

As to Hizbollah, you are quite right. The same laws operate in our part of the world as anywhere else. It is precisely because nuclear weapons are not credible against Hizbollah and the Hamas and the PLO and those other people, that they are succeeding. Precisely.

Next, what brought down the USSR? I was referring, of course, to the war in Afghanistan. And I am fully aware that this was not the only factor. But I would argue that it was very important. Because it broke the faith of the Soviet Government, the Soviet military and the Soviet people in their own ability to manage such a war. So that when the Baltic countries for example decided to break away, there was nobody to stop them. And how right they were in their loss of faith, as the events in Chechnya show every day. Where the Russians have been using all they have got for eighteen months, including, as we all know, air power, with results we are all familiar with.

Next, how does the fate that I have predicted for air power merge with the fate of other military forces? Well, I would argue that much of what I have been saying about air power is true for regular state-owned forces in general. It is true for navies. It is true for armies, particularly the heavier units. They are affected to a lesser extent, but they are operating under the same factors and under the same constraints, and one after another, they are proving useless. It was after all not me, but General Westmoreland, an army general, who lost the war in Vietnam. Against whom? Black-

pyjama-clothed, bare-head, bare-foot peasants. It was the mighty Red Army, not me, who failed in Afghanistan, and so on and so on.

So, much of what I have been saying also applies to the remainder of the armed forces. Conversely I was in Paris some months ago. I have never seen a city so heavily guarded - by the French military! There was a soldier on every corner. To the extent that the French Army still has a war at all at the moment - except of course for going to Bosnia, for God knows what reasons - it consists of guarding the streets of Paris. Against what? Moslem terrorists. Incidentally I happened to visit Britain during the Gulf War. There were more British soldiers guarding Heathrow than there were in the Gulf!

Finally, the most serious question, which is always the fate of the state. I just published an article by that name in *Parameters*. You might want to have a look at it. Yes, it is true that the organisations you mentioned and others that you did not mention are fighting to get their states. But funnily enough, in many if not most cases, they start looking for ways of abolishing their own independence even before they get their state. Because they are aware that they are too small, sometimes too fragmented, to make it on their own economically, technologically, socially and so on. For example, I was told by the foreign minister of one of the new ex-Yugoslav republics the other day, and I quote: 'Martin, do you really think we would have taken the trouble of breaking up Yugoslavia if we didn't want to join the European Union?' There you have it. Yes, they want their own state, but only in order to merge those states into larger communities, even before they have been created.

MANAGING THE RAAF BEYOND 2000

AIR VICE-MARSHAL D.N. ROGERS

'... The difficulty lies not so much in developing new ideas, as in escaping from old ones ...'[1]

INTRODUCTION

In the past, the RAAF has generally undergone transitory periods of change that were followed by some years of consolidation, before embarking on further management initiatives. However, the 1990s heralded a fundamental departure by RAAF management from this concept of 'step-change' to a more dynamic and proactive change process. In recent years, the RAAF has demonstrated its willingness to embrace change by assimilating numerous concurrent organisational and workforce-related reviews which have collectively resulted in a reduction of more than twenty per cent in uniformed personnel numbers without any lessening of Air Force capabilities. The concept of 'continuous improvement' is now firmly embedded in our Air Force culture, and will result in ongoing evolutionary change. Indeed, it will be essential for the Air Force to assimilate new management ideas, new technologies, and social and institutional changes if it is to successfully meet the challenges of the next century. We may have to be the pace setters not the followers, as the services have been seen to be in the past.

Notwithstanding the RAAF's commitment to continuous improvement, some fundamental aspects of the Air Force will endure into the next century with little change. Specifically, the RAAF's *raison d'etre,* the provision of effective air power for Australia's security, is unlikely to change, and the prime platforms for projecting combat air power for at least the first decade of the next century will continue to be upgraded versions of the F-111, F/A-18 and P-3C.

As differences in regional military capabilities narrow over the next two decades, the relative effectiveness of RAAF capabilities will depend increasingly on the human factor, necessitating higher skill levels, the fostering of more individual initiative and above all more effective teamwork and corporate management practices. In the future, the RAAF's 'edge' will come more from the synergistic effect of applying extant capabilities and technologies in new and revolutionary ways rather than through the traditional reliance on technological superiority. The key management challenge for the RAAF will be to implement changes in the workforce and structure of the RAAF that will enable this critical 'qualitative edge' to be developed and maintained, within a relatively constant resource base.

The aim of this paper is to identify the management-related imperatives which the RAAF will need to implement over the next twenty-five years, to ensure that it remains a '... cohesive and committed Air Force providing effective air power for Australia's security...'[2] Firstly, this paper will explore the future environment, to

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[1] John M. Keynes, as quoted by Criss P.J., *Australia's Defence at Cross-Roads: Three into Two Does Not Go,* Australian College of Defence and Strategic Studies, 1995.

[2] Extract from the RAAF Vision statement, as agreed at the 1995 CAS Strategic Planning Conference, 1-3 Dec 95, Air Headquarters.

provide a framework within which proposed management strategies can be assessed. The paper will then detail specific RAAF management imperatives within the context of the RAAF's goals: One Team, Effective, Productive and Community Partnership.[3]

THE FUTURE MANAGEMENT ENVIRONMENT

In common with all other elements of the RAAF, the effectiveness of the Air Force management function will ultimately be judged by the contribution made to the key objective of the Air Force - the cost-effective delivery of air power to the battlespace. Notwithstanding this overall objective, the management priorities and strategies of the next century will be influenced by a number of diverse factors, including strategic guidance, changing community expectations and standards, demographic factors and emerging resource pressures.

THE STRATEGIC DIMENSION

For the foreseeable future, guidance in the form of strategic reviews and White Papers will constitute the key government input to defence planning and strategic management. The current guidance, which involves *Strategic Review 1993*, *Defending Australia 1994* and the new government's pre-election policy statement, confirm that the central tenet of Australia's defence policy remains the defence of Australia, through a policy of defence self-reliance. The strategy of 'depth in defence' and current force structure planning gives priority to confronting an adversary with a comprehensive array of military equipment capable of independent, defensive and offensive operations. Defence planning should exploit Australia's technological and geographical advantages through the maintenance of a highly competent defence force equipped with advanced technology equipment and structured for Australia's unique geostrategic environment.

Defence planning, now and into the next century, will be based on two levels of potential conflict: minor, or what we currently refer to as short warning conflict; or major conflict. No regional nation currently possesses the capability or intent to mount a major conventional attack against Australia,[4] although this assessment will need to be continuously re-evaluated as regional capabilities develop over the coming decades. There is general agreement that the RAAF, utilising only existing forces, should be capable of responding to short-warning conflict. Intent can change more rapidly than military capability, and so Air Force capabilities should continue to be based on regional capabilities and not threats.[5] A prime management challenge is the possibility that regional security concerns may surface at the same time as some of the RAAF's major capabilities face block obsolescence early next century.[6] We must cater for these transition periods.

An important aspect of Australia's defence policy is that of self-reliance; the ability to defend Australia without the combat assistance of other nations. However, while Australia should not rely on the combat forces of other countries, complete self-

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[3] The RAAF Goals are detailed in DI(AF)AAP 1010, *The RAAF Plan*, dated 19 Oct 95.

[4] From the draft 1995 Ten Year Defence Plan, para 6, p 2-3.

[5] *loc.cit.*

[6] This problem was raised by Professor Desmond Ball during a presentation on 'Regional Security - An Australian Perspective' at the Australian War Memorial, Canberra, on 14 Nov 94.

sufficiency in logistics and other support is neither practicable nor affordable.[7] Defence, and in turn the RAAF, will continue to seek logistic support from the national support base and, where appropriate, from our allies and other friendly nations.

In Australia's region, as an outcome of increasing economic growth, technological capabilities of regional forces are becoming more advanced, and Australia may not be able to maintain a technological edge in all areas of capability. Australia will need to be selective in the use of technology, emphasising those capabilities which provide a cost-effective advantage. Australia should strive to maintain a qualitative edge in the longer term in the areas of training and competence of personnel, logistics support and system reliability. Given the current strategic outlook, the government will most likely continue to favour investment in defence equipment and facilities. These assets have a long development lead-time, and thus can be rationally justified even though conflict is unlikely in the short to medium term. However, modest real growth will be needed to achieve the program of investment as set out in extant government guidance.

The promotion of effective global security mechanisms is an Australian foreign and defence policy objective, especially through the medium of the United Nations. However, while peacekeeping is not a force structure determinant, the ADF must be structured to be flexible and adaptable enough to undertake peacekeeping and, I suggest, other operations when required. Whilst an Australian peacekeeping force of approximately two hundred is accepted in Defence as being appropriate, there are emerging pressures to increase the level of Australian involvement in peacekeeping activities.[8] Australia intends to expand and accelerate our strategic engagement with the nearer region. This will require a move beyond the framework of existing cooperative activities to consider new opportunities including shared training, defence science and industry cooperation, and procurement.

While strategic guidance provides a broad framework within which the ADF, and in turn the Air Force, should be developed over the coming years, community and government expectations will be a key determinant for the management methodologies adopted to orchestrate these changes.

Community Expectations

In recent years, government policy has mandated that the Program Management and Budgeting (PMB) framework should be the cornerstone of financial and corporate management systems and philosophies throughout all government departments, including Defence.[9] There must be a cultural acceptance within the RAAF of the 'management for results' orientation, devolution of responsibility, and accountability for performance. Management visibility should be provided at all levels. The RAAF must develop better links between resources and performance, improve our performance measures, pursue activity costing and performance assessment at all levels, and develop stronger links between Program/Sub-Program performance and the Portfolio Plan. In future, government will be more critical, and will expect Program

[7] From the draft Ten Year Defence Plan, para 22, p 2-8.

[8] The Joint Committee on Foreign Affairs, Defence and Trade has suggested that 1000 would be a more realistic number. By contrast, Fiji has approximately 1001 peacekeepers, Argentina 1365 and Malaysia 2717. This information was quoted by O'Connor, M., 'Budget Maintains Disciplined Defence Spending', *The Australian*, May 1995.

[9] From information provided in the PMB Manual.

Budget Statements (PBSs) to predict outcomes or results, rather than outputs and processes. For example, I suggest they must address concepts such as 'preparedness' and 'level of capability' rather than the number of flying hours allocated to a particular force element.

While there is bipartisan political support for a self-reliant defence force operating within the alliance relationships, there is a view that the Australian public currently lacks confidence in the ability of the ADF to fulfil this role.[10] A few years ago a community survey indicated that some sixty per cent of Australians did not think that the ADF could defend Australia against an attack from another country, and less than twenty-five per cent indicated our defence is well managed and provides them with cost-effective protection.[11] Overall findings from a May 1995 study,[12] while showing a more positive public attitude to defence, indicated that ADF members are the harshest critics of ADF effectiveness.

The RAAF is coming under increasing pressure to meet community expectations relating to workforce composition and employment conditions. While some unique aspects of military employment command will set the RAAF apart from the wider community, for example General Hackett's 'unlimited liability clause', there will continue to be internal and external pressure for the RAAF to adopt elements of emerging management reforms, including flatter structures, flexible employment and job re-engineering where appropriate. The current Air Force is essentially a young, anglo-saxon, male workforce, not necessarily a microcosm of the wider community. The current emphasis on equal employment initiatives will continue until the RAAF workforce more closely mirrors the makeup of the general community. Of particular concern is that the RAAF has not seen a sustained increase in the proportion of women, or of our increasing ethnic population, entering its workforce in recent years. While there was a steady increase in the percentage of women in the ADF throughout the 1980s, the increase was off a low base of about six per cent, and has plateaued at about twelve per cent. All the gender barriers to employment have been lowered, and ninety-eight per cent of all Air Force jobs are open to women, but the levels have not grown. On the question of ethnic mix, I suspect this is a generational outcome. Many of our newer citizens have come from nations where the military were heavily involved in oppressive rule or controlled many national outcomes. Quite understandably, these new Australians may therefore view a career in the ADF with some concern and dissuade their children from leaning in this direction. I suggest that the next generation of these families having been raised in Australia will have a different outlook as has been experienced in the past. Therefore, I would not expect any change in the Air Force ethnicity mix for ten to fifteen years; however, I hope I am wrong.

Community appeal for service in the Air Force may decline in the face of more intensive commercial sector competition in the smaller, more highly trained recruiting pool.[13] Already, only eight per cent of school leavers even consider the Defence Force as a desirable occupation. The answer may be to target potential recruits earlier, at an

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[10] Wrigley, A.K., *The Defence Force and the Community: A Partnership in Australia's Defence*, Report to the Minister for Defence, Australian Government Publishing Service, Canberra, June 1990, p 478.

[11] *ibid.*, p 481.

[12] Frank Small and Associates Marketing and Research Consultants - Defence Public Relations Strategy Community Opinion, May 1995.

[13] Defending Australia 1994, *Defence White Paper 1994*, Australian Government Publishing Service, Canberra, November 1994, para 6.53, p 69.

age which statistical evidence indicates they are more receptive to considering a career in the military. Overall, thirty per cent of the ten to seventeen years olds in a recent survey had a positive attitude towards the ADF, while a further forty-eight per cent had no particular opinion. This indicates that eighty per cent of young people are at least potentially receptive to information about the possibilities of pursuing a career with the ADF.[14] I see considerable value in the cadet programs for teenagers not only to give an insight into military and Air Force life but also as a means of developing their social skills and understanding of responsibility, ethics and self-discipline.

Difficulties in recruiting are reflected in increased recruiting costs. It will become increasingly difficult to attract and retain the skilled people needed in a modern, effective defence force as society attaches less importance to concepts of service; as several changes of career during a working life become common practice; as expectations of living and leisure standards grow; and as other outlets for adventure become available. The relative sense of security enjoyed by most Australians heightens this recruiting challenge.[15]

At the same time, the ADF is under pressure to meet community expectations about personal freedom and equality of opportunity. This poses particular challenges for traditionally organised and disciplined services, but these expectations must be accommodated as the military cannot be at odds with the community.[16]

DEMOGRAPHIC FACTORS

The management challenges that arise from various demographic factors will significantly affect the composition and perceptions of the future RAAF workforce. The Australian population is aging, and the number of quality younger people available for recruiting will fall over the next twenty-five years. Also, the incidence of sole parenthood in the Australian military is approaching double that of the general Australian workforce.[17] While military service unavoidably amplifies normal stresses on families in some cases, the impacts of many less desirable aspects of service life could be minimised or negated with more careful management.

Workers are becoming increasingly mobile within the wider workforce, and in the next century, quite possibly, less personnel will be willing to remain in extended military service.[18] Those who prefer a reasonable degree of job mobility are likely to be the skilled workers whose marketability is high. Retention of these personnel will be difficult and the RAAF will need to develop retention packages or accept a higher throughput of its workforce along with the inherent increased training overhead associated with this emerging trend in our society.

Additionally, a significant pool of highly trained personnel will choose not to seek full-time employment. Already, twenty-five per cent of jobs in the wider community are part-time.[19] A more flexible approach to the employment of Reserves within the RAAF may provide the opportunity to exploit this currently under utilised

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[14] AMR: Quantum Harris, Youth Scan Report for the ADF, 1995.
[15] *Defending Australia 1994, loc. cit.*
[16] *loc. cit.*
[17] ADF Family Census, 1991, p 36.
[18] Glenn Report, para 1.37, p 15. This information was originally sourced from the National Institute of Labour Studies, Working Paper No 129, 1994.
[19] ABS, 'The Labour Force - Australia', March 1995.

source of trained manpower. The often exposed model of an Air Force with full-time, part-time and job-sharing members must be developed.

RESOURCE PRESSURES

A key management challenge will be to balance personnel costs, operating costs and equipment procurement within a limited resource base. All three areas are exhibiting real cost increases, which will necessitate some key priority judgments to be made over the coming years if the RAAF is to provide the most cost-effective air power capabilities.

It is commonly acknowledged that over seventy per cent of the through-life cost of existing weapon systems occurs during their in-service phase. We now recognise that prudent decisions made during the project phase can significantly reduce the size of this operating and support cost 'hump'. Thus, the analysis of life cycle costs is increasingly becoming the focus of our attention, and is firmly embedded in our acquisition strategies for new equipment. Efficient logistics support throughout a weapon system's life is also critical. The Air Force logistics system has seen some revolutionary changes in recent times with the rationalisation of wholesale storage depots, and commercialisation of many non-core logistics functions. Furthermore, much work is underway within Logistics Command to make the delivery of logistics support leaner and more effective. From a regional perspective, the depth and breadth of logistics support available to the Air Force is a significant strength.

With ongoing pressures to rationalise personnel costs, there is an inevitable trend towards a smaller and more highly trained uniformed workforce. However, there are limits to how far this can be taken before the force becomes too small to sustain the required diversity and depth of skills within viable career structures.[20] This is the so-called critical mass. The per capita costs of Defence personnel will continue to rise in the future, possibly at a faster rate than those of their civilian counterparts due to the unique uniformed overheads. While industrial relations policies dictate that the first call on efficiency gains is for remuneration, efficiency gains are unlikely to fully offset the wage increases that will be necessary to attract and retain the required workforce of the future. Since governments have directed that the Defence budget is no longer supplemented for increases in personnel costs, every future Defence Force Remuneration Tribunal decision will have implications for Australian defence capabilities.[21]

Demands on operating funds will increase over the next decade due to the training associated with the introduction of new high technology equipment and capabilities.[22] In recent years, the RAAF has flagged the increase in operating costs associated with supporting the large number of ADF units which have been relocated to the north and west of Australia.[23] In the longer term, additional funding for operating the new AEW&C capability will need to be found, either in the form of supplementation from across the portfolio or by trading off a lower priority capability.

There is evidence that capital equipment projects have been subject to a real cost increase of up to four per cent per annum in recent decades. While the actual percentage of capital investment devoted to Air Force projects will vary depending on

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[20] *Defending Australia 1994, loc. cit.*
[21] *loc. cit.*
[22] *ibid.*, para 14.15, p 148.
[23] *loc. cit.*

the outcome of the Defence committee process, the real cost increases in capital equipment projects will make it difficult for the Portfolio as a whole to upgrade the current inventory of equipment, let alone invest in new capabilities. A critical point will be the period 2005-2015, when numerous ADF systems including the Air Force operational triad of F-111, F/A-18 and P-3C aircraft are planned to reach the end of their effective service life.

Current guidance endorsed by the new government has funding for Defence likely to be reduced in real terms by a half a per cent in 1996/97, with some one-off adjustments, and to be held at zero per cent thereafter.[24] The Defence share of the GDP is likely to fall below two per cent for the first time in 1996/97. The most optimistic prediction for Defence is maintenance of funding at about that level, with no more than modest increases late in the decade and beyond.

Opportunities and Challenges

From even this brief examination of the environment of the future, some opportunities that should be exploited by RAAF management can be identified. Firstly, Australia is likely to remain relatively capable in the provision of logistics support for high technology capabilities in the field. Secondly, while cognisant of the looming investment bulge, the RAAF should take advantage of any 'windows of opportunity' in the capital equipment program to progress projects in the shorter term. Future involvement in United Nations peacekeeping forces has dual opportunities in that Australia's international profile is enhanced while developing a 'training combat edge' in some RAAF elements. The RAAF should continue to sponsor defence science and promote industry involvement to assist in accelerating Australia's progression towards self-reliance.

The challenges for RAAF managers are also, unfortunately, manifold. There is increasing uncertainty in the regional strategic balance and short warning conflict is possible, which may result in little warning time in which to develop capabilities. The proliferation of modern weapon systems within the region is likely to erode the technological edge currently enjoyed by the RAAF, and there may be less political support in future for off-shore acquisition of high technology weaponry for the RAAF. Defence funding could be indirectly eroded through the introduction of intra-departmental charges, Portfolio funded wage increases and real cost increases in capital equipment and operating costs. The RAAF may lose some public support if it fails to meet community standards associated with employment or the environment. This loss of community support would adversely impact on recruiting and funding for the RAAF in the longer term.

While predictions may be made about the opportunities and challenges that RAAF managers may face in the next century, there is no certainty. The only surety in the future is that the ability of the RAAF to adapt to the emerging environment will be solely dependent on the quality of its people, both its future managers and its workforce.

[24] As presented at the 1994 CAS Strategic Planning Conference.

Managing The Future Air Force

In recent years, some people have questioned the relevance of separate services, when the priority is on joint operations and an integrated approach to combat power.[25] While this argument might be sustainable at a theoretical level, there are many practical reasons for maintaining the RAAF as a separate entity, including the promotion of professional expertise in the development and application of air power. The current CDF made his expectations of RAAF management quite clear in this regard when he stated '... it is the Air Force's duty to ensure that the unique skills and combat power it represents are widely understood and appreciated ...'[26]

Rather than amalgamation, the services of the future will seek to achieve enhanced performance in joint operations and logistic support efficiencies through co-location and single-service management of like functions. Notwithstanding the inherent advantages of this arrangement, managers must be aware that any pressures to integrate the services rapidly may inadvertently prove corrosive to some of the single-service skills and priorities, including the RAAF's maintenance of professional mastery of unique air power skills.

However, the role of future RAAF managers will extend beyond mere advocacy of air power. As noted earlier, as differences in military technologies narrow, the relative effectiveness of our capabilities will depend increasingly on the human factor. The human perspective can be considered at three levels: the individual RAAF member; the future military manager; and the characteristics of the Air Force workforce of the next century.

The RAAF Member of 2020

The RAAF worker of the next century is likely to be a military version of Drucker's 'knowledge worker'.[27] In the future, there will be a greater level of consultation in the management of ADF members, although this trend is already evident.

Recent surveys have indicated that, in general, current RAAF personnel are reasonably content with Air Force life and the military as a profession.[28] By far the greater single factor currently influencing personnel to remain in the service is the security of employment, followed by RAAF pay and retirement opportunity at twenty years, while one of the greatest source of complaints is the quality and availability of continuation training.[29] Over the next two decades, there is likely to be a shift in worker attitudes, where security of tenure and retirement considerations are

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[25] In the case of the ADF's air component, the duplication is not minor. Beyond 2000, the Army is projected to be operating one hundred and thirty-one aircraft, after phasing out their Kiowa aircraft and introducing new surveillance and reconnaissance fixed and rotary winged aircraft. That number does not include the Nomad replacement. The Navy is projected to be operating fifty-nine aircraft shortly after the turn of the century.

[26] Baker, Brigadier J.S., *Report of the Study into ADF Command Arrangements*, Headquarters Australian Defence Force, March 1988, pp 4-16/17.

[27] Drucker, P., 'The Coming of the New Organisation', *Harvard Business Review*, Jan-Feb 1988; and *The Australian*, 28-30 November 1994.

[28] Based on information provided in the RAAF General Attitude Survey 1994 - Summary Data.

[29] The survey indicated that less than half of the survey population (RAAF members) felt fully trained for their respective category/musterings, and only thirty-seven per cent felt satisfied with the availability of continuation training. More than half indicated that there was a need for improvement for post-graduate training.

overshadowed by the challenges of the job, level of empowerment and shorter term remuneration. However, in common with current RAAF members, the future Air Force worker will have high expectations of, and be a keen consumer of, RAAF-sourced training.

The concept of lateral recruitment and contract employment, is I suggest, likely to be used frequently by the RAAF in the next century to offset the predicted reduction in the recruiting base. While recent lateral recruitment programs have targeted personnel shortages in key areas, such as pilots and air traffic controllers, in the future we may see lateral recruitment for what are now bureaucratic posts occupied by Air Force officers. The concept of employing civilian workers under contract, and the increased use of fixed term contracts for senior military officers, will provide improved workforce flexibility, without the longer term overheads.

Some key skills are in such demand in the private sector that the Air Force will continue to have difficulty attracting and retaining members, pilots being a well documented example. In these circumstances, a market forces pay element for these occupations could be struck separately and added to work value based pay. Such arrangements must be kept under constant review.[30] Special consideration would need to be given to the non-reduction provisions for members who are in receipt of a market forces pay element, and the consequent effect of salary compression in the higher ranks would also need to be addressed. Every dollar spent on remuneration and employment conditions must be aimed at retaining personnel in the Air Force. If outlays on retention avoid the expensive training of replacement personnel (and pilots are a prime example) then the investment is prudent and justifiable.

THE RAAF MANAGER OF 2020

While there seems to be general recognition of the characteristics of a good manager, the application of theory to practice in the Australian context sometimes leaves a lot to be desired. The Karpin Report, in comparing Australian managers to those in other nations, notes that against a number of criteria Australia ranks eighteenth out of forty-one nations, and fourteenth out of the twenty-two OECD nations.[31] Karpin concludes that there is a lack of depth in Australian management skills.

While the RAAF has generally been acknowledged as a leader in the field of training and education, it cannot afford to rest on its laurels. There are certain deficiencies which RAAF managers arguably share with their counterparts in the broader Australian community. First, while rated highly in terms of their professional proficiency, military managers are often considered lacking in financial management and in integrative personnel skills, such as those associated with human resource management. These skills are seen as a key tool to gaining a competitive edge in industry, and arguably in the maintenance of an edge in regional defence capability. Hence such skills need to be taught throughout all stages of professional career development. There is, however one distinct difference between the needs of the military and the business community. The ADF's prime need is to develop military leaders who are competent in the profession of arms and also competent managers. In peace time their management skills are more visible but in times of conflict their leadership skills are critical.

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[30] Glenn Report, para 5.23, p 120.

[31] *ibid.*, para 8.21, p 189.

A second deficiency in the RAAF training and education system is its lack of adequate linkages to the broader aspects of strategic planning. Obtaining the requisite equipment will be of little use unless the downstream or consequential training requirements associated with its introduction are fully explored. In a rapidly changing technological environment, upgraded capabilities may well call for skills which are not available in the extant RAAF workforce, either in the right quality or quantity

Some see that the major deficiency of RAAF managers is their failure to embrace a 'business' ethos. The traditional argument that the military is unique and cannot be equated with commercial organisations is difficult to sustain in the face of the proven efficiencies of adopting modern business practices and initiatives such as the Commercial Support Program (CSP). The RAAF cannot expect to maintain the 'best practice' standard unless it provides the necessary training and incentive for its managers. Some appropriate incentives might be in the form of 'gain-sharing', and through changing the personnel assessment criteria to include a measure of the member's business proficiency.

In the future, the primary function of a significant portion of RAAF managers, particularly in the force development, resource management and planning functions, will be to interface with the governmental and Portfolio bureaucracy.[32] For the RAAF manager, the arguments all line up in favour of a pragmatic military professionalism in which greater emphasis should be placed on political and bureaucratic skills. If professional military advice is to receive due weight in defence-decision making at the highest levels, military professionals must be developed who possess the political, managerial and bureaucratic skills needed to operate in the organisational environment of the 21st century.[33]

Many of the changes becoming apparent amongst the managerial sector of the wider community will eventually be mirrored within the RAAF. The new paradigms will be globalisation, flexibility and adaptability. Just like in the civilian sector, there will be a shift from the anglo-saxon male manager of today to a male or female, who is a graduate with a more global focus, operating on a more limited tenure.[34]

In recent years we have seen the widening of the selection pool for senior RAAF management positions, as evidenced by the advent of the General List from group captain up and wider employment of non-aircrew officers in senior command positions. Traditionally, the most senior RAAF leaders and managers have been selected from the 'warrior' classes, namely the pilot and navigator categories. However, the distinction which has historically set these members apart will diminish in future, as more non-General Duties members assume key roles, either as ground combatant commanders or as decision makers aboard AEW&C or in the ground-based air defence environment. A member's importance in operations will be more directly related to their ability to exploit the available information, rather than the presence of a brevet on their chest.

The RAAF has come to recognise that it cannot afford to arbitrarily limit the selection pool for its future managers to specific categories if it is to employ the best people in senior command.

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[32] Funnell R.G., 'The Professional Military Officer in Australia: A Direction for the Future', *Defence Force Journal*, July/August 1980, p 23.

[33] *ibid.*, p 35.

[34] From information provided by Dr Karpin in a lecture at the Revolution in Military Affairs Conference held at the Australian War Memorial (Canberra) in February 1996.

RAAF WORKFORCE 2020

Many of the changes and reviews over the past few years have focused on creating a more efficient, multi-skilled Air Force team. Some of these changes have been implemented through the Trade Restructuring Reviews[35] and the Officer Category Review (OCR).[36] While these particular reviews are largely complete, their aim of enhancing workforce flexibility, efficiency and increasing the emphasis on direct support for combat forces has inculcated Air Force culture, and will likely spawn future initiatives with similar intent. For example, currently only about fifty per cent of RAAF officers are employed in 'operations' areas. However, task reduction, efficiencies and constrained establishment re-distribution for factors like Manpower Required in Uniform (MRU) should result in a more appropriate ratio of about sixty per cent 'operations' and forty per cent 'operations support' by the end of this century. This trend is likely to continue into the next century, and should provide an even more favourable 'teeth-to-tail' ratio.

The ongoing transfer of many support functions to the civil sector will fundamentally change the personnel profile of the RAAF. Specifically, many of the more labour-intensive functions will most likely be performed by contractors, and so the number of less skilled RAAF jobs will fall. However, the RAAF will expect many of those uniformed members remaining in the 'support' areas to be highly trained, with post-graduate qualifications in fields applicable to contract and project management. Of particular importance will be the manning of project offices for key air power-related projects over the coming two critical decades. However, this increase in the skill level of the RAAF's workforce will come at a price; namely, higher training costs and lower retention rates amongst personnel with skills directly marketable in industry.[37]

The move to greater civilian and contractor support will lead to an increase in the officer-to-enlisted ratio, a contentious but often misconceived measure of workforce balance. By the nature of the service, the majority of 'warfighters' in any air force are officers and comparison with our sister services in this manner serves no useful purpose.

The traditions of the three services will continue to be challenged by the necessary emphasis on joint command and operations, the closer integration of service and civilian personnel, and the need for economies. Reductions in the size of the ADF, in response to resource pressures, have also tended to diminish career prospects in some areas. Furthermore, the move toward higher technology systems tends to enhance the prominence of technologists at the expense of warriors. These changes are all necessary to the continuing development of the ADF, but they have to be managed

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[35] Two reviews have been conducted covering the aircraft and non-aircraft trades with a view to manpower savings. These are the Technical Trades Restructure (TTR) and the Non Technical Trades Structure Review (NTTSR). The TTR has been the longest running and most complex of the reviews. It proposed large scale rationalisation of the air and ground maintenance trade structures. All trades were to be incorporated into Avionics, Aircraft or Aircraft Structures. The review addressed basic and post graduate training, promotion, pay and productivity. The NTTSR essentially followed the TTR approach for the non-technical trade musterings. The Supply Related Trades Structure Review followed on from the NTTSR to further pursue supply trades issues.

[36] The Officer Corps Struture Review (OCSR) was established in 1992 and tasked to develop an officer corps structure to meet the current and developing needs of the restructured RAAF. The officer corps consisted of seven branches and twenty-seven categories which the OCSR proposed to reorganise into two functional branches, Operations and Operations Support.

[37] *Defending Australia 1994, loc. cit.*

in ways that retain the essential elements of that ethos which enables service personnel to accept the risks of combat.[38]

The RAAF should move to stabilise the boom and bust cycles in separations and recruitment by weaning itself from the historical reliance on rising unemployment to offset high separation rates. The skills sought by the Air Force over the next decade will not necessarily be found amongst the unemployed. Equally, our personnel should be managed in ways that will withstand the pull of the labour market in periods of heightened economic activity. In short, the ADF should endeavour to recruit to a constant base, and tactically manage separations to suit its strategic circumstances. This represents a fundamental change to traditional personnel management in the ADF[39] and, I admit, will not be an easy task.

RAAF ORGANISATION

Organisations are restructuring to become more productive, effective and efficient by concentrating on core business and multi-skilling, resulting in fewer staff. Additionally, the current wisdom is that management structures of the future will be different. These changes can be characterised as an increasing trend towards 'rational' management where there is a direct relationship between outcomes and inputs.[40]

Management structures are becoming flatter, with middle management being widely culled, and people are being increasingly paid according to the work value of their jobs. The full manifestation of this new emphasis on people comes in the view that people are the organisation, and that best practice in the management of personnel is a major contributor to superior organisational performance.[41] Organisations are increasingly regarding their trained personnel as an investment, one that is expensive to replace. The ADF is well downtrack with its approach to corporate re-engineering, and the Glenn Report has indicated that it might even be considered as the international benchmark for military organisations.

As a public sector industrial organisation, the RAAF has pursued and must continue to pursue 'new age' business and corporate strategies very similar to other public and private sector organisations. These strategies must include:[42]

- concentration on core business (through such initiatives as defining MRU);
- outsourcing (notably through the Commercial Support Program);
- productivity as a performance indicator (flatter, leaner structures and more efficient 'joint'/tri-service activities);
- improving efficiency of logistics support system;
- emphasising systems, science, technology and military intellectual property as the competitive edge;
- concentration on minimum life cycle costing as a prime factor in equipment selection; and
- promoting closer relations with defence industry.

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[38] *loc. cit.*

[39] Glen Report, para 1.99, p 31.

[40] From presentation on 'Organisational Theory' by Dr Jarman to RAAF Command and Staff Course in 1994.

[41] Coopers and Lybrand/ADF Process Review Group, Formulation of Personnel Policy, Department of Defence, March 1995.

[42] Glenn Report, para 1.110, p 34.

Some critics of the military hierarchy have argued that the rank structure is an impediment to organisational reform, and that a reduction of one or two officer and one or two non-commissioned ranks would align the military more closely with modern management practices. While the Bett Review has recommended combining a number of ranks in the UK defence forces, the Glenn Review recommended that the ADF should continue to retain its current rank structure. The Glenn Review argued that rank is still a vital concept in the military and will continue to be important because it recognises the effort and contribution of people.[43]

However, the rank structure should be used as a menu and not a template. In other words, organisational structures should not necessarily use all the available ranks, especially within the bureaucracy. For example, where appropriate, a rank level might be deleted from a chain of command in a staff organisation. The challenge will be making sure that the remuneration matches the demands of the job and the rank, and that rank is not debased to try to achieve a remuneration outcome.

The future management picture is complex, with the issues of individual and community expectations, management trends and changing workforce requirements forming the backdrop against which future management initiatives will need to be framed. The final task will be to identify and categorise the likely changes to the way the RAAF will do business over the next twenty-five years in the context of the RAAF Goals: One Team, Effective, Productive and Community Partnership

ONE TEAM

Many of the changes and reviews over the past four years have focused on creating a more efficient, multi-skilled Air Force team which will form the foundation for the Air Force of 2010. The 'people factor' will continue to be one of our most effective force multipliers, with the combat capability of the RAAF being largely determined by the morale, professionalism and expertise of its personnel. Training and education will continue to be seen as essential investments in the future.

The shape of the RAAF is almost right, but there is still a need for some internal adjustments over the next decade. However, we are looking for evolutionary change rather than the radical change which has characterised the last five years. There is likely to be real growth in the unit cost of manpower in the future, and consequently pressure to contain personnel costs through other management initiatives will continue. The introduction of new capabilities, such as AEW&C, will place additional pressure on personnel costs.

There will continue to be competition from other industries for highly trained RAAF personnel over the coming years. Increased use of Reserves, expansion of opportunities for part-time employment, lateral recruitment and loan programs will be used to address these deficiencies. The use of Reserves offers the chance to obtain benefit from ex-military personnel who have left the services with the valuable skills and experience still needed to develop the Air Force of tomorrow.

Over the next twenty-five years there will be community pressure to increase the percentage of women and racial minority representation in the RAAF workforce,

[43] Report to the Secretary of State for Defence (United Kingdom) on the Independent Review of the Armed Forces Manpower, Career and Remuneration Structures, 1995.

and this will need to be recognised in RAAF personnel management policies.[44] In recent years, the Air Force has placed increased emphasis on exercising the principles of EEO. The ADF is currently examining ways of boosting the employment and retention of women. These measures are timely, as women are likely to outnumber men in the ratio two to one entering the workforce over the next two decades.[45] Thus, while the recruiting pool may be smaller in the future, there should still be adequate numbers to meet RAAF requirements, providing the recruiting base is broadened.

The impact of the Commercial Support Program will have reached maturity by 2010 and I daresay such an approach will be part of the Air Force culture. In fact, average savings of some thirty per cent across CSP-tested activities will be critical to the RAAF, as it will offset some of the financial pressures arising from increasing capital and operating costs over the coming years. A significant reduction in uniformed personnel beyond those already foreshadowed under CSP is unlikely. An Air Force imperative will be to ensure that levels of manning of uniformed personnel do not fall below that required for the RAAF to apply air power effectively and flexibly.

Over the last decade, Australians have increasingly worked comparatively longer hours, a trend which has become increasingly prevalent in ADF and RAAF service in recent years.[46] Thus a recent study showing that ADF members work an average of almost forty-eight hours per week should not, in itself, be cause for concern. However, fundamental workforce and organisational structural problems may be suspected when one considers that some areas of the military are underemployed while others are consistently overtasked, with some members regularly working sixty hours or more per week.[47] An imperative for the RAAF will be to optimise the composition of its workforce to promote a more equitable and efficient distribution of tasks. 'Burnout' through excessive activity levels which are not mandated by actual operational exigencies must be avoided. And it may well be that the overall level of operational preparedness will need to be adjusted to conserve our investment in people.[48]

Effective

When looking to changes in the future, we should not be reluctant to acknowledge the path already trod. From the Coalition's 1976 White Paper through to *DA94*, there has been growing political consensus on the fundamentals of Australia's strategic outlook. This stability has allowed the majority of change to be planned and generally focused in the right direction.

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[44] Glenn Report, para 1.10, p 8.

[45] *loc. cit.*

[46] Australians now work an average working week of forty-three hours, which ranks fourth highest amongst OECD countries behind the US at 43.8 hours. Many professionals and managers are working well in excess of fifty-sixty hours. Additional information is available in the National Institute of Labour Studies, Working Paper No 129, 1994.

[47] The ADF Activities and Working Hours Survey, Infuse Pty Ltd, of 1992-93, showed that ADF members worked an average of 47.9 hours per week. This figure was accepted by the Defence Force Remuneration Tribunal in its consideration of the service allowance case in 1994. Follow-up surveys indicate that service working patterns are changing, but a real decrease in working hours is not yet apparent. The estimate of some members working in excess of sixty hours per week is based on observations by the author of some sections within HQADF and AFO over the period 1990-1996.

[48] Glenn Report, para 1.134, p 41.

NEW MISSIONS

However, the future may bring a shift in emphasis to encompass new missions, including space exploration, anti-drug trafficking, education and job training for deprived youths. The military will not be able to divorce itself from the problems of the community at large. Already we have seen this with Defence support to the civil community, and the use of RAAF Curtin to house illegal immigrants.

Military forces in the future will probably employ small, extremely lethal bands of highly mobile units, dispersed against weapons of mass destruction, and able to quickly find and destroy fast-moving concentrations of enemy troops. According to reports from five Revolution in Military Affairs task groups, enemies in 2010 will not repeat the mistakes of Saddam Hussein and wait for the Coalition forces to attack.[49]

Much has been said and written about the so-called 'Revolution in Military Affairs' (RMA), which is used to describe the synergistic effect of high tempo operations, information dominance and precision munitions. While RMA is predominantly a battlespace phenomena which would be conducted as a joint operation, the RAAF would be responsible for training personnel, supporting the airborne sensor platforms and managing the associated information systems. The combatant skills required for the conduct of RMA operations are difficult to define, except to say that the ability to rapidly counter emerging threats and exploit the environment is paramount.

This points to the need to promote a 'learning organisation', an organisation which continuously improves, and adapts to the evolving environment, by learning from everything it does. In fact, the ability to learn, which I consider to be an important performance measure of military professionalism, is about the only competitive advantage for RMA operations which a military organisation might hope to sustain over an extended period. The importance of military professionalism was underlined by the then Minister for Defence, Senator Ray in 1991, when he stated '... the only useful conclusions we might draw about the Gulf War are broad strategic observations; that is, success in military undertakings is critically related to military professionalism backed by national will and economic strength ...'[50]

Strategic guidance acknowledges that short warning conflicts may be fought using the 'force in being'. Arguably, too much emphasis has been put on the 'come as you are war' in recent years. Some critics hold the view that the ADF has drifted to a pervasive view that it should be prepared for a 'come as you are war' in which there is little or no place for expansion, for Reserve forces, or for marshalling national resources for defence. As a result, not enough effort has been placed on preparedness and mobilisation issues.

PREPAREDNESS, MOBILISATION AND RESERVES

Only in recent years has the RAAF refocused from outputs to outcomes; for example, moved from a preoccupation with flying hours to address the more relevant outcome of preparedness.

What will win wars in the future is getting the best the best out of available resources by optimising operational preparedness, readiness and sustainability. The Air Force will need to introduce management structures that can be used to direct the

[49] Erlich, J. and Holzer, R., *The Worldwide Weekly Defence News*, 5-11 June 1995, p 1.

[50] Ministerial Statement to Parliament, by the Minister for Defence, Senator the Honourable Robert Ray, *Defence in the Twenty-First Century*, Canberra, 30 May 91, para 7.

priorities for preparedness development and this could be achieved by a top-down approach, establishing mobilisation and preparedness cells and developing reportability and accountability processes. An open loop currently exists between guidance, resource allocation and activity levels, which will need to be addressed to lay the foundations for the 21st century Air Force.[51]

An oft-cited quotation is that '... logistics success can accompany military defeat, however, logistics failure will guarantee it ...' The moral is that logistics support is the key to effective operations. Our ability to support peacetime operations is becoming increasingly streamlined and focused, and considerable attention is now being paid to the requirements necessary to support operations in short warning conflict. The major challenges ahead are the identification of the infrastructure and maintenance capacity required to support the appropriate level of capability, and to ensure that the necessary arrangements are in place now, so that the additional capacity is available to us when we need it.

The issue of mobilisation will also need to be explored in the context of its applicability to the RAAF. Conventional forces will always be required to be augmented in the face of substantial sustained threat, which indicates an enduring role for Reserves. While the initial attempts to integrate elements of the Reserves into the 'combat aircrew' components may not have been completely successful, the employment of Ready Reserves in the airfield defence squadrons demonstrated that the Reserves have a place in the operations segment of the future Air Force.

Enhancing the Teeth-to-Tail Ratio

The focus of a myriad of reviews and initiatives this decade, commencing with the *Force Structure Review*, has been to increase the 'teeth-to-tail' ratio within the military. While these reviews have concentrated on directly targeting inefficiencies in the support areas, many inefficiencies in the combat force have yet to be addressed. The following 'modern' military service trends within combat forces have adversely affected the 'teeth-to-tail ratio':

Use of High Technology Systems. High technology systems require additional support personnel. For example, there may be up to one hundred support personnel required behind the scenes to support a modern aircraft. Thus, a leading-edge technology 'force multiplier' might not prove to be so cost-effective when the support overheads are taken into consideration. In essence, the Air Force must pursue the most cost-effective technology.

Expeditionary Structures. In the past, military forces have claimed the essentiality of being self-supporting. However, where the Area of Operations is likely to be one's own country, there are efficiencies to be gained by utilising indigenous support where appropriate.

Force Development Challenges and Priorities

Although the F-111, F/A-18 and P-3C will probably still be the prime RAAF weapons platforms in 2010, their capabilities will be more advanced than they are today. All

[51] This information was provided during a DCAS presentation, and subsequent discussion, at the 1995 CSPC.

three platforms will have undergone major mid-life upgrades and will represent world-class capabilities. There will also be a newcomer, Airborne Early Warning and Control (AEW&C). This capability is the highest priority for the RAAF, and should significantly enhance the ADF's ability to undertake surveillance in the sea-air gap.

In the longer term, investment pressures are expected to increase. By about 2010, plans will need to be in place to maintain essential capabilities as a number of major defence assets, including the F/A-18, F-111 and P-3C, approach obsolescence, and as other assets require upgrading, including the Jindalee Operational Radar Network. Great demands will be placed on defence budgets at that time if essential capabilities are to be maintained.[52]

Of course, the priorities for future capital investment will be determined from a rigorous capability analysis process. Although currently unapproved, other key projects likely to arise prior to 2010 are elements of the space-based surveillance capability and the light tactical airlift capability. Additionally, the lead-in fighter project, centralised software support capability, various electronic warfare and stand-off weapons projects, and the replacement of the C-130H capability will occur in this timeframe.

Funding major capital facilities is a Defence function, so Air Force does not have direct control over this portion of investment. However, Air Force must continue to place emphasis on developing the network of northern airfields, communications and surveillance related infrastructure and improved housing. Upgrade of the bases at Tindal and Darwin, and completion of the bare bases in northern Australia, should be completed by 2005. These bases will provide the essential support for air operations for the defence of northern Australia and its air and sea approaches.

Productive

The RAAF goal of 'productive' encompasses the concept of cost-effective management of personnel and operating costs.

Operating Costs

The complexity of weapons systems in service in 2010 is likely to increase investment, operating and support costs in real terms. Efficiencies may be gained through a greater extension of the tri-service concept to logistics support of operations. Examples of this concept may be the increased provision of common facilities such as messing, repair and maintenance, and non-combat health services.

An imperative will be to minimise personnel training costs by retaining key personnel. The RAAF will need to be more adept at meshing industrial intelligence with much improved economic forecasting data to produce an economic model for the strategic management of ADF personnel. This economic model would inform the RAAF training and ADF recruiting elements, and would assist in efficiently targeting retention initiatives. The modest costs of such a system would be soon recouped.

Operating cost savings must be harvested from the introduction of new F-111, P-3C, C-130 and B-707 simulators over the coming fifteen years. The savings resulting from the introduction of these simulators will be a combination of more efficient technology, use of contractor support and, in some cases, an associated reduction in

[52] *Defending Australia 1994, loc. cit.*

aircraft flying hours. An example is the use of simulators for software driven weapons systems. As technology permits a more effective simulator, we need to ensure the costs of system updates are minimised. Simulators must be driven by the same programs as the aircraft. We will not be able to sustain updates for aircraft and in parallel, one for the simulator; they must be driven by the same program. Simulator manufacturers must be driven to produce such products.

Where identical core specialist training is conducted, the three services should combine to provide a common training syllabus, and if possible use a joint training facility. Additionally, the cost-effectiveness of training may be enhanced by the increased use of simulation. In the future, the networking of the training devices of the three environments across the nation will become commonplace, to facilitate the conduct of joint training. Cost effective alternatives, such as unmanned air vehicles or advanced simulation systems, should be employed instead of the current practice of using costly air assets to provide radar training for surface controllers or defensive system excitation.

The initiatives commenced under several recent reviews, including the Model Air Base Project, are likely to reach fruition in the next five years as the development of Australia-wide ADF information systems and networks mandate standardised procedures. A key challenge will be convincing those who control the bureaucratic processes to adopt emerging technology, rather than limiting the technology by adherence to extant processes; the processes will have to be very flexible. The rate at which information technology is developing is difficult to comprehend, but an indicative measure is that memory/computing power has been doubling every eighteen months or so for the past two decades, and probably will do so for at least the next fifty years.[53] The training overheads of embracing every information technology change are significant, and the RAAF will need to consider carefully the issues of cost-effectiveness, standardisation and interpretability before embracing any step change in information technology.

Appropriate Technology

Future capital equipment proposals will pursue cost-effective technological solutions rather than automatically seek 'leading edge' technology. In many capabilities, the qualitative edge lies not with the hardware, but with the software, training and logistics. However, some evolving leading edge technologies, such as space surveillance and advanced information systems, offer the possibility of enhancing RAAF capabilities and reducing costs. The balance between cost and effectiveness of technological solutions will require astute judgment. The acceptance of commercial in lieu of military standard equipment, where appropriate, has the potential to reduce acquisition costs. More onus must be placed by Air Force managers on equipment manufacturers to meet specified capabilities, costs, life of type and supportability issues without the need to micromanage.

Australia now undertakes a significant amount of indigenous construction and support of defence equipment. Currently, the proportion of capital investment spent in Australia is about sixty per cent, primarily due to the significant involvement of Australian Industry in the submarine project, Anzac frigates and Jorn. Defence, and in turn Air Force, should focus Australian Industry Involvement (AII) into areas which

[53] Noted by a number of eminent speakers at the 'Revolution in Military Affairs' Conference conducted at the Australian War Memorial in February 1996.

contribute most to the goal of self-reliance, such as mission critical software development, surveillance technology and command, control and communications projects. The emphasis must be on long term support rather than short-term involvement such as aircraft assembly which, as we saw with the F/A-18, was a time-limited skill.

FINANCIAL MANAGEMENT

There is a need to improve the RAAF financial management processes, including:

- developing strategies to obtain adequate Portfolio or governmental funding;
- generate additional funding within the RAAF program; and
- identify priorities for cutting costs (eg, what capabilities can go).

However, since government guidance is unlikely to increase in the shorter term, and options for the RAAF to pursue a greater share of the extant Defence budget are few, most effort must be placed in redirecting funds within the Air Force Program, and for prioritising and rationalising activity levels. The recent government edict to redirect funds from lower priority areas to capability-enhancing components of the ADF will be matched by similar initiatives within Air Force. Several changes are also being considered to the RAAF financial management framework, including changes to the Air Force committee system which would ensure that CAS remains firmly in the 'driving seat' for determining funding priorities.

INFRASTRUCTURE RATIONALISATION

At present, facilities investment takes about five per cent of the Defence budget but, as projects are completed, this level is expected to fall later in the decade to around four per cent.[54] Resourcing for major capital facilities is a Defence function, so Air Force managers do not have direct control over this portion of investment. However, we will continue to place emphasis on developing the network of northern airfields, communications and surveillance related infrastructure and improved housing.

The RAAF will require a significant amount of infrastructure to support operations in the north of Australia. However, the 'bare base' concept has enabled the RAAF to minimise the manpower requirements for supporting these bases in peacetime. The RAAF will continue to retain the majority of our personnel in the southern states to minimise operating costs, except where needed for real-time defence or support to Army and Navy.

The recommendations of various current reviews and studies will be selectively implemented by 2010 to rationalise support infrastructure. Air Force is now conducting a review of infrastructure to identify areas where funds could be more effectively employed through the rationalisation of facilities, with the associated reduction in Air Force operating costs. The ADF aviation technical training and ADF clerical training are to be centralised and the emphasis on joint facilities will continue. Already many functions, including medical, legal and warehousing, have been collocated. By 2000, we will see a Joint Force Headquarters, and later the collocation of the single service staff colleges.

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[54] *Defending Australia 1994*, para 14.13, p 148.

COMMUNITY PARTNERSHIP

COMMUNITY AND REGIONAL ENGAGEMENT

The ADF, and in turn the RAAF, must move closer to the wider community. Commercialisation should be regarded not only as an efficiency measure but also as part of a wider strategy in which more of the community becomes involved in ensuring the security of the nation. Over time, this will increase community understanding of defence, increase respect for the Defence Force and create a greater recognition of the career opportunities that military service provides. In essence we must foster an environment of interdependence between industry and Defence.

If the community is to be more involved in defence there is a need to first maximise the bipartisan political agreement on the fundamentals of our strategic posture, and then to embark on a sustained program to explain this posture to the community at all levels. Only through a defence posture designed to draw, when necessary, on the full resources of the people and the national infrastructure is the community likely to believe that Australia can be self-reliant. Other countries have employed this posture of total defence and we must not miss the opportunity to have a defence-conscious community.

Community engagement also has application in the broader context. Australia has adopted a policy of comprehensive engagement with the nearer region. The Air Force has already wholeheartedly embraced the concept of regional cooperation, and we are becoming more involved in terms of exercises and other training activities with our Asean neighbours. Such engagement must be a feature of our relations with our regional neighbours in the new century.

DEFENCE AS A 'GOOD NEIGHBOUR'

Environmental issues are some of the most visible issues in the community and no lessening of their importance is foreseen. Management will need to promote Air Force in a favourable light in its efforts and concern for the environment; however, there are some areas needing particular attention in the coming years. These include on-base industrial hygiene, air weapons ranges, explosives ordnance storage facilities, and the urban encroachment on bases with the attendant effects of aircraft noise. Environmental pressures will increase and will need to be taken into account in future flying activity levels and patterns.[55]

In the future, surveillance systems including Jorn and AEW&C may be routinely used for detecting boats carrying illegal immigrants, drug traffickers and vessels contravening the Australian fishing zone. Although the RAAF's involvement may remain covert for security or operational reasons, where appropriate the Australian public should be allowed to see the contribution of their defence investment working in peacetime, thus developing a strong support base for the ADF.

INDUSTRY SUPPORT

While Australia should not be dependent on the combat forces of other countries, complete self-sufficiency in logistics and other support is, as has been said, neither practicable nor affordable. Australia's policy of self-reliance provides the framework to

[55] *ibid.*, paras 13.27-13.31, p 141.

plan for the development of the national industrial base which will support Air Force capabilities. In essence, future Air Force managers will need to continue to seek strong support from the national industrial base and, where appropriate, from our allies and perhaps our regional partners.

Defence industry policy is being developed to promote strategically relevant capabilities in Australian industry. However, due to the cyclic nature of defence acquisitions, the longer term viability of the companies involved will generally be dependent upon demand from the commercial sector and overseas, rather than defence alone. Australia's self-reliance policy provides the framework to plan for the development of the national industrial base, but recognises that logistics support from overseas will remain an integral part of Australia's defence strategic planning.

Our dependence on a small, technology-based, mobile and integrated force requires us to keep abreast, and in some cases lead, developments in some areas of defence technology, including software development and systems integration.[56] The *SR93* made explicit the government's priorities for industry support. It identified the following industry capabilities as most important for Australia's self-reliance in defence:

- combat systems software and support;
- data management and signal processing, including for intelligence and surveillance;
- command, control and communications;
- systems integration; and
- repair and maintenance of major weapons and surveillance systems.[57]

To encourage greater industry involvement in acquisition and through-life support, the Defence organisation should if practicable modify the timing of its defence projects where this improves the continuity of work-flow, encourages the sustainability of high priority skills, and does not jeopardise the capabilities of the ADF. Air Force will endeavour to provide industry with the earliest possible advice of capability requirements to allow for time to develop or contribute to equipment and through-life support solutions. The concessions should not be a one-way street as industry has to be a partner which shares the business risks. Defence is not a cash cow for industry to see as a means to their ends.

Conclusion

Two decades from now, the RAAF will probably look similar to the force of today, but will have to manage personnel and resources in dramatically different ways if it is to meet the challenges of the new millennium. The key challenges will be to maintain appropriate readiness levels and a qualitative edge, within a relatively constant resource base.

Air Force career development, training and employment practices must meet community expectations if they are to continue to attract the high quality personnel essential for the RAAF to achieve its mission. I have advanced some thoughts about the changing nature of the future RAAF workforce, which will be smaller, more empowered and increasingly commercialised. Given current trends, this workforce is

[56] *ibid.*,para 11.10, p 115.
[57] *ibid.*, para 11.11, p 116.

likely to be more motivated by job satisfaction and shorter term remuneration than by the traditional factor of security of employment. To manage this workforce, the RAAF will require leaders with well developed 'business' skills, and with the flexibility and adaptability necessary to effectively embrace change.

Today I have discussed a number of RAAF management initiatives and options in the context of the RAAF goals: one team, effective, productive and community partnership. Some 'One Team' initiatives, including commercialisation of various support functions, have the potential to offset the financial pressures inherent in rising capital equipment and personnel costs. The potential contribution of the RMA, and the essentiality of effective logistics support, have been discussed in terms of the 'Effective' goal. Several options to achieve the 'Productive' goal have been advanced, including reducing training costs through the increased use of simulation, the retention of key personnel and the rationalisation of training and infrastructure. The ADF, and in turn the RAAF, must move closer to the wider community in pursuit of its 'Community Partnership' goal, with the term 'community' including government, the general public, industry and regional nations. Two strategies that contribute to this goal are the promotion of Defence as a 'good neighbour', and the development of a closer nexus with industry to achieve self-reliance in key defence support technologies.

The RAAF is on track to implement its 'flight plan' for the future. However, now is not the time for complacency, and Air Force managers and planners must continually reassess the external environment as it develops over the coming decades, to ensure that the RAAF achieves its vision of providing effective air power for Australia's security into the 21st century.

DISCUSSION

Aircraftman Chris Lawley: Getting time off from civilian employers is a big problem for reservists. Is the Air Force addressing this problem?

Air Vice-Marshal Rogers: That is a good point and it has been troubling Air Force managers for many years. I think it comes back to developing a closer relationship between Defence and the community. We have a Defence Committee for the reserves to help us talk to industry. In the past we have stipulated our requirements. We have said, 'If you join the reserve you have got to do two weeks per year full-time camp; you have got to do so many weekends,' and things like that. We've got to be more flexible in the future, we have got to work with the employers. Say, for example, somebody has been in the service for fifteen, twenty years, they retire, they get a job outside. We have got to try to retain those skills as best we can. There are some regulations in the Public Service which allow about two weeks leave for the Defence Force. We may have to work out similar arrangements with the private sector. That is a challenge that lies in front of us. There is a long way to go.

Wing Commander Tony Austin: You alluded to the benefits of rationalisation of tri-service training. We are also seeing the development of the concept of the Theatre Australia, with conjoint Headquarters. Sir, do you see that there could be any benefits to the ADF in opening up certain areas to, if you like, cross-pollination between the

three services? I am thinking here of areas such as legal, dental and, dare I say it, medical?

Air Vice-Marshal Rogers: Yes I do Tony. As you know right now we are moving towards a lot more tri-service training. The training commanders of all three services are getting together, looking at all of their individual training to see where there are economies we can put in place; for example, with medical and legal. Once we have done training we will move on to employment. We are also looking at the amalgamation of lawyers. That it is a difficult one because commanders in the field require specialised-to-service advice to let them do their jobs. The concept of collocating all the lawyers and keeping them under the command of the single services may work, but they've got to be in reasonable proximity to where they are employed.

There are I think a lot of other opportunities. Take dental technician training. Army trains them, we train them. That's silly. We've got to do it together. I think what we'll find in the development of the new Headquarters ADF is that, whilst we will have the three component commanders of Chief of Navy, Chief of Army and Chief of Air Force, they will be able to task right across the matrix organisation. It won't be strictly limited to the single service chains.

Squadron Leader Chris Westwood: I would like to get some general comments on the current debate about networks versus hierarchies as far as management and information dissemination goes. Networks, from a management point of view, are far more efficient than hierarchies, and from an information dissemination point of view, hierarchies are now all but unnecessary. The wider societal trends tend to reflect that assertion. Yet from a command and control viewpoint, militaries have always functioned as hierarchies, although hierarchies promote inefficiencies and duplication of effort and, to some extent, encourage micro-management. Sir, can you comment on the balance between networks and hierarchies for the RAAF in the information age?

Air Vice-Marshal Rogers: We have been a little slow on the computer side of things. It was not until about three or four years ago that we realised the need to put down some networking right throughout the Air Force. I think networking had developed on a very ad hoc basis, and I guess that goes to a degree for a lot of the ADF. But we saw the need in the Air Force to get some networking in. And as you know right now we have got several programs in place, not only to put fibre-optic cable right around our bases, to enable the units to communicate, but also for the commands and the units to Air Force Office. We have got data flowing around.

We are also finding in Air Force Office that it's a generational thing. Not only do we have to put the equipment in, but we have to educate the people. The one thing I think we are dropping the ball on is educating people in how to do those things. I find that a number of people on my staff network, but some don't. For example, I find that very few people use email. I have got to try and encourage a little bit more of that.

Air Vice-Marshal E.M. Weller: I will pick up a question here on the organisational issues. Air Force perhaps hasn't moved as rapidly as it should to embrace the lateral radical rearrangement of organisations that we see in Microsoft and other places. Would you care to comment about whether Air Force has made any moves in that direction?

Air Vice-Marshal Rogers: To be frank we haven't made very many moves at all, although we have set up our organisation. In the last eight months Defence has appointed a chief information officer. And we are just in the process of setting up things like the Defence Information Management Committee, which will have representatives from each of the Programs. I am the chief information officer for the Air Force. I have some difficulty with the way we do those sorts of things in Defence, where we come up with an idea and we just pick somebody and say, 'Right. You're it. Off you go and do it,' with very little training and very little exposure. I am not pleading a case for myself. But I am saying, we've got to change the way we do things. We had a meeting on this recently and I put up the idea that we should have a chief information officer who is completely separate from the services and the bureaucracy. He would be the guru, the man who sits back there with a small staff and can have some sort of influence on all the other Programs in Defence. We tend to do things piecemeal fashion. I think we have got to be a lot smarter.

Squadron Leader Westwood: Sir, in part that answers my question. Another command and control debate that is raging at the moment is that the militaries have always argued that there needs to be a top dog to make a decision. Therefore information needs to flow from the ground up, and then a decision will be made, and that then flows back down. That system is contrary to industry trends. Currently there is a pull-down information trend amongst industry, where anyone can grab whatever they need, versus the push-down that the hierarchies promote. The militaries right now are saying, 'We can't go as far as that. We can't go to a pure network.' The question is, in the future, will we be able to remain relevant in an information age where everybody else is networking?

Air Vice-Marshal Rogers: I was trying to allude to that in my presentation, saying that, with our work in the Quality field, we have tried to devolve responsibility and decision making to the lowest possible level. In the future, all the information will be available, yes. And we've got to empower people at all levels to make the decisions appropriate to the tasks that they are given, and not push them up the top. It's a traditional view in the military that the commander up the chain has made the decisions. And this is the approach that we are trying to fight. We are looking at the way we have done things in the past and then looking at the future, at technology. We need to understand what information will be available at all levels and empower people to make those decisions for the good of the organisation. We have to make sure that those people in the future are not only well trained, but are competent enough to make those decisions. And if we don't, we haven't done our job.

Dr Alan Gropman: David, I am interested in your recruiting situation. Have you found in the era of defence cutbacks that the quality of your recruits has gone up?

Air Vice-Marshal Rogers: First up, in the years from 1990 on, when the recession that Australia had to have was in place, our annual loss rates fell to about four per cent on average, whereas our normal turnover is in the order of ten per cent. Consequently the competition for the places we have in the Air Force was a lot keener. We were in a position to select the best. Many of the people who entered the service at that stage are just coming out of the training pipeline, others have been out in the field for one or two years, so the quality is high.

Dr Gropman: In the United States military the quality has gone up steadily, to the point where it's the best it has ever been in the draw-down. The Army used to recruit two hundred thousand. It is now recruiting sixty thousand to eighty thousand and the quality has gone up. Whether that can continue or not is another story. We also find that with the retention of pilots, the closer to the operational mission they are, the better their retention - for example, fighter pilots.

Air Vice-Marshal Rogers: If we take the loss of pilots in the RAAF, it has waxed and waned. In the late eighties we lost, on the average, about one hundred and ten pilots a year for about three years, which really hurt, because it wiped out the supervisory element and the regenerative element. In other words, the instructor force. And we have experienced that in this last fiscal year. To the end of this month, which is the end of our financial year, we will have lost about ninety pilots. The majority have gone to airlines but another drain that is coming in now is the Middle East. We are the biggest operators of PC-9s in the world, so Saudi Arabia - and, I understand, Qatar soon - are poaching a lot of our pilots. Not just for the PC-9s but also fast jets. We can't compete with the types of packages they are offering - salaries in excess of what the Chief of the Air Staff earns.

But what we are saying to these young fellows is, 'Look, there is a reason you joined the Air Force in the first place, right? You had your hand over your heart and all that sort of thing, but you enjoyed it, you enjoyed the life. Why are you leaving?' Sometimes it's family pressures: they want a little bit of stability. Or they can see their friends out in the airlines earning big money, and you can't blame them. But what we can say to these people is, 'Look, if you want to get that out of your system for a couple a years, OK. Go and do your contract and come back. Because we'd like you back.' Whether they'll respond to that sort of approach remains to be seen.

At the Singapore Air Show recently, Dr Tony Tan, the Deputy Prime Minister of Singapore, referred to the growing aerospace industry in Southeast Asia. That boom - civil and military - has spawned a whole new requirement for all the skills associated with the aviation industry, from engineers to fitters to pilots to air traffic controllers. The RAAF has lost a lot of air traffic controllers to Air Services Australia, because they are offering another twenty thousand dollars a year. There is also in Southeast Asia a big market for air traffic controllers and for flight engineers and pilots. Former RAAF flight engineers are now flying with Japan Airlines and we have got a number of pilots in other airlines, not just the traditional Cathay and Qantas. Our people are very highly trained, they are very competent, and those qualities are recognised and they are very attractive outside.

How do we overcome that? We are looking at some form of incentive pay for retention. As I mentioned before, we can't keep up with the Jones's. But we must bear in mind, every dollar we outlay should be aimed at keeping that very expensive resource in the Air Force, from the aircraftman to the air marshal.

Dr Gropman: We find for enlisted people that the best advertising is that we give experience. We prepare you for life and service to the country, in that order. We also find that duty in Somalia, Haiti, Bosnia, Rwanda, is a drag on advertising.

Air Vice-Marshal Rogers: I think that our contribution to Rwanda was viewed by the Australian community as very much a plus in terms of our people going over and doing a job. Same thing for Cambodia and Somalia. I think we got out at the right time, though.

Air Commodore Neil Smith: Both you and Peter [Smith] alluded to the industry partnership and the fact that the ADF should be guiding industry a little more. In the past we have had a preoccupation with manufacturing the platform and in particular bending and drilling metal. Peter mentioned that we are moving away from that and getting into the systems. The point I want to make is that we are still preoccupied with the platform. If you have a look at the weapons for the F-111 and the Hornet, none for either of those aircraft is fully manufactured in Australia. My belief is that if we want to be self-reliant, then we have got to start getting into the weapons business and perhaps accept the fact that we have got to buy the platform.

Air Vice-Marshal Rogers: Neil, I couldn't agree with you more. In the formative stages of programs we have to bring industry in. At present there is no conduit by which we can do that. I have been critical at times of our projects. We have the industry folk beavering away in one area and we have the Force Development people in another area, and the Development side comes up at about the ninth rather than the eleventh hour and says, 'What about the industrial side of the house? How are we going to apply this?' The ninth hour is better than the eleventh, but it's still too late. I could quote the F/A-18 program. I think from memory we paid five hundred million dollars as a premium for the work we did in Australia. I look back now and there is very little of that still of benefit to us, exactly as you suggest. All the money was put into the assembly program, which was essentially a 'follow-a-manual, drill-a-hole, put-a-rivet-in,' with all due respect to the people involved. That is a perishable skill. It's gone. And anyway we can train those people in the very short term.

What we have got to look for in the future, in the earlier stages of developing our programs, is getting industry in and saying, 'This is what we are looking at' and giving them the opportunity to come back to us and say, 'Well, this is where we can play a part here'. I cite AEW&C as a good example. At close to the eleventh hour, some people in the industry were saying, 'We need to have an Australian prime contractor to do this'. Now, that is the wrong time to even think about that. Personally I think they were on the wrong track anyway, because there is no country other than the United States that's been successful in developing that sort of capability. The UK tried and others have tried. There are many things that come into it. There is the business risk, there is the financial risk, there is the knowledge base. We just do not have the capacity in Australia to have something like a prime contractor run the AEW&C, let alone a company big enough to take the financial risk.

So I agree with you wholeheartedly. We have got to revise our whole acquisition process. We have got to get into bed with industry. For example, there used to be a Defence Industry Council many years ago which included the doyens of defence-related industries around Australia. The United States has those sorts things. It has major corporate heads and CEOs sitting on things like the Science Board, advising people. We rely on DSTO, and without them I think we would be suffering very badly. I know it is a sore point with DSTO that we rely on them for some of the support for our ageing aircraft. DSTO believes that we should be putting that out to industry. I think they are quite right. But the industry at this stage is not big enough to sustain that

sort of work over twelve months. If we have a problem with an aeroplane, say for example, the structural aspects of an F-111 wing, we go to DSTO. They have got sufficient resources and they have got the people with the skills to do the analysis and get the answer for us. I don't think Australian industry is structured for that, nor does it have the skills required to do those things.

OPERATING THE RAAF BEYOND 2000

AIR VICE-MARSHAL P.G. NICHOLSON

INTRODUCTION

So far in this conference we have heard about the ideas and strategy which have directed the RAAF to this point, the likely security environment of the New Era and how Australia might respond, and the shape of the ADF beyond 2000. Other presentations have explored technology developments including the use of space, operations other than war, and some of the practical aspects of managing the Air Force and industry partnerships. Professor van Creveld has outlined his view of the future of air power beyond 2025. My purpose in this last presentation is to develop some ideas about how we should operate the force in the New Era.

The approach to this task will be to detail the components of operational capability and in particular our force structure beyond 2000. From there, I will develop some notions about the nature of future war in the air and the likely impact of the Revolution in Military Affairs (RMA). This will lead to identification of the more important future operational concepts and the shape of the organisation needed to employ them in the years beyond 2000. Finally, some of the areas which could provide a capability edge will be examined.

OPERATIONAL CAPABILITY AND FORCE STRUCTURE BEYOND 2000

National defence policies are directed toward establishing and maintaining a given or required level of operational capability. The definition of 'operational capability' has always been extremely difficult. It is accomplished most easily if there is a clear and recognisable threat to national security as was the case for the US and Nato nations during the Cold War. However, in this New Era of Security, while it is generally recognised that the security environment is in the process of being transformed, there is no explicit threat to any regional nation. So, in these circumstances, what level of operational capability is required?

Many models of operational capability have been put forward. Australian doctrine postulates one with three components: readiness, sustainability and force structure. Readiness is a measure of the time required for the force to be ready for combat in a particular role (for example x aircraft at y days for anti-submarine warfare). Sustainability is the ability of the force to maintain a pre-determined tempo of operations for an extended period. Together, readiness and sustainability are referred to as preparedness. A better model is that proposed by Frank Carlucci, a former US Secretary of Defense, which has a fourth component which he terms force modernisation. Unfortunately, for both models, there is an inherent tension between preparedness and the remaining two components of operational capability - force structure and force modernisation.

For example, a high level of readiness, that is, the ability of forces to be committed to combat within a short period of time, requires a high level of training to maintain operational proficiency with the concomitant commitment of resources - more flying hours, more steaming time, more track kilometres, and so forth. Similarly, a high

level of sustainability requires resources to be committed to all those aspects required to sustain forces not only at a high state of readiness but through a period of combat, when usage can be expected to be very high indeed. Hence, sustainability requires stockpiles or at least guaranteed supply of high usage items, some of which may be high cost and with short shelf life such as precision guided munitions (PGM). A high level of sustainability also requires a resilient maintenance capability which in periods of peace (non-combat) is by definition operating far under-capacity, or in business terms, inefficiently.

The conundrum is how to balance the resource requirements of people, materiel and money for short term components of preparedness against that required for the longer term components of force structure and modernisation. Another way of expressing this, which highlights the analogy between the business of defence and the commercial world, is achieving a suitable balance between current activities and investment. It is significant that most regional nations have used the present period of a relatively benign strategic environment to concentrate their efforts on investment in capital equipment. In Australia's case, successive White Papers and many other defence policy statements have specified that the proportionate balance of defence spending between personnel, operating costs and investment will be maintained at the present roughly 40/30/30 per cent split. We will rely on our strategic indicators and warnings to provide sufficient notice of a need for increased preparedness to shift this balance away from investment toward the higher current activity level necessary for decreased readiness notice for operations.

Any substantial change in force structure, either an increase or a reduction, is a very long term process, longer even than the major equipment acquisition cycle. This is because the need to change the force structure has first to be recognised and then the political ground prepared for the perceived change. Then the associated changes in personnel and equipment must be planned and implemented, including the associated financial programming and budgetary allocations. Once funding is available, the equipment acquisition cycle can start, together with training of personnel, construction of facilities and all the myriad of support arrangements associated with a major project put in place. RAAF force structure will change only marginally in the New Era with the main differences being the introduction of the Jindalee Operational Radar Network and the Airborne Early Warning and Control aircraft. However, these are major capability improvements which will greatly enhance our ability to gather intelligence, conduct surveillance and control both our airspace and the sea approaches to the continent.

Other capability improvements will come through force modernisation by both replacement of existing platforms, and refurbishment and upgrade of others. For example, the C-130J is a replacement program leading to considerably enhanced capability while the F-111C Avionics Update Program and P-3C ESM project, to name only two, upgrade existing platforms with modern, more capable sensors and vastly improved navigation and attack systems. As Martin van Creveld has pointed out, cost is a huge burden for air power and the ability of small to medium powers to upgrade platforms with new systems is crucial to balancing expenditure and developing force structure in a controlled and sustainable fashion.

The Revolution in Military Affairs

War in the air in the New Era will be strongly influenced by what is commonly called the Revolution in Military Affairs. The RMA is usually described in terms of three

interwoven threads of advances in technology, new operational concepts and changes in organisation. For example, the technological innovation of HMS *Dreadnought* revolutionised naval warfare when she entered service in 1906. On the other hand, thirty years later the German Army took existing technology, the tank and the aircraft, and moulded their employment into a new operational concept, the blitzkreig. It is important not to focus too narrowly on the technological advances which are the most evident driver of the new RMA to the detriment of the equally important aspects of the new operational concepts and organisations needed to exploit these advances.

There is little need to dwell on the detail of the technological advances which fuel the RMA, suffice only to identify some of the broad areas which influence operational capability in the future. Perhaps the key point is that the new RMA is founded on information technology and precision engagement. A significant feature of the short list of likely areas of technological advance is that it involves improvement in degree and not kind. Most of the technology is already available although perhaps not yet fully integrated into our force structure. However, our thinking about the operational exploitation of this technology is lacking. Our traditional notions of organisation may no longer be appropriate for the information age. 'We are moving rapidly from a world of information poverty to [one of information] abundance with corrosive effects on all hierarchies'.[1] In my view we are at the end of the beginning of the Revolution in Military Affairs now and will be well into it in the New Era beyond the year 2000.

The enormous increase in the speed of digital data processing together with the decrease in size, power and cost has allowed an unprecedented ability to gather, store and manipulate information. Improved communications connectivity and bandwidth provides the facility to move this information around securely and reliably. Both these advances are already freely available to the private individual who 'surfs the Net'. No commander will be able to prevent people from using the Internet, nor should they want to. On the contrary, military organisations which encourage individuals to use information networks will have an enormous capability to acquire high-quality *knowledge - and, therefore, power - than those which proscribe networking.* Empowerment of the individual strengthens the resiliency of the organisation and its capacity to understand, cope with and exploit change - precisely the circumstances which characterise warfare.

Knowledge of activity in the battlespace and adjacent areas will come from remote sensing using adaptive sensors operating selectively over a wider proportion of *the electromagnetic spectrum than at present. Our ability to detect and identify targets* will be greatly improved and we will employ precision guidance for best weapon effectiveness. This combination of knowledge dominance and precision engagement is the essence of the new Revolution in Military Affairs because these characteristics can be achieved through force modernisation rather than dramatic and obvious changes to force structure. Furthermore, the emphasis has changed from the platform to the systems employed. *Of greatest import however is that both these capabilities will be* available to most air forces in the New Era. This reinforces the need to pay attention to the other components of the RMA, namely, our operational concepts and the organisational design to put them into effect.

[1] Builder, Carl H., 'Is it a Transition or a Revolution?', *Futures*, Vol 25, No 2, March 1993, pp 155-68.

CHARACTERISTICS OF THE RMA

There are several features which characterise the Revolution in Military Affairs. Firstly, the space in which we engage the adversary is multi-dimensional with spatial, temporal and environmental dimensions. In the information age, or more particularly, when in conflict with an information society, we can add another dimension, the knowledge domain. The relative strengths of the opposing knowledge domains has the potential to warp the battlespace just as a black hole distorts a gravity field. This effect is more than the change to the linear battlefield caused by mobility and manoeuvre on land. The characteristics of air power of speed, flexibility and responsiveness enable knowledge dominance to be exploited and permit asymmetric application of force.

Asymmetric application of force can be achieved because knowledge dominance enables the use of the three most important principles of war - surprise, concentration of force and economy of effort. This asymmetry can have effect across all dimensions of the battlespace because knowledge is not just information which has been assessed to become intelligence but comprehension of the opposing commander's intention through understanding his information cycle. In turn, this results in decisive action, disruption of the adversary's capacity to respond and demoralisation of his people as his knowledge domain shrinks. It is important to note that with knowledge dominance force can also be applied asymmetrically across the levels of war; for example there could be a strategic response to a tactical provocation.

It is both a characteristic and a corollary of the RMA that the adversary's strategic centre-of-gravity is now vulnerable to attack by both conventional (non-nuclear) and unconventional means. A corollary because if the adversarial society is information based, disruption of his strategic knowledge domain will incapacitate his political leadership. A characteristic because the technology associated with the RMA allows his strategic target set to be attacked and destroyed.

A further effect of the information revolution is the pervasive presence of the press and its influence on public opinion. The consequence of this is that the ability of a democratic society to respond to an aggressor might be severely circumscribed. For example, a sustained response without quick results may not retain popular support, especially in the face of casualties. On the other hand, the capability to strike at an adversary's centre of gravity at both the strategic and operational level might create an escalatory climate and encourage an earlier resort to offensive action than would otherwise have been the case.

THE NATURE OF WAR IN THE AIR.

With these characteristics in mind, some broad observations are possible about the nature of war in the air in the future. The main factors influencing this will be the increased tempo of operations, the struggle for knowledge dominance, the increased effectiveness of weapons, and the ability to command and control air operations in the joint and combined arena.

Future warfare will be characterised by short, sharp encounters which take place regardless of day or night or the prevailing weather. Surveillance sensors and quality reconnaissance will provide information on the disposition of the decisive points of the adversary's centre of gravity while precision location and guidance will enable their accurate targeting and destruction or neutralisation. The tempo of operations will be furious - high paced, continuous and of short duration.

Enhanced weapons effectiveness accomplished by a combination of superior knowledge of the target set associated with the decisive points of the adversary's operational centre of gravity, recognition and identification of the critical elements in the target set, and precision guidance of weapons will allow attacking forces minimal exposure to the adversary's defensive systems using a small number of long range weapons delivered using stand-off tactics. Force preservation and minimal collateral damage will be important considerations with unmanned vehicles and remotely controlled systems used when adversary defences cannot be satisfactorily countered.

Information, or more precisely knowledge, will became a major determinant of success in warfare both in the conduct of operations and because of the vulnerability of modern states and economies to attacks against their information systems. As states become more technologically and economically advanced and increasingly rely on their information systems, they will become increasingly vulnerable to attacks against that network. In combination with the successful introduction of wide area surveillance and reconnaissance systems and precision guided munitions, that shift in the way nations function has revolutionised the nature of warfare.

Drastic changes in force structure will not be necessary to reap the rewards of the Revolution in Military Affairs. However, modernisation of forces through incorporation of the types of technology already available is eminently feasible and likely. The key to the success of force modernisation will lie in the information domain, especially the capability to command and control these modernised and more effective forces, to employ them at greater tempo and to switch them between different target sets. An effective command and control system is essential in the first instance to achieve information dominance and then to execute the campaign to achieve strategic paralysis.[2]

Operational Concepts

In the New Security Era, our military strategy and its translation into a concept of operations must recognise that the combination of the intelligence available, the precision of modern weapons and the ability to deliver them means that the adversary's strategic centre of gravity is vulnerable. In other words, strategic strike is a realistic and viable option for a small capable force with operational reach. Offensive action, including strategic strike, is fundamental to success for a relatively small force such as the RAAF and any form of attrition warfare must be avoided. This will also have profound political consequences because, as Eliot Cohen has pointed out, incentives for preemption may grow.[3]

Force protection is paramount for a small force and we must ensure our ability to counter or penetrate defences, to preserve the asset in peace and war and to guarantee sustainability until conflict is terminated. For some missions, this can be best achieved through the use of unmanned aerial vehicles but many will require man-in-the-loop decision making and control. Certainly, stand-off delivery of weapons will be necessary together with the ability to actively and electronically suppress enemy air defences.

Because of the pervasiveness of the media and the influence of public opinion, we will be increasingly governed by the Laws of Armed Conflict. We will be driven by

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[2] Stephens, Alan and Nicholson, P.G., *New Era Security and the RAAF*, Paper Number 43, Air Power Studies Centre, Canberra, April 1996, p 18.

[3] Cohen, Eliot, 'A Revolution in Warfare', *Foreign Affairs*, March/April 1996, p 45.

the concepts of military necessity, humanity and proportionality together with community expectations of minimised casualties. All of these will demand improved intelligence and reconnaissance, weapon precision and discrimination, and high confidence and reliable identification systems.

Finally, we must develop independent war fighting concepts for information warfare, that is, attack on the knowledge domain of the adversary's battlespace and protection of our own. The term 'information warfare' is used to describe all aspects of conflict in the knowledge domain and encompasses the subsets of electronic warfare, command and control warfare, deception, psychological operations and public information, as well as attack and protection of information systems (that is, operational security).[4] Information warfare applies across all levels of war. At the tactical level it can ensure successful force engagements. At the operational level it allows dominant manoeuvre for the preparation, deployment and positioning of forces to win the air campaign. At the strategic level it can incapacitate a modern, information based society by disruption of financial, telecommunications and commercial transaction systems without firing a shot.

ORGANISATIONAL DESIGN

At the recent conference on RMA held in Canberra, Carl Builder detailed four basic human organisational schemes discerned in Rand research. The scheme adopted depended on the nature of the transaction within and between groups. According to this categorisation, a hierarchical organisation was appropriate for command and control and power transaction purposes while networks were best suited to the transfer of information and knowledge. However, we have observed that one of the advances driving the RMA is information technology and there is no doubt that networks best facilitate the exploitation of these advances. The implications of networking are unquestionably revolutionary. But if the new opportunities are to be exploited to the maximum, a new kind of organisational model will be necessary. The critical question is: how can a military force network? How can information exchanges take place *across* a war-fighting organisation, as well as up and down, without commanders losing control or, more precisely, being able to exert sufficient control? How to meld an organisation which networks and shares information with our traditional hierarchical command and control arrangements is probably the major challenge of the New Era. There are many analogies with private sector management theory here because an organisation which networks, that is, allows information to flow *around* rather than *through* the chain of command, has effectively flattened the management structure.

At the operational level of war, battle management will be extremely difficult in an information rich environment. The main factor in effective operational control of the tactical means in war remains making correct (or best) decisions in circumstances of ambiguity. In the age of New Era Security the ambiguity will be due to too much uncorrelated, non-associated information creating 'noise' in the knowledge data base rather than the situation of the past when decisions had to be made on the basis of too little information and a depleted knowledge base. At the tactical level, the problem will be whether or not to insert a control element in the 'sensor-to-shooter' link. This will have important implications for managing and implementing Rules of Engagement

[4] See Emmett, Peter, 'Information Mania - A New Manifestation of the Gulf War Syndrome?', *RUSI Journal*, Volume 141, No. 1, February 1996, pp 19-26, for a balanced discussion of the history and future importance of information warfare, and the factors or 'facets' comprising it.

(ROE), especially in the period of tension preceding conflict when ROE may be tightly constrained.

The key to maintaining a high tempo of operations is not the ability to generate a high sortie rate but the command decision cycle time. Given that surveillance, reconnaissance and intelligence information is readily available, including battle damage assessment, and that the communications links are in place to convey orders and target information to direct subsequent operations, the choke point in the decision cycle is the commander and his staff deciding what has happened and what is needed next. We will need to exploit the computing technology advances to produce decision support aids to assist in rapid, consistent, reliable decision making. General Tom Moorman has spoken of another approach - 'channel surfing' a terabit sized data base to extract the required information, or information 'pull' by the user rather than 'push' by the provider.

Finally, the competition for public sector finance will inevitably lead to an environment of constrained resources for defence. The technology available now allows accurate modelling and realistic simulation of many activities now practised only in the field. Thus, simulation offers the prospect of considerably reduced financial outlays particularly in some high cost activities such as flying training and combat team training. More importantly, high quality modelling and high fidelity simulation will permit test and evaluation of new operational concepts and war gaming against real and prospective adversaries.

The Capability Edge of the New Era

From this discussion of the Revolution in Military Affairs and its likely impact on war in the air it is possible to make some judgments on where the capability edge will lie in the New Era of Security. First, to understand what is happening around us we need complementary and well-integrated sensor suites, both remote and platform borne, covering a wider portion of the electromagnetic spectrum with adaptive sensors and near real-time sensor management. The secure, redundant communication links to convey this surveillance information to our operations centres together with the computing capability to manipulate the data goes without saying. The application of new technologies associated with data fusion is extremely important because they offer the prospect of using intuitive and specialist knowledge as a way of correlation and association of seemingly random information entering the knowledge base from all directions.

Command and Control needs to be treated as a capability in its own right in the force structure. Command and Control at the operational level is central to defence self-reliance and our ability to operate independently. The existing ADF capability in Command and Control of joint and combined forces and our continuing emphasis on this, especially at the operational level, is a particular strength which could provide a marked edge in conflict or result in us leading a coalition in a collective response to a regional crisis. The ability of our organisation to respond to changes will be critical in realising this capability.

We need to be constantly refining, testing and evaluating our doctrine, especially in relation to joint and combined operations because doctrine forms the basis for the planning and employment of air power. In turn, doctrine focusing on the long range offensive action capability of air power enables a rethink of our military strategy for the defence of Australia. The ability of air power to strike precisely at long range,

in conjunction with knowledge dominance, allows a more proactive strategy to be applied to control of the approaches to the continent. Rather than the defensive military strategy known as 'defence in depth', air power in the New Era will enable theatre control.[5] The concept of theatre control encompasses not only the traditional air power doctrinal role of control of the air but, through air strike, also control of the sea. In addition, air power can contribute to theatre information control by denying the adversary freedom in intelligence gathering, surveillance and reconnaissance activity in the air and sea approaches. The testing and evaluation process can be greatly facilitated by the simulation and modelling capability offered by advances in computing technology but development of algorithms, especially for campaign and theatre level planning, needs considerable effort.

Our ability to implement many of the new operational concepts, especially offensive action such as strategic strike and theatre control, together with our geographic situation, predicate a force with operational reach. This can be accomplished with a combination of long range platforms, air-to-air refueling and stand-off weapons. In coalition warfare, operational reach can be greatly facilitated by access to forward operating bases. A force with operational reach enjoys the significant advantage of rapid response to contingencies. The ability to rapidly project force also has a profound deterrent effect in the period of tension which would precede conflict.

Finally, what sort of people will the RAAF of the New Era need? Because of the pervasive influence of information technology, there could be a tendency to think that the Air Force should be a group of 'computer nerds', particularly at the crucial operational level of command. Nothing could be further from the truth. To reiterate the theme, the technology is the means to the operational end and although we must shape our organisation to ensure they have adequate influence, we need innovative, creative people with the right operational experience to develop the concepts of operations which exploit technological opportunities.[6]

Conclusions

Air power will remain the single most important comparative military advantage of the developed economies and advanced democracies. Only these states have the national infrastructure and wealth to invest in and maintain competent, modern air forces. Other subnational or international groups do not have this capability. Whether these groups are terrorists, drug barons or organised crime, our surveillance systems enable us to find and target the things they value with strategic air power. The outcome might not always be ideal as in the case of Israeli air power being unable to prevent Hizbollah rocket attacks. However, the Israeli Air Force strikes remind Hizbollah that there will be a price to pay for those attacks. Because Israel has absolute air power dominance, that price can be extracted wherever and whenever the Israelis choose, at little risk to themselves.

Australia will want to fight at a distance, minimise casualties and maximise our technological edge - exactly those aspects which characterise air power and explain why air power is the weapon of first choice for nations with developed economies.

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[5] Stephens, Alan, *Air Power Doctrine Revisited,* Paper Number 44, Air Power Studies Centre, Canberra, May 1996, pp 21-24.

[6] See Hughes, David, '609th Sqdn. Pursues New Realm of Combat', *Aviation Week & Space Technology,* April 29, 1996, pp 52-3, for discussion of the initial USAF personnel employed in information warfare.

Like any other form of combat power, the use of air power may not always lead to unconditional victory but it can achieve the desired political outcome.

The issue is that in order to comply with international pressures, rather than striving for 'total' victory, increasingly we will seek political outcomes by coercion. No better example of this approach can be found than Operation 'Deliberate Force', a brief air campaign (30 August to 20 September 1995) involving 3500 sorties against fifty-six Bosnian Serb targets. The limited political result sought and achieved was to bring about negotiations to stop the fighting, if not the war. This strategic application of air power became possible only when vulnerable ground forces were withdrawn and were no longer potential hostages. In the end, the operation amounted to maximising comparative advantage, of making the most of what Tony Mason has called 'differential air power'.

An operation on the scale of 'Deliberate Force' is not far beyond the RAAF fighting independently and certainly represents a rate-of-effort and effect which could be managed with regional partners. For these reasons, in the right conditions, air forces are flourishing. In our part of the world where economies are booming, air forces are growing, not disappearing. Since World War II, Indonesia, Malaysia, Singapore, Taiwan, India and Pakistan have all developed highly respectable Air Forces starting from nothing.

The age of New Era Security will be one of rapid, unprecedented and unremitting change. The question is not one of managing this change but of seeking ways of actively exploiting it. Unless we aggressively exploit change it will overwhelm us, making our organisation, ideas and capabilities irrelevant. The key to success lies in our people who must be encouraged and empowered to use the tools available in innovative ways so that the milieu of warfare reflects that of their information based society. This is a synergistic process of innovation to employ technological advances in new operational concepts followed by modification and adaptation of our organisation to meet the challenges presented. Certainly, we cannot hope to reap the benefits of new technology without changes to our concepts and organisation.

DISCUSSION

Wing Commander D. Tramoundanis: You discussed the asymmetric application of force across the levels of war. You also mentioned networks as being the most efficient means of transferring information and knowledge. I wonder, then, what these developments in new era warfare will mean for the traditionally recognised levels of war and what the implications will be for the command and control functions ?

Air Vice-Marshal Nicholson: I don't think the revolution in military affairs will change the notion of three levels of war at all. In fact in many ways it will reinforce it. For those who aren't familiar, I will define them. The tactical level is the level of force engagement. The strategic level is the level at which military power is used as an option and interacts with the other national instruments of power. The operational level is that which coordinates and controls the tactical means to achieve the strategic ends. The revolution in military affairs doesn't change any of this. In fact, I believe that the work that we have done on our doctrine and our command and control system reinforces the need to ensure that these three levels are kept isolated, so that at the

operational level only the military options have to be considered. That is not to say that there shouldn't be networking at the strategic level or at the operational or at the tactical level. There will be. In fact there will be networking across them. But I think that the levels of war, despite some references in the literature recently to merging them, are here to stay.

I think it is most important for our war fighting concepts and our operational concepts that we do consider the operational level of war. It is an area where we have been deficient in the past, because we have had no practical experience. We have always been highly regarded at the tactical level, and we have been highly regarded at the strategic level, in that we have usually known when to go to war and who to go to war with or against. But it is at the operational level of war we don't have that capability. And the technologies, the concepts and the organisations that are becoming available are most applicable, in my mind, at the operational level of war.

Air Marshal R.G. Funnell: Peter thanks very much, I found that a very rich presentation. Mine is not a question, it's a challenge to all the serving RAAF members in the room. What I would like them to do is, against the concept of operations you have outlined for the Royal Australian Air Force in the future, to apply the challenge which Professor Martin Van Creveld gave us this morning. He challenged us to apply that concept of operations on the battlefield of the future. How is the Royal Australian Air Force going to apply its air power in sub-national conflict? And if I could just focus the example somewhat, how are we going to apply our air power in association with some neighbour or regional partner that is being subjected to sub-national conflict?

Air Vice-Marshal Nicholson: I couldn't agree more, sir, and in fact I don't have a lot a disagreement with the themes Martin has been exploring for some years. My disagreement would lie with the fact that in our part of the world at least, the states are non-nuclear, and I believe likely to stay so; and the nation state is booming. And I think if anything, the states in our part of the world are more nationalistic than in other areas. I think that it will be decades before that washes out.

Professor Martin van Creveld: Sir, I can claim to no expertise on your part of the world. However, it did strike me how many speakers, and that included you, just ignored the single most important technology that has dominated military life since 1945. Not a single word, as if it were not there. Now I know and understand that this part of the world has not yet seen nuclear proliferation. On the other hand, you might. I would suggest that if a serious threat was ever to emerge to South Korea, Taiwan, Malaysia, Indonesia, New Zealand, and of course Australia, then this part of the world would become nuclear. And the result - hopefully of course, because we can't be sure - would be the same as everywhere else. Namely, an end to large scale interstate war, again, hopefully.

One last remark on this subject. We have mentioned India and Pakistan, which are part of this region. There, it has already happened. During the first twenty-three years of those two countries' existence, they fought three wars against each other (by the way, not one of them caused a political, international border to be moved by as much as a single inch: in the end, they were back where they started). Since the last one, almost twenty-five years have passed. In fact, since 1971 the most important operations mounted by both the Pakistani and the Indian Armed Forces have been directed against their own people. I personally think that it is much more likely that this

will continue, than those two countries engaging in another large scale conventional war.

Air Vice-Marshal Nicholson: Thank you, Martin, and as I said, I think the disagreement is only on the pace of nuclear development in the region. I believe that the ADF of the new era will have the people with the creativity, imagination and innovative bent to tackle those questions when they arise.

Wing Commander Allan George: Sir, any future operation that Australia is likely to be involved in will probably involve a coalition force. We will need to exchange information in that force at all levels, from the top to the bottom. How might we exchange that information? What information are we going to exchange? At what security levels? What information is in the common environment of that force? To that end I think we need to come up with some definition of the common information environment, so that when we go into a coalition force we know what information we are going to put in the common environment.

Air Vice-Marshal Nicholson: It has to treated, I think, on a case by case basis at first. I certainly subscribe to General Moorman's idea that we won't be able to close information off. It is going to be commercially available. A critical factor in warfare in all environments has always been the weather. You can now get, I think at about five minute updates, complete weather information off the Internet. So what we might conceal is probably questionable anyway.

We are moving down that path in a bilateral way through our exercises and meetings with most of the nations of the Asia-Pacific Rim. Most contact is bilateral to create the ground work perhaps for an expansion into a multi-lateral arena in the future. There is considerable work to be done on the security environment and the processes, such as the Asean Regional Forum, before we can contemplate multi-lateral exercising. But through close association with all of our regional partners, I think we are getting close to the mark. We have very close contacts at government levels with most of the regional nations, including at what you might call the grand strategic and the military strategic levels. That contact, which is part of the whole notion of regional engagement, is being pushed down now through the operational level with many more visits and exchanges, so that we are creating a web of personal relationships. The reason I raise that is because these sorts of things have positive outcomes as a result of personal relationships. Exposing our people to the cultures, to the languages of the region is just as important as exposing them to other kinds of information.

Air Vice-Marshal R.V. Richardson: Peter, I would like to be a bit provocative. I thought one of the most thought provoking statements you made was your phrase, 'Air power will, if it hasn't already, develop the ability to control the sea'. Where does that leave our major capital ship programs in Australia?

Air Vice-Marshal Nicholson: I think surface naval forces are extremely vulnerable. The combination of our national assets, let alone information which we might share with other nations, means that we can compile and maintain a surface and air picture with relative ease. Because of the relatively slow movement of surface vessels - relatively slow compared with aircraft - I believe that they are particularly vulnerable, through this whole area, all through the archipelago to our north-west and north to

Japan. Now the two options for sea control are sea-based air power or land-based air power. Our only option is land-based air power. I think the Air Force needs to look at the totality of theatre control: not just the second layer of defence in depth, of control within the theatre, but of movement in and out of the theatre, and that includes naval forces.

Mr Maurice Horsborough: My main concern is the role of the media in influencing public opinion during conflict. If I can quote a classic case during the Gulf War, the ABC which, as you all know, is a taxpayer-funded government station, refused to broadcast messages to our service personnel in the Gulf. To me, that was grossly offensive. One ABC commentator clearly was very anti-war. As this is a new era security conference I feel that we should look very closely at such behaviour. I feel that our service personnel were sent to the Gulf by our democratically elected government, and here was a taxpayer-funded station refusing to send messages to them. I wonder if you have any comments to make?

Air Vice-Marshal Nicholson: Well, I am certainly not going to comment on the funding of the ABC. I'd suggest your comment reinforces the need for the concept of the three levels of war. The strategic level is the one which must take into account all of the aspects of national power, and a free and open press is one of those things. My point is that we must take into account, in our operational concepts, that that freedom exists. And also, as I pointed out, that the pressure the media might exert at the strategic and political level via public opinion or world opinion could well limit some of the military options.

Dr John Cashen: Peter, you have talked about the capabilities that are on-line today, such as JORN, command and control, the air maritime picture, AEW&C. That is a lot of new and very important capability for the air power of the future, for the defence of Australia. What capability, as Air Commander, do you think we still lack?

Air Vice-Marshal Nicholson: I think one of the prime capabilities is operational reach. We need more tankers, lots of them, fast ones. I think the ability to project power will be crucial in the new era of security. And I don't necessarily mean independently, I mean in coalition or at least with collective agreement to what is going on. My American friends can correct me, but I think it was Lee who said the key is to get there 'fustest with the mostest'. Deploying capable forces well forward is not only a powerful deterrent, it can stop a period of tension developing any further. Now, the problem with that is, of course, the sustainability is extremely suspect in those situations. So that would be the second area I would develop.

Squadron Leader John Oddie: We have heard that there are resource constraints on us in the Air Force, which means we need to move towards commercialisation as well as seeking other efficiencies generally. In industry, there is a need to produce a return to the shareholders, but in the ADF those demands lead to a certain tension between our readiness and sustainability and our mobilisation planning. What is the future for us in mobilisation planning, particularly within Air Command?

Air Vice-Marshal Nicholson: That is a subject for a conference by itself, John. First, there is a lot of work going on. The mobilisation issues are really more of the CAS's

responsibilities than mine, and most of that work is being done in the strategic level headquarters. I think the most important thing gets back to total quality management and examining all of our processes. We have to imbue a quite different mind-set in our people and I think that our people are adapting very well to change. As Mac [Weller] pointed out, Logistics Command in particular has gone through massive change. We have got to look at the way we do things and be prepared to try new methods. We need to be creative and innovative.

Now this sounds very glib, but what it boils down to, I believe, is good leadership, and a willingness to change our culture from one of risk averseness to risk management, even to entrepreneurial risk taking. There are some areas where we can't do that: flying safety is a good example. What successful organisations look at is that a fifty-one per cent hit rate is good enough. We expect much higher than that, and generally we will get much high than that, but we need to encourage people to look at new and innovative ways of doing things, of even wondering whether they need to be done at all. That kind of entrepreneurial flavour needs to flow into our people. Our people actually have it, but we are not empowering them to do it very well yet. And that has got to do with Chris Westwood's question earlier to the Deputy Chief of the Air Staff: how do we meld networking and hierarchal organisations? I don't have all the answers, but typically I think an organisation should turn over about every couple of years. Not just the people: the organisational structure.

Group Captain John Harvey: In your discussion about leaders of the future, you said they won't be computer nerds, they will still be those with operational experience. I wonder how you would define 'operational experience' in the future as we move more towards space, UAVs and information warfare type operations? I think the type of operational experience might change considerably if, for example, a UAV does a pre-programmed mission. What do you see as the nature of operational experience ?

Air Vice-Marshal Nicholson: I don't mean that only pilots should run the Air Force. The operational experience needs to be relevant to the times. Right now the operational experience resides mostly in our aircrew and our air defence operators, perhaps. In the future it may well be people who are operating UAVs. It may well be people who are experienced in information attack. It will be appropriate to the times.

Air Vice-Marshal Weller: Peter, can we just take this business of information warfare a little further? There are a lot of young blue-suit people out there who are very comfortable with computing and information. What should they be growing into, how are we going to grow them, where should they be planning their future for information warfare?

Air Vice-Marshal Nicholson: I can't answer that. I want them to give me the answers. At the moment we are just developing our own doctrine in that area. The United States Air Force has some doctrine on command and control warfare. It is my view that battle in the knowledge domain, knowledge warfare, encompasses electronic warfare, command and control warfare, many of the missions which fall into suppression of enemy air defences, both physical attack and otherwise, and deception. Deception plans have always been regarded as a separate entity from operational concepts in the past. I think they have to run across all three levels of war, because deception plans

work on the perceptions of both your own force and the adversary's. Therefore, if you can warp that perception, then you are achieving an effect in the knowledge domain.

Squadron Leader D.G. Millar: One of the big changes for us has been the shift from the classic blue-on-orange exercises to blue-on-blue. Within the region we are seeing lots more of what were originally blue or US-built, British-built systems. With this freedom of access to technology and dependence on industry that we have heard about today, my concern is having common systems - F-18s, F-16s, whatever - built by a third party nation and supported through field service reps, on two sides of conflict. How vulnerable will we be to third party governments deciding who gets the support and who gets the source code and who gets the undoctored block series?

Air Vice-Marshal Nicholson: We are extremely vulnerable, and that is the judgment that has to be made, and it is a very fine judgment as CDF said. We've got to get the right balance between defence self-reliance and self-sufficiency. We can never hope to be self-sufficient. As the Deputy Chief pointed out, it is not practical and certainly not affordable. So we have to make those kinds of judgments: how much we do ourselves, how much do we rely on a third party? I might point out that we are a technically advanced, highly educated, well motivated, literate population. Our population of eighteen or nineteen million people has enormous intellectual capital. In old terminology we would talk about the national will as an instrument as national power. Well, I would say we have this enormous national intellectual capital which can be used to educate and assist and help the development of many of the nations around us. And that close networking of personal relationships, institutional relationships, cultural relationships and social relationships is the essence of regional engagement and that is what will ultimately ensure our grandchildren's security.

Sergeant Geoff Clarke: Over the three days of this conference it has become apparent that information technology is growing immensely within the RAAF and will be relied on heavily in the near future. Currently, however, positions in the information technology area are being filled by personnel from mustering/categories not dedicated solely to IT. Consequently personnel can be posted back to basic mustering duties on completion of their duties, and the new personnel posted in require intense training for their new duties. I believe this process decreases the efficiency of IT development within the RAAF, and I was wondering: is there is a requirement to establish a new mustering/category for information technology?

Air Vice-Marshal Nicholson: No. And it has got to do with that well-known practice of multi-skilling. We have to be familiar, all of us, with the tools. We don't need to know how all the tools work, and indeed I would suggest that is one area of potential considerable resource saving, where we can use the commercial arena to support us and only keep enough blue-suiters, more highly educated in IT, to deploy forward.

And that gets back to the whole issue of information technology support. Everybody has got acquisition problems. The one area where we do have evolutionary acquisition is our new strategic and operational level command support system, known as Joint Project 2030, where it is recognised that the traditional acquisition process cannot possibly keep up with the rate of computing technology advance. So, to put it simply, we are taking our commercial off-the-shelf box and software and growing a

requirement around it and expanding all the time. We are moving nicely down that path.

The other real failure of the acquisition system in relation to information technology is not budgeting and resourcing the support, and that really is where your concern lies - that we are not spending enough money educating our own people or bringing in the right kinds of people. We are a bit inclined to whack down the fibre-optic cable, stick a box on the end of it and finish it there. I think the proportion of spending on hardware and software compared with the support needs to be in the ratio of about one to ten to be effective.

Air Vice-Marshal R.A. Mason: My question follows that last question and answer. Air warfare is not the exclusive domain of air power is it? Information warfare transcends all aspects of warfare. How do you see the evolution of the Australian capability for information warfare blending or indeed conflicting with the interests of the other two services?

Air Vice-Marshal Nicholson: The way I would like to see it is that, first of all, all of the information needs to be pulled together in the strategic headquarters, and that is in fact beginning to happen. I think it will happen further when the existing service offices become service headquarters and components of the strategic headquarters. At the operational level, Headquarters Australian Theatre will become the repository of information. It is a little bit like operational level targeting - the bulk of the work would be done in the Headquarters Australian Theatre and then the components would work out the details. The same with information warfare, because there are some areas where it is better attacked by one or other environment, or someone quite outside the organisation. So I see that being pulled together.

However, that is happening in relatively slow time, and we are actually looking within Air Headquarters at forming a directorate of information warfare to explore some of these issues. One of the things it will do will be to bring together our information, our forward-looking information development staff and our electronic warfare people and smash them all together and let them network and come up with the right answer. I certainly don't know what the answer is, except that, it is not something which is exclusively in the province of air, certainly not.

Air Marshal S.D. Evans: Peter, this is not a question, it is a comment. I notice in your talk you did not mention jointery once; indeed, you had the audacity to say that air power may often be the preferred solution. It is refreshing to me to hear this. I think we have become imbued with the idea that you must talk jointery all of the time, and nothing else. It worries me that in operations we could seek a joint solution, even though it may not be the best, because it is more acceptable. I go back to the abortive Teheran Embassy rescue by the Americans who set up a joint organisation because everyone wanted a bit of the cake, but the thing failed dismally. I know that in most cases operations will be joint, and properly so. But there will be occasions when another form of warfare is preferable and I congratulate you on recognising it and being brave enough to say it.

Air Vice-Marshal Nicholson: Thanks sir, I don't know whether that is good or bad. Actually I don't think anybody's got better joint credentials than me, and I am a fervent advocate of jointery. I am also a strong advocate of air power as a weapon of

first choice generally. But there is no doubt in my mind that the application of air power has got to start at headquarters of the Commander Australian Theatre. He then gives his experts - those people with professional mastery in their environments - the jobs to do. And those jobs need to be planned by expert staff, in our case, air staff. It is only if we have got those expert staff and the proper advice of the Air Component Commander that Commander Australian Theatre can make the right kinds of decisions about what weapons should be used.

CLOSURE

AIR MARSHAL L.B. FISHER

Distinguished guests, ladies and gentleman. Before I close this conference, let me again thank our distinguished speakers, the many senior officers and officials who have made time in their busy schedules to join the RAAF for this most important occasion, our sponsors, all of the delegates, and the staff from the Directorate of Coordination and the Air Power Studies Centre. All of you have contributed to an event I believe has been a great success.

What of the conference? It is clear that we are indeed in a period of 'New Era Security'. At the geostrategic level that era is characterised by uncertainty and complexity. It is also characterised by change, but it is the rate of change which is so different to previous eras, and which is so critical to those organisations charged with national security

In the context of that most challenging environment, the Minister for Defence identified two 'stern tests' for the ADF. First, we must manage the fundamental changes which are taking place in the conduct of warfare; and second, we must implement the corresponding fundamental changes which will be essential to the effective management of the Defence organisation. More than ever before, we cannot be complacent. We must be the masters of change, a particularly demanding task in what is likely to be an extended period of budgetary constraint and peace

Let me summarise some of the key observations to arise during the past two and a half days concerning the way we might tackle our challenges.

The most important was the unequivocal statement, made by both the Minister and the CDF, that the direct defence of Australian territory is, and remains, the core business of the ADF. But that core business must not blind us to our other responsibilities, prominent among which are regional cooperation and support for UN activities.

How should the ADF and the RAAF go about meeting our major responsibilities in the New Security Era? Several points repeatedly arose during the presentations.

We will continue to go further down the joint path, to the benefit of Australian security and the ADF. Regardless of any technological change, the continuing relevance of the air/sea gap to Australian concepts of operations was stressed, with CDF suggesting it has become more difficult than ever before for any potential aggressor to try to operate in that gap. The RAAF's planned AEW&C capability is the ADF's most pressing need. Information dominance, the precision application of force, and situational awareness are the keys to success.

Fully exploited, those kinds of capabilities will permit the achievement of strategic objectives by actions and forces which previously may have been considered tactical, from the very outset of combat. In that context, we must note General Moorman's point that, increasingly, the microchip is becoming the heart of power projection.

Some important questions were raised regarding the future of air forces generally and the RAAF in particular, ranging from the argument that the ADF should

become fully integrated, to the suggestion that the days of air forces in their traditional form are numbered.

In the medium term at least - say out to 2020, the period bounded by the purview of this conference - I see absolutely no chance of the latter happening. On the contrary, all the objective evidence in the Asia-Pacific region at least points in the other direction: that air forces are expanding and growing, and will continue to exercise a decisive security influence in our overwhelmingly maritime, as opposed to continental, environment. Indeed, on this point, I now formally invite Professor van Creveld to attend the RAAF's one-hundredth anniversary in 2021! I certainly intend being there.

As regards increased integration, the Minister and CDF have unequivocally stated their commitment to, and belief in the efficacy of, a strong joint force built on the three single services. Nevertheless, I would have to say that Air Marshal Funnell's important point on further integration cannot be ignored. Increasing integration is unquestionably occurring.

I take the point made by a number of our eminent speakers concerning the fundamental changes which are likely to affect our air force - changes driven by such emerging technologies as UAVs, the exploitation of space, information warfare and long-range missiles. Like all advanced military forces, the RAAF is going to have to experience a culture change in both our outlook and the way we do business if we are to maximise the enormous opportunities those kinds of technologies offer. In particular, we are going to have to understand the sociological implications of the current technological revolution, ensuring that the RAAF and the ADF continue to match our outlook and values with those of the community we serve.

Within our joint force, I note that both CNS and CGS flagged a growing need for more air power as one of their central requirements in the coming years. It will be the RAAF's task to satisfy that need. In a period of continuing budgetary constraint and peace, it will not be easy to achieve all of our objectives. We will have to work closer with industry and make greater use of commercially developed systems, noting that for many technologies, commercially produced systems are dramatically outpacing those produced solely for the military, especially in the fields of communications, information systems and electronics generally.

As an organisation, the RAAF will have to draw the line ruthlessly between what is essential and what is merely 'nice to have' and, as the ADF's prime provider of air power, we will have to display principle and determination in advocating the position we believe represents the 'essential' air power needs of our joint force.

Nothing will be more important in constructively pursuing our objectives than the quality of our leadership at all levels. In that context, let me say in passing how pleased I have been to see so many senior NCOs and junior airmen and airwomen present here for the past few days, just as I have been delighted with the attendance and active involvement in the conference of all ranks

The leadership message I would like all of you to think on, to take back to your colleagues, and to then work assiduously to implement, is that vision and knowledge will create confidence and certainty in our Air Force, our future, and our ability to maximise the remarkable opportunities which will exist to foster Australian and regional security in the coming quarter century.

In my opening remarks I advised you that this was not to be a conference for self-congratulation, but rather, for hard work. I believe we have achieved that objective, while, at the same time, enjoying ourselves in a most stimulating environment.

But in no way, shape or form does that mean that we are anywhere near to doing all that has to be done to grasp the opportunities of New Era Security. All of us will have wasted our time here if we do not now move on from the essential start point of academic debate to what is in many ways the far more difficult task of grabbing hold of the issues, of using the ideas we have developed, of turning theory into practice.

As I formally close this conference, I urge all of you personally to assume some responsibility to ensure that we fully seize the remarkable and exciting opportunities before us.

Thank you for your participation.

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Many strategists believe that defence forces around the world are currently experiencing a 'Revolution in Military Affairs'. While the description 'revolution' might be questioned, there is no doubt that dramatic changes are taking place. Nor is there any doubt that the rate of change is unprecedented, a factor which has the potential both to create uncertainty and raise international tensions.

This book examines some of the critical issues associated with New Era Security. While the individual chapters were written specifically with the Royal Australian Air Force and Australian defence in mind, most of the insights and observations are relevant to national security concerns generally.

Anyone with an interest in strategic studies, foreign relations, military history and defence technology will find this volume invaluable. Topics discussed include the future nature of war, the balance of power, information warfare, command and control, military capabilities, emerging technologies (for example, the exploitation of space, unmanned air vehicles, precision weapons and the like), and regional security.

A feature of the book is the question and answer periods which follow each chapter.

The contributors are J.S. Baker, Paul Dibb, L.B. Fisher, R.G. Funnell, Alan Gropman, Patrick Hine, Benjamin S. Lambeth, Tony Mason, Thomas S. Moorman, Peter Nicholson, David N. Rogers, Peter A. Smith, Soedjati Djiwandono, J.M. Sanderson, Alan Stephens, R.G. Taylor, and Martin van Creveld.

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