

Seven Perennial Challenges To Air Forces

Sanu Kainikara



© Commonwealth of Australia 2009

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission. Inquiries should be made to the publisher.

Disclaimer

The views expressed in this work are those of the author and do not necessarily reflect the official policy or position of the Department of Defence, the Royal Australian Air Force or the Government of Australia, or of any other authority referred to in the text. The Commonwealth of Australia will not be legally responsible in contract, tort or otherwise, for any statements made in this document.

Release

This document is approved for public release. Portions of this document may be quoted or reproduced without permission, provided a standard source credit is included.

Author: Kainikara, Sanu.

Title: Seven perennial challenges to air forces / Sanu Kainikara

ISBN: 9781920800437

Subjects: Air power.

Air forces.

National security.

Other Authors/Contributors:

Australia. Royal Australian Air Force. Air Power Development Centre.

Dewey Number: 358.4

Cover design and layout by Graeme Smith

Published and distributed by:

Air Power Development Centre

TCC-3

Department of Defence

CANBERRA ACT 2600

AUSTRALIA

Telephone: + 61 2 6266 1355

Facsimile: + 61 2 6266 1041

E-mail: airpower@defence.gov.au

Website: www.raaf.gov.au/airpower

ABOUT THE AUTHOR

Sanu Kainikara is a former fighter pilot of the Indian Air Force who retired as a Wing Commander after 21 years of commissioned service. During his service career, he has flown nearly 4,000 hours on a number of modern fighter aircraft and held various command and staff appointments. He is a Qualified Flying Instructor and a graduate of the Fighter Weapons School, the Defence Services Staff College, as well as the College of Air Warfare. He is a recipient of the Air Force Cross.

After retirement from active service, he worked for four years as the senior analyst, specialising in air power strategy for a US Training Team in the Middle East. Subsequently, he was a member of the Aerospace Engineering faculty at the RMIT University, Melbourne and a consultant to the Air Operations Division of DSTO, also at Melbourne. He is currently the Air Power Strategist at the Air Power Development Centre, Canberra and is also a Visiting Fellow at the University of New South Wales. He has published widely on national security, strategy and air power and is the author of five books—*Papers on Air Power*, *Pathways to Victory*, *Red Air: Politics in Russian Air Power*, *Australian Security in the Asian Century* and *A Fresh Look at Air Power Doctrine*. He is also the contributing editor of the book *Friends in High Places: Air Power in Irregular Warfare*.

Dr Kainikara has two Bachelors degrees, a Masters degree in Defence and Strategic Studies from the University of Madras and a PhD in International Politics awarded by the University of Adelaide.

ACKNOWLEDGEMENT

The author would like to acknowledge Group Captain Rick Keir for several discussions that distilled a number of arguments put forward as well as for the suggestions that have served to improve the cohesiveness of this book. Further, his Foreword to the book is gratefully appreciated.

The author is also indebted to WGCDR Keith Brent for editing the draft version with great care and to Graeme Smith for creating an aesthetically pleasing cover design and extremely readable lay out.

FOREWORD

This paper is about the seven perennial challenges to air forces. Dr Kainikara defines the seven perennial challenges as those that will always present conundrums to air force commanders—regardless of how far air forces develop in terms of strategic and inter-Service acceptance, technology, strategy, operational art and tactics.

In broad terms, the paper covers a range of topics—from the nature of independent air forces, the perceptions of politicians, the public and the media, and the issues of attrition and collateral damage.

In specific terms, the paper identifies seven discrete arenas that challenge the efficacy of air power:

- Environment
- Technology
- Demography
- Resources
- Politics
- Attrition
- Collateral damage

Dr Kainikara has observed these challenges as a professional airman and air power strategist since 1971, when he joined the Indian Air Force as a fighter pilot. I am certain that there would be agreement that these challenges are always present and never seem to quite go away—thus, they are truly perennial.

The paper finishes with an essay on the question of independence. Independent air forces have been around since 1918 and the Royal Australian Air Force, created in 1921, is the second oldest in the world. It is interesting, however, that *The Third Brother*, as the Air Force is known, has never been fully accepted by its elder brothers.

This is not a problem unique to Australia—but an international one. Whilst the benefits of air power are well accepted and acknowledged to the point where a significant amount of combat power of the surface forces is made up of air power elements, each air force invariably suffers attacks on its independence—whether the arguments be made on the dubious grounds of efficiency, ethos or cost-effectiveness. Without doubt, the real arguments for a separate and independent air force are based on the pervading nature of airspace that affects all other operating environments and the requirement for *professional mastery* of air power—a mastery that can only be acquired by years of experience, study and reflection – a mastery impossible to acquire when air power is not your core business line. One also wonders whether any resource-limited medium-sized nation, such as Australia, can indeed afford to penny-packet its air power resources across three separate Services—but that is another debate for another day.

I trust that this paper will add to the ongoing intellectual debate and add something of substance to the development of air power strategy and employment principles.

Group Captain R.J. Keir, AM, CSC
Director
Air Power Development Centre
Canberra

AUTHOR'S PREFACE

The world is in turmoil, even if there is palpable peace and stability in many corners with matured nation-states making concerted attempts to ensure that the disquiet does not reach their shores. A dispassionate analysis of the current international security reveals that some of the blame for the current imbroglio rest with the Western nations who in the past few decades were so absorbed in their pursuit of national prosperity that clear indications of the emerging disruption went unnoticed. While ignoring the warning signs may not have been a conscious decision, the results of the upheaval are bound to stay with the international community for a considerably long period of time. As yet—nearly a decade after the events of 11 September 2001, which could be considered to have been the ultimate catalyst for the distinct and rapid shift in global security perceptions—there does not seem to be any viable solution emerging to contain the vexed issues that have made a mockery of the concept of peace and stability in large parts of the world.

In today's information age, the events taking place even in remote parts of the world have cascading effects that impact nations that are comparatively stable. This has been acknowledged by the Western nations who view these events—some unrelated, but a number of them interconnected—as direct threats to their own security, compelling the West to intervene using a variety of means. The use of military forces to contain emerging threats is perhaps the most common and may be the result of the absence of a cohesive whole-of-government plan within a nation and the inability of the other elements of national power of nations to function effectively as a coalition.

For the foreseeable future, the military forces of the West will be involved in peace support operations—which includes the entire spectrum from humanitarian aid to stabilisation operations, other than actual combat against conventional or irregular forces.

However, in the past few decades there has been a noticeable change in the way in which military forces are employed as well as on the expectations regarding what they would achieve in such interventions. The military forces of the West are being increasingly used to resolve issues and situations that are predominantly receptive to non-military solutions. At the same time, the expectation that the military would succeed in resolving these issues to the satisfaction of all parties concerned has increased manifold. In combination with the restrictions imposed on the application of force that the West has placed on their military forces—for a number of reasons ranging from a base level concern for human life to the philosophical morality of using force—the forces would tend to become stretched in their overall capability to achieve the desired objectives. Under these circumstances the constraints placed on military forces assume critical importance.

Along with the other Services, air forces are also affected by the changes taking place in almost all aspects of the employment of military force. Military planners, including air campaign planners, have the onerous responsibility of attempting to mitigate the inherent restrictions that come with altered employment ethos and expectations so that the force can operate as close to optimum as possible. From an air power perspective there is a lacuna in this situation. On the one hand, there is a tendency amongst air power enthusiasts to emphasise its strengths and through them explain the optimum employment of air power to obtain victory. There is an underlying truth in the fact that air power is essential, and is critical at times, to victory in a conventional conflict. On the other, the restrictions placed on the unimpeded employment of air power cannot be wished away and have to be carefully considered and ameliorated to the greatest extent possible at the planning stage itself. The two are incompatible.

In considering the constraints under which air forces have to function, there is a tendency to investigate only those that can be

directly addressed within the air force itself. This makes mitigating the issues a simple matter of an air force decision, unaffected by any outside influence. It is suggested that this approach will not provide a sustainable way forward for modern air forces mainly because it is already clear that military forces, including air forces, will not be able to operate in a vacuum in the contemporary security scenario. Factors that even 20 years back would not have featured in the planning process of an air campaign now exert crucial influence on the planning process of an air campaign.

There is a distinct alteration, towards one of benign ambivalence, in the general perception of national security. This has a salutary impact on the way in which military forces are perceived and the status accorded to them within the national psyche. The Western nations are now reluctant to be seen as 'militarising' and, therefore, tend to keep their military forces as low-key as possible. One of the reasons for the current tendency to 'civilianise' the military as far as possible is an attempt at nominally reducing the 'strength' of the standing military forces. In this environment of political correctness, the military forces will find themselves at the receiving end of unpalatable restrictions that diminish their overall capabilities, while still having to achieve laid down objectives.

The correctness or otherwise of decisions that impinge of the efficacy of military forces can be debated. However, a pragmatic air power enthusiast will be best served by understanding and accepting the challenges that face modern air forces. Only then can a clear vision for the employment of air power in the pursuit of national security be evolved.

Sanu Kainikara
Canberra
November 2009

CONTENTS

About the Author	vii
Acknowledgement.....	viii
Foreword.....	ix
Author's Preface.....	xi
Introduction	1
I. Vulnerabilities and Constraints	7
II. The Challenges.....	15
Challenge One – Impact of the Environment.....	17
Challenge Two – Impact of Technology.....	28
Challenge Three – Influence of National Demography	33
Challenge Four – Resource Constraints at the National Strategic Level.....	41
Challenge Five – Political Dimension of the Employment of Air Forces.....	45
Challenge Six – Attrition Tolerance	51
Challenge Seven – Dealing with Collateral Damage.....	57
III. The Question of Independence	63
Conclusion.....	69

... I wish to note several points describing the main limitations which will be faced by the Air Forces in the coming millennium. Higher expectations, especially of air power, are developing. There is also high sensitivity to collateral damage and civilian casualties. It is difficult to estimate just how many casualties public opinion is willing to tolerate, since depends on varying conditions in different locations and different circumstances. There is a large quantity of information and data on an unlimited number of targets; each target requires separate government authorisation...

Major General Eitan Ben-Eliahu
Commander Israel Air Force
Presentation at the Millennium Air Power Conference,
Singapore, 2000

Moreover, air power will always carry with it the skeletons of Guernica and Dresden. No matter how precise the weaponry and professional the aircrew, every so often a weapon system will fail and non-combatants will die... The 'CNN factor' will be exploited to the full by all those who believe that air power is inhumane, somehow unfair and 'yet again' indiscriminate and hence, in sum politically counterproductive.

Air Vice Marshal Tony Mason (Retd) RAF
Air Power: A Centennial Appraisal, 1994

INTRODUCTION

The end of the Cold War saw the beginning of a period wherein the need for innovative strategic security thought was gradually lowered in priority to facilitate greater socioeconomic research and analysis. This led not only to stagnation of strategic security thought but also to the fragmentation and diffusion of the fundamentals of national security within the West.¹ Perhaps this was an inevitable fallout of the sudden collapse of the Soviet Union that left the Western nations with the feeling of a winner's euphoria that manifested itself as a sense of security from all evil. Subsequently, the most important thrust for most liberal democracies became the quest for increased prosperity and a place for themselves in the globalised world.

The collapse of the Soviet Union, however, did not bring about the predicted universal peace but, on the contrary, only managed to remove one of the fundamental assurances of a balanced and steady world order. In fact, the incidents of ethnic violence, civil war and terrorism increased markedly in the aftermath of the end of the Cold War. At the same time the world witnessed a visible reluctance on the part of the West to intervene in any meaningful manner in the more volatile regions of the world. This was the result of a conscious attempt to pursue a risk-avoidance security strategy, that was seen by the non-Western world as the Achilles heel of Western military forces—a reluctance to accept casualties.

While the West has been busy in the pursuit of even greater prosperity, there has been an evolutionary change taking place in the conduct of armed conflict. The first and most important is the fact that armed conflict is no longer the exclusive preserve of the legally

1 Dr Michael Evans, 'Appointment in Samarra: Western Strategic Thought and the Culture of Risk', in Michael Evans, Russell Parkin and Alan Ryan (eds.) *Future Armies, Future Challenges: Land Warfare in the Information Age*, Allen & Unwin, Crows Nest, NSW, 2004, p. 4.

constituted military forces of a state. Second, because of the non-state status of the combatants, the clear distinction between states of war and peace has become obscured, both literally and in a virtual sense. Effectively, the relationship and balance between the military forces of a state and the fighting forces or militia of a non-state entity have changed and now defy a clear definition or demarcation. The issue is that these changes were not noticed by a sanguine security establishment, although they were clearly visible to anyone who was watching.

It is also not surprising that superior ideas that very clearly indicated the West's self-obsessed understanding of the larger world order and international security to be wrong and a grave mistake in the broader context were cautiously not accepted into mainstream thinking. The West also failed to analyse the political, economic and security turmoil that engulfed most of the non-Western world during the 1990s, which pointed towards the declining authority of the state against indigenous insurgencies and the rise of religious fascism that supports terrorism as an acceptable form of waging war.

When the final explosion came, it was heard throughout the world, and the democratic nations were left asking uncomfortable questions. Even worse was the reaction of these states in terms of declaring a 'global war on terror', with no identified adversary and a makeshift strategy to be implemented to achieve an unclear end-state. For want of a better option, the world's military forces were pushed into fighting this war, one that had all the ingredients of previous failed campaigns. Conventional military forces, trained and developed to win battles, campaigns and wars through the application of overwhelming firepower, reliant almost completely on technological superiority, are not ideally suited to combat fleeting adversaries who cannot be readily identified, do not operate according to the accepted norms of conflict and who adopt tactics designed to neutralise the advantage of conventional military forces.

Nonetheless, in a number of cases conventional forces have comprehensively defeated irregular forces in battle—the defeat of the Taliban in 2002 and the second Battle of Fallujah in Iraq are fine examples. The fact that the West was unable to convert these successes to holistic long-term victories is the culmination of the joint effect of a number of factors over which the military has very little or no influence or control. Long-term or permanent victory over irregular or insurgent forces can only be achieved through a whole-of-government approach, wherein all elements of national power are brought to bear appropriately in order to obtain a political solution to the issue. Since this is a complex process that requires strategic coordination there is only limited understanding of its optimum application. Not surprisingly, there have been no comprehensive long-term victories for conventional forces in contemporary conflicts.

War is always complex and each evolution brings its own unique ‘fog and friction’ that must be surmounted by military forces if they are to be successful. This is not always easily achieved. Further, war is never an isolated act, even when one of the contenders is ill-defined in form and actions and the lead-up to it may not be clearly discernible. As Clausewitz wrote: ‘War does not spring up quite suddenly, it does not spread to the full in a moment; each of the two opponents can, therefore, form an opinion of the other, in a greater measure, from what he is and what he does, instead of judging him according to what he, strictly speaking, should be or should do.’² Therefore, it is incumbent on the military forces of the West to understand the nature of the adversary and adapt not only the operational concepts but also the tactical aspects of conflict in order to defeat this new threat.

2 Carl von Clausewitz, in Anatol Rapoport (ed.), *Clausewitz on War*, Penguin Books, Harmondsworth, England, 1968, p. 106.

The definition and understanding of national security has undergone a dramatic change in the past few decades. It is no more a question of protecting the borders and ensuring physical safety of the homeland, but one of protecting the ‘national interest’ wherever it may be and in different areas and levels of interaction. The strategic context in which the defence of the nation has to be ensured has become much more dynamic than ever before. Accordingly, the military forces of a nation operate in a complex and unpredictable security environment, across the entire spectrum of conflict. They have to cater for the changing character of conflict as well as for the changed notions of morality and ‘correctness’ of applying lethal power that have become manifest in the recent past. Further, lessons learned from recent operations indicate that the adversary will resort to irregular warfare when confronted by the conventional might of the State’s military forces. Under these circumstances, military forces are evolving to become more adaptable organisations.

By the very nature of its business—to fight and win wars—military forces are learning organisations, especially since it is a fact that no two wars are the same. The flexibility and adaptability inherent in the military forces are their greatest strengths and make them the best placed within the elements of national power to be the thread that connects the disparate security initiatives.

Air power has been a military instrument for only a century and can therefore be considered an infant in comparison to the much older and established naval and land forces. From the beginning, air power has been contentious—in its application, its strategic usefulness and mainly in the control of its assets, especially in times of conflict. Even though most of the nations that maintain standing military forces now have independent air forces, the capabilities inherent in air power have influenced the other Services in such a manner for them to aspire to have their own integral ‘air arms’. Ownership of air assets has been a vexed issue ever since the advent of air power as a viable

military capability. This can only be considered a subconscious manifestation of the acceptance of the ubiquity of air power.

The advantages of possessing adequate air power capabilities and the virtues of air power itself can be and has been perpetually extolled. In fact, a number of air power enthusiasts even claim air power as the panacea for all security related issues where military forces have to take the lead in securing national interests. This is the result of a perceived need to continually justify the capabilities of air power, although they do not generally try to explain the vulnerabilities inherent in air power and the constraints in its application that can affect the desired outcome. These well-intentioned individuals do not understand that such claims are detrimental to a holistic understanding of the employment of air power and also do long-term damage to its credibility.

This paper examines the vulnerabilities of air power and how they impact the employment of air forces in conflict situations. It first explains constraints and vulnerabilities in a generic manner and then identifies seven perennial challenges to air forces that continuously impinge on their effectiveness to the overall detriment of the application of air power. The challenges that have been identified have universal applicability and are not restricted to any one air force, although the effect of each challenge, as well as cumulative effects of a combination of two or more, will vary in different air forces dependent on a number of factors. However, the variations in the way in which these challenges manifest in different air forces have not been examined here.

Irrespective of the status of air power within individual military forces, its employment has to be done within a number of constraints. Further, air power also has a number of vulnerabilities that impinge on its effective application. While the vulnerabilities can be ameliorated by identifying them in time and initiating remedial actions, constraints are not easily mitigated. From a purely

‘academic’ point of view, this situation is not conducive to optimum employment of air power. However, the reality is that the measure of ‘optimum’ would have to be tailored to cater for the constraints, especially in the contemporary international atmosphere of brittle and fragile diplomatic stand-offs and belligerence.

The use of military force by Western nations in the quest for an elusive ‘world peace’ is by itself becoming a debated issue. Air power, which is seen as a monopoly of the West, is doubly targeted and viewed as the most abrasive element of power by the developing world where most of the contemporary conflicts are being fought. This is further reinforced by the air power dependent *modus operandi* being practised by Western forces engaged in such conflicts. It is therefore not surprising that air power is constantly being maligned as the most error-prone of military capabilities and is placed under extremely restrictive employment rules by the political leadership. Air power in fact is the asymmetry of the West, which their adversaries are consciously trying to neutralise through a number of concerted methods.

This paper is meant as a baseline explanation of the vulnerabilities of air power that manifest as challenges to air forces, especially in times of extremely sensitive international political situations. In the contemporary world there is only a fine distinction between the perception of the necessity or otherwise of using force. Even the slightest mistake in applying lethal force through the military is becoming unacceptable to the international community. Further, such mistakes also play into the hands of the insurgents groups who are only too happy to bring disrepute to conventional forces. Under these circumstances, it is necessary for all professional airmen to understand clearly the challenges facing their air forces to ensure that air power can be employed appropriately to contribute to national security.

I

VULNERABILITIES AND CONSTRAINTS

The Western way of waging war has been constantly evolving, the pace becoming fairly rapid since the end of the Vietnam War. By the late 20th century, the concept of attacking the enemy with technology-enabled, sterile, long-range weapons that minimised the risk of friendly casualties had become the primary way in which Western nations waged war. Very clearly demonstrative of this concept are the cruise missile attacks mounted by the United States (US) on suspected terrorist camps in response to the bombing of the US Embassies in Kenya and Tanzania in 1998. However, there is increasing evidence to suggest that this concept was always a nonstarter, based on unproven hypothesis regarding the conduct of war. The attacks of 11 September 2001 on the Twin Towers of the World Trade Centre in New York, acted as a catalyst to the West to reconsider not only the concepts of waging war but also to recast their threat perceptions.

There is no doubt that the attack on the Twin Towers was a defining moment in modern history and altered the understanding of threats to national security within the relatively peaceful Western nations and, perhaps, across the rest of the world. Threat perceptions underwent a nuanced change. Further, the two major wars that were initiated after the attacks and are still ongoing, in Afghanistan and Iraq, have proved the fallibility of a concept of operations that was rooted in technology and sought end-states that were not compatible with the cultural ethos of the nations in question. There is now a growing, if reluctant, understanding that conflicts are won or lost in the fundamental space of human ideas. How this will transform the nature of war is not yet clear, but the current global conflict is

fully enmeshed in the cognitive domain as a clash of contradictory norms, ethics and moral attitudes.

Although the need to operate in the cognitive domain has been recognised, when the need arose to counter the threat posed by non-state, irregular forces, the so called 'Free World' had very little choice but to rely on their conventional military forces. It has to be accepted that these military forces were not trained or equipped to combat what was, even then very clearly visible as, a war of ideals and ideas. After nearly eight years of continuous operations, the military forces of the West are still at the vanguard of these conflicts and not winning the war, even after conventional military victories fairly early in the campaign. There is no doubt that committing conventional military forces to contain and defeat dispersed, ideologically and religiously motivated irregular forces of indeterminate size, capability and intent is not the ideal situation.

A deeper examination of the global socioeconomic circumstances at the turn of the century clearly indicates that the preoccupation of the West with ensuring economic stability had diluted their attention towards the impending drastic changes that were about to envelop their security perceptions. For a number of years the West was ensconced within a deep sense of security and concentrating purely on single-minded pursuit of national prosperity. This made them either unaware of the indications emanating from other parts of the world, unable to string together disparate events that once again indicated an impending attack, or they chose to ignore as improbable the warnings from security agencies regarding increasing threats to the west's interests across the world.

A more positive alternative note is that military forces, when thrown into a situation for which they were unprepared, were able to leverage their inherent flexibility and adapt admirably to the changed circumstances in which they have been forced to operate. The ability to adapt fairly rapidly is a tribute to the professional

mastery of the military personnel that aided them to identify the changes that needed to be made and institute prompt action to retain the advantage that was initially gained. From a purely military perspective, this is a vindication of the selection and training regime that most modern military forces have instituted. Although military forces have been able to win battles and even campaigns at the tactical and operational levels of the conflict, these have not yet resulted in victory for the Western nations in the war that is now being labelled *The Long War*. In the context of national security, there still seems to be a lack of understanding regarding what military forces can achieve and what they cannot. It has to be implicitly understood that in the changed global sociopolitical and economic environment, total victory, even against an adversary with minimal warfighting capabilities, is almost completely outside the capability spectrum of conventional military forces of a nation.

The West, however, continues to struggle to prevent or counter the turmoil that is prevalent in the contemporary global security environment predominantly through the use of military force. Currently at least, there does not seem to be any improvement in the situation and a lasting solution seems extremely far-fetched. Almost as an adhoc measure, military forces are being employed to contain a very wide swath of contingencies ranging from the purely benign provision of humanitarian aid to combat operations against military forces, mostly irregular, either genuinely non-state or state-sponsored. In addition, because of the altered view of national security, Western military forces are increasingly being employed in areas far away from their own nations against adversaries who are not clearly defined and do not adhere to the conventional rules of combat.

The core values embedded within the conventional military forces of nation-states—adherence to the rules of engagement, international ‘norms’ in the conduct of war, the clear distinction between civilians and combatants, and the concept of discrimination and

proportionality in the application of force—are an anathema to most of the irregular forces that they encounter in combat. In addition, these adversaries define victory and defeat in very abstract terms that makes ‘winning’ the campaign very difficult. Even if a clear-cut military victory is achieved, the ideological and religious bias of these irregular adversaries makes it impossible for military forces alone to convert that victory into tangible political containment of the problem. The answer lies in being able to employ all the elements of national power in a coherent and concerted manner to achieve lasting solutions to vexing problems.

While the need to have such a whole-of-government approach to national security is accepted within the West, there is an unexplained over-reliance on military forces to carry out the bulk of the operations. This is rooted in the fact that, in most nations, the other elements of government that should be carrying out non-warlike operations that are critical to winning the conflict do not have the capacity to do so effectively. For military forces, this demands the establishment of a much broader spectrum of capabilities than would be required to successfully undertake conventional warlike activities. There is a major fallout from this situation, which is detrimental to their efficacy. The sheer spread of capabilities that a military force will be forced to induct to be effective in this broader role will automatically dilute the core capabilities that should be resident within the force to ensure victory in combat operations. If the enhanced spread of capabilities is inducted without carefully ensuring that the primary warfighting capabilities of the force are retained at the required level—in terms of equipment, personnel, resources and training—it could gradually become a visible vulnerability of an otherwise capable force.

Even the most competent of military forces have vulnerabilities and operate under constraints that are imposed on them. A force is most effective when allowed to operate without constraint and has the wherewithal to not be vulnerable. The effectiveness of the force is

also dependent on its capacity to keep any vulnerability that exists hidden from the adversary.

Vulnerability—the quality or state of being vulnerable—is commonly understood to mean fragile or subject to harm (and/or hurt), usually from external sources but sometimes from internal sources as well. When the term is used in relation to a place or fort, it means open to attack or assault; weak in respect of defence.¹ In military terms, therefore, vulnerabilities are the Achilles heel of the force and concerted effort must be oriented towards ameliorating them. There must be clear understanding throughout the force that vulnerabilities become the centres of gravity that must be protected from enemy attack at all times in conflict situations. Constraints on the other hand are external limitations or restrictions that are placed on the employment of a particular capability resident in the force that make it operate at less than optimum output. Further, most of the constraints placed on a force will be known to the adversary who can then exploit them to advantage. This is particularly the case when conventional forces of a sovereign nation are employed to counter and contain irregular, non-state forces that do not adhere to any accepted rules of engagement and would rely on the conventional forces operating under constraints of laid down rules of engagement.

Vulnerabilities can be protected in a number of different ways, the best way being the induction of the necessary capabilities that would cover the vulnerability on a permanent basis. There is also the possibility of a temporary solution, especially if operating within a coalition, when a partner nation will be able to conceal the vulnerability using their own capabilities for the duration required. Constraints, however, can only be overcome by the removal of

1 A. Delbridge, and J. R. L. Bernard, (eds.), *The Macquarie Concise Dictionary*, Third Edition, The Macquarie Library, McMahon's Point, NSW, 1998, p. 1316.

the external restraint or compulsion that has been imposed on the employment of a force. This is perhaps relatively more difficult because most of the constraints would be politically imposed and their removal, even when attempted, will be a long-drawn process that may limit any advantage that could accrue from their removal.

For example, the inability of air power assets to stay airborne indefinitely—leading to a certain amount of impermanence—is a vulnerability. This can be ameliorated in a number of ways, by increasing the number of assets that are available, by air-to-air refuelling to enhance the ‘staying power’, and by employing uninhabited aerial vehicles to remove the human element that restricts the time that a platform can stay aloft. Whereas, the imposition of restrictive rules of engagement that limit free-ranging and full-spectrum application of lethal force is a constraint in the employment of air power in an offensive manner. Even though air power currently has the capability to be precise, discriminate and proportional in the application of force, political constraints do not permit its use across the capability spectrum. Air campaign planning must be done with full awareness of these restrictions to ensure that they do not become vulnerabilities that can be exploited by the adversary.

The effectiveness of air power in support of national security imperatives is dependent on planners understanding the existing vulnerabilities and constraints in its employment in the contemporary environment and the awareness of how they can be best mitigated. This has a strategic or ‘political’ dimension to it as well as operational or ‘application’ dimension that will impact on the efficacy of air power across the spectrum of conflict. Normally vulnerabilities—because they are inherent—would be manifest at the strategic level, whether they are political, in the cognitive domain of the nation or the physical domain of the military force, whereas constraints—because they are externally imposed—will generally impact at the operational and tactical levels of conflict.

In the past two decades or so, it is seen that the majority of the threats to the security of sovereign states have mostly emanated from non-state entities conducting irregular warfare. Given the globalisation of trade and finance, the chances of state-on-state conflicts occurring are fairly low and this situation is unlikely to change in the near future. However, nation-states do not seem to be making serious attempts at understanding this altered security scenario and have not been able to refine their response—which needs to be a whole-of-nation approach—to these amorphous threats. In the contemporary scenario, it is therefore a certainty that military forces will continue to be committed to all kinds of operations, which may or may not have any direct security implications for the nation, mainly because they are normally the only cohesive and readily responsive entities available that can react to emerging situations.

This rapid responsiveness of a modern military force is almost completely dependent on air power's core competencies that are derived from its inherent primary characteristics—flexibility, responsiveness, speed, reach, penetration, precision, discrimination and lethality. Air power capabilities of air control, strike, air mobility, intelligence surveillance and reconnaissance (ISR), and command and control (C2) permit it to shape, deter and defeat adversaries in the battlespace. This makes air power a highly coveted military capability. Optimised employment of air power, however, needs airmen to be professional masters who should not only be capable of leveraging its advantages but also be cognisant of its vulnerabilities and the constraints under which it is normally forced to operate. The vulnerabilities of air forces and the constraints in which they operate, individually and in combination, pose a number of challenges to their achieving the desired objectives. Air commanders at all levels have to be aware of these challenges in order to analyse and overcome them. The pinnacle of professional mastery for an airman would be rising above these challenges in the employment

of air power in such a way as to negate its vulnerabilities completely and thereby deny the adversary a tangible centre of gravity to target.

The challenges to the application of air power are many, a large number of them contextual and, therefore, transitory in nature. However, there are some challenges—vulnerabilities as well as constraints—that are perennial and will always affect the unimpeded application of air power to its detriment. This book identifies and analyses the seven major challenges that all air forces face in the efficient application of air power. While it elaborates on the challenges, it does not examine or advocate possible solutions that could overcome them. Solutions are not being offered because the challenges that have been identified are perennial in nature, and cannot be mitigated completely at any time. These challenges only vary in their intensity of impact on the smooth application of air power, never becoming fully dormant. Further, even with the technology-enabled evolution taking place in air power, it will continue to face these challenges for the long term since they too evolve with the changes taking place.

II

THE CHALLENGES

Although there are very clear distinctions between vulnerabilities and constraints, which have been explained, in the employment of air power they tend to combine to create issues that are complex. The term ‘challenge’ is being used to denote each issue that arises from either or both, to indicate the more generic nature of these issues. Most of the issues that stem from either vulnerabilities or constraints are contextual in some manner or the other and, therefore, adaptive and agile air forces recognise and mitigate them relatively early in their inception. In fact, the alacrity of recognition and the rate of mitigation, if carefully monitored, jointly are very clear indicators of the alertness, flexibility and robustness of a force. These issues become challenges only when they combine and transform into complex entities with multiple lines of influence—some of which may only manifest in a gradual manner—that create secondary and tertiary effects on the conduct and progress of air campaigns.

There are seven major challenges that can be identified as perennial to air forces in the employment of air power. They have been classified as ‘perennial’ because, irrespective of the capability growth of air power and the refinement in its application by air forces that themselves embody sophistication in their concepts of operations, these challenges will always present conundrums to air commanders. This is mainly because these challenges emanate from external roots and, therefore, it is not surprising that they cannot be controlled by actions initiated even at the strategic military level. Only one of the challenges can be considered primarily internal to air forces and air power, and even that also has secondary external inputs that complicate its direct amelioration. However, each one of

Seven Perennial Challenges to Air Forces

the seven challenges has direct implications at both the strategic and operational levels in the efficient employment of air power.

Of the six challenges that are products of factors external to air forces, two cannot be influenced in any meaningful manner by either the air force or the nation. They are:

- the impact of the environment on air operations, and
- the impact of technology on the development of air power.

The other four challenges flow from a combination of a nation's culture, threat perceptions, industrial base, ethnic cohesiveness of its population and its economic strength. While these are also external to air forces, some of them can be influenced by decisions at the highest levels of government. They are:

- the influence of national demography and its changes,
- resource constraints at the national strategic level,
- political aspects of the application of force, and
- national ethos regarding attrition tolerance.

The seventh challenge is dealing with collateral damage, which is directly connected to the actual application of air power at the operational and tactical levels.

Challenge One – Impact of the Environment

The defence planner who ignores the probability that global climate change and its resulting environmental impact will have such [international and regional] destabilising effects should proceed at considerable peril.

Rebecca R. Rubin¹

The environment impacts air operations across the entire spectrum of conflict—from benign airlift operations in aid of civilian authorities to combat operations against another air force—in multifarious ways. However, there are three main elements that must be considered when analysing the environmental impact, and within the ambit of which all the major as well as minor implications can be grouped. These are geography or terrain, weather and environmental considerations, or what can be termed the ‘green effect’. Terrain and weather have impacted aviation from its very inception. In fact, the first powered flights undertaken by the Wright brothers were themselves delayed for a few days because of unsuitable weather,² and it has remained a constant source of delay and anxiety to aviation ever since. However, ‘green effect’ is a somewhat more contemporary concept and derives its implications for air power from the increasing concern regarding environmental protection.

1 Rebecca R. Rubin is the President of the environment and defence consultancy, Marstel-Day.

2 Valerie Moolman, *The Road to Kitty Hawk*, Time-Life Books, Alexandria, VA, 1980, p. 151.

Terrain

Air power is not limited by oceans, by shorelines, by shallow water. It is not limited by mountains or mountain passes or rivers, shallow or deep. It is not limited even by distance.

General T. Michael Moseley
Chief of Staff, USAF, 2006

One of the major claims that air power enthusiasts make regarding the flexibility of air power is based on its ability to transcend the limitations on military manoeuvre imposed by inhospitable terrain. This is true to a certain extent and air power can and routinely does overcome difficulties posed by terrain. In most cases the reference is to the ability of air power to transit across inhospitable terrain unlike surface forces, whose speed of deployment and ability to conduct manoeuvre is directly affected by terrain. While air power responsiveness and manoeuvre is not affected in the same manner since it operates in the third dimension, terrain directly affects air power effectiveness, in operations across the spectrum of conflict. The dilution of effectiveness is clearly apparent in radar shadow regions and in areas that have physical obstructions which diminish the technology-based capabilities of air power in both surveillance and strike roles. Further mountainous or heavily canopied jungle terrain makes accurate targeting difficult and decreases weapon effectiveness. However, synthetic aperture radars (SAR) have the capability to 'see' through foliage, thereby reducing the impact of such terrain on offensive targeting. Air campaigns in such terrain would invariably be critical contributions to surface force operations and the reduction of air power effectiveness can be of a magnitude sufficient to have severe implications for the success of the overall operations or campaign.

Admittedly, global positioning system (GPS)-guided weapons have the capability to strike the coordinates that are fed into them, even in heavily covered jungle. However, obtaining accurate coordinates

of a target is an involved and expensive process. In combination with the high cost of the weapon itself, the overall capacity to unerringly stipulate targets that can then be attacked in a 'blind' mode by air assets is exclusive to only a few nations. In other circumstances, the accuracy of a strike cannot be assured because of inherent intelligence gaps. No intelligence is completely infallible and, therefore, even the most sophisticated GPS-guided weapon system has an element of risk attached to it as the target coordinates may not be correct if inaccurate databases are used and faulty target development procedures are instituted.

The other technology-enabled concept used to counter the targeting problems in inhospitable terrain is laser designation. However, in order to designate the target, it must be visible to the designating team, whether air or land-based. However, mountains and jungle often preclude designating a target from the air, either self-lasing by the attack aircraft itself, or 'buddy-lasing' by another aircraft. Under these circumstances the option available is for a ground team to do the designation, which is extremely dangerous for the designating team, since they have to be in close proximity to the target. Laser designation involves a human-in-the-loop, which inherently carries the risk of the precision-guided munitions striking the wrong target through misidentification because of human error. Further, laser designation has also got a drawback in that the lock of the weapon to the designator can be broken if physical line of sight is not possible. Even if conditions are favourable, the entire process needs a great deal of coordination and dedicated training. The impact of terrain on air weapons effectiveness cannot be completely eliminated with the necessary assurance for it to be discounted.

In the past few decades, almost all conflicts have been conducted in the mould of irregular warfare and the prevailing global security environment indicates that this trend will continue well into the future. This creates a situation wherein there is an absence of clearly defined front lines and points of contact between the adversaries.

Accordingly, surface combat will be dominated by swift operations by small groups of elite soldiers undertaking specialist missions anywhere in the battlespace. The success of these operations hinge on the ability of air power to insert, sustain, support with fires and knowledge, and extract the teams as required. Of equal importance is the need for air power to shape the battlespace, in terms of obtaining and maintaining control of the air and carrying out strikes, to isolate the non-conventional adversary. Complex terrain assists the diffused non-conventional adversaries to evade detection from airborne intelligence, surveillance and reconnaissance (ISR). Terrain can limit the effectiveness of air power in inserting, sustaining and extracting Special Forces into the combat zone and targeting centres of gravity and high value targets to an extent wherein the overall campaign itself will start to lose momentum and initiative.

In conventional conflict, air power is critical to shaping the battlespace through interdicting supply lines and isolating the adversary forces. However, in complex and inhospitable terrain, identifying and targeting lines of communications become difficult and require an inordinately large quantum of air power assets to generate the necessary capabilities—ISR and strike—to be effective.

Further, even while using the latest technology, line-of-sight communications can become difficult in mountainous terrain. This automatically increases the reliance on space-based communications, which may not always be secure or, in the case of smaller forces, available at all times. Such a situation has implications for the efficacy of the command and control of air operations, thereby impeding the smooth progress of a campaign. While there are solutions to all the issues that arise because of terrain, they do not assure complete amelioration. Therefore, air operations will be directly affected by inhospitable terrain and this will produce a secondary effect on surface operations.

Weather

Theoretically, contemporary air power has all-weather, day and night operating capabilities. However, these capabilities are at the very high end of the technology spectrum and are not only expensive to obtain but also require dedicated training and experience to employ effectively. This combination of high-end technology and adequacy of training is currently available to very few air forces. Even these capabilities are degraded to a certain degree by inclement weather. As the air power capability moves down the technology spectrum, this degradation becomes increasingly pronounced till it reaches a place wherein all-weather capabilities cease to exist in a force. The loss of efficacy because of weather conditions is applicable to all air power capabilities and only varies in the degree to which it affects each of them.

The impact of weather is particularly appreciable in the case of ISR and targeting activities. Airborne ISR is a combination of air and space-based activities, both of which are susceptible to being affected by weather. Satellites are critical to ISR and are vulnerable to weather, the performance of their electro-optical and infra-red sensors being adversely affected. In contemporary conflict situations, constant and continuous information flow is essential to ensure adequacy of situational awareness of the commanders. ISR, derived from a combination of space-based assets and airborne platforms, plays a major role in providing this capability and any deterioration of the information gathering, exploitation and dissemination process will adversely affect the decision-making process of the force. Further, ISR is critical to ensuring correctness of the targeting process and the precision of the subsequent strike. The majority of adversaries that modern conventional forces face in contemporary conflict situations rely on low-technology asymmetry to neutralise their superior warfighting capabilities.

Adverse weather conditions can directly affect air power capabilities of forces that are not operating at the apex of technology and who do not have ready access to innovative and sophisticated equipment, such as SARs that can 'see' through poor weather conditions like rain and sandstorms. Such equipments are cost-intensive and unlikely to become commonly available to all air forces in the near future. Weather, therefore, can become an ally to these diffused irregular forces ranged against modern air forces.

Unlike airborne, manned platforms, satellites have a fixed flight path and can provide ISR over a selected area only at pre-calculated, although regular, intervals. This is an inherent constraint that negates the concept of flexibility of air power. If the weather is unsuitable to gather information at the pre-designated time that the satellite is over the area of interest, it will not be able to collect any data. On the other hand, a manned platform can avoid weather patterns and, if necessary, revisit the theatre of operations repeatedly to obtain the necessary information. A combination of high-end air and space power can provide both ISR and accurate targeting irrespective of weather conditions. However, the resource-intensiveness of acquiring, maintaining and operating a holistic ISR capability, in a sustainable manner even over the medium term, precludes it being available to most air forces. Even the few air forces that could afford to nurture such a capability would find that only a very limited quantum is resident within the force. It can be safely assumed that weather conditions will be a constraining factor in the application of air power for the foreseeable future.

The most commonly used air power capability in terms of ISR is resident in its imaging sensors. However, modern air power relies heavily on infra-red sensors and SAR as well as signal, communications and electronic intelligence (SIGINT, COMINT and ELINT) to monitor the adversary and for targeting purposes. Collectively, the strength of one capability compensates for the weakness in another. However, the sophistication required to

conceptualise, train and effectively operate these capabilities in an optimised combined manner is very high and within the operating envelope of very few air forces. Even the slightest misalignment in any one would have a debilitating effect on the overall capability. While these technology-enabled capabilities mitigate the effect of weather to some extent, it cannot be completely ameliorated. Weather will continue to be a restricting factor in the efficient application of air power.

Green Effect

There are very clear indicators that climate change and other environmental developments will be a defined factor, if it is already not one, affecting international and regional stability, increasing the complexity of the security debate. At the strategic level defence planners have to be aware of this relatively new element that is becoming increasingly important in global interactions and make it integral to overall defence analysis and planning.³ The direct effects of climate change—such as reduced food production, rising sea levels, lack of clean water, desertification and climate induced displacement of population—in turn increase the potential of creating more failed states, which are well known havens for terrorist activities.⁴ Climate change can create environment-driven regional instability and conflict possibilities and, therefore, needs to be monitored to improve conflict avoidance strategies. This is one issue that emanates from the environment and has an overarching strategic impact on global security that creates a cascading effect on military forces and air power.

While climate change will remain a strategic factor in defence planning well into the future, the impact of environmental

3 Rebecca R. Rubin, 'Climate Change can Threaten Defence Plans', in *Jane's Defence Weekly*, 29 July 2009, Jane's Publishing Company, Horley, Surrey, p. 23.

4 *ibid.*

protection activities on the effectiveness of military forces are more visible and immediate. The 21st century has seen the vociferous rise of environmental protection activists and their concerted lobbying, mainly in the West. At a purely academic level, environmental protection as a sacrosanct and non-violable primary factor to be adhered to in the planning and conduct of any developmental or security activities is a noble concept. However, it is an extreme stance and is not often a practical concept to implement. While the case for environmental protection is strong, the activities to ensure that protection requirements are adequately met have to be balanced with the training reality of the military forces. The activists tend to take a one-sided view in their approach to protectionism.

Democratic governments face a dilemma in these cases. On the one hand, the environmental activists form fairly influential groups and there are bound to be political ramifications in ignoring their protests. On the other, the military forces need to train as realistically as possible in order to maintain their competencies at the required level, a fact that is also known to the government. Democracies always have to maintain a delicate balance in their actions between what is seen to be proactive to the demands of the people and what is in the broader national interest, something that is not always apparent to the general public. Therefore, in dealing with the diverging requirements of environmental protection and military training needs, governments tend to lay down restrictions on the military forces, especially when there is no visible direct threat to the nation.

Air power in particular is targeted by the environmentalists in three different areas. First, is the issue of 'noise pollution' associated with aircraft flights. Military cargo aircraft, unlike their civilian counterparts, operate with reduced margins of safety in terms of fuel carried and the load that is lifted, for obvious reasons. Therefore, they cannot always adopt noise abatement procedures. In the case of fighter aircraft the situation is even more dire, since their engines

produce greater noise, they operate at different altitudes and at times fly over populated areas for operational reasons. The only lasting solution will be to base military aircraft away from heavily populated towns and cities. However, the enduring principles in selecting sites for military air bases to meet air power generation needs are proximity to population centres, access to commercial and industrial facilities and the provision of increasingly sophisticated support arrangements to meet the highly advanced technological complexity of air power systems.⁵ These requirements are at odds with relocating military bases to remote, 'non-populated' areas.

Second, live armament delivery practices have a devastating effect on the flora and fauna of the area designated for this purpose. This is undoubtedly true. However, the mitigating point is that most of the air-to-ground live firing ranges are located in extremely remote areas to avoid the risk of unintended damage to life and property because of errors during transit or delivery. In recent times, environmental protection groups have protested even the use of remotely located ranges, insisting that 'rare' species of plants and animals are being exterminated. This issue does not have a solution and the debate between the military aviation community and the environmental protectionists will continue into the future. However, it is also of interest, and perhaps ironic to note here that most air forces' live firing ranges have been able to protect the biodiversity of the area from environmental vandalism much better than 'open' areas in the same region. It is believed that governments need to legislate the need to use the range for practice purposes and set aside the necessary area. Air forces are often not adept at public relations and, therefore, risk losing the fight to more savvy 'green' organisations to

5 Dr Sanu Kainikara and Wing Commander Bob Richardson, *Air Bases: The Foundation of Versatile Air Power*, Chief of Air Force Occasional Paper No 3, Air Power Development Centre, Canberra, 2008, pp. 43–44.

the detriment of their operational readiness, unless such actions are instituted.

Third, aircraft are claimed to be the cause of the highest environmental pollution because of the large quantity of fuel that they burn on a daily basis. Once again this may also be true. The only way to reduce the pollution would be to restrict the quantum of flying being undertaken by the air force. Delivery of air power is a complex art and needs constant and concerted practice, from the technical teams to the pilots who fly the aircraft. Maintaining the skill levels of the personnel at the appropriate level requires a minimum amount of flying to be undertaken. Most of the air forces today operate only the bare minimum flying hours necessary and do not have the capacity to reduce the training without it adversely affecting the operational readiness. While pollution associated with fuel burn will always remain, it could perhaps be reduced by using fuel that is more refined. However, the cost factor involved in using more expensive fuel would also have to be considered before moving forward with this idea.

Environmental pollution is a major consideration for all air forces and steps have been initiated to minimise the effect of fuel burn. There are active research and development efforts going on to develop alternative fuels that will have reduced carbon emission, although a recognisable breakthrough has not yet been achieved. Even after such fuels are created, their open availability and affordability will be restricted to few air forces at least for the mid-term future. Air forces are also turning increasingly to simulation—much more environmentally friendly than actually operating airborne platforms—to meet some of the training needs of the force. This effectively reduces the carbon footprint of air vehicles in training by reducing the number of hours of operations. However, to retain the necessary qualitative edge in warfighting there is still a requirement for training with the equipment to be operated, whether it is flying an aircraft or firing a weapon. It is therefore

necessary to maintain an optimum balance between the two, which means that environmental pollution can never be completely neutralised through these initiatives.

The three primary charges that are laid against air forces vis-à-vis environmental issues have no immediate or complete solutions. There are suggestions to reduce the performance of military aircraft in order to reduce noise pollution, which is not viable solution since it will compromise the performance of the platform itself. Realistic and frequent training is the bedrock on which operational preparedness of an air force depends and any restriction that reduces the minimum training time required will create a loss of preparedness that would become apparent, even in the short term. This is not in any way an attempt to belittle or dismiss the activities of the environmental protection groups or the requirements to ensure the diversity of the environment in a sustainable manner.

While catering to the dichotomous requirements of environmental protection and the basic needs of national security, it is strongly felt that environmental requirements should be carefully balanced with the training required to keep the fighting forces of a nation at an appropriate state of readiness. Any dilution of training, either quantitative or qualitative, will have a downward spiralling effect on the efficacy of the force as whole, leading to less than optimum performance when the necessity to employ air power in support of national security arises. Maintaining the air force at the necessary level of operational readiness should not be allowed to be diluted or compromised for short-term, politically expedient reasons such as pacifying environmental groups. This is particularly so since air forces contribute only in a very limited manner to the overall greenhouse effect. The decision regarding how environmental degradation and training requirements of the air force is balanced will have to be taken at the highest levels of government. The necessity is for a contextually balanced approach to the issue.

Challenge Two – Impact of Technology

It may be said that warfare has acquired a new phase—technological war. In the past, research and development were only preparation for the final and decisive testing of new systems in battle. Today the kind and quality of systems which a nation develops can decide the battle in advance and make the final conflict a mere formality—or can bypass conflict altogether.

General Bernard A. Schriever, USAF (Ret)⁶

Air power was born of technology and has continued to remain a technology-reliant capability. In fact, the effectiveness of air power, in all its applications, is completely dependent on the air force's ability to accept and optimally employ sophisticated technology. Air force is perhaps more dependent on technology for its effectiveness than either land or naval forces. It is generally agreed that technology has been responsible for the 'progress' that mankind has made over the centuries. However, air power's dependence on technology is also a double-edged sword. It is technological solutions to issues that impede the effectiveness of air power that has been the most important factor in bringing this relatively new warfighting capability to the vanguard. Today air power is one of the most coveted capabilities that a nation can aspire to possess. However, while technology is air power's greatest strength, technology-dependence is also its weakness and can very rapidly become a centre of gravity that is difficult to defend, which an adversary could target. Technology-dependence is susceptible to being targeted by asymmetric means and the neutralisation of the advantages that technology brings to conventional air power. There is a need to ensure that technology that acts as a force multiplier is

⁶ General Bernard A. Schriever, USAF (Ret) was the first Commander of the Air Force Systems Command, responsible for the acquisition of missiles.

very carefully protected to avoid the force losing its edge to lesser capable adversaries.

High-end technology is a cost-intensive phenomenon, both in terms of its acquisition as well as in the training requirements for personnel to operate it efficiently. However, it is also critical to modern high calibre air power for its efficacy. These are dichotomous factors. The need to induct expensive technology to have adequate air power capabilities restricts its spread to air forces that have the infrastructure to accept it and the resources to afford it. As technology continues to improve the effectiveness of air power, the desired level of capabilities will be available to a lesser number of air forces. This will lead to a technology gap between allies and regional partners that will inhibit interoperability, thereby reducing the total air power capacity resident in a coalition. Further, it could lead to a situation wherein most members of a coalition will be dependent on the major partner for the necessary air power contribution. In large-scale coalition operations, lack of total air power will become a limiting factor.

A study conducted by the RAND Corporation has identified that by the mid-21st century the entire United States Defense budget will be able to procure only one single air platform if the cost growth and inflation in procurement continues at the same pace as it is currently.⁷ While this may not come to pass, the trend towards unaffordable growth in the cost of air assets is important to note. This trend would point towards fewer, but more complex and extremely expensive air platforms that would impact on the overall capability of even large air forces to operate effectively in different theatres simultaneously.

7 Obaid Younossi, Mark V. Arena and others, *Is Weapon System Cost Growth Increasing?*, RAND Corporation, USA, 2007, www.rand.org/pubs/monographs/MG588, accessed on 9 October 2009.

There is another aspect to high-end technologies that will perhaps only increase in its intensity into the future. While the scientific community is developing a number of cutting edge technologies, most of them are dual-use and, therefore, commercially driven rather than conducted solely as military research, as was the practice earlier. This increases the chance of these technologies being available to adversaries who could then either choose to use them or develop countermeasures against them. This could develop into an asymmetric threat that may neutralise the advantages of high-end capabilities. The difficulties in regulating the spread of such dual-use technologies will become an issue that cannot be totally controlled. The challenge therefore is to induct these technologies and then have the capability to modify them from a purely military or air power perspective to ensure their security in employment.

The strong dependence on technology makes the development of air power competencies a complex process. The broader technological educational base of a nation becomes extremely important in this situation. The effectiveness of a contemporary air force is dependent on two complementary factors—the availability of well-educated personnel and a developed indigenous industrial complex. The ability of the nation to create a pool of qualified people from which to draw in order to sustain the force at the required level of technological competency is critical. A nation also needs a minimum level of industrialisation to be able to maintain the sophisticated equipments that are essential for the generation of modern air power capabilities. This is also indirectly dependent on having a sufficiently educated workforce.

Aviation industry is an enormously expensive, complex outlay and very few nations have the capability to be stand-alone air power capability generators. The impact of this situation is threefold:

- First, most air forces are dependent on friendly nations and allies for acquiring most of the assets.

- Second, even though high-end capabilities can be procured, in most cases the maintenance expertise is resident in the country of manufacture, a situation that can be leveraged to preclude complete autonomy of decision-making even at the grand strategic level. The country of manufacture of the platform that provides the capability can exercise a stranglehold on the air force in question.
- Third, these assets are expensive and, therefore, attrition replacement is a key issue at all times.

Most air forces operate under these three constraints, which will only become more pronounced with the increasing technological sophistication of equipment and associated increase in the cost of procurement.

At the tactical and operational levels, high-end technology could rapidly become a liability when air forces have to function as part of expeditionary forces in remote and inaccessible regions. Under these circumstances air forces may have to operate in areas that may, at best, only have rudimentary technical facilities which could be incapable of supporting the technological requirements of modern air power. This would need situational planning in order to incorporate redundancies into air power capabilities that will have to take into consideration the lower technology levels that would be encountered in the area of operations. In extreme cases, the non-availability of technical support infrastructure could become debilitating to the efficient generation of air power, turning high-end technology into a critical vulnerability. In irregular warfare, an intelligent adversary will always try to identify such opportunities and could turn this through asymmetry into a centre of gravity with devastating effect. Contemporary conflicts are predominantly waged as irregular wars fought in inhospitable areas against illusive adversaries. Conventional forces engaged in such conflicts are

sustained mainly through air resupply of provisions and warfighting material. The vulnerability of air power, reliant on high technology, must be carefully factored in at the planning stage of its application to minimise the impact of the low-technology environment prevalent in these theatres of operation.

Technology-dependence to enhance air power capabilities and tailor them to suit the increasingly demanding requirements of the modern battlespace will continue to be a challenge to the practitioners of air power. Careful analysis of the circumstances and subsequent balancing of the capabilities that are required to achieve the desired effect will reduce the impact of the challenge but will not be able to ameliorate it completely.

Smaller air forces face a peculiar challenge vis-à-vis the induction of emerging technology. In order to retain technologically sophisticated capabilities at an adequate level of competence it is necessary to stay at the leading edge of research and innovation. This facilitates the induction of the latest technological developments at the earliest opportunity, thereby providing the force with a technology edge. However, this process has the drawback in that emerging technology does not always lead to its successful induction as operational capability. Failure of technology is a fact of life and can never be discounted. Under these circumstances, smaller air forces do not have the critical mass to absorb the failure without its capabilities being adversely affected. In certain cases this could lead to catastrophic collapse of the force itself. Smaller air forces, therefore, need to stay slightly behind the cutting edge of technology to safeguard themselves from such a collapse. The balance required to be maintained is delicate, susceptible to the influence of a number of factors and, most importantly, contextual. Ensuring the appropriate balance in all contexts so that the overall capability of the force is never compromised and yet the force retains the necessary high-end capabilities is an exacting task and an enduring challenge even to the most professional masters of air power.

Challenge Three – Influence of National Demography

In a few decades, around nineteen polities will be moving towards the demographic range above 100 million ... Very few nation-states of the past have successfully managed populations this big as democracies...

Coral Bell⁸

The science of demography is the quantitative study of human populations through subjects such as the geographical distribution of people, socioeconomic status, birth and death rates, and age and sex distributions in order to identify the influences on population growth, structure and development. In a democracy, the demography of the nation impacts directly on the composition, culture and ethos of its military forces. All three Services are equally affected, but in slightly varied manners, with some elements and characteristics of national demography affecting one Service more than others.

Evolutionary changes that take place in the demography of a nation also alter the nation at large and can even impact the grand national strategy and security perceptions of the nation. Such changes affect air power capabilities in a number of areas. However, most of them can be grouped under two fundamental but broad areas—the personnel issues associated with standing military forces in a democratic nation and the secondary effect of budgetary constraints on fighting forces.

In contemporary democratic nations, universal conscription is not a normally accepted practice. The exceptions to the rule are nations with a very small population pool from which to draw personnel for their armed forces or who face constant existential threats.

⁸ Coral Bell, *Living with Giants: Finding Australia's Place in a more Complex World*, Australian Strategic Policy Institute, Canberra, April 2005, pp. 13–14.

Therefore, an ‘all volunteer’ armed force of a nation will be in direct competition with other prospective employers to recruit the ‘best and the brightest’ of the population. Further, armed forces require a comparatively younger group of personnel that reduce the numbers from which they can be recruited. Of necessity, armed forces tend to move personnel to different locations periodically and also attempt to regulate the monetary benefits in order to align them to the average national earning. The result is that, in most democratic nations, the lure of better remuneration and the less disruptive lifestyle prospects offered by civilian employers will limit the availability of the better performing young adults to the military. Considering the ageing population in most developed nations, the broader pool of people to draw from will reduce into the future, further aggravating this problem. Only in times of long-drawn conflicts, which are perceived by the general public as sufficiently important to national security, will this situation change substantially, probably by the introduction of conscription. A standing, all volunteer military force that is fully subscribed and has no deficiencies in its manning state is a utopian dream for defence planners.

There are three factors connected to demography, in an indirect manner, which affect the recruitment prospects of national military forces:

- First, the prevailing economic state and medium-term future prospects of the nation—a stable and prosperous economic situation will make it difficult for military forces to attract sufficiently qualified people.
- Second, the threat perception of a nation as understood by the general population—in the absence of any visible and direct physical threat to the nation, the public at large will find it difficult to understand the nuances of national security vis-à-vis the need for expeditionary operations in some faraway place. This will lead to, on the one hand, indifference to the deployed force’s success

or failure and, on the other, vociferous opposition to the nation's participation in the conflict. Democratically elected governments, catering to the domestic electoral cycle, may not be able to withstand the demands for the withdrawal of forces.

- Third, the national ethos towards military service, is perhaps more difficult to quantify. The willingness to commit to voluntary military service is based primarily on cultural, ethnic and socioeconomic inputs. Some ethnic groups are more inclined to join the armed forces than others and, therefore, in communities where such ethnicities are predominant, the military will find it relatively easy to find volunteers of the right calibre than in others.

The demographic balance in the developed world is visibly changing. In most of these nations, the birthrate continues to remain below what is required to avoid an eventual decrease in the overall population. This also leads to an ageing population, which is compounded by the tendency of the younger generation to stay in the educational system for much longer than what was previously the norm. There is also a trend amongst the military service eligible population to not commit to full careers, wanting to retain a certain amount of flexibility in employment options. All these factors are detrimental to recruiting the 'right people' in sufficient quantities to ensure that the military forces are adequately manned.

Amongst the three Services, the entry point stipulated for recruitment is highest in terms of educational requirements for air forces, mainly because of their technology bias. Therefore, everything else being equal, air forces will find it harder to recruit people with the required level of education and aptitude as compared to the other Services. Under these circumstances, the impact of demography that indirectly influences the educational process of a nation is felt unequivocally in an air force.

In addition, air forces also face a challenge that is unique to them. By virtue of the technologically sophisticated assets that they operate, air forces impart high calibre technological training to their personnel. This acts as a double-edged sword in that this training makes the air force personnel highly qualified people who are 'poached' or headhunted by civilian employers through the offer of much better employment conditions, leading to a higher than average departure rate in air forces. The very evident disparity in remunerations and serving conditions between air forces and civilian aviation companies often tempts uniformed personnel to seek premature retirement after having obtained a fairly high level of technological competency. This is a worldwide phenomenon. Retaining sufficient numbers of personnel with the necessary training, competence and experience is a perennial challenge to air forces of all democratic nations. The loss of trained personnel has a secondary, but critical effect on the force. It takes a number of years for an airman to develop adequate professional mastery, which is lost with the person's departure, thereby diminishing the overall competence of the force. Very short-term mitigation of this issue is possible through the institution of rewards for enrolment and, more importantly, for continued service. However, neither do these measures provide a long-term solution, nor do they mitigate the challenge completely, even in the very short term.

The other area where demography plays an important role is in the secondary effect of budgetary constraints placed on the military forces. During times of comparative peace, governments want to be seen as catering to the needs of the larger community in terms of welfare activities. This normally reveals itself in a discernible tendency amongst democratic nations to introduce and initiate 'costcutting' measures in defence budgets, even if the armed forces are deployed on operations. Reduction in defence budgets manifests in a two-pronged manner—first, it reduces the capacity of the military forces to compete with the civilian industry in terms

of remunerations and conditions of service and, second, it increases the urgency to outsource or ‘civilianise’ as many military functions as possible, barring the actual combat functions, as a cost-saving measure. The first impact of such short-sighted policies is the loss of flexibility of the force. For air forces, that are the mainstay of expeditionary operations, reliant on their responsiveness, reach and penetration for their effectiveness, this is particularly debilitating. Such budgetary control activities create constraints on the force leading to a decline in their effectiveness, which will be difficult and take double the time to build back. There is a need for democratic governments to maintain a well-studied balance between budgetary cuts and resource allocation to ensure that air forces have the operational capability that is desired of them.

From an air power perspective, ‘savings drives’ and budgetary cuts have an immediate and more than cursory impact. There are five major detrimental factors that can be identified:

- First, the fighting force in terms of personnel—that is, the people who actually go into harm’s way routinely in the performance of their duties—is a much smaller percentage of the whole force in an air force as compared to the other Services. This lends itself to a situation where the efforts to civilianise military functions are likely to be more concerted in air forces, to the extent that a number of air forces have already outsourced even the daily servicing and maintenance of fighting equipment to civilian contractors. While this might afford considerable savings in peacetime, there is also a downside to this situation. These civilian organisations normally would not have the capacity or the will to deploy to hostile operational environments when needed, which in itself will have two immediate repercussions. Inability or reluctance of the supporting technical personnel to deploy into the operating theatre during hostilities will directly reduce air power’s rapid responsiveness—one of its most

prized characteristics. In a more circumspect manner, this will also adversely impact on the inherent flexibility of air power to deploy and operate in an expeditionary mode in distant theatres, thereby effectively curtailing its reach and penetration capabilities.

- Second, personnel in uniform have a different work ethic and a ‘get it done’ attitude that transcends the normal number of hours of work per day ethos, especially when preparing for deployments—on exercise or for operations. Nations have civilian health and safety rules and regulations that are legally binding and perhaps more restrictive than those applied to uniformed personnel in operational conditions. These restrictions on the civilian workforce will not permit a unit manned by a mix of civilian and uniformed personnel to prepare itself for deployment on a ‘war footing’ when necessary. In an air force, technicians are also required to deal with explosive ordnance loaded on aircraft on a routine basis. The increased danger to personnel in these activities has so far precluded the employment of civilians in this role. However, the shortage of uniformed technical personnel might necessitate the induction of civilians into roles that would require operational training, with the added onus of increased compensation, insurance etc., somewhat negating the basic objective of savings that are supposed to accrue.
- Third, civilianisation will reduce the overall number of personnel who would have had military service experience. This affects the nation in the long term and the force almost immediately. First, the national ethos towards military forces and service will undergo a gradual and imperceptible change, leading to further complexities in recruiting and retaining personnel. It will also change the way in which the younger generation views military service, reducing its status and further eroding an already vulnerable position. Second, the number of people who could

form part of the reserves for the force will reduce dramatically. In air forces the reserves are a highly qualified group with specialist training, expertise and experience, who are drawn on when there is a requirement to increase numbers to cater for a surge in operations or for other activities. They are also the repository of corporate memory in terms of best practices and act as effective mentors to freshly inducted personnel. Civilian organisations that provide technical capabilities are normally unlikely have a long-term interest in improving the level of expertise of their personnel—preferring to maintain the status quo, viewing training as a cost burden and not as an opportunity to improve effectiveness—leading to the diminishing and eventual loss of core competencies within cohesive and homogenous groups. The reduction in the reservist numbers, which will be an immediate fallout of civilianisation, will have a cascading effect on the preparedness of the air force, particularly in the fighting units.

- Fourth, and one that can never be adequately quantified or fully expressed, is the question of unit loyalty, fighting spirit, esprit de corps and the cohesiveness of an operational unit. Only personnel in uniform will have the sense of pride (that term being used for want of a better word) in a unit sufficiently developed to actually put themselves in dangerous and life-threatening situations knowingly to ensure that the honour of the unit, and, therefore the force, is not tarnished. This is a combination of intangible elements like courage, camaraderie, a sense of self-worth, confidence in oneself and others in the unit etc., which is difficult, if not impossible, to inculcate in a 'civilian' group with fragile and limited loyalty to the group or organisation. The absolute need to fight and win—the basics on which air forces are built—gets skewed with the introduction of a civilianisation process.

- Fifth, with the increased use of civilians, who cannot be deployed into operational theatres, to carry out traditionally military tasks, the strategic depth of the organisation that caters for the provision of reinforcements and future rotations is considerably reduced. Air forces of most democratic nations today face this issue, at least to some extent. With only front-line units available for deployments, the frequency of rotation and duration of deployment are increasing to an almost unsustainable level.

Air forces of the democracies will always have to contend with the challenges posed by demography—they are not going to go away. In fact, they may only increase in intensity as the current trend of national populations becoming more ethnically and culturally diverse through global immigration becomes more pronounced, forcing accepted societal norms to evolve and change. This factor emphasises that the move visible in most of the developed world to civilianise core functions of air forces is, at best, of short-term benefit based on a myopic vision of the capabilities that need to be embedded in an air force. They hollow out an air force and will eventually become long-term vulnerabilities, which will be extremely difficult to mitigate—more so in the short term—when emergent threats to national security become more than apparent. Air power, resident in air forces of calibre, will need to be protected from the vagaries of demographic change and is not a low cost option to ensuring adequacy of national security.

Challenge Four – Resource Constraints at the National Strategic Level

Logistics is the bridge between the economy of the nation and the tactical operations of its combat forces. Obviously, then, the logistic system must be in harmony, both with the economic system of the nation and with the tactical concepts and environment of the combat forces.

Rear Admiral Henry E. Eccles, USN (Ret)⁹

Almost all military forces face resource constraints, even at the best of times, because governments are reluctant to allocate a larger share of national resources to defence than what could be perceived as adequate in the public eye. This is even more apparent in democratic societies wherein the electoral cycles impact on the division of national resources between defence and other areas like welfare, medical care and infrastructure. In recent times, there has been a change in the relativity between national security and defence. Military forces are seen as the traditional guarantors of national security, whereas in contemporary terms there are also non-traditional elements that contribute to assuring national security. This has necessitated a rebalancing of resource allocation within the broad ‘national security’ agenda, perforce reducing the quantum that can be made available to the military. It is now necessary to allocate increased funding and resources to non-traditional security agencies like law enforcement, customs and border control, intelligence, transport security and even health.

⁹ Rear Admiral Henry E. Eccles (Ret) is the author of the pathbreaking book, *Logistics in the National Defense*, that laid out the conceptual framework for the theory of logistics. He was a major figure at the Naval War College, Newport, Rhode Island, from the late 1940s through the 1970s, as a thinker and writer on naval logistics and military theory.

The increased complexity of national security and the larger number of agencies involved in it, combined with the finite amount of resources available to most nations, have forced democratic nations to continually attempt to minimise the resource requirements of their respective military forces. This effort is normally twin-arrowed, one aimed at financial stringency and the other at reduction in the number of personnel and assets within the military. Both these activities have a significant effect on the overall military force and particularly affect air forces. Enforced financial stringency is incompatible with the cost-intensive nature of air power assets in terms of their acquisition, operations and maintenance. In terms of direct savings, reducing the number of air power assets being procured will provide a substantial one-time saving, which will have to be carefully balanced with the reduction in air power capabilities that the reduction will create. Greater saving ensured by per item of equipment that is not purchased can never be without any apparent reduction in the overall capability and sustaining power of the force. To the casual observer, air forces, because of their proclivity to be platform-centric in providing air power capabilities, provide an immediate and very visible opportunity for the government to demonstrate the financial curtailment that it is imposing on the defence force.

Resource constraints in the military, however, also have other causal factors than merely the government's reluctance to be seen as indifferent to popular demand. First, all democratic nations try to move towards a situation of self-sufficiency in developing military capabilities. The national industrial base plays a crucial role in this quest by ensuring that the necessary military hardware is of the required calibre and manufactured in adequate quantity. Air power assets are normally at the high end of the technology spectrum and require extremely sophisticated manufacturing capabilities for indigenous production. Further, the cost of creating and maintaining a balanced air force with the necessary air power capabilities is so

high that it precludes the option of 'going solo' in almost all nations. Most nations do not have the complete infrastructure necessary to manufacture and support air power assets and capabilities and are, therefore, dependent on allies and other friendly nations to field air forces with adequate all-round capabilities. The fact that even the closest of allies will not provide full and free access to the entire technology involved means that air forces will be forced to maintain an umbilical chord to the country of supply to ensure that air power competencies are sustained at the required level. This is a clear vulnerability and will challenge the strategic politico-military leadership at all times, especially when the nation has to move into conflict phase on its own. Combined with the very high price tag that most air power assets carry and the political dimension of acquiring these assets, air forces will always have to be content with the limited availability of assets that sometimes translates to an inadequate quantum of capabilities that can be brought to bear in operations.

Second, even if there is adequate financial capability to acquire and operate cost-intensive air power assets, the procurement of sufficiently sophisticated equipment that will provide the required capability to the air force is almost completely dependent on the political and diplomatic status of the nation within the international community. This factor is extraneous to air forces and purely in the realm of grand national imperatives of security, foreign policy and alliances and treaties. However, it plays an extraordinarily critical part in the wellbeing and effectiveness of an air force dependent on other nations for technology transfers and other support activities for its operational efficiency. The complexities of international relationships make it imperative for air forces to become as self-reliant as possible and also to be aware of the fragility of assurances of technology support, even from close allies.

The third factor is a combination of the general public perception of threats to the nation, the national ethos regarding the need for

an air force, the understanding of the nation's standing and status within the international community, and the medium to long term requirement to participate in international coalition operations as part of humanitarian intervention or peace support operations. If the national perception of threat is low and the public opinion is one of minimal commitment to international requests for assistance, it is more than likely that the military forces will be under-resourced. Under these circumstances, air forces may find it extremely difficult to obtain the minimum amount of resources required to sustain an independent status. This factor is not purely a resource allocation issue and has larger ramifications that go to the core of the debate regarding the need, efficacy and purpose of a nation maintaining an independent air force.

In all cases, resource constraints and their many iterations and implications will be perennial challenges to air forces, even when the force is fully immersed in operations. Mitigating circumstances will be few and far between, and the strategic leadership of air forces will have to constantly finetune their resource requirements to cater for the broader national constraints while ensuring that the force meets the security needs of the State.

Challenge Five – Political Dimension of the Employment of Air Forces

The measure of air power is the ability of a nation to exploit airspace for its own purposes—and in wartime deny it to an enemy.

Admiral Arthur Radford, USN
Chairman of the Joint Chiefs of Staff, 1953

Societies have always resorted to laying down the accepted norms and enforcing them through the enactment of laws developed through an intricate legal system. Conflict situations between two groups or nations are no exception. Today, the conduct of wars is governed by the Law of Armed Conflict (LOAC) that originated in medieval customary practices. The modern LOAC had its beginning at the first conference on International Humanitarian Law, held in Geneva in 1864. This first Geneva Convention was signed by 16 states and was followed by conferences in 1906, 1929 and 1949, all of which further developed and refined the law.¹⁰ The latest development has been the 1977 Additional Protocols.

In addition, the Hague Law is a set of international laws that prescribe the means and methods of warfare. It comprises a series of treaties that state what is, or is not, legitimate in the conduct of war. The first example of Hague Law is the 1868 Declaration of St Petersburg, followed by the 1899 Hague Conventions, 1907 Hague Conventions, Gas Protocol of 1925, 1954 Hague Cultural Property Convention, 1972 Biological Weapons Convention, 1980 Conventional Weapons Convention, 1992 Chemical Weapons Convention and the 1999 Ottawa Land Mine Convention.¹¹ Much

10 Royal Australian Air Force, Australian Air Publication 1003—*Operations Law for RAAF Commanders*, Second Edition, Air Power Development Centre, Canberra, 2004, p. 3.

11 *ibid*, p. 4.

of the Hague Law is accepted as customary international law and directly affects the employment of air power.

By definition, an air force of a sovereign nation is an element of its military power legally permitted to employ air power across the spectrum of conflict, from humanitarian assistance to the lethal application of force in combat when necessary, in the pursuit of legitimate orders from the government of the day. A majority of the world's nations are signatories to the Geneva Conventions and its Protocols, and the Hague Law, which are the two primary international agreements that are still considered the governing bodies of work regarding the conduct of war and other associated issues. However, a number of nations are not signatories to the later and more recent Protocols and Conventions, limiting their influence and making them less effective internationally. Air power and its employment in conflict are grouped under the generic umbrella that governs the conduct of war and the laws regarding application of lethal force have been interpreted in a very broad manner to make them applicable to all air operations.

The LOAC codes, which are common law interpretations of the rights and wrongs and the moral and ethical correctness or otherwise of the application of lethal military force, are the nearest that there is to a guide for the employment of air forces. However, some grey areas still exist and they are open to various interpretations, which affect the application of force. LOAC provides the legal sanction for attacking a target that has been identified as legitimate within the law, although other extraneous factors can negate such an attack on the same target, making it more of a constraint than a facilitator for the air force to operate efficaciously. These are generally politically motivated constraints that curtail the freedom of action of air forces to neutralise even legitimate targets because of considerations of either domestic or international repercussions.

The induction of new weapons systems, such as uninhabited aerial systems and directed energy weapons, developed through cutting edge scientific research, has increased the demand for legal sanctification of their use. The requirement for legal support will definitely increase and become more complex in the absence of any binding treaties or international agreements regarding the employment of emerging technology. There is already an ethical debate in progress regarding these developments and this might result in the imposition of regulated constraints on their employment, which may negate the asymmetric advantages these systems would have provided to conventional forces.

In today's information age, contemporary conflict is beamed almost in real-time across the globe. Air attacks are visually spectacular and, therefore, attract more than their fair share of media reporting in any conflict. Perhaps because of the impersonal impact that air attacks create, there is a growing tendency within the world media to be prosecutor, judge and jury in analysing the legality or otherwise of such strikes. Even though in a number of cases this is done without adequate and clear understanding of the legal framework or the operational requirements that necessitated the strike, the adverse publicity that is generated further inhibits the political leadership from wanting to or being seen to assume a clear decision-making role in the employment of air forces.

Even when the legality of a strike on a target is not in doubt, quite often the morality of the attack is debated in the media with sufficient furore to make even the most focused political leader wary of the use of air power in lethal attacks. In actuality, the international political repercussions of the application of lethal force are perhaps the least when air power is used because it does not involve the physical positioning of forces in another country that could amount to an invasion. Essentially, there is a segment of the media—albeit a small percentage—that automatically considers the employment of air forces for anything other than the provision of humanitarian

assistance as a gross travesty of justice. This is an unfortunate development and has a negative impact on the higher levels of national security decision-making.

The irregular nature of contemporary warfare, the very vague legal, moral and ethical status of the adversary combatants, the open suggestion of the beginning of a clash of cultures, the fundamentalist-fuelled emphasis on the religious aspects of the ongoing conflicts and the very real concern of the political leadership of the West to be seen to hold the moral high ground and be doing the 'right' thing, all combine to produce a completely opaque list of conventions and rules of engagement that are enforced in the employment of air forces. The challenge for air force commanders and professional masters of air power is to unravel these knots and to be able to apply air power in a legal and, more importantly, an acceptable manner in pursuing national security interests and imperatives—a tall order, under any circumstance.

In the recent past, most of the conflicts in which developed nations have been engaged have been conducted far way from home, as are the two ongoing conflicts in Afghanistan and Iraq. This trend is likely to continue for some more time. Such expeditionary operations necessitate the use of air bases in the vicinity of the area of conflict by their air forces. This requirement poses a number of constraints on the actual combat employment of air forces.

- First, in order to reach the designated forward base the air force will have to obtain overflight permission from countries along the way, which may or may not be forthcoming.
- Second, it will be far easier to obtain permission to base airlift and force multiplier assets in a forward base, but most host nations will be cautious of accepting combat elements of the air force into their airfields. This may require the negotiation of separate permission from the host nation.

- Third, restrictions imposed by the host nation on the usage of the base could result in the effective curtailment of the freedom of action of these assets. Any expeditionary operation will normally have a political dimension to it, in terms of dealing with the host nation's domestic political and cultural sensitivities.

Deploying air assets to a nation with a partially hostile population brings with it the additional requirement for air base and asset protection. Commanders will also have to be cognisant of possible personnel issues that could arise from cultural misunderstandings or insensitivities between air force personnel and the local population that could even lead to clashes. These disparate factors, in themselves not insurmountable, coalesce into a very broad challenge in mounting expeditionary operations and its mitigation will not be easy nor will any effort to do so be foolproof. Air forces will have to learn to live with it.

Air forces engaged in peace support operations—an amorphous term used by NATO to include conflict prevention, peace enforcement, peacekeeping, peace building and provision of humanitarian aid—face two major constraints in optimising their contribution to the joint campaign. First is that the objectives of the military task force and, by association, that of the air force, are never clearly defined in most of these circumstances, which invariably leads to mission creep in the classic sense. Air power has the capacity to ensure that the entire task force avoids being enveloped in mission creep. However, warding against it setting in will always require applying air power in a less than optimum manner. Second, the rules of engagement, especially for air forces in their application of lethal force, are always more restrictive than in other situations. This has the potential to allow the adversary, who may also be the aggressor, to easily seize the initiative in the conflict thereby increasing their probability of victory.

The employment of air forces, particularly in an offensive mode, in peace support operations is often perceived by the general public, amply influenced by the media, as a disproportionate and inappropriate response to what is considered minor infractions of the peace process. There is also a perception that the use of air forces in peace support missions is a far too expensive proposition. This is a misconception. Air power not only provides the capability to mount an immediate response to illegal activities, it is also less expensive in the long term than the deployment of surface forces to contain such minor incidents. The use of air forces in peace support missions is never a mistake but the constraints on their use, imposed for considerations other than purely military, makes these operations more complex, thereby reducing the assurance of success. The balancing of political requirements and the need to optimise the application of air power will at times be dichotomous. In almost all cases wherein such a competing set of priorities rise to the surface, the political imperatives are bound to be considered more important, even at the cost of operational setbacks. Air power professionals will need to be clearly aware of the possibility of such a situation developing, at times rapidly, in the midst of operations. There may not be a solution to this conundrum.

Challenge Six – Attrition Tolerance

So far as air power is concerned, a dilemma will be how many aircraft and their crews represent an acceptable loss for any given operation. Looked at in the cold light of day, this is clearly a vital question and one which should not be avoided.

A. C. Williams¹²

In a democratic nation, the decision to commit the state's military forces to armed conflict will obviously be taken at the highest political level and with full awareness that there is the possibility of casualties in undertaking military operations. There is no escaping the fact that all forces engaged in armed conflict will suffer attrition, that is the loss of friendly forces and equipment, at some point or the other and the air force is not an exception. Attrition is a process by which the strength of a force—physical, psychological and virtual—is gradually worn down as a result of attacks on its operational capability and its capacity to regenerate depleted forces. This process encompasses the decline in the force's overall capability through human casualties, the loss of warfighting equipment and the destruction of both civilian and military infrastructure. Such a decline will indirectly affect the security status of the nation, not only at the tactical and operational levels, but also at the strategic level. Tolerance to attrition is a psychological factor, in individuals as well as in a broader national sense. It must also be remembered that the three factors that together form the attrition process may have individually different tolerance levels, especially at the national strategic level. However, there are few elements unique to the air force, as opposed to many others that are common to all Services, which affect attrition and its tolerance from an air force perspective.

12 A. C. Williams, 'Challenges Facing Military Power', in Stuart Peach (ed.), *Perspectives on Air Power: Air Power in its Wider Context*, The Stationary Office, London, 1998, p. 344.

The most critical of the three factors is the sensitivity, particularly in the developed world, towards casualties. While the loss of human life is a universally unacceptable factor, the sensitivity is especially emphasised when the casualties are the nation's own soldiers, sailors or airmen. The fact that Western nations are extremely sensitive to casualties has been so highly publicised that it has gradually become an accepted vulnerability and, therefore, adversaries have targeted it as the centre of gravity of conventional Western military forces. Non-state irregular combatants who do not have the same respect for human life and who are in pursuit of a religious ideology that elevates martyrdom to a high pedestal see this as a weakness and try to exploit it, even at the cost of their own lives. However, these adversaries tend to be unaware of the subtle nuances that underscore attrition tolerance within the national ethos of a Western nation. It has been demonstrated over and over again that these nations are willing and have accepted very high casualty rates when the majority of the population has perceived victory in a conflict as a necessity for the very survival of the nation or even its continued prosperity and stability. The difference lies in the general understanding and acceptance of whether a war is one of necessity or one of choice. There is a distinct difference between such conflicts and, accordingly, the nation's willingness to accept human casualties and attrition. Attrition tolerance in what are perceived as wars of choice will always be the lowest.

Another major factor that impinges on the perception of attrition in a nation is the acceptability or otherwise of civilian casualties on both sides of the conflict. From a Western perspective, this is not as applicable in contemporary conflicts that are being fought far away from the home country and, therefore, do not normally involve civilian casualties at home. However, the civilian casualties in the host nation where combat operations are being conducted do have a direct effect on the general perception regarding the conduct of the war. This is an aspect wherein the media plays a very

important role in shaping the perception and opinion of the home crowd and can be critical in shoring up or breaking the popular support for the government's actions. In the past decade or so, the Western media has played a less than unbiased role in reporting engagements, skirmishes, battles and campaigns. There seems to be a pervasive belief that only military actions that have gone wrong are newsworthy and this has made them repeatedly report one or two incidents of genuine failure while not mentioning hundreds of accurately conducted strikes. Air forces in particular have been targets of this biased reporting.

The non-state adversaries have been very quick to leverage off the Western media's unseemly haste to report even unconfirmed actions and to analyse them vis-à-vis morality and the conduct of conflict and to question the actions of the conventional military engaged in conflict. The irregular adversary considers three major factors as inimical to Western nations in conflict—civilian casualties, friendly military losses and a protracted conflict. They are adept at manipulating the media to report the casualties being caused by the military forces, while consciously downplaying the devastation being created within the general public by their own actions. Since it is always through the prism of the media that the home population gets information regarding the conflict, there is ample opportunity for the adversaries to exploit the 'soft and humane' nature of the West. By targeting the soft centre of gravity of public support to the war, the adversary manipulates the results of even individual tactical actions to create strategic effects. The Western media unwittingly is becoming a force multiplier for irregular adversaries waging an ideological war against the values that they represent.

While not in any way advocating the curtailment of the freedom of the press—which is one of the pillars on which democracy is built—it is felt that the media should undergo a comprehensive awareness program in order to better understand the onerous job military forces carry out within an extremely constrained environment.

Further, they must also be able to grasp the strategic effects that even a single skewed report can create in the volatile environment in which contemporary conflicts are being waged. The other side of the coin is that military officers at all levels need to understand the overall functioning of the media, the time-sensitive manner of their operations and the utmost importance of being able to provide proactive information to the media as required. This would require the military to unravel obtrusive confidentiality of information and to do away with a certain amount of secrecy involved in disseminating it, while continuing to ensure the security of operations. To achieve an acceptable level of openness it may be necessary to authorise field commanders to interact directly with the media. This will ensure that minor issues are addressed and clarified quickly and not allowed to be blown out of proportion. On the whole, the media needs to be clear that being unbiased in their reporting of a battle or campaign does not mean being proactive to the adversary alone and the military needs to become more media friendly.

Extreme casualty sensitivity, leading to an unacceptably low level of attrition tolerance, is almost always the creation of an over active media. This situation is then very cleverly manipulated by an adversary well versed in perception management. There is an irony in the fact that the very forces, that protect the media's right to freedom of expression are the ones that are more often than not targeted by the media and their good standing tarnished, while the same reporting tends to make 'heroes' of an adversary who, let alone not adhering to the accepted norms in the conduct of combat, does not adhere to even the base level of humanity expected in armed conflict. Perhaps it is time for the Western media to take an introspective look at their conduct and align themselves appropriately, without sacrificing their 'independence.' Emotive reporting with scant regard for the strategic repercussions of such analysis, which may not always be correct, will only play into the hands of the aggressive and radical adversary, and provide them with more material to manipulate the thinking and perceptions of the people.

It is a combination of a low level of attrition tolerance and air power's visible ability to provide a responsive, low-risk option to contain emerging threats that make it a first choice option in the application of force. However, unlike in the case of surface combat, the loss of an air asset is a much more spectacular event and likely to be reported by the media as a catastrophic failure in the conduct of the campaign. Western forces have not been exposed to aerial attacks and their air forces have not had to operate in contested airspace for so long that there is a growing perception of even a single 'air casualty' as unacceptable. While the contemporary irregular adversary may not have air power capabilities in the conventional sense, the improved man portable air defence systems that are proliferating give them the capability to contest control of the air in an asymmetric manner. Under these operating circumstances, loss of air assets cannot be ruled out. The leadership at the political and military strategic level has to be aware of this and must be extremely cautious when dealing with such losses to ensure that it does not spin out of control, affecting morale and even the basic campaign itself. The Western forces have lost air assets in contemporary conflicts and they have not been viewed as unacceptable. Therefore, the impact of attrition of air power is directly linked to the perception of the conflict as one of necessity or choice in the home country.

There is no doubting that operational security precludes providing information regarding the conduct of a campaign to the general public. However, the reason for going to war, strategic end-states desired, probable international repercussions of the actions being contemplated and the possibility of casualties must be debated and stated openly if public support for the action is really being sought. Along with this, there is also a need to define the level of acceptable attrition in a contextual manner prior to the conflict and explain it to the general public vis-à-vis the necessity to enter conflict in the first place. It is also necessary to ensure that the entire nation understands that, more than attrition, it is the desired

end-state that will end combat operations. Unless support for the campaign is forthcoming from the population, it will be foolhardy for the government to enter conflict. The essential requirement is to ensure that that media manipulation of perceptions is reduced to an acceptable and containable level.

The last factor regarding attrition tolerance, from an air force perspective, is the cost factor—financial and political—of loss of equipment. Losses to air force assets can very rapidly make the force operationally unviable and incapable of providing the necessary quantum of air power. It can also become financially unsustainable in terms of the resources required to ensure adequate attrition replacement. Further, a long lead time is required to replace air power assets because of the technological sophistication of their manufacture, operations and maintenance. Therefore, even if financial resources were to be made available, immediate attrition replacement to sustain the air effort may not be a possibility. The high visibility of air force losses and the public outcry that can be expected could have a detrimental effect on the political will of the nation to continue the conflict. National morale is a fragile entity and can be very easily fractured. This will be further exacerbated in situations wherein the political leadership is already on the defensive regarding the reason and conduct of the conflict.

The national perceptions viewed through the prism of media reporting, extreme casualty sensitivity, low level of attrition tolerance and the high visibility that employment of air forces has, will continue to constrain the efficacy of employing the highly sophisticated capabilities of air power. Most of these constraints can be reduced to a great extent through well-planned and thought through strategies to ensure that media reporting is accurate and unbiased, and by intelligently keeping public opinion aligned with the government policies. Attrition is an automatic by-product of the employment of force, but the national ethos of its tolerance is fickle and susceptible to manipulation by intelligent adversaries.

Challenge Seven – Dealing with Collateral Damage

Given the nature of precision weapon warfare, education of decision-makers as to their capabilities and limitations is critically important.

Richard Hallion, 1999
USAF Historian

Collateral damage is a term generally used to denote unintended damage, injuries or deaths, especially to non-combatants and civilian or dual-use infrastructure, caused during combat operations in a conflict situation. A majority of sovereign states are signatories to protocols, broadly based on the principles of discrimination and proportionality, that lay down the norms in the application of lethal force by their military forces. Until the mid-20th century, the accepted morality of applying force was one of casual negligence of the unnecessary destruction caused in trying to neutralise a target. However, in the aftermath of World War II, at least within the West, this perception rapidly evolved to one of extreme caution in targeting procedures in a span of less than 50 years.

The reasons for this volte face are many:

- The international community was horrified by the unparalleled destruction and associated human suffering caused by the unrestricted use of military power during World War II and wanted to find a better way to conduct war.
- The realisation that the winning coalition would also be responsible for the reconstruction of the destruction and rehabilitation of the displaced population had a salutary impact on the strategic thinking regarding the application of military force.
- The necessity to restrict damage was facilitated by technological developments that greatly improved the accuracy of weapon

systems and provided planners with the wherewithal to be precise in the application of lethal force. This capability was enhanced when combined with the ability to assure the accuracy of intelligence regarding the location of the target to produce what has come to be termed 'precision strike'.

- Discrimination, proportionality and accuracy have become the watchwords in political circles when application of force is discussed, particularly with respect to air power.

In the past few decades, the unintended deaths or injuries of innocent civilians in war caused by conventional military forces have become a highly emotive issue. In fact all such instances are normally portrayed in the media as callous acts by superior military forces acting at will against 'defenceless' civilians. Any civilian casualty caused by Western forces has become a sort of 'Holy Grail' in reporting for the media. There are two aspects to this that all military commanders and political leaders must understand at its most basic level. First is that the death and injury to innocent bystanders and destruction of purely civilian infrastructure caused by the actions of irregular forces is generally reported in a muted manner and not pontificated upon by the Western media. On the other hand, similar or even lesser damage caused by the actions of the regular military forces battling the very same irregular non-state entities is reported in graphic detail and the forces involved condemned. It is in the reporting of collateral damage that the media plays an inordinately important role and has the capacity to affect strategic decision-making that will reverberate across the entire campaign or war.

The second aspect perhaps has more impact on the conduct of contemporary military operations against irregular forces. Experience demonstrates that almost all non-state or quasi-state entities battling national military forces and employing in irregular warfare—that encompasses, counterinsurgency, stabilisation or

peace support operations—have recognised collateral damage caused by the military as an issue that can be manipulated to win them sympathy and support, which is the fundamental requirement to sustain insurgencies. Therefore, the media reporting of collateral damage has been identified as a centre of gravity to be targeted. Irregular forces are unusually adept at manipulating a sympathetic media in search of ‘human interest’ stories and very often manage to turn instances of unintended collateral damage into asymmetry in their favour. This is further reinforced by the fact that the media does not consider either successful ‘correct’ actions by the state military forces or similar collateral damage caused by the actions of the non-state entities to be sufficiently newsworthy.

The very often quoted damage to Europe that was created by the Combined Bomber Offensive during World War II, the damages caused to dual-use facilities and their repercussions on civilians during recent air campaigns in the Middle East and the Balkans, and the heavily publicised attack on the Chinese Embassy during the Kosovo campaign have reinforced the perception of air power as the biggest culprit in creating collateral damage. This perception is not substantiated by the statistics of recent conflicts, which clearly indicate that application of lethal force from the air is responsible for about 15 per cent of the total collateral damage. However, incorrect targeting by air power—for a number of disparate reasons—is a highly visible act and gets more than its fair share of media coverage, analysis and condemnation. Irrespective of the underlying reasons, this is a reality with which air campaign planners have to contend and try to mitigate as much as possible. In circumstances wherein collateral damage cannot be avoided, or at least restricted to acceptable limits, it becomes a vulnerability that could lead to political constraints being placed on the employment of air power that in turn will diminish its effectiveness. Such a situation would have far-reaching consequences on the conduct of any joint campaign.

There must also be clear awareness across the entire force that collateral damage caused by even a single action at the tactical level can very rapidly deteriorate into strategic level convulsions leading to unwanted, and perhaps unwarranted, political interference in the conduct of a campaign. The aerial strike on a hijacked fuel tanker in Afghanistan on 4 September 2009 at Kunduz that is reported to have killed a number of civilians including children, which in less than three days became a parliamentary question for the German Chancellor to answer and also led to the demand for the resignation of the German Minister for Defence, is a very illustrative example of this direct connection between tactical action and strategic consequence. Political interference, however benign, in the actual conduct of an air campaign is the first step towards failure and eventual defeat. The short history of air power provides ample evidence of the disastrous effects that such political interference produces on the final outcome of the broader military campaign. The campaigns of the *Luftwaffe* in the Battle of Britain and the US Air Force in the Vietnam War spring to mind immediately.

Air power is coveted for its capability to respond almost immediately to any emerging eventuality across the spectrum of conflict—from humanitarian assistance in case of natural or man-made disasters to security issues that might develop into threats to the nation as such. However, when the response requires the application of lethal force, it is necessary to balance this capability with accurate ISR and targeting procedures to ensure that avoidable collateral damage does not detract from the rapidity of response. This is a uniquely air power issue and must be encompassed in the planning process at all times since it is a critical factor that will affect the conduct of the overall campaign. Air power has the resident capability to neutralise a target, in a time-sensitive manner, when required. However, there is nothing worse than applying lethal power and neutralising the wrong target to give air power a reputation, mostly undeserved, for failure and the title of ‘wrongdoers’. It is apparent that optimising

the advantages inherent in responsive air power capabilities and leveraging off them is a complex process. Further, if incorrectly done, it can create insurmountable problems for the efficacy of offensive air power. Collateral damage that results from the responsive application of air power also carries the possibility of escalating what otherwise may have been a limited operation, especially if the political dimension within the theatre of operations is riddled with acute internal dissensions.

There will always be collateral damage, even if it is miniscule, when military forces are engaged in conflict, regardless of the nature of the adversary and the character and conduct of the campaign. This is so, irrespective of the best intentions of the force to minimise collateral damage and the technological sophistication in the application of force. This is an irrefutable fact of life. Further, the chances of collateral damage are only going to increase in the future as more campaigns are likely to be launched against non-state adversaries who operate in urban areas within the civilian population. They also carefully plan their irregular warfare tactics in such a way as to ensure that collateral damage becomes an inescapable part of the application of conventional force, in the firm belief that it is a centre of gravity of state military forces. In most contemporary conflicts this may indeed be true. Justly or unjustly, the immediate mental picture formed in the mind of the general public when collateral damage is mentioned is that of an air strike gone terribly wrong. Air forces across the world will have to be cognisant of both these factors and be prepared to deal with accusations of callousness, irresponsibility and outright failure every time that they are employed by their governments in the pursuit of national security.

Collateral damage and its political fallout will not ever become an issue of the past, irrespective of the legality and sophistication of the application of lethal force. Air commanders have to become experts at mitigating the repercussions of collateral damage—through all

levels of the national security debate—to ensure that battlefield victories do not become unwitting strategic defeats.

III

THE QUESTION OF INDEPENDENCE

The air ocean and its endless outer space extension are one and indivisible, and should be controlled by a single homogeneous force.

Alexander P. de Seversky (1894–1974)

In Section II, seven perennial challenges to the efficient application of air power, all of which have direct impact at the tactical, operational and strategic levels, have been identified and briefly explained. However, there is a far greater challenge, at a much higher level than even the strategic application of air power that all air forces face, even though it may not be readily apparent to the casual observer—the question of the independent status of the force in relation to the other Services. The vexed issue of the independence of air forces has been a constant factor in the debate regarding air power and its optimum employment as an element of military power from its very inception during World War I. The issue has waxed and waned in importance dependent on the context and circumstances of the debate and lain dormant in the recent past. However, the issue has not been resolved in the past 100 years and is bound to come up again at some point in the future. The question of the need for independent air forces seems to have a life of its own, and will be probably being debated a century hence. In order to place and understand the seven perennial challenges in context, it is necessary to examine this issue in an overarching manner.

Part of the blame for the other Services trying periodically to abolish the air force, and partition the air power capabilities and assets

between themselves, must be shared by the air power enthusiasts. Commencing immediately after World War I and to a certain extent continuing even today, air power advocates seem to have a proclivity to consistently articulate highly exaggerated air power capabilities that verge on the wishful thinking. It is, therefore, not surprising that air power performance falls short of the claimed capability and in a relative sense is considered less than effective. This situation lends itself to being misinterpreted, either genuinely or deliberately, by the other Services to indicate that air power would be better managed and more efficaciously employed if its control was handed over to more 'experienced' forces. This accusation of inefficiency is re-emphasised by detractors of air power through a somewhat laboured argument that history does not support the granting of independent air force privileges to the application of air power. It is indeed true that, in comparison to two millennia of history resident in the land forces, air power has only a century of history to fall back on and independent air forces even less, since the first independent air force was formed only in 1918! However, independent status of a basic military capability cannot be determined on the basis of the length of its existence, but has to be done purely on its contribution to the overall military capabilities of the joint force and, to a lesser extent, to the nuances necessary to be mastered in ensuring its optimum application.

Independence of any element within the military is dependent on that capability clearly demonstrating its individual capacity to not only contribute directly and significantly to overall victory in war but also becoming a critical factor in achieving victory. This means that victory cannot be achieved if the capability in question is absent or less than required. If this explanation is accepted, then the debate regarding the independence of air forces can be put to rest once and for all, since air power has contributed to victory in innumerable occasions in the past few decades and, more importantly, been the war-winning factor on a large number of occasions, specifically in

the past two decades. Further, air power has conclusively become a military capability, perhaps the only one, which can rapidly create effects that easily transcend the purely military—becoming an efficient strategic political tool.

The current reality is that even with all the resident strategic capabilities that have been amply demonstrated, air forces are still likely to be treated at less than par by the other Services, presumably a subconscious denial of acceptance as an equal. This sibling rivalry is all too common and perhaps will only go away when an independent space and/or cyber force is created, at which time the three Services, including the air force, would together try to undermine the status of the 'new kid on the block'. This is mainly because an independent space/cyber force will encompass and pervade all the three mediums, much as air force covered and permeated both the surface and maritime domains when it arrived on the scene a century ago.

The question of the independent status of air forces is only being tagged here to highlight two primary aspects regarding air power:

- First, only air forces can provide the necessary level of control of the air in and around the theatre of operations that will ensure freedom of unimpeded manoeuvre for the rest of the joint force. This primary requisite for adequate control of the air for the success of surface operations has been so deeply subsumed in the psyche of Western military forces that it does not seem to feature as a requirement anymore. The fact that Western forces have always been provided the necessary level of control of the air for since World War II has led to a careless disregard, as well as a loss of meaning and status, of the need for control of the air that demands an independent campaign to achieve and maintain at the required level. Since this paper is about perennial challenges facing air forces, the concept of control of the air is not being elaborated further.

- Second, within the contemporary spectrum of conflict, there is no mission, operation or campaign that can be conducted with complete assurance of success if air power, wielded effectively by an independent air force, is not available to contribute. Such contribution can be in terms of ISR before, during and after the conflict, in activities that shape the battlespace advantageously for the surface forces, in the exploitation of the deterrent capabilities of air power or in the provision of responsive, precise, proportionate and discriminatory attacks on identified targets.

Most of the modern army and naval forces now operate integral air arms in addition to the air force. A large force like the United States military may find this a viable situation and even necessary for operational effectiveness. For smaller forces, operating under constraints of resources and personnel, the creation of what in effect are three separate 'air forces' in order to have direct control over air assets will create a plethora of command and control issues which will detract from the optimum employment of scarce air assets. Operating separate air arms for the army and navy will also create training gaps and duplicate maintenance facilities, wasting resources that could be gainfully utilised elsewhere. More importantly, the entire air power capability of the small force may not even be doctrinally aligned because of the inherent disparities in the operating ethos of the three Services. This could lead to a situation when the quantum of air power that the small force produces may not be sufficient to meet tactical and operational requirements. There is merit in smaller military forces studying the prospect of creating joint air capabilities that reside within the air force to optimise the contribution of air power to the overall military capability.

Frankly, it is about time to end the debate regarding the need or otherwise to have an independent air force. The need of the hour

is to get on with moulding the three Services into a seamless force that can leverage off the strengths of each individual Service on an as required basis. A seamless force is the best answer against a dispersed and ill-defined adversary and cannot be formed in the absence of any one of the three Services. If there is a shortfall in any one, the seams will become evident from the outside and can develop into 'gaps' that will in turn be the centres of gravity to be exploited by an intelligent enemy.

It has to be clearly understood that only an independent air force will be able to provide the necessary robustness to the application of force, lethal, nonlethal and contributory, from the third dimension in this triumvirate of military power. Within this sphere, air forces face the seven perennial challenges that, if not carefully manipulated and well contained, will detract from the holistic effectiveness of air power. Any effort directed towards detracting from its independent status can only diminish the air force's ability to contribute meaningfully to the joint campaign, thereby directly weakening the military effort towards national security.

Seven Perennial Challenges to Air Forces

CONCLUSION

Air forces have evolved in the course of the past century from being fledgling contributors to military forces that can, and often do, make the difference between victory and defeat. This has been achieved through a pragmatic combination of people and technology. From the beginning, air power practitioners have been people of extraordinarily prophetic vision, who were able to develop innovative and forward-looking concepts, had astute understanding of the application of each of air power's resident capabilities and were dedicated professionals in their employment of air power. Throughout its history, air power has been aided by technological advancements that regularly improved its capabilities by quantum leaps, making possible what was only an impossible 'pipedream' only a few decades ago.

The improvement in air power capabilities by a magnitude made it imperative for its practitioners to be professional masters of air power to ensure the optimisation of its operational application and strategic employment. The adequacy of such professional mastery is dependent on an incremental growth through the lower rungs at the technical level and encompasses a full career spanning decades. Additionally, in contemporary times it requires an understanding of the employment of air power as part of a seamless force to augment or lead a joint task force consisting of a combination of land and naval forces and other government agencies in a multinational environment. This is not easily achieved.

While the achievements of air forces—both in war and in peace—are many and laudable, there are seven primary challenges to their efficacy that have been identified here. They are considered primary mainly because none of them can be fully eliminated now or into the foreseeable future and, therefore, will always have a detrimental effect on the application of air power.

Individually, none of the challenges are of such a magnitude as to completely overwhelm the efficiency of an air force. However, circumstantially, in combination with each other or as a collective whole, they have the potential to reduce the effectiveness of air forces to levels that would border on their being totally debilitated. There is a real need for a clear understanding of each one of the challenges and for enunciated mitigation strategies that take into account the context of the application of air power. This has to be done while accepting the fact that none of the challenges can be fully mitigated for any length of time. These challenges also impose two further issues on the air campaign. First, each one of the challenges has either direct or indirect strategic dimensions that manifest at the highest levels of politico-military decision-making and, therefore, none of them can be contained even temporarily at the purely operational level. This situation carries the inherent risk of strategic interference at the execution level of air campaigns, which has always proven to be damaging to their overall smooth conduct. Second, challenges, by their very nature, tend to impact operations at the most inopportune time. Therefore, air campaign planners need to have an in-depth understanding and must be cognisant of each one of them, from the initial planning stages through the execution and the successful culmination of the campaign. The air commander must constantly be aware of the strategic dimensions that each challenge could throw up and must have the professional mastery to mitigate their effects from the strategic to the tactical level.

The objective of this monograph has been to highlight the constraints and vulnerabilities that modern air forces have to contend with on a daily basis while striving to provide the nation with air power of the required quality and adequacy whenever required. It is hoped that it will also provide a better understanding of the complexity of applying air power through the employment of air forces. Governments have, in the past decade or so, increasingly resorted to the employment of air forces as a responsive reaction to

emerging threats. At times such deployments have been without a really clear vision regarding the objectives to be achieved and a definition of the desired end-state. Further, even when the end-state is defined, even vaguely, the suitability of air power to pursue a particular course of action to achieve it is not considered at the appropriate strategic level. Air power's responsiveness and low probability of own casualties have become the most important characteristics from a political perspective. Relegating the plethora of other capabilities that air forces can bring to bear across the spectrum of conflict to secondary status is detrimental in the long term to the understanding of the value of air power. Air power is the most flexible and efficient military capability and can alter and shape the battlespace to one's advantage provided the air campaign is sufficiently well planned in line with the clearly laid down objectives and taking into account the perennial challenges that face air forces.

Air forces will continue to meet the increasing demands being placed on them to the best of their ability; this is an inherent character of forces of calibre. However, indiscriminate employment of these forces carries the danger that relentless stretching of the finite resources of the air force will at some stage make it snap and putting it together again may prove to be an impossible task. It will be prudent for air power professionals to monitor constantly the perennial challenges that face air forces and continuously refine the mitigating strategies that could be put in place so that the plans for their employment will be pragmatic and yet meet the national security requirements.

A modern, autonomous, and thoroughly trained Air Force in being at all times will not alone be sufficient, but without it there can be no national security.

General H. H. 'Hap' Arnold, USAAF
Commanding General, US Army Air Forces, 1941-1945

