Airborne Intelligence, Surveillance and Reconaissance for the Future Australian Defence Force

2008 Chief of Defence Force
Fellow

Airborne Intelligence, Surveillance and Reconaissance for the Future Australian Defence Force

Flight Lieutenant Travis Hallen

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Air Power Development Centre
Level 3
205 Anketell Street
TUGGERANONG ACT 2900
AUSTRALIA

Telephone: + 61 2 6266 1355
Facsimile: + 61 2 6266 1041
E-mail: airpower@defence.gov.au
Website: www.raaf.gov.au/airpower

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The Director
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

About the Author

Flight Lieutenant Travis Hallen joined the Royal Australian Air Force as a Navigator in 2000. After completing 113 Basic Navigator Course in March 2002, Flight Lieutenant Hallen was posted to 11 Squadron at RAAF Edinburgh where he qualified as a Navigator/Communicator on P-3 Orion Maritime Patrol Aircraft in December 2002. During a five and a half year posting at 11 Squadron, Flight Lieutenant Hallen conducted numerous operational deployments in support of border protection operations as well as Australian Defence Force operations in the Middle East and East Timor. In 2007 Flight Lieutenant Hallen was awarded the Chief of Defence Force Scholarship to conduct research into the integration of airborne intelligence, surveillance and reconnaissance in the Australian Defence Force. He was posted to the Air Power Development Centre in 2008 as the Chief of Defence Force Fellow. Upon completion of the fellowship, he was posted to the Directorate of Personnel – Air Force as the Personnel Manager for Air Combat Officers and Airman Aircrew.

Flight Lieutenant Hallen has a Bachelor of Arts (Honours) with a major in Japanese from the University of Queensland and a Master of Aviation Management from the University of Newcastle. He is currently a PhD candidate at the University of New South Wales where he is conducting an historical analysis of the effectiveness of air power in Australian defence, focussing on the influence of command and control arrangements.

Foreword

This Chief of the Defence Force (CDF) Fellowship Paper, *Airborne Intelligence, Surveillance and Reconnaissance for the Future Australian Defence Force*, describes an airborne intelligence, surveillance and reconnaissance (ISR) concept designed to meet the needs of the future force envisioned in *Joint Operations for the 21st Century*, the Australian Defence Force's (ADF) Future Joint Operating Concept (FJOC). The prominence of ISR in current military discourse is a clear reflection of its growing importance in enabling operational success in the increasingly complex environments in which the ADF is called upon to operate. This paper's innovative, yet practical examination of airborne ISR in the future, networked force complements and expands upon the ADF's strategy and capability development documents, to provide an aim point to direct the development of airborne ISR. It is through concurrent technological, conceptual and procedural innovation that the ADF will ensure it is positioned to meet the challenges and capitalise on the opportunities of the future.

A key feature of the concept proposed in this paper is the emphasis placed on the vital role played by air power as part of ADF operations across all domains. Air power is an inherently joint capability and is not simply the realm of the Air Force. The paper acknowledges this fact by clearly articulating the need for the ADF to approach the development of its future airborne ISR capability as a collaborative effort, with all Services and Defence agencies focused on harmonising their specialist contributions to deliver an effective capability. Flight Lieutenant Hallen highlights how skilled practitioners across all Services can leverage off the unique characteristics of air power and the connectivity of the networked ADF to create the versatile airborne ISR capability needed to support commanders across all domains.

Although written by an Air Force officer, *Airborne Intelligence, Surveillance and Reconnaissance for the Future Australian Defence Force* is the product of an extensive process of consultation across the Australian Defence Organisation. Its joint foundations are clear. The result is a paper that captures my intent behind the CDF Fellowship program. Each year, an ADF member is selected to conduct research into a subject that is likely to contribute to Defence goals or outcomes. The papers they produce increase the corporate knowledge within Defence and provide unique perspectives on important issues that will inform the decisions of policymakers and strategists. They are intended to inform the development and shaping of the ADF to allow it to reach, know and exploit in present and future operating environments.

The vision for airborne ISR described by Flight Lieutenant Hallen is aspirational, but also provides a core of practical guidance to begin applying its principles. Realising this vision will require the ADF to challenge a number of preconceptions on how we develop, manage and employ this key operational capability as part of a seamless force.

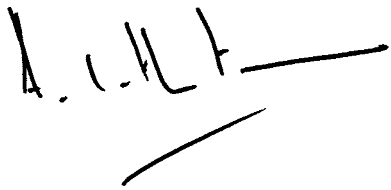
However, the Australian military has, throughout its history, shown its willingness to adapt and innovate in order to overcome the limitations of size and thereby establish itself as one of the world's finest military forces.

Airborne Intelligence Surveillance and Reconnaissance for the Future Australian Defence Force is an excellent source of reference for those personnel engaged in airborne ISR, a vital aspect of the ADF's operations, now and into the future. This paper also makes an important contribution to the ongoing debate about the future of the ADF.

I commend this paper to you and encourage you to continue the discussion on the shape of the ADF's future airborne ISR capability begun here by Flight Lieutenant Hallen.

A.G. HOUSTON, AC, AFC
Air Chief Marshal
Chief of the Defence Force

Australian Defence Force Headquarters
June 2009



Acknowledgments

The list of those who have helped transform this report from an idea into a reality is a long one, more than can be listed here. While all the support I received was important and valued, special mention must be made of those without whom this paper would not have been possible.

First, my thanks must go to those who have enabled me to undertake this Fellowship year. Particular thanks must go to Air Chief Marshal Angus Houston who through the Chief of the Defence Force Scholarship Program provided me with this opportunity to make a meaningful contribution to shaping the future ADF. I would also like to thank Air Commodore Warren Ludwig, Commander Surveillance Response Group, for his willingness to sponsor this research effort. My thanks must also go to the Director, Group Captain Tony Forestier, and the staff of the Air Power Development Centre for the opportunity to be a part of the APDC team. To Natalie Griffin for her patience, support and guidance on the administration side of the Scholarship. Finally, to Professor David Lovell, Jo Muggleton, Shirley Ramsay and Marilyn Anderson-Smith at the Australian Defence Force Academy School of Humanities and Social Sciences for their invaluable support.

Secondly, I would like to express my sincerest appreciation to those who have helped shape the ideas and words that collectively form this report. Principal among these is Wing Commander Bob Richardson, whose tireless efforts in revising, editing and improving my concepts and drafts have seen the demise of all too many innocent pencils. Thanks must also go to Squadron Leader Danny Chisholm, Squadron Leader Andrew Loch and David Clarke for their willingness to test and critique my ideas and writings, always in a positive way. To Dr Sanu Kainikara whose lucid and timely guidance ensured my continued sanity at critical stages of the year. To Wing Commander Tim Creevey and the Capability Development staff at Headquarters Surveillance and Response Group for their willingness to read, edit and comment on countless drafts. I am also indebted to those within the Australian Defence Organisation who took the time to contribute and help provide my research with a truly joint flavour, including Steve Hledick, Sue Blundell, Lieutenant Colonel Scotty Palmer, Major Jason McCarthy, Commander Ken Macaulay-Black, Lieutenant Kate Ryan and Dr Patrick Hew.

Last, but most definitely not least, I must thank my family, Renata and Tiago, who have sacrificed so much to give me the chance to undertake and complete this Fellowship year. It has been through their enduring support and understanding during what has been a challenging year for us all that this report was able to be completed.

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Abbreviations and Acronyms

AC	Companion of the Order of Australia
ADDP	Australian Defence Doctrine Publication
ADF	Australian Defence Force
ADO	Australia Defence Organisation
AFC	Air Force Cross
AFDD	Air Force Doctrine Document [US]
AO	Area of Operations
CDF	Chief of the Defence Force
COG	Centre of Gravity
DCP	Defence Capability Plan
DIGO	Defence Imagery and Geospatial Organisation
DSD	Defence Signals Directorate
DSTO	Defence Science and Technology Organisation
FASOC	Future Air and Space Operating Concept
FJOC	Future Joint Operating Concept
FMOC	Future Maritime Operating Concept
GMTI	Ground Moving Target Indicator
HQJOC	Headquarters Joint Operations Command
ISR	Intelligence, Surveillance and Reconnaissance
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance
JIPB	Joint Intelligence Preparation of the Battlespace
JMAP	Joint Military Appreciation Process
JP	Joint Project
JPS	Joint Planning Suite
JOP	Joint Operations Portal
JSTARS	Joint Surveillance and Target Attack Radar System
NATO	North Atlantic Treaty Organisation
NCW	Network Centric Warfare

SAR	Synthetic Aperture Radar
SLOC	Sea Lines of Communication
TUAS	Tactical Unmanned Aerial System
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
UN	United Nations
US	United States
USAF	United States Air Force

Executive Summary

This paper describes a concept for the planning and tasking of airborne intelligence, surveillance and reconnaissance (ISR) operations to meet the needs of the future force described in Joint Operations for the 21st Century, the Australian Defence Force (ADF) Future Joint Operating Concept (FJOC). This future airborne ISR concept describes the demands that will be placed on the ADF's airborne ISR capability in the future operating environment and proposes a methodology that will ensure the ADF is positioned procedurally and organisationally to meet those demands.

The future airborne ISR concept proposed in this paper is comprised of the following components:

- A theoretical foundation that defines ISR and describes the contribution that air power makes to it.
- A description of the requirements that will be placed on airborne ISR in future ADF operations, derived from an analysis of the ADF's strategy and capability development documents.
- An airborne ISR planning methodology that will allow the ADF to meet the requirements of future operations.

AIRBORNE ISR – A FOUNDATION FOR JOINT UNDERSTANDING

ISR integrates intelligence and operations functions to provide actionable information to supported commanders in order to improve their situational awareness and aid their achievement of decision superiority and knowledge dominance. The ISR process comprises four functions: direction, collection, processing and dissemination.

- **Direction** is the tasking of ISR assets to create ISR systems which collectively execute the functions of the ISR process to provide supported commanders with actionable information.
- **Collection** is the gathering of the raw data needed to satisfy the supported commanders' information needs.
- **Processing** is an iterative process which transforms data into information, and information into intelligence.
- **Dissemination** is the transmission of information to those who require it in order to make effective decisions.

These functions are interrelated, and efforts to improve ADF ISR must address all functions of the process.

The characteristics of air power make airborne ISR assets increasingly valuable tools for providing the information support that is vital to commanders' decision-making effectiveness. The main characteristics of air power which influence its contribution to ISR are perspective, reach and penetration, relative impermanence, flexibility and responsiveness.

This paper recognises that airborne ISR alone cannot satisfy all the information needs of all of the ADF's commanders. Airborne ISR complements information collection activities conducted in other domains in support of ADF's operations. To optimise the contribution to operations made by the ADF's airborne ISR assets, ISR planners must understand how the characteristics of air power influence air assets' contributions to ISR. Such an understanding is essential to ensure that planners allocate the asset with the characteristics best suited to the needs of the task.

AIRBORNE ISR IN THE FUTURE FORCE

A future concept that will focus the ADF's airborne ISR capability development efforts can be derived from an analysis of its strategy and capability development documents; the future operating concepts, Defence capability roadmaps and the Defence Capability Plan.

The Future Air and Space Operating Concept (FASOC) describes how the ADF's future air power capabilities will be employed to best effect in the networked and seamless future ADF. In so doing it identifies the developments to be delivered by the Defence Capability Plan that will influence the ADF's airborne ISR capability. Key amongst these will be the creation of a ubiquitous information domain supported by an adaptive command and control system. These developments will enable the integration of airborne ISR at the information and tasking level in support of future operations.

The future land operating concept, outlined in Complex Warfighting and Adaptive Campaigning, envisions future land operations being conducted against adaptive adversaries operating in complex terrain. A key feature of future land operations will be the increased likelihood that potential adversaries will operate below the threshold of the force's ability to detect them in, and discriminate them from, this complex terrain. Improvements in the force's ISR capability will ameliorate this issue, but not solve it. Accordingly, the future land force will engage in adaptive action, acting in order to stimulate a response from an adversary in order to raise their operational profile to a level that enables their detection and discrimination. The unpredictability of an adversary's actions will also create operational uncertainty, reducing the ability of the future land force to predict the flow of an adversary's operations. Future airborne ISR in the ADF must therefore be able to seize on transitory events and provide responsive on-occurrence support to future land force commanders.

In the future maritime domain described in the Future Maritime Operating Concept – 2025 (FMOC) airborne ISR will continue to play a vital role in the effective application of ADF maritime power through the support provided to develop the commander's battlespace awareness. It will also play an increasingly important role in the protection of Australian maritime forces and interests from the conventional and asymmetric threats that will be encountered in the future maritime operating environment. Airborne ISR must be able to provide the future maritime force with 'persistent, forward ISR ahead and in-stride with the force to maximise warning times' to enable effective maritime force projection and protection.

As the ADF continues to evolve into a fully networked force it will seek to move beyond operating jointly and aim to operate as a largely seamless force. Achieving this level of integration will be enabled by the technical capability delivered by the Defence Capability Plan, but capitalising on these technical advances will require conceptual, organisational and procedural innovation in the ADF's approach to ISR. For airborne ISR, this will be achieved primarily through centralisation of the direction function of the ISR process. Centralisation is the only means through which the ADF's diversified asset base, controlled at different levels of command by geographically and organisationally dispersed commanders, can be managed to create a balanced, responsive and adaptable airborne ISR capability that is able to meet the needs of all ADF commanders in the complex operating environment of the future.

AN AIRBORNE ISR PLANNING METHODOLOGY FOR THE FUTURE FORCE

Centralised coordination must be based on an airborne ISR planning process that:

- effectively prioritises competing tasks generated throughout the force,
- ensures that this prioritisation reflects the requirements of the joint campaign, and
- is responsive to changes that will invariably occur in a dynamic operating environment.

This paper proposes an airborne ISR planning methodology that will meet these requirements. The proposed methodology is based on capturing the ISR-related outputs of the operation planning process within a relational hierarchy.

The relational hierarchy framework links the ISR-related planning conducted at successive levels of command to the strategic directive that establishes the ultimate aim of a campaign. This framework is augmented with utility values assigned by commanders at all levels that reflect the relative contribution of the outcomes and activities identified during their planning process to the achievement of a superior commander's objective.

These values provide the degree of precision in the determination of ISR task priority that will be essential in future operations.

The development of a relational hierarchy augmented by utility values will provide a central airborne ISR coordinating authority with a clear appreciation of the contribution to the campaign made by individual ISR tasks. Guided by this appreciation, the central coordinating authority will organise, sequence and direct the tasking of the force's airborne ISR assets in a way that best meets the needs of the campaign.

By capturing and prioritising the ISR-related needs of commanders at all levels in the joint campaign, the proposed planning methodology provides a means to prioritise competing ISR support requirements, align tasking with the needs of the campaign, and adapt tasking rapidly and effectively to respond to changes in the operating environment.

CONCLUSION

Airborne ISR will to play a vital role in future ADF operations. Despite the sizeable investment planned by the ADF to develop further its ISR capability, ADF airborne ISR assets will most likely remain high-demand low-density assets. To ensure that these highly capable airborne ISR resources provide the support required by future commanders operating against adaptive adversaries in the complex operating environments of the future, the ADF must continue to innovate and adapt procedurally, organisationally and culturally in order to develop an integrated airborne ISR capability. The future airborne ISR concept outlined in this paper provides an aim point to focus these development efforts.

To achieve ongoing success…we need to look toward the future and identify how we want to fight – we cannot simply rely on the practices of today being successful in the challenging environment of tomorrow.

Air Chief Marshal A. G. Houston, AC, AFC
Chief of the Defence Force
May 2007

Chapter 1: Introduction

I applaud Congress' support for additional intelligence, surveillance, and reconnaissance assets … as ISR is vital to the success of our operations in Iraq and elsewhere.

General David H. Petraeus[1]

At 1815 local time on the evening of 7 June 2006, two 500-pound bombs destroyed an isolated farmhouse north of Baghdad, killing all its inhabitants. Among the dead was Abu Musab al-Zarqawi, the leader of al-Qaeda in Iraq and, at the time, Iraq's most wanted terrorist. Seen as a major Coalition victory in the war on terror, this attack provides an excellent example of the utility of precision air strike in counterinsurgency operations. Although the 10 minutes of F-16 time taken to destroy the target may have attracted the majority of attention, the contribution made by over 600 hours of airborne intelligence, surveillance and reconnaissance (ISR) tasking that supported the find, fix, track and target stages of the operation was equally important to the operational outcome.[2] The ability to fulfil this vital role has seen airborne ISR become increasingly important as a major contributor to operational success.

Information has long been regarded as the lifeblood of military operations and the cornerstone of effective decision-making. For modern militaries such as the Australian Defence Force (ADF), information has progressed from being an operational enabler and has increasingly come to underpin the success, or otherwise, of all military operations. By providing 'the information needed to make more informed and more timely decisions',[3] a military's ISR capability provides the foundation for the decision-making effectiveness of its commanders at all levels and across the range of its operations. The importance of ISR in this respect was reflected in General David Petraeus's April 2008 report to the United States (US) Congress on the situation in Iraq, in which the then commander of Coalition forces emphasised the vital role played

1 General David H. Petraeus, 'Report to Congress on the Situation in Iraq', delivered to the United States Congress, Washington, DC on 08 April 2008, pp. 3–4: http://www.defenselink.mil/pdf/General_Petraeus_Testimony_to_Congress.pdf, accessed 8 May 2008.

2 Lieutenant General David A. Deptula, 'Transformation and Air Force intelligence, surveillance and reconnaissance' delivered to Air Force Defense Strategy Seminar, Washington, DC, 27 April 2007: http://www.af.mil/library/speeches/speech.asp?id=321, accessed 08 September 2008.

3 Office of ISR Coordination, *Defence ISR Roadmap – 2007–2017*, unclassified edition, Department of Defence, Canberra, 2007, p. 3.

by ISR in achieving operational success. The ADF has demonstrated the operational effectiveness of its airborne ISR capability across a range of operations, from protecting Australia's northern coastline, through to its vital contribution to Coalition efforts in Iraq and Afghanistan.[4] However, for the ADF to maintain a qualitative edge over potential adversaries and overcome the challenges to be faced in an uncertain future, it must continue to develop an ever more effective and efficient airborne ISR capability.

The vast geographic expanse of Australia's area of strategic interest, the growing complexity of the operating environment and the challenges posed by increasingly adaptive adversaries will place increasing demands on the ADF's airborne ISR capability to provide high-quality information support to its commanders. Additionally, the expected continuation of the ADF's current high operational tempo will place pressure on airborne ISR planners to maximise the output of the ADF's relatively small ISR resource base.[5] In recognition of these challenges, the Australian Defence Organisation (ADO) is planning a multi-billion dollar investment in ISR and its enabling systems that will see a major upgrade in the ADF's ISR capability in the years to 2017.[6] However, the full benefit of this investment will not be realised unless it is accompanied by conceptual innovation that questions the traditional practices governing ISR in the ADF and seeks to find new ways to optimise the employment of the ADF's airborne ISR assets. Through this innovation, the ADF will be able to exploit fully the advantages that are offered by modern technology.

Despite the substantial investment into the development of ADF ISR, the ADF does not have sufficient depth to create an effective ISR capability in **each** environmental operating domain. To ensure that its ISR capability is able to provide support to commanders across all domains, the ADF must integrate its ISR assets operating in the air, land and maritime domains into a single coherent capability. Achieving this integration requires the development of an innovative approach to the management and employment of ISR assets. This need for innovation is particularly important in the air domain. Unlike its ISR capabilities in the other domains, the ADF's airborne ISR capability is currently divided between the three Services, which makes airborne ISR one of the 'system-wide' capabilities referred to in the ADF's capstone future vision document, Australian Defence Doctrine Publication–D.3—*Joint Operations for the 21st Century*, commonly referred to as the Future Joint Operating Concept (FJOC),

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4 Commonwealth of Australia, *Official Committee Hansard – Senate – Foreign Affairs, Defence and Trade Legislation Committee – Estimates – 2 November 2005*, Senate, Canberra, 2005, p. 10: http://www.aph.gov.au/Hansard/senate/commttee/S8869.pdf, accessed 18 November 2008.

5 Houston, Air Chief Marshal Angus, 'Address to Senior Leadership Group Event', delivered on 20 May 2008, Canberra.

6 Office of ISR Coordination, *Defence ISR Roadmap – 2007–2017*, classified edition, Department of Defence, Canberra, 2007, p. 23.

that is 'able to bind single-service capabilities and structures into a synergistic whole'.[7] Integrating the ADF's highly capable single Service airborne ISR assets, and realising the synergy that exists between them, will greatly improve the ADF's ability to optimise the employment of available resources. This will in turn allow the ADF to achieve and maintain knowledge dominance in a range of operations conducted in increasingly complex environments across the breadth of Australia's area of strategic interest.

The vision of the ADF as an integrated force is clearly established in the FJOC and therefore must be considered an inviolate aspect of future force development. Accordingly, integration will be a defining characteristic of the capability development process for airborne ISR in the ADF.[8] Integration in this context involves the synchronisation of the planning and conduct of airborne ISR operations, as well as the alignment of the products created by those operations, in order to satisfy operational objectives. This is a more challenging proposition than the simple alignment of individual ISR tasks with operational objectives. It requires a unity of ISR effort in which the employment of individual ISR assets is coordinated with that of all other ISR assets in an area of operations to avoid unnecessary task duplication and promote mutual support in ISR operations. This coordination must include all ISR assets operating within a geographically confined theatre as well as any 'home-based' assets that can provide support to deployed units by leveraging off the ADF's network infrastructure. The challenge facing the ADF in realising this vision of an integrated airborne ISR capability is that it currently lacks the joint conceptual foundation that is required to direct the development of an airborne ISR as an integrated capability. This conceptual deficiency also precludes the ADF from realising the full extent of the contribution that can be made by the airborne ISR assets in the current ADF inventory. For the integration of airborne ISR in the ADF to be achieved it is first necessary to develop of a clear future airborne ISR concept that can be used to focus and direct development efforts.

Aim

The aim of this paper is to provide the ADF with a future airborne ISR concept that addresses the needs of the future force envisioned in FJOC.

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7 Department of Defence, Australian Defence Doctrine Publication–D.3—*Joint Operations for the 21st Century*, Department of Defence, Canberra, 2007, [ADDP–D.3—*Joint Operations for the 21st Century*], p.12.

8 Office of ISR Coordination, *Defence ISR Roadmap – 2007–2017*, unclassified edition.

Scope

A number of papers addressing the role and conduct of ISR in the ADF were written contemporaneously with this paper, each addressing ADF ISR from a different perspective. The McKenna Report into 'The Management and Use of ISR Information by Headquarters Joint Operations Command' (HQJOC)[9], the Defence Science and Technology Organisation (DSTO) report into integrating ISR in the ADF, and the Army's Land Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) Concept Paper all make valuable contributions to the ADF's understanding of ISR and the shaping of its ISR capability. Where this paper differs is in its focus on identifying the requirements that future operations in all domains will place on the ADF's airborne ISR capability, and developing a future concept in response to those requirements. The insights used to inform the development of the future airborne ISR concept described in this paper have been drawn from an examination of the publicly available ADF and single Service future-focused documents. The result is a concept based on a non-technical view of what the ADF's airborne ISR capability will provide to commanders of the ADF's future force envisioned in FJOC. It is an aspirational concept that is not bound by the cultural and organisational dynamics that currently exist in the ADF. Although it is based on the needs of the future force, by describing steps that can be taken now to improve the effectiveness of current capabilities in modern operating environments, the approach proposed in this paper will also benefit the ADF's present day commanders.

In its description of an airborne ISR concept for the future force, this paper focuses on the management and employment of airborne ISR in the ADF at the operational level and below. This focus has ensured that the topic is addressed in sufficient detail to allow the paper to provide clear outcomes that offer practical guidance for the future and can be used in the near term to make a positive and meaningful impact on ADF operations. There are three notable areas that are excluded from detailed examination as a result of this limited focus; how airborne ISR is integrated with the ISR capabilities in the other domains, the role of airborne ISR in direct support of the strategic level of command, and the integration of ADF airborne ISR assets into multinational operations. Despite the constrained focus of this paper, the generic conceptual foundation upon which the specific future concept it describes is built can be adapted to meet the specific needs of other domains, levels of command and operational arrangements. Detailed examination into applying this generic concept to other contexts is outside the scope of this paper and would require a separate research effort.

[9] Brigadier Timothy McKenna, 'Management and Use of ISR Information by HQJOC', unpublished report commissioned by Headquarters Joint Operations Command, Canberra, 2008.

Structure

The future airborne ISR concept proposed in this paper is comprised of three components:

- A theoretical foundation that defines ISR and describes the contribution that air power makes to it.
- A description of the requirements that will be placed on airborne ISR in future ADF operations, derived from an analysis of the ADF's strategy and capability development documents.
- An airborne ISR planning methodology that will allow the ADF to meet the requirements of future operations.

This paper is structured to provide a staged development of the future airborne ISR concept based on these three components. The first stage in the development of the future concept is outlining a joint approach to airborne ISR in the ADF. This joint approach will shape the role ascribed to airborne ISR in the future force, a role which is also influenced by the type of operations and capabilities that are envisioned in the ADF's future development documents. This concept will provide the focus that will direct the ADF's airborne ISR development efforts, and also influence the way airborne ISR is conducted in the contemporary ADF. The rationale for this approach to the development of the future airborne ISR concept is pictorially represented in Figure 1–1. As Figure 1–1 highlights, this conceptual development is a continual process that will allow the concept to be enhanced as the ADF's understanding of ISR and its vision of the future change. This paper is only the first step in this process.

The paper begins by laying the theoretical foundations for the airborne ISR concept. Entitled 'Airborne ISR – A Foundation for Joint Understanding', Chapter 2 examines the generic ISR concept and air power's role in its conduct. This examination is informed by current procedures, discussions with those in the ADO involved in airborne ISR, and the available literature relating to air power and how ISR is conducted. The aim of Chapter 2 is to overcome the ADF's current lack of joint doctrinal guidance on the conduct of ISR by proposing an approach to ISR that meets the needs of the joint force and which is based on how ISR is currently understood and conducted in the ADF and allied militaries. Supporting this generic ISR concept is an overview of the characteristics of air power that makes airborne ISR such an important capability for the ADF. This examination of ISR in general and air power's contribution to it provides the common conceptual basis from which a description of airborne ISR in the future force can be built.

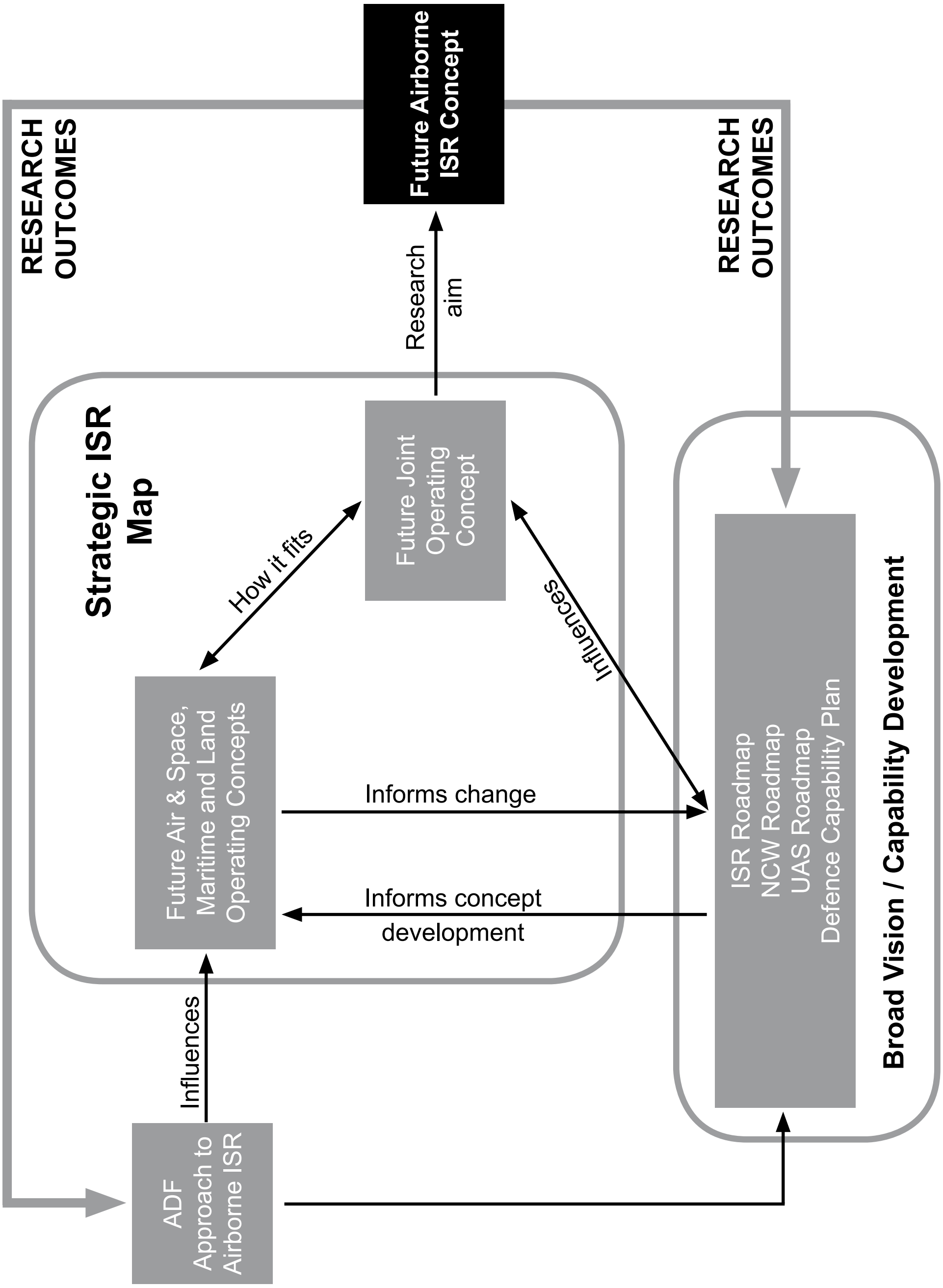

Figure 1–1: Airborne ISR Concept Development Flow

Chapter 3, 'Airborne ISR in the Future Force', draws on the ADF's strategy and capability development documents to provide an insight into what will be required from the ADF's airborne ISR capability in the future force. An appreciation of the role that airborne ISR will be required to play in future operations and the tools that will be available to the ADF to fulfil it can be derived from an analysis of its future development documents. Clarifying airborne ISR's role in the future force involves examining the domain-specific future operating concepts to build a comprehensive understanding of what airborne ISR must provide future commanders across all domains. This awareness of airborne ISR's future role is complemented by a study of how future capability development, outlined in various Defence *Roadmaps* and the *Defence Capability Plan* (DCP), will facilitate the conduct of this role. Collectively, these documents provide the ADF's view of what airborne ISR is expected to provide the future force and, as such, lay the foundation for the development of the future-focused approach to airborne ISR. As these future documents have been informed by the trends observed in current operations, the needs of commanders in the future that are identified in this chapter also reflect, and are increasingly relevant to, the needs of today's ADF commanders.

Chapter 4, 'An Airborne ISR Planning Methodology for the Future Force', proposes a methodology that will enable the ADF to meet the requirements for airborne ISR in the future force that are identified in Chapter 3. In positioning itself to meet the challenges that future operations will pose, the ADF cannot afford to remain static in its approach to operations planning. It must continue to innovate and adapt its processes, organisational structures and cultures to ensure it retains its edge in dynamic strategic, operational and tactical environments. By proposing an innovative methodology that draws on current Australian planning processes and research conducted in the US into improving ISR planning and execution, Chapter 4 provides the practical dimension of this paper. The proposed methodology is not intended to represent the only means through which the needs of the future force can be realised, as it can be expected that the future networked and highly integrated ADF will create multiple approaches to enhance its capabilities. This paper explores one viable option for the ADF that will facilitate the integration of its airborne ISR capability to meet the challenges of the future operating environment.

Methodology

In seeking to create a future airborne ISR concept that reflects the unique nature and needs of the ADF, this paper has sought, where possible, to draw on available Australian-produced literature as the basis for the concepts developed herein. However, despite the growing ubiquity of the term ISR in the ADF, there is a paucity of Australian literature relating to ISR at the unclassified level. Accordingly, appropriate ISR-related documentation produced by allied militaries and other organisations has been used to develop the academic and doctrinal foundation for the concept described in this paper. Due to the differences that exist between the ADF and its allies in terms of organisational culture, approach to operations and resources, concepts drawn from foreign sources have been carefully analysed to ensure their applicability to the Australian context. Accordingly, the concepts that are based on information drawn from foreign sources have been examined in consultation with ADO stakeholders to ensure their validity prior to inclusion in the paper.

Engagement and consultation with a range of ADO agencies has been crucial in the development of this paper. This consultation has made it possible to develop an awareness and appreciation of the various perspectives on ISR that exist in the ADO, and that must be reconciled in order to develop an integrated airborne ISR capability that addresses the needs of commanders across the ADF at all levels of command. This consultation has been wide-ranging and has included representatives from the three Services and other Defence agencies. It has also provided a means through which to validate the concepts developed in this paper to ensure that they align with the ISR needs of the ADF.

To ensure that the future concept described in this paper receives the exposure needed to make a meaningful impact on future force development, this paper will be made accessible to the widest possible readership. Accordingly, it has been drafted from the outset with the intention of making it publicly releasable upon its completion. This requirement has precluded the use of classified material in its preparation, although the unclassified concepts developed herein have been validated against information at the classified level through closed discussion with ADO ISR stakeholders. As the aim of this paper is to provide a future-focused approach to airborne ISR that is removed from any specific capabilities, this restriction in classification has not impeded the development and validation of the concept it proposes.

Terminology

This section defines the meaning of selected key terms used in this paper. The terms are not proposed as doctrine; rather they are defined here to provide clarity and to ensure a common understanding throughout the paper. Terms not elaborated on in this section have been used in the way defined by their natural language meaning or, where the term has specific military usage, the *Australian Defence Glossary*.[10]

AIRBORNE ISR

Airborne ISR is defined for the purposes of this paper as 'the use of *air power*[11] in the conduct of ISR'. This definition refers to the domain in which ISR is conducted, not the domain that is targeted or that is being supported. Air power in ISR extends beyond the airborne collection assets to include those assets that are external to the airborne platforms but are vital to the development and supply of the data and information that lies at the heart of ISR. Accordingly, airborne ISR must be understood to include all assets involved in the creation of ISR products using aviation assets as the collection platform.

ISR PRODUCT

'ISR product' refers to the data or information that is generated through the conduct of ISR operations. There is a temporal dimension to ISR that is increasingly important in modern operations. Data and/or information must be generated *and* received in a time frame that allows its use by a supported commander in their decision-making process. The temporal nature of the 'ISR product' is further elaborated in Chapter 2.

ASSETS AND SYSTEMS

Assets and systems both refer to the means through which ISR products are created. However, there are differences in the way these terms are used in this paper. For the purposes of this paper, 'asset' is used to refer to individual entities that are involved in ISR. For example, the aircraft that collects information and the analysts who process it are considered 'ISR assets'. 'System' is a collective term that refers to the combination of individual ISR assets that work together as a single entity to create an ISR product. The use of these terms in this paper reflects the 'system-of-systems' approach to ISR referred to in the *Defence ISR Roadmap*, with integration seen in terms of both the integration

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[10] Department of Defence, *Australian Defence Glossary*, Chief Information Officer: http://dlms.dcb.defence.gov.au//. **Editor's Note:** The *Defence Glossary* is now at http://adg.eas.defence.mil.adgms/.

[11] 'Air power is the ability to create or enable the creation of effects by or from platforms using the atmosphere for manoeuvre'. Royal Australian Air Force, Australian Air Publication 1000–D—*The Air Power Manual*, Fifth Edition, Air Power Development Centre, Canberra, 2007 [AAP 1000–D—*The Air Power Manual*], p. 3.

of ISR assets into ISR systems, and the integration of ISR systems to create an ISR capability.[12]

DATA, INFORMATION AND INTELLIGENCE

The use of the word 'intelligence' to refer to the product of ISR has attracted a great deal of debate, without resolution, throughout the course of the research for this paper. Resolving this debate, which centres on when 'information' is deemed to become 'intelligence', and who is responsible for that transformation, is beyond the scope of this paper and entering into it beyond the degree necessary to inform the discussion of the airborne ISR concept would detract from the paper's focus.

The terminology adopted in this paper represents an information hierarchy that creates clear distinctions between the stages of information processing. The lowest level of this hierarchy is *data*; the raw, unprocessed representations of the operating environment that are collected by a sensor, exemplified by the raw video feed displayed on an operator's screen. When data is processed, whether by automated systems or humans, and ascribed meaning it is then considered to be *information*. Determining the images presented on the video screen represent a tank inside a military compound is an example of this transition from data to information. *Intelligence* represents the next, and highest, tier of processing; it assigns significance and relevance to the processed information. Concluding that the tank on the screen is hostile and is preparing for an attack on nearby friendly units illustrates the transformation of *data*, through *information* into *intelligence*. The key term in these definitions is 'processing' which, for the purposes of this paper, is seen as an iterative process with progressive levels of processing increasing the informational value of the product. This is explained in greater detail in Chapter 2.

UNMANNED AERIAL SYSTEMS

Unmanned aerial systems (UAS) are an increasingly important component of the ADF's airborne ISR capability. However, they continue to represent a nascent capability still afflicted by a degree of conceptual ambiguity that is steadily being resolved in the ADF. The most salient aspect of this ambiguity is the current lack of standardised terminology to classify the various types of UAS.[13] The tier system described in the ADF UAS Roadmap has been used in this paper when referring to different UAS platforms. Table 1–1 outlines how the different tiers are defined, as well as alternative descriptors, including a UAS class-system. Although the UAS Roadmap adopted the class-system

12 Office of ISR Coordination, *Defence ISR Roadmap – 2007–2017*, unclassified edition, p. 9.

13 Department of Defence, *Defence Unmanned Aerial Systems Roadmap*, Department of Defence, Canberra, 2007, p. 23.

in its examination of UAS, the classifications used are too broad and lack the degree of differentiation between asset characteristics and capabilities that is provided by the use of tier identifiers. Use of the tier system also aligns the terminology used in this paper with that adopted by the Australian Army, currently the ADF's primary UAS user.

				Typical Physical/Performance Characteristics			
Class	Tiers	Typical Terms	Examples	MTOW (kg)	Span (m)	Op Alt (ft)	Speed (kts)
Small	Tier I	Micro	AV Wasp	< 1	~ 0.3	< 500	~ Ten
		Mini/ small	Skylark Raven	~ 10	1–2	< 1000	~ Ten
Tactical	Tier II	Sub-Tactical	Aerosonde Scan Eagle	~ 30-50	> 3	< 10000	< 100
	Tier III	Tactical	Shadow 200 I-View 250	Hundreds	> 5–10	< 10000	~ 50–100
	Tier IV	MALE[a]	Heron Predator	> 1000	> 15	< 40000	100–200
Theatre	Tier V	HALE / HAE[b]	Global Hawk	> 10000	> 30	> 50000	100–300+
Survivable		UCAV / URAV[c]	J-UCAS	> 10000	> 10	Varies	>>100

[a] Medium Altitude Long Endurance (MALE).
[b] High Altitude Long Endurance (HALE) / High Altitude Endurance (HAE)
[c] Unmanned Combat Aerial Vehicle (UCAV) / Unmanned Reconnaissance Aerial Vehicle (URAV).

Table 1-1: UAS Classes and Tiers[14]

The future airborne ISR concept that is described in this paper has the potential to shape the development of an airborne ISR capability that will satisfy the needs of the ADF's commanders as they face the challenges posed by complex and unpredictable future operating environments. By harnessing the ADF's continual drive towards transforming into an integrated force, this paper seeks to establish an integrated airborne ISR capability in the ADF that acts as a pathfinder for the integration of other capabilities that are critical for the future force to be able to reach, know and exploit the future operating environment. To be implemented successfully, however, those responsible for development of the ADF's ISR capability must approach the process with a willingness to challenge accepted practice and acknowledge that the only way to meet the challenges of an uncertain future and maintain a qualitative edge in its airborne ISR capability is through a unified approach to ADF airborne ISR.

[14] Department of Defence, *Defence Unmanned Aerial System Roadmap*, p. 25

Chapter 2: Airborne ISR – A Foundation For Joint Understanding

It seems that Joint Intelligence Surveillance Reconnaissance (JISR) can be all things to all men.

Captain Steve Kenny, RN[1]

Victory, speedy and complete, awaits the side that employs air power as it should be employed.

Marshal of the Royal Air Force Sir Arthur Harris

Key points:

- This chapter provides the foundation for the development of a joint approach to ADF airborne ISR.
- ISR is an integrating function that meshes intelligence and operations to provide actionable information to supported commanders to aid in developing the situational awareness needed to achieve decision-superiority.
- Efforts to increase ISR effectiveness must go beyond increasing the number of ISR assets and must address the way in which ISR is conducted by the ADF.
- The characteristics of air power make it ideally suited to the conduct of ISR tasks. The different ways that air power assets embody these characteristics must be understood in order to optimise their employment.
- To match optimally the characteristics of air power to the requirements of the task, ISR planners must be able to draw on the most appropriate assets from the pool of ADF airborne ISR assets.

The first step in the development of a future airborne ISR concept is the creation of a solid foundation of theory upon which the concept can be built. The core of this theoretical foundation is an understanding of the generic ISR concept; what ISR is, the

1 Captain Steve Kenny, RN, 'Joint Intelligence Surveillance Reconnaissance (JISR)', in *The Journal of the Joint Air Power Competence Centre*, Edition 5, Joint Air Power Competence Centre, Kalkar, 2007, p. 17.

role it plays in operations and how it is to be conducted. Supporting this generic concept is an appreciation of the characteristics of air power that enhance its contribution to ISR operations. By addressing these two aspects of airborne ISR, this chapter provides the foundation for the development of a future airborne ISR concept that will focus the ADF's airborne ISR capability development efforts to ensure that it meets the needs of commanders in the future operating environment.

A key requirement for the future airborne ISR concept is that it must support the integration of the ADF's various ISR assets into a single, coherent capability. As the ADF's future capability development will be shaped by its understanding of the ISR concept, achieving integration requires that the theoretical foundation upon which the future concept is built must represent a joint perspective of ISR. However, there is currently no document that outlines a common ISR concept to inform the development and employment of the ADF's ISR capability across the organisation. While the lack of a documentary foundation does not prevent the ADF's development and employment of an ISR capability, it generates conceptual ambiguity which inhibits the development of a cross-organisational approach to ISR that unifies individual organisation-centric approaches into a coherent, integrated and synergistic concept. A unified concept of ISR will provide the basis upon which an integrated capability that meets the needs of commanders across the organisation can be built. While it is beyond the purview of this paper to develop a definitive concept of what ISR should mean to the ADF, it is possible to outline an interpretation of ISR that can be used to inform the development of a unifying concept. The discussion of ISR in this section draws on information from a range of Australian and allied documentary sources as well as discussions with a broad cross-section of ADO representatives, to outline an approach to ISR that will aid the development of a unified ISR concept and the associated joint ISR doctrine in the ADF.

The need for a unified ISR concept is greatest in relation to the ADF's airborne ISR capability, which comprises a range of assets whose command and control is dispersed between the three Services and the ADO. The range of airborne assets currently maintained and planned to be acquired by Defence creates a diversified ISR asset base from which a balanced and effective capability can be built. However, developing a balanced capability requires that those responsible for the development, maintenance and employment of these diverse assets share a common understanding of how the various assets contribute to the ADF's airborne ISR capability. The contribution made by individual airborne assets to a force's ISR capability is derived from their technical capabilities and by the way their tasking leverages off the characteristics of air power to exploit those capabilities. Understanding how these attributes of the ADF's various airborne assets can be employed to maximum effect is crucial to optimising the contribution of an airborne ISR asset in support of a joint campaign.

A Generic ISR Concept

Despite the absence of specific joint ISR doctrine to guide ADF ISR into the future, there have been significant steps forward in the development of an ADF approach to ISR. These steps include the publication of the 2007 *Defence ISR Roadmap* and the inclusion of a definition for ISR into the ADF's official lexicon, the *Australian Defence Glossary*. The *Defence ISR Roadmap* provides an overview of the ADF's ISR vision and a series of milestones along a broadly defined development path to realise it. It is not intended to be the ADF's authoritative document on the ISR concept and therefore does not provide specific guidance on how ISR should be conducted. Significantly, the *Defence ISR Roadmap* does not provide a precise definition of ISR.[2] In the absence of a definition, the ambiguity that characterises the ISR concept has persisted, allowing ISR to continue being considered as 'all things to all men'.[3] The ambiguity surrounding the exact meaning of ISR was largely resolved with the inclusion in mid-May 2008 of the US Department of Defense (DoD) definition of ISR into the *Australian Defence Glossary*. However, a degree of debate regarding the application of this new definition has continued and the ADF's guidance on the concept remains fragmented. The draft ADDP 3.7—*Collection Operations* used the *Australian Defence Glossary* definition of ISR to describe a discrete element of collection operations, but at the time of writing this paper [2008] ADDP 3.7 remained provisional and subject to change, precluding its use as a definitive view on ISR in the ADF.[4] However, the most important document in developing an appreciation of the role ISR in the future force is the FJOC, which establishes ISR as a key capability in ensuring the effectiveness of the future force. These ADF sources provide the framework within which the ISR concept used in this paper has been developed.

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2 In discussions with the Office of ISR Coordination, the *Defence ISR Roadmap* sponsors, it was stated that defining ISR was difficult due to the large number of competing definitions that existed at the time drafting. As it was not the aim of the *Roadmap* to provide definitive guidance on the conduct of ISR in the ADF, selecting from the competing definitions was considered counterproductive to the *Defence ISR Roadmap's* goals, therefore defining the exact meaning of ISR was left to be resolved at a later date.

3 Kenny, 'Joint Intelligence Surveillance Reconnaissance (JISR)', p. 17.

4 Australian Defence Force Warfare Centre, Australian Defence Force Doctrine Publication 3.7—*Collection Operations*, First Edition, Department of Defence, Canberra, 2008 [ADDP 3.7—*Collection Operations*].

DEFINING ISR

Said to have been coined in the mid-1990s by the then Vice Chairman of the United States Joint Chiefs of Staff, Admiral William Owens, ISR has come to be seen as a vital component of the revolution in military affairs and a defining concept of information age warfare.[5] For the ADF the most important aspect of the change in operations heralded by the information age is 'the ability to increase vastly the speed and capacity to collect, organise, store, process, tailor and distribute information'.[6] This ability is encapsulated in ISR, which has been growing in prominence in the ADF in recent years, and is defined as:

> … an activity that synchronises and integrates the planning and operation of sensors, assets, and processing, exploitation, and dissemination systems in direct support of current and future operations. This is an integrated intelligence and operations function.[7]

A definition in isolation is insufficient to provide an understanding of an operational concept as it does not indicate how this activity will be conducted. This understanding requires the definition to be linked to the range of actions and processes that are involved in the conduct of operations, and which are shaped according to the context in which they are employed. Ideally, this would involve providing the definition with doctrinal expression. For ISR in the ADF, ADDP 3.7 provides a degree of context to the ISR concept in its reference to ISR as a subset of collection operations conducted by specialised platforms with a primary intelligence role.[8] It is argued in this paper, however, that the use of ISR in this way unnecessarily restricts the application of the concept to a narrow subset of ADF assets, potentially limiting the benefits that can be achieved by the ADF's innovation in the area of ISR. The ADDP 3.7 interpretation of ISR also limits the synchronisation and integration referred to in the ISR definition to the 'processing, exploitation, and dissemination systems … of the collection asset'[9], rather than viewing it as a force-wide integration concept that draws together

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5 Lieutenant General David A. Deptula, USAF and Major R. Greg Brown, USAF, 'A House Divided: The Indivisibility of Intelligence, Surveillance, and Reconnaissance', in *Air & Space Power Journal*, vol. xxii, no. 2, Summer 2008, Air University Press, Maxwell Air Force Base, Alabama, 2008, p. 6: http://www.airpower.maxwell.af.mil/airchronicles/apj/apj08/sum08/deptula.html, accessed 12 July 2008.

6 Department of Defence, *Defence 2000: Our Future Defence Force*, Defence Publishing Service, Canberra, 2000, p. 108.

7 Department of Defence, *Australian Defence Glossary*, Chief Information Officer: http://dlms.dcb.defence.gov.au//. The *Defence Glossary* is now at http://adg.eas.defence.mil.adgms/.

8 ADDP 3.7—*Collection Operations*, pp. 1–3. The author obtained clearance from the document sponsor to reproduce information drawn from ADDP 3.7 in the paper.

9 ibid.

all assets involved in the collection, processing and dissemination of information in support of ADF commanders. In the ADDP 3.7 interpretation, other assets involved in the provision of information support to a force's commanders are viewed as part of a broader *collection operations* concept. Collection operations are regarded as 'an *amalgam* of intelligence and operations functions'[10] not as an *integration* of the functions as envisaged by the ISR definition. Creating this distinction between assets with a primary intelligence gathering role, and those for which intelligence collection capabilities are ancillary to their main role inhibits the development of a holistic approach to ISR that integrates all the functions involved in the conduct of ISR. Such a holistic approach will become increasingly important as the ADF continues its drive towards becoming a networked and integrated force.

The use of the word 'amalgam' in ADDP 3.7 to define collection operations is significant. It implies that the component intelligence and operations functions continue to exist as a mixture of distinct functions that are easily discernible and are merely used to complement each other. By adopting this approach, ADDP 3.7 reinforces the traditional division that has existed between the operators who collect information and the intelligence staff who process it; a division that has lost relevance in an increasingly networked ADF. Integration, on the other hand, involves the meshing of functions to such a degree that the distinction between the individual functions is largely invisible to those outside of the process. Integration is therefore a central requirement in the development of a seamless capability. By acknowledging the need to *integrate* the intelligence and operations functions associated with collection operations, the ISR concept seeks to capitalise on available technology that has made it increasingly difficult to distinguish between where collection ceases and processing begins. This integration is the key to realising the synergy between the two functions, thereby creating a more effective information production concept. The growth of ISR as an integrating function therefore represents a technology-enabled conceptual evolution that brings collection operations into the information age. Capitalising on these technological advancements through conceptual innovation offers greater benefits, in terms of both the quality of information and the speed at which it is delivered, than that envisaged in the traditional, more segregated, view. The ISR concept presented in this paper provides a foundation for this conceptual innovation. To capitalise fully on the ADF's current and planned capability this concept extends beyond the limited confines of specialised collection assets to cover the full range of assets, irrespective of their primary role, that have the potential to provide actionable information to commanders throughout the force.

[10] ibid., pp.1–2. Emphasis added.

THE ROLE OF ISR

The role of ISR in ADF operations is to provide the accurate, relevant and timely information needed by decision-makers to allow them to achieve knowledge dominance.[11] The information produced through the conduct of ISR and disseminated through the network that links ISR assets and supported commanders enhances a commander's situational awareness and, by extension, assists them in achieving the decision superiority that is necessary for operational success. Creating an ADF airborne ISR capability to meet the needs of the future force therefore requires a deeper appreciation of ISR's role in, and relationship with, the development of situational awareness and decision superiority, as this relationship is the key to understanding how ISR impacts on operational performance.

Situational awareness and decision superiority

Situational awareness is a concept that is frequently referred to but not defined in the ADF. The result is that, like ISR itself, situational awareness has come to mean different things to different people. For the purposes of this paper situational awareness refers to:

> a decision-maker's awareness of the cultural, physical, geographical, meteorological and operational features of the operating environment upon which they make the decisions necessary to achieve their intent.[12]

As all decisions will invariably be based on the decision-maker's knowledge and understanding of the prevailing situation, situational awareness can be seen to underpin all decisions made by commanders at all levels of a force. Situational awareness is not a binary concept; it cannot be said that a commander either has or does not have situational awareness. Rather, it should be seen as a continuum along which the level of situational awareness varies depending on the availability and the quality of information upon which it is based. A commander's situational awareness can never be considered absolute or perfect, a widely understood tenet of military thought generally ascribed

[11] This statement is modified from USAF ISR doctrine to suit the ADF context. The original statement being: 'The goal of ISR operations is to provide accurate, relevant, and timely intelligence to decision makers'. United States Air Force, Air Force Doctrine Document 2–9—*Intelligence, Surveillance, and Reconnaissance Operations*, Headquarters Air Force Doctrine Center, Maxwell Air Force Base, Alabama, 2007 [AFDD 2–9—*Intelligence, Surveillance, and Reconnaissance Operations*], p. 1.

[12] This is modified from Carl Builder's definition of situational awareness as 'a state attained by a decisionmaker [sic] in which he is cognisant of the key physical, geographical, and meteorological features of the battlespace that will enable his command concept to be realised'. Quoted in Walter Perry, David Signori and John Boon, *Exploring Information Superiority: A Methodology for Measuring the Quality of Information and Its Impact on Shared Awareness*, RAND Corporation, Santa Monica, CA, 2004, pp. 89–90: http://www.rand.org/pubs/monograph_reports/MR1467, accessed 18 November 2008.

to the 'fog of war'. Indeed, increasingly adaptive adversaries and the complexity of the modern operating environment make attempts at attaining perfect situational awareness an ultimately futile endeavour. It follows that in the operating environments of the future, successful commanders will continue to be those who are able to make effective decisions in spite of incomplete situational awareness.

ISR's contribution to the situational awareness of the commander should therefore not be viewed in terms of providing complete knowledge of the operating environment. It should be seen as a means through which to develop the level of awareness that is necessary to enable a commander to make effective decisions. Accordingly, the provision of ISR support must reflect the identified needs of the commander being supported, and not be driven by an unrealistic aim to provide a complete 'picture' of the operating environment. By filling critical gaps in commanders' awareness of the operating environment that limit their ability to make decisions, ISR operations maximise the chances of achieving decision superiority, a key determinant of operational success. ISR support should therefore be focused on providing the information that is necessary to address the gaps in commanders' situational awareness in order to allow decision superiority to be achieved.

The current *Australian Defence Glossary* definition of decision superiority in the operational dimension relates to 'the ability to make and implement more informed and more accurate decisions at a rate faster than the adversary'.[13] In the organisational dimension the concept becomes more complex, referring to 'the degree of dominance in the cognitive domain that an organisation achieves through its decision-making processes that enables it to acquire and maintain an advantage over its competitors'.[14] Irrespective of the dimension being considered, it is clear from both definitions that for commanders to achieve decision superiority they must effectively balance the competing priorities of information quality and the speed of its delivery. Balancing these priorities presents a significant challenge to commanders in most operational situations, but more so in the data-rich dynamic operating environments typified by operations such as those currently being conducted in Iraq and Afghanistan.[15] ISR will not be the sole factor in determining a commander's ability to achieve decision superiority. Variations in a commander's individual attributes will affect their ability to assimilate information and to make effective decisions based upon it. However, ISR is the only variable that

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[13] Department of Defence, *Australian Defence Glossary*.

[14] Air Power Development Centre, *Decision Superiority: An Air Force Concept Paper*, Paper No. 28, Air Power Development Centre, Canberra, 2008, p. 10.

[15] Increases in the amount of data available increases the time taken to sift and process it, making the provision of actionable information to the supported commander in these environments challenging.

can be easily adjusted during operations to reflect the changing needs of the situation and of the commander.

ISR facilitates decision superiority by ensuring that the information needed to develop sufficient awareness of the operational environment is available in time to allow decisions to be made and implemented. ISR-derived information supplied to commanders must therefore be provided in a readily understandable format, it must be relevant to the decision-making needs of the commander and it must be provided in a time frame that enables it to influence the commander's decision-making process. Information that satisfies these criteria is referred to as 'actionable information'.[16] To be considered effective, the ADF's ISR capability must be able to provide commanders with the actionable information needed to ensure that they are able to develop the situational awareness necessary to achieve decision superiority across the range of operations that the ADF will be expected to conduct. This requires the implementation of a process that integrates all the assets needed to produce the type and amount of information needed by a commander within the time frame that is available. The process that achieves this is referred to as the 'ISR process'.

THE ISR PROCESS

The effectiveness of the ADF's joint ISR capability is not determined simply as the sum of the capabilities of individual assets; it is also the product of the way in which these capabilities interact to create actionable information. This interaction is governed by a process that integrates the four functions involved in the creation of an ISR product; direction, collection, processing and dissemination. This integration can occur at a force-wide level, drawing together geographically dispersed ISR assets, or it can occur internally on a single platform. Regardless of the scale of the process, its efficient execution is critical to the effectiveness of the ADF's ISR capability. Attempts at improving ISR must therefore not focus only on an increase in the numbers and/ or capabilities of ISR assets, but they must also address the way these assets and the functions they deliver are integrated to produce the outcomes being sought.

Although there is no formally promulgated ADF representation of this process, the *Defence ISR Roadmap* provides guidance on what the ADF envisions it to be; namely, 'a recurring process comprised of direction, collection, processing and dissemination'.[17]

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16 Michele Knight, Les Vencel and Paul Amey, *Future Net-Centric Intelligence, Surveillance and Reconnaissance Concepts*, [RESTRICTED] DSTO-TR-2053, Defence Science and Technology Organisation, Edinburgh, 2007, p. 4. The author obtained clearance from DSTO to include information from this document in the paper.

17 Office of ISR Coordination, *Defence ISR Roadmap – 2007–2017*, classified edition, Department of Defence, Canberra, 2007, p. 7.

This statement provides a basis for understanding the way ISR assets interact to produce actionable information. The process itself, as developed for the purposes of this paper, is represented as a 'network of interrelated, simultaneous' functions,[18] illustrated at Figure 2–1. The efficient and effective execution of the process is not dependent on the outcome of any one of these functions in isolation. Success is dependent upon the effective conduct and interaction of all the component functions as a whole. Any attempt to improve the conduct of ISR must therefore be based on a holistic approach to the ISR process, as focusing on improving one part of the process without addressing the others is unlikely to realise the full potential of the system.

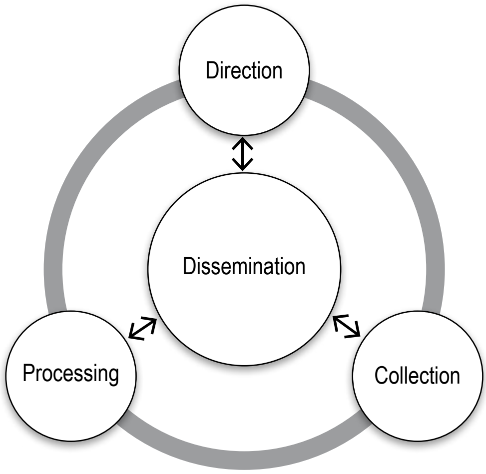

Figure 2–1: The ISR Process

The following sections describe the functions of the ISR process, as they are defined for the purposes of this paper, and outlines potential considerations for their conduct in the future force. It is not an examination of the current state of the ISR process in the ADF, although that has informed the development of the process. Rather, it is an aspirational description of how the process should be viewed in the ADF.

[18] AFDD 2–9— *Intelligence, Surveillance, and Reconnaissance Operations*, p. 9.

Collection function

The collection function involves the gathering of the data that is needed to satisfy the information and intelligence requirements of supported commanders. This data can take many forms, with the type collected being dictated by the information needs that drive the collection, as well as the collection capabilities of the sensors gathering it. Effective collection is therefore based on clearly articulated statements from commanders as to their information requirements, and the tasking of assets with the capabilities and characteristics best suited to satisfy these requirements.

Increasingly complex and capable sensors will continue to increase the quantity and fidelity of data available to ADF commanders and ISR planners. Advances in signals intelligence (SIGINT), enhancements in imagery intelligence (IMINT), and the rise of hyper-spectral imaging are examples of the capabilities that are proving increasingly useful in satisfying information needs.[19] These technological advancements have also seen a marked increase in the capability of tactical platforms. The equipping of tactical unmanned aerial systems (TUAS) with Ground Moving Target Indicator (GMTI) and Synthetic Aperture Radar (SAR) are recent examples of this.[20] The impact of technological advances is not confined to the air domain. In the land and maritime domains, technology is similarly being translated into improved information collection capabilities.

Processing function

The processing function covers the range of activities that attach meaning to the collected data, thereby transforming it into information and eventually into intelligence. In simple terms it involves 'the conversion of raw data to information and into intelligence'.[21] Traditionally processing has been regarded as the purview of dedicated intelligence staff; however, the ever-increasing automation of information processing and the growing importance of processing by collection sensor operators as a way of providing near real-time analysis will continue to see the processing function extend beyond its traditional boundaries. This expansion in the scope of the processing function is largely being driven by the ADF's ongoing evolution into a networked and

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[19] JP 2078 is aimed at providing the ADF with a hyper-spectral imaging capability in the 2019–2021 time frame.

[20] William Matthews, 'NanoSAR sharpens vision of small UAVs', in *C4ISR Journal*, vol. 7, no. 4, May 2008, Army Times Publishing Company, Springfield, 2008, p. 10; and Martin Streetly, 'UK's WK450 UAV makes first flight', in *Jane's International Defence Review*, vol. 41, June 2008, Jane's Information Group, Surrey, 2008, p. 34.

[21] Brigadier Timothy McKenna, 'Management and Use of ISR Information by HQJOC', unpublished report commissioned by Headquarters Joint Operations Command, Canberra, 2008, p. 13. The author obtained clearance from Brigadier McKenna to draw on information from this report in the paper.

integrated force, and is itself a key driver behind the rise of ISR as an integrating concept. The ADF's evolution into the future force will see processing increasingly being viewed as an iterative function that employs the links and nodes of the networked force to share information with the aim of enabling those handling it to value-add to the information received. Information handling therefore becomes primarily a value-adding activity rather than an administrative function concerned primarily with information routing. In this way, processing becomes a collaborative function that uses the expertise of different organisations, seamlessly connected as part of a network, to refine and improve the quality of the ISR product as it is disseminated throughout the force.

While each processing iteration is intended to improve the quality of the processed information, they also have the potential to add to the time delay between the collection of information and its receipt by the supported commander. Any such delay in information transmission may result in it being unavailable to commanders in time to influence their decision-making, thereby reducing their ability to take timely actions and negatively impacting on the overall effectiveness of the process. Although developments in networking technology and automated data processing have compressed the processing time frame, the requirement for human involvement in the processing function will remain for the foreseeable future. This continuing need for 'man-in-the-loop' processing in some circumstance means that a certain degree of lag will inevitably remain. The potential impact of this lag can be reduced by conducting processing as a distributed, systemic function, with the processed product being made continuously available, at different levels of fidelity, throughout the network during its processing progression. This represents a networked approach that will allow commanders to access the data/information when they judge it suits their operational circumstances, in terms of time and quality. This ability will enable commanders to bypass additional processing whenever the veracity of the available information is considered sufficient, or if the situation requires greater expediency in the decision-making process.

The effective conduct of the processing function is dependent upon having sufficient processing capability and capacity tasked to support the efforts of the collection asset. The potential scale of the processing requirements for ISR data is illustrated by US efforts to increase the number of round-the-clock unmanned aerial systems (UAS) orbits[22] in support of operations in Iraq and Afghanistan from the present level of 27 to 50 by 2011. This 23-orbit increase requires the United States Air Force (USAF) to add an additional 2000 analysts to process the data that will be collected.[23] Without

[22] Operational level UAS are generally employed in orbits over designated geographic areas. When tasking arises they will shift from that orbit as required to conduct their mission.

[23] Michael Hoffman 'More ISR intel analysts needed', in *Air Force Times*, 20 August 2008: http://www.airforcetimes.com/news/2008/08/airforce_intel_jobs_081808, accessed 26 August 2008.

the addition of supporting processing capability, improvements in the conduct of the collection function can be nullified, as the increased quantity of data collected may not be processed to the level required in the time frame available. Ensuring the adequacy of the ADF's processing capability and capacity into the future will require investment across all inputs to capability, not only in increasing the number of assets available. In particular, it is necessary to ensure that the training of the human assets, who will continue to play a vital processing role, keeps pace with technological and procedural advances. Careful planning will be required, both in terms of capability development and operational employment, to ensure that appropriate information processing assets are allocated in support of ISR operations and that the assigned capacity is sufficient to meet the needs of supported commanders.

Dissemination function

The dissemination function involves the transmission of information to those who require it in order to make effective decisions. Conceptually, it connects the three other functions of the ISR process and represents the link between the ISR process and the ADF's Network Centric Warfare (NCW) concept. There are two dimensions of dissemination that must be addressed when examining this function of the ISR process. The first dimension is the stage of the ISR process at which collected data is transmitted through the network. The second dimension relates to the need to ensure the widest possible awareness of ISR tasking throughout the network. Both dimensions play a pivotal role in the effectiveness and efficiency of ISR operations.

The first dimension of dissemination is generally discussed with reference to the Processing-Exploitation-Dissemination (PED) models that represent the stage of processing at which data/information is provided to the network. In traditional dissemination models this information dissemination occurs post-processing in accordance with a Task-Process-Exploit-Disseminate (TPED) cycle. However, TPED is 'not well matched to the high tempo of [the] network-centric operations' which will increasingly come to characterise the future force's operations.[24] The systemic processing function outlined above requires that data and information be made available to the network at all stages of the ISR process. Disseminating the raw collected data and processed information throughout the network will not only allow commanders to access the information they need when they need it, but will also facilitate the conduct of the processing function by enabling access to a range of distributed processing sources as a part of a single system. The ADF's continual evolution into a networked force has seen a growing prominence of such a 'hybrid' dissemination model, which makes data,

[24] Knight et al., *Future Net-Centric Intelligence, Surveillance and Reconnaissance Concepts*, p. 17. The author obtained clearance from DSTO to include information from this document in the paper.

information and processing capability available through the network during each stage and iteration of the ISR process.[25] This model forms the basis of the dissemination function for ISR in the future force.

The second dimension of dissemination involves developing awareness throughout the force of the information requirements of commanders, as well as ISR tasking that is currently being, or is scheduled to be, conducted.[26] The benefits of this awareness are twofold. Firstly, it facilitates an increase in the potential user base for the collected and processed ISR outputs by making commanders throughout the network aware of ISR operations. This allows commanders not allocated dedicated ISR support to determine if ISR operations planned in support of other commanders have the potential to enhance their own situational awareness. Similarly, with knowledge of the information needs of all commanders, ISR planners are able to task assets in support of multiple commanders, thereby optimising asset employment and increasing ISR efficiency. This knowledge of force-wide ISR tasking will also facilitate effective information management practices.

Both dimensions of the dissemination function require a well-designed network infrastructure that facilitates ease of transmission as well as ease of access to information by network users. However, it is not only the design of the network infrastructure that is important to the dissemination function. Dissemination also requires the availability of adequate bandwidth and radio frequency spectrum to transmit the information and intelligence throughout the force. Managing the increasing demand for bandwidth within available capacity will pose a significant challenge to ISR planners in the future. This pressure on bandwidth was highlighted in a 2004 study into US Army bandwidth requirements that showed a tenfold increase in the demand for bandwidth from Operation *Desert Storm* to Operation *Iraqi Freedom*.[27] Predictions show this demand continuing to grow dramatically in the coming years. The limited availability of radio frequency spectrum and bandwidth, coupled with the conflicting demands of competing organisations, can impede the conduct of operations. UAS operations have highlighted the complexities of radio frequency spectrum management, as interference from communications and jammers have reduced their freedom of operation in some areas. In some cases this interference has even resulted in the loss of assets.[28] ISR planning for the future force must therefore include the allocation/tasking of sufficient bandwidth and radio frequency spectrum to allow necessary data and information to

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25 ibid.

26 ibid.

27 Leland Joe and Isaac Porche III, *Future Army Bandwidth Needs and Capabilities*, RAND Corporation, Santa Monica, CA, 2004, p. 10.

28 Nathan Hodge, 'Radio interference in Iraq hampers US UAV operations', in *Jane's International Defence Review*, 17 March 2008, Jane's Information Group, Surrey, 2008: http://idr.janes.com/public/idr/international_defence_digest.shtml, accessed 12 May 2008

be disseminated throughout the network and reach those who require access to it. The effective management of the ADF's dissemination pathways and network infrastructure will be a vital to the successful conduct of ISR operations in the fully networked and integrated future force.

Direction function

Although it is the last function to be discussed, the *direction function* is the first function to be conducted during the execution of the ISR process. Its position at the conclusion of this section is a reflection of its role in bringing together the assets that execute the other functions of the ISR process in order to create the ISR systems that will satisfy the ADF commanders' operational information requirements. The direction function is responsible for developing the tasking that guides the efforts of the ISR assets. ISR effectiveness will be a direct reflection of the sufficiency and appropriateness of the assets assigned to conduct each function of the ISR process. Unlike the other functions, direction is procedural in nature and is influenced less by technology and more by organisational structures and processes. The inherent adaptability of these structures and processes makes the direction function the area where conceptual innovation in ISR has the greatest potential impact.

Effective execution of the direction function is reliant on two key factors. First is the need for a capable agency with the authority and the means to influence the tasking of the assets necessary for the execution of the ISR process. Second is the need for commanders to articulate clearly the information requirements around which the ISR systems will be designed.

The ISR planners who execute the direction function are responsible for the optimal allocation of scarce ISR assets to ensure they have the greatest possible impact on achieving the desired campaign outcomes. This allocation must be based on careful consideration of the contribution that individual asset tasking makes to strategic, operational and tactical level objectives, as well as an appreciation of the needs of the supported commanders and the wider campaign. Based on their awareness of the information requirements generated throughout the force, the ISR planners, under the authority of a joint force commander, will task the available collection, processing and dissemination assets to create ISR systems that achieve the best outcomes for the force with optimal usage of resources. Ensuring that the ISR systems so designed meet the requirements of the supported commanders requires that the ISR planners have a clear appreciation of the exact needs of these commanders. Any ambiguity regarding these needs will likely result in them not being met, or in the inefficient allocation of available assets. The organisational structures and procedures that will govern the employment of airborne ISR in the future force must adequately address the tasking and information requirements needed for the execution of the direction function if the ADF is to realise fully the potential of its airborne ISR capabilities.

The future airborne ISR concept proposed in this paper shapes the way the direction function of the ISR process will be executed in the future force. It does this by establishing how airborne ISR planners in the future force will be able to draw on the assets they need to satisfy the information demands of supported commanders across all domains and at all levels. Achieving this level of sophistication of direction is vital to the creation of a future ADF airborne ISR capability that is able to meets the needs of the force's commanders in the future operating environment. For a small force such as the ADF, where personnel and equipment limitations have placed a premium on maintaining a balanced force with high quality capabilities, this ability is the basis for the development of an efficient and effective airborne ISR capability to meet the needs of the present and future force.

Air Power and ISR

Since the dawn of military aviation, air power has been seen as a valuable tool for providing the information support that is vital to commanders' decision-making.[29] Early military aviation is replete with examples of airborne reconnaissance influencing the decision-making of commanders, frequently contributing to operational success despite the limitations of aircraft at the time. Although technology has now overcome many of the factors that limited the effectiveness of early airborne collection activities, airborne ISR must, even now, always be considered as complement to and not a substitute for ISR conducted in the other domains. Human intelligence (HUMINT) and other specialised activities will continue to play a vital role in increasing the situational awareness of ADF commanders. Airborne ISR is a powerful tool that, when employed effectively, complements other information collection activities being conducted in support of ADF operations.

The contribution of air power to a force's ISR capability is derived not only from the capabilities of the individual airborne ISR assets but also from the way that these assets are tasked to exploit the characteristics of air power. Understanding how the characteristics of individual airborne assets can be used to augment or complement those of other ISR assets will enable the optimisation of the contribution that the ADF's airborne ISR assets make to a joint campaign. An understanding of air power

[29] The first recorded use of military aviation was by the French during the Battle of Fleurus (1794), who used the reconnaissance balloon *l'Entreprenant* to observe the movement of Austrian forces.

characteristics is therefore essential if the ADF's airborne ISR assets are to be employed in ways that maximise the synergy that can be gained from combining airborne ISR with ISR efforts conducted in the other domains. Although these characteristics are inherent in airborne collection, the network technology that has created real-time links between airborne collection platforms and the other assets in the ISR system has extended the influence of these characteristics also to affect the ground-based assets linked to the airborne sensors. The following section outlines how the characteristics of air power influence the contribution of airborne assets to the conduct of ISR operations in the future networked ADF.

CHARACTERISTICS OF AIR POWER

Optimising the effectiveness of air power requires that air power assets be employed in a way that exploits their characteristics to best effect. Airborne ISR planners therefore require an appreciation of how these characteristics are manifested by different assets, and the impact they have on operational performance. The 14 air power characteristics listed in the *The Air Power Manual* are all relevant to the employment of airborne assets in any role;[30] however, this chapter has focused on those characteristics that have the greatest impact on air power's contribution to ISR. Grouped together under the headings of perspective, responsiveness, reach and penetration, relative impermanence, and flexibility, the characteristics of air power covered below are crucial to the contribution of air power to the ADF's ISR capability.

Perspective

'Perspective describes the way that a force physically views the battlespace.'[31] The ability of airborne assets to operate above the area of operations (AO) enables an expansion in the perspective of airborne ISR systems, and a corresponding increase in the dimensions of the observable battlespace. This is the major distinguishing feature between airborne ISR and its land and sea-based counterparts. The expanded view provided by airborne ISR systems allows networked commanders to 'see' around corners, over hills and into compounds, and to extend their view of the AO beyond the sensor horizon of their maritime and land-based assets. The range and definition that this expanded perspective provides to commanders will vary between airborne assets. The benefit of the perspective provided by an airborne asset will ultimately be determined by the capabilities of the asset, in terms of sensor and air vehicle performance, and by the situation in which the asset is employed. While manned platforms and tier IV

[30] Royal Australian Air Force, Australian Air Publication 1000–D—*The Air Power Manual*, Fifth Edition, Air Power Development Centre, Canberra, 2007 [AAP 1000–D—*The Air Power Manual*], p. 78.

[31] ibid., p. 79.

and V UAS are generally considered to provide an improved perspective to supported commanders, restrictions imposed by environmental conditions, terrain, operational considerations or an adversary's efforts at concealment may require these platforms to operate at other than their optimum altitude or location. The resulting degradation in collection performance may, in some circumstances, be so great that different assets would provide a better option to conduct the collection. Even in situations where airborne platforms are unconstrained in their operations, the physical environment or the nature of the adversary may render the perspective of the force's airborne ISR assets unable to provide the resolution or detail that is necessary to make effective decisions. Operations in Afghanistan provide graphic examples of this limitation of air power. The difficulty in distinguishing between the Afghan citizenry and insurgents has been attributed as the cause of a number of incidents of Coalition air strikes resulting in civilian casualties.[32] Determining whether an airborne ISR asset is the most appropriate asset for the task, and if so what type of asset, requires careful consideration of the information needed, the capabilities of the asset and the impact that environmental and operational constraints imposed on its employment have on the asset's ability to collect the necessary data.

Reach and penetration

In addition to providing airborne ISR systems with an enhanced perspective, altitude also allows them to overcome the geographical and physical barriers that limit the scope of operations of land and sea-based systems. This freedom of manoeuvre provides commanders with the ability to extend their visibility of an operational area deep into an adversary's territory or into otherwise inaccessible areas. Reach and penetration is facilitated not just by the endurance of the platform that allows the physical deployment of the asset deep into the area of interest, but also by the extended sensor and communications ranges offered by altitude. These extended ranges increase sensor coverage, as well as allowing airborne platforms to maintain line-of-sight (LOS) communications at greater distances. The ability to extend the reach of its ISR assets is vital to a nation such as Australia, which is required to gain and maintain knowledge dominance across its broad geographic area of strategic interest.

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[32] Human Rights Watch, *"Troops in Contact": Airstrikes and Civilian Deaths in Afghanistan*, Human Rights Watch, New York, NY, 2008: http://hrw.org/reports/2008/afghanistan0908, accessed 24 October 2008.

Joint Surveillance and Target Attack Radar System (JSTARS) in Complex Terrain

Making its debut during Operation Desert Storm, six years before its planned Initial Operating Capability (IOC), JSTARS played a pivotal role in providing air and ground commanders with the information to develop the situational awareness necessary to decimate the Iraqi ground forces both prior to and during the ground phase of the operation. However, the success of the system in tracking ground targets in the flat expanse of the Kuwaiti desert did not easily transfer to the more complex terrain, both physical and human, encountered during the subsequent UN and NATO-led operations in Bosnia and Kosovo. The mountainous topography of the Balkans resulted in terrain masking which limited the visibility of the battlespace offered by the JSTARS GMTI sensors during both campaigns. The black areas in Figure 2–2 depict areas not visible due to terrain masking experienced by JSTARS aircraft conducting a representative orbit during operations in Kosovo. Similarly in Bosnia, the intermingling of friendly forces and members of the Former Warring Factions (FWF) resulted in JSTARS being unable to discriminate effectively between opposing forces.[33] The problems faced by JSTARS during the Yugoslavian Civil Wars highlights how the effective application of air power must account for the operational factors that will impact on its employment.

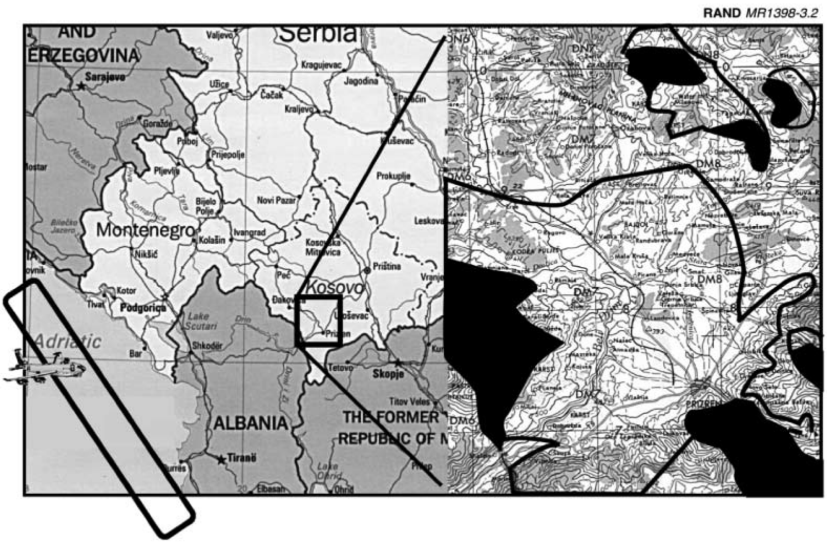

Figure 2–2: JSTARS Coverage of Prizren Region of Kosovo[34]

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[33] Larry K. Wentz, 'Intelligence Operations', in Larry K. Wentz (ed.), *Lessons From Bosnia: The IFOR Experience*, Command and Control Research Program, Washington, 1997, p. 102.

[34] ibid.

There are two main benefits that air power's reach and penetration provides commanders. Firstly, combined with speed, air power's reach and penetration allow airborne assets to provide support rapidly to geographically dispersed commanders, a useful ability in large or geographically isolated theatres of operations. Secondly, airborne assets can be employed well in advance of the deployment of land or sea forces into an AO, enabling commanders to enhance their situational awareness prior to their deployment into the area.

Relative impermanence

Despite improvements in endurance offered by long-range UAS and air-to-air refuelling (AAR), current and planned airborne assets cannot remain airborne indefinitely, which makes air power relatively impermanent when compared with some land and sea-based collection assets. Air power's relative impermanence can make continuous coverage of an area resource-intensive and very demanding for forces with a limited number of air power assets. Although relative impermanence can be seen as a limitation in some circumstances, it can also be beneficial in situations where an extended overt presence in the battlespace may prove either too provocative or politically untenable to permit the deployment of land and maritime units into the operational area. The ability to adjust easily the temporal footprint of airborne ISR makes airborne ISR systems ideally suited for operations such as those in and around disputed territory, where local inhabitants are adverse to a foreign military presence or when political considerations preclude a more permanent presence. The carefully controlled tasking of airborne ISR systems to collect in these situations reduces or avoids the adverse reactions that may stem from the use of other assets.

Air power's relative impermanence can be overcome to some extent through careful planning that matches operational tempo, conduct of operations and platform capabilities to achieve the persistent effect required by the operational situation. With sufficient collection and processing resources it is possible to maintain a rate of effort that achieves the persistence deemed necessary in the circumstances. However, sustained high rates of operations must be carefully managed to ensure that limitations on operator endurance and platform maintenance requirements do not lead to an overall degradation in performance and capability. Like planners in all domains, airborne ISR planners must ensure that their efforts to develop a more persistent presence in the operational area do not unnecessarily result in a degradation of capability that will impact subsequent operations.

Flexibility

'Air power's flexibility and adaptability comes to the fore in the context of ISR.'[35] Flexibility, as used this context, refers to the 'inherent ability [of air power assets] to switch between roles and missions'.[36] Advances in technology have led to greatly improved multi-role and swing-role capabilities of aircraft, with many aircraft now able to claim at least a limited level of this capability.[37] From an ISR perspective this means the range of assets that are considered capable of contributing to ISR is far greater than those that are traditionally defined as collection assets. This realisation has been behind the growing prominence of 'Non-Traditional' ISR (NTISR), a term used to refer to 'employing a sensor not normally used for ISR' in an ISR role.[38] Although NTISR is generally used to refer to strike and fighter aircraft, it can cover the employment of any airborne platform which is not a specialised intelligence collector in an ISR role. Visual and radar data collected by transport aircraft entering an operational area, for example, can provide valuable information about that particular area. The potential contribution by these 'non-traditional' assets will continue to grow as the availability of modular sensor packages increases and the capabilities of existing sensors improve. Capitalising on the inherent flexibility of airborne assets will allow more airborne assets to contribute to ISR operations, increasing the number of collection resources available to ISR planners.

Responsiveness

The final characteristic to be described, 'responsiveness', is increasing in importance in the modern dynamic operating environment where decision cycles are becoming increasingly compressed. All air power assets possess an inherent ability to adapt rapidly to changes in a dynamic and complex battlespace by shifting the focus of their tasking. This focal shift may involve the asset supporting a different commander, collecting on a different target, or even exploiting its flexibility to transition from collection to

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35 Dr Sanu Kainikara and Group Captain Tony Forestier, *Air Power for Australia's Security: More than the Three Block War*, Chief of Air Force Occasional Papers, Paper No. 1, Air Power Development Centre, 2007, p. 19.

36 AAP 1000–D—*The Air Power Manual*, p. 88.

37 Multi-roling refers to the ability to perform different roles, but requires reconfiguration on the ground in order to be achieved. Swing-roling is the ability to change roles in flight. Refer to AAP 1000–D—*The Air Power Manual*, p. 88.

38 United States Air Force, *Non-Traditional Intelligence, Surveillance, and Reconnaissance (NTISR) Functional Concept*, Headquarters Air Combat Command, Langley Air Force Base, VA, 2007, p. 6.

engagement. Airborne ISR assets can exploit this responsiveness to adjust their mission profile to meet the needs of a changing situation. The most dramatic example of the effect of this responsiveness is the ability of airborne assets to shorten the sensor-to-shooter time frame by collecting data, disseminating it to the commander in real-time to facilitate and enhance targeting decisions, and then, in some instances, employing the same sensor platform to conduct the strike against the target. The compression of the time frame that this allows greatly improves the likelihood of a commander achieving decision superiority.

Although the capabilities of airborne ISR assets will evolve, the characteristics of air power will continue to influence their use in the operations of the future force. Combined with a comprehensive understanding of the operational situation and the needs of the supported commanders, understanding the characteristics of air power will ensure planners are able to employ the force's airborne ISR assets in ways that optimise their contribution to the conduct of the joint campaign.

Chapter 3: Airborne ISR in the Future Force

The ADF must adapt to the future operating environment in order to maintain and build its unique and effective approach to warfare. Understanding the future operating environment is at the heart of that challenge

ADDP–D.3—*Joint Operations in for the 21st Century*[1]

Key points:

- An aim point to focus the development of a future airborne ISR concept for the ADF can be derived from an analysis of the ADF's strategy and capability development documents.
- The Defence ISR principles require that ISR in the future ADF must be operationally focused, integrated and interoperable.
- The *Defence Capability Plan* will deliver capability enhancements to all functions of the ISR process. Key amongst these will be the ubiquitous information domain supported by an adaptive command and control system that will enable the integration of airborne ISR in support of future operations.
- The future land force will engage in adaptive action to address the challenges posed by adaptive adversaries operating in complex terrain.
- Airborne ISR in support of operations in the land domain must enable commanders to seize on a transitory event by providing responsive on-occurrence support.
- Future maritime commanders will require persistent airborne ISR support to facilitate effective maritime force projection and protection.
- The ADF's evolution into a networked, integrated and balanced force will be key to its airborne ISR capability meeting the responsive and persistent support needs of future commanders.
- Developing an integrated and balanced capability requires a degree of centralisation in the direction of the ADF's airborne ISR assets.

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1 Department of Defence, Australian Defence Doctrine Publication–D.3—*Joint Operations for the 21st Century*, Department of Defence, Canberra, 2002 [ADDP–D.3—*Joint Operations for the 21st Century*], p. 7.

- The centralised coordination of all ADF's airborne ISR assets will include the direction of tactical level collection assets, processing capability and dissemination pathways.

The FJOC outlines a vision of the future ADF as a balanced, networked and integrated force engaging in ISR-enabled Multidimensional Manoeuvre (MDM) to fulfil the military contribution to a National Effects-Based Approach (NEBA) to Australian security. To realise this vision the ADF is making substantial investments into the development of its technical capability; including a multi-billion dollar investment aimed at enhancing its ISR capability.[2] This investment will provide a significant improvement in the effectiveness of ADF airborne ISR. However, there is also an organisational and cultural dimension to the evolution of the ADF into the future force that must also be addressed if the ADF is to capitalise fully on the promised potential of its future technical capability. As the ADF continues to evolve technically, organisationally and culturally into the future force, it must do so with a clear vision of the force it wishes to become. In guiding the ADF's evolution, the broad strategic vision laid out in the FJOC is supported by the more detailed capability and domain-specific insights into the nature and requirements of the future force. These detailed insights provide the lens through which capability development efforts (technical, organisational and cultural) can be focused to ensure the capability they deliver meets the needs of the future force. In terms of the development of the ADF's airborne ISR, the understanding of the required role and nature of airborne ISR in the future force that is necessary to direct future development efforts can be derived from analysis of the ADF's strategy and capability development documents. The appreciation of the requirements placed on the ADF's airborne ISR capability by the future force is the second component of the future airborne ISR concept proposed in this paper, and is the focus of this chapter.

AIRBORNE ISR CAPABILITY DEVELOPMENT PATH

The future airborne ISR concept proposed in this paper is shaped in part by the insight into the technical aspects of the ADF's future airborne ISR capability that is provided by its capability development documents. The multi-billion dollar investment in Defence ISR outlined in the 2006–2016 *Defence Capability Plan* (DCP) will deliver a major increase in the ADF's technical ISR capability across all domains and in all functions of the ISR process. The nature of these investments is in part shaped by the Defence capability roadmaps (ISR, NCW and UAS) which provide the strategic guidance used by capability planners to balance the DCP to ensure it reflects the broad vision for the

[2] Office of ISR Coordination, *Defence ISR Roadmap – 2007–2017*, classified edition, Department of Defence, Canberra, 2007.

ADF's ISR and associated capabilities. This section provides a brief overview of the future capability development guidance contained in the *Defence ISR Roadmap* and the projects to be delivered by the DCP that are relevant to the development of a future airborne ISR concept for the ADF.

ISR Roadmap

The *Defence ISR Roadmap* outlines the ADF's future vision of ISR as a capability able to 'actively and continuously observe Defence areas of interest to the advantage of decision makers at all levels'.[3] To support the achievement of this vision, the *Defence ISR Roadmap* outlines the 'principles and attributes of how Defence ISR is to operate as a balanced, networked and deployable capability'.[4] These principles 'provide a framework for the development of [an] integrated ISR capability'[5], which will be:

- **Operationally focused.** The ADF's ISR capability must be directed towards providing the support needed to achieve operational success. Achieving this operational focus requires that ISR assets operate within a management and tasking framework that 'meets operational requirements' and be able to disseminate information to those who need it when it is needed, as well as being resilient in the face of diverse threats.[6]
- **Integrated.** 'Defence ISR must bridge organisational and technical boundaries to ensure integration between core capabilities to achieve optimal application of ISR resources.'[7] Although the *Defence ISR Roadmap* states that this integration is primarily at the information level, it also has an organisational dimension that will require substantial development in the areas of ISR asset management and tasking.
- **Interoperable.** The ADF's ability to achieve and maintain interoperability with its allies and multinational partners is important to fulfilling ISR's role in the future force.[8] This paper does not directly examine the integration of ADF airborne ISR in combined operations. However, the future concept that is proposed in this paper is based on the premise that any conceptual innovation to increase the effectiveness of ADF airborne ISR should also enhance its employment in multinational operations.

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[3] Office of ISR Coordination, *Defence ISR Roadmap – 2007–2017*, unclassified edition, Department of Defence, Canberra, 2007, p. 9.

[4] ibid.

[5] ibid., p. 5.

[6] Office of ISR Coordination, *Defence ISR Roadmap – 2007–2017*, classified edition, pp. 31–32.

[7] ibid., p. 32.

[8] ibid., p. 34.

These guiding principles must shape the development of the ADF's future airborne ISR capability.

Defence Capability Plan

The majority of the enhancements in the technical dimension of the ADF's airborne ISR capability are contained within the DCP. The DCP includes projects aimed at improving the ADF's capabilities in all functions of the ISR process. Collection capability will be improved through projects such as AIR 7000 (AP-3C replacement), JP 129 (airborne surveillance for land operations) and JP 2078 (hyper-spectral imaging). JP 2096 (surveillance enhancement) will provide distinct benefits in the processing of information from multiple surveillance sensors. However, the DCP projects aimed at improving the direction and dissemination functions are of most direct relevance to the development of the future airborne ISR concept. It is these projects that will enable the development of the high-capacity information network and the adaptive command and control systems which are vital to the integration of the ADF's airborne ISR capability at the information and tasking level.[9]

A number of projects currently underway as part of the DCP will contribute to the realisation of the high-capacity network that will form the information backbone of the networked future force. The projects outlined below are indicative of the ADF's efforts to create the networked environment that will become increasingly critical to the effectiveness of ADF airborne ISR.

- **DEF 7013 (Joint Intelligence Support System)**. This project seeks to network the databases and applications between intelligence-related organisations at all levels of command.[10]
- **JP 2064 (Geospatial Information Infrastructure and Services)**. Delivery of this project will enhance the access ADF commanders have to geospatial information to assist in the conduct and planning of operations.[11]
- **JP 2065 (Integrated Broadcast System)**. Delivery of this project will facilitate the management and dissemination of 'tactically significant information' that is produced by ADF and allied ISR efforts.[12]

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9 'Information level', refers to the ISR product. 'Tasking level' refers to the assets that are tasked to produce the ISR product.

10 Department of Defence, *Defence Capability Plan – 2006-2016: Public Version*, Defence Capability Group and Defence Materiel Organisation, Canberra, 2006, p. 50.

11 ibid., p. 72.

12 ibid., p. 74.

The delivery of these and other related projects will provide ADF commanders with unprecedented access to the information needed to improve their situational awareness. Information access alone will be insufficient to meet the needs of commanders in the future operating environment. The information that is available must also be relevant to the commander's decision-making needs. The utility of the information network created by these projects will therefore be judged by the ability of commanders to access the information that they need to develop their situational awareness and attain decision superiority. Information access will be complicated by the restrictions on the amount of information that can be stored and disseminated within the network due to limitations on storage capacity and bandwidth. These restrictions emphasise the need to implement robust information management procedures, as well as to ensure that the assets tasked with supplying the information to populate the network are employed in ways that ensure that the data/information they collect, process and disseminate throughout the network is relevant to the needs of the commander. The type, content, quality, timeliness and amount of information that is provided to the network by the ADF's airborne ISR assets will be based on the tasking allocated to the assets during the execution of the direction function of the ISR process. For this reason, the development of the information network should occur concurrently with the implementation of an adaptive and robust command and control system that supports the execution of the direction function.

The technical base for this adaptive and robust command and control system will be provided through the delivery of JP 2030 (ADF Joint Command Support Environment). JP 2030 is a long-running project that has a number of elements that are designed to support the integration of the various ADF command support systems. Two of the key elements provided through Phase 8 of this project are the Joint Operations Portal (JOP) and the Joint Planning Suite (JPS). The JOP will provide a collaborative computer-based environment that will allow commanders at all levels of the ADF to plan and coordinate operations effectively across the breadth of the force during high-tempo operations. The JPS augments the JOP and is a suite of planning tools that seek to improve the automation of ADF joint planning at all levels. Key among the tools envisaged by the JPS is one designed to assist in the conduct of the Joint Military Appreciation Process (JMAP). Through the provision of common planning tools that function in a collaborative environment, the command and control system envisaged in JP 2030 will provide the technical foundation for a flexible, integrated and responsive command and control concept that allows for the effective planning and execution of airborne ISR operations across the ADF.

These and other related projects in the DCP will provide the ADF with the technical foundation for the development of an integrated airborne ISR capability. In particular, JP 2030 will deliver to the ADF the ability to plan collaboratively and synchronise operations across the organisation, at all levels of command. This ability is necessary for the ADF to achieve the integration of airborne ISR at the tasking level. This integration will allow ISR planners to develop and implement airborne ISR tasking schedules that ensure ADF commanders receive the support they need, when they need it, and from the asset with the capabilities and characteristics that are best suited to provide it. This integration at the tasking level will be supported by an information network that will provide commanders with access to raw data when needed, as well as ready access to data subjected to higher level processing should that be required. However, the benefits that these capabilities present can only be realised if these technical advances occur in conjunction with the conceptual innovation needed to utilise them fully.

A key aspect of this conceptual innovation is an understanding of the future environments in which the ADF will be required to operate and the requirements that operations in these environments will place on ADF airborne ISR. This understanding can be gained through an analysis of the ADF's domain-specific future operating concepts; *The Future Air and Space Operating Concept* (FASOC)[13], the Future Land Operational Concept (FLOC)[14], and the *Future Maritime Operating Concept – 2025* (FMOC)[15]. Collectively these three concepts represent the ADF's perspective on the nature of future operations in the three principle domains.

AIRBORNE ISR IN THE FUTURE AIR DOMAIN

FASOC outlines how the Air Force intends to realise 'the potential of the planned 2006–2016 DCP force' in providing the air power contribution to the future seamless force.[16] It provides a conceptual link between ADF air power, capability development documents and the FJOC. This link can be used to develop an appreciation of how airborne ISR will contribute to the operations of the future force across all domains. Although it is written primarily from an Air Force perspective, the concepts contained within FASOC also apply to the air power capabilities operated by the other Services.

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[13] Royal Australian Air Force, Australian Air Publication 1000–F—*The Future Air and Space Operating Concept*, Air Power Development Centre, 2007 [AAP 1000–F—*The Future Air and Space Operating Concept*].

[14] FLOC is currently encapsulated into two separate publications: Australian Army, *Complex Warfighting*, Australian Army, Canberra, 2006; and Australian Army, *Adaptive Campaigning*, Australian Army, Canberra, 2006. The author obtained clearance from Army Headquarters to include information from these documents in the paper.

[15] Australian Defence Force, *Future Maritime Operating Concept – 2025: Maritime Force Projection and Control*, Unclassified Version, Defence Publishing Service, Canberra, 2006.

[16] AAP 1000–F—*The Future Air and Space Operating Concept*, p. 5.

FASOC identifies four key developments to be realised through the DCP that will change the nature of future ADF air power.[17] First is the development of the high-capacity network. Second is the acquisition of persistent ISR platforms fitted with high-fidelity sensors. The third refers to the 'implementation of integrated, adaptive command and control (C2) systems which will fully exploit the latent synergy within the network and the intelligence, surveillance and reconnaissance (ISR) regime'.[18] The final development provides capabilities designed to leverage off the benefits offered by the network and command and control systems. These four developments will enhance the ADF's airborne ISR capability in terms of the assets themselves, as well as their ability to integrate effectively into ADF operations in all domains. The acquisition of highly-capable assets, such as the Multi-mission Unmanned Aerial Vehicle (MUAV) to be delivered under AIR 7000 and the Joint Strike Fighter, will provide a major boost in the ADF's ISR capabilities. However, it is the high-capacity network and the adaptive command and control systems delivered by the projects outlined above that are the focus of this paper. An examination of FASOC provides an appreciation of the impact that these projects will have on the ADF's future airborne ISR capability.

The vast amounts of data and information generated by ISR operations, which will provide commanders at all levels and in all domains with the information they need to operate effectively, will flow through the ADF's high-capacity network. In FASOC's vision of the future operating environment, this network represents a 'ubiquitous information domain' in which commanders and those involved in the ISR process engage in collaborative data and information transfer to ensure the resultant ISR product meets the content, quality and temporal needs of commanders in the joint force. This networked information domain will encompass all airborne ISR assets, from TUAS through to theatre level manned and unmanned ISR assets, allowing the information level integration of ISR operations conducted by all of the ADF's airborne ISR assets. Integration at this level will allow data, information and tasking orders to flow quickly and seamlessly across the network, thereby increasing the potential ISR support options available to commanders and ISR planners, as they will no longer be bound by the limited connectivity of the ADF's ISR assets. This increasing connectivity will allow operational and strategic level commanders to receive support from tactical level assets, and tactical commanders to receive greater support from operational and strategic level assets, including national strategic level agencies such as the Defence Signals Directorate (DSD) and the Defence Imagery and Geospatial Organisation (DIGO). Access to these high-end processing capabilities will enhance the ability of tactical units to process the information collected by organic airborne ISR assets

[17] ibid., pp. 20–21.

[18] ibid., p. 21.

should that be considered necessary in the circumstances. Operating effectively within this information domain will require a change in the ADF's ISR operating paradigm. Whereas previously data and information that was not pertinent to the immediate task may have been discarded, the proposed concept will exploit the potential that the same data may hold significance to others within the network. With an increase in the number of assets operating within the ubiquitous information domain, the requirement for effective information management procedures that cater for the needs of the various groups within the network similarly grows in importance.

Integration at the tasking level will be achieved through the development and implementation of an 'adaptive command and control (C2) system which will fully exploit the latent synergy within the network and the [ISR] regime'.[19] This command and control system, based on the tenet of 'centralised command and decentralised execution', will allow for the 'effective and efficient use of finite air power resources' as well as providing the responsiveness needed to deal with the challenges faced in the conduct of air operations against a 'dynamic adversary'.[20] This responsiveness will be made possible by the development of the information network which will facilitate access to real-time information flows between commanders at all levels, airborne ISR planners and those involved in the conduct of the ISR process. This connectivity will enable the exploitation of the characteristics of ADF air power by facilitating the responsive tasking of airborne ISR assets suited to the needs of ADF commanders, allowing changes in the operating environment to be identified and acted upon within a compressed time frame.

AIRBORNE ISR IN THE FUTURE LAND DOMAIN

Complex Warfighting and its companion publication, *Adaptive Campaigning*, together represent the ADF's view of what the requirements will be for operations conducted in the future land domain.[21] These documents envisage future land operations being conducted predominantly in complex terrain against adaptive adversaries who engage in asymmetric warfare and operate below the ability of ADF land forces to discriminate them from their surrounds. Although not discounting the possibility of conventional conflict, *Complex Warfighting* argues that US hegemony means 'conventional war has ceased to be the primary area for military confrontation'.[22] One of the changes that results from this shift in the strategic environment is that future land force must

[19] ibid.

[20] ibid., pp. 28–29.

[21] Australian Army, *Complex Warfighting*; and Australian Army, *Adaptive Campaigning*.

[22] Australian Army, *Complex Warfighting*, p. 3.

focus as much on securing the peace and returning the environment to 'normality', as it does on winning the land battle.[23] ADF operations in Iraq, Afghanistan and East Timor are modern examples of this 'single comprehensive concept' of the land force's role in the modern and future battlespace. Providing the means through which to achieve both of these outcomes in a complex environment is the focus of the adaptive campaigning approach to land force operations which 'comprises five interdependent and mutually reinforcing lines of operation'; joint land combat, population protection, public information, population support and indigenous capacity building.[24] Although *Adaptive Campaigning* only references ISR in relation to the 'joint land campaign', the need to ensure effective, timely and accurate decision-making permeates all five lines of operation. Therefore, to meet the needs of future land commanders, the ADF's airborne ISR capability must be able to support all lines of operations in complex terrain.

Operations below the detection and discrimination thresholds

A key feature of Army's vision of future land operations, with particular relevance to the ADF's ISR capabilities, is the increasing likelihood that potential adversaries will operate below the *detection* and *discrimination thresholds*, depicted in Figure 3–1.[25] These thresholds refer to the level at which an adversary's activity enables their detection by the force, the detection threshold, and the ability of the force to discriminate a potential adversary from the complex terrain, the discrimination threshold.[26] The level of each threshold will be governed by the nature of the operating environment, as well as reflecting the total ISR capabilities of the force in question.[27] As the nature of the environment in which a force is operating is largely beyond its control, the major focus on reducing these thresholds must be on improving the force's ISR capability.

[23] Australian Army, *Adaptive Campaigning*, p. 4.

[24] ibid.

[25] *Complex Warfighting* uses the term 'ISTAR threshold' in preference to 'detection threshold'. The inclusion of the terms 'detection threshold' and 'discrimination threshold' to represent Army's future concept is in accordance with guidance received from Lieutenant Colonel Chris Mills and Lieutenant Colonel Patrick Sowry of the Army's Directorate of Combat Development. This guidance was based on the concepts contained in the updated Future Land Operational Concept intended for release mid-2009.

[26] As the *discrimination threshold* also has an 'action' dimension, the level at which this threshold is set will also vary with the ability of the force to create precision effects. This, however, is an issue of targeting and is therefore acknowledged, but not analysed, in this ISR paper.

[27] 'Total' refers to the combination of land, maritime and air-based ISR capabilities that can be brought to bear by the force.

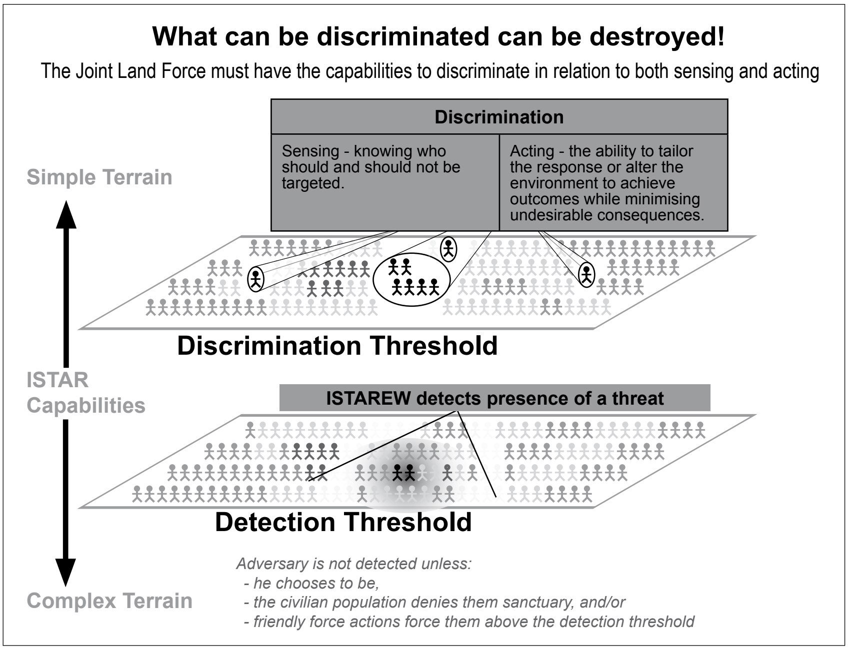

Figure 3–1: Detection and discrimination thresholds

The ADF is making a concerted effort to boost the ISR capability of smaller land units in order to improve their ability to detect and discriminate adversaries in the complex future land operating environment. Efforts to develop organic airborne ISR capabilities, such as tier II (Scan Eagle) and tier III (JP 129) UAS, are aimed at providing a 'devolved capacity for unit and small-team ISR'[28] thereby lowering the individual detection and discrimination thresholds of smaller force elements. However, the limits inherent in a resource-focused solution for smaller forces such as the ADF mean that, although additional resources may ameliorate the issue to some degree, they do not resolve it. The inadequacy of a resource-based approach is reinforced by the growing disaggregation of the battlespace and the resultant increase in the use of large numbers of small-teams,[29] as the expansion in the number of small-teams will make the provision of highly-capable organic airborne ISR support to all units cost prohibitive.[30] Similarly, the growing use of a larger number of smaller combined arms teams will make it unfeasible for non-organic ISR assets to support all teams involved in the execution of land operations. The

28 Australian Army, *Adaptive Campaigning*, p. 26.

29 Australian Army, *Complex Warfighting*.

30 While it may be possible for the provision of tier I UAS at lower levels, at present these assets are limited in terms of capability. The capability gap between what is provided by tier I and that which is provided by tier II is substantial.

paucity of operational level airborne ISR assets in the ADF will necessitate that their employment be focused on providing support where it will have the greatest potential impact; either where the success of an operation is critical to the campaign outcome, or where there is a high probability that the employment of the asset will make an appreciable difference to the outcome of an operation. The rationale behind this attitude towards the close management of operational level airborne ISR assets was summed up succinctly by the former Chief of Staff of the United States Air Force (USAF), General John Jumper, who stated:

> I have so few ISR assets that I can't afford to look where the target can't be. I've got [to] understand the battlefield and put those 'soda straws' of those ISR assets that I have in a place where there is a high probability there is going to be a target. I can't just go out and gander over the countryside hoping somebody drives through my soda straw so I can go kill it.[31]

Resource limitations, the complexity of the operating environment and the increasing adaptability of the ADF's adversaries together mean that, despite increases in the number of assets and advances in ISR capability, land forces must be prepared to conduct operations against adversaries operating 'below the ... [detection and discrimination] threshold'.[32] The need to conduct operations in these sub-threshold environments has given rise to the Act-Sense-Decide-Adapt (ASDA) cycle, based on the need, in certain circumstances, for the force to stimulate a potential adversary into action which will raise the adversary's operational profile above the force's detection and discrimination thresholds.[33] The practical application of this concept is achieved through adaptive action.

If an adversary is operating below the force's ability to detect them, the force can act to stimulate a response from the adversary that will raise their operational profile to a level that will allow their detection. With the adversary operating within the force's detection capabilities, ISR efforts can be focused on discriminating the adversary from the complex terrain. Discriminating the adversary enables the development and execution of a course of action that will allow the force to achieve their objective while minimising the amount and degree of any unintended impact on the environment surrounding the adversary. For this approach to be successful the force must be able to execute its course

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31 As quoted in Lieutenant General Joseph E. Hurd, 'Network Centric Warfare and Air Power', in Keith Brent (ed.), *Network Centric Warfare and the Future of Air Power: The Proceedings of a Conference held in Canberra by the Royal Australian Air Force – 16–17 September 2004*, Air Power Development Centre, Canberra, p. 32.

32 Australian Army, *Complex Warfighting*, p. 6.

33 Australian Army, *Adaptive Campaigning*, p. 8.

of action during the period that the adversary is operating within their detection and discrimination capabilities. Operational success therefore rests on the ability of the land force to act rapidly and decisively or, alternatively, to prolong the duration of contact with the adversary. Rapid and decisive action may not always be an option; accordingly, the future land force must possess the ability to maintain contact with their adversary for a period of the force's choosing. Contact with the adversary can be prolonged through continued 'prodding' by the force to ensure the adversary continues to operate within the detection and discrimination capabilities of the force. However, this may not always be possible, particularly when the force is engaged in operations against innovative and adaptive adversaries, whose defining characteristic will be the ability to adapt their operations, once detected, to avoid further contact and fade back into the complex terrain, dropping below the force's thresholds. An alternative option is to lower the force's detection and discrimination thresholds, thereby reducing an adversary's ability to retreat back into the complex terrain once they are detected. One means of lowering the land force's thresholds is through the provision of additional, non-organic, ISR support. The impact of additional non-organic ISR support is illustrated in Figure 3–2. The provision of additional support must occur rapidly when a requirement is identified if it is to be effective. The ability of the ADF to provide this responsive ISR support to allow the land force to maintain sufficient contact with and discrimination of an adversary will directly influence the outcome of an operation. The responsiveness of airborne assets makes them ideally suited to provide the rapid support required under the adaptive action construct. Accordingly, airborne ISR capability must be designed to allow full exploitation of the responsiveness of its component assets.

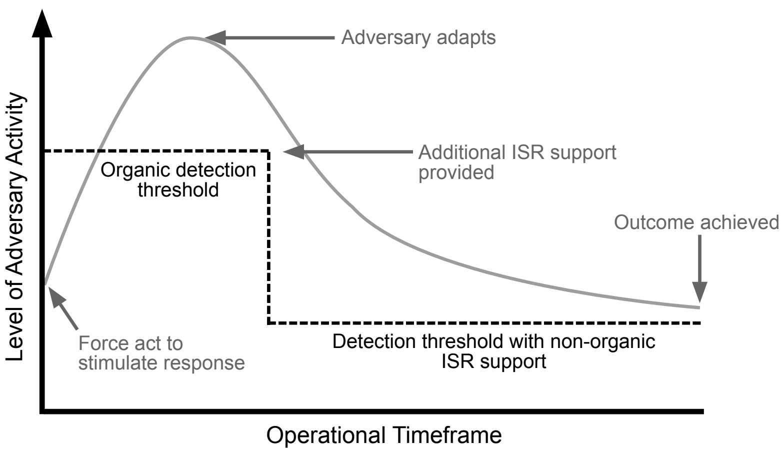

Figure 3–2: ISR support to adaptive action

The development of the discrimination threshold concept has highlighted another consideration in the employment of airborne ISR in the future land domain; the inability in certain circumstances for airborne platforms to provide the level of discrimination needed to engage an adversary decisively in complex terrain. In some instances the actions of an adversary may facilitate their discrimination solely through the employment of an airborne ISR platform. This was exemplified by the movement and launching of Hezbollah rockets during the Israel-Lebanon conflict in 2006, such as the examples pictured in Figure 3–3. However, current operations continue to highlight the difficulty in using airborne assets to discriminate an adversary from neutrals and friendly forces, which may preclude the reliance on airborne assets alone to reduce the discrimination threshold sufficiently to allow an adversary to be engaged decisively. Operations in the future land domain will continue to require that the airborne ISR support provided to land commanders in complex environments be integrated closely with the support provided by other ISR systems to ensure that the force can achieve the discrimination necessary to enable operational success.

Figure 3–3: Aerial photographs of a 23 mm anti-aircraft cannon next to a residential house in southern Lebanon[34]

Operational uncertainty

Operations in a complex land environment also call for a degree of persistence in the support provided by the ADF's airborne ISR capability. This need is based on the *operational uncertainty* created by the unpredictability in the actions of the adaptable adversaries likely to be encountered in the future land domain. By sheltering in complex terrain, potential adversaries are able to initiate actions at the time and place of their

[34] Extracted from Reuven Erlich, 'Hezbollah's use of Lebanese civilian as human shields: The extensive military infrastructure positioned and hidden in populated areas. From within the Lebanese towns and villages deliberate rocket attacks were directed against civilian targets in Israel', Intelligence and Terrorism Information Center at the Center for Special Studies, Gelilot, 2006, p. 42.

choosing, decreasing the force's ability to predict, with any degree of certainty, the shape or flow of operations that will be conducted against an adaptable adversary in complex terrain. This operational uncertainty creates a need for commanders in the future land domain to have ready and rapid access to ISR support to enable their force to respond quickly and decisively to unanticipated upsurges in adversary activity. This unpredictability requires that airborne ISR planners create a degree of ISR persistence across the area of operations for the duration of the operation. Achieving such persistence in this context does not necessarily equate to continual direct support to the land force in question, rather it requires that airborne ISR support be available to respond on an as-required basis. The ADF's future airborne ISR capability must be able to provide support to the land force not just on-time and on-target but also 'on-occurrence'.[35]

The centrepiece of the ADF's future vision of operations in the future land environment is the adaptive campaigning concept, which is enabled by adaptive action. Adaptive action enables the force to be able to seize on transitory events to realise its tactical goal. By utilising adaptive action, the future land force will be better able to operate against an adaptable adversary in complex terrain. It follows that airborne ISR in the future force must be able to capitalise on any opportunity to sense potential adversaries operating above the detection threshold, and discriminate them from the background of complex terrain. An airborne ISR capability that is able to achieve this will increase the likelihood of the land force realising its desired outcome in an engagement, whether kinetic or non-kinetic, in the shortest possible time frame and at the lowest possible risk to the force. The ADF's airborne capability must therefore be designed and developed both technically and organisationally to enable responsive and on-occurrence support to commanders conducting operations in complex and dynamic operating environments against adaptable adversaries.

AIRBORNE ISR IN THE FUTURE MARITIME DOMAIN

The ADF's perspective on future force operations in the maritime domain and the requirements they create is described in the FMOC. FMOC states that the ADF's future maritime force must be able to 'project force and gain local sea control from homeport, across open ocean SLOCs, through choke points and across the littoral' in operating environments 'characterised by multi-faceted, symmetric and asymmetric threats'.[36]

[35] Lieutenant Colonel Jason Thomas, 'Reach and Precision: Not the Real Revolution for Air Power, at Least Not Yet' in *Australian Army Journal*, vol. iv, no. 1, Autumn 2007, Land Warfare Studies Centre, Canberra, 2007, p. 43.

[36] Australian Defence Force, *Future Maritime Operating Concept – 2025*, p. 14. The author obtained clearance from Navy Headquarters to include information from FMOC in the paper.

Australia's maritime power projection requirements extend beyond securing Australia's maritime jurisdictional areas and its vital sea lines of communication (SLOC) to include the protection of Australian interests farther afield, as illustrated through the ADF's naval involvement in operations in East Timor and the Pacific, and the reconstruction of Iraq. Key to the ADF achieving its maritime force projection requirements in these diverse roles across the vast expanse of the world's oceans and waterways is the situational awareness that enables the effective and efficient application of maritime power and the protection of the maritime forces projecting it. Airborne ISR will play a vital role in providing this awareness to the future maritime force.

Over 70 per cent of the Earth's surface is covered by sea, making maritime power projection a potentially potent instrument of national policy.[37] However, the speed limitations of maritime units (both surface and subsurface), relative to aviation assets, limit their ability to deploy rapidly in order to apply this power. This limitation means that 'the response time of maritime forces will be measured in days or even weeks'.[38] The deployment of naval forces must therefore be executed with sufficient precision to ensure maritime power is applied where it is required in a time frame that allows the application of that power to achieve its desired outcome. The ability of maritime commanders to develop sufficient situational awareness to allow them to employ their unit to maximum effect in the shortest possible time frame is constrained by the sensor limitations inherent in surface and subsurface-based units. Technological advances, such as increasingly capable unmanned underwater vehicles (UUV), will extend a tactical commander's visibility of the operating environment and allow the enhancement of their situational awareness. However, the characteristics and capabilities embodied in the airborne assets at the disposal of the maritime commander, both organic and non-organic, means that airborne ISR will play a vital role in extending their visibility of the operating environment over the horizon. This extended visibility will allow the future maritime force 'to detect, identify and neutralise threats more comprehensively, and thus establish a more thorough and effective level of sea control where required'.[39] Integrating organic and non-organic airborne ISR assets in support of maritime operations will therefore play an important role in enabling the precision projection of the ADF's maritime power.

Protection of the ADF's maritime forces during their employment is critical not only to the success of the immediate operation, but also to the continued viability of Australia's

[37] Royal Australian Navy, RAN Doctrine 1—*Australian Maritime Doctrine*, Defence Publishing Service, Canberra, 2000.

[38] ibid., p. 52.

[39] Lieutenant Robert Hosick, RAN, *Royal Australian Navy Aerospace Capability 2020–2030*, Working Paper No. 16, Sea Power Centre Australia, Canberra, 2003, p. 40.

maritime power projection capability. The threats posed to Western maritime forces and interests include increasingly capable conventional forces as well as potential non-conventional adversaries who adapt their mode of operation to overcome the technical superiority of Western navies and engage in asymmetric attacks. Despite the relative infrequency of asymmetric attacks on maritime forces and interests,[40] when compared to the number conducted in the land domain, these attacks have the potential to have a disproportionately greater impact when they do occur. The attack on USS *Cole* (2000) and the French oil tanker *Limburg* (2002) by explosive-laden boats are striking examples of the effect small irregular maritime forces can have on Western maritime forces and interests. The operations of Combined Task Force 158 (CTF 158), of which Australia is a part, 'maintaining security in and around both the Al Basrah (ABOT) and Khawr Al Amaya Oil Terminals (KAAOT)' in the Northern Arabian Gulf,[41] through which three quarters of Iraq's Gross Domestic Product (GDP) is generated, reflect the seriousness with which Western governments take the threat posed by non-conventional maritime attacks.[42] Combating the threat posed to maritime forces and interests by the asymmetric use of maritime power will require persistent ISR coverage of an area of interest in order to increase the likelihood of identifying an attack in sufficient time to allow for an effective response to be executed. The responsiveness of airborne ISR assets organic to maritime units makes them inherently suited to fill this role. However, the limitations on the number of airborne assets that can be operated from maritime units means that the needs of future maritime commanders are unlikely to be satisfied solely by the employment of organic resources. Accordingly, maritime commanders of the future force will continue to require an integrated airborne ISR capability to facilitate effective force protection.

Airborne ISR must be able to provide the future maritime force with the information support needed to achieve effective force projection and force protection. From a maritime force perspective, the key to realising this is by ensuring 'persistent, forward

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[40] Captain James Pelkofski, USN, 'Before the Storm: Al Qaeda's Coming Maritime Campaign', in *Proceedings*, vol. 131, no. 12, December 2005, US Naval Institute, Annapolis, MD, 2005, pp. 20–24. In this article Captain Pelkofski categorises only two out of the 651 terrorist attacks documented by the National Counterterrorism Center in 2004 as examples of maritime terrorism.

[41] Commander United States Naval Forces Central Command, 'Combined Task Force 158', United States Navy, Washington, DC, 2008: http://www.cusnc.navy.mil/command/ctf158.html, accessed 22 September 2008.

[42] A major threat posed to these terminals is the use of bomb-laden boats to attack the terminals. On 24 April 2004, an attempted attack by a bomb-laden dhow failed after it was detonated as a US boarding party approached the vessel, killing two US Navy sailors and a US Coast Guardsman. Pelkofski, 'Before the Storm: Al Qaeda's Coming Maritime Campaign', pp. 20–24; and United States Fifth Fleet Public Affairs, 'Coalition Maritime Forces Revise Iraqi Oil Terminal Protection Procedures', United States Fifth Fleet, Bahrain, 6 May 2004: http://www.navy.mil/search/display.asp?story_id=13177, accessed 25 September 2008.

ISR ahead and in-stride with the force to maximise warning times'.[43] Persistent ISR is particularly important when the maritime force is facing the asymmetric threats posed by high-speed manned and unmanned boats, increasingly capable submarine threats and conventional anti-shipping threats. Such threats have compressed the time frame between when a potential threat is detected and when its impact is felt by the force. The characteristics and capabilities of airborne ISR assets, whether organic or otherwise, make them ideally suited to overcome the speed and sensor limitations inherent in maritime-based units. However, achieving persistence in the provision of airborne ISR support places a significant strain on the resources of a smaller force, such as the ADF. Scarce airborne ISR resources must be managed through a carefully designed process that ensures the support provided by organic and non-organic assets is integrated and optimised to meet the needs of the maritime component of a joint force. For future ADF airborne ISR to meet the needs of commanders in the future maritime force, it must provide persistent ISR support in order to facilitate the application of maritime power, as well as to protect the units involved.

AIRBORNE ISR AND THE FUTURE FORCE

Although the exact details of Australia's future strategic environment remain uncertain, it is clear from the ADF's future operating concepts that the environments in which the ADF will be called upon to operate will remain invariably dynamic and will be characterised by complexity, adversary adaptivity and asymmetry. Achieving operational success in such environments requires an ADF airborne ISR capability that is flexible, adaptable and responsive enough to meet the needs of commanders across all domains in a variety of scenarios. The ADF's airborne ISR assets will provide ADF commanders, across all domains and levels of command, with the ability to 'build and sustain sufficient knowledge … to identify required actions and … assess the effects of [these] actions', a key aspect of the ADF's manoeuvrist approach to operations.[44] This approach requires the ADF to ensure that its airborne ISR capability, among others, is designed and developed to meet the needs of commanders across the full range of operations and in a variety of increasingly complex and dangerous environments. How successful the ADF is in developing this capability will depend on its organisational and cultural evolution into the force envisioned in the Chief of the Defence Force's (CDF) future force.

The three attributes of this future force that will have the greatest influence on the shaping of ISR in the ADF are that it will be networked, integrated and balanced. These

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[43] Australian Defence Force, *Future Maritime Operating Concept – 2025*, p. 17. The author obtained clearance from Navy Headquarters to include information from FMOC in the paper.

[44] ADDP–D.3—*Joint Operations for the 21st Century*, p. 22.

three closely related attributes together highlight the need to ensure the integration of the ADF's airborne ISR capability.

- **Networked** refers to the linking of information flows between various elements of the force through the use of procedures, technology and the protocols that direct the employment of that technology.
- **Integrated** means that the ADF will have moved past 'joint' towards operating as a largely seamless force. Even when operating jointly, organisational, technological and cultural seams continue to exist between the Services. These seams not only limit the effectiveness of the force but also create vulnerabilities that can be exploited by an astute adversary. Seamlessness refers to the ability to combine the professional mastery of the individual operating environments maintained by the Services into a synergistic whole that functions within a common organisational and operational ethos and where technological barriers have been removed. This degree of integration will ameliorate the seams that currently exist between the Services.
- It is through achieving this level of integration that the ADF will be able to realise a **balanced** force. Balance, in this context, does not refer to a force that has 'a bit of everything'. For the ADF, balance must be viewed in terms of the ability to bring together focused capabilities, capitalising on the flexibility of our forces, to allow the ADF to adapt to meet new challenges in innovative ways. Achieving this balance would not be possible without seamless integration in a networked force.

These three attributes will be crucial to the ADF meeting the responsiveness and persistence needs of future commanders, as well as ensuring the quality and timeliness of the ISR product that is created.

Developing an operationally focused, balanced and seamless airborne ISR capability, which capitalises on the technical capability that will be delivered through the DCP, will require innovation in the development, management and employment of ADF airborne ISR. To manage effectively the organisational, cultural and technical seams that exist within its airborne ISR capability, the ADF must develop innovative organisational arrangements, many of which will challenge current ISR management practices. Such innovative practices, based upon the ubiquity of the information domain, and the responsiveness and adaptability of future command and control systems, will ensure that ADF commanders receive the support they require from airborne ISR assets that are best able to provide it, irrespective of the Service or level of command which nominally controls the asset. These airborne ISR management practices will invariably require a degree of centralisation of the ADF's airborne ISR capability.

Centralised coordination of airborne ISR in the future force

Centralisation in this context refers to the coordination of asset employment, not the control over the assets themselves. Although coordination is not a defined doctrinal term in the ADF, its natural language meaning, 'to combine in harmonious … action',[45] is adequate to convey the intent of centralised coordination. Harmonising and synchronising the employment of its organisationally and geographically dispersed assets will result in the ADF's airborne ISR capability becoming a single coherent capability comprised of diverse assets mutually reinforcing in support of achieving a common overarching campaign aim. In the future force the synchronisation of the disparate assets involved in providing ISR support to the ADF's commanders will best be achieved through the centralised coordination of the direction function of the ISR process. The benefits of a centrally coordinated process for the tasking of airborne ISR assets were identified during a November 2008 meeting of an Air and Space Interoperability Council (ASIC)[46] project group investigating the integration of UAS into the coalition battlespace.[47] This indicates recognition among Australia's allies that centralised coordination represents a viable option for the effective management of airborne ISR assets in future forces and coalition operations.

This view of airborne ISR in the future ADF envisions the establishment of a central airborne ISR coordinating authority responsible for the coordinated employment of the airborne ISR assets assigned in support of a campaign in the realisation of a strategic end-state. Nominally positioned at the operational level of command as part of a joint headquarters, the central coordinating authority's primary focus will be ensuring that the airborne ISR resources available to the joint force commander, including tactical assets, are fully utilised where possible and that tasking arrangements represent the best match between assets' capabilities and characteristics, and the requirements of the task. This is a role similar to that currently performed by the ISR Division (ISRD) within the Air and Space Operations Centre (AOC). These tasking arrangements will be contained within an Airborne ISR Tasking Plan which is developed by the central coordinating authority. The Tasking Plan represents the sequenced, deconflicted and resourced tasking schedule that coordinates the employment of the ADF's integrated airborne ISR capability in support of a campaign. An important feature of the plan is the inclusion of tactical level organic assets and the non-aviation assets involved in the processing and dissemination of ISR information into the tasking schedule.

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45 *The Macquarie Concise Dictionary*, Third Edition, Macquarie Library, Sydney, 1998, p. 245.

46 ASIC is a council comprising representatives of Australian, New Zealand, Canadian, UK and US militaries with the principal objective of promoting interoperability between the respective Services.

47 Air and Space Interoperability Council, 'Integration of Uninhabited Aerial Systems into Coalition Battlespace', unpublished Advisory Publication from meeting of C208A Project Group, Sydney, 3–7 November 2008.

Coordinating tactical level airborne ISR assets

As tactical airborne ISR assets will, for the foreseeable future, continue to be designed and acquired with a focus on meeting tactical unit requirements, they are best suited to being employed primarily at that level. In the future force, tactical commanders will therefore continue to direct the employment of airborne ISR assets organic to their unit. Although the tasking of these assets will remain largely at the tactical level, their incorporation into the ubiquitous information domain will mean they increasingly have the capability to provide valuable support beyond their controlling unit. Accordingly, the seamless integration of tactical level ISR into a campaign will greatly improve the quantity and diversity of ISR support available to the future force as a whole. Effectively integrating an organic ISR asset into a whole-of-force capability requires awareness throughout the force of the ISR support requirements of tactical commanders, as well as the planned employment of their organic assets. This awareness will allow the central coordinating authority to determine if there is any latent capability that can be employed to satisfy ISR support requests generated by other commanders, as well as identifying any incidental tasking that can be conducted by the organic asset. Integrating the conduct of tactical level ISR into a whole-of-force airborne ISR campaign in this way will increase the potential positive impact made by tactical level assets and decrease the likelihood of unintentional task duplication, while ensuring that tactical commanders continue to receive the airborne ISR support they require.

In addition to managing the employment of latent tactical ISR capability, the central coordinating authority will also be able to adjust tactical level asset tasking to ensure that assets are employed when and where they will have the greatest impact. The potential operational utility of an airborne ISR asset is more than a question of the capabilities of the collection sensor or the processing expertise of the analysts, though these are important attributes. Correct asset selection is also influenced by the operational context within which the request for ISR support was generated and in which the support will be provided. A commander's requirements for stealth, manoeuvrability in confined operating areas or long endurance will influence the selection of the most appropriate asset, as will concern over the impact of the potential loss of an asset operating in a high-threat environment. The ability to adjust the tasks of all airborne ISR assets assigned to a campaign, at whatever level, will enable the central coordinating authority to match the capabilities and characteristics of assigned assets to the requirements for ISR support identified by the force's commanders at all levels. The inherent flexibility of airborne ISR assets operating within a fully networked force means that the shifting of ISR support between commanders will be technically achievable. However, tasking organic assets in support of a different commander presents organisational and operational challenges.

Situations may arise when a *paramount operational requirement* is assessed to outweigh the identified needs of a tactical commander employing an organic airborne ISR asset.

In such circumstances the central coordinating authority may adjust the tasking of tactical assets to meet the needs of the paramount requirement. This tasking adjustment may result in a tactical commander temporarily losing the support of their organic ISR asset. Such adjustments of ISR asset tasking have the potential to impact operations negatively at the tactical level, where commanders plan based on an assumption of available support from their organic ISR assets. This potential reduction in effectiveness of tactical operations may occur either as the result of an actual loss of capability, or as a result of the impact that the potential for a loss of support has on a commander's ability to plan operations. However, when airborne ISR assets are being directed by a central coordinating authority with visibility of and authority over the range of airborne ISR assets available to the force, such tasking adjustments need not equate to loss of ISR support. In situations where tasking adjustments occur in response to specific requirements of an alternate higher priority task which calls for the particular characteristics and capabilities of a tactical asset, the loss of a tactical commander's organic support may be offset by the provision of alternative support arrangements, such as from operational level assets. When this is not possible, the decision to remove organic ISR support from the tactical level commander will only occur within clearly established guidelines and in circumstances objectively considered to be of vital importance to the campaign. Determining what is and what is not considered to be a paramount operational requirement will always remain situation dependant and rest on the professional mastery of the commanders responsible both for the planning of the campaign and the allocation of ISR support. The tasking of tactical assets to provide support outside of their organic controlling unit is a contentious issue that requires considered deliberation, and wide-ranging and in-depth consultation to establish the exact guidelines in which it will occur. Although it describes a planning methodology that will allow tactical assets to be effectively employed as an integral component of a whole-of-force capability, this paper does not aim to resolve this issue definitively. Rather, it highlights that the effectiveness of airborne ISR in the future force rests on the development of command and control arrangements and tasking mechanisms which enable the support provided by airborne ISR assets controlled at all levels to extend beyond their immediate controlling units.

Coordinating processing and dissemination assets

The direction of the future force's integrated airborne ISR capability will not be limited to the collection assets responsible for the gathering of data. Airborne ISR planning will extend to cover the coordination of the processing and dissemination assets that are central to the networked force's ability to produce and distribute actionable information. For this reason, the central coordinating authority will also be responsible for the tasking of the processing capability, and the dissemination pathways and infrastructure that are available to the force to support ISR operations. This tasking process will work in much the same way as the tasking of aviation assets with two notable distinctions.

Firstly, most airborne collection platforms will have an integral processing capability that will be employed automatically with the asset, including the crew (airborne and ground-based) that operate with the asset and processing that occurs within the sensor assembly. This integral processing capability may be sufficient to satisfy the requirements of a commander's support request. However, when additional processing is required it can be provided through the use of reach-back organisations, such as intelligence support units,[48] DIGO and DSD, which provide additional processing capacity as well as a more specialised capability. The increase in collection capability that the DCP is intended to deliver, and the corresponding growth in the quantity of collected data, will mean that in the future the use of these reach-back organisations will no longer be an optional consideration, but rather a necessity that will be critical to the effectiveness of the ADF's ISR capability. However, like collection assets, these processing assets are finite resources that require careful management in order to ensure that the support they provide is employed where and when it is most needed by the campaign. The apportionment of processing support must be integrated with the centralised coordination of collection assets to ensure the optimal blend of collection and processing capability is provided to satisfy commanders' ISR support requirements. This integration is best achieved through the use of the same central coordinating authority that assigns the collection assets to the ISR support requests.

The second distinction concerns the management and employment of the dissemination infrastructure and pathways that allow the transmission of information between ISR assets and the commanders they support. The ADF's network infrastructure and information transfer pathways are the backbone of the seamless future force. Their employment in support of ISR operations must therefore be balanced against the force's wider operational needs. The finite nature of dissemination capability and its criticality to effective networked operations across all levels of a joint force means that its management will likely be centralised at a high level. Accordingly, part of role of the central airborne ISR coordination authority will be to liaise, either directly or through the joint force commander, with a network controlling authority to ensure that there is sufficient dissemination capability available for tasking during the ISR process. The resulting allocation of dissemination capability will then be apportioned as required to enable the interaction of ISR assets and supported commanders in the conduct of the campaign.

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[48] Single Service intelligence support units, such as 87 Squadron (RAAF), provide a valuable ground-based processing capability that is able to provide real-time and post-mission analysis in support of ADF operations.

FUTURE AIRBORNE ISR CONCEPT

The characteristics of airborne ISR assets means they are inherently able to provide the persistence and responsiveness that will be demanded by operations in the future operating environment. As enhancements in ADF capabilities across all functions of the ISR process are delivered through the DCP the potential for airborne ISR to provide an effective contribution to ADF operations will correspondingly increase. However, the growing complexity of the operating environments, increased adaptability of potential adversaries and the expected continuation of the ADF's current high operational tempo will mean that the demand for the ADF's highly capable assets will likely outstrip the amount of support that they are able to provide. Enabling the ADF's future airborne ISR capability to fulfil the requirement to provide high quality, responsive, on-occurrence and persistent support to ADF commanders at all levels and across all domains will therefore necessitate conceptual, organisational and cultural innovation in the way airborne ISR operations are planned and managed. A crucial part of the solution to this challenge is the central coordination of the direction of airborne ISR assets at the operational level. Centralisation of airborne ISR in this way will enable the management of the technical, organisational and cultural seams that will invariably persist despite the ADF's evolution into the networked and integrated future force envisaged in FJOC.

Chapter 4: An Airborne ISR Planning Methodology for the Future Force

The benefits of having an integrated joint force are numerous, and will critically include improved intelligence, surveillance and reconnaissance data. It will result in enhanced, integrated command and control structures that enable the forces to be employed in a more coherent and effective manner.

ADDP–D.3—*Joint Operations in for the 21st Century*

Key points:

- Centralised coordination of airborne ISR in the ADF must be based on an airborne ISR planning process that effectively prioritises competing tasks generated throughout the force, ensures that this prioritisation reflects the requirements of the campaign, and is responsive to changes in operating environment.
- Basing this process upon current operation planning processes ensures the close alignment of ISR planning with other operational activities, and reduces any additional ISR planning burden on commanders.
- Capturing the ISR outputs of the operation planning process in a relational hierarchy allows ISR planners to appreciate the relationship between the ISR support requirements of organisationally and/or geographically dispersed commanders and the strategic directive that establishes the ultimate aim of a campaign.
- The use of utility values to reflect a commander's assessment of the relative contribution of outcomes and activities to the achievement of a superior commander's objective will enhance the ability of ISR planners to assign priority and apportion weight of effort in line with the needs of a campaign.
- The development of a relational hierarchy augmented by utility values will provide the backbone of an airborne ISR planning process that will allow the ADF to meet the needs of the future force.

The ability of a centrally coordinated airborne ISR capability to meet the requirements of the future force is dependent upon the planning process on which the execution of the direction function is based. The development of a process that enables these requirements to be met is therefore a vital component of the future airborne ISR concept. However, developing and describing a detailed process that will retain its validity in the face of the ADF's technical, organisational and cultural evolution into the future force is not possible in this paper as the process would be reliant on a number of factors that cannot be predicted with sufficient accuracy. It is possible, however, to outline a concept-based airborne ISR planning *methodology* that provides the basis from which a detailed process can be subsequently developed. This chapter describes such a methodology, drawing on current ADF planning concepts as well as research into improving ISR planning that was conducted by the RAND Corporation for the United States Air Force (USAF).[49] This planning methodology, which will guide the centralised coordination of the future force's airborne ISR capability, is the third, final and practical component of the future airborne ISR concept proposed in this paper.

The development of the proposed methodology is based on an assessment of the requirements that must be met by any future airborne ISR planning process. There are three main requirements that the future planning process must meet: it must ensure the integration of ISR support with conduct of individual operations as well as the campaigns these operations support; it must enable effective prioritisation of competing support requests generated across all domains and through all levels of command; and it must enable the provision of responsive support to commanders. In developing a methodology that matches these requirements two sides of the planning process must be addressed; the commander's planning that identifies the requirements for ISR support, and the central coordinating authority's planning that tasks the airborne ISR assets to satisfy these requirements. Although these can be viewed as independent processes, to meet the requirements of the future planning process it is necessary to regard them as sequentially executed parts of the single process. This approach to ISR planning forms the basis of the methodology proposed in this chapter.

Before commencing the description on the planning methodology two key terms used in that discussion must be defined. These definitions are not intended to replace current doctrinal terms. Instead, they aim to provide the precision and clarity in describing the methodology that cannot be achieved using existing terminology in the ADF lexicon.

- **ISR Support Request.** This term is used in preference to 'collection requirements' (CR) to refer to the information needs of the commander that ISR is required to satisfy. *ISR Support Request* highlights that the ISR tasking process must address more than the collection of data and must include

[49] Sherill Lingel, Carl Rhodes, Amado Cordova, Jeff Hagen, Joel Kvitky and Lance Menthe, *Methodology for Improving the Planning, Execution, and Assessment of Intelligence, Surveillance, and Reconnaissance Operations*, Technical Report 459, RAND Corporation, Santa Monica, CA, 2008: http://www.rand.org/pubs/technical_reports/TR459, accessed 18 November 2008.

all functions of the ISR process that are necessary to satisfy the needs of supported commanders. These requests must include specific detail on the information required (type, content and level of detail), the time frame within which it is required (including if it is persistent or transitory in nature), the operational considerations for the ISR task and the context within which the support is required. These details will enhance the ability of planners to provide the right type and amount of support to ensure that the data/information is available at the right time.

- **ISR Support Plan.** A collection of ISR Support Requests that are linked by their contribution to a commander's achievement of a specific objective is referred to as an *ISR Support Plan*.

INTEGRATING AIRBORNE ISR INTO OPERATIONS AND CAMPAIGNS

In order to ensure that the employment of scarce airborne ISR assets makes the greatest possible contribution to a commander's ability to achieve operational success, it is crucial that ISR planning be closely linked into the broader operation planning process. In this way ISR will be planned and employed as an integral component of operations, rather than as an add-on support capability, thereby improving the quality of the support that is provided to the commander. Integrating ISR planning into operations planning will require commanders to develop their ISR Support Requests based on the information needs, rather than on the perceived capabilities of the assets from which they wish to receive the support. This requirement may seem counterintuitive for commanders planning to employ their organic ISR assets; however, as all assets and commanders will be operating as part of an integrated capability, a commander cannot necessarily predict the exact asset which will provide the support they require. With an awareness of the detailed needs of the force's commander, including how the support request fits into a commander's intended course of action, the central airborne ISR authority will be able to create and task airborne ISR systems more effectively to meet the needs of the supported commander.

The integration of ISR and operations planning can be achieved by designing the ISR planning methodology around the capture and use of the ISR-related outputs generated during the conduct of the joint operation planning process. The joint operation planning process, depicted in Figure 4–1, is used by ADF commanders at all levels and all domains to develop a course of action that will enable the intent of a superior commander to be achieved. There are two main benefits to be gained from basing the airborne ISR planning methodology on the ADF's joint operations planning process. Firstly, it ensures the close alignment of the planning and management of airborne ISR with that of other operational activities, facilitating the integration of ISR into the conduct of operations. Secondly, basing ISR planning on current operation planning procedures reduces any additional burdens related to the development of ISR plans which may be placed on commanders. To realise these benefits the airborne ISR planning methodology is designed to capture the ISR-related outputs and use them to form the basis for the Airborne ISR Tasking Plan.

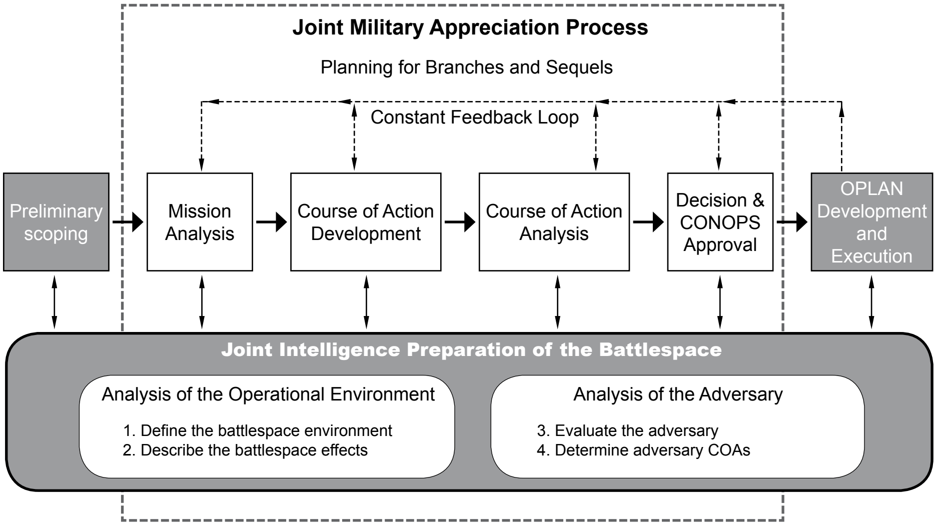

Figure 4–1: Joint operation planning process[50]

Joint operation planning process

The joint operation planning process can be divided into four distinct, but interrelated sub-processes. The two sub-processes of the joint operations planning process that are of most relevance to the generation of commanders' ISR support requirements are Joint Intelligence Preparation of the Battlespace (JIPB) and the Joint Military Appreciation Process (JMAP), as it is during the execution of these two sub-processes that the gaps in a commander's situational awareness are identified and the ISR Support Requests generated. These two sub-processes therefore provide the major inputs into the airborne ISR planning process.

- **Preliminary Scoping.** Although not directly contributing to the generation of an ISR Support Request, preliminary scoping plays an important role in

[50] Joint Operations Command, Australian Defence Force Publication 5.0.1—*Joint Military Appreciation Process*, Draft, Defence Publishing Service, 2008, p. 1–5. The author obtained clearance from the document sponsor to reproduce this image in the paper.

the proposed planning methodology. The aim of this stage of the process is to place the operations being planned by a commander within the context of tactical, operational and strategic objectives. Preliminary scoping therefore links operations planning conducted throughout the force into the broader campaign, creating linkages between tasks generated at lower levels of command and the higher level guidance that established the need for the operations. These linkages play a vital role in aligning the provision of ISR support with the conduct of the campaign.

- **JIPB.** JIPB is a four-stage process that lays the informational foundation for the development of a commander's plan of action. Through the analysis of the operational environment and the adversary, JIPB identifies the gaps in a commander's awareness of the operating environment that need to be filled in order to make more informed decisions during the planning stage of the operation. While some awareness gaps may be filled by currently available data, information and intelligence, those that are not will result in the generation of ISR Support Requests. Generally commencing prior to the JMAP, the JIPB is an ongoing process that continues to support the JMAP throughout its conduct. Accordingly, JIPB-related ISR Support Requests may continue to be developed throughout the duration of the planning process.
- **JMAP.** The heart of the joint operation planning process is the JMAP. Using the information and intelligence generated by the JIPB, commanders and their staff use the four-step JMAP to develop a course of action that will enable the realisation of the superior commander's intent. This course of action is generally represented as a line of operation, depicted in Figure 4–2, interspersed with a number of decisive points. These decisive points are major events or activities that are 'considered decisive in achieving the mission and end-state'.[51] In developing their course of action, commanders will generate ISR Support Requests to fill gaps in their situational awareness additional to those identified during JIPB, as well as determining where and when ISR support will be required **during the execution** of the commander's course of action. At the conclusion of the JMAP, commanders will have developed a plan of action that will direct the employment of the assets under their control to realise the end-state desired by a superior commander. This plan of action will include a number of ISR Support Requests that will form the basis for the ISR Support Plans that are an adjunct to the commander's course of action.

[51] ibid., p. 5–8.

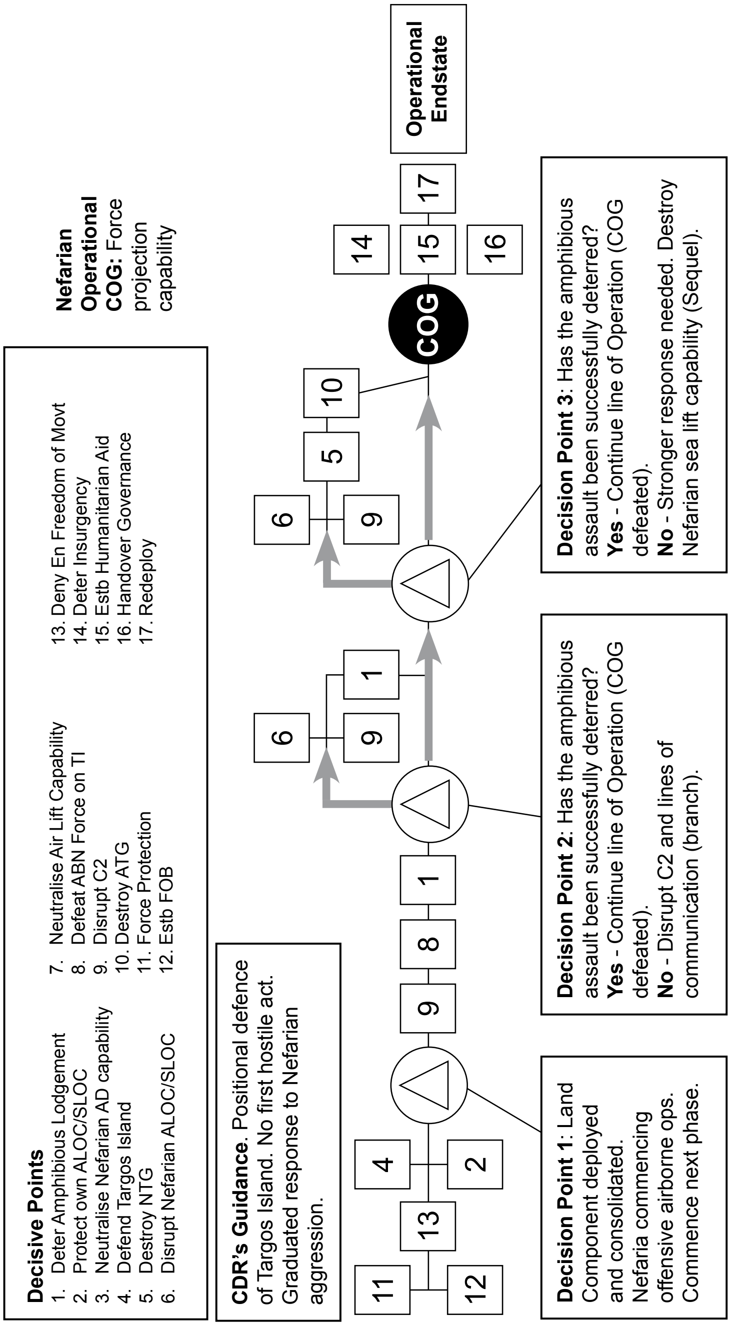

Figure 4–2: Illustrative line of operation[52]

[52] ibid, p. 5–14. The author obtained clearance from the document sponsor to reproduce this image in the paper.

Although JIPB and the JMAP are mutually reinforcing sub-processes of operations planning, there is a marked difference between the ISR Support Requests that are generated during their respective execution. ISR Support Requests generated during JIPB can be regarded as *planning enablers*; they allow the commander to develop the level of situational awareness that is needed to undertake effective operations planning. ISR Support Requests generated during the JMAP, however, are more accurately viewed as *mission enablers* as they are intended to support the execution of the course of action that allows the commander to achieve the desired end-state directed by the superior commander. This difference in enabling roles influences the way in which the proposed methodology treats the ISR Support Requests generated during the operations planning process.

Relational hierarchy

Capturing the ISR-related outputs of the joint operations planning process within a relational hierarchy will facilitate the alignment of ISR support with the conduct of a campaign. A relational hierarchy, often referred to in this context as a strategies-to-task framework[53], is a hierarchical framework stratified into layers that represent the levels of command being considered by the planning process. Existing at each level of command are a number of nodes, each representing a decisive point, an outcome or activity identified by a commander during the planning process that will enable the realisation of the objectives set at the higher levels of command. These nodes are linked throughout the hierarchy, with the resulting linkages representing the relationship of each activity/objective to the achievement of a campaign end-state. The proposed airborne ISR planning methodology uses the understanding of the relationships between the outputs of planning processes conducted throughout a force that such a hierarchy provides. By establishing the links between seemingly disparate tasks generated by commanders throughout the organisation, a relational hierarchy provides an ideal backbone for an airborne ISR planning methodology that will facilitate the alignment of airborne ISR tasking with the conduct of the campaign.

Creation of a relational hierarchy for use in airborne ISR planning

The technical aspects of the creation and use of a relational hierarchy to support airborne ISR planning will depend upon the nature of the command and control systems that are available to the force at the time. The delivery of the Joint Planning Suite under JP 2030 Phase 8 will enable the joint operation planning process to occur within a collaborative networked environment, greatly improving the integration of planning at the different levels of command and across the different domains involved

[53] Lingel, et al., *Methodology for Improving the Planning, Execution, and Assessment of Intelligence, Surveillance, and Reconnaissance Operations.*

in a campaign. The methodology described in the following pages assumes the ability of future commanders to engage in effective collaborative operations planning, such as through the use of a computer-based, networked planning application envisioned in JP 2030.

Airborne ISR planning commences, like other operation planning processes, with strategic direction establishing the need for the ADF to conduct operations to realise a specified end-state. This direction provides the high level guidance to all ADF commanders that will ultimately direct their actions during the execution of a campaign. This guidance provides the common thread that runs through all tasks developed by the commanders assigned in support of a campaign and provides the starting point for the creation of the relational hierarchy for use in airborne ISR planning. The strategic objective of the campaign sits atop the relational hierarchy, and is the source of the tasking which cascades down through the levels of command as the planning process proceeds. Preliminary scoping at the operational level places the strategic objective into a context that directs the planning efforts of the operational level commanders, and creates the linkage between the strategic level objectives and the operational level activities and outcomes that will enable these objectives to be achieved.

The first ISR-related input into the hierarchy will be the ISR Support Requests that are generated during the conduct of the JIPB at the operational level. Within the hierarchy these requests exist between the levels of command as the JIPB-generated ISR Support Requests are developed to enable planning by lower level commanders. This positioning within the hierarchy reflects the fact that these ISR Support Requests are prerequisites to lower level planning and should therefore be regarded as part of the requirements associated with the superior commander's ISR support needs. Managing JIPB-generated ISR Support Requests in this manner impacts on the allocation of ISR support, addressed later in this section.

Aided by the awareness gained through JIPB, the commander uses the JMAP to develop a course of action. The decisive points that are identified as a result of this process form the next level of the relational hierarchy, representing the required actions and outcomes identified by the commander to enable the objectives at the strategic level to be realised. The ISR support that is required during the execution of the course of action is represented within the hierarchy as ISR Support Requests that are associated with the decisive points they support. Collectively, these ISR Support Requests represent the ISR support that will be required at the operational level to enable the commander to achieve the objectives established at the strategic level. Figure 4–3 illustrates the development of the relational hierarchy, with associated ISR Support Requests, at the operational level.

The decisive points generated at the operational level provide tactical level commanders with the objectives that will be used to inform their planning. Tactical level commanders establish the links between their planning and the objectives of the operational commander during preliminary scoping and develop a course of action that will enable these objectives to be achieved. In this way the relational hierarchy will be populated by the outputs of the tactical commanders' planning processes as per the process at the operational level. This same process continues through successive levels of command as commanders complete their planning, thereby creating a continuity of process that ensures consistency in the conduct of ISR planning throughout the force. Figure 4–4 illustrates a small scale relational hierarchy linking the ISR Support Requests generated at the tactical and operational level to the strategic objective driving the conduct of the campaign.

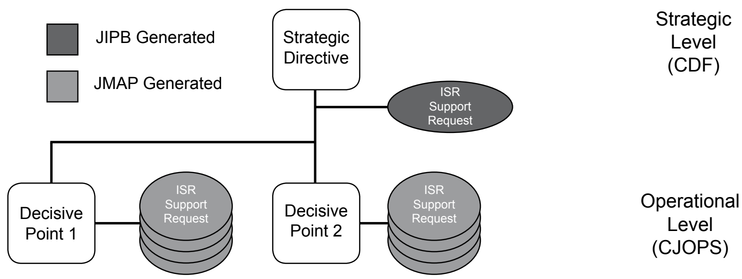

Figure 4–3: ISR Support Requests generated through JIPB and JMAP at the operational level

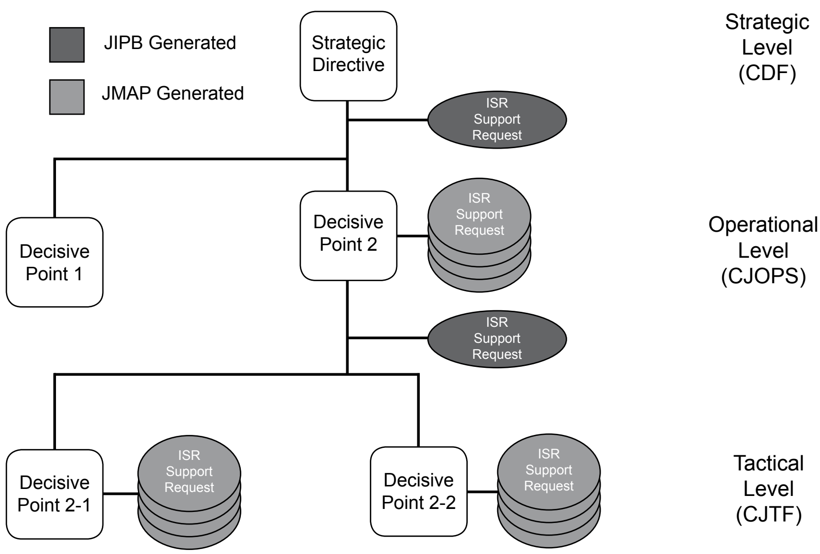

Figure 4–4: Development of relational hierarchy to the tactical level

The association of ISR Support Requests with the objectives and activities they support allows the creation of a commander's ISR Support Plans. As each commander may have multiple objectives there will invariably be more than one ISR Support Plan developed by each commander. These plans collectively represent the total ISR support a commander has identified as being required in order to achieve a specified outcome. Viewing ISR support in terms of collective requirements rather than individual tasks that can be dealt with in isolation enhances the planning of airborne ISR as it factors the interdependence of individual ISR tasks into the planning process, and facilitates the integration of ISR into the conduct of operations. ISR Support Plans are developed, using the relational hierarchy, by combining the ISR Support Requests associated with each decisive point into a single list. In this way, ISR planners and commanders are able to develop a clear understanding of what ISR tasks need to be conducted in order for an objective to be achieved. DP 2–1 and 2–2 in Figure 4–5 illustrate the creation of these ISR Support Plans at the tactical level. The process for including ISR Support Requests generated during the JIPB into these plans will differ slightly from those generated during the JMAP. As these requests are associated with the support requirements of the superior commander, they are treated as an addendum to the ISR Support Plan developed by the commander at the higher level, reflecting their enabling role in the planning at the lower level of command. The inclusion of an ISR Support Request generated during the JIPB at the tactical level into the ISR Support plan of the operational commander is illustrated by ISR Support Plan associated with Decisive Point 2 in Figure 4–5.

The development and populating of the relational hierarchy and the generation of the ISR Support Requests and Plans continues in tandem with the operation planning processes occurring at all levels of command. This development of the relational hierarchy is the first stage of airborne ISR planning. Once created, the hierarchy is then used to facilitate the prioritisation of ISR Support Requests to ensure that the weight of effort assigned to support the force's commanders reflects the optimal apportionment of scare resources in the conduct of the campaign.

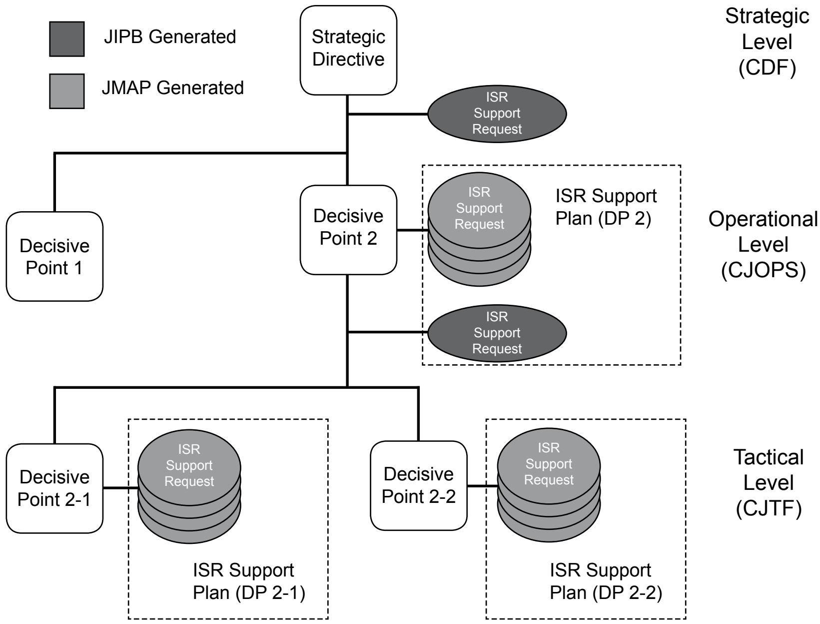

Figure 4–5: The development of ISR Support Plans at the operational and tactical level

PRIORITISING COMPETING ISR SUPPORT REQUIREMENTS

Airborne ISR assets are high-demand low-density assets.[54] Consequently, the tasks they are assigned must be prioritised to ensure that ISR support is apportioned in a way that best aids the achievement of a campaign's desired outcome. A key aspect of the airborne ISR planning methodology is its ability to prioritise ISR Support Requests generated at different levels of command and in different operating domains. Prioritising these ISR Support Requests requires the development and use of a common assessment criterion that enables seemingly disparate tasks to be compared objectively in order to determine their relative priority. This criterion is provided by the linkages between tasks and the strategic objective of a campaign that are developed through the relational hierarchy.

The links created between the tasks developed at the various levels of command within a force allow a straightforward appreciation of where the support requirements of a commander at any level fit into a joint campaign. However, understanding how an

[54] Lieutenant Colonel Daniel R. Johnson, USAF, *Enabling Intelligence, Surveillance, and Reconnaissance Effects for Effects-Based Operations Conditions*, Maxwell Paper No. 34, Air University Press, Maxwell Air Force Base, Alabama, 2005.

individual ISR Support Request fits into a campaign is, of itself, insufficient to allow the effective prioritisation of competing requests, as it does not necessarily reflect the contribution that a task may make to the achievement of a campaign aim. Some outcomes or activities identified during the planning process will be assessed as having a greater potential impact on the realisation of a campaign end-state than others. Commanders must therefore be provided the means to indicate their assessment of the relative importance of an outcome is order to influence the support that is provided to enable its realisation. Establishing this relative importance between competing ISR Support Requests is achieved through the use of utility values.[55]

Assigning utility values

Utility values are numerical values assigned to the objectives and tasks contained within the relational hierarchy to reflect a commander's assessment of their relative contribution to the realisation of a higher level objective. These values allow for a more precise differentiation between tasks during the prioritisation and asset apportionment stages of the planning process than a simple ordinal ranking system. For example, when assessing the weight of effort apportioned between Decisive Point 1 and Decisive Point 2 in Figure 4–5, a commander assigning utility values of 0.2 and 0.8 respectively provides planners with clear appreciation of the relative importance of the tasks. The degree of discernment in task importance that the use of these values provides will be essential in future operations as the continued scarcity of high-demand assets will require that the planning process is based on a clear understanding between commanders and ISR planners as to where and when efforts should be focused to achieve maximum operational benefit.

The final stage of the development of the relational hierarchy is the calculation and insertion of these utility values by the force's commanders. These values will be calculated and assigned by the commander to each decisive point in a commander's course of action that is captured in the framework, as well as each individual ISR Support Request that is associated with the decisive points. Values will also be assigned to the ISR Support Requests generated during the JIPB. The assignment of utility values to decisive points has a dual purpose. Firstly, it communicates a commander's determination of relative importance between the ISR Support Plans that have been created from his inputs into the relational hierarchy. Secondly, they establish a relative priority between the decisive points and their associated ISR Support Plans that are generated by subordinate commanders and linked to the objectives set by the superior commander. Figure 4–6 illustrates the use of utility values in determining priority. In

[55] Lingel, et al., *Methodology for Improving the Planning, Execution, and Assessment of Intelligence, Surveillance, and Reconnaissance Operations*.

this example the operational commander has assigned a higher relative importance to Decisive Point 2 than Decisive Point 1. Accordingly, the ISR Support Plan for Decisive Point 2 would receive a proportionally higher weight of effort than a plan linked to Decisive Point 1. At the tactical level in this example, the equal importance assigned to the two activities aimed at achieving Decisive Point 2 will result in ISR Support Plans for Decisive Points 2–1 and 2–2 receiving an equal priority during the asset tasking process support. Within each ISR Support Plan, utility values will also be assigned to individual ISR Support Requests in order to establish the relative priority of support requirements within the ISR Support Plans. Once these utility values are assigned, the central coordinating authority will have sufficient information available to determine the apportionment of scarce airborne ISR resources in order to optimise the contribution made by the force's available assets in achieving operational success and realising the desired campaign outcome.

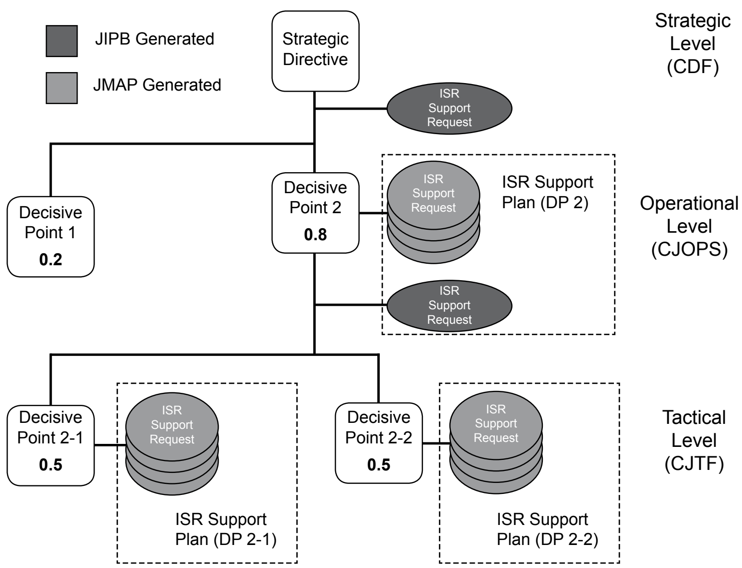

Figure 4–6: Illustrative relational hierarchy augmented with utility values

The main benefit to be gained through the use of utility values in determining the apportionment of ISR support is the precision they introduce into the prioritisation process. Providing commanders with the flexibility to assign relative importance to support requirements allows planners to apportion support to commanders proportional to the **commanders'** assessment of their needs. This proportional support gives commanders a greater degree of control in the determination of the support they receive. A fully developed relational hierarchy, including utility values, allows commanders at all levels to ensure that the airborne ISR planning process adequately captures their requirements and that asset tasking adequately reflects their needs.

Apportioning airborne ISR support

Guided by the fully developed relational hierarchy, the central airborne ISR coordination authority will organise, sequence and direct the tasking of the airborne ISR assets assigned in support of a campaign. This will lead to the development of an Airborne ISR Tasking Plan that outlines the employment of airborne ISR assets in support of the campaign effort. The primary focus of the central coordinating authority in the creation of this plan will be ensuring that available assets are fully utilised where possible and that tasking schedules represent the best match between assets' capabilities and characteristics, and task requirements. The apportionment of airborne ISR support by the central coordinating authority will be based primarily on the prioritisation of ISR Support Plans that is enabled by the development of the relational hierarchy. The focus on prioritising Support Plans, as opposed to individual Support Requests, is the hallmark of an approach that seeks to ensure the integration of ISR into the conduct of operations. Such an approach will avoid the provision of piecemeal support based on the prioritisation of individual ISR Support Requests across the force, a 'peanut-butter spreading' approach to ISR tasking.[56] Tasking based on individual ISR Support Requests may see ISR support provided to a large number of commanders, but the resultant effort may not be sufficiently focused to provide a meaningful boost to the achievement of the campaign outcome, and therefore would represent a less than efficient use of scarce resources. In contrast, prioritising ISR Support Plans focuses the ISR effort in support of the achievement of specific outcomes that have been prioritised based on the contribution they make to the campaign.

Despite the focus of prioritisation being on ISR Support Plans, individual ISR Support Requests may still be assigned ISR assets in support. Once the central coordinating authority has tasked the available ISR assets in support of the prioritised ISR Support Plans, spare or latent capacity may remain which can be used to support individual ISR Support Requests. Where it is possible, the central coordinating authority will apportion the unassigned capability of operational level ISR assets, as well as tactical level organic assets, to individual ISR Support Requests. Determining which Support Requests are allocated assets will depend on their assessed utility value, as well as the ability of tasked asset to provide incidental or ancillary support based on geographical, temporal and capability considerations.

[56] Lieutenant Colonel Michael L. Downs, 'Rethinking the Combined Force Air Component Commander's Intelligence, Surveillance, and Reconnaissance Approach to Counterinsurgency', in *Air & Space Power Journal*, vol. xxii, no. 3, Fall 2008, Air University Press, Maxwell Air Force Base, Alabama, 2008: http://www.airpower.maxwell.af.mil/airchronicles/apj/apj08/fal08/downs.html, accessed 7 November 2008

At the conclusion of the asset apportionment process, the central airborne ISR coordinating authority will have developed a comprehensive Airborne ISR Tasking Plan that sequences, synchronises and directs the employment of all airborne ISR assets assigned to support a campaign. This plan represents the integrated application of the ISR process across all levels of the campaign and between all functions of the ISR process. In the preparation and management of the plan, the central coordinating authority assumes the responsibility of managing the organisational and technical seams that will continue to exist between the ADF's airborne ISR assets. The role of the central airborne ISR coordinating authority is therefore pivotal to the development and maintenance of a seamless airborne ISR capability in the ADF.

ENSURING THE RESPONSIVENESS OF THE PLANNING PROCESS

The process that directs the employment of the ADF's airborne ISR assets must be able to adjust tasking schedules rapidly and effectively to respond to changes in the operational situation as they occur. The responsiveness in the tasking process will ensure that the changes that will invariably occur in a complex operating environment are reflected, where necessary, by revisions in the airborne ISR tasking arrangements. Ideally, the process that allows for this responsiveness in asset tasking will be consistent throughout the stages of an operation, from its initial planning through to its completion. Ensuring consistency in the making and implementation of tasking decisions promotes a degree of predictability in the planning process. Predictability will, in turn, engender trust and confidence in the planning process; two attributes vital to the effectiveness of a process that integrates across organisational and cultural boundaries.

The responsiveness required from the planning process is achieved through the use of the relational hierarchy and the associated utility values. Changes in the operating environment can be reflected in the ISR Tasking Plan in one of two ways. Firstly, adjustments can be made to the utility values assigned in the relational hierarchy to reflect changes in a commander's assessment of the relative importance of a particular outcome or activity. Should this occur the commander concerned adjusts the utility values of the outcomes and task associated with their operations to reflect the new realities of the operational situation. These changes will have a flow-on effect through the force that will adjust the priorities, not only of the tasks generated by the commander making the adjustments, but all tasks generated at the lower levels of command that are linked to it through the hierarchy. Once these changes are made, the central airborne ISR coordination authority can adjust the tasking of airborne ISR assets in order to reflect any resulting shift in priorities. The second way in which changes can be reflected is through the addition of new activities/outcomes or ISR Support Requests that had not previously been included during the planning process. New ISR Support Plans and Support Requests generated in this way would be linked in the same way as those generated through the initial planning process and would therefore be assessed for priority in the same manner. The efficacy of this approach to ensuring the responsiveness in the proposed airborne ISR planning methodology is reliant on the inputs into the relational hierarchy being made in real-time in a networked environment. As such, this methodology will capitalise on the ADF's development into a networked force and will enable airborne ISR planners to harness the inherent responsiveness of the ADF's airborne ISR assets. The end result will be a balanced, integrated and networked airborne ISR capability for the ADF that will support commanders in achieving operational success in uncertain future operating environment.

AN AIRBORNE ISR PLANNING METHODOLOGY FOR THE FUTURE FORCE

The airborne ISR planning methodology outlined in this chapter provides the practical dimension of the future airborne ISR concept proposed in this paper. It is based on the use of the ISR-related outputs of the joint operation planning process to populate a relational hierarchy augmented by utility values. This approach promotes the integration of ISR into the conduct of operations, and allows the central airborne ISR coordinating authority to prioritise and apportion the support provided by scarce airborne ISR assets to optimise their contribution to the achievement of a desired campaign outcome. When employed by a networked force supported by collaborative planning tools, this approach will enable the responsiveness and persistence that will be required by commanders in the range of future operations the ADF can be expected to conduct. While there remains a possibility that, as the ADF evolves into the future force, aspects of the planning processes upon which this methodology is based may change, it is not expected that there will be a significant shift in its underlying philosophy. Accordingly, the terms used to label aspects of the process are not as important as the concepts they represent. Approaching the methodology in this way creates an enduring foundation that will ensure its continued applicability during the ADF's evolution into the future force.

Chapter 5: Conclusion

> *To achieve ongoing success … we need to look toward the future and identify how we want to fight – we cannot simply rely on the practices of today being successful in the changing environment of tomorrow.*
>
> Air Chief Marshal A. G. Houston[57]

Irrespective of the exact nature of the operations that the ADF will conduct in the future, the ADF's airborne ISR capability will invariably play a crucial role in enabling its success. The diversity and sophistication of the threats posed to Australia's national interests, the growing adaptivity of its potential adversaries and the increasingly complex operating environments will make timely and accurate information a vital component of all future ADF operations. The demands to provide such information persistently and responsively across diverse and expansive operating environments make airborne ISR a capability that is key to the operational effectiveness of the future force. The ADF is already in the process of acquiring and developing highly capable airborne ISR assets that will enhance the ability of the future force to collect, process and disseminate data and information. However, the enhancement of its technical airborne ISR capability that this investment is aimed to deliver is not currently being guided by a joint ADF understanding of ISR and how it is to be conducted as part of a balanced, integrated and networked force. This paper describes an airborne ISR concept for the future ADF that provides a focus that will ensure that airborne ISR develops as a coherent and integrated capability.

Although it is possible to reap some of the benefits of technological innovation through steady adaptation of current processes and organisational structures to incorporate new systems as they are acquired, it is only through concurrent organisational and procedural innovation designed in response to new capabilities that the full benefit of technological innovation can be realised. The future airborne ISR concept described in this paper was developed based on an objective view of the ADF's vision of its future rather than on its practices of today. The result is an aspirational concept that envisages a seamless force operating within a ubiquitous information domain that is able to provide ADF commanders, at all levels and in all domains, with the information they need to achieve

[57] Department of Defence, Australian Defence Doctrine Publication–D.3—*Joint Operations for the 21st Century*, Department of Defence, Canberra, 2002 [ADDP–D.3—*Joint Operations for the 21st Century*], p. i.

operational success. This concept challenges many traditional practices which are in danger of losing their relevance in modern information age militaries. For the ADF to be able to meet the challenges of the future, it must be willing to question the continued validity of the assumptions upon which its operational processes and organisational structures are presently based.

The creation of a ubiquitous information domain supported by an adaptive command and control system will be the defining feature of the future ADF that will shape the development of its airborne ISR capability. Through the networking of all elements of the force, the contribution of ADF airborne ISR assets involved in all functions of the ISR process will grow significantly. While this promises to provide the ADF with the ability to increase vastly its information production potential, it also presents the challenge of determining how to manage and employ effectively, as a coherent capability, diverse assets controlled at different levels of command by geographically and/or organisationally dispersed commanders. The solution to this challenge is the development of organisational structures and processes that facilitate the effective centralisation of the ADF's airborne ISR capability. By providing a central airborne ISR coordinating authority with an awareness of the ISR support needs of all ADF commanders, and the ability to direct the tasking of all available assets, the ADF will ensure that commanders receive the support they require from the assets best able to provide it.

The ADF envisioned in the FJOC will fully exploit its future airborne ISR capabilities by leveraging off its growing network infrastructure. However, for the ADF to realise the operational benefits to be gained through its technological innovation, it must willingly undertake simultaneous conceptual, organisational and procedural innovations. Some of these innovations may present significant cultural challenges for the ADF; however, the ADF has repeatedly demonstrated its ability to innovate where it is necessary to improve its operational performance. Through harnessing its continual drive for innovation the ADF will be able to incorporate its planned ISR capabilities into the future force in a way that enables it to develop, maintain and employ an effective integrated airborne ISR capability that will support its achievement of knowledge dominance over its potential adversaries in an uncertain future.

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