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The Parliament of the Commonwealth of Australia

# Inquiry into Australian Defence Force Regional Air Superiority

**Defence Sub-Committee**

Joint Standing Committee on Foreign Affairs, Defence and Trade

August 2007  
Canberra

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**Cover photo captions:**

'A No. 1 Squadron F-111 aircraft participating in Exercise Red Flag during February 2006.' (U.S. Air Force)

'A No. 1 Squadron F-111 aircraft against a Tindal Sunset during Exercise Arnhem Thunder 2007.' (Official No: 20070812raaf8164229\_013)

'Hornet fighters from RAAF Base Tindal link up in mid-air to receive fuel from a Boeing 707 tanker/transport aircraft, flying in close formation at more than 700 km per hour.' (Official No: 20070814ran8100087\_083)

'An F/A-18 aircraft taxis for take-off from RAAF Base Tindal during Exercise Arnhem Thunder 2007.' (Official No: 20070809raaf8164229\_2\_012)



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## Foreword

The issue of Australia's regional air superiority has been the subject of considerable discussion and commentary from 2000. The strategic guidance outlined in the *Defence 2000 – Our Future Defence Force* and the acquisition and phasing out of equipment proposed in the *Defence Capability Plan 2004–2014* has provided the basis for much of the debate amongst key stakeholders.

The Defence Sub-Committee of the Joint Standing Committee on Foreign Affairs Defence and Trade first examined the issue of Australia's air combat capability in its *Review of the Defence Annual Report 2002-03*. Further to this inquiry, in June 2005, the Senate resolved that the Joint Standing Committee on Foreign Affairs, Defence and Trade 'inquire and report into the ability of the Australian Defence Force to maintain air superiority in our region to 2020, given current planning; as well as any measures required to ensure air superiority in our region to 2020.' To support the Committee in its deliberations, two public hearings were held and over 40 submissions were entered into evidence.

In terms of report structure, Chapter 2 outlines the strategic considerations, both global and regional, which underpin Australia's future regional air superiority. Concepts such as a balanced force structure, asymmetric threats, and an assessment of regional military capabilities are discussed. The chapter concludes that Australia must continue to monitor developments in the region when considering new and improved air combat capabilities.

Chapter 3 of the report considers the Australian Defence Force's (ADF) current capability planning, beginning with an overview of the *Defence 2000 – Our Future Defence Force* and subsequent Defence updates in 2003 and 2005. An outline of the Hornet Upgrade Program follows and its role in the transition to the new air combat aircraft is discussed. In concluding, the Committee notes the introduction of a new capability is underpinned by strategic policy and the constraints of providing a well balanced ADF.

The withdrawal from service of the F-111 is examined in Chapter 4 along with a consideration of the aircraft's technical and maintenance issues. Also discussed are

the merits of enhancing the F-111 and extending its in-service life past 2010. The chapter concludes that industry could support the F-111 until 2020 but there are risks, including the ability to sustain critical skills amongst the current workforce. The Committee notes the increasing severity of the risk profile in extending the F-111 beyond 2010.

Chapter 5 summarises the ADF's future capability planning with particular attention being given to the acquisition of the Joint Strike Fighter (JSF) as well as any potential capability gap which may arise from a delay in its purchase.

The report concludes in Chapter 6 with a comparative analysis of the JSF and the FA-22 Raptor covering issues such as capability, availability and cost. Irrespective of whether the FA-22 Raptor is available for export sale to Australia, the Committee notes the purchase of the JSF is considered by Defence to provide the most effective and efficient air combat capability.

Hon B C Scott MP  
Chair  
Defence Sub-Committee



## Membership of the Committee

Chair	Senator A B Ferguson (until 14/8/2007)	Senator M A Payne (from 15/8/2007)
Deputy Chair	Hon G J Edwards, MP	
Members	Senator A Bartlett (from 8/2/06)	Hon B G Baird, MP
	Senator P M Crossin (from 2/12/05)	Mr P A Barresi, MP
	Senator A Eggleston	Mr M Danby, MP
	Senator S Hutchins	Mrs T Draper, MP
	Senator D Johnston (until 7/3/07)	Mrs J Gash, MP
	Senator L J Kirk	Mr S W Gibbons, MP
	Senator the Hon J A L Macdonald (until 23/6/05 and from 8/2/07)	Mr B W Haase, MP
	Senator C M Moore	Mr M J Hatton, MP
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	Senator N J Stott Despoja	Hon J E Moylan, MP
	Senator R B Trood	Hon G D Prosser, MP
	Senator R S Webber	Hon B C Scott, MP
		Mr R C G Sercombe, MP
		Hon W E Snowdon, MP
		Dr A J Southcott, MP (from 23/2/06)
		Mr C Thompson, MP
		Ms M Vamvakinou, MP
		Mr B H Wakelin, MP
		Mr K W Wilkie, MP
Secretary	Dr Margot Kerley	

## Membership of the Defence Sub-Committee

Chair	Hon B C Scott MP	
Deputy Chair	Mr M J Hatton MP	
Members	Senator A Bartlett (from 8/2/06)	Mrs T Draper, MP
	Senator P M Crossin (from 2/12/05)	Hon G J Edwards, MP (ex officio)
	Senator A B Ferguson (ex officio) (until 14/8/07)	Mrs J Gash, MP
	Senator S Hutchins	Mr S W Gibbons, MP
	Senator D Johnston (until 7/3/07)	Mr B W Haase, MP
	Senator the Hon J A L Macdonald (until 23/6/05 and from 8/2/07)	Hon W E Snowdon, MP
	Senator M A Payne	Dr A J Southcott, MP (from 23/2/06)
	Senator N Scullion (from 17/08/05 until 8/2/07)	Mr C P Thompson, MP
	Senator R B Trood	Mr B Wakelin, MP
		Mr K W Wilkie, MP

## Committee Secretariat

Secretary	Dr Margot Kerley
Research Officer	Mr Michael Crawford
Defence Adviser	Wing Commander Anne Borzycki Commander David Jones, RAN (from December 2006)
Administrative Officer	Ms Emma Martin



## Terms of reference

On 14 June 2005, the Senate referred to the Committee an inquiry into:

- the ability of the Australian Defence Force to maintain air superiority in our region to 2020, given current planning; and
- any measures required to ensure air superiority in our region to 2020.



## List of abbreviations

AAR	Air-to-air refuelling
ADF	Australian Defence Force
ADO	Australian Defence Organisation
AEW&C	Airborne Early Warning and Control Aircraft
ASPI	Australian Strategic Policy Institute
AUPC	Average Unit Procurement Cost
BVR	Beyond visual range
CEO	Chief Executive Officer
CMDS	Counter Measure Dispensing Systems
CTOL	Conventional Take-Off and Landing
DCP	Defence Capability Plan
DMO	Defence Materiel Organisation
EWSP	Electronic Warfare Self-Protection
HUG	Hornet Upgrade
ISR	Intelligence, Surveillance, and Reconnaissance
JASSM	Joint Air-to-Surface Stand-Off Missile

JDAM	Joint Direct Attack Munition
JSF	Joint Strike Fighter
MoU	Memorandum of Understanding
MP	Member of Parliament
MRTT	Multi-Role Tanker Transport aircraft
NACC	New Aerospace Combat Capability
NCW	Network-centric warfare
OEM	Original equipment manufacturer
PSFD	Production Sustainment and Follow-on Development
RAAF	Royal Australian Air Force
R&D	Research and development
Retd	Retired
SDD	System Development and Demonstration
SOP	Sole Operator Program
US	United States

## Introduction

### Previous debate

- 1.1 Australia's regional air superiority has been the subject of regular commentary and debate by government, various defence and strategy organisations, the media and the general public since 2000 but in particular since 2002/03.
- 1.2 The Defence Sub-Committee of the Joint Standing Committee on Foreign Affairs, Defence and Trade first examined issues relating to Australia's air combat capability in its *Review of the Defence Annual Report 2002-03*.
- 1.3 The Committee's report focused on the following topics:
  - The Department of Defence (Defence) rationale for retiring the F-111 in 2010;
  - F/A-18 Hornet and AP-3C Orion proposed strike capability;
  - Defence capability prior to the acquisition of the Joint Strike Fighter (JSF); and
  - the comparative capability of the JSF.
- 1.4 The Committee made two recommendations:
  - at the start of the next Parliament, the Minister for Defence should request the Committee to conduct an inquiry into the ability of the

Australian Defence Force to maintain air superiority in our region to 2020; and

- in 2006, the Government should make a statement focusing on:
  - ⇒ the most accurate delivery date for the replacement combat aircraft;
  - ⇒ the implications this date will have on the decision to retire the F-111 in 2010;
  - ⇒ the need to ensure that key upgrades and deep maintenance on the F-111 continues through to 2010 with the possibility of extending the lifespan should the need arise; and
  - ⇒ the measures the Government will take to ensure that Australia's superiority in air combat capability in the region is maintained.

1.5 In response to the first recommendation, the Government did not agree, noting that:

The Defence Capability Plan makes sufficient provision to maintain Australia's air combat capability at a level at least comparable qualitatively to any in the region. The Government continues to monitor regional developments and, were there a need to, the Government would adjust the Defence Capability Plan.<sup>1</sup>

1.6 In response to the second recommendation, the Government partially agreed noting that:

The ADF [Australian Defence Force] New Aerospace Combat Capability is an important issue on which announcements by the Government can be expected at key milestones. Similarly, the Government will make relevant announcements relating to other air combat capabilities such as F/A-18 Electronic Warfare Self Protection, Tactical Air Defence Radar Systems, and Airborne Early Warning and Control.<sup>2</sup>

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1 Review of the Defence Annual Report 2002-03, *Government Response to Joint Standing Committee on Foreign Affairs, Defence and Trade*, November 2004, p. 3.

2 Review of the Defence Annual Report 2002-03, *Government Response to Joint Standing Committee on Foreign Affairs, Defence and Trade*, November 2004, p. 3.

## Background

- 1.7 In the *Defence 2000 – Our Future Defence Force* (the ‘White Paper’), Australia’s air combat capability was described as the ‘most important single capability for the defence of Australia.’ Following this assertion, the White Paper proceeded to outline Defence’s air combat capability goal:
- The Government’s aim is to maintain the air combat capability at a level at least comparable qualitatively to any in the region, and with a sufficient margin of superiority to provide an acceptable likelihood of success in combat.<sup>3</sup>
- 1.8 The paper then noted three major challenges facing this goal:
- the capability of the F/A-18 would become outclassed by the growth in capabilities of regional air forces;
  - the Boeing 707 aircraft would need to be refurbished or replaced in order for Australia to maintain an air to air refuelling (AAR) capability; and
  - the replacement of the F/A-18 fleet upon its retirement between 2012 and 2015 would need to be addressed.<sup>4</sup>
- 1.9 In response to these challenges, Defence planned to upgrade the F/A-18’s capabilities, purchase Airborne Early Warning and Control (AEW&C) aircraft, replace its AAR aircraft, and look at potential replacements for the F/A-18 and the F-111 fleets.<sup>5</sup>
- 1.10 Defence continues to maintain and implement these plans:
- F/A-18 upgrades continue;
  - AEW&C aircraft will be delivered in 2009;
  - new Multi-Rolled Tanker Transports (MRTT) are due to enter service in 2009;
  - in June 2002, Defence announced its intention to participate in the United States F-35 JSF program with the expectation of replacing the F-111s (and eventually the F/A-18s) with the JSF; and

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3 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, pp. 84–5.

4 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, pp. 85–6.

5 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, pp. 86–7.

- in March 2007, the Government announced its decision to acquire 24 F/A-18F Block II Super Hornet aircraft.
- 1.11 In 2003, the *Defence Capability Plan 2004-2014* revealed that the planned withdrawal date for the F-111 would be 2010 rather than the original date of 2015.<sup>6</sup> This decision was based on ongoing reviews of the F-111s maintenance needs, as well as wing fatigue problems and a fuel tank explosion – both of which arose in 2002.<sup>7</sup> In addition, the Air Force advised Defence in 2002 that by 2010, the Air Force will have ‘a strong and effective land and maritime strike capability...[which] will enable withdrawing the F-111s a few years earlier.’<sup>8</sup>

## Concerns

- 1.12 The decision to purchase the JSF, upgrade the F/A-18 Hornet and retire the F-111 fleet earlier than originally expected has led to a number of on-going concerns. They include:
- a capability gap resulting from the 2010 retirement of the F-111s and the planned delivery of the JSF in 2012-2014 – which the F/A-18 upgrades and Super Hornet acquisition are expected to address;
  - the suitability of the JSF for Australia’s defence needs;
  - the JSF’s capabilities given the fact that it is, at present, a ‘paper plane’; and
  - the rising cost of the JSF and the impact of those costs on the fleet numbers.

## Conduct of the inquiry

- 1.13 In June 2005, the Senate resolved that the following matters be referred to the Joint Standing Committee on Foreign Affairs, Defence

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6 Department of Defence, *2004–2014 Defence Capability Plan: Public Version* (DCP 2004-14), November 2003, p. 44.

7 Department of Defence, *Supplementary Submission No. 4, Defence Annual Report 2002–03, Air Combat Capability*, June 2004, pp. 5–6.

8 Minister for Defence Media Release 0142/2003, *Defence Capability Review*, 7 November 2003.

and Trade for inquiry and report under the following terms of reference:

- the ability of the Australian Defence Force to maintain air superiority in our region to 2020, given current planning; and
- any measures required to ensure air superiority in our region to 2020.

1.14 The Committee advertised the inquiry in *The Australian* on 2 November 2005. The Committee sought submissions from government departments, relevant organisations and individuals.

1.15 The Committee received 41 submissions, listed at Appendix A, and took evidence at public hearings in Canberra on 31 March 2006 and in Ipswich on 5 July 2006. Copies of the transcripts of evidence from the public hearings and the volume of submissions are available from the Committee's secretariat and for inspection at the National Library of Australia. The transcripts and submissions can also be obtained from the Committee's website at:  
<http://www.aph.gov.au/house/committee/jfadt/adfair/index.htm>

## Structure of the report

1.16 This report continues in Chapter 2 with a discussion of the strategic considerations, both global and regional, which underpin Australia's future regional air superiority. Strategic concepts such as network-centric warfare and asymmetric threats are examined. The chapter concludes with an examination of the regional strategic challenges facing Australia and their impact on Australia's future air superiority.

1.17 Chapter 3 covers the ADF's current capability planning including the Hornet upgrades. Chapter 4 addresses issues surrounding the F-111, while Chapter 5 summarises the ADF's future capability planning with particular attention given to the purchase of the JSF and any potential capability gap which may arise from a delay in its purchase.

1.18 The report concludes in Chapter 6 with a comparative analysis of the JSF and the FA-22 Raptor (Raptor) covering issues such as capability, availability and cost. Chapters 3, 4, 5 and 6 are intended to address, in part, the debate surrounding the potential viability of an F-111/Raptor force mixture proposed in a submission to the Committee prepared by Dr Kopp and Mr Goon.



## Strategic Considerations

### Introduction

- 2.1 Strategic considerations, both global and regional, are imperative when discussing Australia's future regional air superiority. Government's strategic objectives are a cornerstone of defence policy and acquisition decisions. It is not surprising then that strategic debate has underpinned the evidence received by the Committee for this inquiry.
- 2.2 Evidence gathered by the Committee noted several strategic considerations which impact Australia's decisions regarding air superiority. This chapter will group these issues under two general headings:
- contemporary strategic concepts; and
  - regional strategic assessment.

### Contemporary strategic concepts

- 2.3 Changes occurring in strategic doctrine directly impact decisions being made about the maintenance of Australia's regional air superiority. New asymmetric threats, increased technological capability coupled with Australia's unique defence requirements have, over time, changed Australia's defence strategy. In the case of

air power doctrine (but not exclusively) the maintenance of Australia's regional air superiority is being influenced by developments in 'network centric warfare' and 'beyond visual range' weapons and tactics. While concepts such as these are not new, they do impact Defence's procurement strategy. This is best reflected in the decision to participate in the JSF program.

2.4 The remainder of the chapter will review several strategic concepts which have arisen over the course of the inquiry and their impact on the maintenance of Australia's regional air superiority. They are:

- network-centric warfare;
- beyond visual range;
- balanced force structure; and
- asymmetric threats.

## Network-centric warfare

2.5 Network-centric warfare (NCW) is a term which describes how information is gathered by a variety of sources and rapidly disseminated amongst a connected network of land, air and sea forces in order to provide increased situational awareness and the ability to react/strike first.

2.6 One of the reasons for the Government's decision to participate in the JSF program and pursue communication systems such as the AEW&C aircraft, is the recognition that modern warfare, and air warfare in particular, has become network-centric.

2.7 Defence has recognised this for some time. In *Defence 2000 – Our Future Defence Force*, networking was cited as a key characteristic of the Revolution in Military Affairs – the uptake of information technology by armed forces, which continues to impact the ADF.<sup>1</sup>

2.8 Defence's submission to the Committee further established its commitment to network-centric warfare stating that it:

... is moving away from a platform centric approach to warfare and is moving towards a network centric approach with emphasis on information and knowledge superiority.<sup>2</sup>

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1 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, p. 108.

2 Department of Defence, *Submission No. 15, Sub. Vol. 1*, p. 65.

2.9 Professor Ross Babbage described to the Committee the future of the regional air defence environment:

Air superiority will not be achieved simply by operating advanced fighter aircraft. Key elements will include space based sensors, high altitude surveillance sensor of various sorts, over the horizon radar systems, [AEW&C], other electronic sensor systems and so on.<sup>3</sup>

2.10 Professor Babbage notes that these elements will be 'highly networked' thereby enhancing the ADF's ability to maintain regional air superiority.<sup>4</sup>

2.11 This description echoes Defence's plan for the future Air Force air combat capability. The plan includes three phases:

- current equipment upgrades and bi-lateral exercises;
- the introduction into service of a number of new systems and upgrades to existing platforms; and
- the future purchase of the JSF.<sup>5</sup>

2.12 Defence expects that the continued systems upgrades and acquisitions will ensure that Australia maintains an air combat capability edge in the region. The final phase, in particular, is expected to provide a:

... quantum leap in Air Force air combat capability for Australia both, because of the capabilities of the JSF itself and also because of what it will bring as part of the overall networked ADF capability.<sup>6</sup>

2.13 The advantage of a highly networked ADF was also highlighted by Dr Alan Stephens, who noted that the continued integration of networked sources in the ADF will result in 'an unequalled degree of situational awareness, which historically has represented a combat advantage of the highest order.'<sup>7</sup>

2.14 Despite the advantages networking presents to Australia's regional air superiority capability, challenges remain. Dr Stephens commented that 'if network systems are to realise their full

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3 Professor Ross Babbage, *Transcript 31 March 2006*, pp. 26-7.

4 Professor Ross Babbage, *Transcript 31 March 2006*, pp. 26-7.

5 Department of Defence, *Submission No. 15, Sub. Vol. 1*, pp. 66-7.

6 Department of Defence, *Submission No. 15, Sub. Vol. 1*, p. 67.

7 Dr Alan Stephens, *Submission No. 1, Sub. Vol. 1*, p. 5.

potential, very significant developments in how Defence Forces work together will be required.’<sup>8</sup>

- 2.15 Dr Stephens was referring to the need to overcome what he described as ‘powerful cultures’ within the individual services which have the potential to hinder the effectiveness of joint warfare capabilities. Dr Stephens did point out, however, that Australia’s individual services undertake integrated operations ‘very well.’<sup>9</sup>
- 2.16 Dr Stephens’ comments were a reminder to the Committee that networked systems, while representing a marked advantage in war fighting capability, are still vulnerable to a variety of factors. The Committee noted that ‘the strengths of the JSF and anything else ... the network-centric approach to warfare are also the weaknesses.’<sup>10</sup>
- 2.17 Dr Kopp noted the advent of Russian long-range missiles that have been designed to destroy AEW&C aircraft. He was concerned that unless Australia possessed a fighter plane which could push out beyond the network and hunt down fighters carrying these missiles, the system could be at risk.<sup>11</sup>
- 2.18 A submission by Dr Jensen MP also cautioned that the ‘jamming of the network data links by an enemy would essentially reduce the networked fleet to the capabilities of ... individual platforms.’<sup>12</sup>
- 2.19 The Committee posed these scenarios to Professor Babbage who commented that while these were important issues, new systems in development and a commitment to a ‘multilayered’ approach to defence would overcome these challenges.<sup>13</sup>
- 2.20 Professor Babbage stated that the advantages to having a networked system overcame any potential challenges as long as the network is robust, enduring and long-range.<sup>14</sup>

## Beyond visual range

- 2.21 Defence strategists consider beyond visual range (BVR) to be the future of air combat. Dr Stephens told the Committee that ‘there is a

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8 Dr Alan Stephens, *Transcript 31 March 2006*, p. 20.

9 Dr Alan Stephens, *Transcript 31 March 2006*, p. 20.

10 Committee, *Transcript 31 March 2006*, p. 36.

11 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 6.

12 Dr Dennis Jensen MP, *Submission No. 21, Sub. Vol. 2*, p. 248.

13 Professor Ross Babbage, *Transcript 31 March 2006*, p. 37.

14 Professor Ross Babbage, *Transcript 31 March 2006*, p. 37.

consensus amongst air defence professionals that the key to victory in the twenty-first century will be to dominate the beyond visual range domain.<sup>15</sup>

2.22 In the BVR domain enemy targets are destroyed by missiles far beyond the sight of those who have launched them. First detection means the first kill. Having networked systems allows for the greater possibility of early detection, thereby ensuring success.

2.23 Air Marshal Shepherd told the Committee that Defence now has long-range stand-off missiles and gave his vision of the future:

I hope that my fighter pilots of the future never get to see an enemy aeroplane unless it is in the data-linked image that is sent back from the long-range missile as it is about to hit one and blow it up.<sup>16</sup>

2.24 In contrast, Dr Jensen MP warned in his submission that:

The Department of Defence is being naïve if it believes that all air combat in the future will take place in the beyond visual range arena, with combat never getting to the merge.<sup>17</sup>

2.25 Dr Jensen MP cited several historical examples when strategic assumptions were proved wrong and noted that even the JSF still carries a gun.<sup>18</sup>

## Balanced force structure

2.26 A balanced force structure, in the Australian context, refers to the need to balance limited resources amongst the Air Force, Army and Navy in order to achieve the best possible outcomes to meet Australia's national interests.

2.27 To ensure regional air superiority, Defence has argued that Australia 'cannot buy an air defence force or an air superiority force at the expense of other aspects of a balanced Defence Force.'<sup>19</sup>

2.28 The concept of a balanced Defence Force becomes important when considering the decision to purchase the JSF, retire the F-111s and

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15 Dr Alan Stephens, *Submission No. 1, Sub. Vol. 1*, p. 6.

16 Air Marshal Shepherd, *Transcript 31 March 2006*, p. 60.

17 Dr Dennis Jensen MP, *Submission No. 21, Sub. Vol. 2*, p. 249.

18 Dr Dennis Jensen MP, *Submission No. 21, Sub. Vol. 2*, p. 249.

19 Air Marshal Shepherd, *Transcript 31 March 2006*, p. 54.

upgrade the F/A-18 Hornets – all issues which will be covered later in this report.

## Asymmetric threats

- 2.29 The word asymmetry, in a strategic context, can be used in several ways. It may refer to an engagement between dissimilar forces or the use of a different strategy to gain an advantage over an adversary. In the context of this inquiry, the word asymmetric is used to describe threats such as terrorism, information warfare and the use of weapons of mass destruction.
- 2.30 Australia's ability to maintain regional air superiority must be based, in part, on its ability to counter asymmetric threats. This inquiry has examined the impact of asymmetric threats on Defence's plan for the future Air Force combat capability.
- 2.31 Some commentators, including Defence, are confident that the current plan for the future Air Force combat capability, which includes the purchase of the JSF, addresses potential asymmetric threats facing Australia.<sup>20</sup>

## Committee comment

- 2.32 The Committee has been provided with a broad outline of the various strategic concepts which underpin the Government's decision's regarding the future air combat capability plan. Australia must continue to recognise and integrate new strategic considerations, such as network centricity, into its defence planning in order to maintain air superiority in the region.
- 2.33 The Committee recognises that capability requirements must be viewed in the context of both existing and projected strategic considerations, as well as developments in war fighting and technology.

## Regional strategic assessment

- 2.34 Integral to the debate surrounding the best future Air Force air combat capability is the strategic foundation upon which the plan is
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20 See Professor Ross Babbage and Defence evidence, *Transcript 31 March 2006*, pp. 26–40 (esp. p. 32 and p. 40).

based. Defence told the Committee that its strategic guidance is contained in the *Defence 2000 – Our Future Defence Force*.<sup>21</sup> This guidance provides the basis for Defence planning.

- 2.35 Some evidence received by the Committee took issue with the strategic basis upon which Defence is making its decisions. This evidence provided an alternate view of the strategic challenges facing Australia.

## The Defence perspective

- 2.36 Mr Pezzullo, Deputy Secretary Strategy, advised the Committee that Defence bases its decisions on the guidance it receives from the Government. In the case of the future air combat capability plan, the strategic underpinnings of Defence's decisions are based on the *Defence 2000 – Our Future Defence Force* and subsequent guidance from updates such as the *Defence Update 2005*.<sup>22</sup>
- 2.37 Government's most recent strategic assessment can be found in the *Defence Update 2005* under the heading 'The Growth of Regional Military Capabilities.' This section acknowledges that 'military capabilities in the Asia Pacific region are growing,' and notes that disparities are appearing between the military capacity of larger and smaller countries in the region. The report also states that:
- ... middle-level powers [in the region] will seek to extend their capacity to project power and to gain further advantage from networking and the fusion of intelligence, surveillance and reconnaissance systems.<sup>23</sup>
- 2.38 Defence defines 'the region' as 'the nations and environs of South East Asia and the South West Pacific,' and advised the Committee that any operations beyond the region 'would be part of a wider coalition and any capability comparison would require a comparison of the coalition capability rather than just that of Australia.'<sup>24</sup>
- 2.39 Defence is confident that the current future Air Force air combat capability plan, which is explained in detail in Chapter 3, more than

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21 Mr Michael Pezzullo, *Transcript 31 March 2006*, p. 41.

22 Overview of the *Defence 2000 – Our Future Defence Force* and subsequent Defence Updates can be found in Chapter 3.

23 Department of Defence, *Australia's National Security – A Defence Update 2005*, December 2005, p. 5.

24 Department of Defence, *Submission No. 15, Sub. Vol. 1*, p. 64.

adequately addresses the strategic guidelines established by the Government.

## Different perspectives

### The ability of regional countries to achieve a network-centric warfare model

2.40 Dr Stephens expanded on the Defence position, noting that although countries in the region will attempt to network, as the 2005 update suggests, no other state, with the exception of India, China and perhaps Singapore, can:

... realistically aspire to assemble the essential combination ... of high-quality people, advanced technologies, robust indigenous R&D [research and development], the right ideas and the economic strength.<sup>25</sup>

2.41 When questioned further about what the Committee considered to be a potentially dangerous assumption, Dr Stephens observed that Defence Forces in the region faced organisational barriers between the services which hindered their ability to implement a joint warfare model.<sup>26</sup>

2.42 Dr Kopp did not believe that Dr Stephens assertion was a reasonable one and cited the following points to support his claim:

- the large and growing populations of regional countries will enable them to source the necessary talent to implement NCW models;
- the standard of education and training across the region is improving; and
- new technology is highly automated and therefore easily operable for those with very low skills.<sup>27</sup>

### Redefining the definition of the region

2.43 Dr Kopp and Mr Goon are also of the opinion that the strategic basis upon which Defence is making its decisions is flawed. In particular, they believe that the Government definition of 'the region' should be widened in order to address new geo-strategic realities:

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25 Dr Alan Stephens, *Transcript 31 March 2006*, p. 19.

26 Dr Alan Stephens, *Transcript 31 March 2006*, p. 20.

27 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 9.

There is a basic issue of how we define the region and how we plan our force structure. The idea that the near region – and this covers the South East Asian nations – is virtually our sole concern because of geographical proximity is really predicated on the idea that this is the only land mass from which you can launch aircraft into Australian airspace. That assumption is no longer true.<sup>28</sup>

2.44 Dr Kopp and Mr Goon noted that countries such as China and India have the ability to reach into Australian airspace in a limited capacity and that defence planning needs to address this issue by ensuring that Australia is able to discourage countries such as China from ‘even contemplating a coercive political play.’<sup>29</sup>

2.45 Defence’s response to this suggestion reiterated its previous comments that any military engagement with forces beyond the Government’s definition of the region would be an operation undertaken by a coalition of national armed forces.

2.46 Mr Pezzullo advised the Committee that:

The scenario [military conflict with China or India] is predicated upon a massive erosion of US military and strategic capability ... and Australia having to operate independently beyond our immediate region ... [this] is a radically different set of circumstances which, I must say, I do not necessarily see even in the most speculative parts of my crystal ball ... The only basis upon which I could see that arising would be through a massive political rupture of the relationship [Australia/US] ... and a massive erosion of the US military capability edge.<sup>30</sup>

## Committee comment

2.47 Regional countries will continue to advance their air warfare capabilities. Providing Australia continues to implement new and enhanced capabilities and does not underestimate the capacity of others, the chances for maintaining regional air superiority are good.

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28 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 8.

29 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 8.

30 Mr Michael Pezzullo, *Transcript 31 March 2006*, p. 42.

- 2.48 Defining a region can be an ambiguous process – the exact nature of what constitutes Australia’s region only has meaning within the overall context of a particular strategic view. The current strategic view is that which is set out in the *Defence 2000 – Our Future Defence Force* and subsequent updates.

## Current Capability Planning

### Introduction

- 3.1 In order for the ADF to effectively deliver the capability required to support the achievement of national interests and objectives, it must be underpinned by a planning process designed to ensure the correct and appropriate mix of platforms, systems, weapons and trained personnel. The strategic guidance given to the ADF by Government determines the manner in which this appropriate force mix is achieved.
- 3.2 As mentioned in Chapter 1, the foundation document from which ADF force planning and capability development decisions are made is the *Defence 2000 – Our Future Defence Force*. Strategic planning cannot remain static, because the world environment does not remain static. Accordingly, the *Defence 2000 – Our Future Defence Force* has been further developed and built on by the *Defence Update 2003* and the *Defence Update 2005*. These updates incorporated guidance informed by the prevailing threats and challenges and sought to ensure that the ADF remained a force capable of meeting future military challenges.
- 3.3 This chapter will examine the strategic guidance that underpins the capability development processes for the ADF as well as the current capability plan and the Hornet Upgrade (HUG) program. Issues involving the F-111 will be discussed in the next chapter.

## White Paper overview

- 3.4 The *Defence 2000 – Our Future Defence Force* outlines Australia's strategic interests and objectives:
- ensure the defence of Australia and its direct approaches;
  - foster the security of our immediate neighbourhood;
  - promote stability and cooperation in Southeast Asia;
  - support strategic stability in the wider Asia Pacific region; and
  - support global security.<sup>1</sup>
- 3.5 Furthermore, the White Paper sets out the capability priorities for the ADF to achieve the strategic tasks above. Specifically, Australia needs a balanced and integrated force able to deliver two key sets of capabilities:
- Maritime – mostly air and naval forces; and
  - Land – including the air and naval assets needed to deploy and protect them.
- 3.6 Government decisions with regard to ADF capability development are guided by the following principles:
- operational flexibility – ensuring capability that is broad enough to meet a range of scenarios across a spectrum of credible situations;
  - integrated capability – optimising all the elements of capability: personnel, training, support, maintenance, logistics, intelligence, doctrine, platforms, etc;
  - interoperability – across the ADF and with allies and coalition partners;
  - fully developed capability – ensuring that the required level of capability exists across the ADF to achieve key tasks;
  - capability edge – more than just platforms and systems, rather the effective use of people, technology, training, doctrine, organisation and logistics;
  - operational concurrency – the ability to undertake more than one task at a time;
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1 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, pp. 29–31.

- sustainability – underpinned by an effective approach to long-term recruitment and retention and a capability industry base to draw on for support;
  - technology focus – maximising and exploiting the opportunities offered by the information technology revolution; and
  - cost-effectiveness – to achieve the maximum capability at the lowest possible cost.<sup>2</sup>
- 3.7 The White Paper stated that ‘air combat is the most important single capability for the defence of Australia’ and added that the Government’s aim was to:
- ... maintain the air-combat capability at a level at least comparable qualitatively to any in the region, and with a sufficient margin of superiority to provide an acceptable likelihood of success in combat.<sup>3</sup>
- 3.8 As briefly outlined in Chapter 1, the White Paper identified three major challenges facing the ADF in meeting this capability goal:
- first, the growth of the air combat capabilities of regional Defence Forces was assessed as eventually seeing the F/A-18 aircraft ‘outclassed’ and that this emerging deficiency would have to be addressed;
  - second, an AAR capability was critical to optimise range and endurance of the air combat fleet, to support not only an air superiority task, but also for air support to surface ship deployments and deployed land forces; and
  - third, the future of Australia’s air combat capability after the F/A-18 reached the end of its service life between 2012 and 2015 had to be addressed.<sup>4</sup>
- 3.9 In order to meet the strategic interests and objectives of the White Paper, to ensure that stated capability priorities are achieved, and that Australia’s air combat capability is maintained given the challenges outlined above, the Government planned the following:
- continuation of the upgrade program for the F/A-18 aircraft;
  - acquisition of AEW&C aircraft;

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2 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, pp. 53–7.

3 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, p. 85.

4 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, pp. 85–6.

- acquisition of aircraft to upgrade the AAR capability with the platforms also capable of providing an additional airlift capability; and
- examination of options for acquiring new air combat aircraft to replace the F-111 and F/A-18 fleets with provision being made in the *Defence Capability Plan* for a project to acquire up to 100 new combat aircraft.<sup>5,6</sup>

## Defence Updates 2003 and 2005

- 3.10 The *Defence Update 2003* and the *Defence Update 2005* further developed and built on the *Defence 2000 – Our Future Defence Force*. These updates provided strategic, capability and force structure guidance that was informed by the prevailing threats and challenges and sought to ensure that the ADF remained a force capable of meeting future military challenges. However, the fundamentals of the White Paper remain ‘sound and well-grounded.’<sup>7</sup>
- 3.11 The evolutionary nature of structuring and optimising the capability delivered by the ADF is such that some of the challenges identified in 2000 have been addressed. Since that time, a range of projects have commenced, or been announced, to expand and enhance the air power capability of the Air Force. For example:
- upgrades to the AP-3C Orion maritime patrol aircraft;
  - phases 2 and 3 of the HUG program;
  - acquisition of new generation AAR aircraft i.e. the MRTT aircraft;
  - acquisition of AEW&C aircraft and supporting systems i.e. simulator;
  - development and installation of Electronic Warfare Self Protection (EWSP) systems;
  - weapons upgrades for selected platforms;
  - acquisition of a heavy lift capability; and

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5 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, pp. 86–7.

6 This project became AIR 6000 – New Aerospace Combat Capability.

7 Department of Defence, *Australia’s National Security – A Defence Update 2005*, December 2005, p. v.

- establishment of Project AIR 6000 – New Aerospace Combat Capability (NACC).
- 3.12 The *Defence Update 2005* acknowledges that the growth of regional military capabilities remains a challenge for Australia and the ADF just as it did in 2000. Accordingly, Government force planning and capability decisions will continue to be informed by such regional factors in conjunction with the broader issues of retaining an ADF sufficiently flexible to meet a range of contingencies:
- In developing future capability the Government seeks to shape a security environment favourable to Australia’s interests ... It means retaining a technological edge. It also means ensuring that the Government has the widest range of options available to respond to possible threats.<sup>8</sup>
- 3.13 Notwithstanding the projects planned and underway to enhance Australia’s air power, or the position stated in the *Defence Update 2005* in relation to managing the regional air superiority balance, submissions to this inquiry have expressed concern that the current force planning is ‘wholly unrealistic given the developing strategic environment, and regional capabilities.’<sup>9</sup> The strategic environment and the key political, resource and national interest drivers in relation to Defence capability planning were discussed in more detail in Chapter 2.
- 3.14 Strategic imperatives, the guiding principles outlined above, examination and analysis of the challenges identified and future roles and responsibilities of the Air Force, combined with the necessity of maintaining a balanced and flexible ADF, have informed Government decision-making in relation to Australian’s future air combat capability requirements.

## Current planning

- 3.15 The current *Defence Capability Plan (DCP 2006-2016)*<sup>10</sup> is the guiding document with regard to the future capability requirements of the

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8 Department of Defence, *Australia’s National Security – A Defence Update 2005*, December 2005, p. 12.

9 Air Power Australia, *Submission No. 20, Sub. Vol. 2*, p. 162.

10 Department of Defence, *2006–2016 Defence Capability Plan: Public Version (DCP 2006–16)*, June 2006.

ADF. *The Defence Update 2005* fed into the capability review process and largely influenced the *DCP 2006-2016*. This DCP is intended to bring the ADF's 'equipment acquisition and capability development strategy over the next decade into line with [the] increasingly complex security situation.'<sup>11</sup>

3.16 The *DCP 2006-2016* addresses a range of aerospace related projects, all of which contribute to achieving a capable and joint ADF. For a nation like Australia, with a vast land mass, extensive borders, a relatively small population and limited resources, 'capability decisions will continue to emphasise the importance of joint warfighting and of the ADF developing as a fully networked force.'<sup>12</sup> There were divergent submissions to this inquiry in relation to the priority that is placed on the pursuit of 'jointness' and the faith in a 'networked force' as the answer to success in future warfighting.

3.17 In their submission, Dr Kopp and Mr Goon advised the following:

In strategic terms Australia's small population base and small industrial base, by regional standards, makes it imperative that Australia retain the capability to achieve and maintain air superiority over any regional opponent ... Australia can afford to compromise in its Army and Navy capabilities, but it cannot afford to compromise in Air Force capabilities.<sup>13</sup>

3.18 Further, Dr Kopp advised the Committee that 'Defence have misunderstood the relationship between capability and networking'<sup>14</sup> and that the force structure 'model that Defence are proposing cannot deliver what they believe it can deliver.'<sup>15</sup>

3.19 The main projects in relation to maintaining Australia's air superiority are:

- AIR 5376 Phases 2 and 3 – ongoing systems and structural upgrades and enhancements to the F/A-18 as part of the HUG;<sup>16</sup>

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11 Minister for Defence Media Release 097/2006, *\$51 Billion Defence Capability Plan for 2006-2016*, 20 June 2006.

12 Department of Defence, *Australia's National Security – A Defence Update 2005*, December 2005, p. 20.

13 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 175.

14 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 5.

15 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 6.

16 Department of Defence, *2004-2014 Defence Capability Plan: Public Version (DCP 2004-14)*, November 2003, p. 24.

- AIR 5409 – Bomb Improvement Program – acquisition of a system to provide all-weather and improved accuracy delivery of MK-80 and BLU-109 series bombs;<sup>17,18</sup>
- AIR 5418 – Follow-on Stand-off Weapon Capability – acquisition of a long range stand-off air to surface weapon to improve the ADF’s strike capability against fixed and relocatable targets on land and in the littoral environment;<sup>19,20</sup> and
- AIR 6000 – NACC – this project was established in 1999 in order to ‘identify and acquire a NACC to replace the air dominance and strike capabilities currently provided by the F/A-18 and F-111 aircraft fleets.’<sup>21</sup>

3.20 The remainder of this Chapter, and Chapters 4 and 5, address various projects, pre-conditions and planned activities to progress the transition to Australia’s future air combat capability.

## Hornet Upgrade program

3.21 Australia’s F/A-18 Hornet fleet is being upgraded to ensure the continuation of an effective air combat capability as the ADF transitions to the new air combat aircraft. The AIR 5376 upgrade and enhancement program for the Hornet fleet has been underway since the late 1990s and will continue until around 2014 by at which time the fleet will have been upgraded. Defence believes that once the Hornet upgrades have been completed, the aircraft will:

... provide a similar avionics capability to the new Super Hornet [and] when combined with new all-weather precision and stand-off weapons and supported by the new Airborne Early Warning and Control aircraft and multi-role tanker transport, will provide us with a formidable networked air

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17 Department of Defence, *2004–2014 Defence Capability Plan: Public Version* (DCP 2004–14), November 2003, p. 29.

18 In October 2005, the Boeing Joint Direct Attack Munition (JDAM) solution was selected as the preferred tenderer for this capability.

19 Department of Defence, *2004–2014 Defence Capability Plan: Public Version* (DCP 2004–14), November 2003, p. 35.

20 In February 2006, the Lockheed Martin Joint Air-to-Surface Stand-off Missile (JASSM) was selected to deliver this capability.

21 Department of Defence, *2001–2010 Defence Capability Plan: Public Version* (DCP 2001–10), June 2001, p. 57.

superiority system of systems that is, without doubt, second to none in the region.<sup>22</sup>

3.22 A brief overview of the HUG phases follows:

- Phase 1 has been completed and involved: enhancement of the aircraft's communication anti-jamming capability, upgrade of the mission computers, installation of an additional data bus, improvement in target identification and improvement in navigation and situational awareness.
  - ⇒ Phase 1 also implemented upgrades to the associated F/A-18 maintenance, software and training support infrastructures.
- Phase 2 seeks to incorporate advanced avionics and weapon systems and includes the following sub-phases:
  - ⇒ Phase 2.1 (completed) – replacement of the Fire Control Radar and introduction of an Enhanced Interference Blanking Unit.
  - ⇒ Phase 2.2 (approved) – incorporation of a secure jamming-resistant Link 16 Data Transfer System, a full colour Display Upgrade, a Digital (Moving) Map System, the Joint Helmet Mounted Cueing System, and the upgrade of the Counter Measures Dispensing System (CMDS).
  - ⇒ Phase 2.3 (approved with the exception of the complementary radio frequency jammer) – upgrade of Electronic Warfare Self-Protection (EWSP), including replacement of the Radar Warning Receivers and further upgrades to the CMDS.
  - ⇒ Phase 2.3C – procurement of a complementary radio frequency jammer to finalise the EWSP capability upgrade for the aircraft.
  - ⇒ Phase 2.4 (approved) – improvement to detection, identification, precision targeting and damage assessment phases of counter air, strike and offensive air support operations currently supported by the AN/AAS-38 Nite Hawk targeting Forward Looking Infra-Red pod.
- Phase 3 seeks to restore the structural life of the aircraft airframe to enable transition to the NACC. This phase comprises structural refurbishment programs as follows:
  - ⇒ Phase 3.1 (approved) – the design, development and installation of minor structural modifications and inspections required half way through the fatigue life of the aircraft. This phase will

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22 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 39.

address the most immediate deficiencies and ensure structural integrity through to Phase 3.2.

- ⇒ Phase 3.2B (approved) – involves a program featuring the replacement of a number of discrete structural components and all preparatory activity to conduct an aircraft centre barrel replacement program.
- ⇒ Phase 3.2C – involves the procurement and installation of centre barrel modification kits to provide sufficient aircraft structural life to transition the air combat capability from F/A-18 to the NACC.<sup>23</sup>

3.23 In addition to the HUG program, the Hornet aircraft will have their power projection capabilities enhanced through the acquisition of new and improved weapons, as discussed earlier in this chapter. Specifically, acquisition of the Joint Direct Attack Munition (JDAM) will equip Hornets with:

... new 'smart' bombs that will provide a state-of-the-art weapon capability that can be accurately fired during the day or night and all weather conditions.<sup>24</sup>

3.24 The acquisition of the Joint Air-to-Surface Stand-off Missile (JASSM) will provide the F/A-18 fleet with a new long-range air-to-surface missile. The acquisition of the JASSM ensures that 'Australia retains its strike capability so Australian objectives can be met whilst maintaining the safety of aircraft and crews.'<sup>25</sup>

3.25 Dr Kopp and Mr Goon believe that:

The planning model devised for the interim F/A-18A capability is not viable as the return on investment in capability and the additional service life is very poor, while incurring significant risk.<sup>26</sup>

3.26 It has also been suggested that the funding allocated to the Hornet upgrade could achieve a better outcome for Australia if it was directed towards keeping the F-111 in service. Dr Kopp and Mr Goon note that 'early retirement of the F-111 and the resulting diversion of

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23 Department of Defence, *2006–2016 Defence Capability Plan: Public Version* (DCP 2006–16), June 2006, p. 19.

24 Minister for Defence Media Release 174/2005, *New 'Smart' Bombs for Australia's F/A-18 Aircraft*, 19 October 2005.

25 Minister for Defence Media Release 019/2006, *New Missiles for the Australian Defence Force*, 28 February 2006.

26 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 207.

F-111 funding to the F/A-18 is probably a blunder of multi-billion dollar proportions.’<sup>27</sup>

- 3.27 Nonetheless, Defence remains confident that upgrading the Hornet is the best approach to ensure Australia’s air superiority until the NACC is in service. This position, including the proposed transition plan to the NACC, while maintaining a viable air power capability, was previously advised to the Committee during the review of the *Defence Annual Report 2002–03*.<sup>28</sup> For example, Defence advised the Committee that:

The reason we planned those upgrades to the F/A-18 was to cater for exactly the sorts of developments that we are now seeing in the region ... Once we have those upgrades I think we will be more than a match for the opposition, particularly when supported by AEW&C, air-to-air refuelling tankers ...<sup>29</sup>

- 3.28 Given the strong differing positions between Defence and Dr Kopp and Mr Goon in relation to the Hornet upgrades, associated costs and the regional strategic viability of an upgraded Hornet, the Committee chose to seek comments from other witnesses about the issue.

- 3.29 Dr Alan Stephens accepted that the HUG program was an expensive undertaking and that there was uncertainty in relation to operating the upgraded Hornet should the introduction of the NACC be delayed, nonetheless, he told the Committee:

Unlike the F-111 which has no legitimate control of the air role – a very marginal role – the F/A-18 will at least provide us with control of the air, strike and a whole range of options. The addition of the JASSM – which is stealthy and with a range of ... about 400 kilometres – is not to be lightly dismissed. It would capture the attention of the people whose attention we want to capture.<sup>30</sup>

- 3.30 Professor Ross Babbage advised the Committee that he supported the logic of the Hornet upgrade, including the centre-barrel replacements, for a range of reasons:

The costs of running the F-111 longer are very much more substantial [than the Hornet] and provide a lesser return, in

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27 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 3.

28 Department of Defence, *Supplementary Submission No. 4, Defence Annual Report 2002-03, Air Combat Capability*, June 2004.

29 Air Marshal Angus Houston, *Transcript 15 December 2003*, p. 51.

30 Dr Alan Stephens, *Transcript 31 March 2006*, pp. 22-3.

my view, than a rebarreling option ... The advantage of that is that not only do you get a fighter-bomber aircraft that can sustain itself reasonably well through the whole crossover phase of JSF introduction ... but you also have the opportunity of, if you wish, expanding, by strapping other weapons on it ... It seems to me that that is a better payoff.<sup>31</sup>

## Committee comment

- 3.31 Current planning for Australia's future air combat capability has been underpinned by Government strategic guidance with the cost effective delivery of capability, as well as balance across the ADF, as key drivers.
- 3.32 The HUG program, and the introduction into service of the enabling capabilities to support the retirement of the F-111 and the transition to the JSF, is a highly complex undertaking. The many interdependent activities associated with this transition, including the management of a potential 'capability gap', are all aspects of managing the risks associated with the successful maintenance of Australia's regional air superiority.

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31 Professor Ross Babbage, *Transcript 31 March 2006*, p. 29.



## F-111 Withdrawal from Service

### Technical and maintenance considerations

- 4.1 In addressing Australia's future strike capability requirements, the *Defence 2000 – Our Future Defence Force* projected that the retirement of the F-111 fleet would likely occur in the 2015–2020 timeframe. The White Paper further went on to observe that it would be:
- ... unlikely that there will be any comparable specialised strike aircraft suited to our needs available at that time ... [and] the best option may be specialised strike variants of air combat aircraft. This would allow the replacement of the F-111 by the same type of aircraft as we buy to follow the F/A-18 ...<sup>1</sup>
- 4.2 The Defence Capability Review conducted in 2003 revised the withdrawal from service date of the F-111 to around 2010. This new timeframe reflected the rebalancing of the ADF's structure and capabilities that occurred following the release of the *Defence Update 2003* and subsequently reflected in the *Defence Capability Plan 2004–2014*. This timeframe continues to underpin Defence planning with regard to air superiority and is again reflected in the latest capability planning document, the *Defence Capability Plan 2006–2016*.
- 4.3 There has been much debate in the media and amongst air power commentators with regard to the decision to change the planned

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1 Department of Defence, *Defence 2000 – Our Future Defence Force*, December 2000, p. 93.

withdrawal date of the F-111. During his opening statement to the public hearing on 31 March 2006, the Chief of Air Force addressed the issue of the revised timeframe for the withdrawal of the F-111. Specifically, he outlined the Defence position as being based on minimising the risks associated with operating an ageing aircraft and ensuring an ongoing effective balance across ADF capability:

When you add up the structural risk, the system risk, the support risk, the financial risk and the overall risk to capability, you have a clear and undeniable question about the viability of the F-111 beyond the period when we plan to withdraw it. And all these risks increase as the aircraft age. At the end of the day, my job and the job of all of us here is to minimise strategic risk for Australia. Clearly to go down such a path with these sorts of costs is irresponsible, and the funding pressures would put at risk our balanced land, maritime and air capabilities. We need to decide when to retire the F-111 so that we can manage the transition to the new air combat capability without risk to our overall capability – not be forced to do it at an indeterminate time of the aircraft's choosing. We need to confidently plan for our future, not leave it to chance.<sup>2</sup>

- 4.4 At the public hearing on 5 July 2006, Defence also advised that the revised planned withdrawal date was influenced by maintenance issues and concerns that had previously been unknown, specifically, the failure of a fatigue test conducted on the aircraft wings. Defence commented that:

Probably the most defining event was in the middle of that period [between the 2000 White Paper and Defence Update 2003] – that is, the fatigue test article failure in 2002 ... that caused a fairly substantial rethink as to the supportability of the F-111 and how we could manage it.<sup>3</sup>

- 4.5 Given the conviction with which many commentators have suggested that the F-111 could be upgraded, and its service life extended, the Committee pressed Defence for further information on this matter. Defence and industry contractors providing the maintenance support to the F-111 made the following general comments about extending the aircraft's operational life:

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2 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 40.

3 Group Captain Adrian Morrison, *Transcript 5 July 2006*, p. 5.

We have updated the F-111 to get us through to a planned withdrawal in 2010 or 2012 ... Beyond that, its ability to be viable in a number of defence scenarios diminishes over time.<sup>4</sup>

At the moment, we see nothing which would prevent us going beyond that timeframe [2010]. However ... as the aircraft gets older, there is an element of risk ... there is a risk of having problems that we do need to solve increasing the cost, perhaps reducing some of the capability ...<sup>5</sup>

From an engineering perspective, this aircraft is certainly capable of performing until 2012 and beyond, but at some point, you will obviously need to make further investment depending on how far you want to take it.<sup>6</sup>

... we have made plans ... up to 2012. Probably the impediments [to extending] would be things like support and test equipment that would need to be upgraded, because some of that is old technology.<sup>7</sup>

- 4.6 The Committee also sought comment from the Officer Commanding No. 82 Wing, a F-111 pilot, on extending the aircraft's operational life. In response to Committee questioning, the Officer Commanding stated:

... from the point of view of a pilot ... I believe that the amount of dollars and effort required to get a very small increase in its current capability is not an option that we would want to take up.<sup>8</sup>

- 4.7 Where extension of aircraft life has been discussed in the media and by specialist commentators, the B-52 Bomber is regularly referenced as an excellent example of the longevity that can be achieved through upgrades and enhancements.
- 4.8 The Committee sought comment from Defence as to why the F-111 could not be extended in service when the United States clearly has the intention to do so with a similarly ageing aircraft; i.e. the B-52. Defence advised that the two aircraft were quite different and that direct comparisons were difficult, specifically:

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4 Group Captain Gavin Davies, *Transcript 5 July 2006*, p. 3.

5 Group Captain Adrian Morrison, *Transcript 5 July 2006*, p. 3.

6 Mr Geoff Webb, *Transcript 5 July 2006*, p. 3.

7 Mr Daryll Macklin, *Transcript 5 July 2006*, p. 4.

8 Group Captain Gavin Davies, *Transcript 5 July 2006*, p. 6.

... they are very different beasts [sic] in the way they have been manufactured and in the access to structure and things like that. In a tactical fighter aircraft like the F-111, there is not a lot of space to get in easily ... The F-111 is a very special beast [sic] in terms of the type of technology that has been used in the aircraft. If you compare that to, say, a B-52, you probably have more airline type technology coming into play ... Ultimately you have to simply look at issues such as fatigue life, wear, the nature of operations of the aircraft and so on ... Are you operating in a benign environment or are you, for example, operating an aircraft at 30,000 feet straight and level for five-hour missions or operating at 200 feet in excess of Mach 1 and pulling lots of G all the time.<sup>9</sup>

- 4.9 Defence concluded that while the aircraft could be technically maintained to 2020, the performance in operational roles would diminish and that it would require:

... a substantial upgrade to not only basic aircraft systems, but also avionics and so on, just to give it both maintainability and supportability ... we would probably need to remanufacture wings ... [and] if we were going to do that for the next 30 or 40 years I think we would want to try and redesign it ... So it is not impossible, but I am beginning to wonder why.<sup>10</sup>

- 4.10 Furthermore, in addition to risks to the aircraft and the delivery of capability, Defence also believes that there would be risks to Australian industry with extending the operational service of the F-111. The Chief of Air Force advised the Committee that:

We know completely the ability of Australian industry to support this aircraft now, and we are not sanguine at all that a major upgrade would be achievable and supportable within Australia.<sup>11</sup>

- 4.11 While industry contractors expressed confidence in their technologies, workforces and their ability to provide ongoing support to the F-111, they nonetheless accepted that there would be increasing risks and cost pressures. While approximately 70 percent of the life-of-type spares were purchased from surplus United States stock, some of the

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9 Group Captain Adrian Morrison, *Transcript 5 July 2006*, pp. 12-13.

10 Group Captain Adrian Morrison, *Transcript 5 July 2006*, p. 28.

11 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 40.

original equipment manufacturers (OEM) are scaling back, or ceasing production, of some of the components and parts. In addressing this issue, Rosebank Engineering advised that:

A lot of effort would need to go into components spares but, having said that, we are doing that along the way ... Rosebank has done reverse engineering many times in the past where there is no OEM support ...<sup>12</sup>

- 4.12 In relation to ensuring a timely, and ongoing supply of spares, the manager of the F-111 Engines Business Unit commented that:

Some of those spares would have to be manufactured, and it takes companies a lead time of anything up to two years ... to go back into production ... We would have to assume that the cost of spares would increase ...<sup>13</sup>

- 4.13 In relation to spares and ongoing future availability, particularly as OEM suppliers cease to manufacture them, Raytheon advised the Committee:

We have OEM suppliers now who are telling us that they do not want to undertake these activities in the future ... So we are undertaking life of type buys now ... I can undertake a buy now or later, but it might cost me if I do it later because I will have to ask that support base to retool and remanufacture.<sup>14</sup>

- 4.14 Tasman Aviation Enterprises also expressed the belief that supportability of the aircraft can be achieved, but that there are difficulties, particularly to do with the 'scale' of production runs:

We can manufacture most of the aeroplane. There are some parts that we are not going to be able to do in Australia, because the technology or the equipment is not here ... How we come up with ways of solving unique problems that a sole operator brings is going to come up in the future, and volume is going to be the issue.<sup>15</sup>

- 4.15 However, Tasman Aviation Enterprises emphasised that while reverse engineering and innovative design analysis has enabled the

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12 Mr Daryll Macklin, *Transcript 5 July 2006*, p. 4.

13 Mr John Duff, *Transcript 5 July 2006*, p. 10.

14 Mr Mark Harling, *Transcript 5 July 2006*, p. 12.

15 Mr Andrew Sanderson, *Transcript 5 July 2006*, p. 14.

F-111 maintenance teams to sustain a viable spares base, to do so into the future may not be possible:

A lot of the way the aeroplane was built was welding steel together in a unique process, certainly around the wings. There will be a new technology that would have to be brought into Australia ...<sup>16</sup>

4.16 Dr Kopp and Mr Goon submit that early retirement of the F-111 will result in 'significant loss of employment in domestic systems integration and aerospace industry sector, including training positions.'<sup>17</sup> The Committee therefore sought industry comment as to the business, expertise and training impacts of withdrawal of the F-111.

4.17 The industry contractors who appeared as witnesses were generally positive as to their ability to plan and structure their workforces to transition to other aviation business when the F-111 retired, including balancing retention of unique technical expertise until the retirement date. The biggest issue requiring management from their perspective was ensuring predictability of the withdrawal date to enable them to effectively and efficiently transition their businesses:

Our [Rosebank] current plans are that we have to look ahead for other avenues ... whether it be aviation or whether we support it. But certainly, whatever we do, we will still retain the core skills that we have developed and learned from.<sup>18</sup>

F-111 occupies about 60% of [Tasman Aviation Enterprises] ... so we are actually diversifying beyond the F-111 so we can sustain that workforce into the future as well ... so you get a way of continuing the skill set into the future, not just relying on the F-111. There will be a decline as the F-111 withdraws, but we are making sure our forward forecasting is looking at where we can take that group of people ...<sup>19</sup>

Beyond the F-111, from an avionics perspective, there are only a small number of elements that will be replicated in other platforms ... Those people and those skill sets will be

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16 Mr Andrew Sanderson, *Transcript 5 July 2006*, p. 21.

17 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 144.

18 Mr Daryll Macklin, *Transcript 5 July 2006*, p. 15.

19 Mr Andrew Sanderson, *Transcript 5 July 2006*, p. 16.

retained. It is our job as an industry partner to diversify ...  
into other platforms as best we can ...<sup>20</sup>

- 4.18 As the planned withdrawal date nears, different strategies will need to be employed to ensure critical skills are retained. Further, the stockpiling of components and spares needs to be managed, particularly if re-tooling and re-manufacture is required. Nonetheless, all industry witnesses recognised that the F-111 retirement 'will happen one day.'<sup>21</sup>
- 4.19 However, as mentioned above, the ability of industry to plan and transition from the F-111 to future business opportunities is a major requirement, which is based upon being able to work towards a known, and secure, withdrawal date. Raytheon referred to this requirement as 'tenure security.'<sup>22</sup>
- 4.20 Finally, in relation to the maintenance/technical aspects of the F-111 planned withdrawal, submissions to this inquiry have suggested that replacing F-111 engines with F-22 or F15/F16 engines, would provide another means by which the operational life of the aircraft could be extended and the capability effect enhanced.<sup>23</sup> The Committee pursued this proposition during the public hearing at RAAF Base Amberley. Defence advised the Committee that while not impossible to change the engine in a tactical fighter aircraft, such an undertaking is not easy:
- When you start introducing that sort of technology, particularly with such a small fleet, you end up with all of the integration costs but you are not able to amortise it ... So we have to wear all of the qualification testing, the integration and design and so on. It is a very big program we are talking about. As well as that, the scale of the program is such that I think, as we went through it, we would suffer significant aircraft availability problems ... So even if you decided to do this today, it would probably be a decade before you actually came out of it again.<sup>24</sup>
- 4.21 Defence planning therefore remains focussed on withdrawal of the F-111, to 'get off that increasing risk curve at a time of our own
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20 Mr Mark Harling, *Transcript 5 July 2006*, p. 16.

21 Mr Mark Harling, *Transcript 5 July 2006*, p. 16.

22 Mr Mark Harling, *Transcript 5 July 2006*, p. 16.

23 Mr John Peake, *Submission No. 3*; Mr Adam Lane, *Submission No. 19*; and Mr James Sadler, *Submission No. 23*.

24 Group Captain Adrian Morrison, *Transcript 5 July 2006*, p. 28.

choosing.’<sup>25</sup> Defence added that it believes the biggest risk factor is not the risks they are planning to manage and mitigate, but those they have not yet anticipated.

4.22 There has been speculation that the risks as identified by Defence in continuing to operate the F-111 beyond around 2010 are overstated. In 2004, Dr Kopp advised the inquiry into the *Defence Annual Report 2002-03* that Defence had ‘failed to produce a single strategically or technically convincing reason for F-111 early retirement.’<sup>26</sup>

4.23 Again, in a submission to the present inquiry, Dr Kopp and Mr Goon stated that ‘the risks in extending the life of the F-111 are low, and well understood due to the extensive taxpayer investment in the Sole Operator Program [SOP].’<sup>27</sup>

4.24 A submission to the inquiry from Air-Vice Marshal Criss (Retd) supported the Dr Kopp and Mr Goon contention above regarding good risk management and the subsequent development of appropriate risk management strategies:

Good risk management is all about knowing what you know and finding out about those things you don’t know, then putting in place risk-management strategies that ensure the risks do not materialise. The F-111 operates under this strategy in the only true Ageing-Aircraft Program in the ADF. We know the aircraft backwards and we know the risks.<sup>28</sup>

4.25 Defence does not support these contentions regarding risk. Chief of Air Force observed, ‘There are increasing risks. Those risks increase with age. We believe we have those risks managed up to the planned withdrawal date.’<sup>29</sup>

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25 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 44.

26 Dr Carlo Kopp, *Transcript 4 June 2004*, p. 99.

27 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 133.

28 Air-Vice Marshal Criss (Retd), *Submission No. 38, Sub. Vol. 3*, p. 488.

29 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 44.

- 4.26 The F-111 SOP<sup>30</sup> has enabled the RAAF to develop 'an excellent understanding of what it takes to operate and maintain it ... [but] we know there are significant issues to be addressed to extend its life ...'<sup>31</sup> Defence believes that the research and activities that have been, and continue to be, undertaken as part of the SOP, are effectively keeping the F-111 going until the planned withdrawal around 2010, not that the program itself presents the means by which the aircraft life should be extended much beyond that time.
- 4.27 During the public hearing at RAAF Base Amberley, the F-111 maintenance support teams, contractor and Defence witnesses, commented on the successes and positive impact of the SOP on the sustainment of the aircraft. They also noted, however, that:
- If there is a problem that nobody has foreseen ... we will be the first people to find it [and] ... if something does occur, we may not necessarily get a forecast of it ... We are certainly better informed than we were, but there can never be a rock solid guarantee that there will not be another surprise.<sup>32</sup>
- 4.28 Defence categorised the 'risk' issue in terms of three key factors:
- the F-111 is an old aircraft, is very complex technically and as the sole operator, Defence 'cannot turn to anybody else to help us manage [it]';<sup>33</sup>
  - management of those issues that may not be known, but can be anticipated. For example, the aircraft has a test called cold-proof loading test which, according to the Chief Defence Scientist, will see one or more aircraft fail in the near future and those issues will have to be managed;<sup>34</sup> and

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30 The SOP was established in the late 1990s in response to the United States retirement of its F-111 fleet. The RAAF, in partnership with the Defence Science and Technology Organisation (DSTO), stood up the program to deal with the knowledge issues that were going to arise when required to operate the aircraft alone and to fill in the gaps that existed in taking the aircraft past where the USAF had been. The USAF retirement of their F-111s also enabled the RAAF to acquire an expanded inventory of spares and to invest in a number of test programs to identify future maintenance issues. [Witness testimony of AVM Monaghan to public hearing on 4 June 2004 into the Review of the Defence Annual Report 2002-03, Transcript, p. 81.]

31 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, pp. 39-40.

32 Group Captain Adrian Morrison and Mr Geoff Webb, *Transcript 5 July 2006*, p. 11.

33 Dr Roger Lough, *Transcript 31 March 2006*, pp. 44-5.

34 Dr Roger Lough, *Transcript 31 March 2006*, p. 45.

- management of those issues ‘that we do not know we do not know,’<sup>35</sup> that is, unanticipated problems the risk of which occurring accelerates with each passing year.

4.29 To assist the Committee’s understanding of the scope of risk factors that have to be managed, Defence provided the following examples:

- the F-111 ejection system is powered by a rocket motor which ejects the entire crew module. Rocket motors are a safety critical system and manufactured to an exacting standard. These motors generally have a safe life of 20 years. The last one that Defence holds was manufactured in 1997, with most manufactured around 1994-5. Therefore, they run out of life in 2015. To extend beyond that time, which would be ‘extreme’, it would be necessary to ‘start up a defunct production line and who knows what the cost would be, even if they could do it;’<sup>36</sup>
- there were exotic materials used in aircraft built in the 1950s and 1960s that pose unacceptable health and safety issues today, for example, beryllium; and
- pushing the life out much beyond 2012 makes obtaining certain replacement parts increasingly difficult, ‘notwithstanding that we have got as many as we can from the desert. They would have to be re-manufactured.’<sup>37</sup>

## **Strategic/air superiority considerations**

4.30 In addition to the aging aircraft and sole operator issues discussed above, ‘early’ retirement of the F-111 is considered by many to be ill-advised because of the consequences for Australia’s regional security once the ADF ceases to possess a long-range strike capability. For example, Dr Jensen MP stated that:

The F-111 fleet currently provides around 50% of the RAAF’s total strike firepower ... Not only that, but the F-111 is a unique asset in the region ... With the loss of this capability, our competitive edge will be lost.<sup>38</sup>

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35 Dr Roger Lough, *Transcript 31 March 2006*, p. 45.

36 Dr Roger Lough, *Transcript 31 March 2006*, p. 45.

37 Dr Roger Lough, *Transcript 31 March 2006*, p. 46.

38 Dr Dennis Jensen MP, *Submission No. 21, Sub. Vol. 2*, p. 247.

- 4.31 In a submission to the inquiry, Major James Rotramel, a retired USAF F-111 Weapons Systems Officer, observed that:

Whatever you decide to replace your F-111s with, you need to acknowledge that you are going to be giving up a capability that seems to be uniquely suited to your country's range and payload requirements.<sup>39</sup>

- 4.32 The Committee sought information from Defence as to the way in which the long-range strike roles and responsibilities of the F-111 could be managed once the aircraft was withdrawn from service. With regard to the roles and responsibilities of the F-111, the Chief of Air Force made the point to the Committee that when the F-111 was originally acquired it was envisaged that the aircraft would operate alone, however:

That is not the way we would operate with the F-111 and we have not done so for many years. So when you get to the issues about range ... and the reach that we are able to project strike ... we are effectively constrained to the range of the F18 [sic] with the F-111 now, because the F-111 does not have the situational awareness, it needs to be escorted by F18s [sic] ... It is not as if we were withdrawing a capability that had the power to bomb Vladivostok, say, to replace it with something that is much shorter range ...<sup>40</sup>

- 4.33 The Officer Commanding No. 82 Wing commented that from his perspective, as an F-111 pilot:

... the majority of a modern battlefield scenario will involve a composite package of aircraft to get the best outcome. So I would suggest that the scope for a lone-aircraft role has diminished since we first purchased the F-111.<sup>41</sup>

## Evolved F-111 proposition

- 4.34 Differing opinions as to the alternative strategies that could have been pursued were raised during the public hearing as well as in the submissions received by this inquiry. For example, Group Captain

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39 Major James E. Rotramel (USAF, Retd), *Submission No. 5, Sub. Vol. 1*, p. 28.

40 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 57.

41 Group Captain Gavin Davies, *Transcript 5 July 2006*, p. 30.

Cottee (Retd), as a former RAAF pilot who worked on the acquisition of the F-111, believes that there is:

... no significant valid reason why these aircraft should not continue through to 2020, at least, considering the large spares holdings acquired during the time when 2020 was planned as life-of-type. There is adequate expertise remaining in Australia to ensure continuing structural integrity.<sup>42</sup>

4.35 Mr James Sadler strongly supports the 'Evolved F-111' option as proposed by Dr Kopp and Mr Goon and contends that:

Replacing the legacy parts that are hard to maintain and/or are rare within the F-111, with modern, more cost-effective and supportable equipment is the way forward ... Defence's argument concerning the F-111's high operational and maintenance cost would be irrelevant if these upgrades were implemented, as support costs and maintenance hours would be much lower than the present number.<sup>43</sup>

4.36 Dr Kopp and Mr Goon first submitted their 'Evolved F-111' concept to Defence in the late 1990s and believe that it remains an economically and strategically viable option. During the public hearing they advised that pursuing such a program would be feasible:

The upgrades proposed for the F-111 are principally technology insertion upgrades to upgrade the remaining legacy systems in the aircraft. The nature of the upgrades and the types of technologies that we are talking about are low risk technologies ... the remaining legacy avionics in the aircraft, which are principally the cockpit, the radar and the Pave Tack system.<sup>44</sup>

4.37 The 'Evolved F-111' option was formally submitted to Defence as part of the AIR 6000 project in 2001. Essentially the submission proposed:

... the acquisition of a force mix with up to 55 F-22A Raptors to replace the F/A-18, extensive but low risk incremental upgrades to extend the life of the F-111, and acquisition of further mothballed surplus F-111s to enhance fleet strength.<sup>45</sup>

4.38 Furthermore, Dr Kopp and Mr Goon noted that:

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42 Group Captain M.J. Cottee (Retd), *Submission No. 13, Sub. Vol. 1*, p. 56.

43 Mr James Sadler, *Submission No. 23, Sub. Vol. 2*, p. 264.

44 Mr Peter Goon, *Transcript 31 March 2006*, p. 13.

45 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 128.

The F-22A/F-111 force mix is cheaper to implement than the plan devised by Defence, as only the F/A-18As need to be replaced with new fighters, and the existing investment in the F-111 and its extensive support base is exploited fully.<sup>46</sup>

- 4.39 During the public hearing, Mr Goon advised the Committee that he remained confident in the model development by himself and Dr Kopp as it was based on a national interest issue:

... we want the best for Australia in force structure, in terms of defence capability. We looked at that from a variety of different directions and put in a considerable amount of effort in analysis and reporting. We came up with what we thought was, as we still think today is, the most cost-effective optimal option for Australia in air power force structure in relation to the air combat capability requirement.<sup>47</sup>

## F-111 – general observations

- 4.40 Given the divergent positions stated in the submissions and testimony of the Department of Defence and Dr Kopp and Mr Goon, the Committee sought general comment from other inquiry witnesses in relation to the future of the F-111.
- 4.41 Dr Stephens advised the Committee that, given his background as a Canberra pilot, he did not support keeping the F-111 in service as he was 'not a big fan of engineering solutions to drag old aeroplanes along past their natural life.'<sup>48</sup> He nonetheless believes that Australia should retain a strategic strike capability, and that manned aircraft currently still present the best option to achieve this, but that the F-111 was not a viable option past its planned retirement date.
- 4.42 Professor Babbage cited the risks associated with extending the life of the F-111 and commented that it 'is rather an old air frame. It is suffering ... from quite serious fatigue challenges.'<sup>49</sup> He further added that it is 'not going to be a viable option in intense environments

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46 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 133.

47 Mr Peter Goon, *Transcript 31 March 2006*, p. 5.

48 Dr Alan Stephens, *Transcript 31 March 2006*, p. 22.

49 Professor Ross Babbage, *Transcript 31 March 2006*, p. 28.

downstream ... [and] would be in some difficulty without an enormous amount of support.’<sup>50</sup>

- 4.43 As the ADF’s airworthiness authority, and the officer tasked with delivering an effective air power outcome for the Government, the Chief of Air Force, used the following analogy when describing his position on extending the life of the F-111:

... taking an EH Holden – a good car in its day – reworking it from the ground up, calling it a V8 Commodore and expecting it to win first time out at Bathurst.<sup>51</sup>

### Committee comment

- 4.44 The Committee understands that industry contractors currently supporting the F-111 could manage maintaining the life of the aircraft up to 2020, and possibly beyond, however there would be risks that would increase over time. For example:

- the potential for significant cost and capital outlay pressures, particularly if components and parts needed to be re-manufactured and the facilities did not exist in Australia; and
- the management and sustainment of a specialised and diminishing trained workforce as the core of F-111 maintenance personnel are an ageing demographic.

- 4.45 The Committee believes that industry contractors maintaining the F-111 require predictability in relation to the planned withdrawal date of the F-111. This will ensure that business imperatives, including transitioning their workforces and retention of critical skills, can be managed in an effective manner to minimise potential negative impacts.

- 4.46 The Committee notes that although there are differing views on the likelihood and severity of the risk in operating the F-111 past 2010, there is agreement that there are a variety of substantial risks.

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50 Professor Ross Babbage, *Transcript 31 March 2006*, pp. 28–9.

51 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 40.

## Future Capability Planning

- 5.1 The *Defence 2000 – Our Future Defence Force* addressed Australia's national security requirements in relation to air superiority and the capabilities needed to ensure an effective Air Force over the coming decades. The strategic guidance provided in the White Paper was enhanced and rebalanced in subsequent Defence Updates, as discussed previously, with the primacy of air superiority essentially unchanged.
- 5.2 Accordingly, the AIR 6000 NACC project was established to address Australia's future requirements with regard to acquisition of a platform capable of achieving the air dominance and strike capabilities currently resident in the F/A-18 and F-111 fleets.
- 5.3 On 26 June 2002, the Government announced that Australia would join the System Development and Demonstration (SDD) phase of the international JSF program, as the JSF had been assessed as the most likely aircraft to satisfy Australia's strategic needs with regard to future combat air power.
- 5.4 Joining the JSF program would enable the ADF to access levels of capability and technology that would be a generation ahead of other contemporary aircraft. Further, Australia's participation in the program would ensure that Australian industry would be able to compete for JSF work and would also provide opportunities to participate in the development, production and through-life support phases of the program.<sup>1</sup>

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<sup>1</sup> *Australian participation in the Joint Strike Fighter Program*, <<http://www.defence.gov.au/jsf/>> (Accessed 8 May 2006).

- 5.5 During the press conference following the announcement that Australia would join the JSF SDD phase, the Minister for Defence advised that the decision had been made in accordance with the White Paper guidelines. He noted that the Government did not believe that there was 'any other alternative that would meet our capability requirements within the costings that we put into the White Paper.'<sup>2</sup>
- 5.6 During the 31 March 2006 public hearing of this inquiry, Defence informed the Committee that Australia's future air combat capability, currently planned to be the JSF:
- ... will be a highly capable fifth-generation stealthy multi-role air combat aircraft. Defence is confident that this aircraft will cost effectively provide Australia with the most sensible air combat solution, and, when integrated into the networked force of AEW&C and upgraded ground command and control systems, will mature to meet Australia's future air superiority requirements.<sup>3</sup>
- 5.7 There is public opposition to acquiring the JSF as Australia's NACC. As discussed in Chapter 4, extension of the life of the F-111 is strongly favoured as a more viable strike option for Australia's future, enhanced by the air superiority capability of the Raptor.
- 5.8 A detailed capability comparison between the JSF and the Raptor is provided in Chapter 6.
- 5.9 The JSF is considered by many to 'have limited performance, limited agility and limited stealth compared to the F-22.'<sup>4</sup> Indeed, Dr Kopp and Mr Goon believe it is 'simply wrong' that the JSF could serve effectively as an air superiority fighter.<sup>5</sup> They also submit that the aircraft would not be able to 'credibly fill the diversity of roles which the F/A-18 and F-111 performed successfully over recent decades'<sup>6</sup> nor will it be capable of matching the expanding regional capability.
- 5.10 As the development of the Raptor and JSF aircraft have been run as more or less parallel programs, Defence contends that the JSF is

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2 Ministers for Defence and Industry Press Conference, *Australia to Join Joint Strike Fighter Program*, Canberra, 27 June 2002.

3 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 39.

4 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 2.

5 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 3.

6 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 192.

potentially a more advanced aircraft than the Raptor. Defence told the Committee that they held this position because:

... a lot of the hard yards have already been done in many of the systems on the F-22 and they are now being adapted and modified for the F-35 [JSF] ... The F-35 is a more advanced aircraft than the F-22 because it will be taking both hardware and software a lot further.<sup>7</sup>

- 5.11 Notwithstanding the Defence support for the future air combat capability, there have been several submissions to this inquiry which have supported the concerns expressed by Dr Kopp and Mr Goon. For example, Dr Jensen MP believes that:

The JSF should be seen as a jack of all trades but master of none.<sup>8</sup>

- 5.12 The former RAAF Air Commander Australia, Air-Vice Marshal Criss (Retd), submits that:

... the F-22, in open literature, is credited with superior performance to the JSF in all respects at near to, or even perhaps at, price parity. The F-22 is even openly acknowledged by the JSF manufacturer and the United States Air Force to be superior and it is already in operational service delivering unsurpassed levels of fighter and strike capability to that nation.<sup>9</sup>

- 5.13 Mr Ken Oaten referred to the acquisition of the JSF as a decision that:

... compromises our defence posture as we will have no means to either sustain a long range strike campaign or to stamp our authority on airspace in time of conflict.<sup>10</sup>

- 5.14 In response to criticisms that Defence has not conducted sound test and evaluation as part of the NACC development process, Defence advised the Committee that since the SDD decision was announced, significant resources had been devoted to examining, analysing and evaluating Australia's air combat capability requirements and the manner in which the development of the JSF fitted with these evaluations. Defence stated that personnel from the Defence Materiel Organisation, the Defence Capability Group and the Defence Science

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7 Dr Stephen Gumley, *Transcript 31 March 2006*, p. 49.

8 Dr Dennis Jensen MP, *Submission No. 21, Sub. Vol. 2*, p. 249.

9 Air Vice Marshal P.J. Criss (Retd), *Submission No. 38, Sub. Vol. 3*, p. 485.

10 Mr Ken Oaten, *Submission No. 7, Sub. Vol. 1*, p. 34.

and Technology Organisation, as well as ADO members in the United States had been working hard to 'test the decision and not try to justify it.'<sup>11</sup>

- 5.15 As the debate about the suitability of the JSF continues, and while Defence reports that this aircraft is currently envisaged as the ADF's new air combat aircraft, Australia has not yet committed to purchase it. The first major decision in the acquisition process was joining the SDD phase of the JSF program.
- 5.16 The second decision, known as first-pass approval,<sup>12</sup> was announced by the Minister for Defence on 10 November 2006 when he advised that he planned to sign the JSF Production Sustainment and Follow-on Development (PSFD) Memorandum of Understanding (MoU) in December 2006.<sup>13</sup> Subsequently, the MoU was signed in Washington D.C. on 12 December 2006.<sup>14</sup>
- 5.17 The key remaining decision point in the NACC acquisition process is the second pass decision in 2008. Second pass approval is formal approval by Government of a specific capability solution to an identified capability development need.<sup>15</sup>
- 5.18 During the 31 March 2006 public hearing Defence stressed to the Committee that the November 2006 first-pass decision was not the point at which the acquisition approval was granted:
- That call comes in 2008. That is nearly three years to look at the development of the program, to see how it is progressing and to do our risk management approach to see what we are doing with the F/A-18 fleet, the F-111 fleet and the arrival of the F-35.<sup>16</sup>
- 5.19 One final element of the current planning, in relation to the NACC, relates to management of the transition from the existing structure to the future force. Defence advised the Committee that the transition from the ADF's legacy fleets to the new air combat capability extends
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11 Lieutenant General David Hurley, *Transcript 31 March 2006*, p. 59.

12 First-pass approval refers to the process whereby Defence gives Government the opportunity to narrow the alternatives being examined by Defence to meet an agreed capability gap. First-pass approval allows a project to be included in the Defence Capability Plan and the Major Capital Investment Program.

13 Minister for Defence Media Release 148/2006, *The Joint Strike Fighter*, 10 November 2006.

14 Minister for Defence Media Release 163/2006, *Australia Enters Next Phase of the JSF Program*, 13 December 2006.

15 Department of Defence, *Defence Capability Development Manual 2006*, p. 30.

16 Lieutenant General David Hurley, *Transcript 31 March 2006*, p. 53.

to more than phasing out and bringing in new platforms, there is the vital aspect of the personnel transition.

- 5.20 In relation to the personnel transition planning, Defence noted the reality of current and future recruiting pressures, and that it is not possible to:

... just go out and recruit another 200 to 400 intelligently-trained pilots and maintainers from the street. It will take time to grow those people.<sup>17</sup>

- 5.21 Accordingly, as part of the ADF strategic workforce planning process, the Air Force needs to manage the move of personnel from the F-111, to supporting the NACC. Chief of Air Force noted that the building blocks of the plan are in place. The personnel establishment assigned to the F-111 would move to the JSF environment, but it was unlikely to be a one-for-one establishment shift as there would be savings and efficiencies with the JSF.

- 5.22 The Officer Commanding of No. 82 Wing has the responsibility for operating the RAAF's F-111 fleet and he advised the Committee that the transition process to the future NACC was already underway. By way of example, he noted that equipping the F-111 with AGM142 missiles presents a great learning experience for the Air Force because:

All our electronic warfare development and tactics development is directly transferable to the F/A-18 – and the JSF downstream.<sup>18</sup>

- 5.23 He further added that with regard to transitioning to the future, the phased approach to workforce management and training, that is, F-111 retirement, capability delivery through the enhanced F/A-18 and enabling capabilities, and finally, operational service of the NACC, was a sound method to ensure Australia's air superiority was not compromised. Specifically:

The other factor here for me as an operator is that the Hornet provides the better stepping stone to a single [seat] JSF or whatever in terms of our ability to grow the expertise and experience to function in the way we intend to function beyond 2015.<sup>19</sup>

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17 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 56.

18 Group Captain Gavin Davies, *Transcript 5 July 2006*, p. 6.

19 Group Captain Gavin Davies, *Transcript 5 July 2006*, p. 29.

- 5.24 There has been little public comment from sources other than Defence with regard to the personnel and training aspect of the current planning for Australia's future air superiority requirements.
- 5.25 Quite apart from the ongoing debate in relation to the following three key themes that have arisen during this inquiry:
- the appropriateness of the JSF decision;
  - the capability of that aircraft; and
  - the proposed F-111/Raptor force structure.

there has also been considerable concern expressed as to the potential for Australia to be without a viable air combat capability if current planning falls short of expectations. However, the Government has addressed the potential risk by its decision to purchase 24 Super Hornet aircraft.

## **The capability gap issue**

- 5.26 The potential for a time-lag between the phasing out of legacy platforms and the introduction of the JSF (as the preferred solution for Australia's air combat requirements), requires careful management to minimise the impact on Australia's national security. There has been media speculation and public commentary as to the ability of the ADF to manage this potential gap. The Committee accordingly pursued the 'gap issue' with questions to Defence and other witnesses at the public hearings.
- 5.27 Defence reiterated its plan in relation to the Hornet upgrade as the means by which the ADF's air superiority would be maintained until the introduction of the JSF. Nonetheless, it acknowledged that the JSF program could slip, but advised the Committee that the nature of the aircraft development was such that the phased, or block, approach provided an element of planning flexibility. The CEO of the Defence Materiel Organisation observed:

I would predict that occasionally a block might get a bit delayed, but we would still have an operating aircraft flying.<sup>20</sup>

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20 Dr Stephen Gumley, *Transcript 31 March 2006*, p. 48.

5.28 Defence added that not only did the 'block' nature of the development program provide planning flexibility, but so did the actual phasing-in of the JSF. In particular, 'there will be at least a five-year overlap between the JSFs ... and the F/A-18.'<sup>21</sup>

5.29 The personnel transition plan is considered by Defence to be an important element of the total planning package associated with the phasing-in of the NACC. The need to train up personnel as the JSF comes into service provides another layer of flexibility to manage any potential gap in capability. Defence advised that:

It also takes time to train pilots, so probably not every capability in the JSF would need to be immediately available on day one, because it just could not be used. So there is a little bit of schedule contingency in there from a practical sense.<sup>22</sup>

5.30 Central to Defence's contingency planning is the upgraded capability that will be available to the ADF by the post-HUG F/A-18. The particular phase of the upgrade program that is focused on managing any potential gap scenario is Phase 3.2C, that is, replacement of the aircraft's 'centre barrels' – the central fuselage.

5.31 This particular phase of the HUG program has been part of the Defence strategy to manage any gap for quite some time now. In 2004 during the hearing into the *Review of the Defence Annual Report 2002-03*, the then-Chief of Air Force advised the Committee that the 'hedging strategy' involved replacement of the centre barrels in a number of the F/A-18 aircraft and that a similar program was already underway in Canada.<sup>23</sup>

5.32 During the 31 March 2006 public hearing, Defence reiterated that its gap management strategy involved the upgraded Hornet and centre barrel replacements as necessary. It emphasised that by the end of the decade the Hornet upgrades will deliver a 'better capability than the one we currently have with both the standard Hornet and the F-111.'<sup>24</sup> The number and timing of the centre barrel replacement program would be linked to the introduction of the JSF:

... the year the JSF comes in will determine how many centre barrels in the Hornet we have to do and how far out we have

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21 Air Commodore John Harvey, *Transcript 31 March 2006*, p. 52.

22 Dr Stephen Gumley, *Transcript 31 March 2006*, pp. 48-9.

23 Air Marshal Angus Houston, *Transcript 2 August 2004*, p. 13.

24 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 51.

to take the Hornet. Nevertheless, we cannot keep the Hornet going for an extra 10 or 20 years. So there is a band of slippage in there that is within our current planning ...<sup>25</sup>

- 5.33 The Committee sought the opinion of Professor Babbage in relation to the capability gap issue. Professor Babbage advised that in managing a potential capability gap, decision makers would need to balance risks in determining a course of action. Specifically:

If it looked as though the security environment in the region was going to get much worse, maybe we ought to look at the sort of options that we are not at the moment seriously contemplating ... if suddenly we were taken by surprise in 2008, say, and the F-111s were about to go and it looked like we were going to have a gap, it would probably be possible for us to do a short-term leasing arrangement – with some considerable difficulty – as a back up.<sup>26</sup>

- 5.34 While Professor Babbage proposed a short-term leasing option as a gap solution, he did not believe that it should be planned for at this point in time and that it would not be money well spent. He supported Defence in the utility and appropriateness of the Hornet upgrades including the re-barrelling option.
- 5.35 In their submission to the inquiry, Dr Kopp and Mr Goon highlight a risk to Australia's national defence that could arise in relation to the Hornet upgrade's 'relatively short time window.' Noting the extent and diversity of the activities to be undertaken as part of the upgrade, there is a real potential that aircraft availability will drop with the resultant 'negative effects on defence capabilities.'<sup>27</sup>
- 5.36 In commenting on specific aspects of the HUG program, and the implications for maintaining Australia's regional air superiority, Dr Kopp and Mr Goon made the following observations:

[HUG is] intended to upgrade and enhance the aircraft's air combat capabilities, endeavouring to address the growing imbalance in regional air superiority and the resulting threats. At the same time, these programs are intended to provide interim, albeit lesser, strike/reconnaissance/surveillance/air vehicle interceptor/close air support capabilities in place of the F-111s which Defence has recommended to be retired

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25 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 52.

26 Professor Ross Babbage, *Transcript 31 March 2006*, p. 29.

27 Dr Kopp and Mr Goon, *Submission No. 20, Sub. Vol. 1*, p. 122.

early ... the threat to Australia's long standing position in regional air superiority is further exacerbated by features peculiar to the F/A-18 'Classic' and the Australian variants ...<sup>28</sup>

5.37 Mr Michael Devlin's submission to the inquiry expressed concern with regard to the viability of upgrading the Hornet as the means by which the Air Force transitions to the JSF and any capability 'gap' is managed. He proposed the acquisition of an interim aircraft — 'at least 100 F/A-18E and F/A-18 Super Hornet aircraft.'<sup>29</sup> A fast-tracked acquisition process could see these aircraft in service by 2012, if not earlier, and any 'potential gap in Australia's defences will thus be plugged.'<sup>30</sup>

5.38 With regard to the acquisition of an interim aircraft to reduce the risk of a capability gap, Defence advised the Committee during the 31 March 2006 public hearing that:

Were we to go to an interim fighter for some strange reason — and we do not expect that to happen — it would cost us more than the JSF, so it [the JSF] is still the best value for money, not just in a fifth generation sense but when comparing it against fourth generation contenders.<sup>31</sup>

5.39 Furthermore, it was emphasised that the retirement of the F-111 was not directly linked to the introduction of the JSF, but formed part of the progressive transition from the current air combat capability to the future environment:

We are not transitioning from F-111 to JSF. We are upgrading from F-111 and current Hornet to an upgraded Hornet and then to JSF. We need that head space, in a constrained system, to be able to do that. We are getting out of the F-111 business not based on when the JSF comes in but on how the increase of the sum total of the risks of the F-111 play out.<sup>32</sup>

5.40 In its submission to the inquiry, Defence commented on the complexity of transitioning to the future NACC and the issue of risk and capability management:

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28 Dr Kopp and Mr Goon, *Submission No. 20, Sub. Vol. 1*, p. 117.

29 Mr Michael Devlin, *Submission No. 2, Sub. Vol. 1*, p. 16.

30 Mr Michael Devlin, *Submission No. 2, Sub. Vol. 1*, p. 17.

31 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 54.

32 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 52.

While Defence has confidence that the JSF will mature to meet the Air Force's future air combat capability requirements, it is clear that cost, schedule and capability risks associated with introduction of the JSF decrease the later we acquire the aircraft. It is also clear that cost, schedule and capability risks associated with the F/A-18 (and the F-111) increase the longer we keep the aircraft in service. From an overall Air Force air combat capability perspective, therefore, it is necessary to balance the two sets of risks: the ultimate aim being to maintain a regionally comparable Air Force air combat capability with manageable risk in the most cost effective way.<sup>33</sup>

- 5.41 Subsequent to the public hearings, discussion in relation to the 'gap' and an 'interim aircraft' continued in both the general and specialist media.
- 5.42 The Chief of Air Force was reported in November 2006 as acknowledging the potential for slippage of the JSF which had resulted in the development of contingency plans. These plans included an extension of the life of the F-111 up to around 2012, in lieu of around 2010, and the ongoing Hornet upgrade program. *The Australian* further reported that should the JSF be delayed by five years or more, the RAAF was expected to acquire the Super Hornet as the 'interim aircraft.'<sup>34</sup>
- 5.43 Indeed, during a media briefing in relation to the JSF program, the Deputy Chief of Air Force was questioned directly as to whether the Super Hornet was the preferred 'interim aircraft' to maintain Australia's regional air superiority. Air-Vice Marshal Blackburn advised the following:
- ... we're confident that ... we shouldn't need an interim solution. However, as with most things in Defence, we're looking at contingency plans ... that's just prudent planning on our part ... We've looked at a range of what is available on the market and what would suit us ... So there's [sic] a variety of options depending on what actually happens with the program.<sup>35</sup>

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33 Department of Defence, *Submission No. 15, Sub. Vol. 1*, p. 6.

34 Patrick Walkers, *RAAF factors in expansion*, *The Weekend Australian*, 25 November 2006, p. 2.

35 Media Conference, *Defence Update Briefing in relation to AIR 6000 Project*, Canberra, 10 October 2006.

- 5.44 Dr Kopp believes that the Super Hornet is not a viable contingency option:

... the Super Hornet's agility, supersonic speed and acceleration performance, critical in air combat, are not better than the earlier model [which Australia currently employs], due to a Congressional mandate during development. With unique engines, radar, airframe and electronic warfare systems, the Super Hornet shares little real commonality with its predecessor, driving up support costs. All it offers is better radar, improved avionics and 36 per cent more internal fuel, at a price tag estimated at \$2.5 billion.<sup>36</sup>

## Bridging the gap

- 5.45 On 6 March 2007, the Government announced its decision to acquire 24 F/A-18F Block II Super Hornet multi role aircraft in order to ensure Australia maintains its air combat capability edge and to complement the transition to the JSF.<sup>37</sup>
- 5.46 The total program investment is approximately \$6.6 billion over 13 years, which includes acquisition, all support costs, and training for aircrew and maintenance personnel. Personnel will commence training on the platform in 2009 with the Super Hornets to be operational in 2010, coinciding with the withdrawal of the F-111.<sup>38</sup>

## Committee comment

- 5.47 The unique nature of the JSF project, and Australia's decision to join the SDD phase of the program, provides opportunities for Australian industry that would not be available if a more traditional capital acquisition strategy had been undertaken.
- 5.48 Any potential for Australia's regional air superiority to be diminished or in any way undermined because of slippages in the JSF program, (or the acquisition of some other new air combat platform), would be unacceptable.

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36 Dr Carlo Kopp, *The Age, Flying into trouble*, 30 December 2006.

37 Minister for Defence Media Release 017/2007, *\$6 Billion to maintain Australia's Regional Air Superiority*, 6 March 2007.

38 Minister for Defence Media Release B05/2007, *Super Hornet Bridging Air Combat Capability*, 8 May 2007.

- 5.49 The Committee notes the Government's decision to purchase the Super Hornet to address any potential air combat capability superiority gap during the transition to the JSF.

## Australia's Future Air Combat Aircraft

### Introduction

- 6.1 The formal debate over which future air combat aircraft/force mixture will best ensure that the Australian Defence Force maintains regional air superiority began in 2000 with the release of the *Defence 2000 – Our Future Defence Force* and the subsequent establishment of the AIR 6000 project (NACC). The Government's decision in 2002 to support the current future Air Force air combat plan did not quell that debate. Many submissions made to this inquiry contend that the Government's decision was not the right one.
- 6.2 This Committee examined the issue in its *Review of the Defence Annual Report 2002-03*. In Chapter 5 of that report there is a section titled 'The comparative capability of the F-35 [JSF]'. This section outlined the JSF's expected capabilities and compared them to air combat platforms, such as the Raptor, and other proposed force structures.
- 6.3 As noted in the first chapter, Recommendation 3 of that report has resulted in this inquiry being referred from the Senate. Once again, the Committee has undertaken to examine the question of which future air combat aircraft/force mixture best addresses Australia's needs with particular attention being paid to the comparative merits of the JSF and the Raptor.
- 6.4 Dr Kopp, Mr Goon and others contended that the JSF alone will not satisfy Australia's air combat capability needs. They propose a force

mixture of upgraded F-111s and Raptors.<sup>1</sup> Defence and other private commentators believe that the Raptor, while a superior fighter in most ways is not multi-role and therefore is not as suited to Australia's needs as the JSF.<sup>2</sup> Other points were raised in relation to both aircraft. This chapter will summarise these discussions using three headings:

- capabilities;
- cost; and
- availability.

## Capabilities

6.5 Amongst the many capabilities of the JSF and the Raptor, three particular ones were brought to the attention of the Committee and discussed in some detail by witnesses. They were:

- stealth;
- range; and
- networking.

6.6 In reviewing this evidence, the Committee has remained cognisant of the need to consider capability issues in conjunction with the strategic concepts noted in Chapter 2.

## Stealth

### Rating

6.7 In 2005, the US Department of Defence publicly released a PowerPoint presentation which noted that the JSF had low observable stealth characteristics. This terminology represented a change in the JSF's stealth characteristics from what had previously been described as very low observable. This shift raised concern in Australia about the stealth capabilities of the JSF.<sup>3</sup>

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1 A complete discussion on the F-111s can be found in Chapter 3.

2 Brian Weston, *Submission No. 24, Sub. Vol. 2*, p. 275.

3 Sydney Morning Herald, *Not so stealthy: the \$15b fighters*, 14 March 2006.

- 6.8 The Committee sought to clarify the meaning of any change in the stealth capability of the JSF, noting that one of the JSF's selling points was its stealth capability and that a stealth downgrade would have negative implications.<sup>4</sup> When asked for comment on this issue, Professor Babbage advised the Committee that there had been no real downgrade in stealth capability at all and, in fact, what had occurred was simply a change in terminology.<sup>5</sup>
- 6.9 Defence corroborated Professor Babbage's comments and advised the Committee that:
- ... just this week the JSF Project Office changed the public releasable slide ... There was a change in the terminology on one slide of the publicly released PowerPoint presentation. There was no change to the capability of the aircraft.<sup>6</sup>
- 6.10 Clarification of this point provided an opportunity for the Committee to discuss issues of stealth capability on the JSF and the Raptor.

### Comparative capability

- 6.11 The most comprehensive comparison between the JSF and the Raptor was written by Air Marshal Angus Houston and published by ASPI in 2004. In the report, titled *Is the JSF good enough?*, Air Marshal Houston notes that the 'F/A-22 sets new levels in stealth without having to compromise its aerodynamic performance.'<sup>7</sup>
- 6.12 Dr Kopp and Mr Goon's submission agrees. It notes that although the JSF is stealthy, its level of stealth has been compromised for a variety of factors and therefore does not compare to the high stealth capability of the Raptor.<sup>8</sup>
- 6.13 It is worth noting, however, that the JSF will not have to face the Raptor in battle. Air Marshal Houston points out that:
- ... we only have to do battle against F/A-22s in training exercises. Against 4<sup>th</sup> generation adversaries, the JSF has the decisive advantages of stealth and comprehensive situation

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4 Committee, *Transcript 31 March 2006*, p. 35.

5 Professor Ross Babbage, *Transcript 31 March 2006*, p. 35.

6 Air Commodore John Harvey, *Transcript 31 March 2006*, p. 48.

7 Strategic Insights: ASPI, *Is the JSF good enough?*, August 2004, p. 6.

8 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 204.

awareness, both from its onboard sensors and through the network.<sup>9</sup>

- 6.14 While the JSF doesn't match the Raptors' overall stealth capability, the JSF has considerable stealth capability. For example, it is 'very stealthy on top'<sup>10</sup> and is able to carry two 2,000 pound bombs in a stealth configuration.<sup>11</sup> Its stealth capability is therefore an advantage when compared to current 4<sup>th</sup> generation aircraft.
- 6.15 Dr Kopp and Mr Goon note that in regards to their proposed Evolved F-111, the JSF has an advantage in stealth.<sup>12</sup> As is the case when the JSF is compared with the Russian Sukhoi Su-30 or Su-35 series of aircraft.<sup>13</sup>
- 6.16 The JSF may have, on paper, superior stealth capability to most air combat aircraft currently in service. But what of the future? Dr Jensen MP posed a fundamental question to the Committee: 'What happens when the threat aircraft are stealthy as well?' He suggests that in such a case the JSF would be forced to engage the aircraft within visual range. The question then becomes, how well can the JSF perform in this circumstance?<sup>14</sup>
- 6.17 This is the fundamental question concerning those who are opposed to a future air capability structure based solely on JSFs.

## Committee comment

- 6.18 Australia must ensure that its next air combat aircraft purchase has comparable stealth capability to other combat aircraft in the region.

## Range

- 6.19 The range of an aircraft raises several inter-related points which need to be taken into consideration when choosing the best air combat aircraft option for Australia. For example:
- short range aircraft require refuelling and refuelling is done by tankers;

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9 Strategic Insights: ASPI, *Is the JSF good enough?*, August 2004, p. 8.

10 Professor Ross Babbage, *Transcript 31 March 2006*, p. 31.

11 Dr Alan Stephens, *Transcript 31 March 2006*, p. 21.

12 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 199.

13 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 193.

14 Dr Dennis Jensen MP, *Submission No. 21, Sub. Vol. 2*, p. 249.

- tankers need combat air patrols to protect them and those aircraft will need refuelling as well;
  - if the strike aircraft cannot adequately protect themselves, then further combat patrol aircraft will be required; and
  - the further the target, the further tankers, strike aircraft and combat patrol aircraft will have to push out and this has the effect of stretching network support such as the AEW&C aircraft.
- 6.20 The Committee was advised that both future aircraft options discussed during the inquiry – the JSF and the Raptor – are, when compared to the F-111, short-ranged.<sup>15</sup> Should the F-111 be retired as planned, either replacement, be it the JSF or Raptor would require tanker support at long range.
- 6.21 Dr Jensen MP believes that Australian geography demands a longer-range aircraft,<sup>16</sup> but Defence pointed out that even though the F-111s have superior range, it is still forced to send its tankers far afield because the Hornets, which are currently used to protect the F-111s, need refuelling.<sup>17</sup>
- 6.22 Like the Hornets, the JSF will need refuelling. Dr Jensen MP is concerned that the JSF's short range will have a negative multiplying effect:
- A shorter range fighter requires that the tankers get closer to the target. This puts them into a more vulnerable position, requiring a larger [combat air patrol], which necessitates the need for more tankers.<sup>18</sup>
- 6.23 Dr Kopp and Mr Goon are concerned that the JSF will not be able to provide the necessary tanker protection. They believe that as the JSF goes farther a field with tanker support, the JSF's air-to-air combat capability limits the protection it can afford itself and the tankers and therefore more would be required.<sup>19</sup>
- 6.24 They maintain that their upgraded F-111/ Raptor proposal is better suited to the task. While the Raptor would need refuelling, its greater

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15 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 17.

16 Dr Dennis Jensen MP, *Submission No. 21, Sub. Vol. 2*, p. 250.

17 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 60.

18 Dr Dennis Jensen MP, *Submission No. 21, Sub. Vol. 2*, p. 250.

19 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 6.

combat effectiveness is such that fewer would be required to protect the F-111s and the tankers (as well as other aspects of the network).<sup>20</sup>

- 6.25 Defence is confident that a 'fully networked system of systems', including the JSF will provide the necessary level of 'knowledge dominance in the air battle space,' which will enable Australian forces to 'see first, shoot first, kill first.'<sup>21</sup>

## Networking

- 6.26 All participants of the inquiry, the Committee included, agreed that network-centric warfare is the way of the future.<sup>22</sup> As such, the Committee sought to compare the relative networking capabilities of the JSF and the Raptor.

## JSF

- 6.27 On paper, it would appear that the JSF is a superior networking aircraft. Professor Babbage has stated that 'no other aircraft has the ability to gather, process and share information that the JSF will have.'<sup>23</sup> This should be of little surprise, as the JSF has been designed from the ground up for network-centric operations.<sup>24</sup>
- 6.28 The JSF is equipped with a wide range of advanced sensors, many of which are reprogrammable by software.<sup>25</sup> This will enable the JSF to adapt to a variety of contingencies and provide valuable surveillance capabilities – many of which we have not had in the past. For example, Professor Babbage noted that the JSF will be able to survey littoral environments with great clarity, simultaneously scanning for multiple items.
- 6.29 Mr David Connery expanded on the surveillance options the JSF will provide. He envisioned its use in disaster relief operations, noting that the JSF would be able to survey damage areas and quickly relay that information back to decision makers.<sup>26</sup>

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20 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 17.

21 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 60.

22 The Committee and Dr Carlo Kopp, *Transcript 31 March 2006*, p. 7.

23 Professor Ross Babbage, *Transcript 31 March 2006*, p. 24.

24 Dr Alan Stephens, *Transcript 31 March 2006*, p. 20.

25 Professor Ross Babbage, *Transcript 31 March 2006*, p. 27.

26 Mr David Connery, *Transcript 31 March 2006*, p. 32.

- 6.30 This type of flexibility reflects the multi-roled nature of the JSF. Defence used a cricket analogy to make this point:

[the JSF] is a very good all-rounder, a brilliant all rounder, across all the strategic tasks ... that we develop.<sup>27</sup>

## The Raptor

- 6.31 The Raptor's networking abilities were also discussed at the public hearing. Professor Babbage described the Raptor as a half-generation behind the JSF.<sup>28</sup> Dr Stephens believes that in the ISR (Intelligence, Surveillance, and Reconnaissance) domain, the Raptor is lacking. For example, the Raptor does not have a transmit-receive data link, only a receive data link.<sup>29</sup>
- 6.32 The Committee asked Dr Stephens about the possibility of upgrading the Raptor's ISR capability and the potential cost of such an upgrade. Dr Stephens informed the Committee that the US has been upgrading the Raptor's ground attack capabilities in order to make the cost of the Raptor justifiable and that he expects such upgrades to continue. He also commented that the additional cost of an ISR upgrade to the Raptor would be 'very small.'<sup>30</sup>

## Committee comment

- 6.33 General discussion on the comparative networking ability of the JSF and the Raptor indicates that the JSF is superior in this regard. This is best epitomised by the fact that the Raptor's systems have been adapted and modified for the JSF.

## Cost

- 6.34 There are many factors to be considered when examining the cost of the JSF. The US has established seven cumulative cost categories for the JSF described in the chart below:

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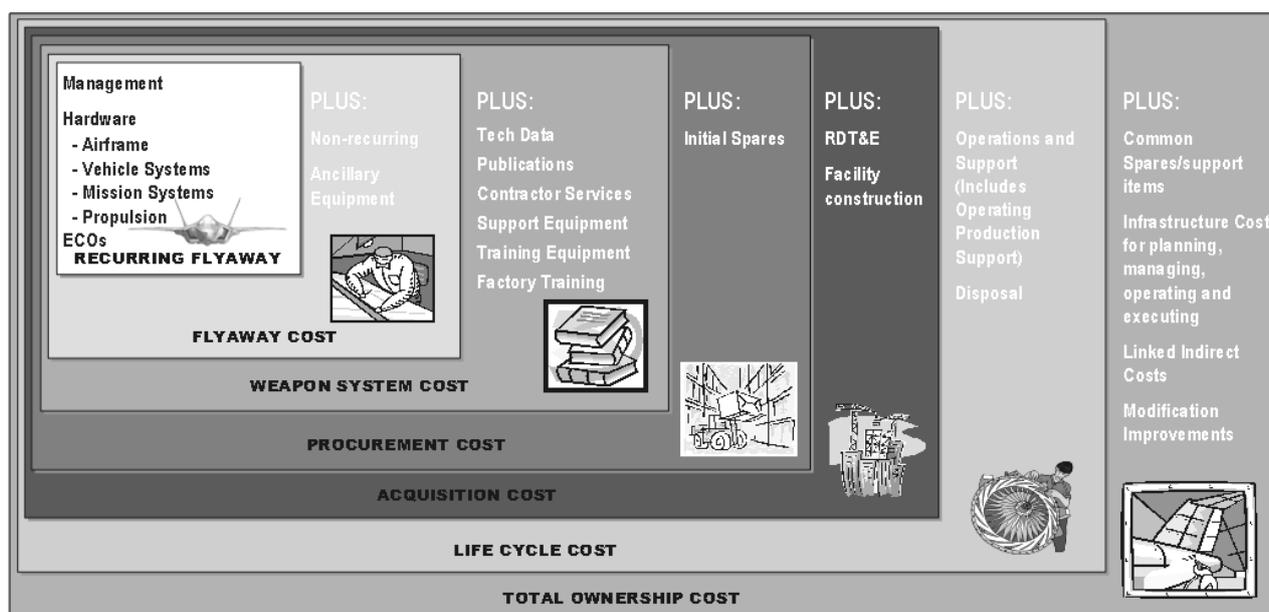
27 Mr Michael Pezzullo, *Transcript 31 March 2006*, p. 58.

28 Professor Ross Babbage, *Transcript 31 March 2006*, p. 30.

29 Dr Alan Stephens, *Transcript 31 March 2006*, p. 20.

30 Dr Alan Stephens, *Transcript 31 March 2006*, p. 24.

Figure 6.1 JSF cost definitions (US chart)



Source: Department of Defence, *Submission No. 27, Sub. Vol. 2, p. 299.*

- 6.35 Several different prices for the JSF have been quoted, each one based on a different cost definition. The Committee was particularly interested in the Average Unit Procurement Cost (AUPC) of the JSF which includes the average cost of the aircraft plus ancillary equipment, logistics support, training equipment and spares.
- 6.36 The Committee was advised by Defence that the JSF AUPC is approximately US\$67.3m per aircraft in 2005 prices (this is based on the average cost for all 3 variants of which the Australian variant (CTOL) is the cheapest). Defence noted that the quoted AUPC is based on the American model (shown in Figure 6.1) and is not an Australian unit projection cost, which would include specific Australian project requirements. It did note, however, that the above cost was 'indicative of the relative cost of the [JSF] system versus other systems.'<sup>31</sup>
- 6.37 Dr Kopp and Mr Goon provided their own costing in a submission to the Committee. They believe that, based on publicly available US Government documents, the AUPC of the CTOL variant of the JSF is US\$81.3m per aircraft in 2004 prices.<sup>32</sup> When they included an annual

31 Department of Defence, *Submission No. 27, Sub. Vol. 2, p. 294.*

32 Air Power Australia, *Submission No. 20, Sub. Vol. 1, p. 105.*

inflation factor of between one and three percent, they believe that the JSF AUPC could be as high as US\$103m per aircraft in 2012.<sup>33</sup>

- 6.38 Dr Kopp and Mr Goon further note that a 'de-escalation in costs can usually be achieved when an aircraft is in full rate production.'<sup>34</sup> Australia plans to purchase the JSF at the beginning of the production cycle or curve, when costs could potentially be higher than later in the production curve. As a result, they contend that the purchase of 100 Block 2 or 3 JSF could cost Australia somewhere between US\$112m and US\$120m per aircraft in 2012 dollars. When a projected exchange rate was added to this cost, they contend that the JSF could cost between A\$160m and A\$171.4m per aircraft in 2012 dollars.<sup>35</sup>
- 6.39 Dr Kopp and Mr Goon contend that it would be cheaper for Australia to buy 55 Raptors in 2010 than 100 JSF in 2012. Their submission states that the cost of such a purchase would be US\$126m per aircraft in 2004 dollars.<sup>36</sup>
- 6.40 Defence advised the Committee that the AUPC cost for the Raptor was US\$175m per aircraft in 2005 prices.<sup>37</sup> Dr Gumley of the Defence Materiel Organisation (DMO) further noted the potential update costs which could be attached to a Raptor purchase:

... we would be paying substantial update costs. The aeroplanes coming out now are already in need of update in some areas because they have been out for many years. There are FMS costs, which is the charge the US government charges Australia to process the orders. Sometimes they waive those fees; sometimes they do not. We have not had the discussion yet but there is always the question of: do we have to pay our share of the past research and development and bringing it into manufacture? What is our share of the amortisation? The Americans will have about 183 or 184 F22s by the time they finish their program. If we were to get 40 or 50 then we would be paying probably 20 per cent of the R&D costs of that aircraft. Maybe that will be waived it; maybe it will not be – we do not know – but that would add up to an extra \$100 million per aeroplane.<sup>38</sup>

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33 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 106.

34 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 106.

35 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 107.

36 Air Power Australia, *Submission No. 20, Sub. Vol. 1*, p. 115.

37 Department of Defence, *Submission No. 27, Sub. Vol. 2*, p. 294.

38 Dr Stephen Gumley, *Transcript 31 March 2006*, pp. 49–50.

- 6.41 Dr Gumley's sentiments were echoed in another submission which noted that 'the F-22 is not a multi-role aircraft. Australia would either have to sacrifice strike capability or somehow fund an enormously expensive strike capability enhancement program.'<sup>39</sup>
- 6.42 Mr Goon also raised the issue of operational costs in his discussion with the Committee. He believes that because the JSF is a smaller fighter, it has a reduced payload and combat effect. As a result, Mr Goon contends that the ADF will require a greater amount of JSF and tanker support in order to achieve its goals and, as such, operational costs will be higher.<sup>40</sup> Both Dr Kopp and Mr Goon believe that a Raptor/F-111 force mix will have greater range and combat effect thereby reducing operational costs through greater efficiency.
- 6.43 Defence has stated that the JSF alone is the 'right choice' because it is a multi-role, fifth generation strike fighter capable of fulfilling the Australia's needs 'at a cost that will allow the balanced development for the ADF of a broad range of capabilities in all environments.'<sup>41</sup>
- 6.44 The Committee was advised in a separate submission that new aircraft types, such as the JSF, are increasingly flexible (multi-role) and reflect the need 'to reduce the expensive logistic and support costs involved in operating two fleets of RAAF combat aircraft:
- Rationalisation of two such support systems into one means that more of Australia's defence dollar can be spent on acquiring a credible number of operational platforms.<sup>42</sup>

## Committee comment

- 6.45 The above cost debate highlights the relative nature of aircraft cost analysis, as each analysis can be based on a series of different strategic and tactical considerations.
- 6.46 Current price comparisons between the JSF and the Raptor reveal that the JSF is the cheaper product. The Committee recognises that the cost of the JSF may fluctuate; however, operational costs and multiple fleet maintenance costs must also be taken into account.

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39 Mr Brian Weston, *Submission No. 24, Sub. Vol. 1*, p. 275.

40 Mr Peter Goon, *Transcript 31 March 2006*, p. 15.

41 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 39.

42 Mr Brian Weston, *Submission No. 24, Sub. Vol. 1*, p. 274.

## Availability

### Technology transfer

6.47 The issue of US technology transfers is of particular importance to Australia. Current US laws do not allow for the transfer of sensitive stealth technology to participating JSF program partners. Britain and Australia have been lobbying the US to change its technology transfer laws to ensure that both countries can independently operate and support their JSFs upon purchase.<sup>43</sup>

6.48 Professor Babbage told the Committee that in his view, Australia must gain access to the capacity to modify and adapt the JSF for its particular needs.<sup>44</sup> He believes that there will be occasions when Australia will need to use the JSF in different ways to the US:

We need to be able to modify the sensor's software so that if we want it to look for something else or report in a different format to fit in with something else on one of our Wedgetail aircraft or something like that we can make it happen.<sup>45</sup>

6.49 The Committee asked Defence to comment on its position in relation to this matter and was advised that:

Australia will not enter the MoU for the Production, Sustainment and Follow-on Development (PSFD) phase unless we are assured of necessary access to technology and data to operate and support the JSF aircraft.<sup>46</sup>

### Committee comment

6.50 The Committee notes that upon signing the PSFD MoU in December 2006, Defence stated that 'the MoU and associated documents also

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43 *Britain in clash over US fighter secrets*, <<http://www.timesonline.co.uk/printFriendly/0,,1-2-2086523-2,00.html>> (Accessed 15 March 2006); and *The World Today – Strike Fighter purchase suffers setback*, <<http://www.abc.net.au/worldtoday/content/2006/s1592291.html>> (Accessed 16 March 2006).

44 Professor Ross Babbage, *Transcript 31 March 2006*, p. 34.

45 Professor Ross Babbage, *Transcript 31 March 2006*, p. 34.

46 Department of Defence, *Submission No. 27, Sub. Vol. 2*, p. 298.

guarantees Australia's access to the technology and data it needs to operate and support the JSF.<sup>47</sup>

## Is the Raptor for sale?

- 6.51 The Committee is not aware of a formal request from the Government to purchase the Raptor but notes that the United States is not allowed, by law, to pursue its sale with other countries.<sup>48</sup>
- 6.52 At Senate Additional Estimates in February 2007, Defence confirmed that the US Deputy Defence Secretary, Gordon England wrote to the Australian Defence Minister, Brendan Nelson, confirming that the Raptor is not available for export sales.<sup>49</sup>
- 6.53 Furthermore, Defence told the Committee that even if it was released by the US Government for export, it is not the preferred choice because it 'has limited ability in strike and even less utility and capability for offensive air support.'<sup>50</sup>

## Committee comment

- 6.54 This chapter summarises the debate heard by the Committee over the comparative merits of the JSF and Raptor. Each aircraft is unique and is designed to serve different purposes; therefore, comparisons can be problematic and often remain general in nature. The Committee notes Dr Kopp's belief that:

While the joint strike fighter is being marketed as a multi-role fighter, it is being developed mostly to hunt battlefield targets, with air defence as a secondary role. Otherwise the United States would not have built the F22 Raptor. As a result the joint strike fighter will have limited performance, limited agility and limited stealth compared to the F22. Put simply, it is too small and its performance and stealth will not be good enough.<sup>51</sup>

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47 Minister for Defence Media Release 163/2006, *Australia Enters Next Phase of the JSF Program*, 13 December 2006.

48 Senate Standing Committee on Foreign Affairs, Defence and Trade, *Estimates, Estimates Hearing, Transcript 31 May 2006*, p. 32.

49 Senate Standing Committee on Foreign Affairs, Defence and Trade, *Estimates, Additional Estimates Hearing, Transcript 14 February 2007*, p. 24.

50 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 39.

51 Dr Carlo Kopp, *Transcript 31 March 2006*, p. 2.

6.55 The Committee also notes Air Marshal Shepherd's comments regarding a potential Australian purchase of the Raptor:

... there is no doubt that it will be the world's best air superiority fighter. If we were living in a hypothetical world and it was available, which it is not, and we could afford it, which we can but it would distort the budget, the F22 and the JSF would give us a better air superiority capability in the air-to-air role. There is no doubt about that. But at what cost? What cost to government in distorting other government programs, what cost to Defence in distorting our own capability budget and a balanced ADF ... [the Raptor] comes at a cost – of maintenance people, different aircrew et cetera. So it becomes a logistics, training and engineering cost to what is by world standards a moderate sized but First World capable air force.<sup>52</sup>

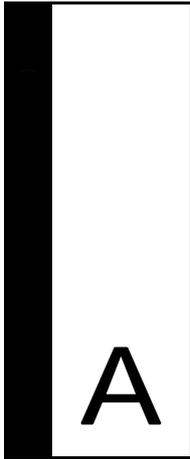
6.56 Notwithstanding the availability, or otherwise, of the Raptor for sale, the Committee notes Defence is firmly of the view that the JSF provides the best capability versus cost whilst maintaining a balanced ADF.

**Senator Marise Payne**  
**Chair**  
**15 August 2007**

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52 Air Marshal Geoff Shepherd, *Transcript 31 March 2006*, p. 60.

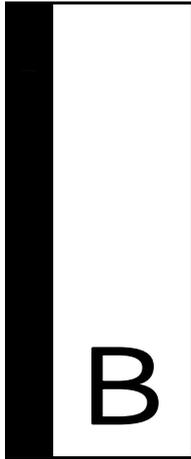




## Appendix A—List of Submissions

- 1 Dr Alan Stephens
- 2 Mr Michael Devlin
- 3 Mr John Peake
- 4 Mr Gordon Bradbury
- 5 Major James Rotramel (USAF, Retd)
- 6 Mr Robert Livingstone
- 7 Mr Ken Oaten
- 8 Dr Duncan Steven
- 9 Kerry Plowright
- 10 Brigadier Brian Cooper (Retd)
- 11 Mr Ted Bushell
- 12 Mr Murray Warfield
- 13 Group Captain Milton Cottee (RAAF, Retd)
- 14 Mr Keith Meggs
- 15 Department of Defence
- 16 Mr Peter Goon
- 17 CONFIDENTIAL
- 18 Mr Graeme Palmer

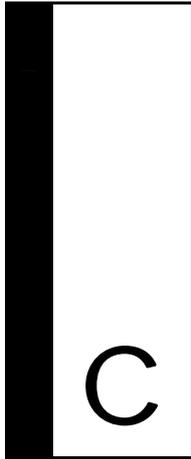
- 19 Mr Adam Lane
- 20 Air Power Australia
- 21 Dr Dennis Jensen MP
- 22 Group Captain Ronald Green (RAAF, Retd)
- 23 Mr James Sadler
- 24 Air Vice-Marshal Brian Weston AM (RAAF, Retd)
- 25 Brigadier Brian Cooper (Retd) – supplementary submission
- 26 Mr John Peake – supplementary submission
- 27 Department of Defence – supplementary submission
- 28 Department of Defence – supplementary submission
- 29 Air Power Australia – supplementary submission
- 30 Mr Andrew Russell
- 31 Photon VFX
- 32 Mr Erik Peacock
- 33 Department of Defence – supplementary submission
- 34 Mr Ted Bushell – supplementary submission
- 35 MIGMan's - Flight Simulation Museum
- 37 Mr Peter Larard
- 38 Air Vice-Marshal Peter Criss AM AFC (RAAF, Retd)
- 39 Mr Peter Larard – supplementary submission
- 40 Mr Jack Garden
- 41 Mr Ted Bushell – supplementary submission



## Appendix B—List of Exhibits

- 1 Mr Ted Bushell  
*Observations of the past 25 years by the 1972 Industrial  
Mobilization Course*





## Appendix C—List of Hearings and Witnesses

**Friday, 31 March 2006 – Canberra**

### **Air Power Australia**

Dr Carlo Kopp

Mr Peter Goon

### **Department of Defence**

Air Commodore Mark Binskin, AM, Director General Capability Management – Air Force

Dr Stephen Gumley, Chief Executive Officer, Defence Materiel Organisation

Air Commodore John Harvey, Director General New Air Combat Capability

Lieutenant General David Hurley, AO, DSC, Chief Capability Development

Dr Roger Lough, Chief Defence Scientist

Air Commodore Roy McPhail, AM, Director General Aerospace Combat Systems

Mr Michael Pezzullo, Deputy Secretary Strategy

Air Marshall Geoff Shepherd, AO, Chief of Air Force

**The Australian National University**

Dr Alan Stephens, Visiting Fellow, Strategic and Defence Studies  
Centre

**The Kokoda Foundation**

Professor Ross Babbage

Mr David Connery

**Wednesday, 5 July 2006 – Queensland****Boeing Australia Limited**

Mr Geoff Webb, Project Manager F-111 Weapon System Business Unit

**Defence Materiel Organisation**

Group Captain Adrian Morrison, Officer Commanding Strike  
Reconnaissance Systems Program Office

Mr John Duff, Director F-11 Engines Business Unit

**Number 82 Wing**

Group Captain Gavin Davies, Officer Commanding

**Raytheon Australia**

Mr Mark Harling, Program Manager Avionics Business Unit

**Rosebank Engineering**

Mr Daryll Macklin, Site Manager and Senior Maintenance Manager

**Tasman Aviation Enterprises**

Mr Andrew Sanderson, General Manager