



THE GREAT DEBATE



Dear APA Visitors,

The Air Power Australia submission to the JSCFADT Inquiry into ADF Regional Air Superiority was accepted recently and has since been posted on the parliamentary website.

The APA team's effort to provide 'information rich' analyses to visitors was regarded to be necessary to impart knowledge and information on the imperatives and nuances as well as the nuts and bolts of the matters now before the JSCFADT inquiry into Australia's air superiority. Many of those contributing this knowledge and information have had to stay in the background for reasons advised previously to this committee as well as to the many Senate Inquiries into Defence Matters. With this in mind, we have endeavoured to communicate the dire importance of this matter over the past 18 months, since APA went online. I would like to think with some success and hope you can agree. However, gaining access and imparting information and knowledge is one thing. Gaining traction on an issue in amongst the myriad that many of you have to deal with everyday is something else, as my friendly local member, Mr David Fawcett MP, keeps reminding me. There are significant costs and risks in such an undertaking, particularly when it involves trying to engage in exchanges on complex matters with such extremely busy and driven people like Federal Parliamentarians and their Advisers, as well as Industry Leaders. For those in whom one of the obvious risks may have materialised (eg. 'Who is this goon and who does he think he is?'), I seek your indulgence for just a little bit longer and, hopefully, your support so, together, we can achieve the collective aim which now, succinctly put, is:

“To ensure getting the best Air Combat Capability that our Nation can afford for our fighting men and women, without exposing ourselves to the risks that arise from having any gap in our air combat capabilities, is assured”

in keeping with the stated belief of our Prime Minister, the Hon John Howard PM, that *“each generation of Australians is obliged to leave our country in better shape than they found it”*.

In sharing with you some of the experiences of the latter stages of the journey that we have been on for over six years now, I have also welcomed the inputs and responses from many of you. I feel it may be beneficial to give some feedback on some of the more poignant of these, along with some well intentioned and, hopefully, thoughtful and thought provoking comments.

Firstly, senior Defence officials say that the JSF is the best choice for Australia because of six cardinal capabilities that are being represented as specific and, somehow, peculiar to the JSF. These are its intended stealthiness; its intended multi role capability; its AESA Radar; the suite of additional sensors/systems it is intended to have (ie. EOTS, DAS, etc); its intended networked communications; and, its intended affordability. This view is not shared by all ranks/levels in the ADO nor Industry.



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Secondly, the view held by many is that the matters before the JSCFADT inquiry are extremely polarised and personalised, with the advocates of both points of view strident and committed in their support of their group's position. For whatever reason, this has become a personalised debate on what appear to be extreme views, maybe because Industry, Academia and private citizens are not seen as stakeholders in Defence nor having any say in Defence Matters. Maybe we are being seen by some as trying to invade a form of hallowed turf, which they regard as their exclusive domain.

Thirdly, the process of politics is one of compromise – to seek out the middle ground which, hopefully, leads to an optimal if not eloquent solution. If the latter features can be achieved then all the better, politically, as this reinforces the worth of the political apparatus and its processes as well as those incumbent within. The middle ground is where balance and reasonable consensus can be found.

On the first point, of the six cardinal capabilities used to promote the JSF, three of these (radar, sensors & systems, networked communications) are systems (aka 'black boxes') that can and are intended to be integrated into other aircraft, such as the Super Hornet, A-10, B-2A, F-111S and the F-22A. Therefore, they are not unique to the JSF. Using them to promote the JSF over other aircraft is just lame. Of the remaining capabilities, the F-22 is considerably more stealthy than what the JSF is intended to be. The Super Hornet and the F-22 are multi role aircraft with the F-22 dominant in the air superiority role. The F-22 (circa 2008) will have far greater multi role capabilities, all around, than the JSF or the Super Hornet. And, the JSF will cost well over twice what senior Defence officials have told the Parliament.

The second point is historical, well documented and goes to whether the stated values, ethics, conduct and integrity sought in such manifestos as the *Defence Service Charter* are a true reflection of what happens inside Defence. It is true matters are extremely polarised. However, the cause is not in substance but, rather, in process. The Industry proposal was derived from extensive, detailed and intellectually rigorous analyses of data and the advice of experts. The current plans of senior Defence officials are based on opinions, subjective perceptions and pre-conceived ideas, and disregard the advice of experts in Defence. The Industry proposal was developed after the public invitation by then Defence Minister, Mr John Moore, who sought Industry and Academia input to enhance Australia's defence capabilities. However, matters certainly have been personalised, leading to the Industry proponents being ignored, with prejudice and suffering damage at the hands of Defence officials.

The Industry proposal of 2001/early 2002 was not an extreme stance, such as the Department's 'replace all with a bright and shiny new, single type aircraft'. Rather, it is, and was devised from the outset as, a compromise, being the result of expert advice based on extensive, detailed and intellectually rigorous analyses. The force structure model provided is an optimisation across all aspects in the four tightly interrelated domains of risks, costs, resources and, most importantly, capabilities, over the whole life cycle. It is far more capable than; far more cost effective than; and, far less risky than the current plans of senior Defence officials. It is optimal and eloquent in its simplicity. This model also enables all the aspects in each of these domains and the interrelationships between these domains to come under Australia's sovereign influence, unlike the alternative being pursued by senior Defence officials.



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A table of comparison of the two force structure options in this Great Debate is provided below. The details on the method of comparison and how the objective scores are determined are outlined in the Table's 'EndNotes'. Against the 18 cardinal metrics used for this comparison, the Industry proposal of 2001/early 2002 scores +7 which means all 18 requirements are satisfactorily met with 7 exceeded by a significant degree. Using the same scale and same method of analysis, the current plans of Defence score -16 and -13 respectively.

Based on data in departmental advice to the Parliament, an estimate of what senior Defence officials have spent pursuing their current plans, up to 2005, is in excess of \$A990.0 million of the estimated \$A21,000+ million that these plans are likely to cost by 2016. A breakdown of this 'up to 2005' spending figure is – JSF SDD Contributions ~ \$A119m; AIR6000 Phase 1A expenses ~ \$A25m; JSF Project Departmental Labour plus On Costs ~ \$A35m; and, F/A-18 HUG ~ \$A907m (not including defence personnel costs).

This spending has been part-funded by cuts to the F-111s and their support that, on current estimates, may see the early retirement of the fleet economically irreversible by the end of 2008, possibly sooner.

All in APA team wish the committee members well in their endeavours and sincerely hope they are successful in achieving the collective aim.

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Co-Founder, Air Power Australia

23 February 2006

COMPARISON : CURRENT PLANS OF DEPARTMENT OF DEFENCE (NACC) VS AUSTRALIAN INDUSTRY PROPOSAL (2001)

S c o r e	<i>AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001)</i>	CAPABILITY, COST, & PROJECT RISK METRICS	<i>CURRENT DEFENCE PLANS</i>	S c o r e
+1 0 -1	<i>2008 Onwards</i> <small>2</small>		<i>2010 TO 2018</i>	+1 0 -1
BRIEF DESCRIPTION OF TWO NEW AIR COMBAT CAPABILITY (NACC) MODELS FOR AUSTRALIA				
	<p>55 x F/A-22A : 50 full systems, start IOC by 2010 + 5 attrition aircraft by 2015 <u>AND</u> 36 x F-111s, progressively evolved by Australian Industry to Evolved F-111S configuration <u>THROUGH</u> incorporation of Incremental Block Upgrades <u>PLUS</u> additional aircraft and parts from the AMARC ³ at less than 10% of book value. Initial LOT = 2025+ (could be extended)</p>	<p>Air Combat Force Structure Model</p>	<p>Up to 71 x F/A-18A HUG aircraft assuming planned phases of Hornet Upgrade Program (HUG) have been completed <u>PLUS</u> Fuselage Centre Barrel Replacement (CBR) <u>PLUS</u> multiple Minor Item Submission (MIS) upgrades <u>PLUS</u> Air 5418 (FOSOW) <u>PLUS</u> Air 5409 (Bomb Improvement Program) <u>PLUS</u> Tanker Aircraft to provide range coverage <u>PLUS</u> cruise missile capability on AP-3C</p>	
	<p>This model meets needs for: - Defence Capability - Manpower challenges - Economy/Balance of Payments - Industrial Base Development - Minimising Dependency Risks - Leaving a 'Better Australia'</p>		<p>Between 75 to 100 x JSF Systems : Low Rate Initial Production aircraft (Block 1, Block 2 and Block 3) <u>PLUS</u> ongoing upgrades to incorporate war fighting capabilities. Significant Single Type dependency risks. Combat UAV option in Tranche 3, though wildly speculative at this stage. ⁴</p>	

Score	AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001)	CAPABILITY, COST, & PROJECT RISK METRICS	CURRENT DEFENCE PLANS	Score
+1 0 -1	2008 Onwards 2		2010 TO 2018 2018 Onwards	+1 0 -1
2	Sub Total	COMBAT CAPABILITY METRICS	Sub Total	-10
0	F/A-22A : Standard	Supersonic Cruise Capability	F/A-18A HUG : None and never will have.	-1
0	Evolved F-111S : Achieved via engine upgrade (F110 ex F-14D or F119)		JSF : None and never will have.	-1
0	F/A-22A : Standard	All Aspect Wideband Stealth Capability	F/A-18A HUG : None	-1
0	Evolved F-111S : Not required. Primarily stand-off missile carrier and cruise missile interceptor. Air dominance fighter and strike capabilities provided by F/A-22A		JSF : None Optimised for 'Forward' and 'Side' aspect Best performance limited to X-Band, only. Target KPP downgraded to LO from VLO – an order of magnitude change.	-1
0	F/A-22A : AN/APG-77 ⁵	Phased Array Radar Capability	F/A-18A HUG : None	-1
0	Evolved F-111S : AN/APG-80 or AN/APG-81 ⁵ via upgrade. Could be done with funded NRE in support of mitigating risks on JSF Program		JSF : AN/APG-81 ⁵	0
0	F/A-22A : Not required, due F-111	Internal Carriage 900 kg Weapons	F/A-18A HUG : None	-1
0	All F-111 (but R/F-111) : Standard		JSF : None (CV variant only)	-1

Score	AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001)	CAPABILITY, COST, & PROJECT RISK METRICS	CURRENT DEFENCE PLANS	Score
+1 0 -1	2008 Onwards 2		2010 TO 2018 2018 Onwards	+1 0 -1
0	F/A-22A : 9,000 kg	Maximum External Payload (Any Weapon Type)	F/A-18A HUG : 6,800 kg Typical for generic small tactical fighter	0
+1	Standard F-111 : 13,600 kg		JSF : 6,800 kg Typical for generic small tactical fighter	0
0	F/A-22A : 2 x 450 kg or 8 x 175 kg	Internal Weapons Payload (Smart Bombs)	F/A-18A HUG : None Does not have a weapons bay.	-1
+1	F-111 : 2 x 900 kg Evolved F-111S: 8 x 175 kg		JSF : 2 x 450 kg or 8 x 175 kg	0
0	F/A-22A : 700+ NMI - PLUS long range asymmetric sub sonic cruise for strike, ISR and electronic attack roles as well as ferry - > 1,000 NMI	Combat Radius on Internal Fuel Suited to Australian Island Continent Status	F/A-18A HUG : 450 NMI (Requires external fuel tanks to achieve this range with any effectiveness)	-1
0	Standard F-111 : 1,000+ NMI Evolved F-111S : >1,300 NMI Asymmetric, long range cruise capability for strike, ISR, cruise missile intercept, and electronic attack roles as well as ferry.		JSF : 650 NMI <u>Note:</u> Combat radius yet to be demonstrated in clean configuration and carrying external stores. Expect this will occur some time after 2006, most likely in 2008 test program.	-1

Score	AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001)	CAPABILITY, COST, & PROJECT RISK METRICS	CURRENT DEFENCE PLANS	Score
+1	2008 Onwards 2		2010 TO 2018	+1
-1			2018 Onwards	-1
2	Sub Total	COST METRICS	Sub Total	-6
+1	F/A-22A: (in 'then year' dollars) 50+5 Systems \$US6,800.0 m (Subject to negotiation on model - potential for significant reduction) <u>Estimate in Australian Dollars</u> @ 2010 exchange \$A9,855.3 m	Value for Money/Cost Effective Acquisition Cost	F/A-18A HUG : \$A3,000+ m <u>PLUS</u> Minor Item Submission (MIS) Project costs, Estimate (MIS) \$A100m to \$A200m These figures are what Defence calls 'cash dollars' which would appear to be 'then year' dollars.	-1
0	Evolved F-111S: (in 2004 dollars) Upgrades \$A1,760.5 m 10 x Attrition Acft \$A 133.3 m (<u>PLUS</u> spares eg. wings, etc.) <u>Total</u> : \$A1,893.8 m		JSF : \$A15,000 m+ NACC Budget - (Assumed 'then year' dollars) Often Stated \$US45m per aircraft is Avg Unit Recurring Flyaway <u>Cost</u> in 2002 dollars not <u>Price</u> in 2012+	-1
+1	F/A-22A : FMS purchase or Lease/Buy or combination of both, with strategic offsets available. <u>Negotiation Win Themes:</u> - Strategic Importance to US - Support for USAF buy/need	Value for Money /Cost Effective Acquisition Model	F/A-18A HUG : large block upgrades and multiple Minor Item Submission (MIS) Projects.	-1
0	F-111 : incremental upgrades to existing fleet, acquire attrition reserve from AMARC at less than 10% of book value, as has been achieved previously.		JSF : Tier 3 partner purchase <u>PLUS</u> large Loss/Lead and high government overhead Industry Involvement Program with no guarantees.	-1

Score	AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001)	CAPABILITY, COST, & PROJECT RISK METRICS	CURRENT DEFENCE PLANS	Score
+1 0 -1 1	2008 Onwards 2		2010 TO 2018	+1 0
			2018 Onwards	-1
0	<p>F/A-22A : Integrated avionics, 4th generation engine.</p> <p>Requirement for life cycle costs to be less than 60% those of F-15.</p> <p>Demonstrated in Initial Operational Test and Evaluation to be on target.</p> <p>Australia being more than 20% of world fleet provides great opportunity, combined with using attrition aircraft, for Australian Industry involvement in life cycle upgrades. Also, stronger buying and negotiation position.</p>	<p>Value for Money/Cost Effective Life Cycle Costs</p> <p>(Note: Present Value Analysis methods used to provide valid basis for comparison. Same escalation and discount factors used for both models, where applicable.)</p>	<p>F/A-18A HUG: Legacy federated avionics; aircraft undergoing deeper maintenance for the first time in conjunction with large suite of modification and refurbishment projects to be done in parallel. Figures derived from analysis of Defence Annual Reports 1999 to 04, Defence Capability Plan to 2015, and previous ⁶. PRESENT VALUE \$'s in 2004 :</p> <p><u>F/A-18A HUG et al</u> Capital Costs (DCP, MIS) >\$A2,241.7 m <u>F/A-18A HUG (to 2015 ⁷)</u> Total Operating Costs >\$A3,002.7 m Total : >\$A5,244.4 m <u>Note :</u> Costs to 2015⁴ vs 2020 for F-111S</p>	-1
+1	<p>F-111 : Mostly integrated avionics, 4th generation engine via upgrades. Figures derived from RAAF Air Combat Capability Paper to Parliament. ⁸</p> <p>PRESENT VALUE \$'s in 2004 :</p> <p><u>F-111 to 2020 (RAAF)</u> Total Cost of Ownership \$A2,224.5 m <u>Evolved F-111S (Industry)</u> Total Cost of Upgrades \$A1,090.5 m Total : \$A3,315.0 m</p>		<p>JSF: Integrated avionics, 4th generation engine, CAIV and international partnering.</p> <p>To be demonstrated in Initial Operational Test and Evaluation presently projected to occur circa 2012.</p> <p>Presumed will meet and achieve metric.</p>	0

Score	<i>AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001)</i>	CAPABILITY, COST, & PROJECT RISK METRICS	<i>CURRENT DEFENCE PLANS</i>	Score
+1 0 -1	<i>2008 Onwards</i> <i>2</i>	PROJECT RISK METRICS	<i>2010 TO 2018</i>	+1 0 -1
0	F/A-22A : Expected life of 40+ years	Minimum of 10 Year Return on Investment Period After Acquisition/Upgrade	F/A-18A HUG : Planned to be completed sometime after 2010. Further upgrades/rebuilds would be required to go beyond 2015.	-1
0	F-111 : 2005-2025+ (Could be extended, or replaced with FB-22 or later build JSF or other capability).	Minimum of 10 Year Return on Investment Period After Acquisition/Upgrade	JSF : Expected life of 30+ years subject to approval for full rate production sometime after 2012.	0
3	Sub Total	RISK METRICS	Sub Total	-13
0	F/A-22A : LOW	Low Acquisition Risks	F/A-18A HUG : LOW in Avionics; HIGH in Centre Barrel Replacement (CBR); overall HIGH in schedule since multiple element project with close interdependencies which, in turn, is part of a 5 project CAPSTONE Program which has yet to be managed as a CAPSTONE. HIGH risk exposure on aircraft availability.	-1
0	Evolved F-111S : LOW Due to extensive research, knowledge and experience on aircraft now resident in Industry, DSTO and, to lesser extent, the RAAF (latter due to downsizing and deskilling).	Low Acquisition Risks	JSF : HIGH Potential for significant variations in capability, cost and schedule timelines with high likelihood of current risks materialising and further risks arising eg. software problems, partners leaving program, Congressional intercession	-1

Score	AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001)	CAPABILITY, COST, & PROJECT RISK METRICS	CURRENT DEFENCE PLANS	Score
+1 0 -1	2008 Onwards		2010 TO 2018 2018 Onwards	+1 0 -1
0	F/A-22A : LOW Since mature, inproduction design with buy at end of current production (low cost end when NRE recovery and recurring engineering (RE) costs are at lowest levels). Increase of USAF buy to 300+ units	Low Cost Risks	F/A-18A HUG : HIGH High probability of additional structural refurbishing costs, more extensive rectifications arising from first time deeper maintenance, and avionics/ weapons upgrades as further delays development challenges arise in JSF program	-1
0	F-111 : LOW		JSF : Very HIGH – uncertainties in total numbers will persist until at least 2015	-1
0	F/A-22A : Nil		F/A-18A HUG : MEDIUM LOW	0
0	F-111 : LOW Incremental upgrades of legacy avionics (cockpit, radar) and legacy systems (Pave Tack) <u>PLUS</u> an engine upgrade in the 2010 to 2020 time window.	Low Design Risk	JSF : HIGH Remains in development with difficulties in performance, weight and cooling capacity <u>PLUS</u> significant software and system integration challenges.	-1
0	F/A-22A : LOW No comparable type exists		F/A-18A HUG : HIGH Outclassed by Sukhoi Su-27/30/35 fighters in aerodynamic and radar performance	-1
0	F-111 : LOW Proven Tier 1 strike platform	Low Strategic Risks	JSF : HIGH – Tier 2 aircraft outclassed by larger Tier 1 Sukhoi Su-27/30/35 fighters in aerodynamic performance	-1

Score	AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001)	CAPABILITY, COST, & PROJECT RISK METRICS	CURRENT DEFENCE PLANS	Score
+1 0 -1 1	2008 Onwards 2		2010 TO 2018 2018 Onwards	+1 0 -1
0	F/A-22A : None	No Strike Capability Gap	F/A-18A HUG : Significant Gap Reduction of precision munitions delivery capability by up to 62.5%. Refer Figure 3 of Parliamentary Submission, "Air Combat Capability", by A G Houston, 04 June 2004. Defence decision to exclude F-111 from Air 5418, has made gap deeper and wider.	-1
+1	F-111 : Already has MIL-1760 smart weapons bus making integration of Air 5418 FOSOW and JDAM easy (and cheap). Is not dependent on refuelling tankers to provide long range strike capability to 1,000 NMI.		JSF : Ongoing Gap Up to 37.5% reduction compared with Defence 2000 White Paper guidance.	-1
+1	F/A-22A : None Superior in all respects to all opposing aircraft ' out to 2025 and beyond.	No Air Superiority Gap	F/A-18A HUG : inferior speed, agility, range vs Sukhoi Su-27/30/35; significant dependency on AEW&C and tankers to provide useful capability	-1
0	F-111 : Requirement met by F/A-22A air dominance fighter capabilities		JSF : Inferior speed, agility, and range when compared against Sukhoi Su-27/30/35 family of aircraft, particularly post 2010 configurations; definitely post 2015 evolved growth variants	-1

Score	AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001)	CAPABILITY, COST, & PROJECT RISK METRICS	CURRENT DEFENCE PLANS	Score
+1 0 -1	2008 Onwards		2010 TO 2018	+1 0 -1
			2018 Onwards	
+1	F/A-22A : None "The F/A-22 will be the most outstanding aircraft ever built. Every fighter pilot in the Air Force would dearly love to fly it." Air Chief Marshall Angus Houston, August 2004	No Air Defence Gap	F/A-18A HUG : Considerable Gap Unsuited for bomber and cruise missile defence due to limited endurance, limited missile payload and limited supersonic speed	-1
0	F-111 : Evolved F-111 capability suitable for bomber intercept, cruise missile defence and ISR/Electronic Attack in addition to established strike roles due to excellent endurance, superior payload, high speed and advanced radar capability ¹⁰ .		JSF: unsuited for bomber and cruise missile defence due to limited endurance, limited missile payload and limited supersonic speed. The operational JSF is intended to be a battlefield strike interdiction / close air support aircraft with some self defence capabilities ¹¹ .	-1
TOTAL NUMBER OF METRICS = EIGHTEEN (18) A score of zero (0) means the air combat capability system meets or achieves all the defined metrics. A negative score means the air combat capability system fails to meet one or more of the metrics. A positive score means the capability system significantly exceeds the requirements of one or more of the metrics.				
+7	2008 Onwards SUPERIOR OUTCOME	NETT ASSESSMENT SCORE TOTALS	INFERIOR OUTCOME-: 2010 TO 2018	-16
			INFERIOR OUTCOME : 2018 Onwards	-13

ENDNOTES :

- ¹ Allocation of scores based on a Parametric Analysis Scoring System which uses -1, 0 and +1 as a way of establishing an objective means of comparison. Defence should be invited to submit its own scores, using this system in keeping with the following guidance:
- +1 Subject model significantly exceeds the requirement by some degree or embodies more than the stated metric;
 - 0 Subject model meets the stated metric or the metric is not applicable to that model; and,
 - 1 Subject model does not achieve or embody the stated metric.
- ² Response to Defence Request for Proposal – “Project Air 6000 Force Mix Option Market Survey”, DTC Air 6000 Technology Group Submission of 25 January 2002 and supporting proprietary Industry Proposals submitted in accordance with the Defence Capability Systems Life Cycle Management Guide, December 2001, after meeting with Air6000 Project Office personnel who sought further, detailed information to support their recommendation of the Evolved F-111 Option for Stage 3 of Air 6000.
- ³ [AMARC](#) – Aerospace Maintenance and Re-generation Center at Davis-Monthan AFB, Tucson, Arizona, USA. Over 200 F-111s remain mothballed at AMARC.
- ⁴ Since the experts in computer science (in particular, in the artificial intelligence domain) can’t agree on when the capability for safe and effective autonomous operation of high risk, lethal assets in demanding, hostile environments (such as experienced in air combat) is going to be possible, with predictions ranging from 15 years to 50 years time to never, it would be fanciful and wasteful let alone naïve for the non expert to commit their integrity and public resources to a date in time.
- ⁵ The F/A-22A’s APG-77 radar and the JSF’s APG-81 radar share transmit-receive module technology, computer processing technology, packaging technology, and multimode capabilities, however, the F/A-22A’s APG-77 is much more powerful, providing twice the detection footprint of the JSF’s APG-81 radar. While the F/A-22A’s APG-77 radar provides excellent bombing capability, it remains the most capable air to air radar ever built. Conversely, while the JSF’s APG-81 radar provides respectable air to air radar coverage capability, it is being optimised as a bomber radar to meet the Joint Operational Requirements Document (JORD) and CAIV.
- ⁶ [Defence Annual Reports 1999 to 2004](#) inclusive, statutory financials; [Defence Capability Plan 2001-10 and subsequent](#) including analysis of activities in current draft; RAAF Air Combat Capability Paper – A Houston, 04 June 2004; ASPI Strategic Insight – ‘Is the JSF good enough’ – A Houston, August 2004; Air Power Australia - [A FAREWELL TO ARMS - REVISITED](#), P A Goon., January 2005; ADA Defender - Winter 2005 – ‘[Affordability and the new air combat capability](#)’, P A Goon.
- ⁷ Analysis and present value (2004) calculations of total operating expenses for the F/A-18A HUG only taken out to 2015 since fleet numbers start to drop off due to fatigue and maintenance related lifing issues shortly after 2014 (on the basis of historical flying rate and fatigue damage accrual rates which, if reduced, will effect preparedness).
- ⁸ [RAAF Air Combat Capability Paper](#) – Air Force Submission to Joint Standing Committee on Foreign Affairs, Defence and Trade dated 04 June 2004. Refer Figure 2 – F-111 Cost of Ownership (Cash) and Table 1 – Ten Year Cost of Retaining F-111 in Service. Cash flow profile figures are discounted to Present Value (2004) dollars using the same discount factors (having applied escalation factors, where appropriate) in the analysis and comparison of both models.
- ⁹ The design aims of the original F-22A, defined in the 1980s, provided capabilities to defeat opposing next generation fighters and bombers. By the early 1990s these aims expanded to include high survivable strike capabilities, resulting in redesignation to the F/A-22A. Over the last five years these capabilities have been further expanded to include intelligence, surveillance and reconnaissance in high threat situations – the F/A-22A will thus absorb much of the role performed until the 1990s by the SR-71A.
- ¹⁰ The earliest design aims of the original F-111 program, defined during the early 1960s, were to provide a bomber for the US Air Force and an interceptor for the US Navy, to protect naval forces from Soviet bombers and cruise missiles. As the F-111 proved too large for aircraft carrier deployment, only the bomber variants were built. The F-111 thus retains the endurance, payload and high speed required to provide defence against bombers and cruise missiles. The Evolved F-111S proposal exploits this inherent capability to expand the utility of the F-111. Refer Parliamentary Submission entitled ‘[Evolving Force](#)’, C Kopp and A Cobb, October 2003 and ‘[Rationale](#)’.
- ¹¹ While the JSF is often loosely described as ‘multi-role’, its performance and avionics capabilities are mostly weighted to provide battlefield support capabilities for ground troops rather than capabilities to defeat opposing air superiority fighters, opposing bombers and provide long range strike. In US service, the JSF is planned to replace the AV-8B Harrier and A-10 Thunderbolt II, as well as F-16s and early model F/A-18s, all aircraft types used exclusively or mostly for supporting ground troops since 1995.
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