Submission No 20 Part 4

Sub Divided & Low Resolution
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Inquiry into Australian Defence Force Regional Air Superiority

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5 Annex A - F-22A Data

Figure 44: *The F-22A is uniquely the only fighter in production, or planned, which combines supersonic cruise capability and top tier stealth performance. (US Air Force).*

This Annex provides a series of charts and diagrams which illustrate basic F-22A capabilities and provides some comparisons against the Joint Strike Fighter.

Figure 45: *An early production F-22A Raptor releasing a GBU-32 JDAM satellite aided guided bomb (upper). The F-22A is a true multirole fighter, intended to excel in the air superiority role, but also to attack the most heavily defended surface targets with precision guided munitions. With unchallenged survivability it will also be used for electronic and imaging radar reconnaissance. The F-22A is designed to carry internal weapons where stealth is required, but can also carry significant external payloads where stealth is not required (lower) (US Air Force).*

Top ten reasons why the F-22A Raptor is the best choice to replace Australia's F/A-18A Hornets:

1. **GREATER CAPABILITY BETTER SUITED TO AUSTRALIA'S NEEDS.** The F-22A is over twice as capable compared to what is being planned as the Joint Strike Fighter.
2. **MORE COST EFFECTIVE.** Buying the F-22A and upgrading the F-111s will be a cheaper yet more capable solution to the current plans.
3. **BETTER DEFINED AND EARLIER SCHEDULE (NO RISK OF CAPABILITY GAP).** Buying the F-22 toward the end of the currently planned full rate production would put the buy in the 2010-2012 timeframe.
4. **LESS TECHNICAL AND FINANCIAL RISK.** The F-22A is a known commodity that is flying today. The Joint Strike Fighter has yet to fly let alone complete development and demonstrate its capability.
5. **MAINTAINING STRATEGIC POSITION AND RELEVANCE IN THE REGION.** The survivability of the Joint Strike Fighter against post 2010 Sukhoi Su-30 derivative aircraft is highly problematic.
6. **DEVELOPING AUSTRALIAN DEFENCE INDUSTRY.** By targeting return on investment already made in F-111 support capabilities.
7. **LESS EFFECT ON BALANCE OF TRADE.** Fewer tax payer dollars have to be spent off shore.
8. **BETTER LIFE CYCLE GROWTH CAPABILITY.** The F-22A and F-111 are larger aircraft with greater system growth potential.
9. **BETTER LONGEVITY AND RETURN ON INVESTMENT.** The F-22A and F-111 are more robust airframe designs that have not been subject to the 'Cost As an Independent Variable' (CAIV) driven cost and capability reductions as is the case with the Joint Strike Fighter.
10. **INDEPENDENCE, SELF RELIANCE AND VALUED CONTRIBUTION TO DEFENCE OF THE REGION.**

With the F-22A in service as a replacement for the F/A-18A, it provides the capability to defeat the most capable regional systems, creating a more permissive operational environment for the F-111.

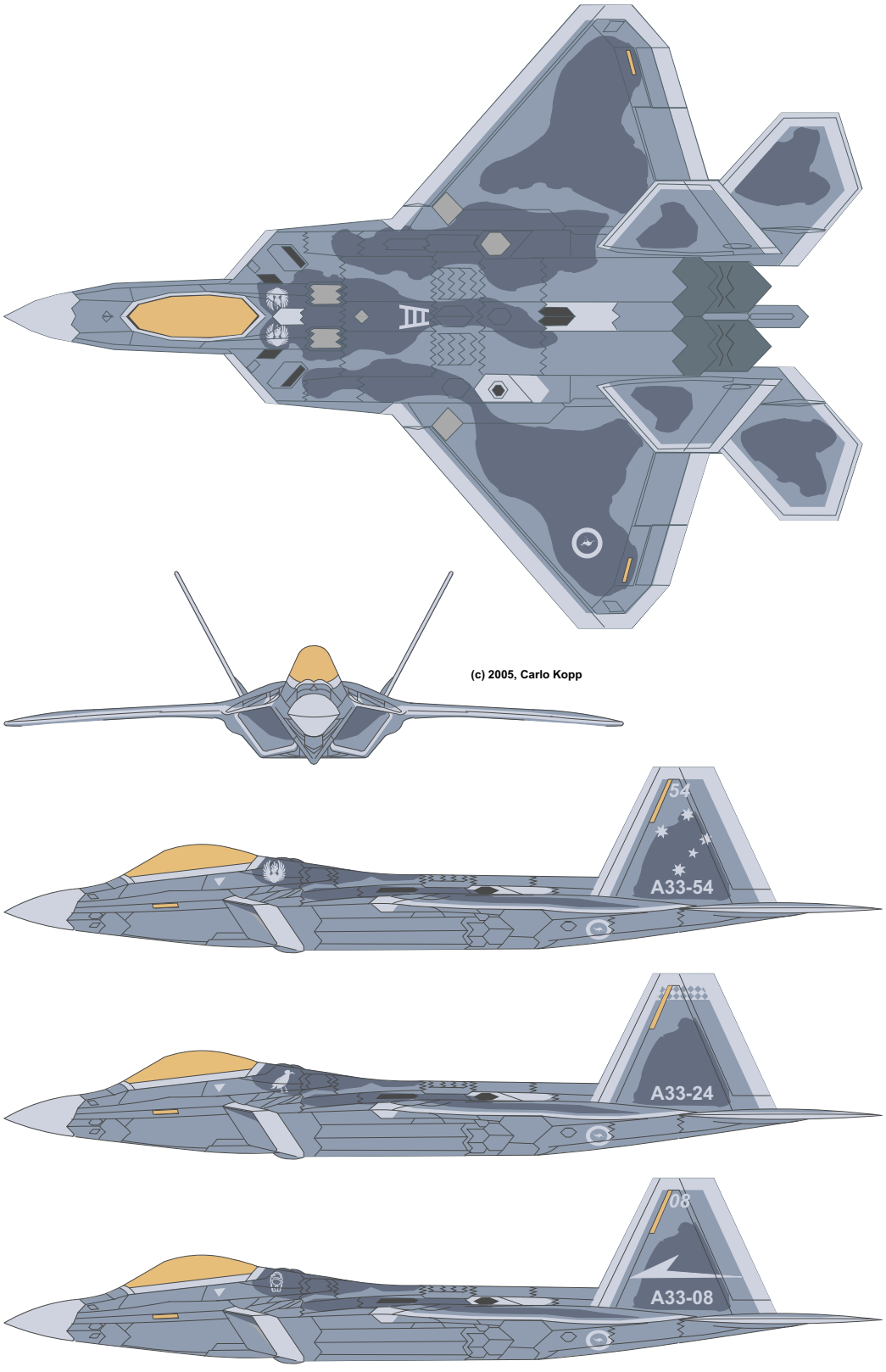

Figure 46: *This diagram illustrates the F-22A in RAAF colours (C. Kopp).*

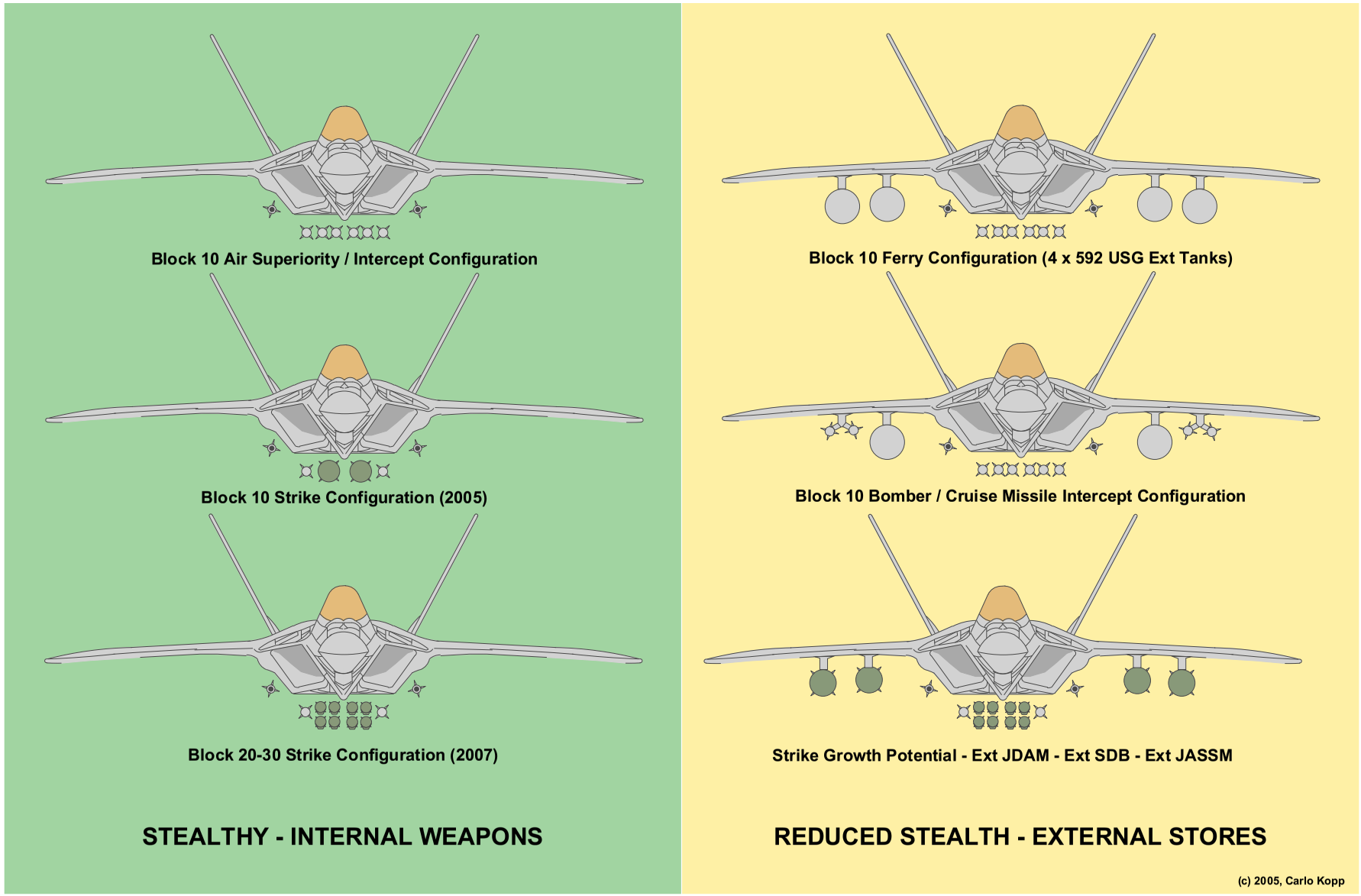

Figure 47: *The F-22A exceeds the internal Air-Air Missile carriage capability of the Joint Strike Fighter, and matches the stealthy internal weapons carriage capability using the Small Diameter Bomb, and GBU-32 satellite aided bomb. The F-22A exceeds the non-stealthy external weapons and fuel carriage capability of the Joint Strike Fighter by 50%. Used as a bomber, the F-22A can carry as as many or more weapons than the Joint Strike Fighter, and do so in situations where the Joint Strike Fighter could not survive (C. Kopp).*

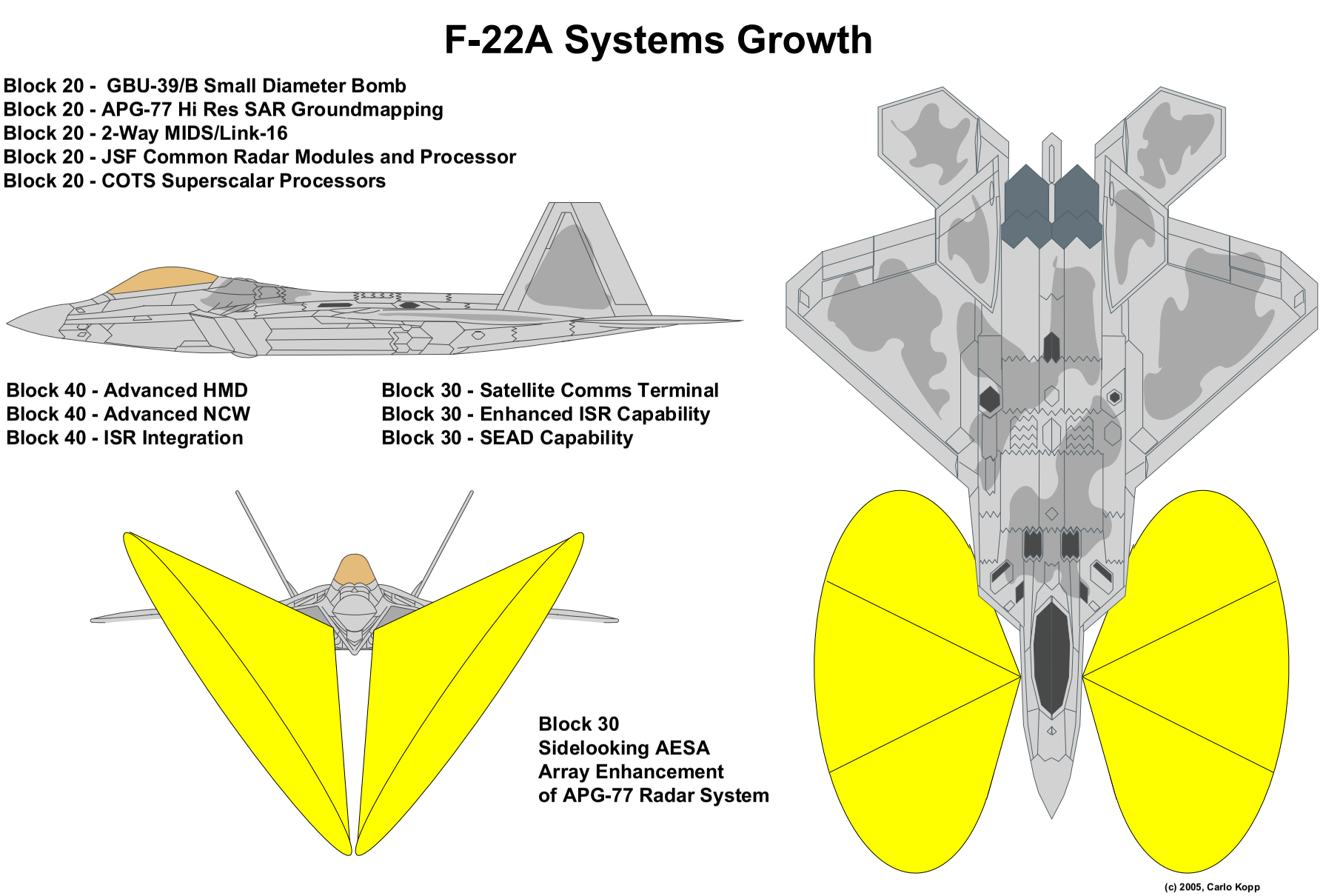

Figure 48: *The production F-22A will undergo a series of block upgrade enhancements over coming years. The strike and Intelligence Surveillance Reconnaissance capabilities it provides will match or exceed those of the Joint Strike Fighter, while the F-22A will always be more survivable in combat than the smaller Joint Strike Fighter (C. Kopp).*

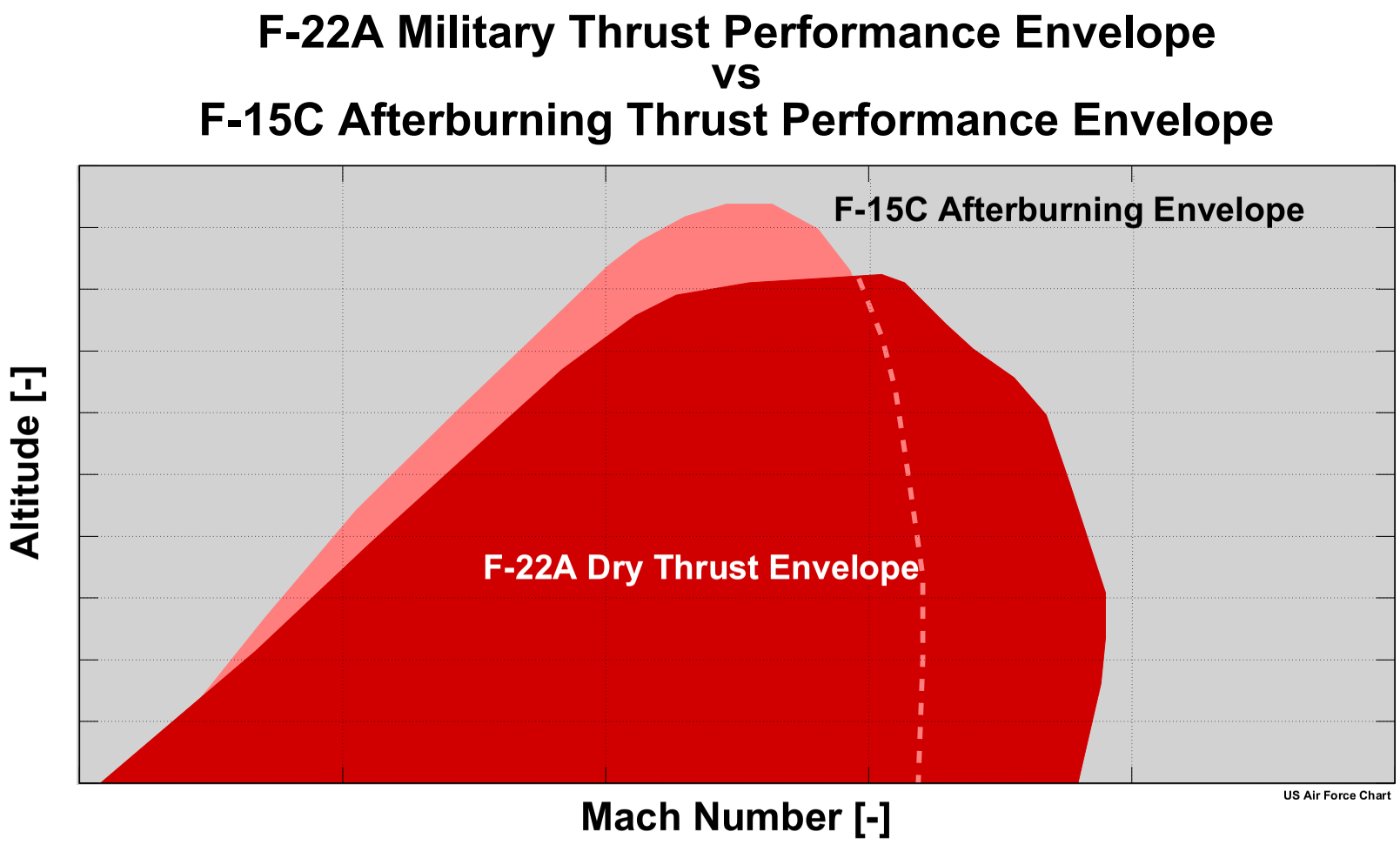

Figure 49: *The F-22A will provide unprecedented gains in energy performance and supersonic persistence over established fighters, and the Joint Strike Fighter. This chart compares the performance envelope of the F-15C at maximum attainable engine performance using afterburner, against the performance envelope of the F-22A without the use of afterburner. Afterburner use increases fuel burn severalfold (US Air Force).*

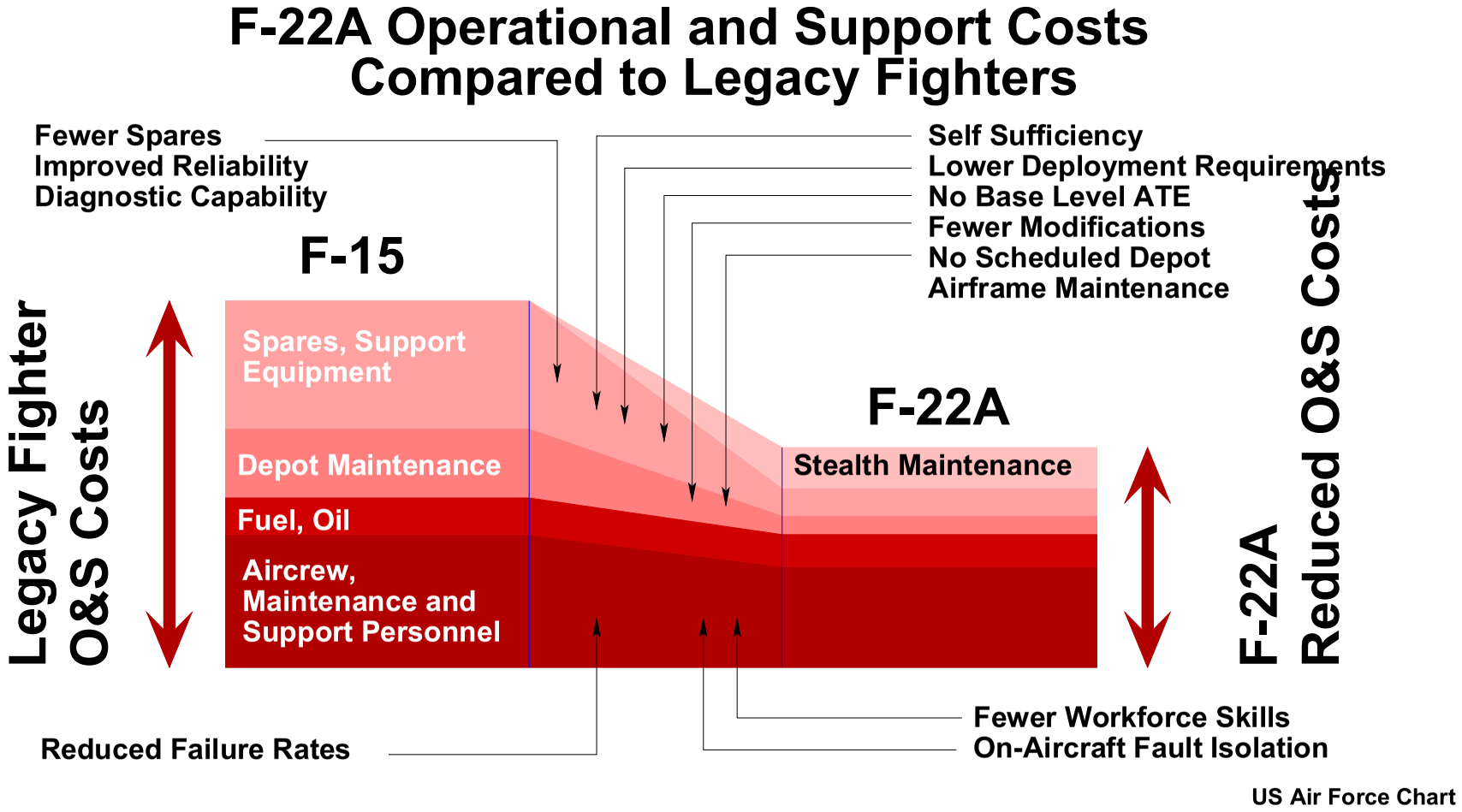

Figure 50: *The F-22A will be much cheaper to operate compared to established fighters. This chart shows a comparison against the F-15, which incurs similar operational and support costs to the RAAF's F/A-18A. The introduction of deeper depot level maintenance activities and planned upgrade programmes (HUG 2 & 3 plus Minor Item Submissions) will see the F/A-18A O&S Costs balloon above those for the F-15 by some degree. (US Air Force).*

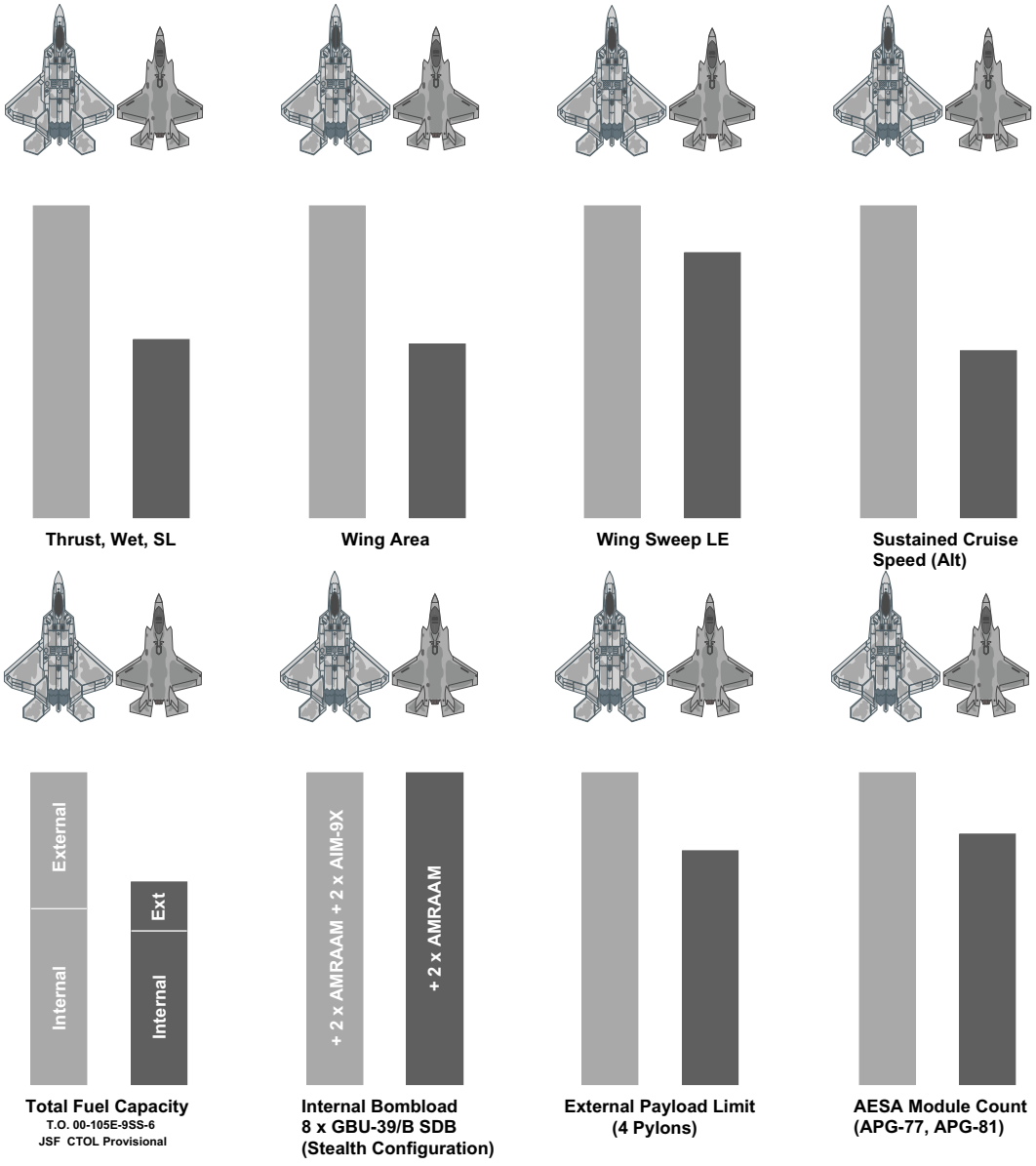

Figure 51: *The F-22A outperforms the Joint Strike Fighter in all cardinal specifications (C. Kopp).*

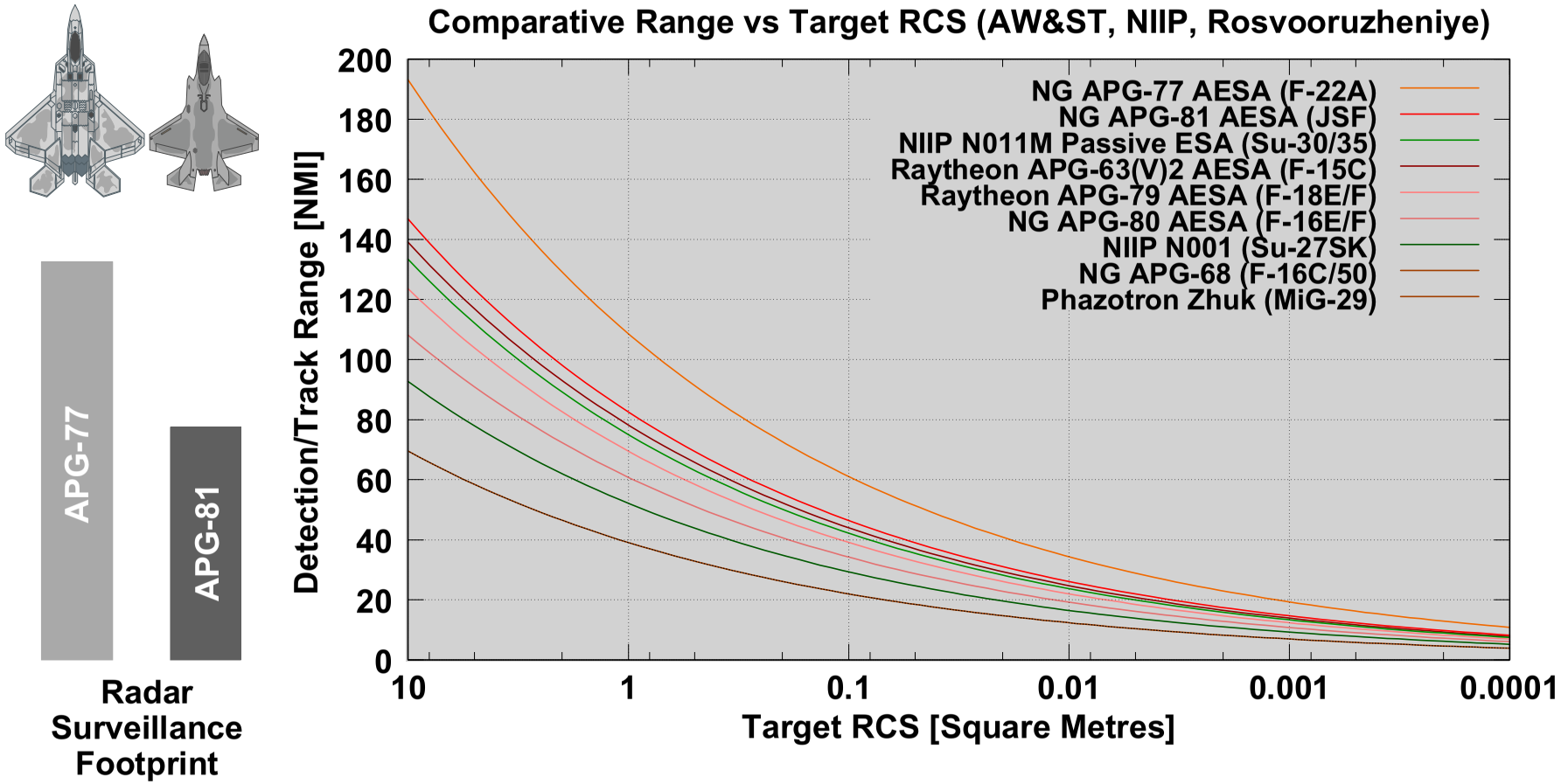

Figure 52: *The F-22A is equipped with the most powerful active array radar ever installed in a fighter aircraft. This will provide it with unprecedented range performance, but also opens up the option of using it as a microwave directed energy weapon to disrupt opposing electronic systems. US sources indicate it will also be used to jam opposing X-band radars (C. Kopp).*

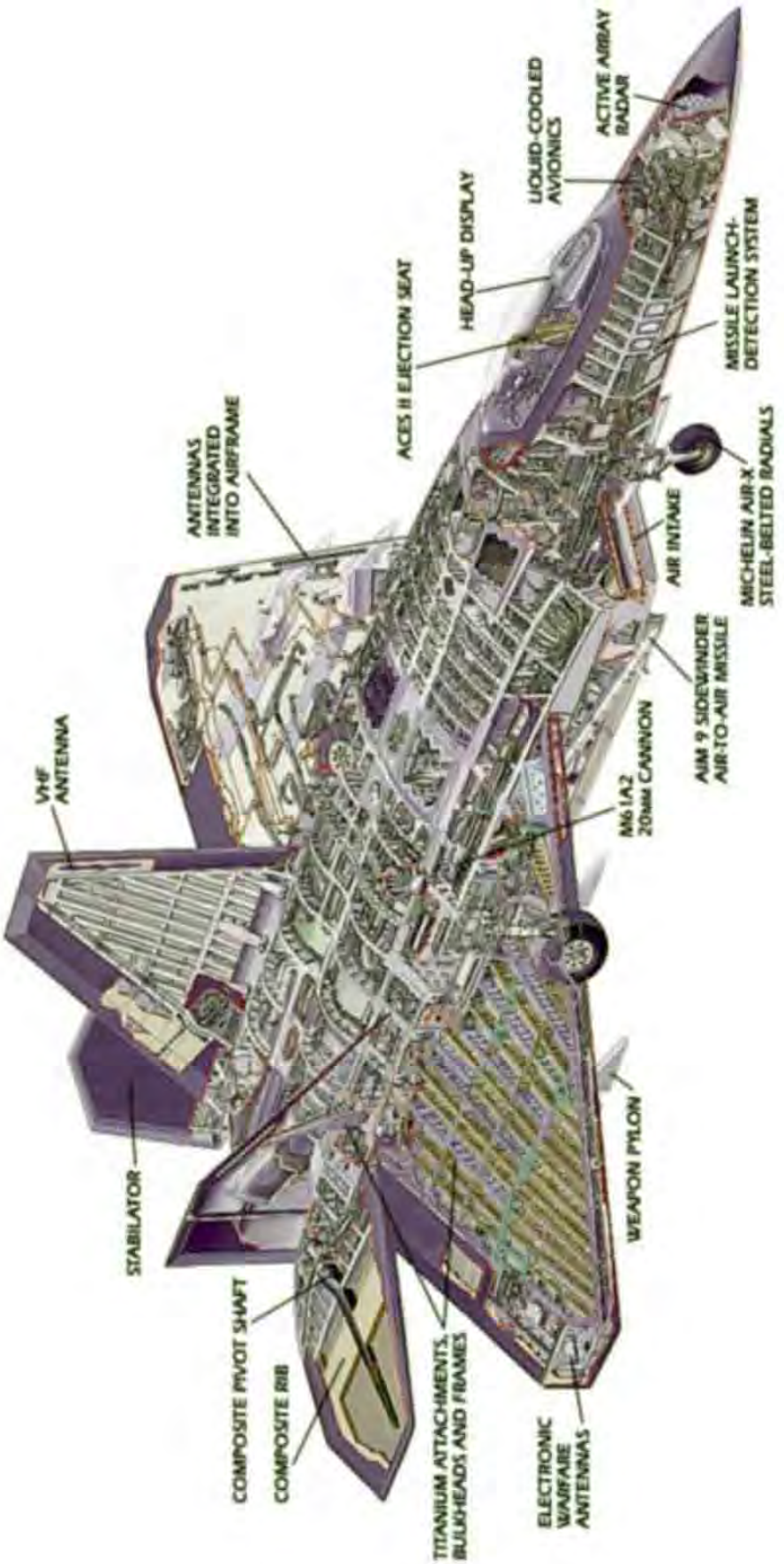

Figure 53: *F-22A cutaway chart (GlobalSecurity.org).*

6 Annex B - Comparison of Current NACC Plan vs 2001 Industry Proposal

This annex contains a detailed tabular breakdown of the comparative scoring performed between the current Defence NACC plan and the 2001 industry proposal. For convenience, the summary table in Table 2 is replicated here.

Proposal Metric	Australian Industry Solution (2001) Score	Current Defence Plan Score
Combat Capability Subtotal	+2	-10
Supersonic Cruise	0	-2
All Aspect Stealth	-1	-1
Phased Array Radar	0	-1
Internal Weapons 2 klb	0	-2
Max External Payload	+1	0
Int Weapons Payload	+1	-1
Combat Radius (Int Fuel)	0	-2
Cost Metrics Subtotal	+2	-6
Acquisition Cost	+1	-2
Acquisition Model	+1	-2
Life Cycle Costs	+1	-1
Return on Investment	0	-1
Risk Metrics Subtotal	+3	-13
Acquisition Risk	0	-2
Cost Risk	0	-2
Design Risk	0	-1
Strategic Risk	0	-1
Strike Capability Gap	+1	-2
Air Sup Capability Gap	+1	-2
Air Def Capability Gap	+1	-2
Net Assessment	+7	-29

Table 5: Summary table of assessment scoring for current defence NACC and interim planning against the 2001 Australian Industry solution.

Note on Analysis Method:

The analysis technique and scoring method used is based upon *ordinal comparison* which is a technique where parameters are ranked by relative magnitude. The scoring is thus based on comparing a large number of parameters against a target, and ranking each score as superior / equal / inferior. This method was chosen over *cardinal comparison*, in which the relative magnitudes of parameters are each expressed as a number, such as a percentage. For many of the metrics in this annex, this ordinal method in fact favours the Joint Strike Fighter and the F/A-18A HUG, by concealing the scale of advantage enjoyed by the F-22A and F-111 in comparison. This analysis is therefore unusually conservative.

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

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 -1*
			2018 Onwards	
BRIEF DESCRIPTION OF TWO NEW AIR COMBAT CAPABILITY (NACC) MODELS FOR AUSTRALIA				
	55 x F/A-22A : 50 full systems, start IOC by 2010 + 5 attrition aircraft by 2015 AND 36 x F-111s, progressively evolved by Australian Industry to Evolved F-111S configuration THROUGH incorporation of Incremental Block Upgrades PLUS additional aircraft and parts from the AMARC [3] at less than 10% of book value. Initial LOT = 2025+ (could be extended)	**Air Combat Force Structure Model**	**Up to 71 x F/A-18A HUG aircraft assuming planned phases of Hornet Upgrade Program (HUG) have been completed PLUS Fuselage Centre Barrel Replacement (CBR) PLUS multiple Minor Item Submission (MIS) upgrades PLUS Air 5418 (FOSOW) PLUS Air 5409 (Bomb Improvement Program) PLUS Tanker Aircraft to provide range coverage PLUS cruise missile capability on AP-3C**	
	This model meets needs for: - Defence Capability – Manpower challenges – Economy/Balance of Payments – Industrial Base Development – Minimising Dependency Risks – Leaving a 'Better Australia'		**Between 75 to 100 x JSF Systems : Low Rate Initial Production aircraft (Block 1, Block 2 and Block 3) PLUS 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]**	

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
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 [1]	*2008 Onwards* [2]		*2010 to 2018*	+1 / 0 / -1
			2018 Onwards	
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 - <u>PLUS</u> 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 0 -1 [1]	*2008 Onwards* [2]		*2010 to 2018* / *2018 Onwards*	*+1 0 -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 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	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			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 +1 0 -1 [1]	AUSTRALIAN INDUSTRY SOLUTION (PROPOSED 2001) *2008 Onwards* [2]	CAPABILITY, COST, & PROJECT RISK METRICS	CURRENT DEFENCE PLANS *2010 TO 2018* / *2018 Onwards*	Score +1 0 -1
0	**F/A-22A : Integrated avionics, 4th generation engine.** **Requirement for life cycle costs to be less than 60% those of F-15.** **Demonstrated in Initial Operational Test and Evaluation to be on target.** **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.**	**Value for Money/Cost Effective Life Cycle Costs** (<u>Note</u>: Present Value Analysis methods used to provide valid basis for comparison. Same escalation and discount factors used for both models, where applicable.)	**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 $'s in 2004 :** **<u>F/A-18A HUG et al</u>** **Capital Costs (DCP, MIS) >$A2,241.7 m** **<u>F/A-18A HUG (to 2015 [7])</u>** **Total Operating Costs >$A3,002.7 m** **<u>Total</u> : >$A5,244.4 m** **<u>Note</u> : Costs to 2015[4] vs 2020 for F-111S**	-1
+1	**F-111 : Mostly integrated avionics, 4th generation engine via upgrades. Figures derived from RAAF Air Combat Capability Paper to Parliament. [8] PRESENT VALUE $'s in 2004 :** **<u>F-111 to 2020 (RAAF)</u>** ***Total Cost of Ownership*$A2,224.5 m** **<u>Evolved F-111S (Industry)</u>** ***Total Cost of Upgrades* $A1,090.5 m** **<u>Total</u> : $A3,315.0 m**		**JSF: Integrated avionics, 4th generation engine, CAIV and international partnering.** **To be demonstrated in Initial Operational Test and Evaluation presently projected to occur circa 2012.** **Presumed will meet and achieve metric.**	0

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 : 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).		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).		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 [1]	*2008 Onwards* [2]		*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**	Low Cost Risks	**JSF : Very HIGH** – uncertainties in total numbers will persist until at least 2015	-1
0	**F/A-22A : Nil**	Low Design Risk	**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	Low Strategic Risks	**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 : Superior in all respects to all opposing aircraft[9] 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
+10 -1[1]	*2008 Onwards*[2]		*2010 TO 2018*	*+10 -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 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.

7 Annex C - Analysis Predictions Provided to Defence (Since May 1998)

1. The impact of acquisitions of Su-27SK by China and Su-30MKI by India was accurately predicted. An unpredicted development was the acquisition of the Su-30MKM series by Malaysia.

2. Acquisitions of Su-30MKK by China were accurately predicted. An unpredicted development was the development and acquisition of the Su-30MK2 by the PLA Navy air arm.

3. Acquisitions of A-50 derivative AEW&C aircraft by China and India were accurately predicted. Unpredicted developments were the current intent by Malaysia to acquire AEW&C aircraft, US intervention to block Israel's sale of the A-50I to China, and US approval of the sale of the A-50I to India.

4. Acquisitions of Il-78 Midas derivative tanker aircraft by China and India were accurately predicted. An unpredicted development was the deployment of several squadrons of indigenous Chinese H-6U/DU tanker aircraft.

5. Acquisitions of further S-300 variant long range Surface-to-Air Missile systems in the wider region were predicted. Indonesia's interest in the S-300PMU series was not predicted.

6. Sukhoi Su-27/30 radar signature reduction measures were accurately predicted.

7. Sukhoi Su-30 N-011M BARS phased array radar capabilities were understated. The Su-27 NIIP Pero phased array block upgrade to the NIIP N-001 radar was not predicted.

8. The Su-27SKU digital glass cockpit upgrade was correctly predicted.

9. The regional proliferation of 'counter-AWACS' variants of the Kh-31R missile was correctly predicted.

10. The regional proliferation of 'counter-AWACS' variants of the KS-172 missile was correctly predicted. India's intent for co-production of the KS-172 was not predicted.

11. The susceptibility of the Wedgetail AEW&C to long range 'counter-AWACS' missiles was accurately predicted.

12. The emergence of anti-radiation variants of the Russian R-77 (AA-12) BVR missile was correctly predicted, but the development of heat-seeking variants was not predicted.

13. The emergence of the improved OLS-30 Infra Red Search Track set on the Su-30MK was correctly predicted.

14. The emergence of third generation optical seeker technology for the Russian R-73/74 family of WVR missiles was not predicted.

15. Strike capability growth in the F-22A was correctly predicted, but did not predict the extent of this growth, or planning to make all intended 380 F-22A fully strike capable.

16. The emergence of the FB-22A strike aircraft was not predicted.

17. The limitations in air combat capability in the Joint Strike Fighter were accurately predicted, as were the underlying reasons for this being so. The emergence of the 'Export Joint Strike Fighter' variant with reduced stealth was not predicted.

18. The potential for the F-111 to be operated well beyond 2020 was not predicted. This was later determined as one of the results of the Sole Operator Program and is one of the cornerstones of the subsequent 'Evolved F-111' proposals.

19. The potential for the B-1B and F-111 to be retrofitted with supersonic cruise engines was not predicted. This was later presented in the 'Evolved F-111' proposal entitled 'Super Cruise and the F-111' and more recently for the B-1B in the Boeing response to the USAF RFI for Interim Long Range Strike Capabilities.

8 Annex D - Adverse Effects of Early F-111 Retirement

Figure 54: *RAAF F-111C departing Amberley for Red Flag exercise in the US, January, 2006 (Defence PR).*

1. **Adverse Capability Effects.**

   (a) A ≈50% reduction in aggregate RAAF striking power available.

   (b) Loss of primary long range land strike capability.

   (c) Loss of primary long range maritime strike capability.

   (d) Loss of high payload battlefield strike capability (Each F-111 ≈ $\frac{1}{2}$ B-52H heavy bomber capability).

   (e) Loss of unrefuelled persistent battlefield strike capability.

   (f) Loss of unrefuelled persistent Combat Air Patrol capability for dealing with terrorist hijackings.

   (g) Loss of potential unrefuelled persistent Combat Air Patrol capability for cruise missile interception.

   (h) Significant increase in F/A-18A fatigue life consumption should regional contingency arise.

   (i) Significant increase in tanker fatigue life consumption should regional contingency arise.

   (j) Loss of primary airborne systems and weapons integration engineering capability at Amberley WSBU.

   (k) Loss of primary engineering capability to execute 'ageing aircraft program' techniques on RAAF platforms.

2. **Adverse Strategic Effects.**

   (a) As regional Sukhoi Su-27/30 numbers and proficiency increase, a 'strategic inversion' of the deterrence relationship will arise - regional nations could challenge Australian regional intervention.

   (b) Loss of primary strategic deterrence tool for dealing with potentially hostile future regimes across wider region.

   (c) In scenario with high risk of terrorist hijackings, F/A-18 and B-707 fleet too small to protect all capitals without F-111 support.

   (d) Likely perception in US strategic circles that Australia is emulating the behaviour of EU NATO nations which downsized critical defence capabilities and shifted that burden on to the US force structure.

   (e) Loss of single highest value combat contribution to US-led coalition air campaigns.

   (f) Loss of capability to rapidly integrate and test new weapons on RAAF aircraft - cf UK in Falklands and US in Afghanistan rapidly adding new weapon types in urgent contingencies.

3. **Adverse Industrial Base Effects.**

   (a) Reduced engineering capability to extend life of other RAAF platforms using 'ageing aircraft program' techniques - F-111 provides 'critical mass'.

   (b) Loss of opportunities for domestic industry to effect import replacement through in-country upgrades on F-111 thus impacting balance of payments.

   (c) Loss of opportunity to inoculate domestic aerospace industry sector and associated systems integration industry sector from post September, 2001, global downturn.

   (d) Loss of opportunities to further add value, and further leverage the vast materiel and intellectual investment the taxpayer has made in the F-111 and its support capabilities.

   (e) Significant loss of employment in domestic systems integration and aerospace industry sector, including training positions.

9 Annex E - Sources and Bibliography

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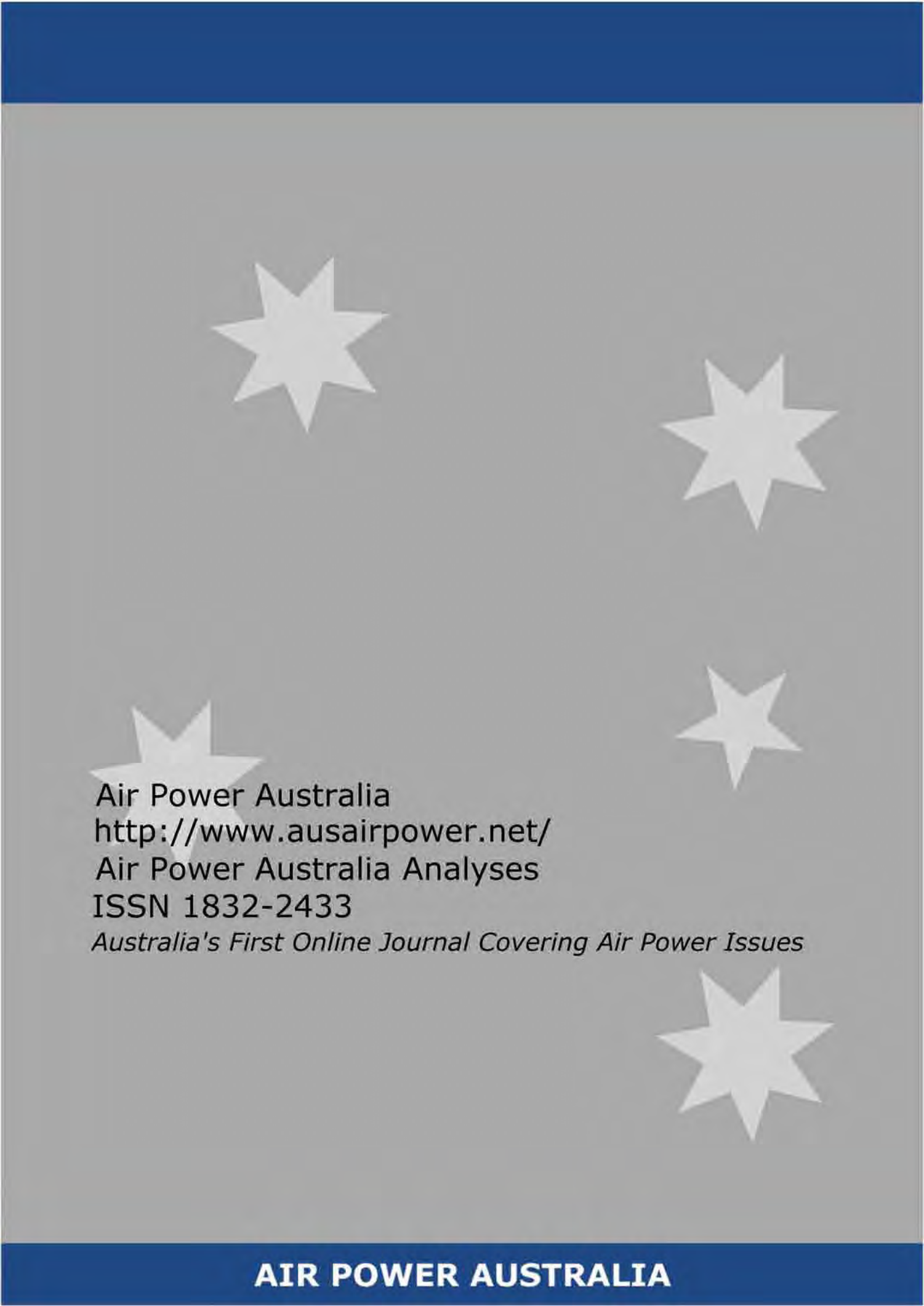
Figure 55: *RAAF F-111C aircraft during the February, 2006, Red Flag exercise in the United States (US Air Force)*

End of Submission



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