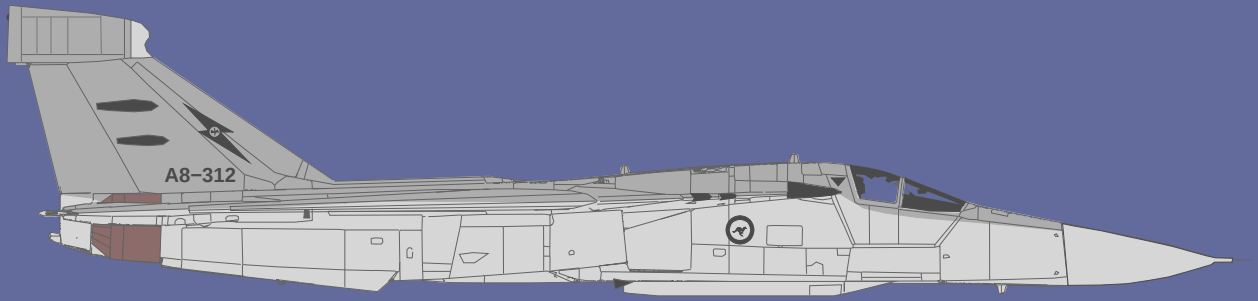
Invited Lecture, Royal Aeronautical Society, Canberra, August 14, 2001



Regional Air Power Development and RAAF Force Structure Options

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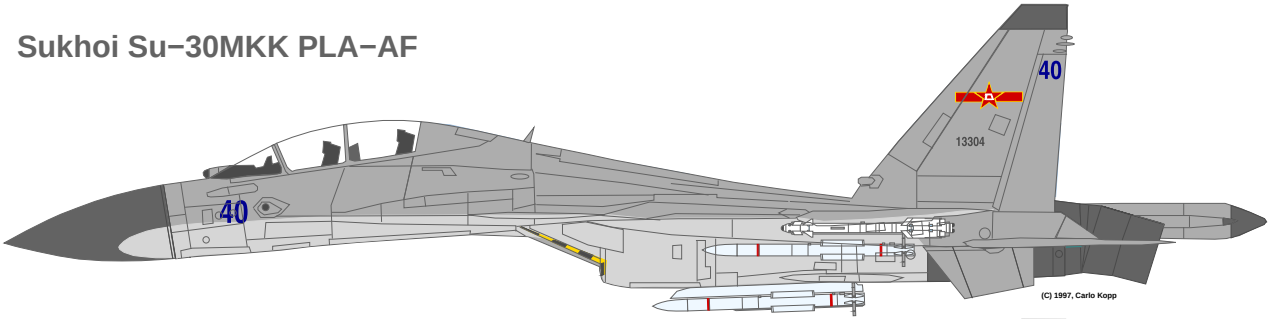
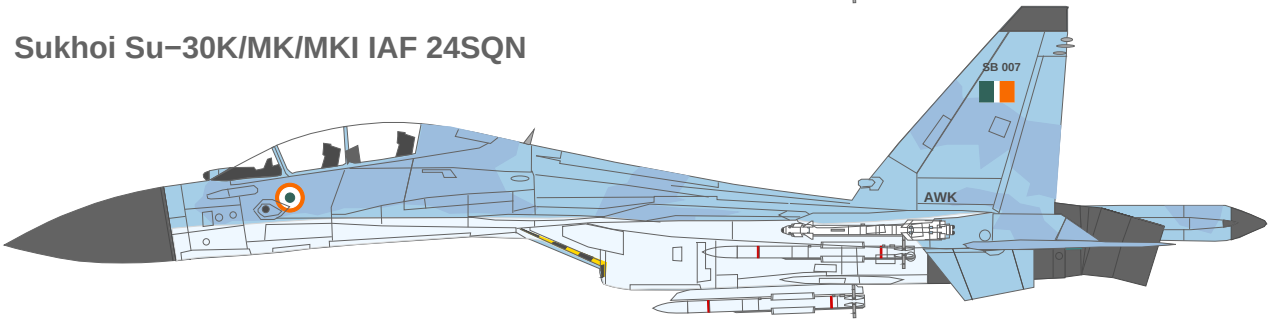
Regional Proliferation

Su-30MKI & Su-30MKK Flanker

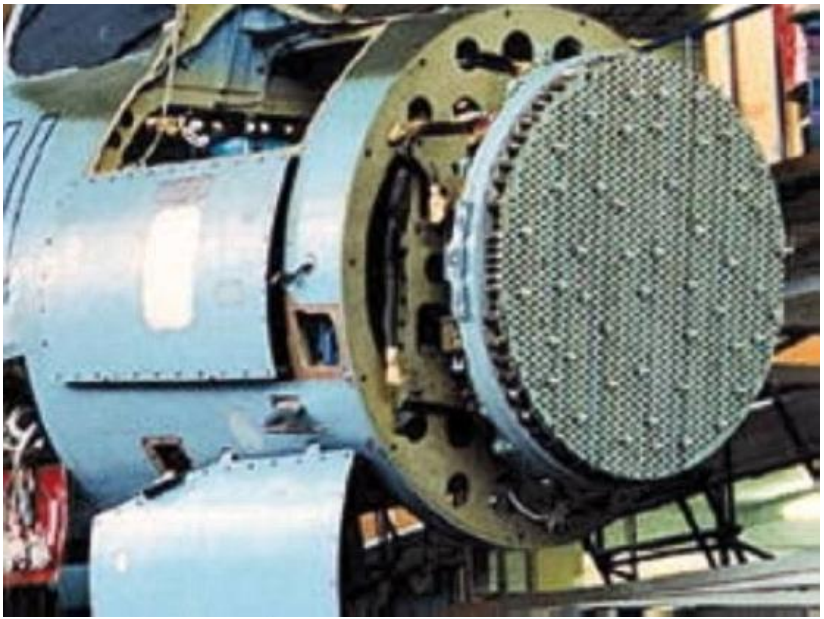
Sukhoi Su−30MKK PLA−AF



Sukhoi Su−30K/MK/MKI IAF 24SQN

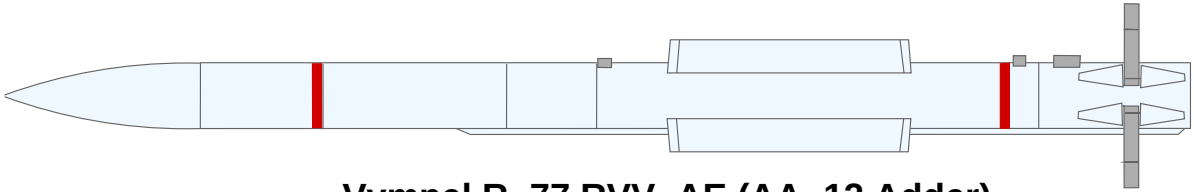


NIIP N-011M Phased Array

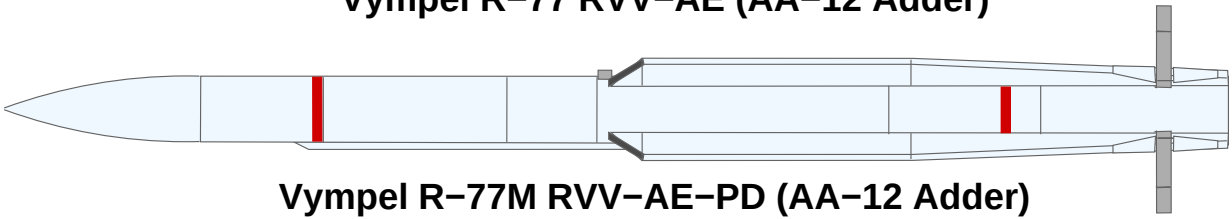


- NIIP's phased array has a 1 metre diameter and was designed for the Su-35 and Indian Su-30MKI (NIIP Photo).

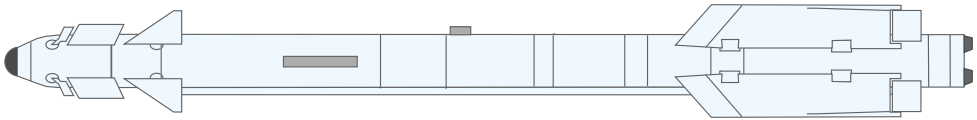
Vympel R-73 Archer & R-77 Adder



Vympel R−77 RVV−AE (AA−12 Adder)



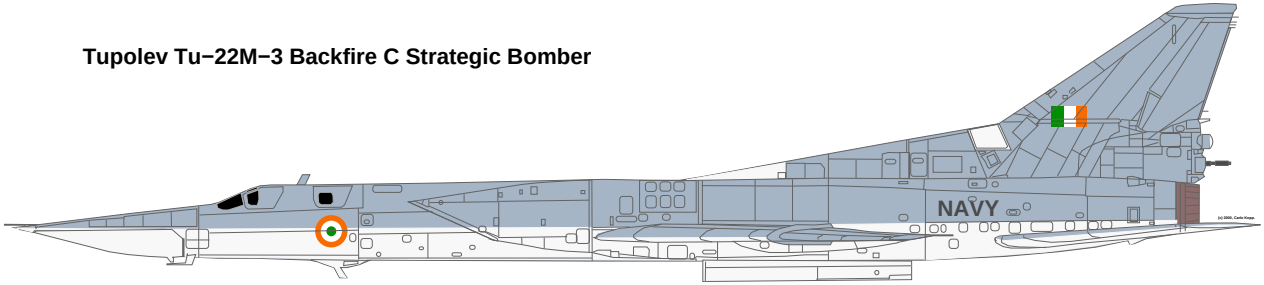
Vympel R−77M RVV−AE−PD (AA−12 Adder)



Vympel R−73/R−73M/R−74 (AA−11 Archer)

Tu-22M-3 Backfire C

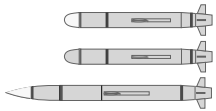
Tupolev Tu−22M−3 Backfire C Strategic Bomber



3M−54E1 Alfa Anti−Ship Cruise Missile (TBD)

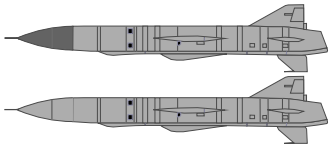
3M−14E Alfa Land Attack Cruise Missile (TBD)

3M−54E Alfa Mach 2.9 Anti−Ship Cruise Missile (TBD)



Kh−22/Kh−22M Burya (AS−4) Anti−Ship Cruise Missile (1 x C/L, 2 x Pylon)

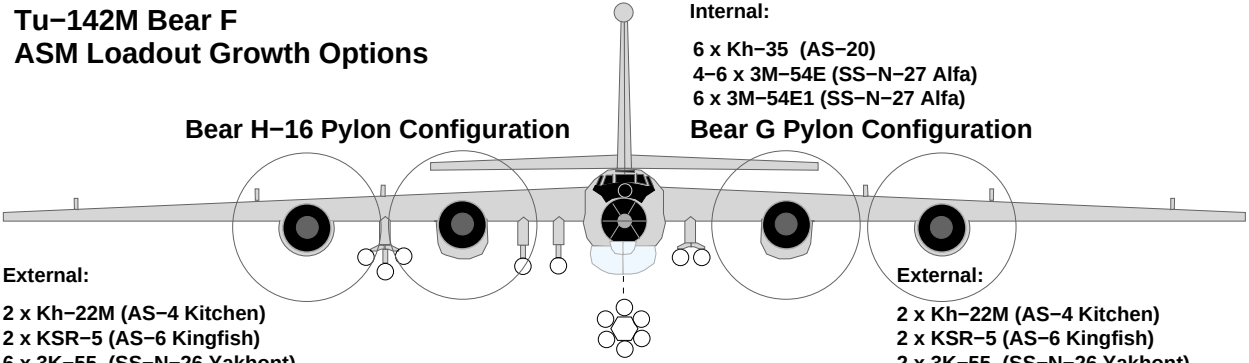
Kh−22/Kh−22M Burya (AS−4) Land Attack Cruise Missile (1 x C/L, 2 x Pylon)



Kh−31R (AS−17) Anti−Radiation Missile (TBD)

Tupolev Tu-142M Bear F Upgrades

Tu−142M Bear F
ASM Loadout Growth Options



Internal:

6 x Kh−35 (AS−20)
4−6 x 3M−54E (SS−N−27 Alfa)
6 x 3M−54E1 (SS−N−27 Alfa)

Bear G Pylon Configuration

Bear H−16 Pylon Configuration

External:

2 x Kh−22M (AS−4 Kitchen)
2 x KSR−5 (AS−6 Kingfish)
6 x 3K−55 (SS−N−26 Yakhont)
6 x Kh−41 (SS−N−22 Sunburn)
10 x Kh−35 (AS−20)
10 x 3M−54E (SS−N−27 Alfa)
10 x 3M−54E1 (SS−N−27 Alfa)

Bomb Bay
MKU−5−6
Launcher
4−6 x ASM

External:

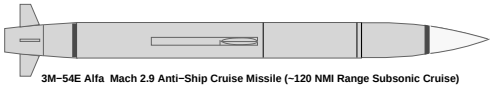
2 x Kh−22M (AS−4 Kitchen)
2 x KSR−5 (AS−6 Kingfish)
2 x 3K−55 (SS−N−26 Yakhont)
2 x Kh−41 (SS−N−22 Sunburn)
4 x Kh−35 (AS−20)
4 x 3M−54E (SS−N−27 Alfa)
4 x 3M−54E1 (SS−N−27 Alfa)

Russian Cruise Missiles

BGM−109C/D Tomahawk Land Attack Missile (~600 NMI Range Subsonic)

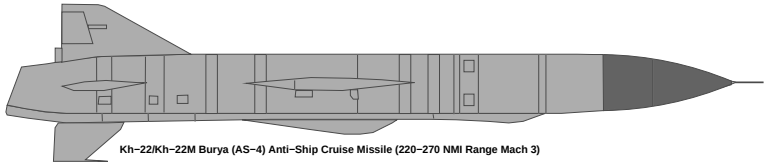
3M−54E1 Alfa Anti−Ship Cruise Missile (~160 NMI Range Subsonic)

3M−14E Alfa Land Attack Cruise Missile (~160 NMI Range Subsonic)

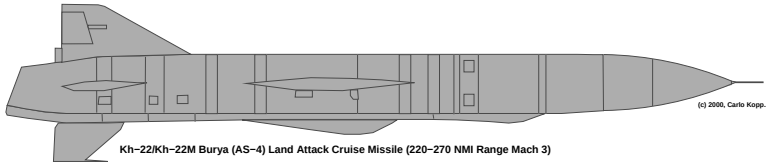


3M−54E Alfa Mach 2.9 Anti−Ship Cruise Missile (~120 NMI Range Subsonic Cruise)

3M−54/3M−14 0.533 Tube Launched From Kilo SSK (or FFG/DDG VLS)
Air Launched Version for Su−30MK, Su−32FN, Tu−142M (TBD)



Kh−22/Kh−22M Burya (AS−4) Anti−Ship Cruise Missile (220−270 NMI Range Mach 3)



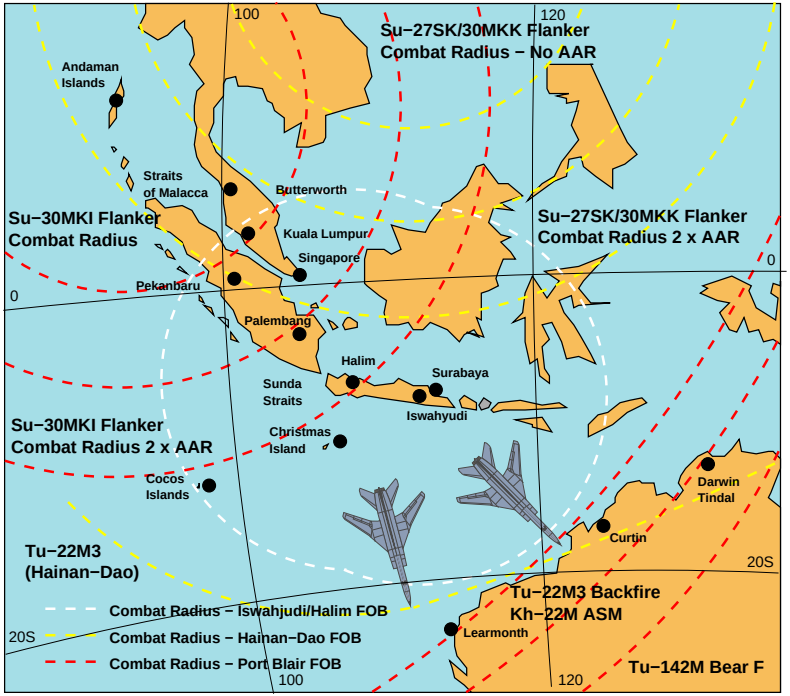
Kh−22/Kh−22M Burya (AS−4) Land Attack Cruise Missile (220−270 NMI Range Mach 3)

Kh−22/Kh−22M carried by Tu−22M−2/Tu−22M−3 Backfire B/C, Tu−95K−22 Bear G

Beriev A-50/A-50E/A-50I AWACS

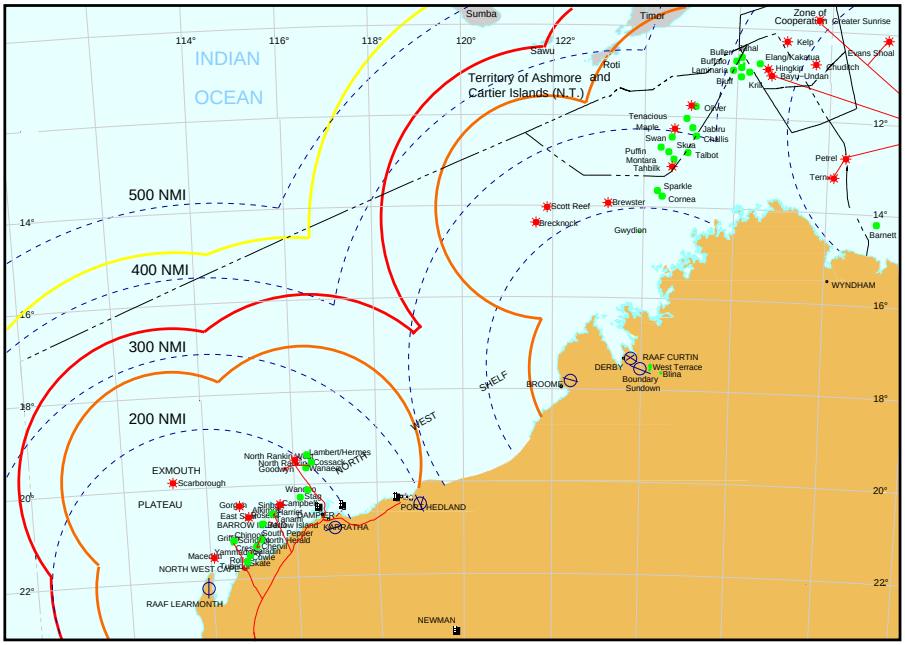
The Project 1143 Aircraft Carrier

Regional Power Projection Radii



Regional Striking Radii (FOB Andaman Islands, Hainan Dao, Java)

Vulnerability of Pilbara/Timor Sea



GAS DISCOVERIES
OIL DISCOVERIES

NORTH WEST SHELF AND TIMOR SEA AIR DEFENCE ENVIRONMENT

200 km

AWH8

200 NMI RANGE CRUISE MISSILE LAUNCH FOOTPRINT
300 NMI RANGE CRUISE MISSILE LAUNCH FOOTPRINT
3M−54E/3M−14E (SUB) LAUNCH FOOTPRINT
RAAF FIGHTER OPERATING RADIUS

Force Structure Responses

for the ADF

Defence 2000 White Paper - OCA/DCA

8.39 '... Australia must have the capability to protect itself from air attack, and *control* our approaches to ensure that we can operate effectively against any hostile forces approaching Australia.'

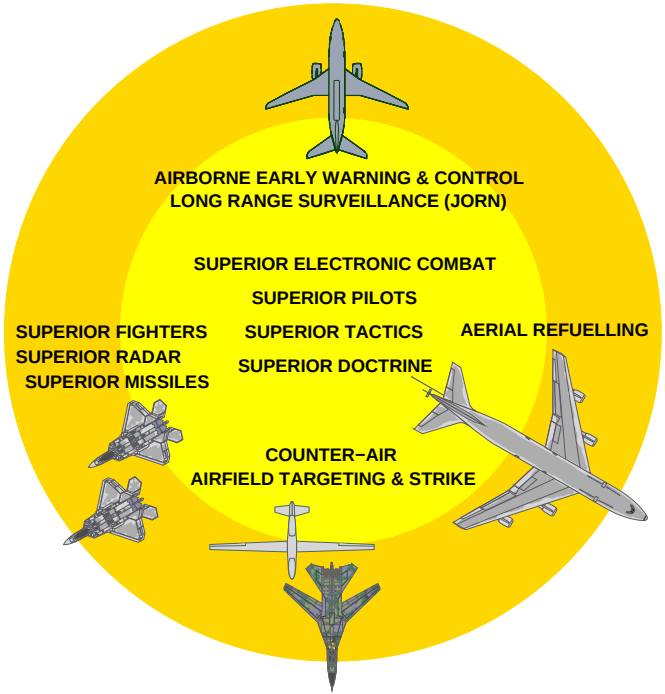
8.42 'This is critical for covering our extended maritime approaches, including offshore territories such as the Christmas and Cocos (Keeling) Islands, and for providing air support to surface ship deployments including amphibious task forces and land forces deployed in our immediate neighbourhood.'

Defence 2000 White Paper - Strike

8.47 '... five new generation AAR aircraft, which would have the capacity to refuel not only our F/A-18 aircraft but also our F-111 and AEW&C aircraft over a wide area of operations.' 'These aircraft will also provide a substantial air cargo capability, ...'

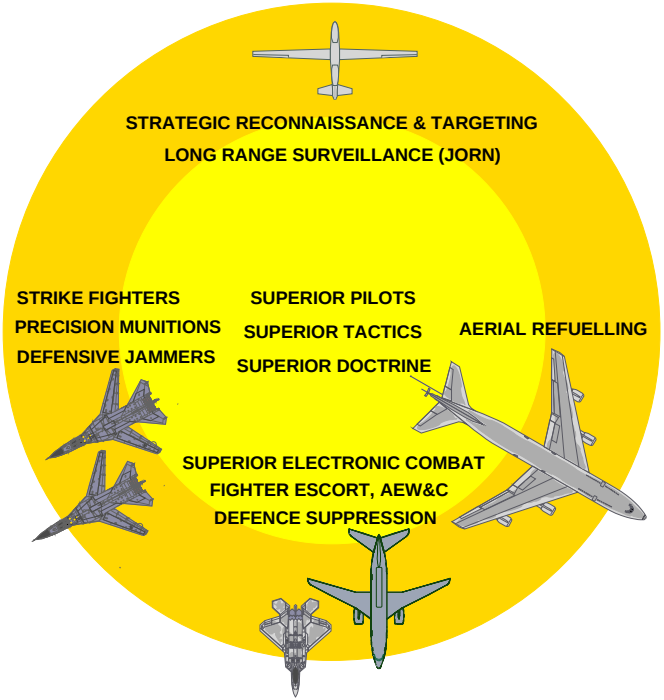
8.71 '... that we have the capability to contribute to the defence of Australia by attacking military targets *within a wide radius of Australia, against credible levels of air defences* ...' '...our capability would be focussed on an ability to attack those militarily significant targets that might be used to mount or support an attack on Australia.' '... have the capacity to mount sustained strike campaigns against a significant number of such targets.'

Offensive/Defensive Counter Air



ACHIEVING AND MAINTAINING AIR SUPERIORITY

Maritime, Strategic & Battlefield Strike



CAPABILITIES FOR DETERRENCE, STRATEGIC AND MARITIME STRIKE

AIR 5402 - What are the Issues?

1. Tanker extended range/long duration over-water operations?
2. Tanker aircrew numbers?
3. Tanker offload performance for a small fleet?
4. Tanker dash speed?
5. Tanker airlift capacity?
6. Airfield fuel replenishment capacity?
7. Airfield runway strength?
8. Tanker fleet funding models?
9. Available flight tested conversions 2001-2005?

Heavy Tankers vs Medium Tankers

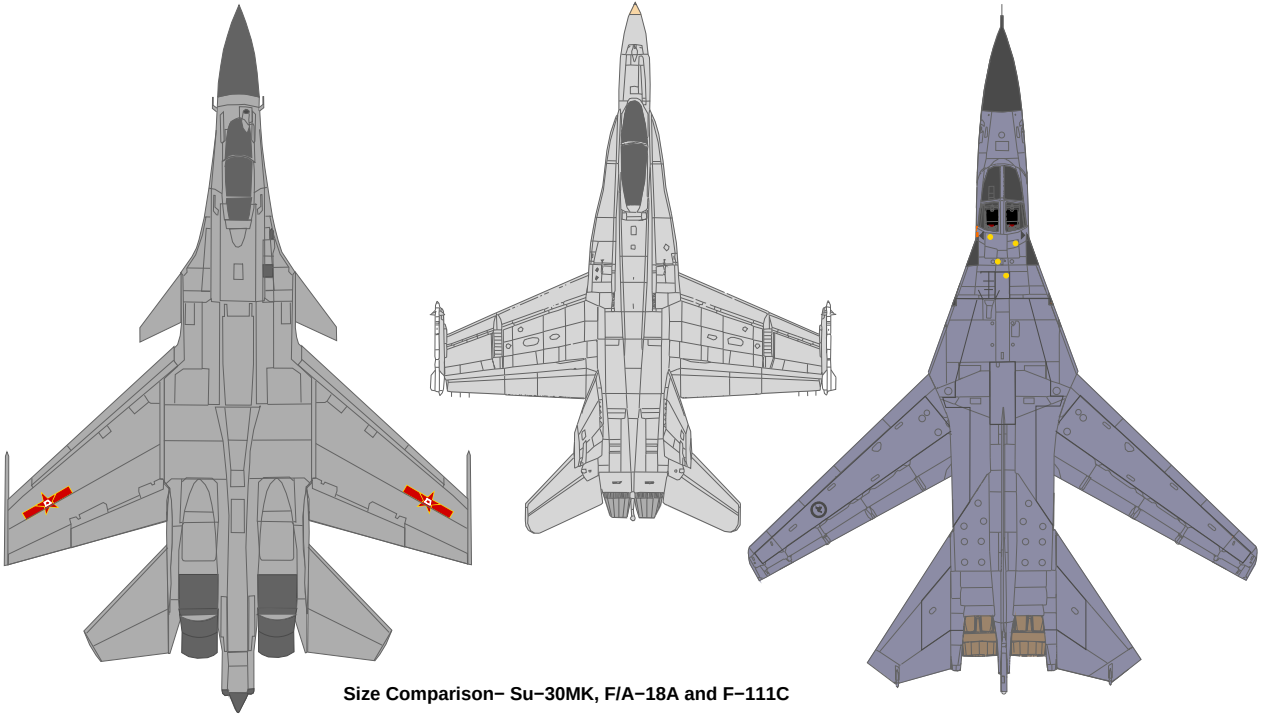
With tanker numbers capped to 5 aircraft, White Paper capability goals will be difficult to meet with medium sized tankers.

Electronic Combat - Support Jammers

- 32 EF-111A aircraft mothballed at AMARC since 1998.
- ALQ-99E Tactical Jamming System with up to 10 jammer modules.
- Retains supersonic performance and combat radius of F-111C/G.
- TF30-P-109 engines, DFCS and AMP avionics common to F-111C/G.
- ALQ-99 ICAP-III includes jamming, ELS and HARM capability.

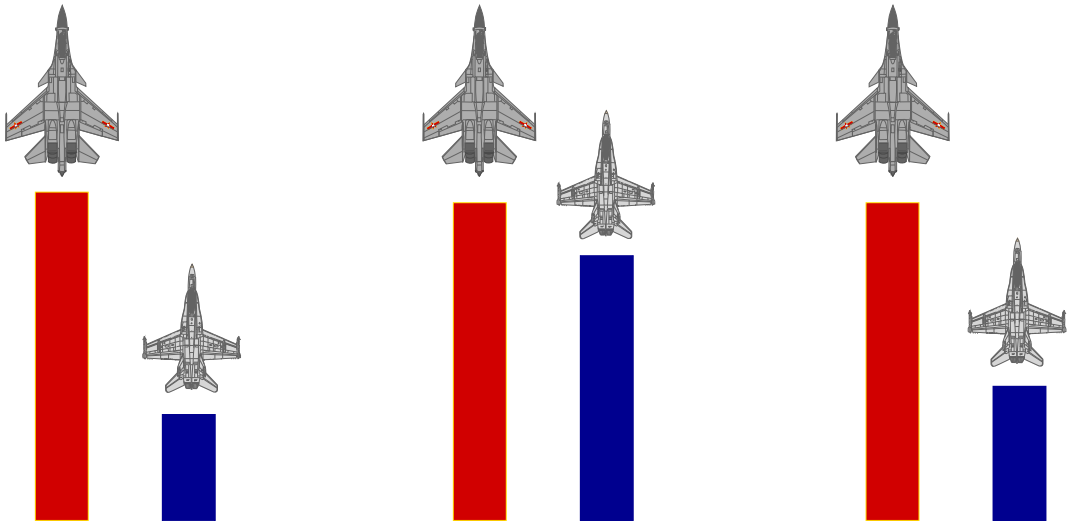
AIR 6000 Issues

Su-27/30 Flanker vs F/A-18A Hornet



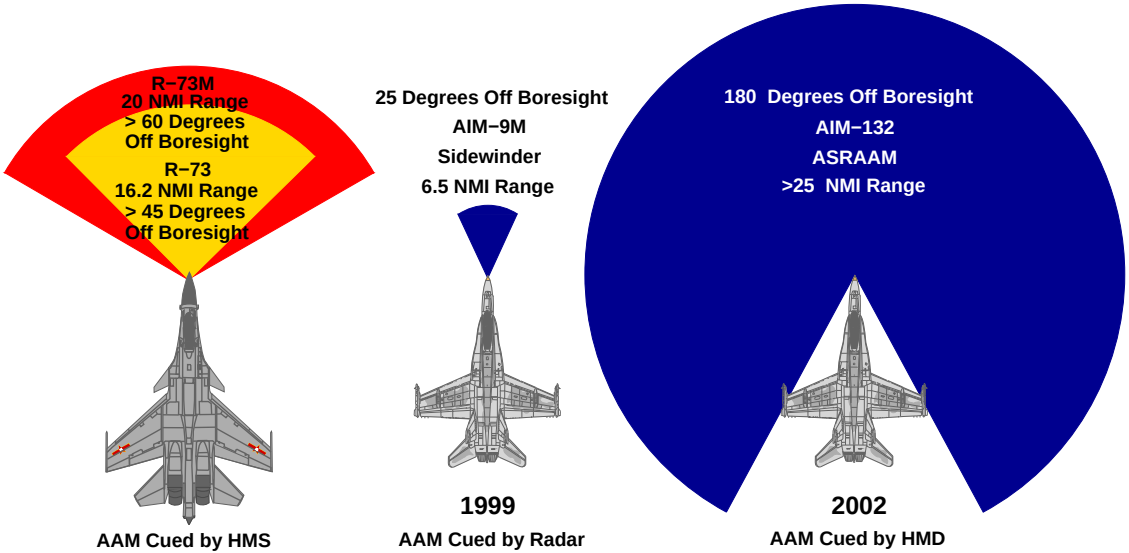
Size Comparison– Su–30MK, F/A–18A and F–111C

Su-27/30 Flanker vs F/A-18A Hornet



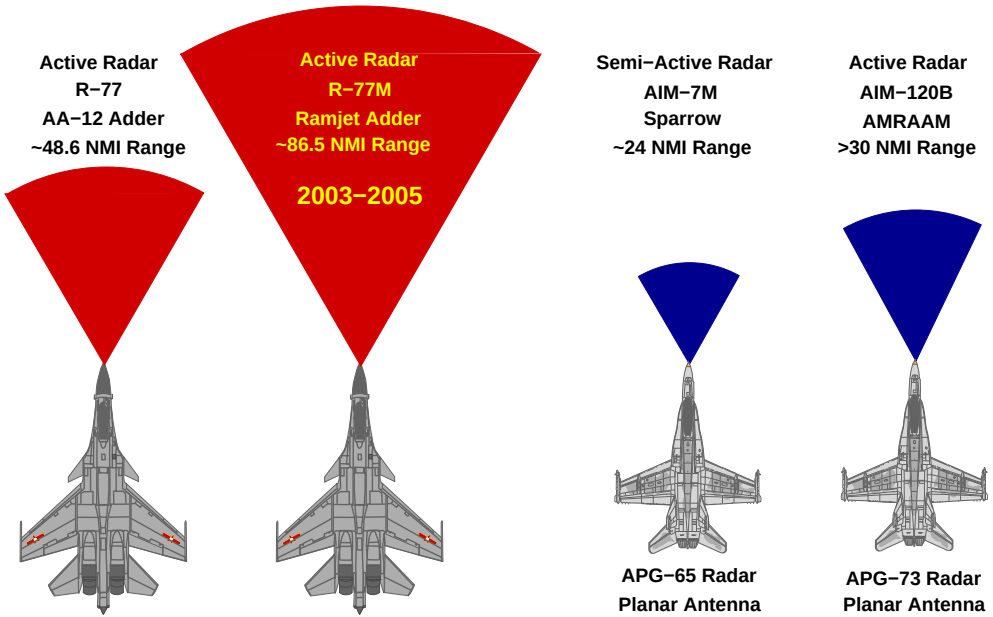
Comparison of Su−27/30 vs F/A−18A

Su-27/30 Flanker vs F/A-18A Hornet



Comparison of Close−in Combat Capabilities Pre and Post HUG / AIR 5400

Su-27/30 Flanker vs F/A-18A Hornet



Comparison of Beyond Visual Range Combat Capabilities Pre and Post HUG / AIR 5400

Regional Proliferation vs AIR 6000

- The clear priority in A6K should be the replacement of the F/A-18A as its small size makes it ill suited to long range combat.
- Conversely, the F-111's 34,000 lb internal fuel capacity makes life extension attractive, against replacement with a smaller fighter.
- Combat radius performance and agility in long range combat configuration should be a high priority.
- Radar aperture size and missile load in BVR combat and bomber cruise/missile intercept roles should be a high priority.
- The growth potential of the Su-27/30 BVR suite and S-300/400 family SAMs makes stealth capability a high priority.
- Robust supersonic cruise is a force multiplier for a small fighter force.

The F/A-18A Replacement?

In terms of lethality, productivity, size, growth potential and deterrent credibility, the F-22A has an unassailable lead over all other A6K alternatives. At a flyaway cost $\approx$ 50% higher than older technology alternatives, the F-22 is not a 'one-for-one' replacement, despite claims otherwise.

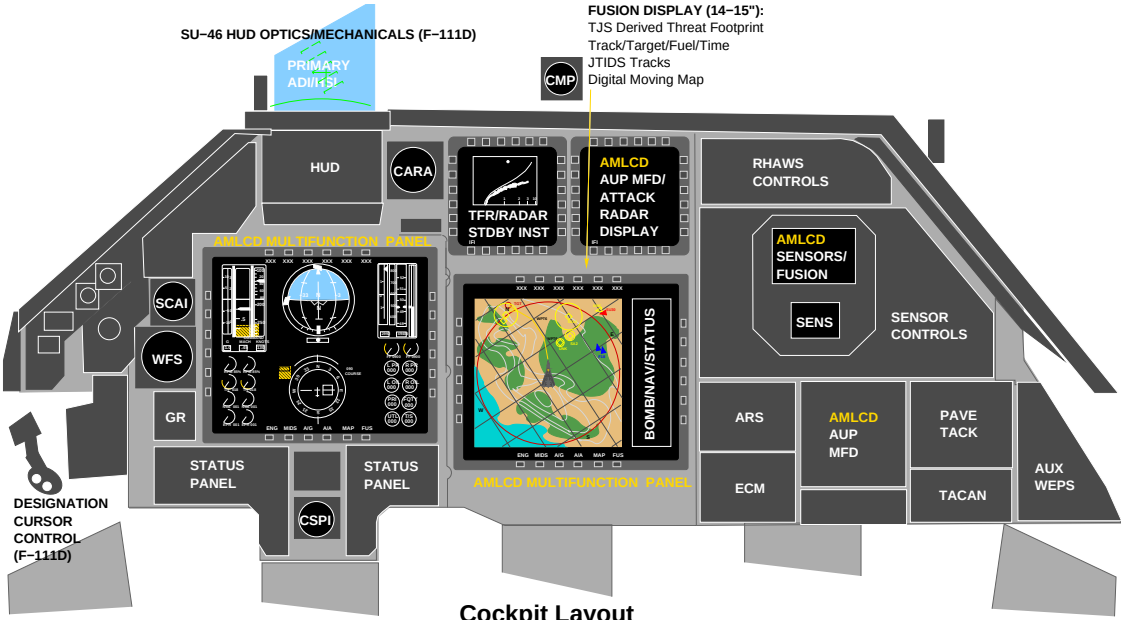
Implementation Strategies for AIR 6000

1. *Write a new White Paper and pretend that 500 regional Su-27/30s do not matter!*
2. Single type F/A-18A + F-111 replacement with F-22, accept a smaller force size against current force structure.
3. Two type F/A-18A + F-111 replacement with F-22 + 'cheaper fighter', retain force size similar to current force structure.
4. Extend the life of the F-111 to 2040 and replace the F/A-18A with a smaller number of F-22s.

Extending the F-111 to 2040

1. Apply structural fixes as per DSTO Sole Operator Program findings.
2. Replace honeycomb skins with CFC as per DSTO Sole Operator Program findings.
3. 2002-2004 replace analogue cockpit with AMLCD glass cockpit.
4. 2003-2006 replace analogue radar with digital solid state phased array.
5. 2015-2020 replace the TF30-P-109 with the F119-PW-100 series supercruising engine common to the F-22 (exploit A6K funding).
6. Adopt F-22 style internal weapon carriage to reduce RCS and exploit supercruising transit speeds, apply RCS reduction techniques.
7. 2015-2020 perform block upgrade of core avionics with F-22/JSF generation integrated avionic suite (exploit A6K funding).

Example F-111C/G Glass Cockpit

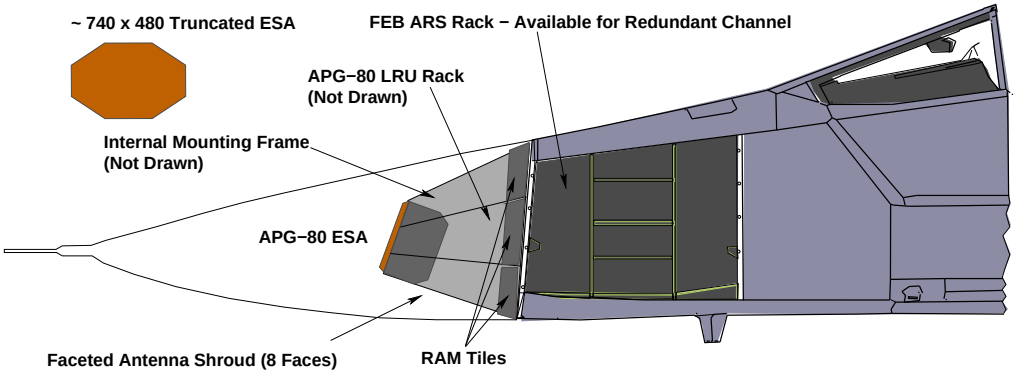


Cockpit Layout

SU−46 HUD OPTICS/MECHANICALS AND PILOT DCC ADAPTED FROM EXISTING F−111D HARDWARE

F/RF−111C/G Digital Glass Cockpit

Example Low RCS AESA Installation

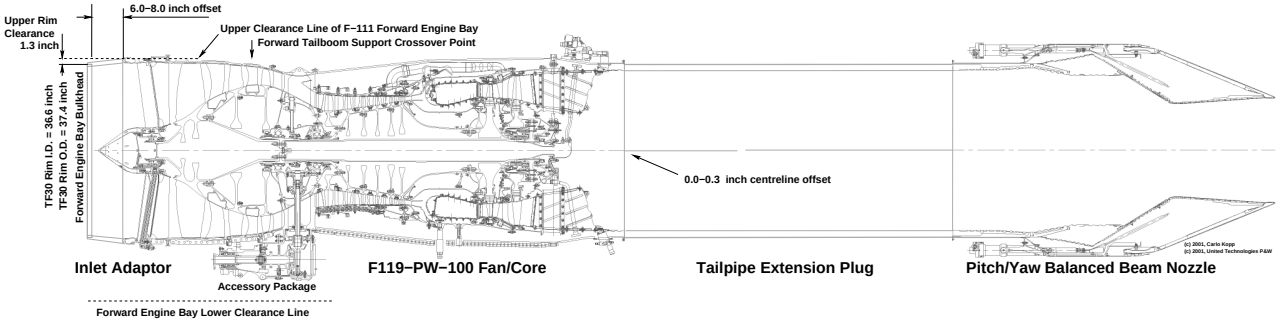


(ESA tilt angle optimised for A/A uplook into turn as a primary requirement)

APG−80 Installation − F−111C/G AUP

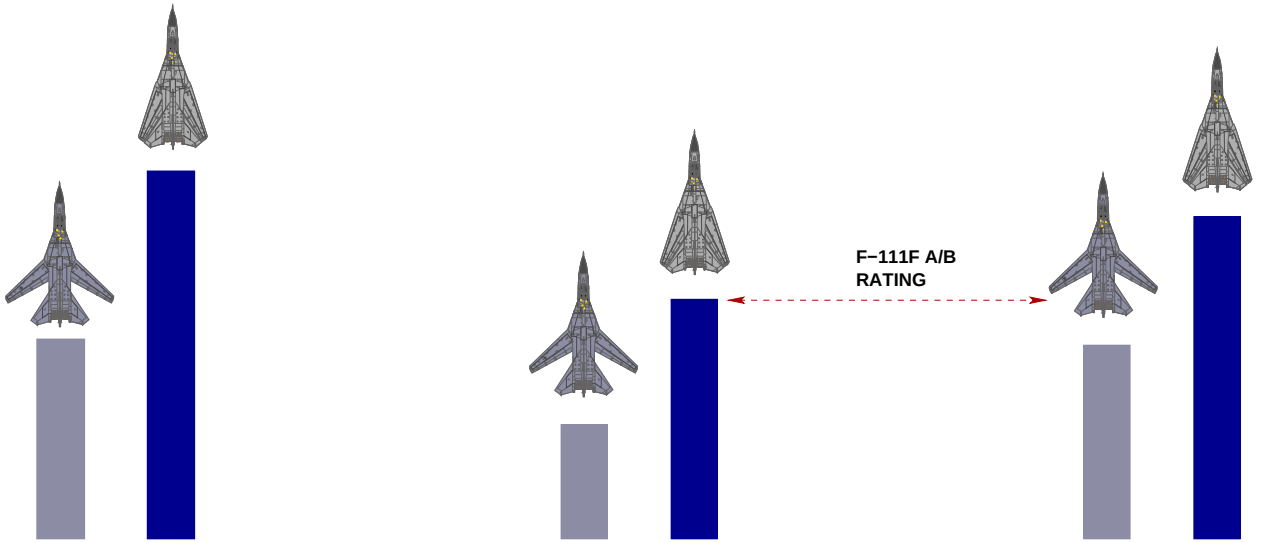
APG−80 Field of Regard (−20 deg Tilt)

F119-PW-100 Supercruise Engine



1. F-111 swing wing and internal bomb bay allows exploitation of F-22 engine technology, possibly doubling transit speed and optempo.
2. F119 more durable and cheaper to operate than current F100/F110 thus reducing long term ownership cost.
3. Reduce inlet integration costs by leveraging NASA/USAF IPCS F-111E FADEC flight test results.

F119-PW-100 Supercruise Engine



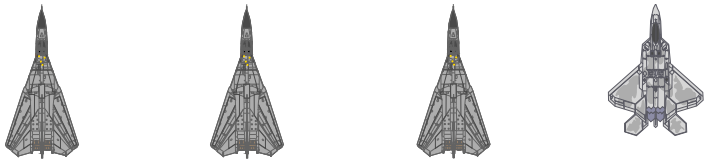
Comparison of F/RF−111C/G TF30−PW−108/9 vs F119−PW−10X

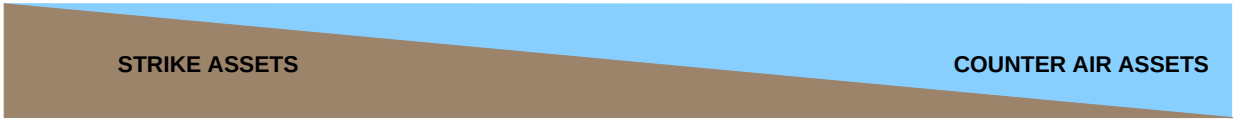
Nominal Thrust Ratings Only − Assumes Inlet Massflow Allows Full F119 Thrust Rating

Supercruising 'F-111S'

1. F119 engine, internal weapons, phased array radar, glass cockpit and RCS reduction => 'Ersatz F-22' for lower threat environments.
2. With AMRAAM and supercruise provides a credible capability for long range bomber/cruise missile intercept, in addition to existing strike roles.
3. Incremental block upgrades avoid 'spikes' in funding profile - boneyard F-111s are cheaper than any new fighter.
4. High return on existing RAAF investments in infrastructure and personnel.
5. Domestic upgrade program keeps funding in Australia.
6. Risks confined mostly to aspects of engine integration program and weapon clearances.

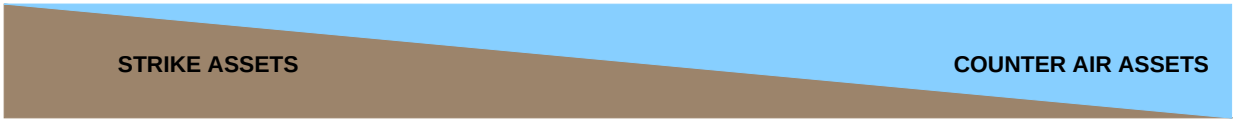
Force Structure Alternatives





F/A−18 REPLACEMENT BY 18 x F−22, LIFE EXTENDED 54 x F−111S 'LIGHT' FORCE STRUCTURE MODEL

ALL FIGHTERS WITH SUPERCRUISING POWERPLANTS, F−111S WITH AESA/AMRAAM



F/A−18 REPLACEMENT BY 36 x F−22, LIFE EXTENDED 54 x F−111S 'BALANCED' FORCE STRUCTURE MODEL

ALL FIGHTERS WITH SUPERCRUISING POWERPLANTS, F−111S WITH AESA/AMRAAM

Conclusions

1. Implementing the White Paper capability goals will present serious funding challenges over the new two decades.
2. Aerial refuelling, electronic combat and fighter capabilities should be implemented robustly, in addition to Wedgetail and Global Hawk.
3. Funding pressures indicate that 'lateral' rather than 'conventional' solutions may be the only affordable answers.
4. Single type A6K solutions may not provide a good balance in capability vs numbers.
5. Life extension of the F-111, leveraging F-22/JSF generation technology, should be seriously explored as an A6K option.
6. *Orthodox strategies in system acquisition may become an unaffordable luxury.*

End Presentation