

# Australia's Regional Challenge – The Proliferation of Russian High Technology Weapons in the Region

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# Asia's "Creeping" Arms Race



- Rapid large scale industrialisation
- Surplus funds for military modernisation
- Improving standards of education/training
- Emulation of US and Russian doctrine
- Emulation of US and Russian force structures
- Focus on air power, precision weapons
- Control of the air, denial of air/sea access
- Major players – China, India, Japan, US
- Smaller nations confront major shifts in the balance of power across the Asia-Pacific
- Russian high tech weapons principal capability driver

# Post Cold War Russian Weapons



- Modern high technology weapons
- Mostly digital processing rather than Cold War analogue hardwired technology
- Exploitation of globalised market for high technology components, materials, software and other basic technology
- Some weapons are evolved from late Cold War era designs
- Some weapons are entirely new post Cold War developments
- Many have no Western equivalents

# What New Capabilities?



- Advanced Derivative Fighters – Su-35BM, MIG-35, Su-30MK, Su-27SKM
- Low Observable Fighters – PAK-FA, J-XX
- Advanced Radars – Irbis E, Zhuk AE/ASE
- Cruise missiles – supersonic and subsonic
- Smart Bombs – EO, Laser, Satnav/Inertial
- Electronic Warfare – DRFM Jammers
- High Mobility Surface to Air Missiles
- Advanced Counter-VLO VHF Radars – Nebo SVU, JY-27

# PAK-FA – F-22 Class Agility + Stealth



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# Sukhoi Su-35BM/Su-35-1 Flanker E+



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# Sukhoi Su-35BM/Su-35-1 Flanker E+



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# Sukhoi Su-35BM/Su-35-1 Flanker E+



- “Deep” redesign of Su-35 – fully digital weapon system, flight controls, systems
- Supersonic cruise AL-31FU-117S engines
- Large area glass cockpit emulating JSF
- Digital datalinks – TKS-2 and “JTIDS-ski”
- Radar absorbent materials – inlets
- Advanced 20 kiloWatt Irbis E hybrid ESA
- Optional Zhuk ASE 20+ kiloWatt AESA
- R-172, R-77M, RVV-AE-PD, R-27, R-74 AAMs; mostly digital designs



# Sukhoi Su-35BM/Su-35-1 Flanker E+



- Khibiny M passive radio frequency surveillance and targeting system
- DRFM self protection jammer
- Missile Approach Warning System (MAWS)
- Electro-Optical targeting system for A/A and A/G
- Tail warning radar system
- Superior to all F-15, F-16 and F/A-18 variants, and Eurocanard fighters
- IOC ~ 2010-2011
- Intended for volume export

# RSK MiG-35 Fulcrum



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# RSK MiG-35 Fulcrum



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# RSK MiG-35 Fulcrum



- “Deep” redesign of MiG-29 – fully digital weapon system, flight controls, systems
- Zhuk AE Active Electronically Steered Array radar
- Digital datalinks – TKS-2 and “JTIDS-ski”
- Advanced Electro-Optical targeting system
- DRFM self protection jammer
- Missile Approach Warning System
- R-172, R-77M, RVV-AE-PD, R-27, R-74 AAMs; mostly digital designs

# Su-30MK and Su-27SKM



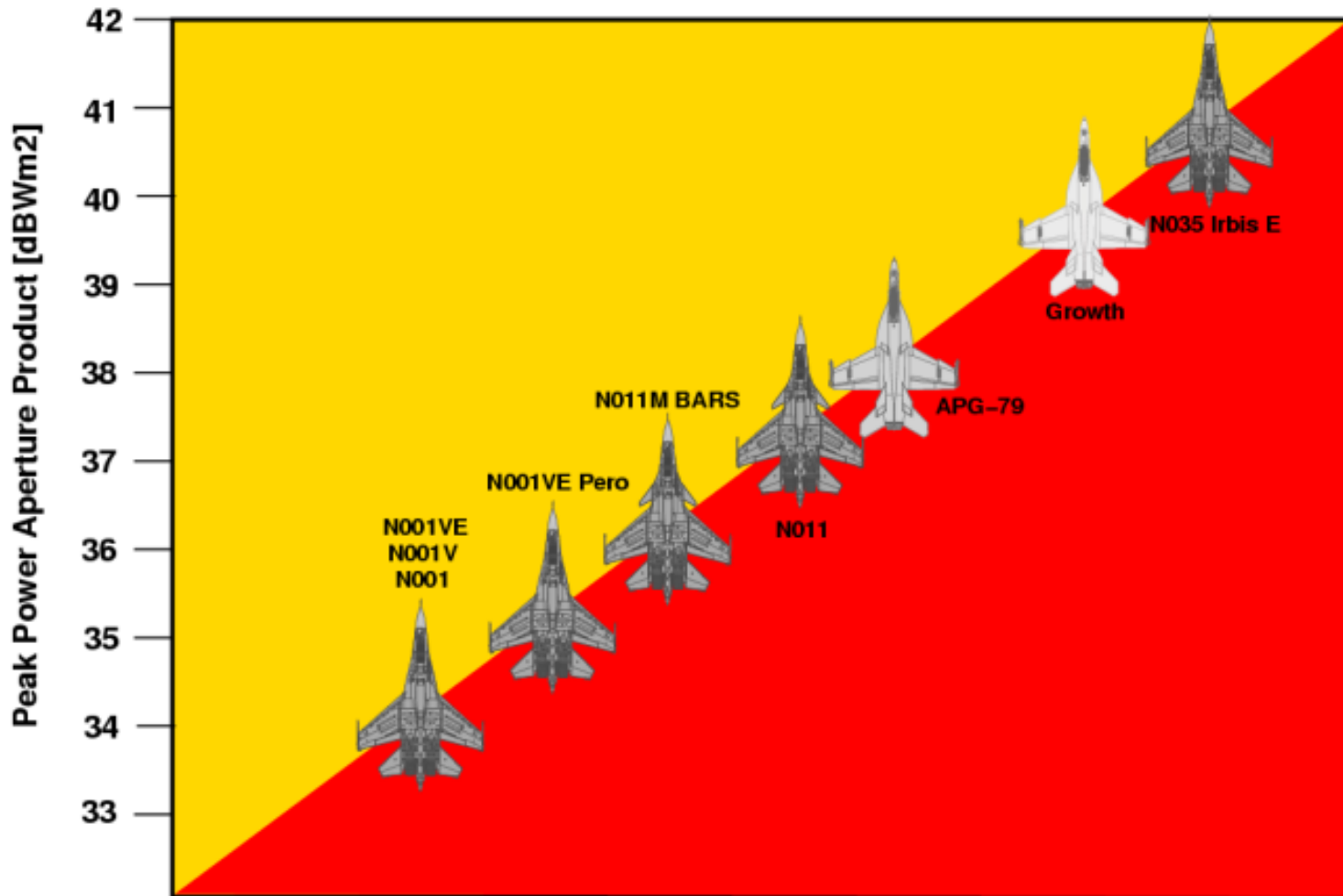
- Digital derivatives of baseline Su-27SK and Su-30K – glass cockpits
- Full range of AAMs and smart PGMs
- Su-30MKI/MKM - digital flight controls and TVC engines – India and RMAF deployed
- Su-30MKK/MK2 – equiv F-15E – PLA-AF, PLA-N, TNI-AU, PAVN
- Many upgrade options especially in radar:
- Irbis E hybrid, Zhuk-ASE AESA, Zhuk MSFE PESA, Pero reflective ESA

# Su-30MKM Flanker H TUDM – IOC 2009



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# How do Russian Radars Compare?



Zhuk ASE

Radar Power Aperture Product Comparisons

# Russian Beyond Visual Range Missiles



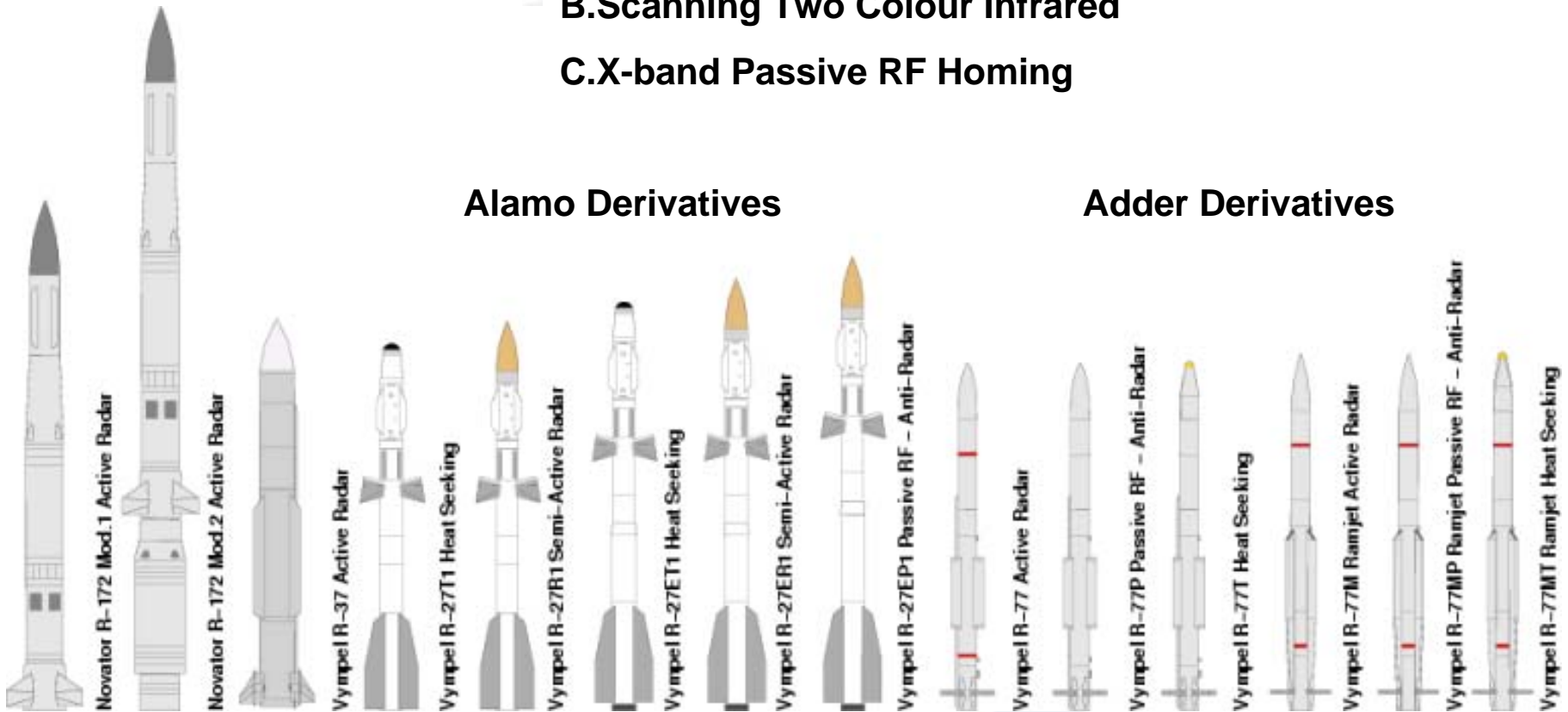
## Anti-AWACS

### Seeker Technology:

A. Monopulse Active Radar

B. Scanning Two Colour Infrared

C. X-band Passive RF Homing



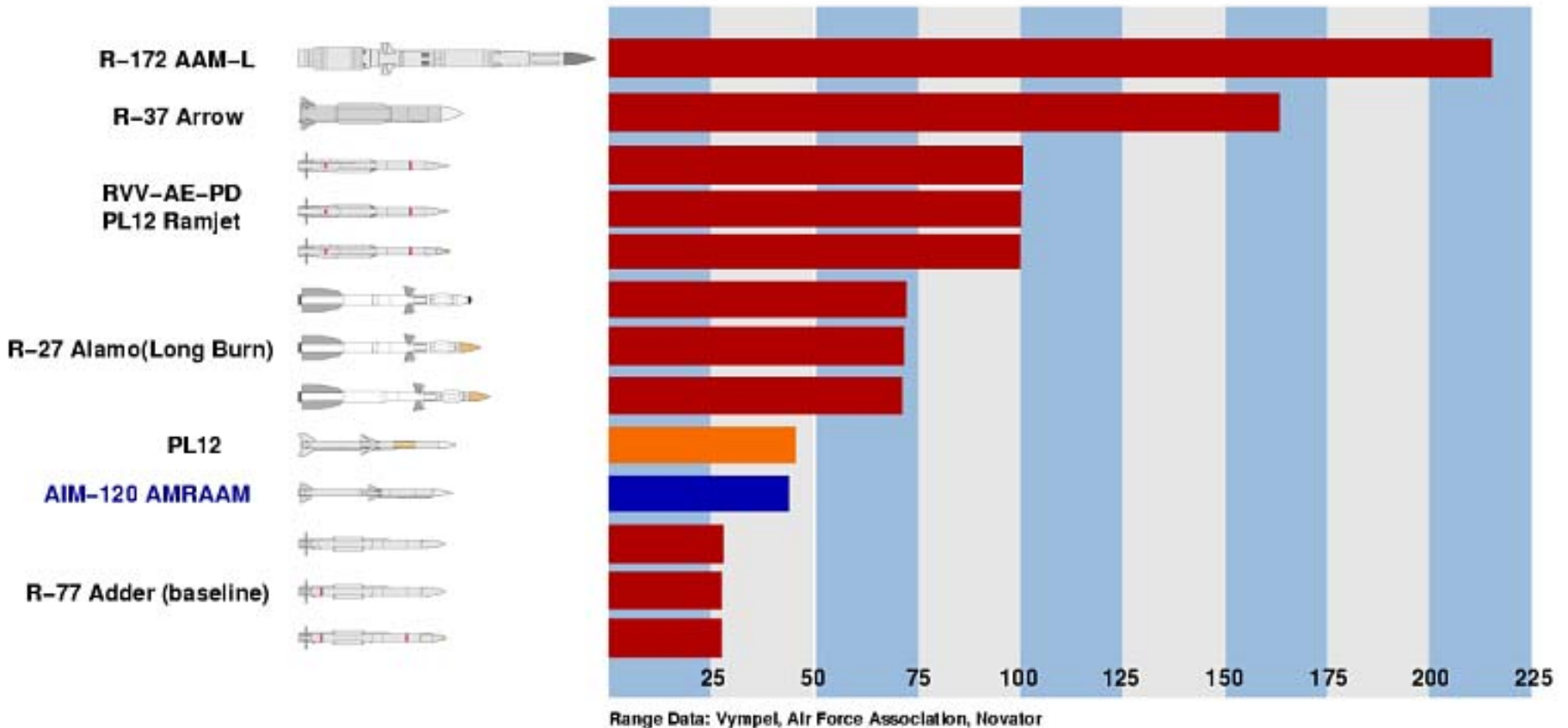
## Alamo Derivatives

## Adder Derivatives

Ramjet Engine



# How do Russian BVR AAMs Compare?



# Russian Missile Capabilities



- Diversity in missile seekers – active radar, infrared, passive X-band anti-radiation
- Diversity in missile airframes:
- R-27 Alamo family short and long burn
- R-77 Adder family AIM-120 AMRAAM class
- RVV-AE-PD family MBDA Meteor class
- R-37 Arrow – 160 NMI – no equivalent
- R-172 – 200 NMI – no equivalent
- Jam resistant seekers, digital controls, midcourse datalinks

# Su-35 Flanker – BVR Missiles (MAKS2007)



R-77M Adder

“AMRAAMski”

R-74  
Archer

R-172

R-27ET1

AWACS Killer

Alamo (Heatseeker)

# Smart Bombs - KAB-500/1500



- Fusion of Paveway and HOBOS technology
- Modular design – warheads and seekers
- Equivalents to Paveway/GBU-15/JDAM
- Warheads – blast/frag, concrete piercing, Fuel Air Explosive / Thermobaric
- ElectroOptical Correlator – cf US DSMAC
- ElectroOptical Datalink – cf US EGBU-15
- Semiactive Laser – cf US Paveway II/IV
- GPS/Glonass – cf US JDAM and SDB
- 1,000 lb and 3,000 lb standard warheads

# Smart Bombs - KAB-1500 ~ 3,000 lb



**1500 kg ElectroOptical Correlator Seeker (Datalink Optional)**



**1500 kg Laser Seeker**

1500 kg E/O Seeker

# Smart Bombs - KAB-500 ~ 1,000 lb



500 kg E/O Seeker



500 kg Laser Seeker



500 kg Satellite Guidance

# Cruise Missiles



- Novator 3M54E/3M14 Sizzler – air, sub, ship and ground launched; subsonic and supersonic terminal stage variants; anti-ship and land attack variants;
- Kh-61 Yakhont/PJ-10 Brahmos A/S air, sub, ship and ground launched supersonic
- Raduga 3M80/81/82 Sunburn – air and ship launched supersonic ASCM
- Raduga Kh-55SM – eq US AGM-86
- DH-10 – eq US Tomahawk
- YJ-63 – eq US Tomahawk MRASM

# Cruise Missiles – 3M54/SS-N-27 Sizzler



## 3M-54E -Supersonic Kill Stage Variant



- Flight at lowermost altitude making it hard for air defence means to kill the missile
- Target approach from preset direction by-passing islands and air defence Zones
- Penetrating high-explosive WH blasting



**Kilo SSK; DDG/FFG SLCM**

**Su-27/30/35; MiG-29/35 ALCM**

**MZKT-7930 8 x 8 GLCM**

## MZKT-7930 TEL Road Mobile



## Air Launch Variants





# Cruise Missiles – Yakhont/Brahmos / SS-N-26



**Tatra 815 8 x 8 GLCM**



**Su-27/30/35 ALCM**

**SSK, DDG/FFG SLCM**



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# 3M80/81/82 Moskit / SS-N-22 Sunburn



**Ship Launch – Type 956 DDG**

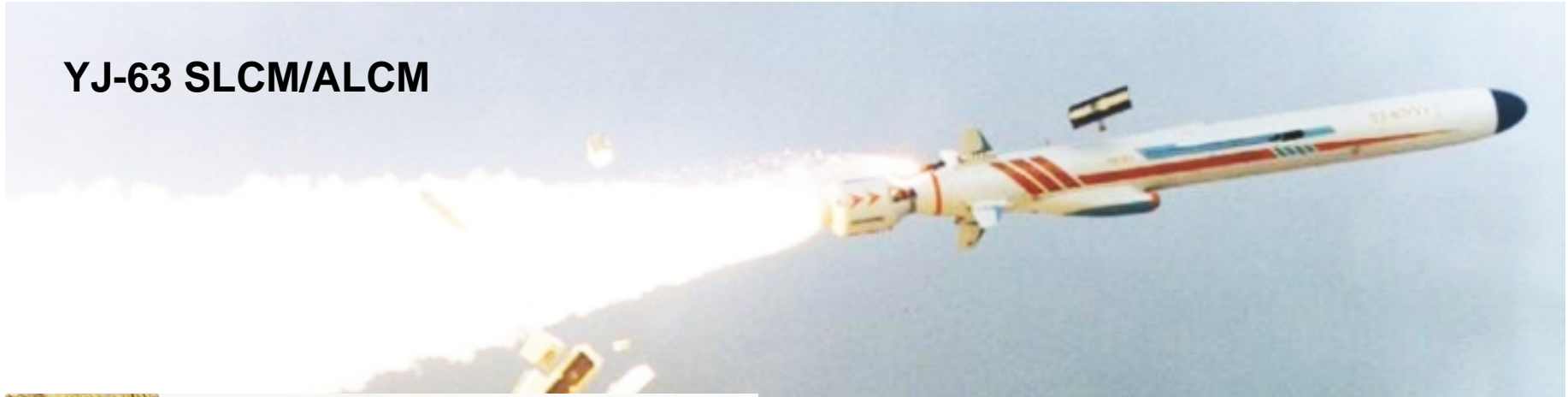
**Air Launch – Centreline Su-33/Su-35BM**

**Thermobaric or Shaped Charge W/H**

# Cruise Missiles – Kh-55, DH-10, YJ-63



**YJ-63 SLCM/ALCM**



**Raduga Kh-55SM ALCM**



**AGM-86/109 Analogues**



**DH-10 SLCM**

# S-400 Triumph / SA-21 Growler – 200 NMI



**92N2E Grave Stone Engagement**



**4/16 Round 5P85TE1 TEL**



**Missiles 48N6E2, 48N6DM, 9M96E/E2**

**Equivalent Patriot PAC-3 / ERINT**

**96L6 Cheese Board – Acquisition**



# S-300PMU1/2 / SA-20A/B Gargoyle – 80-110 NMI



**30N6E/E2 Tomb Stone Engagement**



**4 Round 5P85TE TEL**



**64N6E/E2 Big Bird Acquisition**



**48N6E/E2 Missiles**



# S-300PMU1/2 / SA-20A/B Gargoyle – 80-110 NMI



**5N66M/76N6 Clam Shell / 40V6MD**

**5N66M/76N6 Clam Shell / 40V6M**

**Low Level Acquisition Radar**

**40V6M – 24 Metre Elevation**

**40V6MD – 39 Metre Elevation**

**Both masts available for:**

**Flap Lid / Tomb Stone / Grave Stone;**

**Tin Shield ; Cheese Board**

**Cruise Missile Defeat**

**2-4 hr Deployment Time**



# S-300PMU2 vs Aegis/Patriot - Comparisons



64N6E

**SPY-1A  
Aegis**

64N6E

A graphic for the SPY-1A Aegis missile. It features a central blue octagon with the text "SPY-1A Aegis" in white. This octagon is set against a red background with a jagged, stepped edge. On the left and right sides of this red background, the text "64N6E" is written vertically in white.

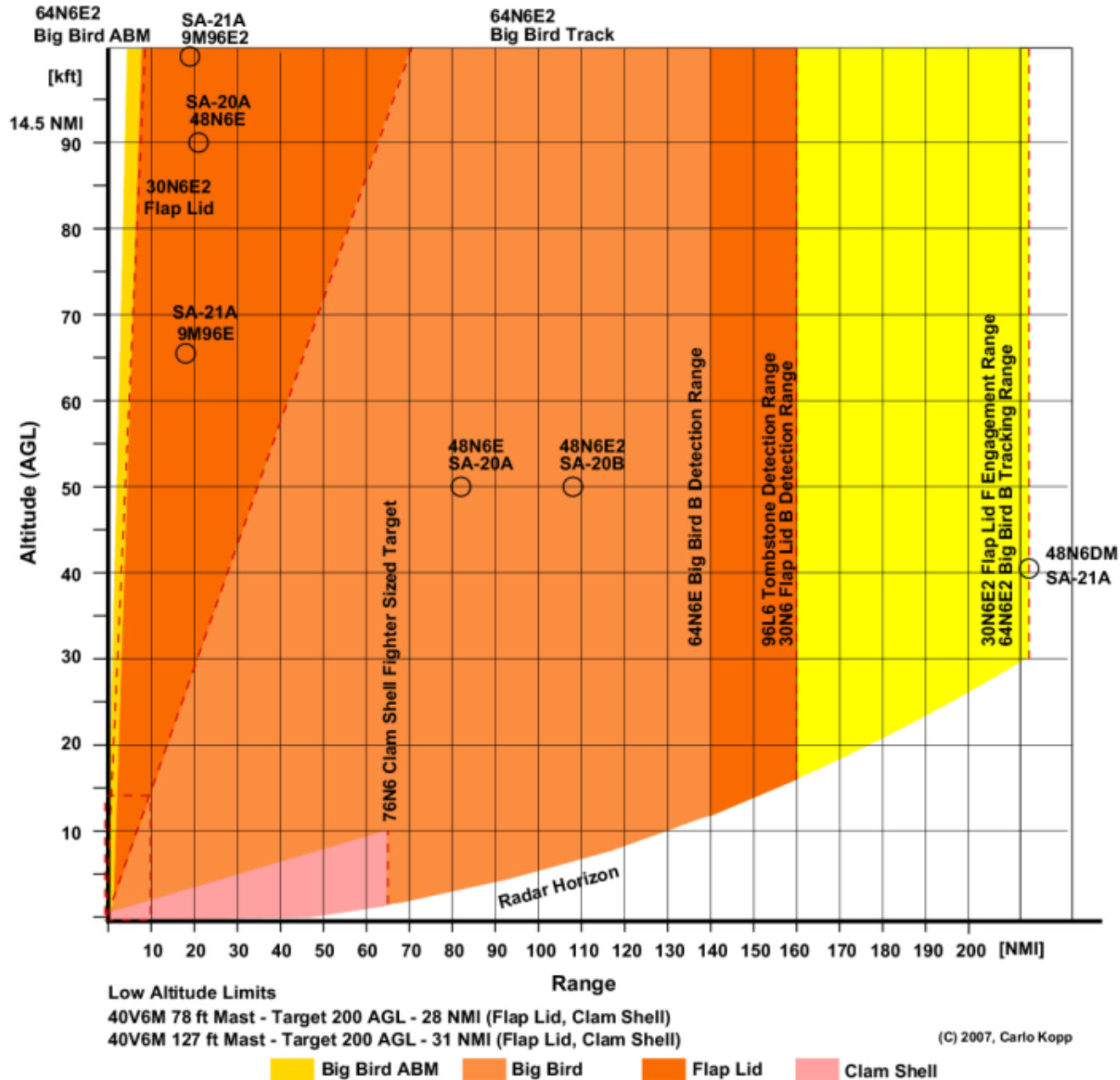
30N6E

**MPQ-53  
Patriot**

A graphic for the MPQ-53 Patriot missile. It features a central blue circle with the text "MPQ-53 Patriot" in white. This circle is set against a red background with a rounded top and a jagged, stepped edge. Above the circle, the text "30N6E" is written in white.

# S-300PMU-2 Favorit (SA-20 Gargoyle) Engagement Envelope

## S-400 Triumpf (SA-21 Growler) Engagement Envelope





# Tor M2E / SA-15D Gauntlet D



**Primary Role:**

**Interception of PGMs in Flight**

**Interception of Cruise Missiles**

**PESA Engagement Radar**



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# Tor M1 / SA-15C Gauntlet C



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# Pantsir S2 / SA-22B Greyhound B



**PESA Engagement Radar**



**Primary Role:**

**Interception of PGMs in Flight**

**Interception of Cruise Missiles**

# 2S6M1 Tunguska M / SA-19C Grison C



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# Almaz-Antey Laser Directed Energy Weapon

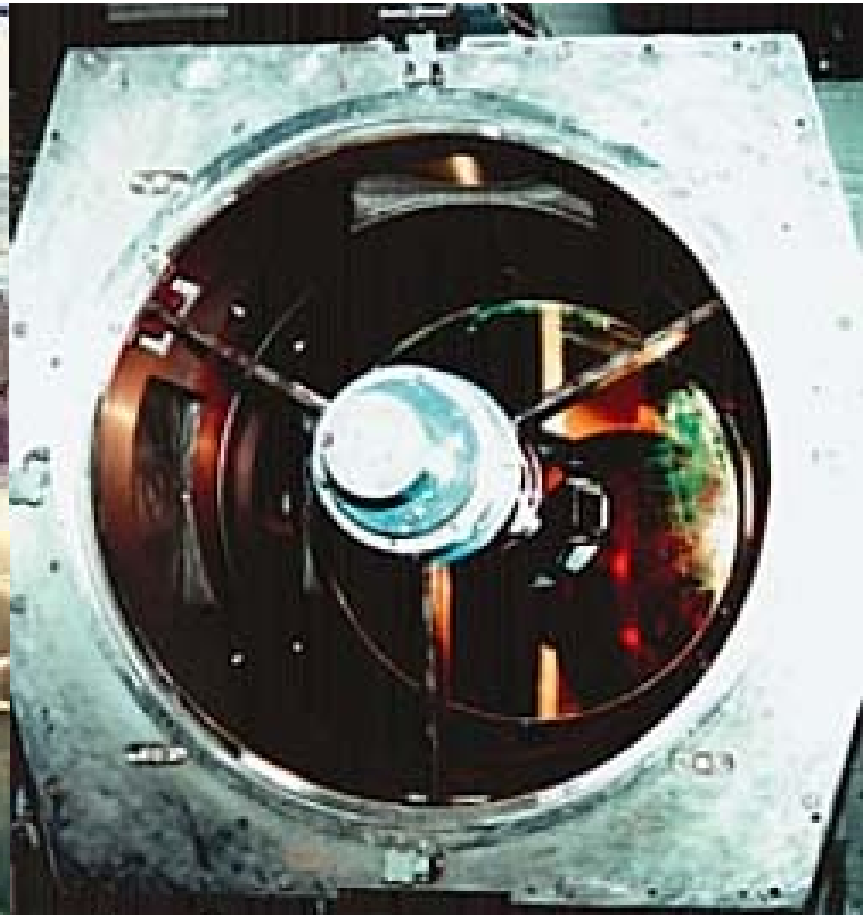


Beam Director on MAZ-7930



Development Project

Modelled on US THEL, but mobile  
Demonstrator with CO<sub>2</sub> GDL



# Nebo SVU VHF AESA Radar



**2 Metre Band Operation**

**Defeats VLO Shaping in JSF**

**High Accuracy – Midcourse  
Guidance of Missiles**

# Passive Emitter Locating Systems



Topaz Kolchuga M ELS



CETC YLC-20 ELS



85V6 Vega/Orion ELS



**Passive Detection;**  
**2/3D Triangulation**  
**Midcourse Missile**  
**Guidance:**  
**S-400 Growler Trial**  
**Target Tracking**

# Observations



- F/A-18A/B HUG not survivable post 2010
- F/A-18F Super H not survivable post 2010
- F-35 JSF not survivable post 2015
- Long range AAMs put AEW&C and AAR tanker aircraft at very high risk
- Long range SAMs deny airspace at high altitudes
- Short range SAMs deny low altitudes and threaten aircraft and PGMs
- ***No currently planned ADF capabilities credible vs advanced Russian systems***



# Conclusions



- If Australia continues down the current force structure planning path, then it:
  1. Loses its capability to control airspace
  2. Loses its capability for independent operations
  3. Loses strategic credibility in region
  4. Becomes a strategic liability to the US
  5. Expendes ~A\$30B without useful effect

**Further Reading: <http://www.ausairpower.net/region.html>**



[Russian / PLA Point Defence Weapons](#)

[Warsaw Pact / Russian / PLA Emitter Locating Systems / ELINT Systems](#)

[NNIIRT 1L119 Nebo SVU: Assessing Russia's First Mobile VHF AESA](#)

[Flanker Radars in Beyond Visual Range Air Combat](#)

[The Russian Philosophy of Beyond Visual Range Air Combat](#)

[Russian Low Band Surveillance Radars](#)

[Hard Kill Counter ISR Programs](#)

[Soviet Maritime Reconnaissance, Targeting, Strike and Electronic Combat Aircraft](#)

[Tupolev Tu-95/142 Bear](#)

[Tupolev Tu-22M3 Backfire C](#)

[The PLA-AF's Airborne Early Warning & Control Programs](#)

[The PLA-AF's Aerial Refuelling Programs](#)

[Sukhoi Flankers - The Shifting Balance of Regional Air Power](#)

[Supercruising Flankers?](#)

[Bypassing the National Missile Defence System - The Cruise Missile Proliferation Problem](#)

[Almaz S-300PT/PS/PMU-1/2, S-400 Triumph, S-400M Samoderzhets](#)

[Antey S-300V and S-300VM](#)

[Sukhoi Su-34 Fullback](#)

[Chengdu J-10 Fighter](#)

[Regional Precision Guided Munitions](#)

[Xian H-6 Badger](#)



# BACKUP SLIDES

# NNI IRT Nebo UE Tall Rack 3D VHF Radar



**Relocatable**

**Long Range 3D VHF Radar**

**Digital MTI Processing**

**Intended Use vs VLO Targets**

**Integrated with S-400 Batteries**

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# NNI IRT Nebo SV 2D VHF Radar



**Mobile ~1 hr Deployment**

**Long Range 2D VHF Radar**

**Digital MTI Processing**

**Intended Use vs VLO Targets**



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# CETC JY-27 2D VHF Radar



**PLA Nebo SV Analogue**  
**Mobile - Towed**  
**Long Range 2D VHF Radar**  
**Digital MTI Processing**  
**Intended Use vs VLO Targets**








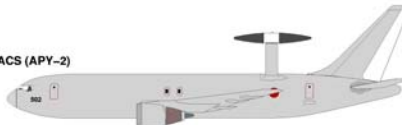

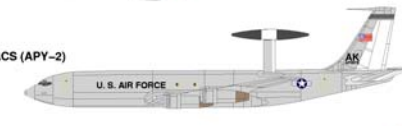














# KJ-2000 AWACS – AESA Technology



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# AEW&C vs Region



 IAF	Elta/Beriev A-50I IAF (ELM-2075 AESA)				
 PLAAF	Beriev KJ-2000/A-50 PLA-AF (PLA AESA)				
 JASDF	Boeing E-767 AWACS (APY-2)				
 USAF	Boeing E-3C AWACS (APY-2)				
 RAAF	NG/Boeing Wedgetail AEW&C RAAF (MESA)				
 US Navy	 JASDF	 RSAF	 RoCAF	Northrop-Grumman E-2C (APS-145)	
 US Navy	Northrop-Grumman E-2D Advanced Hawkeye (UHF AESA)				
 RMAF	Evaluation	PLANNED			
 RoKAF	NG/Boeing EX AEW&C (MESA)				
 RSAF	Gulfstream Eitam G550 AEW (EL/M-2052)				



# Sukhoi Su-33/33UB Flanker D - CV



**Su-33 Navalised Flanker**  
**PLA-N – 48 Ordered**  
**Tailhook/Ski-Jump**  
**Full Su-30MK Capabilities**  
**Single/Dual Variants**



**Su-33UB Navalised Flanker**  
**Zhuk MSFE PESA / TVC**

# Sukhoi Su-34 Fullback – LRIP for RuAF



Long Range Strike Fighter – F-111 Class

PESA Attack Radar

Khibiny M Emitter Locating System

All Su-30MK Smart Weapons

LRIP in 2007 – On Offer to PLA-AF/PLA-N



# Chengdu J-10 Sino Canard Fighter



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# Xian H-6K Turbofan Badger ~2000 NMI



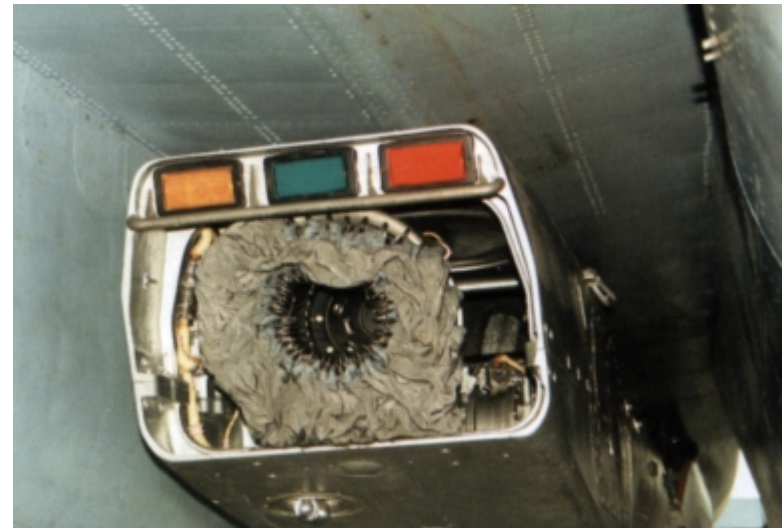
**New Build ALCM Carrier**

**Turbofan D-30KP - ~2,000 NMI Radius**

**Revised Nose, Wing Designs**



# Su-33/35 Buddy Refuelling Capability



# II-78 Midas Tanker



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# Tankers vs Region



# Regional Tier 1 Fighters

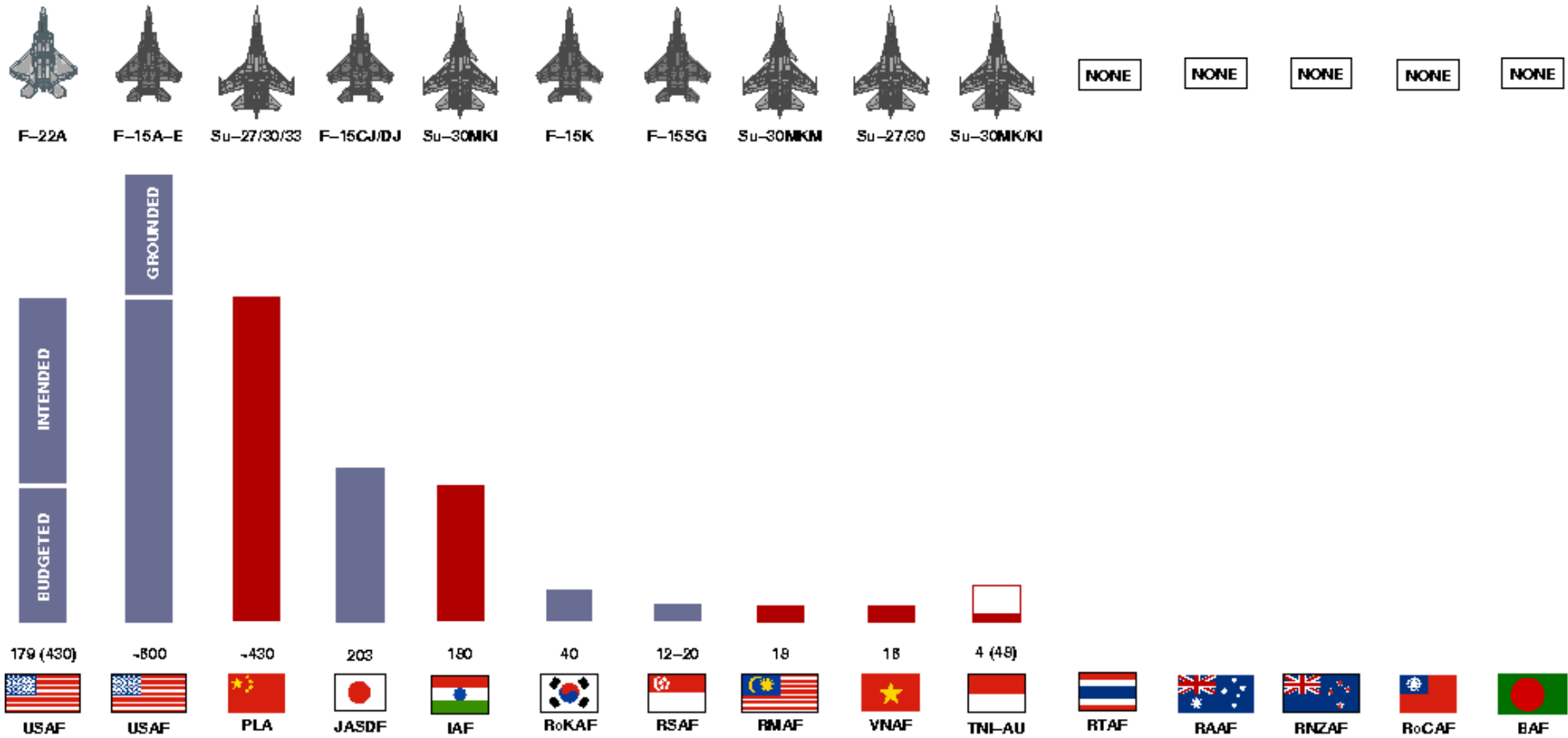


## REGIONAL HIGH CAPABILITY AIR COMBAT FIGHTERS (IN SERVICE OR PLANNED)

					
USAF	USAF	USAF	PLA	PLA	IAF
					
F-22A	F-15A-D	F-15E	Su-27SK/SNK	Su-30MKK	Su-30MKI
					
JASDF	RoKAF	RSAF	RMAF	VNAF	VNAF
					
F-15CJ/DJ	F-15K	F-15SG	Su-30MKM	Su-27SK	Su-30MKV
					
TNI-AU	RAAF	RNZAF	RTAF	RoCAF	BAF
	NONE	NONE	NONE	NONE	NONE
Su-30MKI					



# Regional Tier 1 Fighters

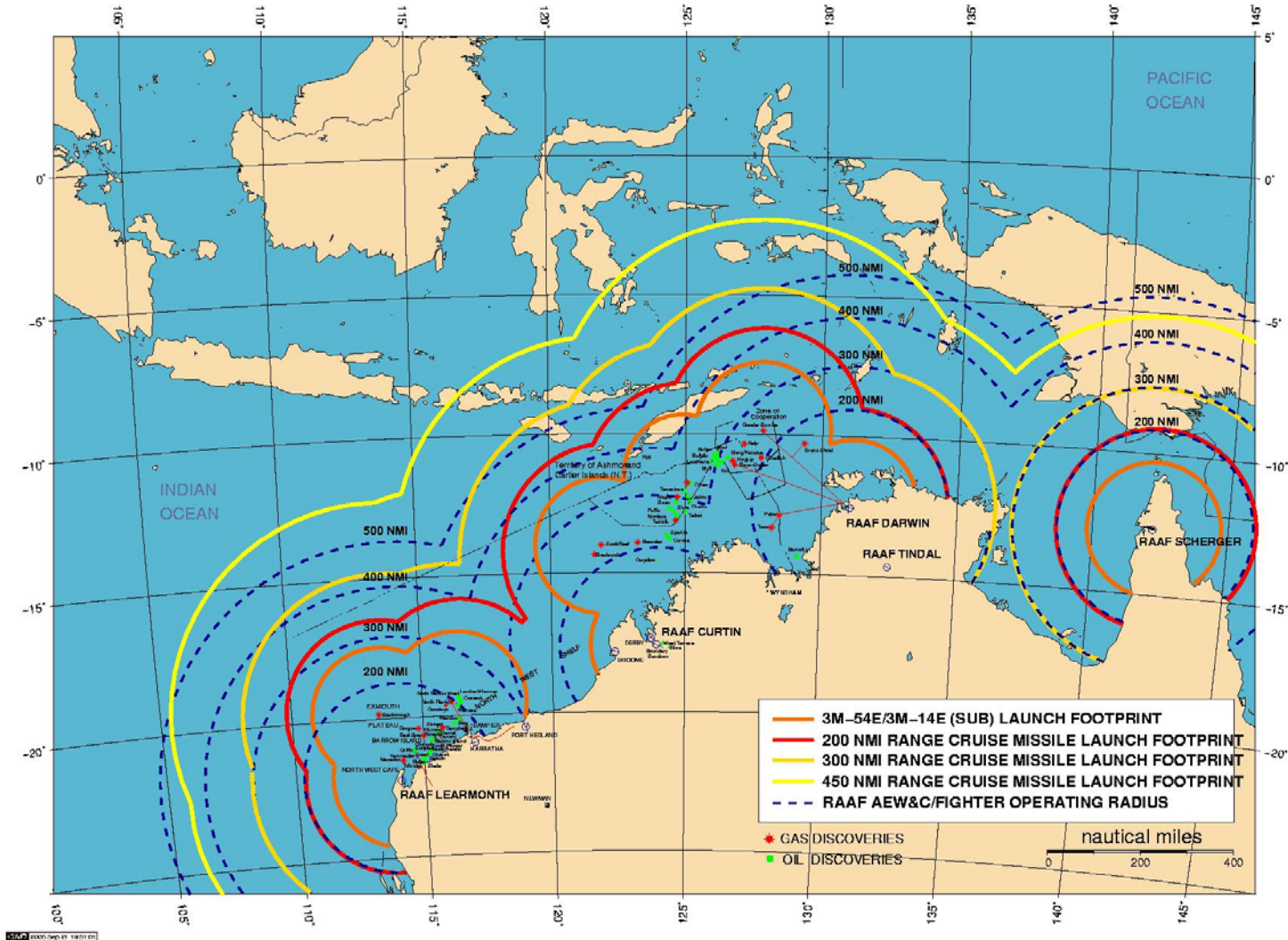


REGIONAL HIGH CAPABILITY AIR COMBAT FIGHTERS  
(IN SERVICE OR PLANNED)

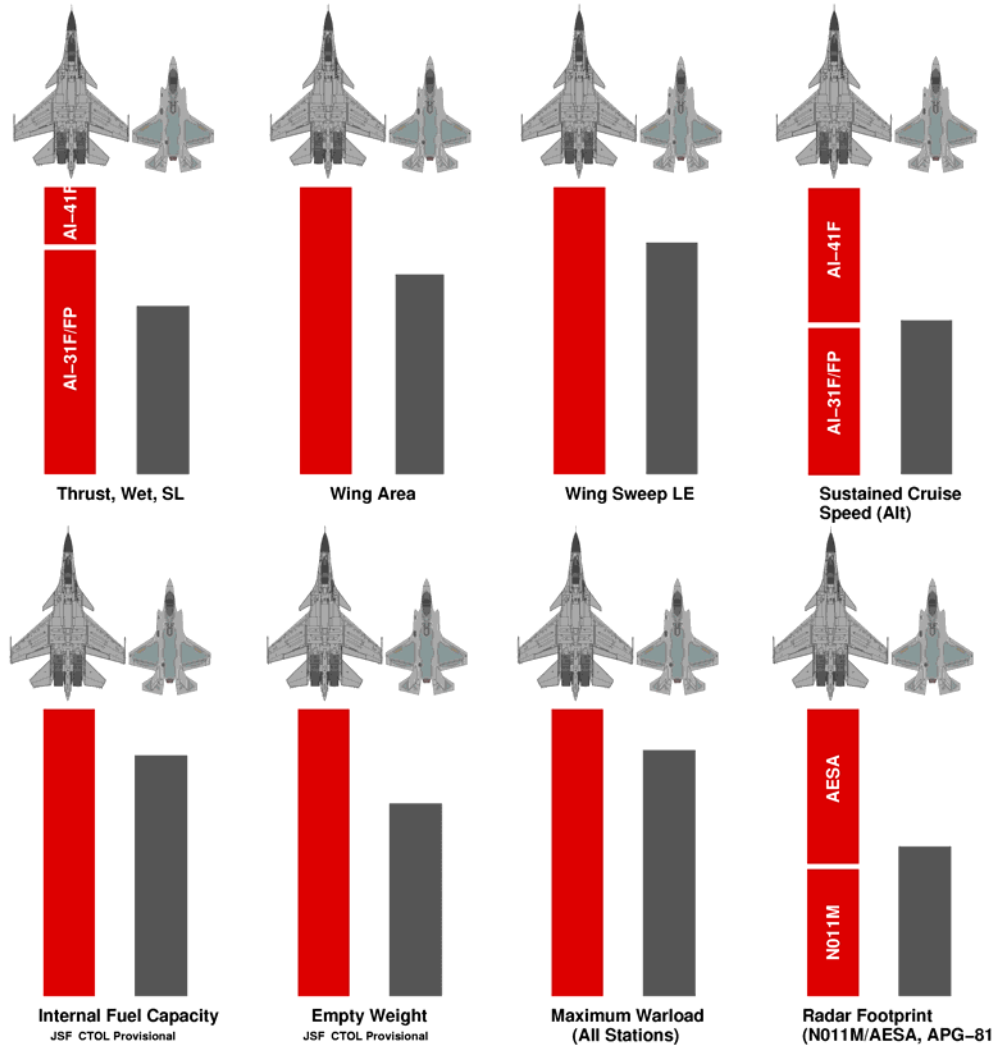
# Cruise Missiles vs Deep North



## NORTH WEST SHELF AND TIMOR SEA AIR DEFENCE ENVIRONMENT



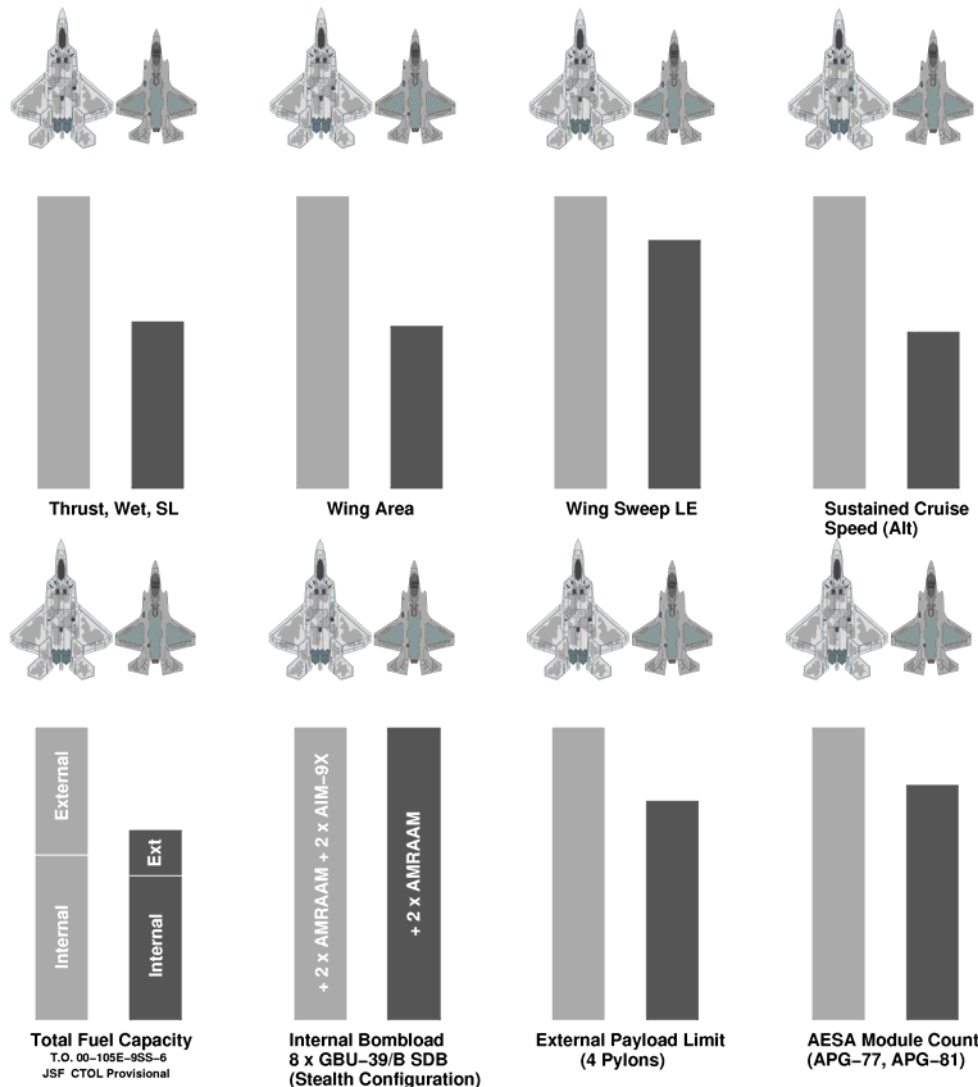
# Flanker vs JSF



owth Su-30 Derivative vs Joint Strike Fighter – Parametric Compa

(Provisional Data)

# F-22 vs JSF



## F-22A vs Joint Strike Fighter – Parametric Comparison

(Provisional Data)