Russian Weapons Proliferation in Asia

Dr Carlo Kopp,
AFAIAA, SMIEEE, PEng
Head Capability and Strategy Analysis
Peter Goon, FTE(USNTPS)
Head Test and Evaluation
Air Power Australia

Russia's Defence Industry Post Cold War

- At the end of the Cold War the Soviet military-industrial complex was the largest globally, exceeding in production volumes even the US industrial base;
- While Design Bureaus were located mostly in Russia, the Ukraine and Belarus, manufacturing plants were scattered across the USSR and some Warsaw Pact allies;
- The collapse of the USSR in 1992 resulted in the loss of most of the volume of business which sustained this industrial base, as well as large scale disruption to the supply from subcontractors;
- *The survival strategy adopted was to refocus almost completely on manufacture for export.*

The New Export Paradigm

- By 1995 the new "export oriented" Russian defence industry, closely coupled with Belarus and Ukrainian contractors, reformed and restructured;
- Many bureaus and plants consolidated and merged, with mergers continuing for more than a decade;
- *Rosvooruzheniye* was formed to market and sell Russian weapons and technology to export clients;
- Soviet era restrictions which limited export of "upper tier" weapons and technology collapsed – almost everything built was available if the offer was good enough;
- Clientele included former Soviet satellites and proxies, but also many new clients in Asia.

The "Fire Sale" of Soviet Weapons Technology

- Russian industry offered high technology weapons, but also basic technology, at pricing well below the US, EU and Israel;
- Unlike Western governments who imposed strict legislative controls on which nation can procure what, and also specific prohibitions on some technologies, *Rosvooruzheniye* was far more "flexible" in what could be exported to whom;
- While large scale orders were orchestrated by *Rosvooruzheniye*, many manufacturers also dealt directly with clientele, especially when exporting basic technology rather than finished products;
- *This strategy was often termed the "fire sale" of the Soviet weapons technology base.*

The Expanding Customer Base

- By volume alone, but also diversity of products and technology procured, China was and remains the single largest customer;
- Exports to China span the whole spectrum of weapons and supporting systems, but also extensive exports of basic technology via technical assistance, and manufacturing technology;
- Until UN sanctions escalated, the DPRK was a client;
- Key legacy customers include Middle Eastern, North African, Latin American nations, Vietnam and India;
- New customers include Malaysia, Indonesia, South Korea, Myanmar, and Thailand in Asia, and Venezuela in Latin America.

Key Exports – A2AD Weapons

- Russian weapons exports are the second largest component of Russian export revenue, following energy and other resource products;
- While "traditional" weapons exports such as small arms, armoured vehicles, artillery, munitions, as well as depot level overhauls and upgrades of Soviet era equipment remain as staples, the largest volumes have been in Anti-Access / Area Denial (A2AD) weapons and systems;
- *The intent of A2AD weapons and systems is to prevent local interventions by technologically sophisticated nations or alliances such as the US and NATO, or neighbours equipped with modern systems.*

A2AD Exports

- Major exports of A2AD systems include:
- Type 636 and 877 “Kilo Class” SSK with 3M54 Klub / SS-N-27 Sizzler Cruise Missiles;
- S-300P / SA-20 Gargoyle long range Surface to Air Missiles;
- Modern air defence radars, especially Counter-stealth designs;
- Tor M1 / SA-15 Gauntlet and Pantsir S1 / SA-22 Greyhound “Counter Precision Guided Munition” systems;
- Sukhoi Flanker long range strike fighters, with a wide range of Precision Guided Munitions;
- Anti-shipping cruise missiles, especially supersonic.

How Good Are Post Soviet Russian Weapons?

- During the Cold War and post Cold War interventions, Soviet/Russian weapons developed a poor reputation, common criticisms being ineffectiveness, unreliability, and susceptibility to Western electronic countermeasures;
- These observations reflect operational experience against weapons exported by the Soviets between 1950 and 1990 – not more recent designs;
- *Of the current generation of modern weapons being exported by Russia, few if any have been encountered in combat by Western forces;*
- Contemporary Western defence departments mostly have very poor literacy in contemporary Russian weapons technology, doctrine and tactics.

Limitations of Soviet Era Export Weapons

- The Soviets were very cautious when exporting weapons technology; Usually only "second tier" systems were exported, often obsolete, and often "dumbed down" by removing sensitive features and components;
- Soviet weapons were designed around the Warsaw Pact conscript/reserve military system, and assumed that users would be *well educated, highly trained and disciplined* – effectiveness was highly sensitive to operator skills and understanding.
- *Enormous disparities in effectiveness observed between use by Warpac personnel (PAVN 1964-73, Mid-East 1969, OAF 1999) and Mid East personnel (Lebanon 1982, Desert Storm 1991, Libya 2011).*

Limitations of Soviet Era Export Weapons

- Soviet era weapons were designed around depot level overhauls and require high skill engineering personnel;
- Most Soviet export weapons employed analogue technology, which required frequent and difficult recalibration;
- Importantly, most Soviet weapons were compromised through capture by Israel, South Africa and other Western aligned nations;
- By 1990 most previously exported Soviet weapons could be defeated by electronic countermeasures;
- ***None of these limitations apply to post Soviet Russian export weapons systems.***

Features of Contemporary Russian Weapons

- Exploit the best technology remaining from the late 1980s Soviet technology base;
- Exploit modern globalised COTS (Commercial Off The Shelf) digital and microwave technology base – software and high performance commodity chips, nearly all of which are unregulated;
- Exploit globalised academic research in applicable science and engineering disciplines;
- Designs usually unique, but modelled on contemporary US, EU or Israeli products where there is an advantage in doing so;
- Retain traditional Soviet ruggedness and robustness, add "Western" digital technology.

Russian vs. US/EU Weapons Systems I

- Mostly, new generation Russian weapons are difficult to differentiate from Western equivalents in most key areas of basic technology;
- Many Russian systems are built from identical components to US/EU equivalents, e.g. computer / signal processing / microwave chips, and software environments and languages;
- Unlike Western weapon systems, where "software bloat" and "creeping featurism" typically displace performance and robustness as measures of worth, Russian systems retain focus on performance, robustness and combat effectiveness;
- Russian systems mostly follow "evolutionary" development paths to minimise risk.

Russian vs. US/EU Weapons Systems II

Basic Technology Comparisons:

- US retains lead in stealth materials technology;
- Russia has closed gap in most stealth shaping techniques;
- US retains lead in X-band radar technology;
- Russia has lead in low-band "counter-stealth" radar technology;
- US retains lead in Electro-Optical sensor technology;
- US retains some lead in radio network technology;
- Russia has very strong lead in supersonic cruise missile technology;
- Russia has closed gap in air-air missile technology, and leads in long range missile designs.

Difficulties with US Military Recapitalisation

- Since 1992 Russian weapons development has been almost wholly focussed on systems built to win modern high intensity nation state conflicts;
- Since 2001 US shifted focus in development on winning COIN conflicts, with funding diverted away from fighting modern high intensity nation state conflicts –> block obsolescence and loss in skills;
- Deep loss of expertise and critical skills sets in the US DoD and industrial base, exacerbated by "offshoring" and "outsourcing" manufacturing;
- US debt problems complicate "reboot" of US effort to recapitalise systems for nation state conflicts;
- *Gates' "Next-war-itis" doctrine has seriously damaged the ability of the US to retain lead.*

Russian Exports to ASEAN

- ASEAN has become a major market post Cold War for Russian weapons technology;
- Russian weapons have tripled the effective "combat reach" of most ASEAN air forces;
- Russia is the primary supplier of high technology Precision Guided Munitions to ASEAN nations, including supersonic cruise missile technology;
- Primary exports have been in long range Sukhoi Su-30 series multirole fighter aircraft, air-to-air missiles and Precision Guided Munitions;
- *Most of the growth in military capabilities across ASEAN nations since 1992 can be credited to Russian exports.*

Russian Exports to Vietnam

- Vietnam was a major recipient of Soviet military equipment during the Cold War, as well as a conduit to the USSR for captured US technology;

Key Russian exports include:

- 24 x Sukhoi Su-30MKV long range strike fighters;
- Air-to-air missiles, and Kh-31 Krypton supersonic anti-ship missiles;
- 2 x Bastion P / Yakhont supersonic ASCM batteries;
- 6 x Type 636KMV Kilo class submarines;
- 10 x Type 1241.8 Tarantul V missile corvettes;
- 2-4 x Type 1166.1E Gepard 3.9 missile frigates;
- 4-6 x S-300PMU2 Favorit or S-400 Triumf batteries; intent to procure Counter-PGM systems.

Russian Exports to Malaysia and Indonesia

Key Russian exports to Malaysia include:

- 18 x MiG-29N Fulcrum fighters;
- 18 x Su-30MKM Flanker H long range fighters;
- Miscellaneous man-portable SAM and ATGMs;

Key Russian exports to Indonesia include:

- 5 x Su-27SK Flanker B long range fighters;
- 11 x Su-30MK2 Flanker G long range strike fighters;
- 60 x BMP-3 Infantry Fighting Vehicles;
- Yakhont / SS-N-26 supersonic anti-ship cruise missiles;
- 5 x Mi-35P Hind E attack helicopters; 6 x Mi-17V5 Hip assault helicopters;
- TNI wishlist includes S-300PMU2/S-400 systems.

Russian Exports to Myanmar and Thailand

- Myanmar has received extensive military aid from China, including large scale construction of modern military airfields for large aircraft.

Key Russian exports to Myanmar include:

- 12 x MiG-29B/UB Fulcrum air superiority fighters;
- 20 x MiG-29SMT Fulcrum air superiority fighters;
- 50+ x Mi-35P Hind E attack helicopters;
- 12 x Mi-2 Hoplite liasion helicopters;
- S-125M Pechora 2M / SA-3 Goa SAM systems;

Key Russian exports to Thailand include:

- 3 x Mil-17V5 Hip assault helicopters;
- Cancelled order for Sukhoi Su-30MK Flanker fighters.

Key Russian Exports to India

- India has been a long standing user and licenced manufacturer of Soviet/Russian equipment – much of India's inventory is Soviet/Russian sourced;
- India remains closely engaged with Russia and is active in numerous collaborative development programs;
- India is partnered with Russia in the Sukhoi T-50 PAK-FA stealth fighter program and expected to built 200+ of these advanced aircraft;
- 270+ x Sukhoi Su-30MKI Flanker H fighters mainly assembled in India, plus missiles and PGMs;
- Licence built Yakhont / Brahmos supersonic cruise missile program;
- Type 877EKM Kilo class subs; 1 x Akula SSN

India - Sukhoi/KnAAPO T-50 PAK-FA/FGFA

- Advanced Stealthy Air Combat Fighter;
- Codevelopment with India, planned licence production;
- Marketed globally as replacement for Flanker, intended to sell 1000+ export airframes.

Perspektivniy Aviatsionniy Kompleks Frontovoy Aviatsii
Sukhoi/HAL Fifth Generation Fighter Aircraft

Sukhoi/KnAAPO T-50 PAK-FA

- Development initiated during 1990s and well publicised in Russian media post 2000;
- 2015 IOC; flight test progressing very rapidly;
- Designed from the outset to defeat the F-22 in close combat, match F-22 in long range supersonic combat, outperform F-22 in range/persistence;
- Advanced second generation supercruise engine and high stealth rectangular nozzle in development;
- High volume export production intended, planned replacement for established Flanker series fighters in global marketplace;
- Advanced digital avionics modelled on F-22.

Russian Exports to China

- Prior to 1992 most indigenous Chinese military equipment was based on licenced or reverse engineered Soviet technology;
- Post 1992 China launched a large scale effort to procure, both legally and sometimes illegally, advanced Russian technology;
- Many recent Russian imports have been reverse engineered, breaching Russian IP – the J-11B, J-15 and "J-16" Flankers based on Su-27/30 designs;
- Key Chinese weapons systems based on imported Russian technology, including Agat seekers for PL-12 Sino-AMRAAM or optical correlator guidance for the DF-21D Anti-Ship Ballistic Missile; guidance and propulsion for DH-10/CJ-10 cruise missiles.

Chengdu J-20 Stealth Fighter

- Russian Engine Technology;
- Russian Radar Technology;
- Russian Missile Seeker Technology;
- US Stealth Shaping Technology;
- Indigenous Airframe, Flight Controls, Cockpit, Systems.

Shenyang "J-31" Stealth Fighter

- Russian Engine Technology;
- Russian Radar Technology;
- Russian Missile Seeker Technology;
- US Stealth Shaping Technology.
- Indigenous Airframe, Flight Controls, Cockpit, Systems.

Shenyang J-15 Navalised Flanker D (Su-27K)

- Reverse engineered Sukhoi Su-27K based on Soviet Sukhoi T-10K prototype(s) bought in the Ukraine as scrap;
- Reverse engineered in violation of Russian IP

DH-10/CJ-10 Cruise Missile Vs. Kh-55SM Kent

Circa 2001 China unlawfully procured multiple Kh-55SM examples, later used to facilitate development of the DH-10/CJ-10 "Sino-Tomahawk" cruise missile

DF-21D Anti-Ship Ballistic Missile (ASBM)

China licenced Russian optical correlator technology for the DF-21D ASBM Terminal Guidance Package

Conclusions – Strategic Impacts

- Russian military exports, both in finished products and basic technology for use in developing indigenous weapons, have been the principal enabler of the "creeping arms race" across Asia;
- Advanced Russian weapons, especially A2AD weapons, represent the most potent military capabilities currently in use by China, India and ASEAN nations other than Singapore;
- Most of the advances in indigenous Chinese weapons technology since 1992 are based on Russian designs or basic technology;
- Advanced Russian military technology remains the primary (but not accepted) benchmark for planning Western military capabilities.


Backup Slides

Anti-Access Weapon Proliferation in Asia

Anti-Access Weapon Case Studies

- Anti-access weapons are actively marketed across the globe, most as anti-access weapons, but sometimes as high performance substitutes for more conventional alternatives.
- Two key case studies – Iran, and China.
- While both have widely differing national agendas, they all share an interest in deterring US interventions and in coercing neighbours which are politically close to the US.
- Iran has a limited domestic high technology industries and relies mostly on imports.
- *China has a well developed domestic defence industry and is both a procurer and proliferator of anti-access weapons, globally*.

China – Case Study

- China is a nascent regional superpower intent on securing its regional strategic position despite and at the expense of the US and its WestPac allies.
- While China is not overtly hostile to the US, its large size and key strategic location result in significant strategic risk to US if intent changes.
- Chinese force structure planning is a fusion of domestic, US and Russian concepts.
- A key focus of Chinese modernisation is the development and deployment of a range of anti-access weapons of Russian and domestic origin.
- The PLA "Second Island Chain" and "String of Pearls" denial strategies are both centred on the anti-access model of warfare.

China – Terminally Guided Ballistic Missiles

- The terminally guided variant of the DF-21 Intermediate Range Ballistic Missile is modelled on the US Cold War MG-31 Pershing II / RADAC design, using Russian and Chinese technology.
- Airframe based on JL-1 SLBM design, but carried on high mobility launcher vehicle.
- Airframe was base vehicle for PLA ASAT design.
- Weapon intended to kill aircraft carriers and to deny the use of fixed basing such as Guam, Palau, Kadena, Yokota and other key US WestPac sites.
- The high mobility of the DF-21 launcher vehicle makes it difficult to track and destroy, as DF-21 units can be rapidly dispersed across wide areas.
- Guidance accuracy will improve as satnav matures.

DF-21 Terminally Guided Ballistic Missile

China – Cruise Missiles

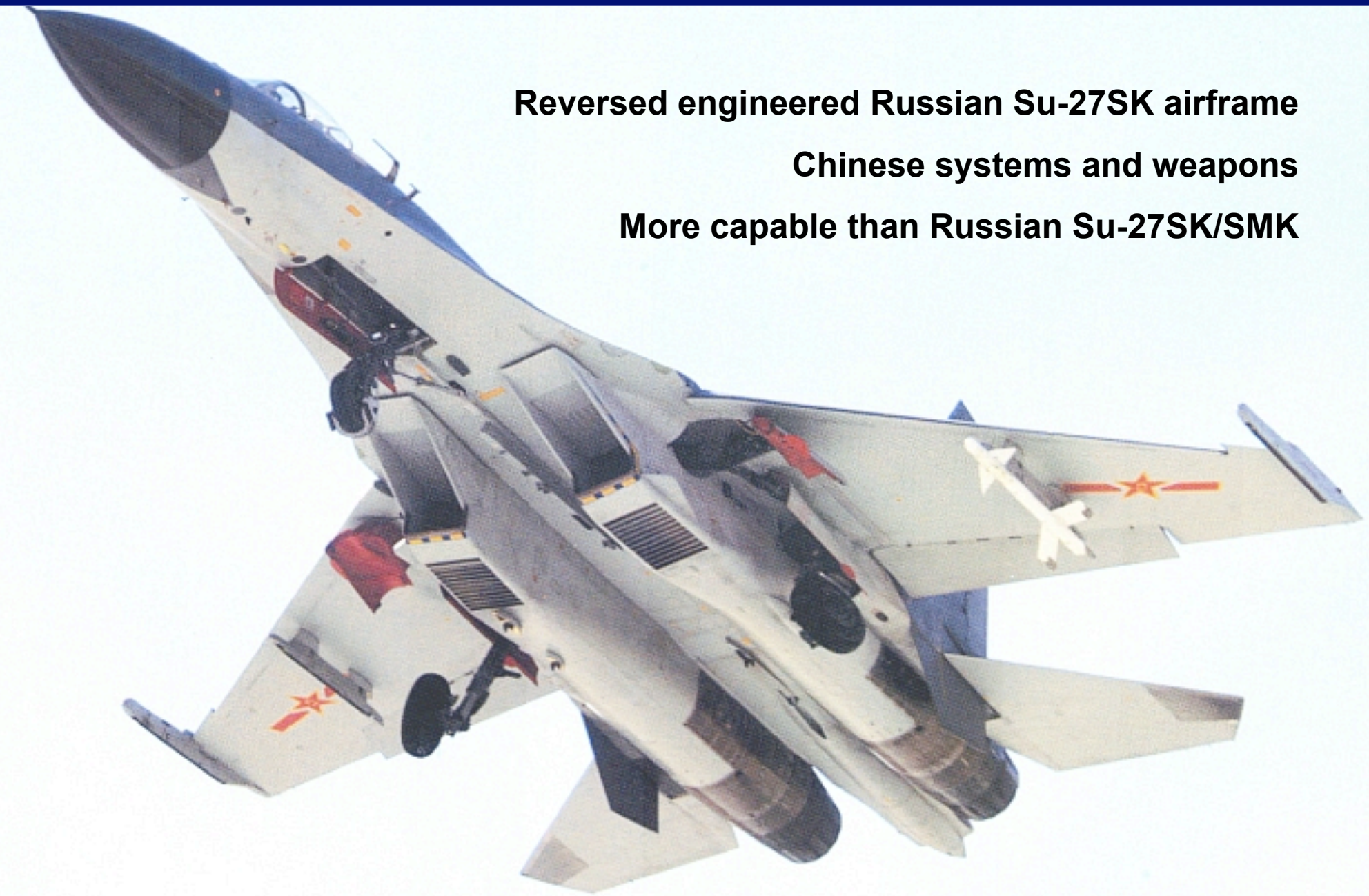
- China manufactures a range of indigenous cruise missiles, and operates a range of imported Russian supersonic and subsonic designs.
- Russian supersonic 3M81 / SS-N-22 Sunburn, 3M55 Yakhont / SS-N-26 Stallion and 3M54E / SS-N-27 Sizzler deployed by PLA-Navy combatants.
- Chinese DH-10, HN-3, YJ-62 emulate US Tomahawk cruise missile concept.
- China involved in 2001 theft of Russian Kh-55SM Granat / AS-15 Kent ALCMs from Ukrainian stock.
- H-6K Badger turbofan powered cruise missile carrier system in late development, with reach to threaten fixed basing such as Guam, Palau, Kadena, Yokota and other key US WestPac sites.

Xian H-6K Badger / YJ-62 Cruise Missile

China – Air Anti-Access Weapons

- China is the single largest export customer for Russian Sukhoi Su-27/30 Flanker fighters, S-300PMU / SA-20 SAM systems, and other air defence equipment.
- China's Flanker fleet is likely to exceed 550 aircraft by 2015-2020, and an indigenous derivative has been produced.
- China's HQ-9 / FD-2000 SAM is based on the early model SA-20 and provides similar capabilities.
- China manufacturing point defence gun systems and other defensive measures capable of frustrating smart weapon attacks on PLA SAM batteries.
- Significant and growing air anti-access capability.

Shenyang J-11B "Sino-Flanker"



Reversed engineered Russian Su-27SK airframe

Chinese systems and weapons

More capable than Russian Su-27SK/SMK

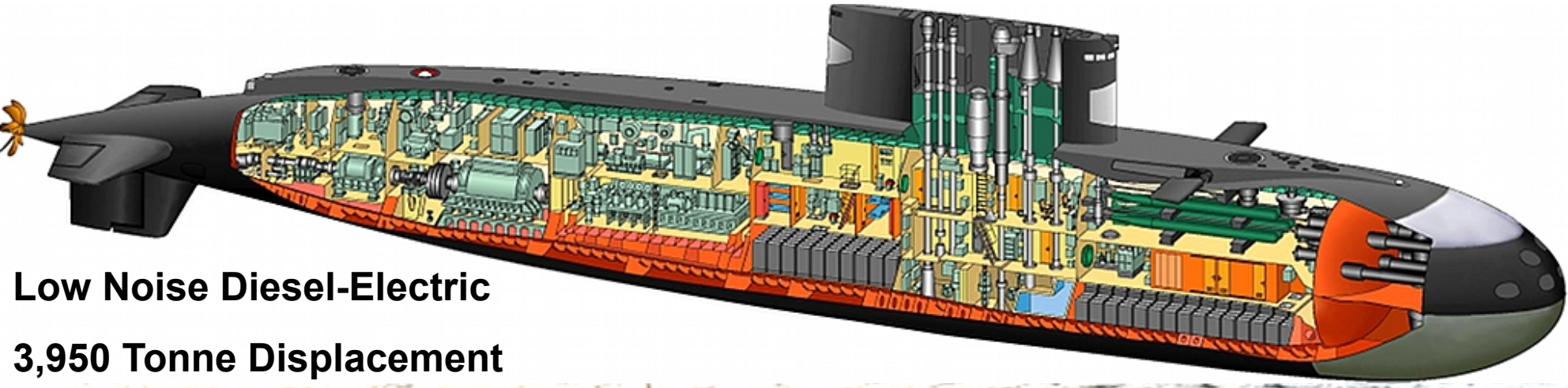
Iran Case Study

- Fascist regime extremely hostile to the US.
- Former US ally subjected to islamist coup in 1979.
- Confrontational foreign policy, anti-Israel.
- Regional ambitions to increase national stature.
- Exceptional long term revenue prospects due to natural energy resources, esp. natural gas.
- Limited but steadily growing domestic technology base and industrial capabilities.
- Key geographical location covering Persian Gulf, Straits of Hormuz and Western Afghanistan.
- Iran has procured a large, by regional terms, inventory of Russian and Chinese built equipment.
- Some Chinese weapons licensed for manufacture.

Iran Maritime Anti-Access Capabilities

- Iran inherited large inventory of US equipment including F-14A, F-4C/D, F-5E fighters and Hawk SAMs, but mostly these are in disrepair.
- Iran acquired a large portion of Saddam's air force including Su-24 Fencer and MiG-29 Fulcrum.
- Iran acquired Kh-55 / AS-15 Kent strategic cruise missiles from Ukrainian warstocks in 2001.
- Procurement of Russian Kilo SSKs, a super-cavitating torpedo based on the Russian VA-111 Shkval, and a large warstock of mobile shore based Chinese anti-ship cruise missiles.
- *Credible maritime anti-access capability within the Persian Gulf, with the potential to severely impact tanker traffic to and from the Persian Gulf.*

Type 877EKM "Kilo Class" SSK



Low Noise Diesel-Electric

3,950 Tonne Displacement

6 x 533mm torpedo tubes

24 x Naval Mines

Warload 18 Rounds

Mix of Heavyweight Torpedoes or

3M54/3M14 Sizzler ASCM/LACM

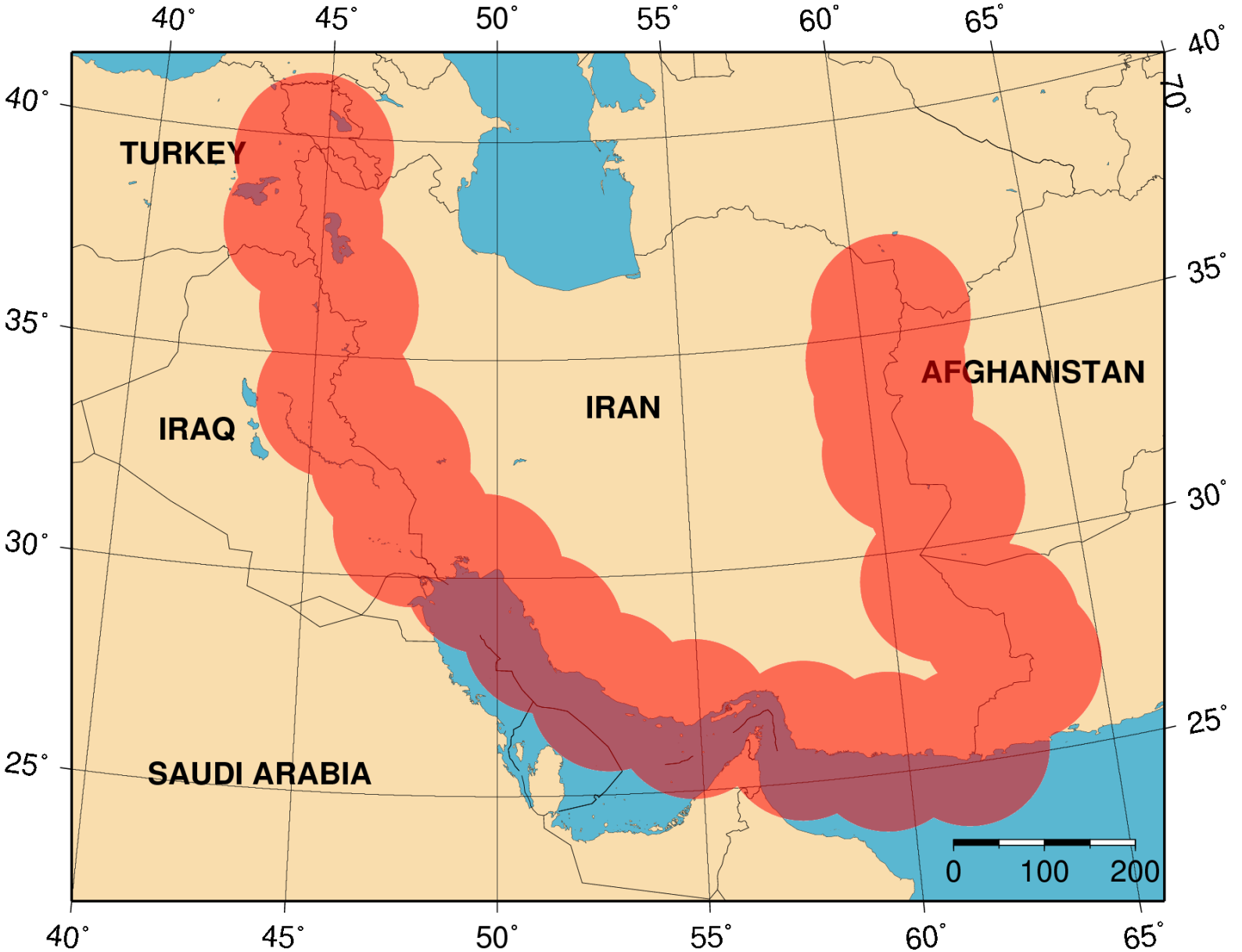
Iran Air Anti-Access Capabilities

- Iran procured several batteries of Russian 160 NMI range S-200 / SA-5 Gammon legacy SAMs.
- Tor M1 / SA-15 Gauntlet point defence SAM procured, providing a terminal defence capability against US cruise missiles and smart bombs.
- Iran ordered Russian S-300PMU1 / SA-20A Gargoyle long range SAM systems – UN Embargo
- Public speculation about procurement of Chinese HQ-9 / FD-2000 long range SAMs, similar to Russian SA-20, to replace Chinese HQ-2 SAMs.
- Public speculation about procurement of 200 Su-30MKM Flanker, S-300PMU2 and S-400.
- *Iran is now developing a credible anti-access capability against legacy US combat aircraft.*

Almaz S-300PMU2 Favorit / SA-20 Gargoyle

Image Vestnik-PVO/APA

AIRSPACE AT RISK – IMPACT OF S–300PMU1/HQ–9/SA–20 DEPLOYMENT



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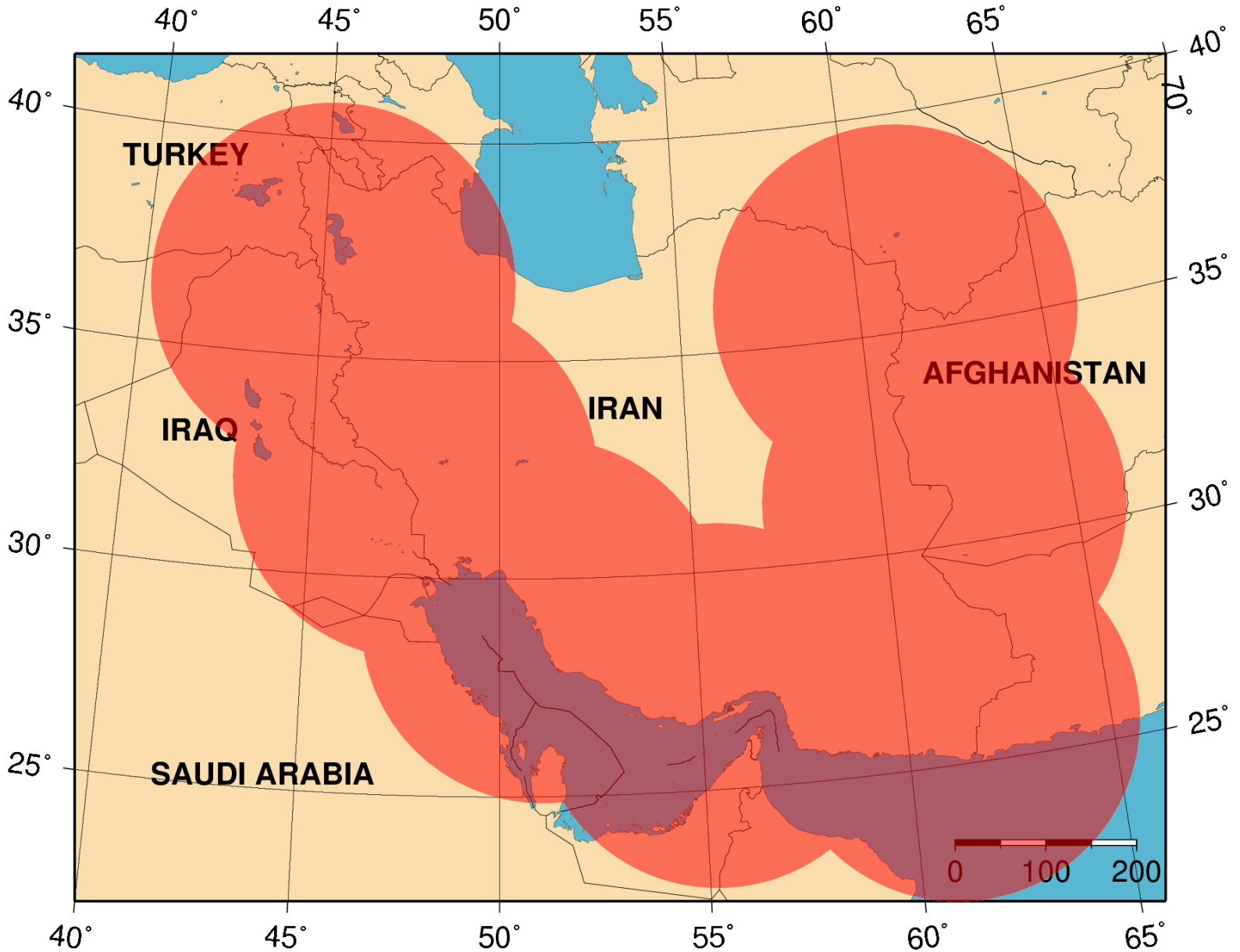
AIRSPACE AT RISK – IMPACT OF S–400/SA–21 DEPLOYMENT



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AZIMUTHAL EQUIDISTANT PROJECTION

Iran - Strategic Impact

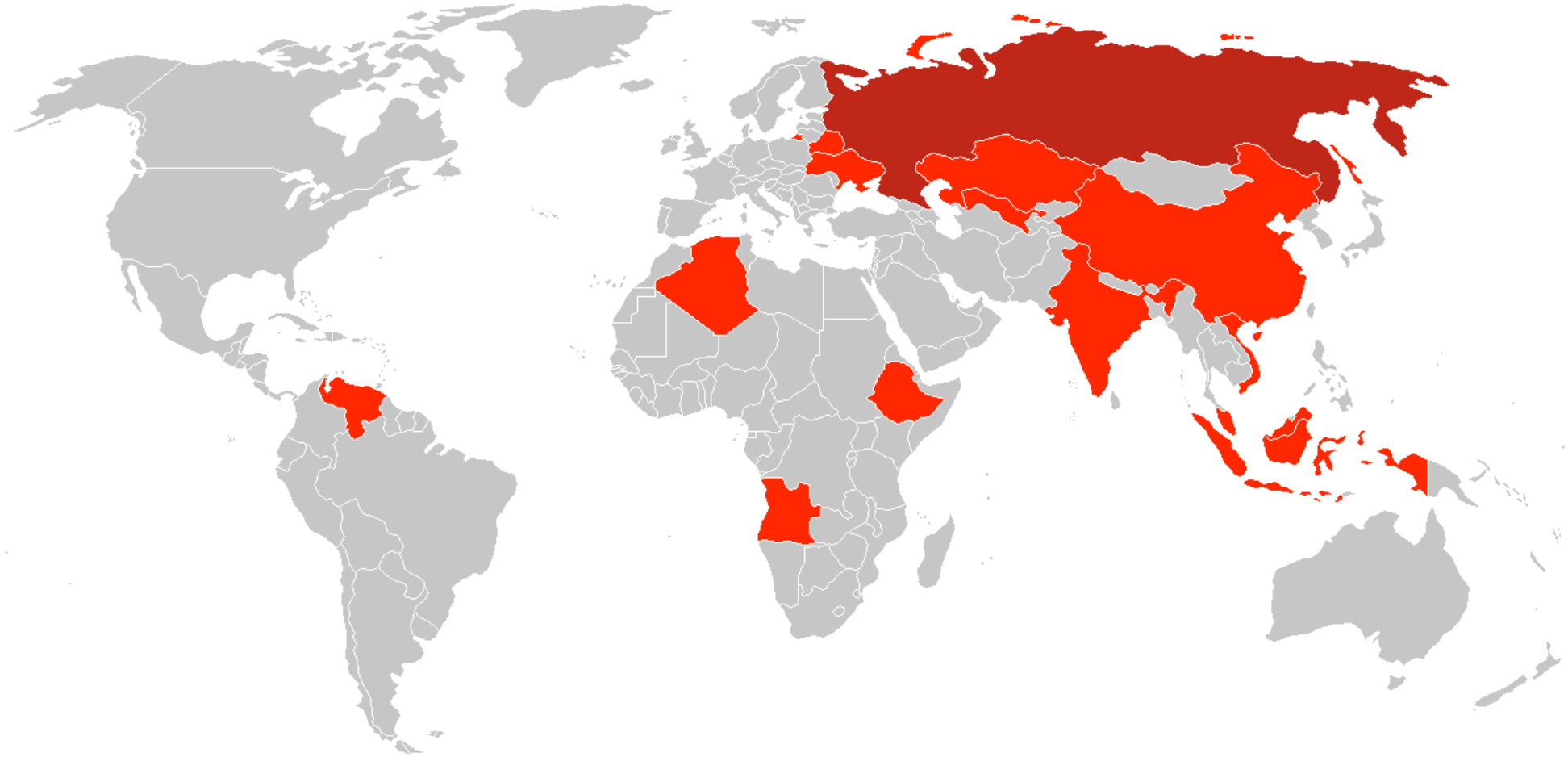
- Iran's long range SA-5 will provide a robust capability to kill US ISR platforms, most legacy aircraft; the SA-20/HQ-9 provides a credible capability to kill legacy types and the F-35 JSF.
- Had it been deployed, the SA-20 would have provided a significant capability to deny airspace at high and medium altitudes outside Iran's territorial boundaries; the SA-5 provides a capability between the SA-20 and SA-21 footprints.
- Airspace denial can cripple logistical resupply by threatening airlift, CRAF and civil air traffic.
- *Iran sought to procure the longer ranging S-300PMU2 / SA-20 and S-400 / SA-21 SAM systems, to extend its A2AD footprint.*

Anti-Access Weapons Technology

Russian / Chinese Fighter Evolution

- 1990: Su-27S Flanker eq. F-15A/C / F-14A
- 1990: MiG-29SM Fulcrum eq. F-16A/C
- 1992: Su-27M/Su-35 eq F-15C
- 1994: Su-30MKK eq. baseline F-15E
- 1997: Su-30MK2 eq. baseline F-15E
- 2002: Su-30MKI eq. F-15E + APG-63(V)2 ESA
- 2005: J-10 Sinocanard eq F-16C
- 2007: Su-30MKM eq. F-15E + APG-63(V)2 ESA
- 2007: J-11B SinoFlanker eq. F-15C
- 2007: MiG-35 eq. F-16C Block 60
- 2008: Su-35-1/Su-35BM eq. F-15SE plus supersonic cruise capability.
- 2009: T-50 PAK-FA intended to match F-22A

Flanker Proliferation



- Su-35-1 currently of offer to China, Brazil, Venezuela and several other nations.
- Yet to be proven claims that Su-30MKM has been offered to Iran.

Flanker Proliferation

- China remains largest client to date, with ~550 Flanker variants in service or on order.
- China may continue to manufacture reverse engineered J-11B, eq. to Russian Su-27SM.
- Baseline Su-27SK exported to China, Vietnam, Indonesia, Ukraine, Belarus, Angola, Eritrea, Ethiopia, Kazakhstan. Russia operates ~400.
- Su-30MKK/MK2 exported to China, Vietnam, Indonesia, Algeria.
- Su-30MK variant ordered by Venezuela.
- Su-30MKI exported to India.
- Su-30MKM exported to Malaysia.
- Su-33 CV shipboard fighter ordered by China.

Diverse Flanker Variants Exported

- Flankers exported globally are typically "customised" with specific avionics and weapons.
- Indian Su-30MKI includes French avionics and Israeli electronic warfare systems.
- Su-30MKK/MK2 supplied to China includes unique radar and weapons configurations.
- Chinese redesigned J-11B includes unique planar array radar, systems, glass cockpit, MAWS and Chinese PL-12 Sino-AMRAAM missiles.
- The large number of different avionics systems, especially radar, presents genuine difficulty in designing electronic countermeasures to defeat the Flanker.
- Midlife upgrades further complicate this problem.

Proliferation Considerations

- Flanker remains most widely proliferated modern fighter aircraft, after the smaller US F-16.
- J-10 Sinocanard and J-11B SinoFlanker intended for export.
- Fulcrum was widely exported and remains in use.
- Stealthy PAK-FA also intended for export, with India likely to be first client.
- Export contracts often include support personnel from former Warpac nations, and in some instances, also combat pilots.
- *US forces could therefore encounter very modern fighters, with modern avionics and weapons mixes, flown and maintained by experienced and competent personnel, in any theatre of operations.*

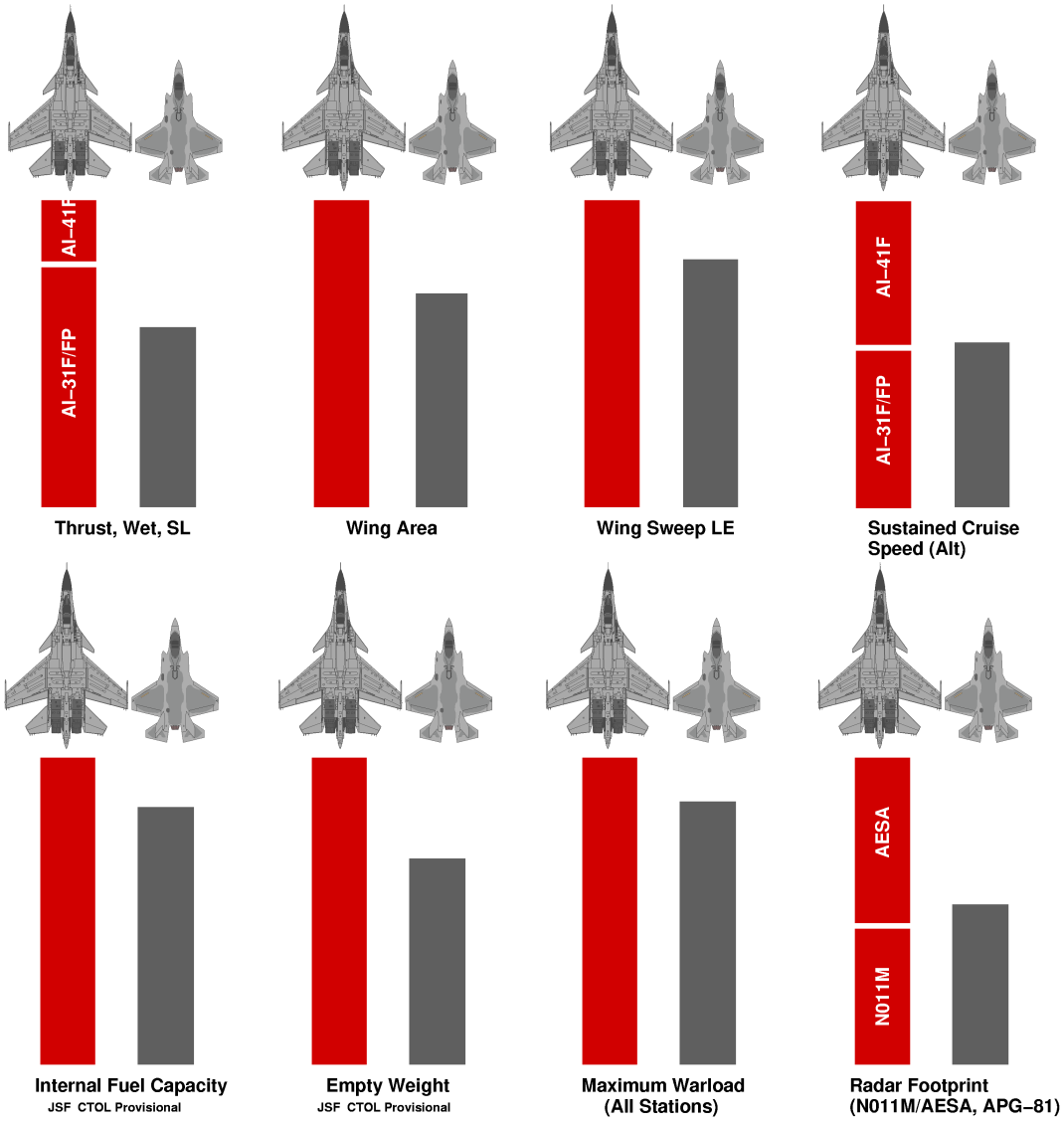
Sukhoi Su-35BM/Su-35-1 Flanker E+

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

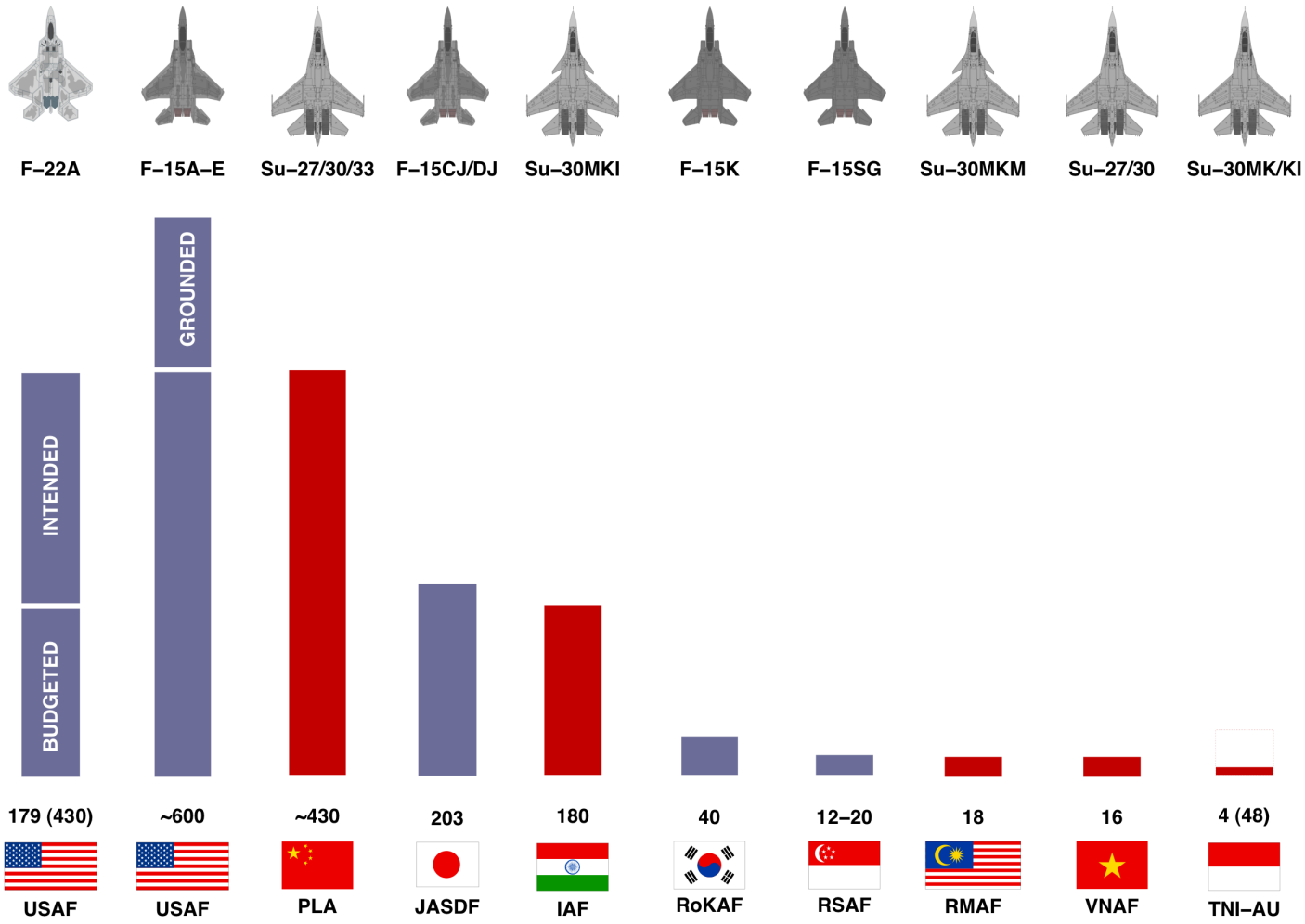
Sukhoi Su-35BM/Su-35-1 Flanker E+

- "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
- Superior to all F-15, F-16 and F/A-18 variants, and Eurocanard fighters
- IOC ~ 2010-2011, Intended for volume export

Flanker vs JSF



High Performance Fighters in Asia - 2009



Su-35-1 Flanker – BVR Missiles (MAKS2007)

- R-172 also designated as R-100 and KS-172.

Su-30MKM Flanker H Malaysia – IOC 2009

- Based on Su-30MKI Flanker H but with improved systems, and French Thales Damocles EO targeting pod fitted.

Russian Beyond Visual Range Missiles

Counter-ISR

Seeker Technology:

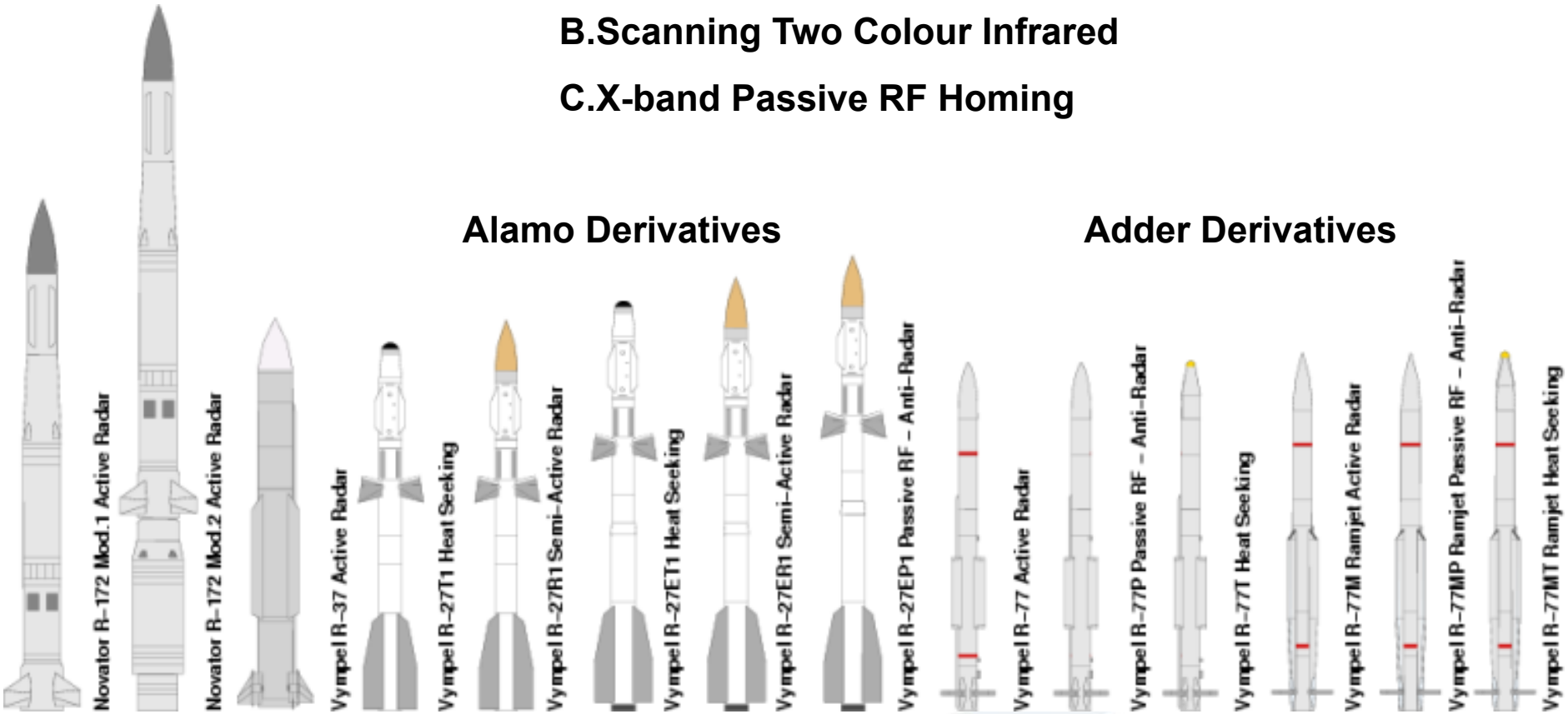
A.Monopulse Active Radar

B.Scanning Two Colour Infrared

C.X-band Passive RF Homing

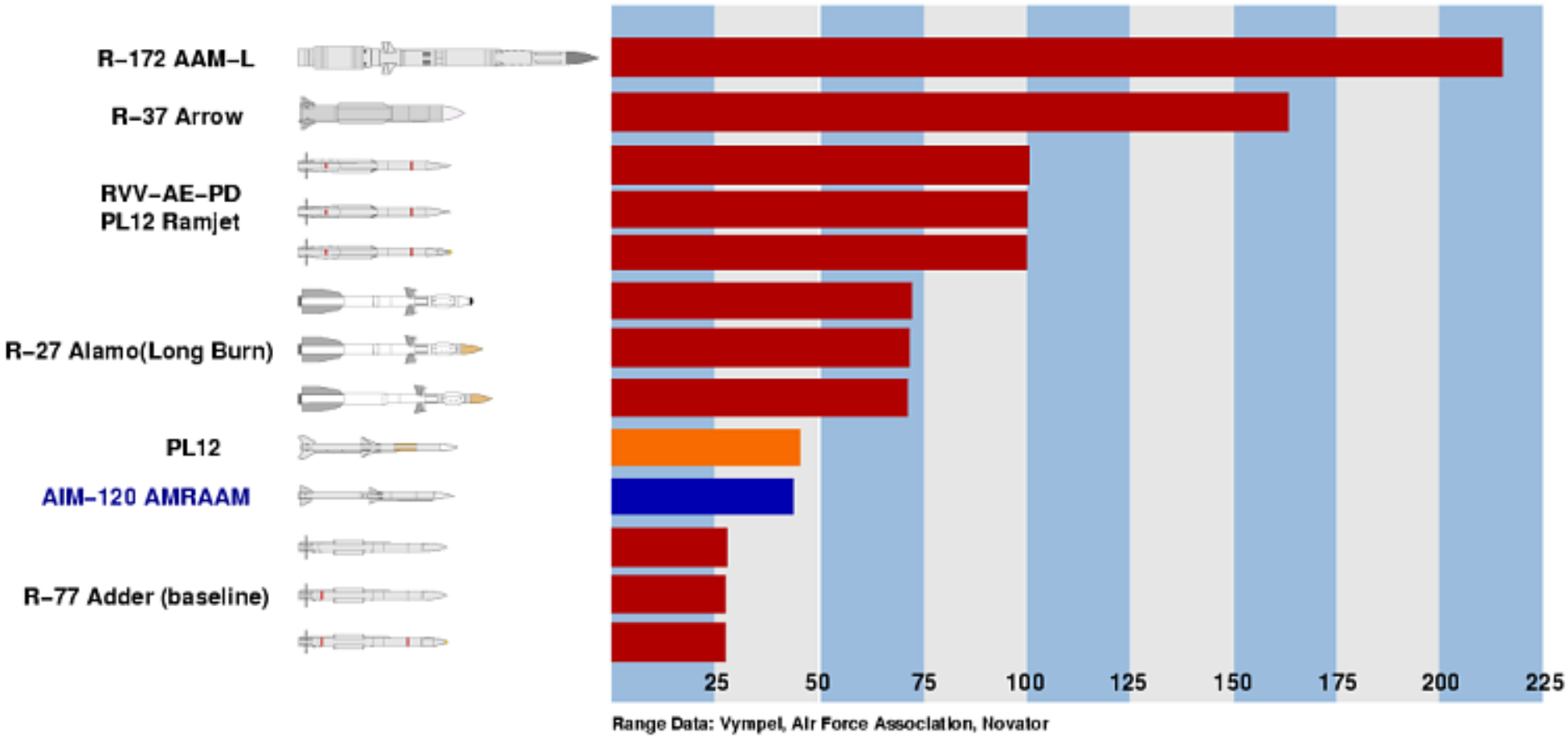
Alamo Derivatives

Adder Derivatives



Ramjet Engine

How do Russian BVR AAMs Compare?



- R-27 Alamo, R-77 Adder and RVV-AE-PD – active radar, anti-radiation and heatseeking guidance equipped variants.
- PL12 Ramjet reported development of baseline Chinese PL-12 AMRAAM analogue.

RSK MiG-35 Fulcrum – First Russian Zhuk AE AESA Radar

PAK-FA – F-22 Class Agility + Stealth

First Flight 2009

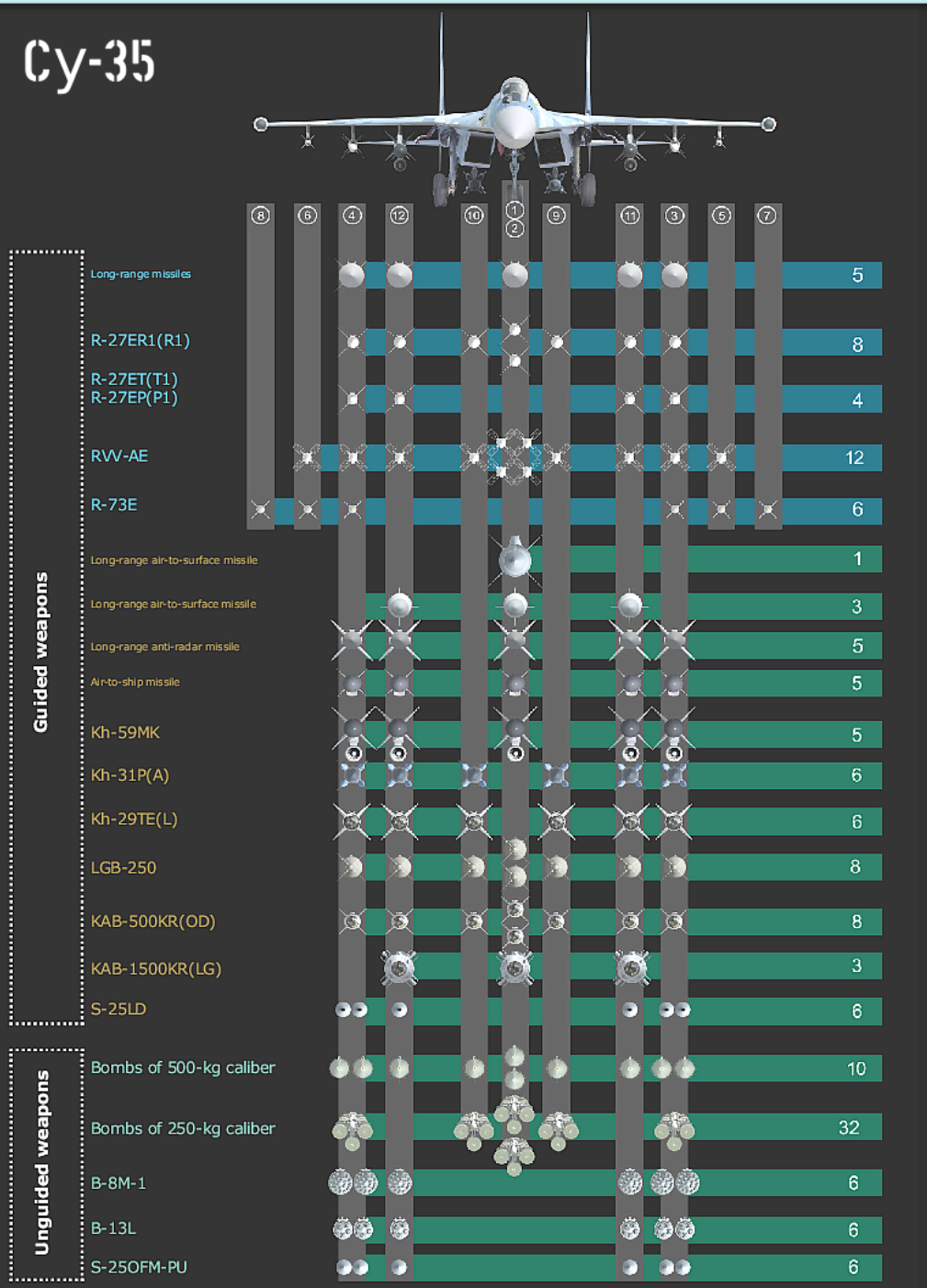
Intended IOC 2016

Guided Bomb Proliferation

- Russia and China are exporting a range of smart bombs which are equivalent to US designs, and some which have no US equivalents.
- Russian KAB-500/1500 bombs supplied with satellite, laser, imaging infrared or TV image correlator guidance, with and without datalinks.
- Blast/fragmentation, bunker busting, fuel air and thermobaric warheads are available for all KAB-500 and -1500 subtypes.
- China is marketing a range of laser and satellite guided bombs, including a glidebomb design similar to the US-Australian JDAM-ER weapon.
- *The only US advantage is in more mature seeker technology and anti-jam GPS antennas.*

EXTERNAL STORES LOADOUT

Russian Su-35-1
Weapons Capabilities
2008 Brochure



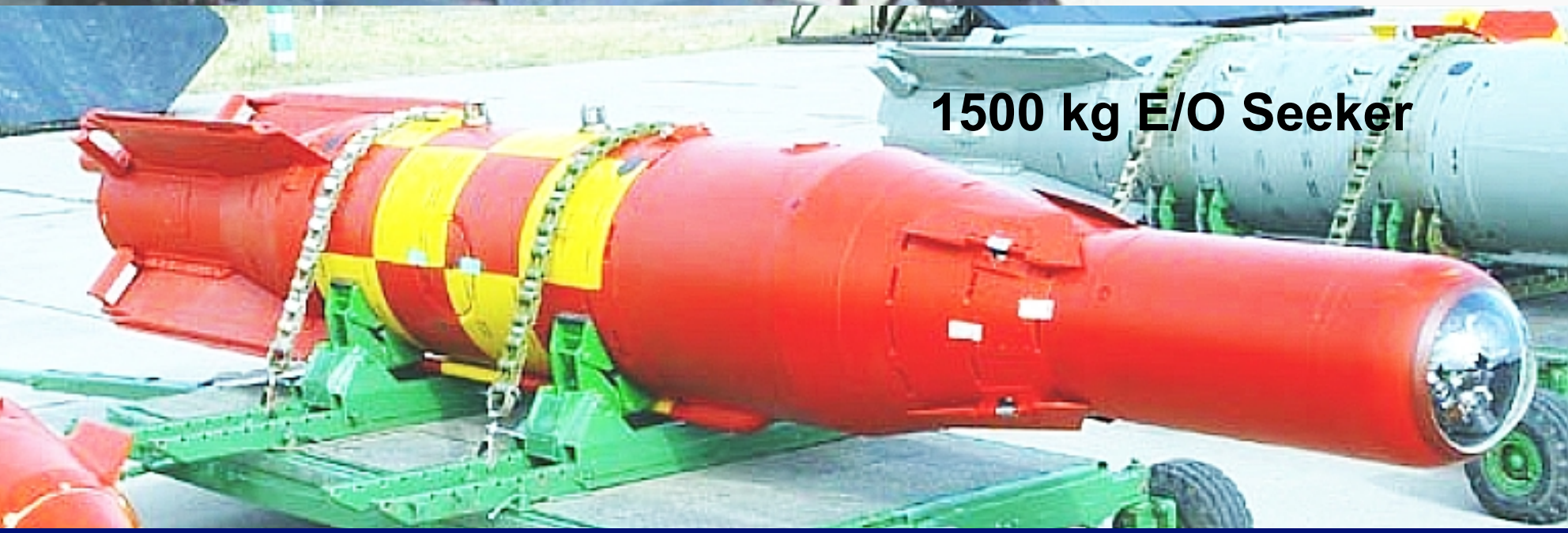
Smart Bombs – GNPP KAB-500/KAB-1500

- Fusion of Paveway and HOBOS technology
- Modular design – warheads and seekers
- Equivalents to Paveway/GBU-15/JDAM
- Warheads – blast/fragmentation, concrete piercing, Fuel Air Explosive / Thermobaric

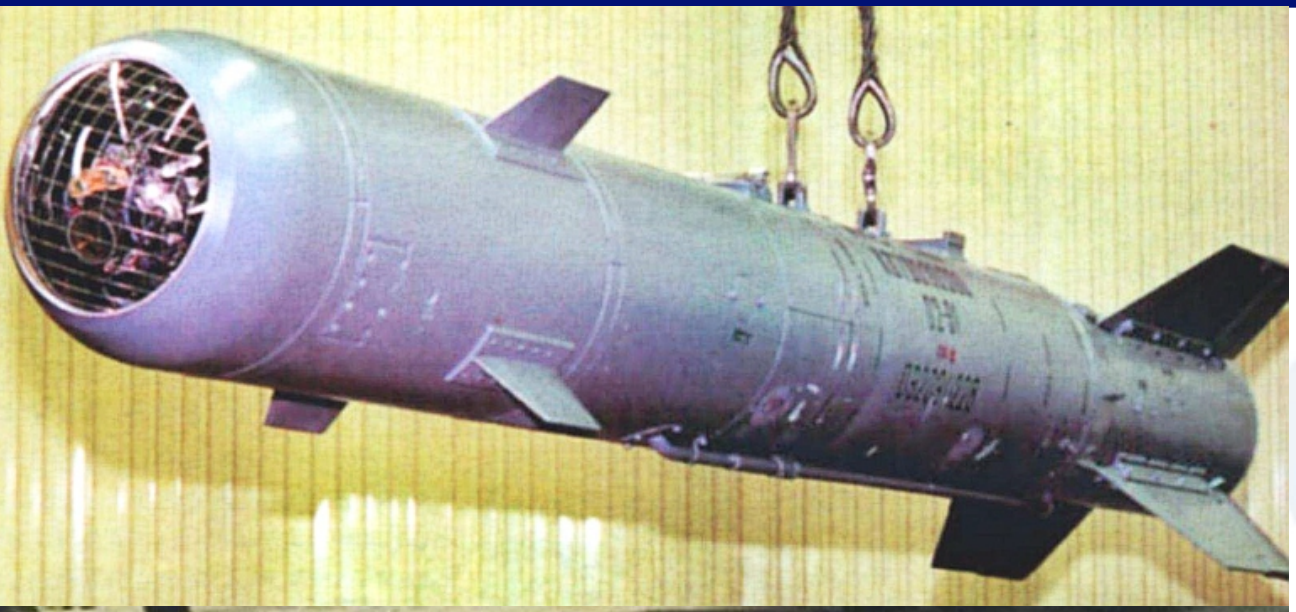
1. ElectroOptical Correlator – cf US DSMAC
2. ElectroOptical Datalink – cf US EGBU-15
3. Semiactive Laser – cf US Paveway II/IV
4. GPS/Glonass – cf US JDAM and SDB
5. 1,000 lb and 3,000 lb standard warheads

- KAB-500/1500 guided bombs provide equivalent capabilities to all US weapons other than 500 lb and Small Diameter Bomb PGMs.

Smart Bombs – GNPP KAB-1500



Smart Bombs - GNPP KAB-500



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

Kilo SSK; DDG/FFG SLCM

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

MZKT-7930 8 x 8 GLCM

Supersonic Variant Available

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

Tatra 815 8 x 8 GLCM

Supersonic CM

Su-27/30/35 ALCM

SSK, DDG/FFG SLCM

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

Supersonic Cruise Missile

Ship Launch – Type 956 DDG

Air Launch – Centreline Flanker

Thermobaric or Shaped Charge W/H

Cruise Missiles – Kh-55, DH-10, YJ-62

Sukhoi Su-33/33UB Flanker D - CV

Su-33 Navalised Flanker

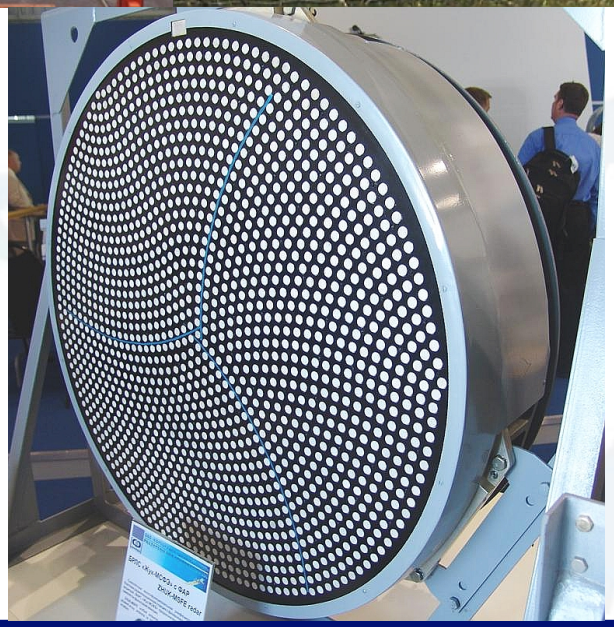
PLA-N – 48 Ordered

Tailhook/Ski-Jump

Full Su-30MK Capabilities

Single/Dual Variants

Equivalent F-14D Tomcat



Recent Upgrades:

Phased Array Radar

Smart Weapons Interfaces

3M54 Sizzler Cruise Msl

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

KJ-2000 AWACS – AESA Technology

- The L-band AESA radar in this Chinese design is two generations of antenna technology ahead of the E-3 AWACS APY-2 radar.

Counter-Stealth Proliferation

- Russia and China continue to develop and deploy a range of counter-stealth technologies.
- Digital VHF-band / "metric" and L-band / "decimetric' radars will defeat typical stealth shaping techniques in US fighters and UAVs.
- Digital processing upgrades to legacy VHF band radars: Spoon Rest, Tall King, Tall Rack.
- New VHF radars: Vostok E, YJ-27, Rezonans NE.
- New AESA radars: NNIIRT Nebo SVU, Nebo M RLM-M/D, VNIIRT Gamma DE series.
- All recent Russian radar designs VHF or L-band.
- Networking of radars and passive RF sensors.
- Passive RF TDOA/interferometer sensors: Orion/ Vega, Kolchuga, Avtobaza, YLC-20 series.

NNIIRT Nebo M VHF AESA 3D Search Radar

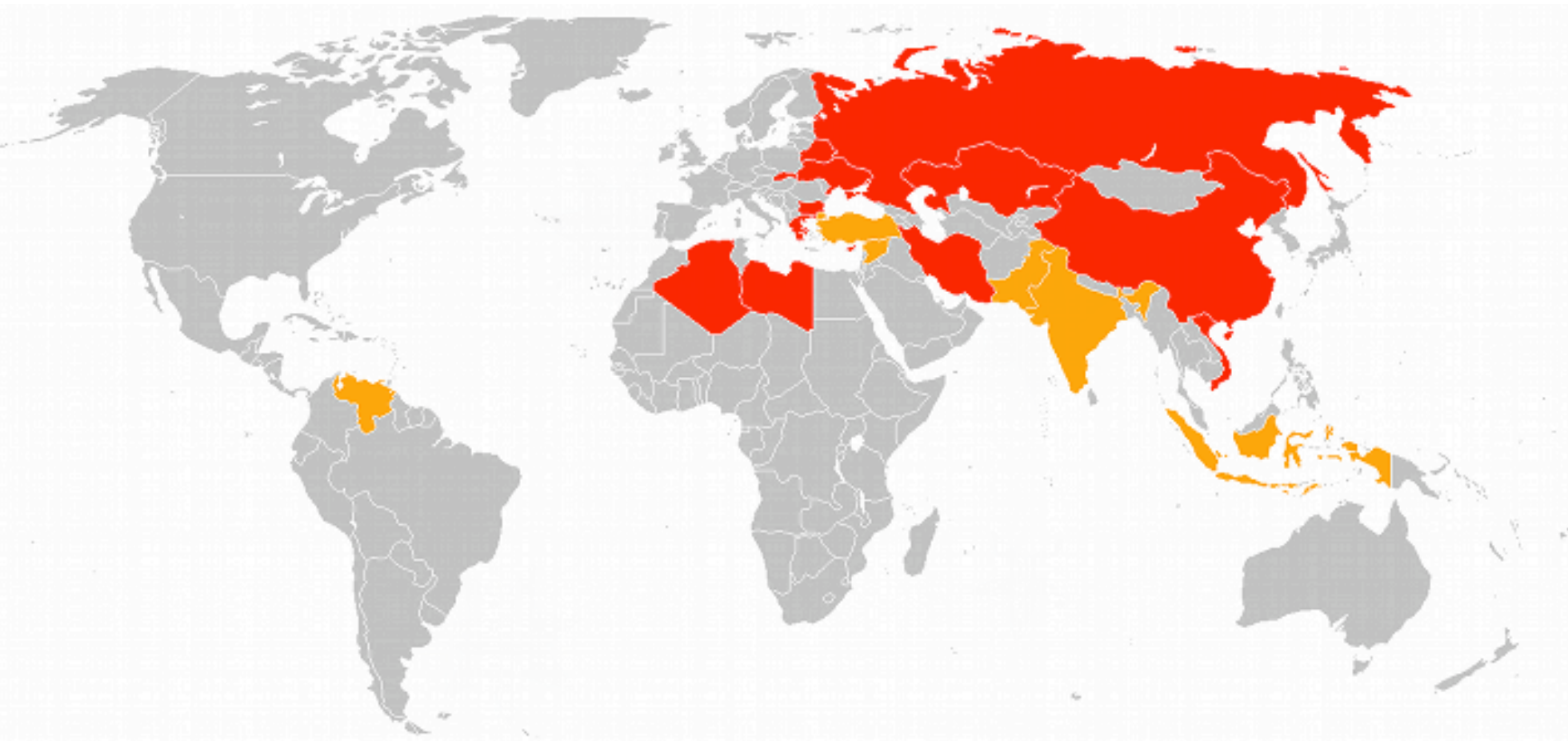
2 Metre Band VHF Operation
Digital MTI Processing
Automatic Frequency Agility
STAP Clutter Processing
Modern COTS Digital Processing
Solid State COTS RF Amplifiers
Networked with SAM Batteries
High Mobility "Shoot and Scoot"
All Terrain Vehicle Chassis

Modern Counter-VLO Radar Examples

NNIIRT Nebo SVU VHF AESA 3D Search Radar

KBR Vostok E VHF Solid State 2D Search Radar

Advanced SA-20/21/HQ-9 Proliferation



- SA-21 – Russia, Belarus; SA-20 Russia, China, Iran, Libya, Algeria, Kazakhstan, Vietnam, Greece; HQ-9 China.
- Stated interest by Venezuela, Syria, Indonesia, Turkey, India, Pakistan.

S-400 Triumf / SA-21– 130-200 NMI

92N2E Grave Stone Engagement

4/16 Round 5P85TE1 TEL

Missiles 48N6E3, 40N6, 9M96E/E2

Equivalent Patriot PAC-3 / ERINT

96L6 Cheese Board – Acquisition

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

30N6E/E2 Tomb Stone Engagement

64N6E/E2 Big Bird Acquisition

48N6E/E2 Missiles

4 Round 5P85TE TEL

S-300PMU1/2 / SA-20A/B Gargoyle Radars

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;

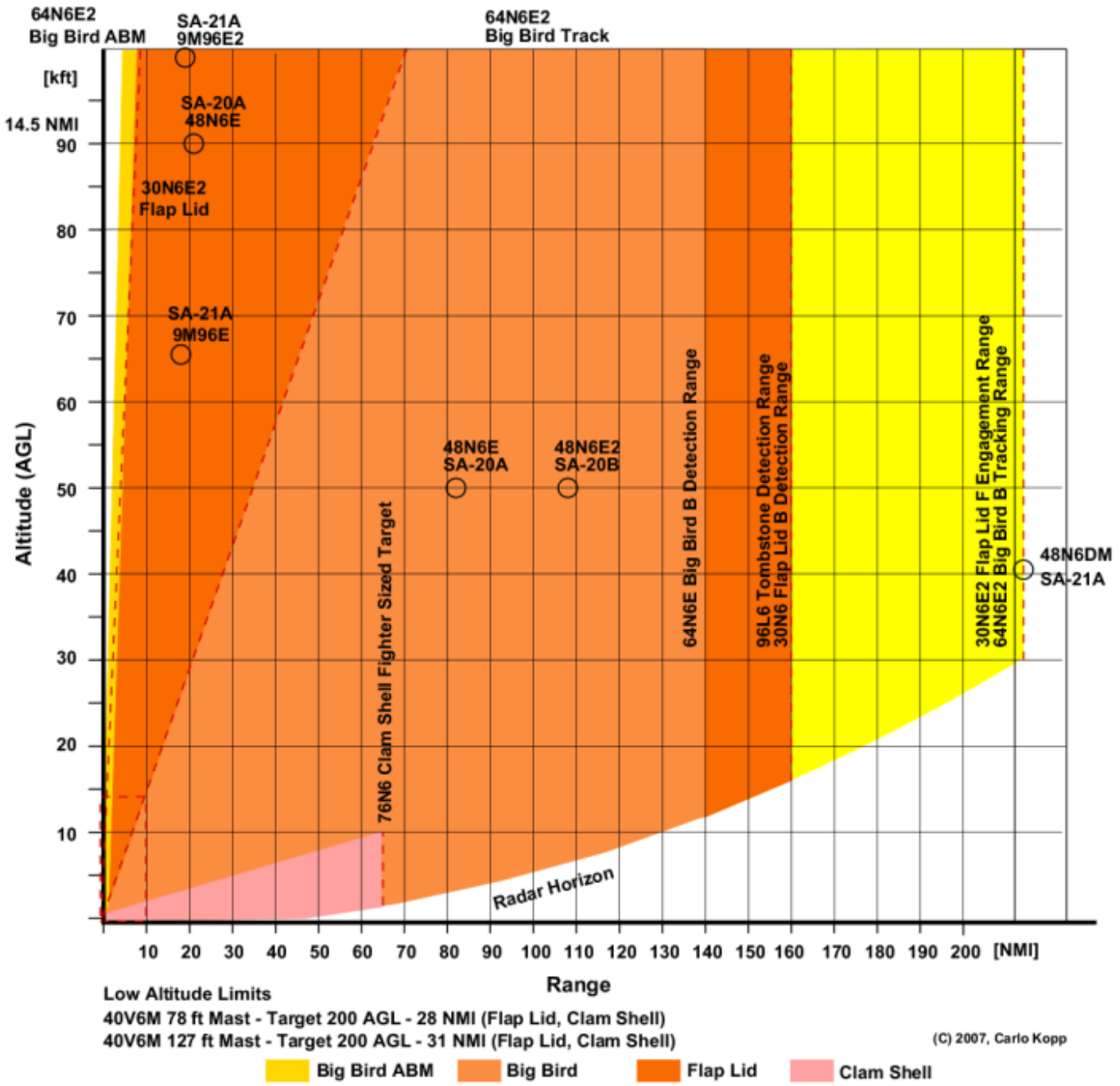
Tin Shield ; Cheese Board; Gamma DE

Cruise Missile Defeat

2-4 hr Deployment Time

S-300PMU2 vs Aegis/Patriot - Comparisons

S-300PMU-2 Favorit (SA-20 Gargoyle) Engagement Envelope
S-400 Triumf (SA-21 Growler) Engagement Envelope



CPMIEC FD-2000 / FT-2000 / HQ-9

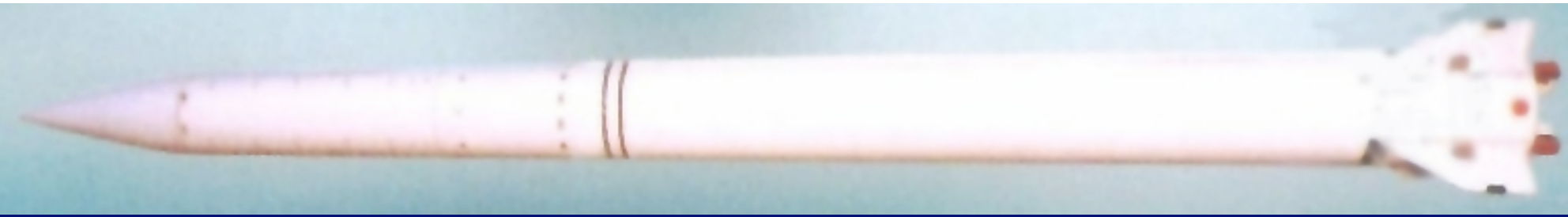
HT-233 Engagement Radar

YLC-2V Acquisition Radar

SA-10/20 technology

FT-2000 anti-radiation round 2-18 GHz

Globally marketed as replacement for more expensive Russian SA-20



SA-5 Gammon/SA-20 Hybridisation

Legacy 5N62 Square Pair controlled by modern 30N6E Tomb Stone / 92N2E Grave Stone phased array

Improve jam resistance and lethality of SA-5 Gammon

HQ-2/SA-2 Guideline Hybridisation

H-200 phased array engagement radar for KS-1A SAM

Candidate Fan Song replacement in hybrid SA-2 batteries.

Anti-Access Weapons

- "Anti-access" weapons are designed to inflict prohibitive combat losses upon high value assets or capabilities, thus denying entry into areas which are within the reach of such weapons.
- By design, anti-access weapons are difficult to defeat and the current generation can only be countered by the highest performing US stealth systems.
- Anti-access weapons are mostly optimised against specific target types, such as aircraft carriers, Intelligence Surveillance Reconnaissance (ISR) platforms, tanker aircraft, or combat aircraft.
- *Global proliferation of high technology anti-access weapons presents the greatest strategic risk to US military forces since the Cold War.*

Anti-Access Weapon Categories

1. Advanced Air Defence Weapons, including Surface to Air Missiles and Counter-Stealth sensors.
2. Advanced fighter aircraft capable of carrying precision guided munitions and cruise missiles.
3. Very long range Air to Air Missiles and Surface to Air Missiles intended to destroy ISR platforms, Electronic Warfare platforms and tanker aircraft.
4. Supersonic and subsonic cruise missiles designed to destroy aircraft carriers, amphibious ships, surface combatants, transports / civilian shipping, and fixed basing infrastructure.
5. Terminally guided ballistic missiles designed to destroy aircraft carriers, amphibious ships, transport vessels and fixed basing infrastructure.

Anti-Access Weapon Delivery Systems

- Advanced Air Defence Weapons and Surface to Air Missiles intended to destroy ISR platforms, Electronic Warfare platforms and tanker aircraft are self propelled systems, or fitted to warships.
- Advanced fighter aircraft can self deploy rapidly.
- Very long range Air to Air Missiles are carried by fighter aircraft, typically of the Flanker family.
- Supersonic and subsonic cruise missiles can be carried by surface combatants, submarines, aircraft or wheeled self-propelled launchers.
- Terminally guided ballistic missiles can be carried by surface combatants, submarines, or wheeled self-propelled launchers.
- *Delivery systems are diverse and flexible.*

Anti-Access Weapon Exporters

- Russian industry is currently the largest developer and exporter of anti-access weapons.
- Post Soviet defence budgets inadequate to sustain industry base, resulted in survival pressures to develop and export high technology weapons.
- Russian industry has absorbed and integrated most advanced Western technologies since 1991, resulting in systems which match or outperform most or all US legacy weapons, and most planned new US weapons.
- Chinese industry is emulating the Russian industry model and increasingly focuses on exporting advanced weapons technology globally.
- *Exports driven by profit motive, not ideology.*

Anti-Access Weapon Buyers

- Most frequently anti-access weapons are being procured by nations which are denied access to US, EU and Israeli high technology weapons, due to embargoes or other political restrictions mandated by US Congress or the EU.
- Russian and Chinese industry have exploited such opportunities repeatedly, as this is a secure market where they do not have to compete with US, EU and Israeli defence contractors.
- *Confluence of interest – nations buying anti-access weapons cannot buy Western weapons, are often hostile to the West, while Russian and Chinese industry has a ready made, secure and well paying market for advanced weapons products.*

Anti-Access Weapon Strategic Aims

- Investment in anti-access weapons is intended to achieve two inter-related strategic aims:

1. Discourage or wholly deter military intervention by the US, a US led coalition force, or intervention by US allies in that region.
2. Provide a coercive military capability targeting neighbouring states, especially if these are close allies or friends of the US.

- The prospect of incurring high combat losses in aircraft, naval vessels and attacks on regional basing will clearly discourage US interventions.
- US allies may balk at basing US assets on their territory, if this incurs the risk of attack.
- *Anti-access weapons will disrupt US alliances.*

Anti-Access Weapon Technological Strategy

- Anti-access weapons are typically "asymmetric" in that they have no direct US equivalents, and are designed to target specific vulnerabilities in US capabilities and US military force structure .
- Anti-access weapons are intended to elicit a "disproportionate response" in defending against them, to drive up the operational and force structure costs incurred in dealing with them.
- Anti-access weapons typically leverage high technology to maximise lethality and survivability.
- Many anti-access weapons evolved from late Cold War designs, but many are entirely new designs.
- *Most anti-access weapons are well engineered products, and often very innovative in design.*

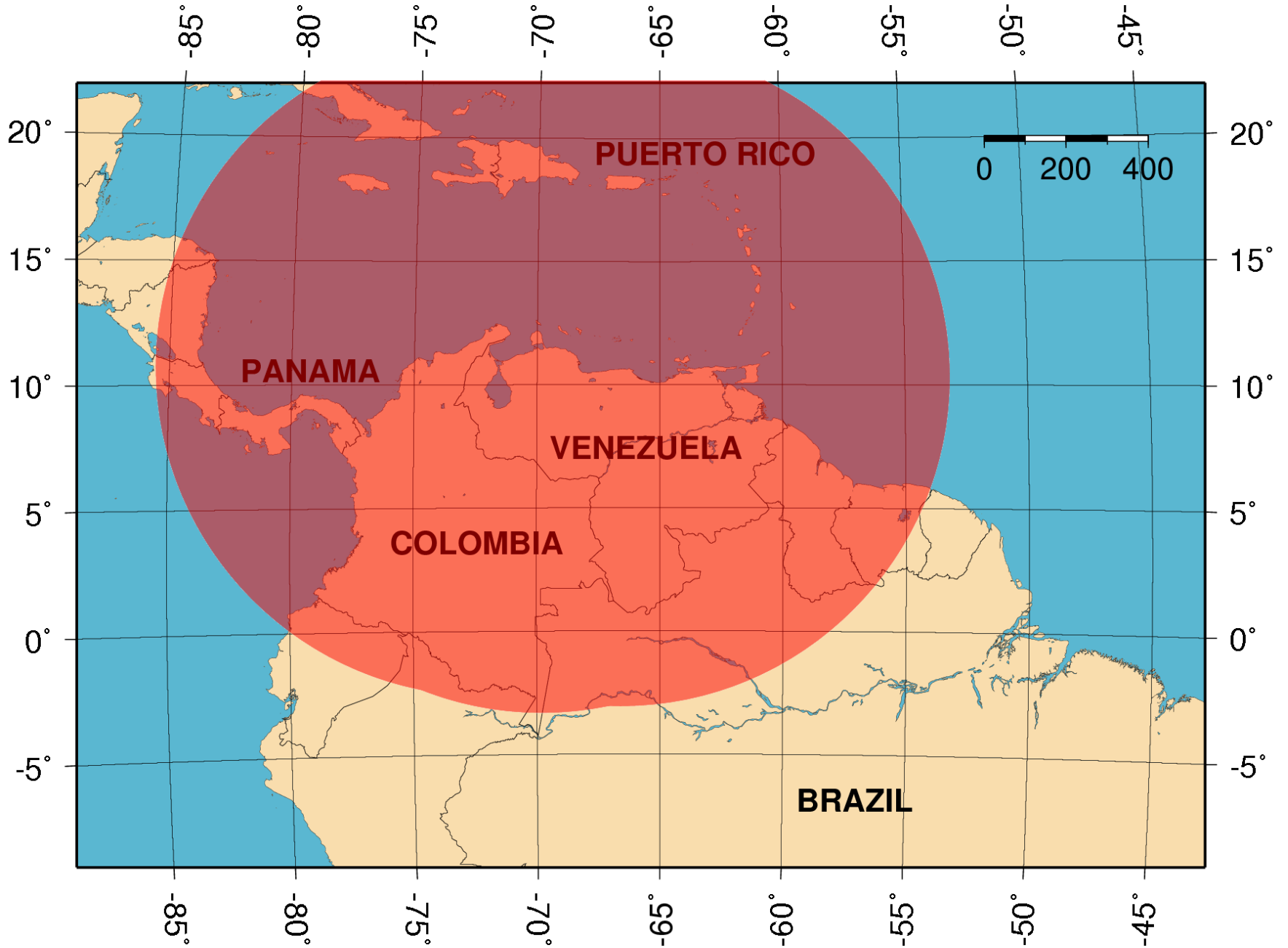
Venezuela Case Study

- Chavez authoritarian regime hostile to the US.
- Former US ally subjected to internal takeover.
- Confrontational foreign policy.
- Regional ambitions to increase national stature.
- Good long term revenue prospects due to abundant natural energy resources.
- Limited domestic technology base and industrial capabilities, but growing defence industrial base.
- Key geographical location covering Panama Canal and Caribbean region.
- *Venezuela has procured a large, in regional terms, inventory of very modern Russian built equipment, and some modern Chinese built equipment*.

Venezuela Case Study

- 24 Sukhoi Su-30MK2 Flanker G long range multirole fighters procured and now deployed, additional 12 aircraft now likely.
- Russian Kh-59, Kh-29 and KAB PGMs procured.
- Reports that two Il-78 Midas tankers procured.
- Fifty Russian Mi-17B, Mi-35 and Mi-26 helicopters, 10 Ilyushin Il-76E Candid airlifters procured.
- 10 Chinese JYL-1 acquisition radars procured.
- 12 Tor M1 / SA-15 Gauntlet point defence SAM systems procured.
- S-300PMU2 / SA-20 Gargoyle publicly canvassed.
- Kilo class SSKs being publicly canvassed.
- Advanced Su-35-1 being publicly canvassed.

SURFACE TARGETS AT RISK – IMPACT OF Su–30MK DEPLOYMENT



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AZIMUTHAL EQUIDISTANT PROJECTION

Venezuelan AF Sukhoi Su-30MK2 Flanker G

Ilyushin Il-78 Midas Aerial Refuelling Tanker

Venezuela - Strategic Impact

- Su-30MK2 Flanker G long range high performance multirole fighter is lethal against most US legacy jets if well operated, and superior to planned F-35 in most cardinal parameters.
- Armed with smart bombs and missiles the ~800 NMI reach provides the capability to hold Puerto Rico at risk, as well as the Panama Canal.
- Deployment of supersonic anti-shipping missiles such as Sunburn, Stallion, Sizzler provides additional maritime anti-access capability.
- The Il-78 Midas tanker provides the Su-30MK2 with reach into the Gulf of Mexico.
- *Further growth in fighter/tanker fleet will provide significant anti-access capability across region.*