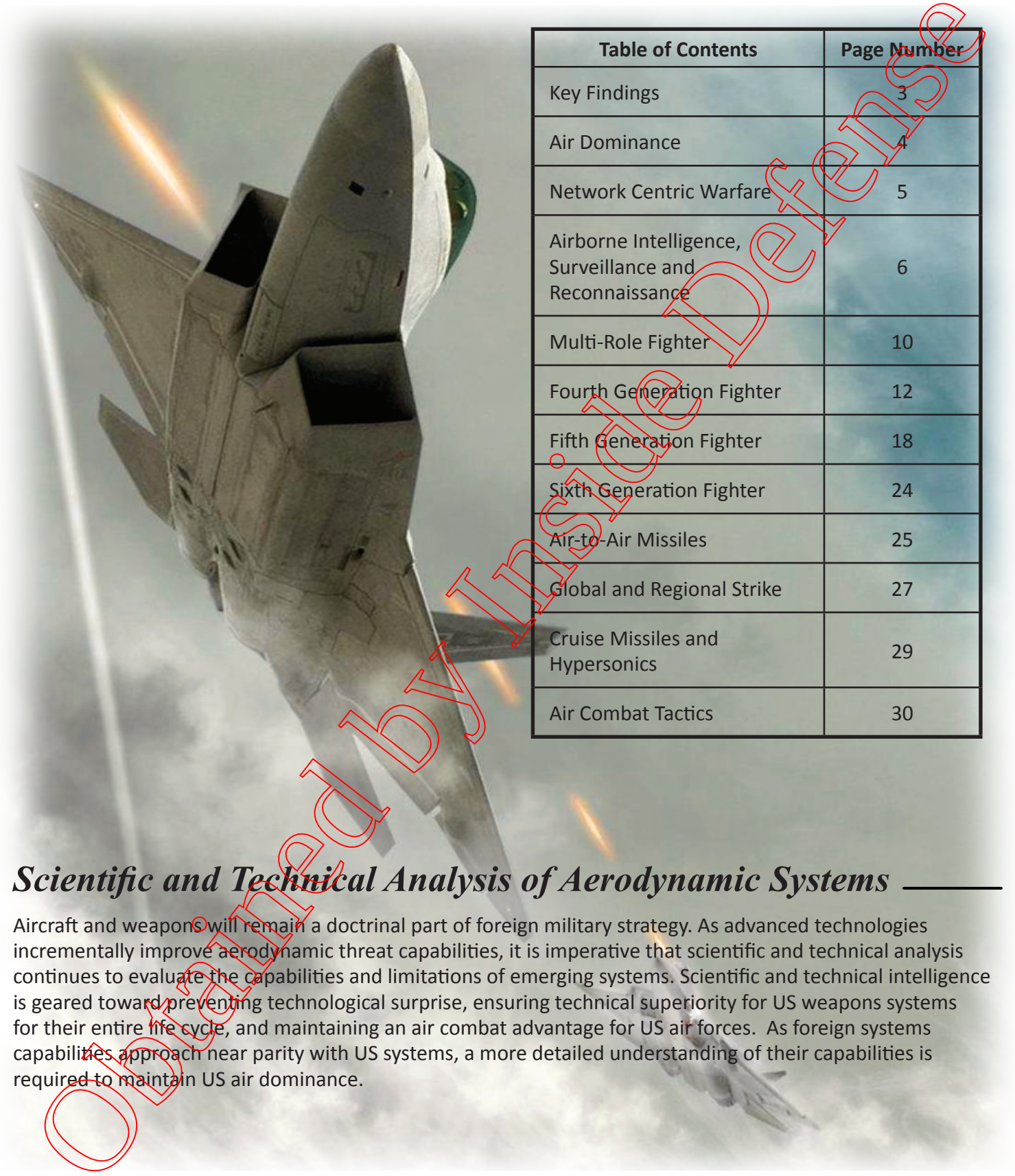
Airborne Threats To US Operations

National Air and Space Intelligence Center
Wright-Patterson Air Force Base, Ohio



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Scientific and Technical Analysis of Aerodynamic Systems

Aircraft and weapons will remain a doctrinal part of foreign military strategy. As advanced technologies incrementally improve aerodynamic threat capabilities, it is imperative that scientific and technical analysis continues to evaluate the capabilities and limitations of emerging systems. Scientific and technical intelligence is geared toward preventing technological surprise, ensuring technical superiority for US weapons systems for their entire life cycle, and maintaining an air combat advantage for US air forces. As foreign systems capabilities approach near parity with US systems, a more detailed understanding of their capabilities is required to maintain US air dominance.

Key Findings

Foreign militaries have learned from US and Coalition air combat operations during recent conflicts, and seek to resolve air combat deficiencies using US airpower as the yardstick.

China and Russia are currently the only *near-peer* threat countries that are equipped with the aerodynamic systems and air forces to challenge US and Coalition forces.

Russian T-50

Key Findings

- *China and Russia are working toward a network warfare strategy that creates a kill chain matrix to find, fix, target, track, and engage potential targets.*
- *Russia remains a key original equipment supplier of aircraft and aerodynamic weapons to rogue nations.*
- *The global aerospace industry uses common aerodynamic system designs to allow customization of technology.*
- *China, Russia, India, Japan, South Korea, Sweden, and Turkey are each developing fifth-generation fighter aircraft. The most prominent are the Chinese J-20 and the Russian T-50 (PAK-FA).*
- *China and Russia both continue to revitalize, research, and develop new strategic bombers to create a global-reach capability using cruise missiles and anti-ship cruise missiles (ASCMs).*
- *Land-attack cruise missiles (LACMs) present a major threat to both military operations and potentially the United States. Over 10 foreign countries currently produce and export LACMs, and over 30 countries own and employ them.*
- *Almost any multi-role fighter or bomber can be configured to carry a weapon of mass destruction.*

Chinese J-20

Air Dominance

The United States and its Coalition partners have maintained air dominance because of technical and tactical air systems superiority. The ability to protect US forces from airborne attack provides a safe operating environment for persistent air surveillance, plus the freedom to maneuver for military and civil air, ground, and maritime assets. Air dominance has become a military instrument of power that provides the United States with an asymmetric advantage over nearly any country in the world. That advantage is being eroded by foreign weapons systems being designed and fielded today. The relative ease for achieving air dominance during recent conflicts has created a grossly inaccurate perception that foreign military weapons systems will remain technologically inferior to US equipment.

The technology being incorporate into foreign weapons systems since the turn of the century is the most significant threat to US air combat observed in decades. The advantages once held by US legacy combat aircraft are quickly eroding with select adversaries.

***Near-Peer Air Threat**: Potential adversaries that have advanced aerodynamic systems, operational inventories, and integrated air defenses to directly challenge sustained US air dominance. This includes potential adversaries that have an aerodynamic power projection capability. China and Russia are considered the only near-peer threats.*

Chinese J-16

***Asymmetric Air Threat**: Potential adversaries operate aerodynamic systems, but cannot compete directly with US airpower because of limited technology, small inventories, or a limited integrated air defense. Asymmetric air threats often include leading technology that could disrupt or delay US air dominance, and temporarily deny US access to a particular country or region.*

Russian Su-35S

Network-Centric Warfare

Individual physical airborne threats remain a concern, but they can no longer be viewed as single threat platforms. Transformation toward information warfare drives integrated information sharing among threat platforms enabling faster, more precise, more effective employment. Emerging network-centric warfare will ultimately require the combined analysis of foreign air, space, ground, and sea capabilities together to fully comprehend a potential adversary capability.

Significant intelligence, surveillance, and reconnaissance (ISR) developments are occurring in China and Russia, where network warfare strategies are evolving to establish a multi-layered sensor and communication architecture for regional activity monitoring. Advanced sensor computer processing and communications data links allow networks to passively track and rapidly combine data for surveillance, target de-confliction, and weapons delivery against fixed or even mobile targets within minutes. Passive tracking capabilities provide US aircraft or ships little to no threat warning.

Fixed-Wing Airborne ISR

Over 1,300 foreign fixed-wing ISR aircraft and 2,000 unmanned aerial vehicle (UAVs) are in operation in 40 countries. These systems utilize radar, electro-optical (EO) cameras, and/or infrared (IR) sensors to monitor, detect, and identify threats in the air, sea, or on the ground. These ISR assets can also direct intercepts of these threats. ISR aircraft support persistent surveillance networks designed for the protection of national interests, including patrol of shipping lanes, preventing drug trafficking, environmental monitoring, and stemming illegal immigration. These same foreign ISR assets have been used to collect data on US military force locations, command structures, operating methods, and training patterns. This data can be used to create electronic databases of US military equipment and define US capabilities.

Chinese Airborne ISR Systems that Offer a Layered Sensor Network

Airborne Early Warning and Control

Airborne Early Warning and Control (AEW&C) aircraft are force multipliers in that they amplify the capabilities of a national military to detect, track, and target threats. AEW&C extend the range of a country's integrated air defense system (IADS) network. In particular, these systems are better suited to detect low-altitude targets at greater standoff distances. Until recently, only the United States, Russia, and NATO were capable of effectively operating such aircraft. Since 2000, Russia, China, Israel, and Sweden have marketed new AEW&C aircraft that incorporate state-of-the-art radar technology, such as active electronically scanned arrays (AESA).

Russian A-50

The reduced size of solid-state electronics and advances in radar technology allow smaller aircraft to be converted to AEW&C. The end result is an increase in proliferation to smaller cash-strapped nations that desire this ISR capability. Pakistan's procurement of the Saab 2000 Erieye AEW&C aircraft is an excellent example of how smaller foreign militaries are integrating AEW&C.

Chinese KJ-2000 AWACS

Airborne Intelligence, Surveillance, and Reconnaissance

Aircraft	Producer	Operator	Radar Technology
KJ-2000 MAINRING	China	China	AESA
KJ-200 MOTH (Y9)	China	China	AESA
A-50 MAINSTAY	Russia	Russia	Mechanical Scan
KJ-500 (Y9 X1)	China	China	AESA
A-50EI MAINDOME	Russia and Israel	India	AESA
ZDK-03	China	Pakistan	Mechanical Scan
Saab 2000 Erieye/ Saab 340 Erieye	Sweden	Pakistan (possible) Thailand Malaysia (possible) UAE (possible)	AESA
Embraer-145 Erieye	Sweden	Brazil Mexico Greece	AESA
Gulfstream 550 AEW&C	Israel	Israel South Korea Singapore Malaysia (possible)	AESA
AESA- Active Electronically Scanned Array			

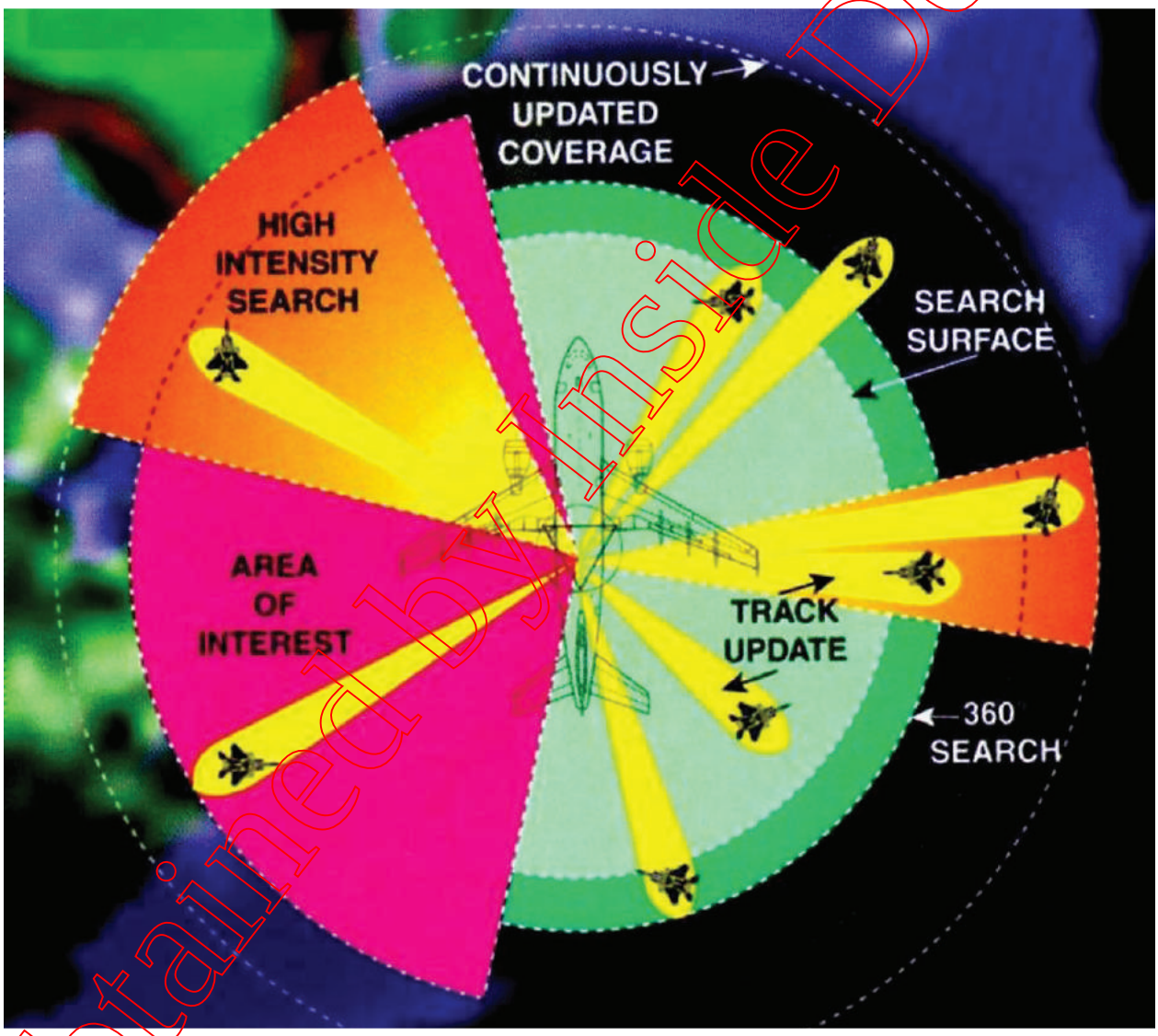
Swedish Saab 340

Chinese KJ-200

Active Electronically Scanned Array

Today's AEW&C aircraft are fitted with AESA radars that offer instantaneous target updates; electronic beam steering; advanced radar modes; vastly improved signal and data processing; very large search volumes; the ability to stare at a target or electronically steer the radar beam; and track thousands of targets simultaneously. These features combine to provide faster target acquisition time, more accurate target position data, and increased ability to detect low-observable targets. AESAs offer increases flexibility, allowing for specialized modes designed to find specific targets, such as cruise missiles and ground targets.

Simultaneous Functions of AESA Radars



Multi-Role Fighter

Fighter aircraft designs were historically focused on aerodynamics and engines geared toward speed and maneuverability to win traditional dogfight scenarios. Today's integrated air defense and network warfare strategies demand fighter aircraft that fuse data from multiple sensors across the information spectrum to enhance pilot situational awareness; use high-bandwidth communications and data links to share data among air defense participants in near-real time; and employ sophisticated, precise, long-range weapons.

Russian Su-30SM

Chinese J-11B

Multi-Role Fighter

The significant technical advantage held by US fighter aircraft has subtly eroded, as the cost and complexity of weapons system development has increased. This forced the global aerospace industry to consolidate and engage in joint development programs for survival. Mergers blurred the lines between different indigenous fighter programs and the technology proliferated, creating a worldwide customer base. More importantly, avionics and weapon design specifications that were once established to ensure Coalition partner interoperability became a global industry standard. This has yielded hybrid combat aircraft designs based on *best-in-class* equipment either purchased from foreign suppliers, or indigenously copied and produced.

Chinese J-10B

Russian Su-35S

Chinese J-11B

"Airpower is like poker.
A second-best hand is like none at all
– it will cost you dough and win you nothing"

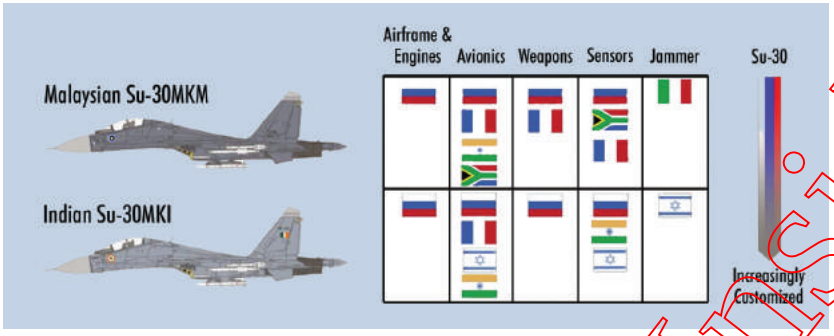
– General George C. Kenney, USAF

Fourth-Generation Fighter

The Russian Sukhoi Design Bureau Su-30MKI and Su-30MKM are excellent examples of hybrid multi-role combat aircraft that exhibit state-of-the-art technology common to newly produced and upgraded fourth-generation fighters. They include the following:

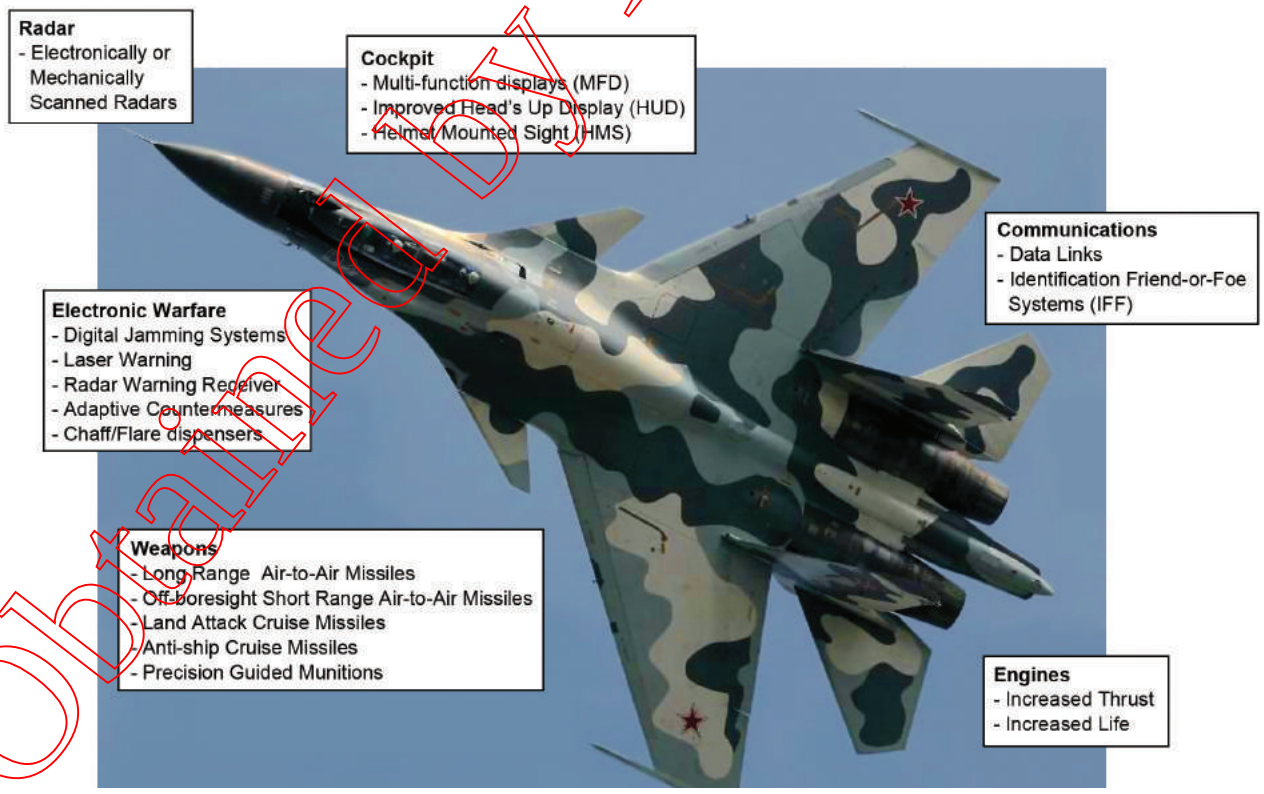
- Russian produced engines, airframe, radar, and IR targeting system
- Israeli produced electronic warfare (EW) jammers and targeting sensors
- French produced pilot displays and navigation systems
- India produced radar warning receiver (RWR) and mission computers

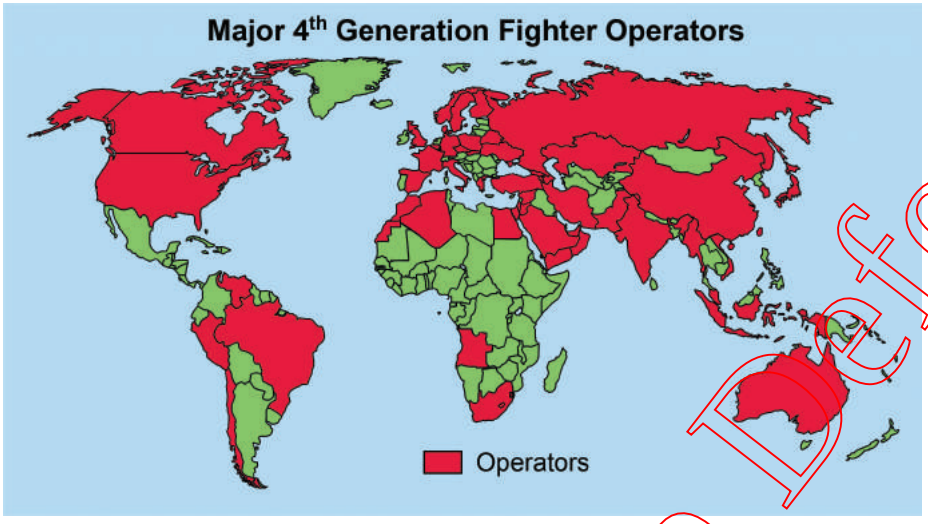

Malaysian Su-30MKM




Indian Su-30MKI

Common Fourth-Genration Fighter Technology





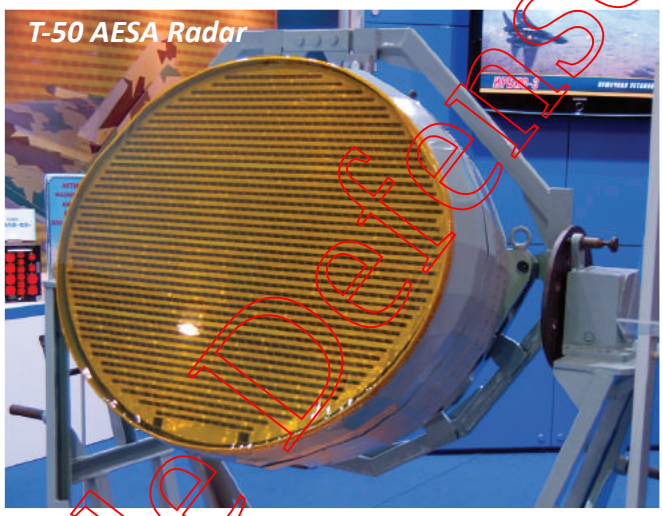
	US vs World – 4th Generation Aircraft							
	J-10B	J-11B	J-16	Gripen	MiG-29M	Rafale	Su-30SM	Su-35S
AESA Radar			X			X		
Infrared Search and Track System	X	X	X	X	X	X	X	X
Glass Cockpit	X	X	X	X	X	X	X	X
Helmet Mounted Sight	X	X	X	X	X	X	X	X
Data Link	X	X	X	X	X	X	X	X
Digital Jammer	X	X	X	X	X	X	X	X
Long-range Missiles	X	X	X	X	X	X	X	X
Off-Boresight Missiles	X	X	X	X	X	X	X	X
Defensive Avionics	X	X	X	X	X	X	X	X
Chaff/Flares	X	X	X	X	X	X	X	X

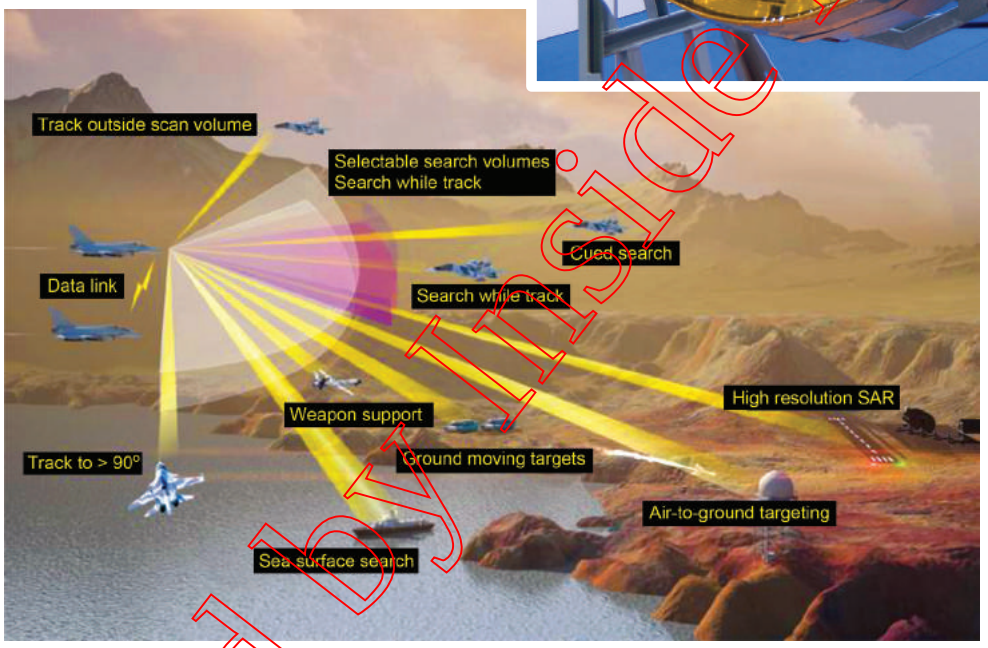
Cockpit Design

Most fourth-generation fighters incorporate glass cockpit technology that includes head-up displays (HUDs); head-down multi-function displays; mission computers with reprogrammable software; geospatial information system mapping products; and a digital data bus. New cockpit designs are allowing data fusion from multiple onboard and offboard sensors. Digital image and video processing displays show graphical representations of sensor threat data to provide greater situational awareness to the pilot.

Radar Technology

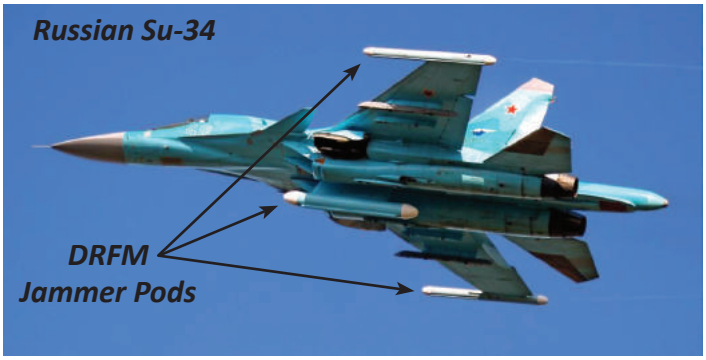
AESA technology similar to that being installed on aforementioned AEW&C surveillance aircraft is also being integrated into new fighters. Advanced fourth-generation fighters have a passive electronically scanned array (PESA) radar, providing long-range radar detection and electronically scanned radar beams that enable the radar to track multiple targets. The end result is reduced pilot workload, automatic target acquisition, and highly accurate target position for air combat engagements. Air-to-ground modes with pinpoint accuracy for precision-guided weapon delivery are also available.


T-50 AESA Radar



Electronic Warfare

The most significant EW technology being used with air combat is the digital radiofrequency memory (DRFM) jammer. DRFM jammers enable instantaneous smart jamming responses by automatically selecting jamming waveforms to counter a specific threat. DRFM jammer employment substantially improves fighter aircraft survivability by disrupting or denying the opposing fighter's radar from tracking. This can drastically reduce any advantage US fighter aircraft hold with a *first look* and *first-shot* capability. Russia, China, France, and Israel lead the foreign market with DRFM jammer technology and sales.



Infrared Search and Track System

Most of today's modern fighters are equipped with an infrared search and track system (IRSTS) to locate, track, and engage enemy aircraft in a passive engagement. New IRSTSs are being integrated onto newly built aircraft and on older aircraft via upgrades. IRSTS technology is expanding in different wavelengths to optimize detection range and performance.

Russian MiG-31BM

Reduced Inventories with Upgraded Capabilities

The staggering cost of fighter procurement has forced some air forces to seek cheaper aircraft upgrade alternatives. Modifications also draw from best-in-class sensors, communications, and long-range weapons procured by the same manufacturers that are building today's frontline multi-role fighters. The end result is often a one to two generation technology leap in mission capability for aircraft that were once deemed a marginal threat.

Russian MiG-29

Another effect of high fighter costs is the reduction of aircraft inventories in foreign militaries. The sheer cost of fighter acquisition is producing almost a one-for-two reduction in aircraft in most foreign air forces. The advent of the multi-role fighter allows the aircraft to conduct roles such as air intercept, strike interdiction, anti-ship, suppression of enemy air defenses, and LACM launches.

Chinese J-11B

Best in Class


Russian Su-35S

The Russian Su-35S is a 4++ generation aircraft that employs fifth-generation technologies into its design, and is the most advanced FLANKER variant to date. Technologies include advanced radar, engines, and avionics. At the center of the cockpit are two large multi-function displays to give the pilot complete situational awareness. New advanced air-to-air missiles (AAMs) and precision-guided weapons round out the progressive capabilities of the Su-35S.

The Chinese J-16 FLANKER is China's most advanced FLANKER. This multi-role strike variant is based on its predecessor, the J-11B, with upgraded avionics, long-range radar, and weapons. Weapons for the J-16 include a full suite of indigenous Chinese air-to-air and air-to-ground guided munitions, combined with an AESA radar to engage targets at longer distances. The J-16 survivability combined with the long-range capability of FLANKER aircraft enables pilots to attack or defend against any enemy target.

Chinese J-16

Fifth-Generation Fighter

Russia and China are developing fighters to challenge air dominance. Each system has specifically been designed to counter and compete with US F-22 and F-35 capabilities. Other countries such as India, Indonesia, Iran, Japan, South Korea, Sweden, and Turkey have also stated that they are developing fifth-generation aircraft.

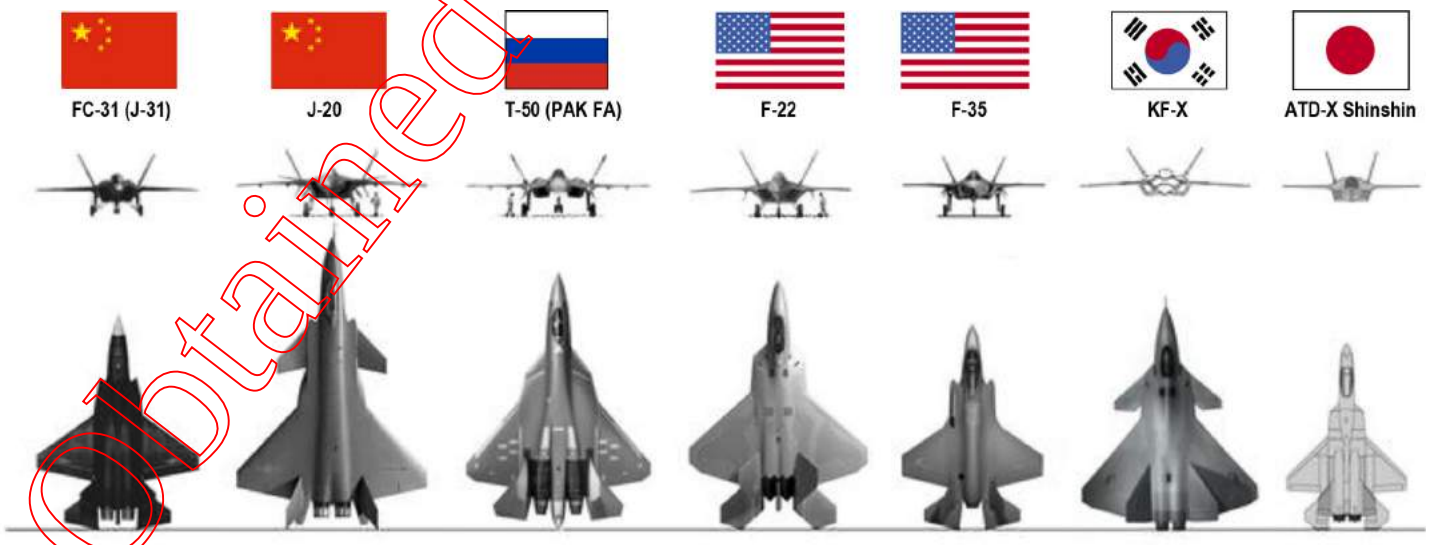
The Chinese J-20, FC-31 (unofficially known as J-31), and the Russian T-50 (PAK-FA) all have potent air-to-air lethality, combined with a standoff attack capability designed to operate using network-centric warfare technology sensor-to-shooter operations.

Chinese FC-31 (J-31)

Chinese J-20

Aircraft	Country	Status
F-22	USA	Operational
F-35	USA	Operational
J-20	China	Development
FC-31 (J-31)	China	Development
T-50 (PAK-FA)	Russia	Development
LMFS	Russia	Development
MFP	Russia	Development
AMCA	India	Development
ATD-X	Japan	Development
FGFA (PMF)	India	Development
FS2020	Sweden	Development
KF-X	South Korea	Development
TFX	Turkey	Development
Qaher 313	Iran	Development

Sample of Worldwide Fifth-Generation Fighter Programs



Common Technology of Fifth-Generation Fighters

Chinese J-20 Cockpit Mock-up

Defensive Avionics Suite
- Spherical Coverage
- Missile Warning
- Chaff/Flare Decoys
- Expendable Jammers
- Radar Warning

Communications
- Data link
- Identification Friend-or-Foe system
- Software defined radios

Cockpit
- Helmet Mounted Display
- Improved Pilot Situational Awareness
- Large Multi-function Displays

Chinese J-20

Engines
- High Thrust
- Thrust Vectoring

Active Electronically Scanned Array Radar
- Long-range Detection
- Simultaneous Functions
- Multi-mission

Electronic Warfare
- Digital Radio Frequency Memory (DRFM) Jammers
- Laser warning
- Radar Warning Receiver
- Shared Antenna

Weapons
- Internal carriage
- Long range/active radar missile seekers
- High off-boresight short range missiles
- Land Attack Cruise Missiles
- Anti-Ship Cruise Missiles
- Precision Guided Munitions

Electro-optic Sensors
- Forward looking Infrared
- Laser targeting
- Long range Infrared Search and Track System

Key systems include:

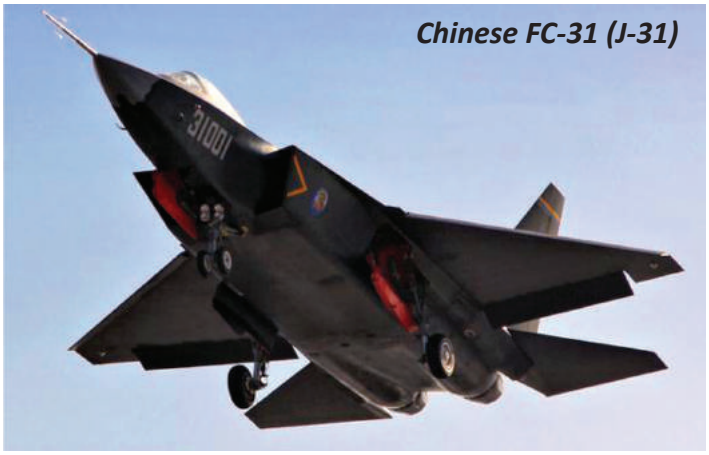
- Super cruise capability, which is the ability to fly above Mach 1.0 without the use of full engine throttle
- Super maneuverability or the freedom to maneuver with very high agility during a dogfight
- Reduced aircraft radar and IR signatures
- AESA radar that extends detection and tracking ranges up to 200 NM. New systems allow air-to-air and air-to-ground targeting of multiple targets (track up to 30 targets while simultaneously engaging up to 8). Radars are being designed with electronic counter-countermeasures against jamming
- Advanced data link that fuses data from air and ground networks into a single air picture; plus share sensor data. Cockpit data includes geospatial terrain databases to enhance air-to-surface targeting
- Cockpit displays that fuse radar, video, and textual data from sensors data to enhance pilot situational awareness
- Advanced multi-band EO systems, allowing for increased target detection capabilities
- Helmet-mounted sight cueing systems that allow an over-the-shoulder look and shot capability
- Advanced DRFM jammers with more power to deny adversary radar use
- EO defensive systems that enable IR and ultraviolet missile launch warning, plus laser warning
- Internally carried AAMs with off-boresight and long-range capabilities

Russian T-50

Chinese J-20

Fifth-Generation Fighter

The Chinese FC-31 (J-31) is a twin engine, mid-sized fighter aircraft manufactured by the Shenyang Aircraft Corporation. Having similar external characteristics, it is likely that the FC-31 is China's export alternative to the F-35 Joint Strike Fighter. The first flight was on 31 October 2012, and is currently in flight testing.

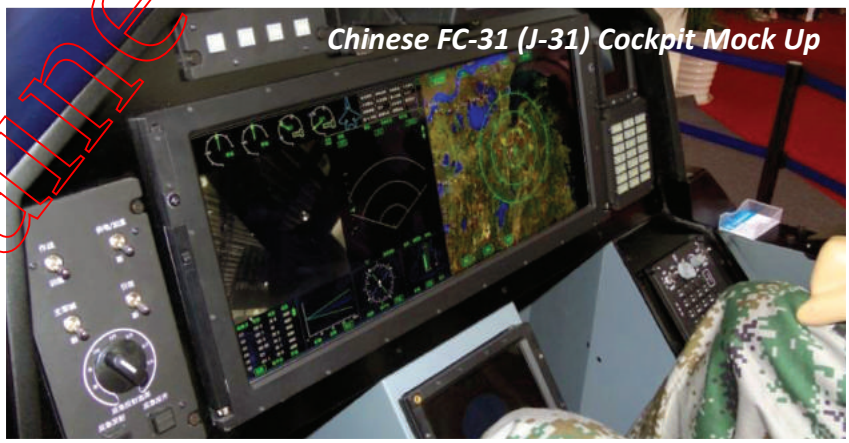


Chinese FC-31 (J-31)

Chinese FC-31 (J-31)

US versus Chinese/Russian Fifth-Generation Fighters

	F-22	F-35	J-20	FC-31 (J-31)	T-50
Super Cruise	X		X		X
Super Maneuverability	X		X		X
Reduced Signatures	X	X	X	X	X
AESA Radar	X	X	X	X	X
Advanced Data Link	X	X	X	X	X
Sensor Fusion	X	X	X	X	
Multi-Band Electro-Optical Systems		X	X	X	X
Helmet Mounted Sight	X	X	X	X	X
Advanced DRFM Jammer			X	X	X
Electro-Optical Defensive Systems	X	X	X	X	X
Internally Carried Long-Range Missiles	X	X	X	X	X
Internally Carried Off-Boresight Missiles	X	X	X	X	X



Chinese FC-31 (J-31) Cockpit Mock Up

Fifth-Generation Aircraft Developments

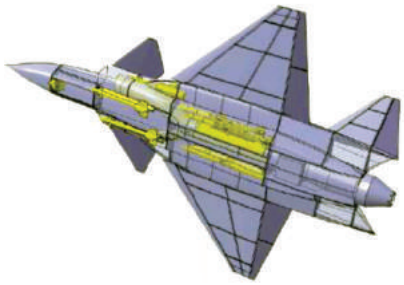
Concept Design Drawings

The rest of the world is also developing fifth-generation aircraft technology. India, Indonesia, Iran, Japan, South Korea, Sweden, and Turkey have stated that they are all developing fifth-generation aircraft that will challenge air dominance.

Japan: Mitsubishi Advanced Technology Demonstrator-X (ATD-X) Shinshin

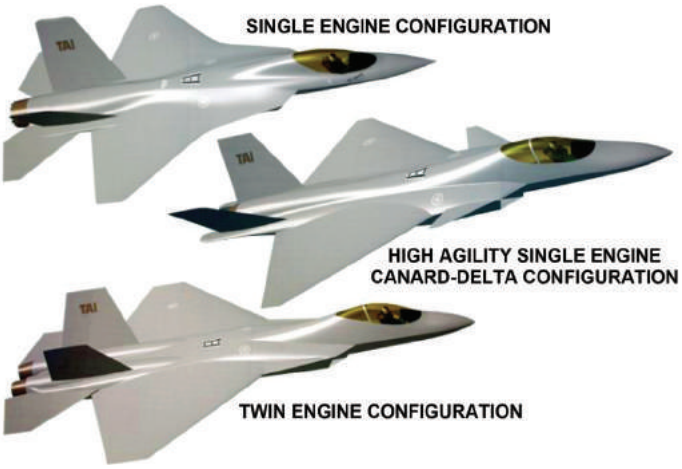
India: Advanced Medium Combat Aircraft

Sweden: Flight System 2020 (FS2020)



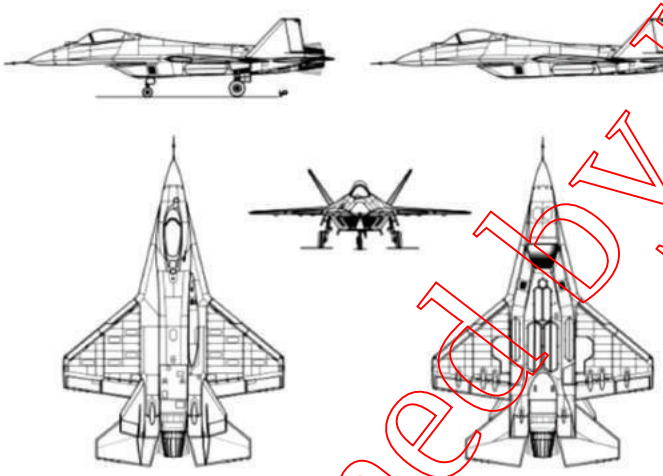
Concept Design Drawings

South Korea: Korean Aerospace Industries KF-X with Indonesia (IF-X)

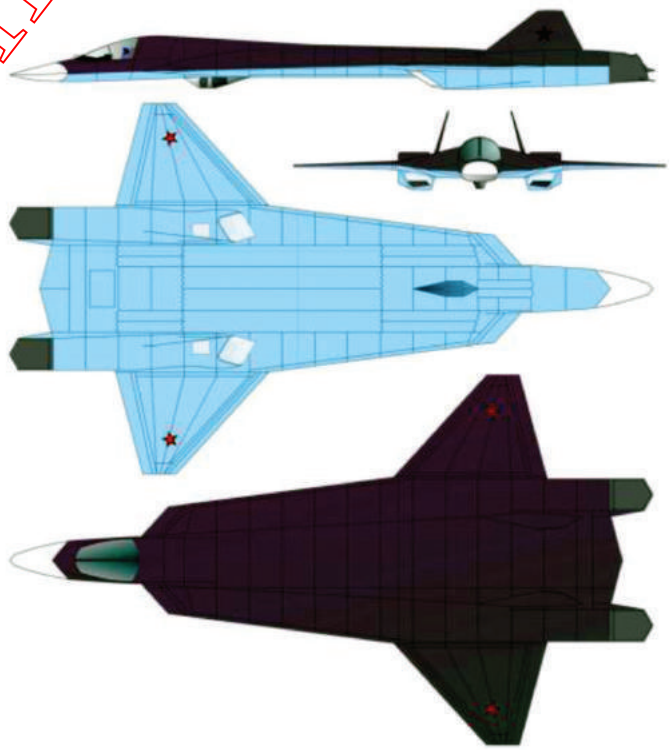


Turkey: Turkish Aerospace Industries TFX (TAI TFX)

Russia: Lightweight Future Fighter (LMFS)



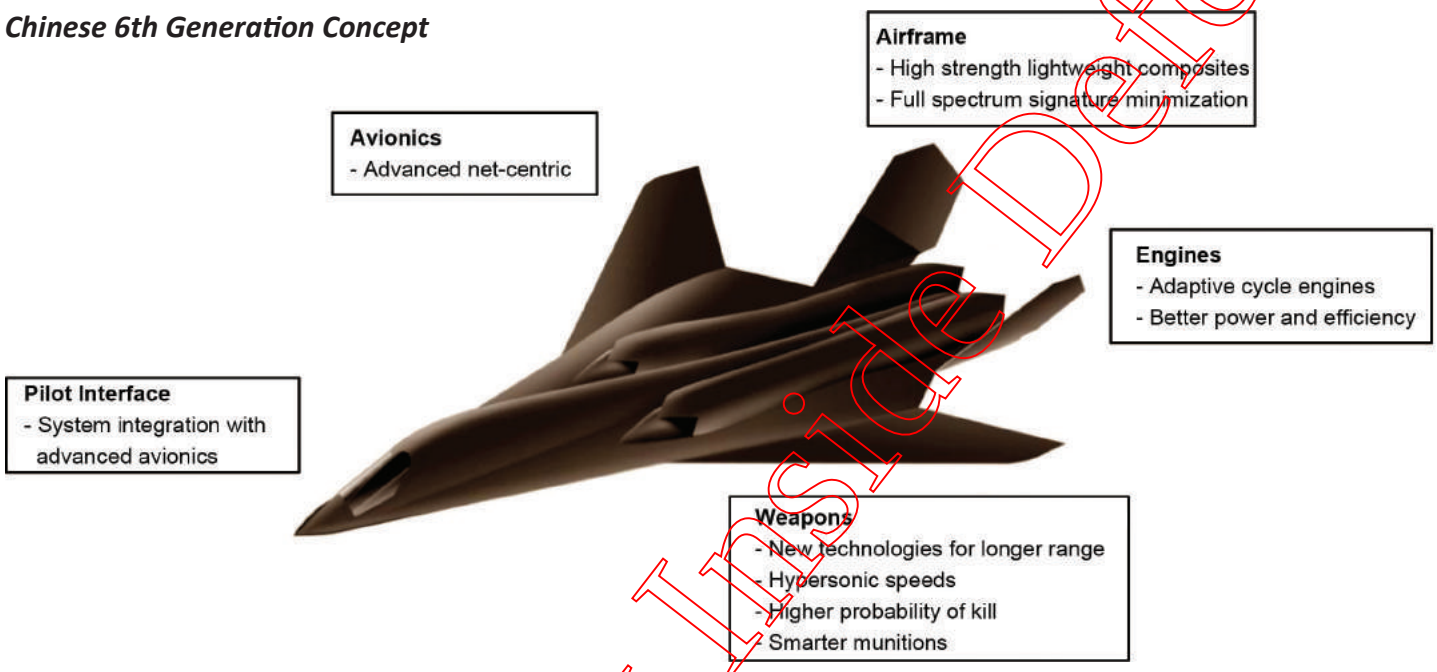
Russia: Multi-Role Fighter Interceptor (MFP)



What's Next?

Sixth-generation aircraft will replace fifth-generation technology and aircraft. Foreign nations have not finalized plans or requirements for a sixth-generation aircraft, though research and development (R&D) has begun.

Chinese 6th Generation Concept



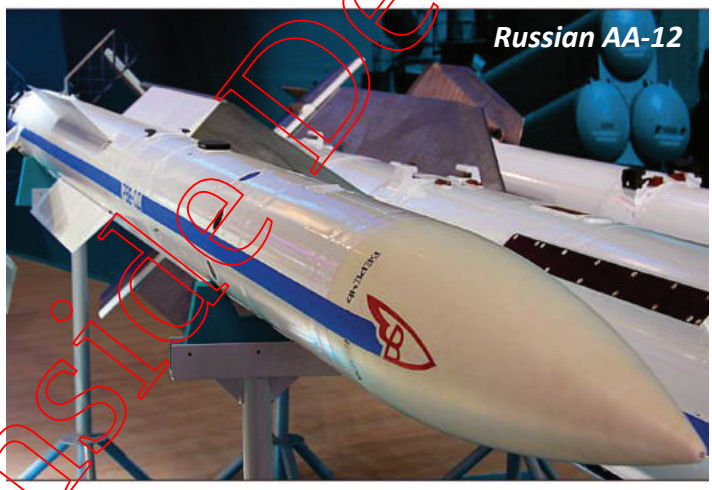
Piloted versus Unmanned

The debate will continue on piloted versus unmanned aircraft as technology evolves with each system. It is likely that most countries will continue to operate both manned and unmanned aircraft for the foreseeable future as part of their integrated air defense network.

Active Radar

Today, AAMs employ active radar seekers that give fighter aircraft a launch-and-leave option. This allows the fighter to launch and move out of harm's way as the missile continues to track and destroy its target autonomously. Active-radar missiles are being designed with aerodynamics and propulsion systems that increase missile range and velocity, thus impacting first-shot ranges and first-missile impact advantages once held by the United States.

Chinese PL-12 (SD-10A)


Russian AA-12


Chinese J-20 with PL-15


Russian AA-X-13

Infrared Missiles

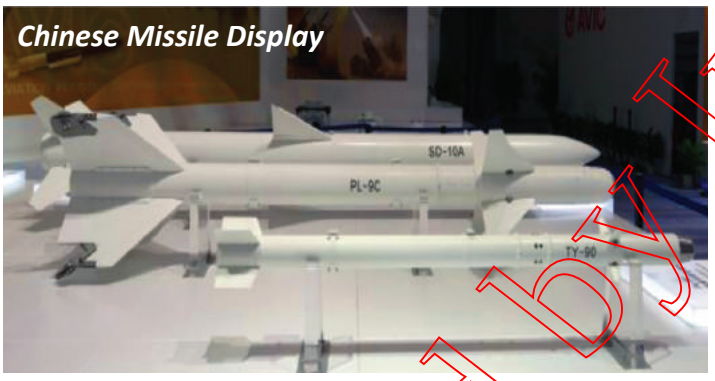
A first-shot advantage remains just as critical during within-visual-range or close-in air combat. Today's short-range missiles utilize imaging IR seekers and digital processing that enhance lock-on range, reduce minimum range requirements for launch, and are very effective at defeating IR countermeasures.


Chinese HMDS

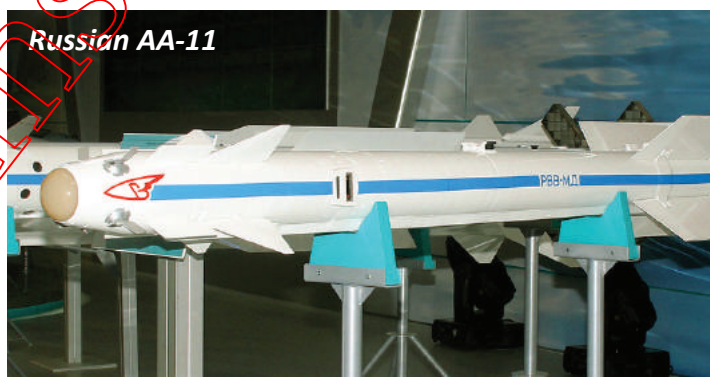

Russian HMDS

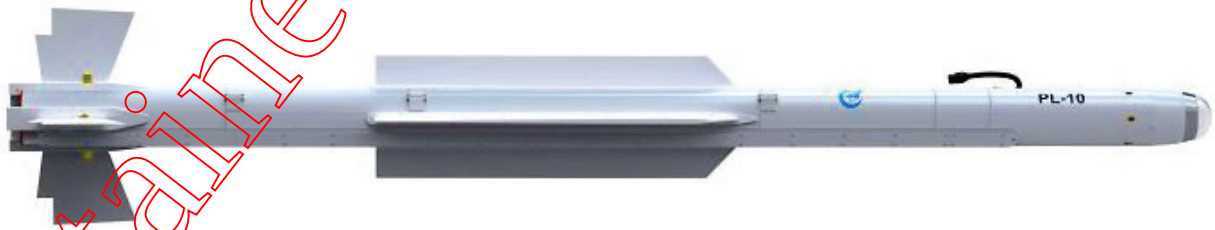
Short-range IR missiles are also being produced with high maneuverability, advanced flight controls, and new seeker technology to enable high off-boresight missile shots. China and Russia both produce helmet-mounted sights (HMS) and helmet-mounted display system (HMDS) that allow the pilot to shoot at virtually anything they can see outside the cockpit. The pilot can simply look in the direction of their target (which may be outside the normal operating envelope of the aircraft's other sensors) to acquire a missile lock and launch.

New IR technology is introducing staring array and imaging seekers that enhance detection and lock-on.



Chinese Missile Display


Russian AA-11



Chinese PL-10

Future Medium- and Long-Range Bomber Developments

New stealth bombers are being developed in both China and Russia for the main purpose of striking global and regional targets. Stealth technology continues to play a key role in the R&D of these new bombers that are expected to reach initial operating capability (IOC) in the 2025+ timeframe. New Chinese and Russian bombers will have additional capabilities with full-spectrum upgrades over the operational bomber fleets, and will employ many fifth-generation fighter technologies in their design.

Future Chinese Fighter Bomber Concept

Communications
-Data link
-Identification Friend-or-Foe system
-Software defined radios

Cockpit
-Improved Pilot Situational Awareness
-Large Multi-function Displays

Defensive Avionics Suite
-Spherical Coverage
-Missile Warning
-Chaff/Flare Decoys
-Expendable Jammers
-Radar Warning

Active Electronically Scanned Array Radar
-Long-range Detection
-Simultaneous Functions
-Multi-mission

Engines
- High Thrust
- Fuel Efficient

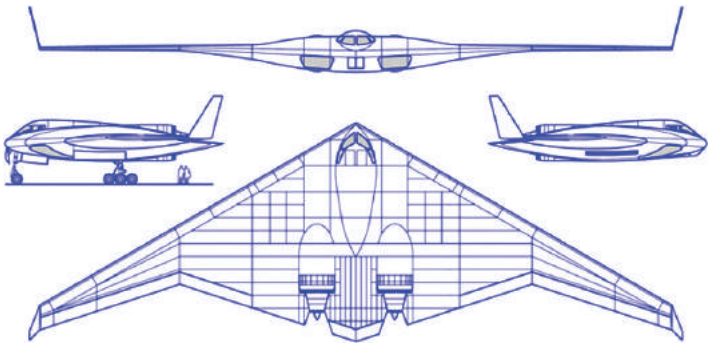
Electro-optic Sensors
-Forward looking Infrared
-Laser targeting
-Long range Infrared Search and Track System

Electronic Warfare
-Digital Radio Frequency Memory Jammers
-Laser warning
-Radar Warning Receiver
-Shared Antenna

Weapons
-Internal carriage
-Long range/active radar missile seekers
-Land Attack Cruise Missiles
-Anti-Ship Cruise Missiles
-Precision Guided Munition

Future Chinese Fighter-Bomber Concept

Russian PAK-DA Concept



Bomber Upgrades

Russian strategic air attack capabilities are well demonstrated by bomber flights that occur along US and Coalition borders. Russian Tu-95/BEAR and Tu-160/BLACKJACK bombers are receiving service life extensions and are being modified with new aiming and navigation systems to permit more precise targeting for conventional weapons and new cruise missiles with standoff ranges up to 2,700 NM. Tu-95/BEAR and Tu-160/BLACKJACK are currently the only adversary bombers that have a global reach. They can fly over 5,000 NM, and even farther with aerial refueling.

China realizes the benefit of power projection from long-range bombers. It is developing indigenous bombers (like the H-6) equipped with ASCMs and/or LACMs. Chinese bomber and weapons development programs are geared toward regional power projection and anti-access strategy to prevent or hamper US air and naval operations throughout East Asia and the Pacific.

Russian Tu-95

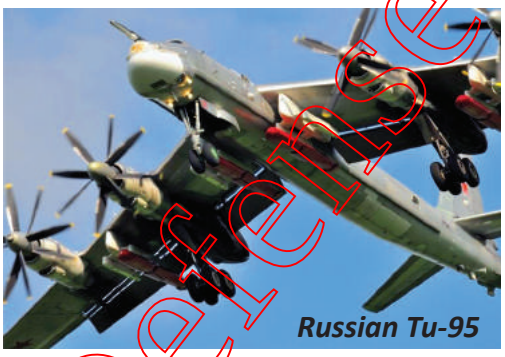
Russian Tu-160

Chinese H-6

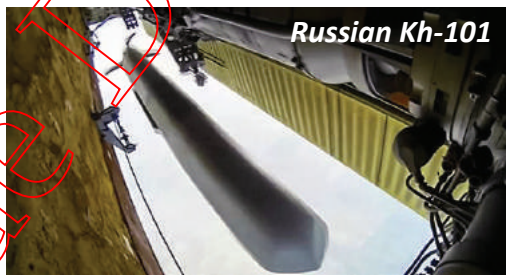
Russian Kh-38 Missile Variants

Cruise Missiles and Hypersonic Cruise Missiles

Cruise missiles are categorized as either ASCMs or LACMs. More than 10 foreign countries develop ASCMs and LAMs. This missile technology continues to proliferate despite international control efforts, such as the Missile Technology Control Regime (MTCR).


Russian Tu-95

ASCMs are a significant concern for navies around the world. They are effective against both military and civilian ships. Aircraft that carry ASCMs can influence international shipping lanes used for world commerce and pose a direct threat to our carrier battle groups. ASCMs rely on launch aircraft or over-the-horizon sensor data for target position, but after launch, employ an onboard seeker to acquire and guide the missile to the target impact. ASCMs are becoming faster, stealthier, and more accurate than those fielded in the past. Distributed sensors and communications networks will continue to improve ASCM targeting in littoral regions throughout the world.


Russian Kh-101

LACMs are pre-programmed and autonomous. They navigate to the target using an onboard inertial navigation system (INS). These systems are often paired with satellite navigation (SATNAV) like GPS and terrain contour-matching radar, or optical-scene-matching systems to improve navigational accuracy. During the terminal guidance phase, these weapons can use optical-scene-matching or radar seekers to find the intended target. Many cruise missiles fly at low levels, and some are treated with radar cross section (RCS) or counter-IR signature-reducing materials to hamper detection. New missile propulsion, navigation, and seeker technology continues to improve long-range accuracy and lethality.

Chinese Cruise Missile

Hypersonic Cruise Missiles

India and Russia are currently developing a hypersonic (>Mach 5) cruise missile called the Brahmos-II. The Brahmos-II program's stated goal is to achieve a range of 165 NM and a speed of about Mach 7, which is double the speed of Brahmos-I. A scramjet engine will provide power during the cruise stage of flight.

Brahmos-II

Air Combat Tactics

Effective employment of advanced weapon systems requires the combined effects of technology and air combat tactics. Historically, the United States has had significant technological advantages, plus the added advantage of other countries' poor pilot training and tactics. Foreign air forces have studied US air combat tactics during recent conflicts, and are starting to incorporate more and better tactics. Almost all fourth-generation fighters are equipped with video and audio equipment to enhance post-mission training. Many nations are also acquiring lead-in fighter trainers equipped with cockpits similar to their frontline fighters, and ground-based simulators to provide a well-rounded training regiment.

Su-35S Simulator

Chinese L-15

Russian Yak-130

Photo Credits

Russian T-50

Chinese J-20

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