

# China's J-20 stealth fighter in fully operational military service, formidable, to advance China's A2/AD strategy

CHINA's made a significant step forward in its bid to equal – and eventually surpass – United States air superiority. According to Beijing's state media, its first stealth fighter J-20 is now operational and “officially commissioned into military service.” This puts it in second place. Before now, only the United States has had a fully operational ‘fifth generation’ fighter. And it's easily the most capable aircraft deployed by any nation in its region – giving it a significant edge over the Japanese, Korean and Indian air forces. They were shown in public for the first time in Nov 2016, when Chinese air force pilots flew two of the twin-engine prototypes for several minutes at the International Aviation and Aerospace Exhibition in the southern city of Zhuhai, as crowds cheered on below.

China has also become the second nation to have two stealth fighter designs: The Chengdu Aircraft Industrial Corporation (CAC) ‘J-20’ and Shenyang Aircraft Corporation (SAC) ‘J-31’. The J-20 and the FC-31 are fifth-generation stealth aircraft with high maneuverability, low-observability, internal weapons bays, and capable of operating in a network-centric environment.

China flew its second stealth fighter J-31, on December 26, 2016. The new J-31 prototype is three tons heavier and about 20 inches longer than the original technology demonstrator; it also had key improvements like anIRST sensor, stealthier

wings, cleaner burning engines, and an improved radar. In addition to avionics and datalinks that enable sensor fusion, SAC officials state that the production J-31s (which could appear soon as 2019) could have supercruise capability, giving them a leg up over current F-35 fighters.

For the United States, it represents a serious threat in certain operational scenarios such as a confrontation over Taiwan or the contested Senkaku Islands. For less capable militaries in the region such as Japan, South Korea and Taiwan, the J-20 represents a game-changing capability shift on the horizon from their primary military threat – the Chinese air force, writes Justin Bronk in CNN.

As with all modern wars, airpower and air superiority play a key role and stealth fighters are critical instruments in establishing it. The rapid strides by China in developments of fifth generation stealth fighters and bombers are threatening to eliminate the air superiority that the West has held since World War II.

## **J-20 and J-31 to advance China's A2/AD strategy and counterbalance US pivot to Asia Pacific**

The multi-role J-20 offers the People's Liberation Army Air Force the ability to penetrate defended airspace to deliver its large payload of weapons. Due to its larger size it will carry significantly more internal fuel, so it will have a longer range and be less dependent on vulnerable aerial refueling tankers in the vast Asia-Pacific. J-20 is meant to have much greater range and endurance than F-22. Its long combat radius of approximately 2000 km (1242 miles) will provide China a long-range strike system capable of reaching targets within Japan, Taiwan, Philippines, Vietnam and Guam.

In a conflict, the J-20 would likely be deployed in air-to-air

combat with the mission of limiting the enemy's radar coverage and strike range. A stealthy, supercruising, interceptor would provide the PLA-AF with the capability to penetrate an opposing Integrating Air defence network (IADS) to destroy U.S. power projection capabilities in the Western Pacific like E-3 AWACS, JSTARS, RC-135V/W Rivet Joint, other ISR systems, and importantly, Air Force and Navy tankers. "This would significantly complicate if not close down air operations from Andersen AFB and fixed basing in the Ryukyu chain, Japanese main islands, and Korean peninsula, during the opening phase of any contingency," said Dr. Carlo Kopp.

It also has larger internal weapons bays than either the F-22 or F-35, so it will be able to carry larger, longer-range missiles or a greater load of standard air-to-air and air-to-ground munitions than either of the US designs. It's could even carry long-range cruise missiles to attack scattered U.S. bases and aircraft carriers in the region. Naval task forces structured around CVBGs and operating within the 1,000 NMI plus radius of the J-XX/J-20 would be at significant risk of rapidly losing their E-2C/D AEW&C and EA-18G Growler Electronic Attack coverage during the opening phase of any contingency.

"Any notion that an F-35 Joint Strike Fighter or F/A-18E/F Super Hornet will be capable of competing against this Chengdu design in air combat, let alone penetrate airspace defended by this fighter, would be simply absurd," Dr. Carlo Kopp said. The F-35 Joint Strike Fighter and F/A-18E/F Super Hornet are both aerodynamically and kinematically quite inferior to the as presented J-XX/J-20 design, and even the shape based VLO capability in the J-XX/J-20, as presented, will effectively neutralise any sensor advantage either type might possess against earlier Russian and Chinese fighter designs

Implications of PLAAF acquiring a stealth bomber fleet, could prove to be effective capability to counterbalance US's attempt to pivot its military and diplomatic efforts towards

the Asian Pacific region.

The Pentagon's latest annual report to the US Congress on China's military and security progress indicates that China is closing the military technology gap in several areas. The PLAAF "is rapidly closing the gap with western air forces across a broad spectrum of capabilities," the report assesses. These include command-and-control, electronic warfare and datalinks. J-20 and J-31 stealth fighters are expected to advance the overall Chinese anti-access/area denial strategy (A2/AD).

<https://www.youtube.com/watch?v=fzbx5nrEYk>

## **China second Nation to have two fifth-generation stealth designs J-20 and J-31 and second largest number stealth fighters**

Chengdu Aircraft Corporation has rolled out "2017," the eight in the line of J-20 jets that China has been developing in the past few years giving China the largest number of stealth fighters in the world after the United States. The J-20 Black Eagle could be fully operational by 2018.

The J-20 is slightly faster, with a maximum speed of Mach 2.5 compared to Mach 2 for the J-31. Both sport a combat radius of approximately 2000 km (1242 miles). J-20 is also bigger and heavier than the American F-22 Raptor and the Russian PAK FA T-50.

China showcased Shenyang J-31 (or "FC-31") stealth fighter jet on the opening day of the Dubai Air Show. The test aircraft has been flying for more than two years, AVIC project manager

Lin Peng told reporters after the briefing. AVIC is planning first flight of the production aircraft in 2019, with initial operational capability scheduled for 2022. The FC-31 will be fully operational in 2024.

Experts believe this would mean the Air Force plans to operate two stealth fighters for different missions, like the U.S. Air Force with the F-22 Raptor and F-35 Lightning II; the heavier J-20 would primarily be a high-altitude dogfighter, while the J-31 would perform a multitude of medium and low-altitude missions (in addition to air-to-air) including close air support, air interdiction, aerial bombardment, and suppression of enemy air defenses.

Some Experts also speculate J-31 to be complement to the J-20 stealth fighter, as a carrier-based fighter for the People's Liberation Army Naval Air Force on the Liaoning Aircraft Carrier and future Chinese carriers. China is known to be working also on a new stealth fighter bomber concept dubbed as H-20.

## **Continuous optimization of J-20**

The J-20 has a long and wide fuselage, immediately behind the cockpit is low observable intakes. All-moving canard surfaces with pronounced dihedral are placed behind the intakes, followed by leading edge extensions merging into delta wing with forward-swept trailing edges. The aft section features twin, outward canted all-moving fins, short but deep ventral strakes, and conventional round engine exhausts.

The J-20 is powered by two jet engines, like the F-22 but not the F-35. This gives it both extra power as well as the ability to survive an engine failure. Unlike the F-22, these are set well back in the airframe. This leaves ample space within the aircraft's body for three large internal weapon bays – vital for stealth aircraft to remain invisible while

carrying weapons.

The weapons are carried internally, with large central bay expected to contain four beyond visual range air-to-air missiles (BVRAAMs) or heavier ant-ship or air-to-surface missiles and bombs. There is also provision for two short-range AAMs in two separate weapons bays on each side of the fuselage. The F-35, and to a lesser extent the F-22, have only small interior bays – meaning they must either go into combat with only a limited number of missiles, or give up much of their stealth advantage when carrying extra or larger weapons under their wings.

It has an infrared search and track sensor and possibly also an electro-optical distributed aperture system (EODAS), the latter a Chinese-designed system similar to that on the Lockheed-Martin F-35 Lightning II stealth fighter.

The J-20 appears to be designed for long-range interception with an emphasis on frontal-aspect low-observability. The forward-mounted canards, poorly shielded engines, underside vertical stabilizers and inferior radar absorbent coatings will limit its stealthiness compared to US Air Force's own stealth fighters, the F-22 Raptor and F-35 Joint Strike Fighter, writes Justin Bronk in CNN.

“There is little doubt this configuration is intended to provide good sustained supersonic cruise performance with a suitable engine type, and good manoeuvre performance in transonic and supersonic regimes,” said Dr Carlo Kopp.

**Chinese engineers are continuously optimizing the performance of J-20's through advanced radars, sensors, stealth**

## **features, cutting-edge weapon system and jammers.**

October 2012, prototype featured a different radome, which was speculated to house AESA radar. 2014 prototype showed a new intake and stealth coating, as well as redesigned vertical stabilizers, and an Electro-Optical Targeting System.

On 13 Sep, 2015, a new prototype marked '2016' begun testing. This prototype has noticeable improvements, such as apparently changed DSI bumps on the intakes, which save weight, complexity and radar signature. Altering the shape of the DSI suggests that this prototype may have more powerful engines than its predecessors, likely to be an advanced 14 ton thrust derivative of the Russian AL-31 or Chinese WS-10 turbofan engines.

Eventually, by 2020 the J-20 is planned to use the 18-19 ton WS-15 engine, enabling the jet to super-cruise without using afterburners. Supercruise is an advanced technology which vastly improves the fuel economy of jet engines – allowing aircraft to coast at supersonic speeds for long distances without having to dump raw fuel on an afterburner.

The flight booms around the engines have been enlarged, possibly to accommodate rearwards facing radars or electronic jamming equipment. It also has a stealthier bumper. The stealthy fuselage extends almost all the way to the engine's exhaust nozzles. The trapezoidal booms on sides of the nozzles are also reshaped, possibly to install rearwards facing radar or ECM equipment.

Compared to previous J-20s, "2016"'s fuselage extends almost all the way to the engine's exhaust nozzles. The greater surface area under fuselage would lead to enhanced stealth against enemy radar. The trapezoidal booms on sides of the nozzles also reshaped, possibly to install rearwards facing radar or ECM equipment.

## J-31

The J-31 is a mid-weight, twin rudder and twin-engine jet, It appears to be a smaller and more agile aircraft than the Chengdu J-20. It also shares with the F-35C (and most other carrier based fighter jets) having the twin forward wheels. J-31 incorporates stealth characters such as forward swept intake cowls with diverterless supersonic inlet (DSI) bumps and a two-piece canopy. Officials touted the aircraft's "outstanding situational awareness" achieved with advanced radar, high maneuvering capabilities, and multi-spectrum low-observability.

The FC-31, which closely resembles the F-35, is a medium-sized, low-observable aircraft designed for "the demands of future battlefield environments," AVIC project manager Lin Peng told reporters during the briefing.

Overall U.S. military and industry officials believe that the J-31 enters will be a match for existing fourth-generation fighters like the F-15 Eagle, F-16 Falcon, and F/A-18 Super Hornet but it lags behind the United States' F-35 technologically. However, AVIC President Lin Zhouming made bolder prediction, saying, "When [the J-31] takes to the sky, it could definitely take down the F-35. It's a certainty."

The plane is equipped with twin engines made in China, officials said – not the Russian RD-93 afterburning turbofan engine made in Russia. Like the F-35, the J-31 has two internal weapons bays that can each carry two medium range missiles. The FC-31 will carry the Small Diameter Bomb, as well as a variety of guided and unguided weapons, officials said.

Its WS-13 engines would be replaced by domestic WS-13E or WS-19 turbofan engines to give it that advantage in speed. The



combination of the J-31's high speed performance, and suggested payload of 6 PL-12 or 4 PL-21 long range air to air missiles suggests that the J-31 has been optimized as an air superiority fighter, though it can be fitted with a wide array of Chinese precision guided munitions like the LS smart bombs.

The test aircraft has been flying for more than two years, Peng told reporters after the briefing. AVIC is planning first flight of the production aircraft in 2019, with initial operational capability scheduled for 2022. The FC-31 will be fully operational in 2024.

The J-31's chief designer, Sun Cong, has said that he hoped that the aircraft would follow his J-15 onto China's aircraft carriers. The carrier-borne fifth-generation fighter could hypothetically give China greater first-strike capability in the event of a war. However, industry sources say development of the J-31 was provided entirely by the PLAAF with no input from the PLAN.

## **J-20 and J-31 being fitted with passive sensors**

Wang Yanyong, technical director for Beijing A-Star Science and Technology, has confirmed that its two systems – the EOTS-89 electro-optical targeting system (EOTS) and the EORD-31 infrared search and track (IRST) – are in development for China's J-20 and J-31 fighters.

Marketing brochures on A-Star's booth suggest that the J-20 could use the passive sensors to detect and aim missiles against the Northrop Grumman B-2 bomber and Lockheed Martin F-22 fighter, even while its radar is being jammed by a Boeing EA-18G Growler. "It lists detection ranges for the B-2 at 150km and for the F-22 at up to 110km," as reported by Stephen Trimble.

## **FC-31 is for Global Export**

China plans to export its stealthy twin-engine J-31 fighter, which would become the first aircraft of its kind available to global customers who face US export restrictions or cannot afford Lockheed Martin's F-35 joint strike fighter. The potential customers include Ally Pakistan, Iran, and Venezuela.

## **Chinese stealth fighters have inferior engine technology, still formidable**

The country's engine technology lags that of United Technologies unit Pratt & Whitney, General Electric and Rolls-Royce, said Douglas Barrie, senior fellow for military aerospace at the International Institute for Strategic Studies in London.

The country's best warplane engine is the WS-10A Taihang, made by Shenyang Aeroengine Research Institute, a subsidiary of China's biggest state-owned aerospace and defence company, Aviation Industry Corporation of China (AVIC), the sources said.

China is trying to procure Russia's most advanced aero engine, Saturn 117S for the J-20 and J-31 has super cruise capability and is installed in the SU-35 PAKFA/FGFA. However, Russians are, evidently, hesitant to offer the 117S knowing the Chinese propensity to reverse engineer and copy them.

"Chinese engine-makers face a multitude of problems," said Michael Raska, assistant professor in the Military Transformations Programme at Singapore's S. Rajaratnam School of International Studies. China's J-20 and J-31 stealth

fighters cannot super-cruise, or fly at supersonic speeds like their closest rivals, Lockheed Martin's F-22 and F-35 stealth planes, without using after-burners, which removes warplanes stealthiness. Their engines also don't produce enough thrust, or power, and need frequent repairs.

**"The J-20 will give the People's Liberation Army Air Force a technological advantage over every other Asian air force. While the J-20 may not be able to supercruise [fly at supersonic speeds without using fuel-thirsty afterburners] with its current Russian AL-31 turbofan engines, its high level of strength, long range and electronic warfare capabilities will make it a very formidable foe for other fighters,"** magazine popular science said.

## **Chinese stealth planes developed with hacked technology**

Many U.S. officials and pilots suspect that the Chinese have been using hacked U.S. technology to aid their indigenous development programs. Sen. Joe Manchin, a Democrat from West Virginia, said the Chengdu J-20 twin-engine stealth fighter bears similarity to the F-22 Raptor made by Lockheed Martin Corp., while the Shenyang J-31 twin-engine multi-role fighter resembles the F-35 Joint Strike Fighter design also made by Lockheed. Chinese very likely stole a large amount of classified F-35 data as indicated by reports of a major cyber breach of Lockheed's programs by Chinese hackers in April 2009

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