



# REVEALED: JAPAN'S NEW FIGHTER PROTOTYPE

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**Japan unveiled its new fighter demonstrator to the public on Thursday, giving a glimpse of what the future of fighter jets may look like.** Meant to showcase a variety of new tech, the X-2 stealth aircraft will almost certainly lead to a sixth-generation fighter aircraft designed to counter the new breed of advanced Chinese fighters.

Painted in the red and white colors of Japan, the X-2 was unveiled to the press at Nagoya Aerospace Systems Works, part of Mitsubishi Heavy Industries. The plane, also known as "Shinshin" ("Spirit of the Heart") has been in development for more than a decade and is expected to fly for the first time next month.

During World War II, Japan lost air superiority over its territory and suffered devastation from high-flying U.S. bombers. In the aftermath of the war, a first class fighter fleet became one of Japan's main defensive goals. A key U.S. ally in the postwar period, Japan was granted access to the newest American fighters, including the F-104 Starfighter, F-4 Phantom, and F-15 Eagle.

In the early 2000s, the Japanese government operated under the assumption that it would be an export customer for the F-22 Raptor. To Japan's surprise, exports of the F-22 were banned under the 2006 Obey Amendment on the grounds that technology built into the F-22 was too sensitive to be sent abroad. Japan, which had expected to begin replacing its F-15s with F-22s right away, was faced with a dilemma.

The country had started work on the X-2 in the mid-2000s, as a hedge against such a ban. The design was frozen around 2005, when the developmental model's stealth capability was tested at a radar cross section facility in France. A first flight was scheduled in 2014, but an issue with the

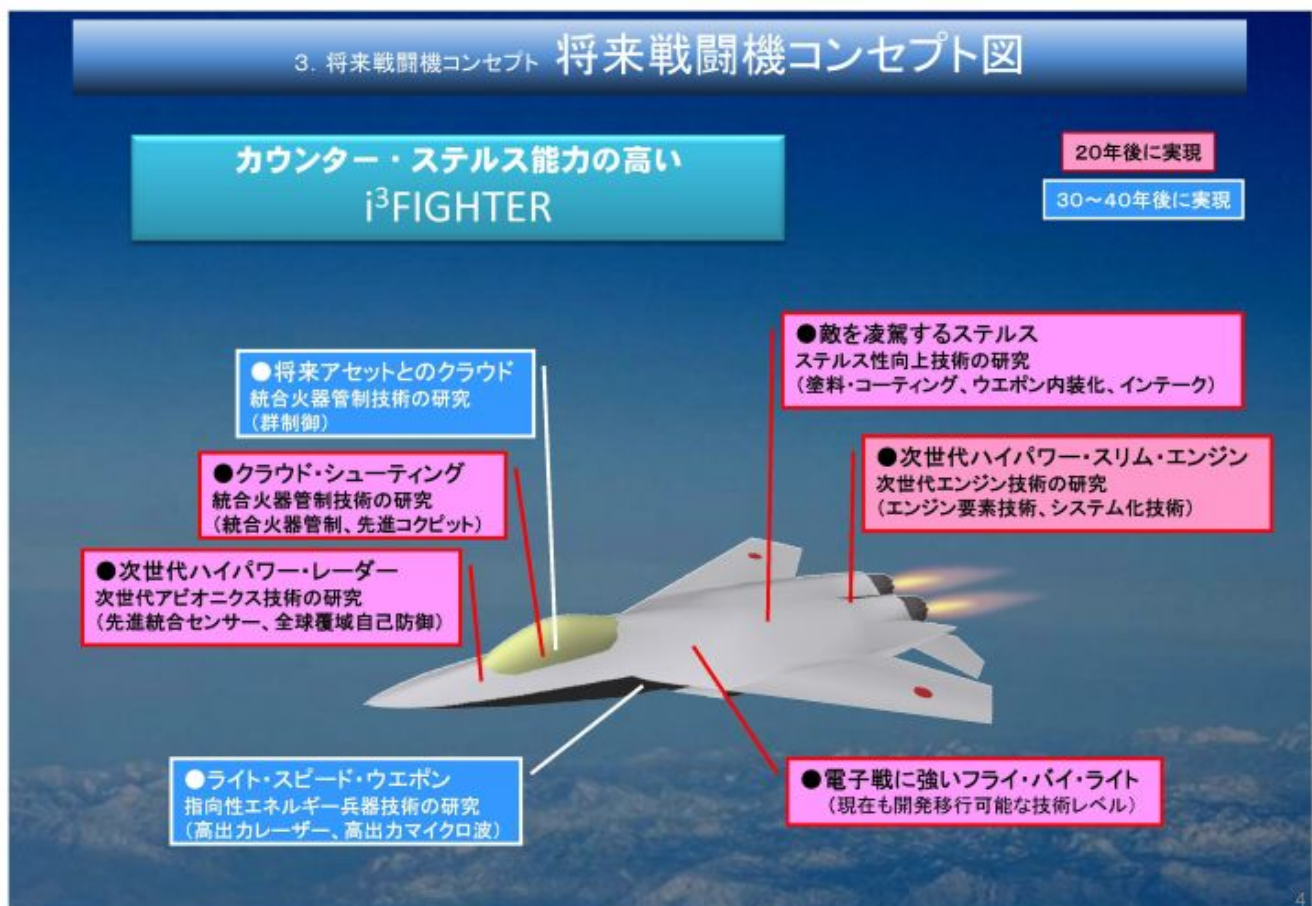
vector thrust control system caused a delay.

Japanese officials have been relatively tight-lipped about X-2's features, but some are obvious. The plane is 46-feet long with a wingspan of 29 feet. The aircraft has a large bubble canopy, giving the pilot excellent visibility in all directions. It is a twin-engine design, utilizing two Ishikawa Heavy Industries low-bypass turbofan engines, each providing a maximum five tons of thrust. The X-2 also has angled twin vertical stabilizers set at an even steeper angle than the F-15 Silent Eagle.

One particularly interesting feature are the thrust vectoring paddles extending from the engine exhausts. These paddles allow the pilot to control the direction of the exhaust, greatly increasing an aircraft's maneuverability. First used on the X-31 experimental aircraft, they are also present on the F-22 Raptor. X-2's thrust vector paddles are serrated for stealth purposes.

Future armament for X-2 is also under development. Japan has developed the Mitsubishi AAM-4B, a long-range missile with an active electronically scanning array (AESA) radar as a seeker. AAM-4B was the first air-to-air missile to incorporate AESA radars, which are just now becoming standard on fighters. Unfortunately, AAM-4B missiles are too large to be carried internally by the F-35 Joint Strike Fighters Japan has on order, and would be difficult to fit in any future fighter.

An agreement by Japan and the United Kingdom this month to pursue joint air-to-air missile development points to the possibility of the AAM-4B seeker being placed on the Meteor missile, a beyond visual range missile designed to fit in internal weapons bays and capable of speeds of up to Mach 4. This would create a considerably more lethal missile than the U.S.-made AIM-120 AMRAAM.



It's important to remember that X-2 is only a technology demonstrator and not representative of what the final fighter, which observers have dubbed F-3, will look like. At least two concept drawings of the F-3 have emerged, one similar to the F-22 Raptor and another with a tailless design similar to Boeing's F-A-XX.

One major factor in the future of the F-3 design is the engine. The X-2 is a relatively small aircraft because the engines produce a relatively small amount of thrust (its two engines produce 5 tons of thrust each, for 10 tons in total—by comparison, the F35's single engine produces 20 tons of thrust.) Japan is preparing to start work on a new engine core, which should lead to a new high performance engine for the F-3. The size of the aircraft will likely be a function of how much thrust Ishikawa thinks it can get from the engine.

In addition to the technologies showcased in Shinshin, Japan's Technical Research and Development Institute (TRDI) is researching technologies including infrared stealth, fiber optics, self-repairing flight control technologies, and building air-to-air radar into the actual skin of the aircraft itself (similar to Raytheon's idea for spray-on radar). TRDI is also looking into battlefield data networking, including using unmanned aerial vehicles to provide targeting information to networked F-3 fighters.

Despite Japan's technological expertise, developing a new fighter will not be a walk in the park. Aircraft avionics—the electronics systems that integrate everything from the engines to flight controls to the process of launching a missile—have grown unbelievably complex, bound together with computers and software that require millions of lines of code. The F-35 fighter, under development for nearly two decades, is still facing enduring computer software problems that won't be resolved for several years more. How Japan intends to get around this problem and others like them remains to be seen.

Japan plans to fly the X-2 for two years and make a decision on going forward with an actual fighter design around 2018. Assuming no major headaches, the F-3 fighter is expected to enter service in the mid-2030s—when Japan's F-15J Eagle fleet will be 50 years old.

Japan's quest to build its own fighter will be long and arduous—and will likely require American or European assistance. But without a top-tier air superiority fighter available, Japan has no choice but to press on.

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