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F-35 Stealth Fighter Prepares for the Unthinkable: War with China or Russia

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The Air Force wants the F-35 to be able to elude the best enemy air defenses well into the 2030s and 2040s

The Air Force F-35 is using “open air” ranges and computer simulation to practice combat missions against the best Chinese and Russian-made air-defense technologies – as a way to prepare to enemy threats anticipated in the mid-2020s and beyond.

The testing is aimed at addressing the most current air defense system threats such as Russian-made systems and also focused on potential next-generation or yet-to-exist threats, Harrigian said.

Air Force officials have explained that, looking back to 2001 when the JSF threat started, the threats were mostly European centric – Russian made SA-10s or SA-20s. Now the future threats are looking at both Russian and Chinese-made and Asian made threats, they said.

“They have got these digital SAMS (surface-to-air-missile-systems) out there that can change frequencies and they are very agile in how they operate. being able to replicate that is not easy,” Maj. Gen. Jeffrey Harrigian, Director of the F-35 Integration Office, told Scout Warrior in an interview.

Surface threats from air defenses is a tough problem because emerging threats right now can see aircraft hundreds of miles away, service officials explained.

Furthermore, emerging and future Integrated Air Defense Systems use faster computer processors, are better networked to one-another and detect on a wider range of frequencies. These attributes, coupled with an ability to detect aircraft at further distances, make air defenses increasingly able to at times detect even stealth aircraft, in some instances, with surveillance radar.

While the Air Force aims to prepare for the unlikely contingency of a potential engagement with near-peer rivals such as Russia or China, Harrigian explained that there is much more concern about having to confront an adversary which has purchased air-defense technology from the Russians or Chinese. Harrigian emphasized that, while there is no particular conflict expected with any given specific country, the service wants to be ready for any contingency.

Harrigian explained that the F-35 is engineered with what developers call “open architecture,” meaning it is designed to quickly integrate new weapons, software and avionics technology as new threats emerge.

“One of the key reasons we bought this airplane is because the threats continue to evolve - we have to be survivable in this threat environment that has continued to develop capabilities where they can deny us access to specific objectives that we may want to achieve. This airplane gives us the ability to penetrate, deliver weapons and then share that information across the formation that it is operating in,” Harrigian explained.

While training against the best emerging threats in what Harrigian called “open air” ranges looks to test the F-35 against the best current and future air defenses – there is still much more work to be done when it comes to anticipating high-end, high-tech fast developing future threats. This is where modeling and simulation play a huge part in threat preparation, he added.

“The place where we have to have the most agility is really in the modeling and simulation environment - If you think about our open air ranges, we try to build these ranges that have this

threats that we expect to be fighting. Given the pace at which the enemy is developing these threats - it becomes very difficult for us to go out and develop these threats,” Harrigan explained. The Air Force plans to bring a representation of next-generation threats and weapons to its first weapons school class in 2018.

In a simulated environment, F-22s from Langley AFB in Virginia could train for combat scenarios with an F-35 at Nellis AFB, Nevada, he said.

The JSF’s Active Electronically Scanned Arrays, or AESA’s, the aircraft is able to provide a synthetic aperture rendering of air and ground pictures. The AESA also brings the F-35 electronic warfare capabilities, Harrigan said.

Part of the idea with F-35 modernization is to engineer systems on the aircraft which can be upgraded with new software as threats change. Technologies such as the AESA radar, electronic attack and protection and some of the computing processing power on the airplane, can be updated to keep pace with evolving threats, Harrigan said.

Engineered to travel at speeds greater than 1,100 miles per hour and able to reach Mach 1.6, the JSF is said to be just as fast and maneuverable as an F-15 or F-16 and bring a whole range of additional functions and abilities.

Overall, the Air Force plans to buy 1,763 JSF F-35A multi-role fighters, a number which will ultimately comprise a very large percentage of the service’s fleet of roughly 2,000 fighter jets.

So far, at least 83 F-35As are operational for the Air Force.

4th Software Drop:

Many of the JSF’s combat capabilities are woven into developmental software increments or “drops,” each designed to advance the platform’s technical abilities. There are more than 10 million individual lines of code in the JSF system.

While the Air Force plans to declare its F-35s operational with the most advanced software drop, called 3F, the service is already working on a 4th drop to be ready by 2020 or 2021. Following this initial drop, the aircraft will incorporate new software drops in two year increments in order to stay ahead of the threat.

The first portion of Block IV software funding, roughly \$12 million, arrived in the 2014 budget, Air Force officials said.

Block IV will include some unique partner weapons including British weapons, Turkish weapons and some of the other European country weapons that they want to get on their own plane, service officials explained.

Block IV will also increase the weapons envelope for the U.S. variant of the fighter jet. A big part of the developmental calculus for Block 4 is to work on the kinds of enemy air defense systems and weaponry the aircraft may face from the 2020’s through the 2040’s and beyond.

In terms of weapons, Block IV will eventually enable the F-35 to fire cutting edge weapons systems such as the Small Diameter Bomb II and GBU-54 – both air dropped bombs able to destroy targets on the move.

The Small Diameter Bomb II uses a technology called a “tri-mode” seeker, drawing from infrared, millimeter wave and laser-guidance. The combination of these sensors allows the weapon to track and eliminate moving targets in all kinds of weather conditions.

These emerging 4th software drop will build upon prior iterations of the software for the aircraft. Block 2B builds upon the enhanced simulated weapons, data link capabilities and early fused sensor integration of the earlier Block 2A software drop. Block 2B will enable the JSF to provide

basic close air support and fire an AMRAAM (Advanced Medium Range Air-to-Air Missile), JDAM (Joint Direct Attack Munition) or GBU-12 (laser-guided aerial bomb) JSF program officials said.

Following Block 2B, Block 3i increases the combat capability even further and Block 3F will bring a vastly increased ability to suppress enemy air defenses.

Block 3F will increase the weapons delivery capacity of the JSF as well, giving it the ability to drop a Small Diameter Bomb, 500-pound JDAM and AIM 9X short-range air-to-air missile, service officials explained.

The AIM 9X is an Air Force and Navy heat-seeking infrared missile.

In fact, the F-35 Joint Strike Fighter fired an AIM-9X Sidewinder infrared-guided air-to-air missile for the first time recently over a Pacific Sea Test Range, Pentagon officials said.

The F-35 took off from Edwards Air Force Base, Calif., and launched the missile at 6,000 feet, an Air Force statement said.

Designed as part of the developmental trajectory for the emerging F-35, the test-firing facilities further development of an ability to fire the weapon “off-boresight,” described as an ability to target and destroy air to air targets that are not in front of the aircraft with a direct or immediate line of sight, Pentagon officials explained.

The AIM-9X, he described, incorporates an agile thrust vector controlled airframe and the missile’s high off-boresight capability can be used with an advanced helmet (or a helmet-mounted sight) for a wider attack envelope.

F-35 25mm Gun:

Last Fall, the Pentagon’s F-35 Joint Strike Fighter recently completed the first aerial test of its 25mm Gatling gun embedded into the left wing of the aircraft, officials said.

The test took place Oct. 30, 2015, in California, Pentagon officials described.

“This milestone was the first in a series of test flights to functionally evaluate the in-flight operation of the F-35A’s internal 25mm gun throughout its employment envelope,” a Pentagon statement said several months ago.

The Gatling gun will bring a substantial technology to the multi-role fighter platform, as it will better enable the aircraft to perform air-to-air attacks and close-air support missions to troops on the ground.

Called the Gun Airborne Unit, or GAU-22/A, the weapon is engineered into the aircraft in such a manner as to maintain the platform’s stealth configuration.

The four-barrel 25mm gun is designed for rapid fire in order to quickly blanket an enemy with gunfire and destroy targets quickly. The weapon is able to fire 3,300 rounds per minute, according to a statement from General Dynamics.

“Three bursts of one 30 rounds and two 60 rounds each were fired from the aircraft’s four-barrel, 25-millimeter Gatling gun. In integrating the weapon into the stealthy F 35Airframe, the gun must be kept hidden behind closed doors to reduce its radar cross section until the trigger is pulled,” a statement from the Pentagon’s Joint Strike Fighter said.

The first phase of test execution consisted of 13 ground gunfire events over the course of three months to verify the integration of the gun into the F-35A, the JSF office said.

“Once verified, the team was cleared to begin this second phase of testing, with the goal of evaluating the gun’s performance and integration with the airframe during airborne gunfire in various flight conditions and aircraft configurations,” the statement added.

The new gun will also be integrated with the F-35’s software so as to enable the pilot to see and destroy targets using a helmet-mounted display.

The gun is slated to be operational by 2017.