



F-35 Lightning II Program

Public Affairs Release – 2015 07 22

F - 3 5 T E S T T E A M F I R E S G A T L I N G G U N

The F-35 Joint Strike Fighter Integrated Test Force is in the process of testing the F-35A's newest munitions asset - the GAU-22/A. The gun is a four-barrel Gatling gun that fires 25 millimeter rounds. Unlike the Marine Corps and Navy variants, the GAU-22/A is integrated internally to the F-35A. In the other variants, the gun is mounted to the outside as a pod. A similar weapon, GAU-12, has been used on the AV-8B Harrier Jump Jet.

The first phase of testing started June 9, when the first shots were fired from tail number AF-2 on the ground at the Edwards Gun Harmonizing Range. The test team hopes to finish ground testing sometime during August and start the airborne phase late September. An operational gun capability will be added with a future block of software, which is in the beginning stages of testing at Edwards.

The tests are done using a target practice round, PGU-23/U, which fires from the gun, but does not explode on impact. The tricky part about this test phase is that the gun will never operationally fire on the ground. To conduct the test, they have to use software to bypass interlocks and "fool the aircraft to make it think it's in the air."

"As an Air Force pilot, it's going to be one more thing that I can select to either strafe air-to-ground targets or shoot as an air-to-air weapon," said Maj. Andrew Rollins, 461st Flight Test Squadron, assistant director of operations.

Rollins is the test pilot on the project. While deployed, Rollins "used a gun often." He said it's particularly useful in an air-to-ground role when enemy targets are in a close proximity to friendlies and dropping a bomb is not prudent.

"The GAU-22/A uses a 25mm shell, which is significantly more powerful than what I've been used to in legacy aircraft, the F-16 the F-15E, F-15C – all those aircraft use a 20mm shell," said Rollins. Integrating a weapon into the aircraft is not in itself unique. But what does make this project special is that it's being integrated into a stealth platform. In legacy aircraft, the gun fires through a hole in the outer molding. In this case, to keep the jet hidden from radar signatures, the gun will be kept behind closed doors until the trigger is engaged. The ground tests with AF-2 are designed to answer questions like; does the gun door open correctly? Does the gun spin up and down correctly? Does the air flow through the vent and is it adequate to clear the flammable gasses? Prior to testing the integration of the GAU-22/A into the F-35A, the gun itself was tested as a standalone. It was also flown during test points without firing to ensure that the flight envelope would not overstress the gun mounts. Preparing for the ground gun fire tests in the jet took roughly six months. AF-2, a highly modified flight sciences aircraft, underwent four months of instrumentation modifications and had a line production gun installed for this project.

Tiffany Krogstad, Lockheed Martin AF-2 flight test engineer, said that the AF-2 is normally a "scientist aircraft" executing loads and buffet testing. "[AF-2] is the only aircraft in the world that can get us this data," said Rollins. "It's been highly instrumented in order to get us the information we need to proceed to the next test point and ultimately to get the gun to its full envelope." As the test conductor, Krogstad and her team are monitoring the gun's performance and ensuring all the systems work as designed. She is especially concerned with making sure the jet can withstand the loads of a firing gun and the gun operates as expected. Since AF-2 is a flight sciences aircraft, it does not have all the missionized systems of full-line production aircraft. The gun will be further tested with a line production jet sometime next year for full integration.

"When we hand [the gun] off to the next aircraft to test full integration with the full avionics and mission systems capabilities, we'll rest easy knowing that we did what we could to make sure that their test won't have those issues," said Krogstad. Rollins on the other hand is looking at it from a test pilot's perspective, evaluating the gun's effects on the aircraft's handling qualities.



An F-35A, tail number AF-2, fires a burst of rounds down range at the Gun Harmonizing Range July 17. The F-35 Joint Strike Fighter Integrated Test Force at Edwards AFB is in the process of testing the F-35A's newest munitions asset - the GAU-22/A. The gun is a four-barrel Gatling gun that fires 25 millimeter rounds. (Courtesy photo by Darin Russell/Lockheed Martin)

"By the time we get airborne, we're hoping that our extensive preparation during planning, ground tests and airborne tests will eliminate every variable except for those associated with flight since flying will be the most demanding phase of this testing," said Rollins. "While we'll be targeting very specific objectives, the pilot will also be observing more qualitative effects such as muzzle flash, human factors, and flying qualities."

During the airborne tests, they will watch for the potential effects of having the gun mounted internally, like vibrations, acoustics and airflow. To evaluate the gun's performance, the test team is made up of personnel from the Air Force, Lockheed Martin, Pratt & Whitney and Northrop Grumman. They are performing duties as engineers, pilots, maintainers, Edwards weapons loading crews, and gun subject matter experts from Fort Worth, Texas.

"Like any of the testing Edwards AFB does, we are managing all of the risk involved with this test," said Rollins. "When we sign it off and go hand it to the warfighter, they can go out and pull the trigger throughout the entire gun envelope and know that the aircraft is going to function properly. It's not going to flameout, it's not going to overheat, it's not going to over G, and it's going to hit the target."