

## The F-35 “can’t fight”; New tactics; Marine Corps operational ....

### TURN, TURN, TURN

The F-35 program is under attack again. This time the complaint, offered up by the “War is Boring” blog and rapidly picked up by the cottage anti-military think tanks, is that the F-35 can’t dogfight. Based on a leaked pilot’s report from a January sortie, the F-35 was sluggish to put its nose on an F-16 in the high angle of attack regime during a mock engagement. That’s aerodynamic-ese meaning the F-35 had its nose up while moving straight ahead—the same thing pilots do when they’re bleeding off speed, getting ready to land.

The blogger quoted the F-35 test pilot as saying, “There were not compelling reasons to fight in this region” of the flight envelope.

Exactly. The F-35 was not designed to excel in close-in, low-speed, turning dogfights, because that’s generally not how air combat happens anymore. The design emphasis of the F-35 was on other capabilities, more relevant for the future.

A little background: The F-35 was always conceived to be the tag team partner of the F-22 in 21st century air combat. Just as the F-15 and F-16 were intended in the 1970s to be the “high-low mix”—a smaller number of expensive F-15s clearing the sky so the many cheaper F-16s could hit a lot of targets—the F-22 and F-35 were to fill the same complementary roles. The F-22 was optimized for air-to-air combat with limited strike capability, while the F-35 was optimized for strike, with a pretty good dogfighting capability as one of its many secondary missions as the “backbone of the force.”

Air combat has evolved tremendously over 40 years, though. Radar and missile technology have gotten so good that if you can be seen and targeted by an enemy aircraft, you’re probably going to die. The days of actually closing with the target, rolling and turning to get behind your opponent, are pretty much over. That’s why the F-22 and F-35 were made stealthy: to give their pilots the first-shot/first-kill advantage, shooting from beyond visual range, without being detected. Practically every chief of Air Combat Command for the last decade has uttered some variation of the line that if an F-22 or F-35 actually gets into a close-in, turning dogfight with an opponent, the pilot’s made a grave mistake.

Statistics bear out this message. Since the 1991 Gulf War, a steadily increasing number of air-to-air victories have been achieved with either beyond visual range missiles or all-aspect missiles, while an ever-diminishing share was won with short-range missiles. The last gun-to-gun kill was recorded in 1988.

According to a recent Center for Strategic and Budgetary Assessments white paper on “Trends in Air-to-Air Combat,” situational awareness is rapidly superseding speed and maneuverability as the key attribute for success in air battles. Speed, acceleration, and agility “are much less useful now that aircraft can be detected and engaged from dozens of miles away,” the CSBA report concluded. Rising in importance are “minimal radar and [infrared] signature; space, payload, and cooling capacity; power for large-aperture long-range sensors; and very long-range weapons.”

The Air Force and its sister services took these trends to heart when the F-35 was being designed. That’s why it bristles

with sensors and relies on tens of millions of lines of computer code to see, identify, prioritize, and shoot air-to-air (as well as surface-to-air) threats long before they become a danger.

Not only that, but with the multisource onboard sensor data coming into the cockpit, coupled with the F-35’s Distributed Aperture System (DAS) giving the pilot 360-degree visibility, it will be tough to “bounce” or surprise the F-35 pilot. Tactics for the F-35 also emphasize formations, multiplying the number of sensors looking for danger. These inputs are merged with info coming from off-board sensors on satellites, AWACS jets, and the network of other platforms to build a comprehensive picture of the battlespace. This leaves as little as possible to chance.

All that said, F-35 pilots believe the jet will be a sterling dog-fighter at need. The Air Force F-35A model was designed to turn at nine Gs with a full load of internal fuel and weapons—far outclassing any enemy lugging missiles and fuel tanks around. The Navy and Marine Corps versions are spec’d to 7.5Gs—the same as their current F/A-18s and AV-8Bs. With the DAS, however, and the F-35 pilot’s helmet, which allows him to see, select, and shoot at a target that he isn’t actually pointing at, F-35 pilots will have extraordinary awareness. The F-35 will be nimble enough, however, to help it evade any missiles actually fired at it.

### STRENGTH IN NUMBERS

Though F-35 operators are understandably tight-lipped about tactics, they do explain that the F-35’s combination of stealth, electronic warfare, cyber capabilities, and—almost as a last resort—agility will seriously degrade each step in an enemy’s kill chain. That is, the opponent’s ability to detect, track, shoot at, and ultimately get close to the F-35 are degraded to near zero.

The F-35 System Program Office, responding to the “War is Boring” blog, noted that the F-35 in the test was the second one built and lacked the stealth coatings and “mission systems software ... that allows the F-35 to see its enemy long before it knows the F-35 is in the area.” It also lacked “the weapons or software that allow the F-35 pilot to turn, aim a weapon with the helmet, and fire at an enemy without having to point the airplane at its target.”

In fact, the test was less a dogfight than a series of “visual combat maneuvers to stress the system, and the F-16 involved was used as a visual reference to maneuver against,” the SPO said. The test was a success in showing the F-35’s ability “to maneuver to the edge of its limits without exceeding them, and handle in a positive and predictable manner,” but the SPO allowed that the results could result in a “misleading” interpretation. Test pilots afterward effused that the exercise actually showed there was plenty of room in the envelope to tweak the F-35’s performance to make it better.

The SPO also said that when a fully equipped four-ship of F-35s has engaged a four-ship of F-16s in “simulated combat scenarios, ... the F-35 won each of those encounters because of its sensors, weapons, and stealth technology.”

The program office offered a quote from Air Force Maj. Gen. Jeffrey L. Harrigan, head of the service’s F-35 integration of-

fice, who said, “It is too soon to draw any final conclusions on the maneuverability of the aircraft. The F-35 is designed to be comparable to current tactical fighters in terms of maneuverability, but the design is optimized for stealth. This will allow it to operate in threat environments where the F-16 could not survive.”

To be sure, the F-35 has had its problems and still faces formidable challenges in software development. At a Colorado defense symposium in July, Air Force Secretary Deborah Lee James acknowledged that the “biggest lesson” from the program is never to build in as much concurrency between development and production, or as she said, “Never again should we be flying an aircraft while we’re building it.” The F-35 “cost us way more money” than expected, she said.

“We’re very focused from now on to driving the costs down per unit, and they are coming down,” James asserted.

While she acknowledged the pilot’s report regarding the F-35/F-16 matchup, she also stated that the jet involved did not have the mission systems that will make the F-35 so powerful once it’s in service. When it is, it will be able to “see an enemy hundreds of miles” away, shoot first, “and the bad guys [won’t] know what hit them.”

The concept is not to have a close-in dogfight, she said, but “with that said, by the time we’re at full operational capability, we’ll be much better in that arena as well.”

Lt. Col. Andrew Allen, commander of the F-35 combined test force, said in a recent interview with *Air Force Magazine* that the F-35 is “not here to replace F-16s ... or F-18s ... or A-10s. ... That’s selling this aircraft short.” The F-35 is supposed to be applicable across the full spectrum of combat, from penetrating heavily defended airspace on Day One to performing urban close air support on Day 365. He said the jet is not there yet, but “are we going to get there? Yes. I fully believe that.”

## PRIME TIME LIGHTNING

The Marine Corps declared the F-35B to have achieved initial operating capability on July 31—a major milestone on an acquisition journey that the Marines has been on since the early 1990s but one that won’t be over for another 15 years.

Commandant Gen. Joseph F. Dunford Jr.—confirmed to start as the new Chairman of the Joint Chiefs of Staff—made the announcement. It came on the last day of the July 2015 target set by the Marines in 2013, but well before the must-have date of December 2015. Dunford said Marine Fighter Attack Squadron 121 (VFMA-121) at MCAS Yuma, Ariz. had just passed an operational readiness inspection, where air-to-air, air-to-ground, close air support, armed reconnaissance, and other missions were demonstrated, some with live ordnance, and the F-35 passed with flying colors. He also said the F-35B did well in “multiple large-force exercises” in recent months. He said the unit had the requisite 10 aircraft of the same 2B configuration, plus 50 “trained and qualified” pilots, and about 500 maintainers to provide “autonomous, organic-level maintenance support,” thus meeting all IOC requirements.

Pentagon acquisition chief Frank Kendall cheered the announcement as a signal the F-35 program overall is “on track” and a sure sign it will deliver on its promises. In the same breath, though, he pointed out that “we still have work ahead” to deliver on software blocks and IOC for the Air Force and Navy with their versions of the F-35. The Air Force plans IOC with the F-35A for next August, and its requirements call for 12 to 24 aircraft in the 3I software configuration, plus spare parts and trained pilots. The Navy expects to be operational with the F-35C in late 2017.

The IOC announcement came with an asterisk: Marine Corps Lt. Gen. Jon M. Davis, deputy commandant for aviation, said though he was thrilled with the results of the ORI, “If I have any concern at this point, it is that the spare parts available to extract maximum value” from the F-35B “will be shy of what we truly need.” Davis said he hopes the F-35 will eventually be able to help the Marine Corps boost the full mission capable rate of its combat aircraft higher than the 70 to 75 percent range, where it is now.

A Lockheed Martin spokesman said it is working with the Marine Corps “every day to alleviate this concern.”

In several press conferences over the last year, Lockheed Martin F-35 Program Manager Lorraine M. Martin has said the parts issue stems from the fact that there are so many different configurations of the three F-35 variants—both flying and on the production line. Vendors are hard-pressed, she said, to make all the parts to both fill the operating needs of the 120

Lockheed Martin photo by Liz Kaszynski



**The Marine Corps declared IOC for the F-35B.**

or so F-35s now in service and provide modifications to bring older jets to current standards and to fill the supply racks for USMC and USAF units that need them to declare IOC.

After VMFA-121 is fully equipped with F-35Bs, Attack Squadron 211 is slated to trade its AV-8Bs in for Lightning IIs in 2016, and VMFA-122 will give up its F/A-18s for F-35s in 2018.

USMC plans to acquire 353 F-35Bs, as well as 67 F-35Cs, the big-deck carrier models. The Harriers will be fully retired in 2026, and the Marine F/A-18s will be phased out for F-35Bs by 2030. The F-35B will also replace USMC EA-6B Prowler electronic warfare jets, with one squadron transitioning in each of the years from 2017 to 2019. The Marine Corps expects to reach a peak production of F-35Bs in 2018, buying 20 to 24 aircraft a year.

The F-35B fulfills a Marine Corps vision from the early 1990s, when the service began planning for a replacement of the AV-8B. That program was referred to as the Advanced Short Takeoff/Vertical Landing (ASTOVL) aircraft.

Post-Cold War budget tightening compelled the Air Force to merge its multirole fighter (MRF) F-16 replacement and the Navy’s A/F-X attack airplane project with the Marine Corps ASTOVL. Harmonizing the disparate requirements of the three services fell to the Joint Advanced Strike Technology (JAST) office, which evolved into the Joint Strike Fighter program.

Lockheed Martin’s X-35 won the ensuing competition with Boeing’s X-32 in 2001, and the F-35A, B, and C efforts began what has become a 16-year development program. 🌟