

Goin' Agile



The F-22 Agile Integration Lab interlinks the 757 Flying Test Bed (shown here) with a sophisticated ground-based test and evaluation facility via a multicable “umbilical” cord. This provides the capability to test several avionics software versions dynamically during a single six-hour flight, land the aircraft, reconnect the umbilical and certify the upgrades against systems that don’t need to be tested in an airborne environment.

MARIAN LOCKHART PHOTO

F-22 team accelerates avionics modernization with new approach

By DOUG CANTWELL

The Seattle-based F-22 team cut the ribbon last month on a new approach to avionics development as well as a new facility.

The Agile Integration Lab consists of a ground-based facility interlinked by way of a supersized “umbilical” with the program’s re-activated Boeing 757 flying test bed. The AIL adds a dynamic test and evaluation capability that will fast-track the integration of new radar capabilities under Increment 3.1 of the Raptor avionics modernization program.

“As far as we know, this hasn’t been done before,” said Brian Harden, program manager for the AIL, referring to the concept of yoking a ground-based lab with an easily detachable dynamic test bed asset. “We operated at a plodding monthly tempo during the engineering/manufacturing/development phase, using a ‘fly-fix-fly’ approach. We can’t afford this in Increment 3.1.”

Increment 3.1 will endow the Raptor with exponential enhancements, such as synthetic aperture radar that will improve the pilot’s ground attack; mission systems that enable delivery of the Boeing-built, precision-guided Small Diameter Bomb; electronic attack capabilities to foil enemy air defenses; and dynamic retargeting that allows last-minute mission adjustments.

Boeing provides the wings, aft fuselage, avionics integration and training programs and part of the sustainment for the F-22.

FAILURE NOT AN OPTION

If you load a new version of avionics software on board an actual F-22 aircraft in order to flight-test it, you run into all kinds of bottlenecks, Harden explained. For one, you have to get the new software certified for “man-rated” systems—where there’s a test pilot’s safety at stake—that can eat up weeks of your schedule.

With the AIL, he said, “it’s not a stretch to say we can accomplish in a day what used to take a month.” His team can upload multiple software versions into the flying test bed’s workstations, test them during a single six-hour flight, land and park the airplane in its stall beside the ground-based lab, reconnect the umbilical, and certify the software updates in concert with F-22 systems that don’t need to fly on the test bed: weapons, engines and flight controls, for example.

The team faced a narrow window for standing up the AIL. If they didn’t meet their June 6 deadline for going operational, it would throw everything off cycle for flight tests at Edwards Air Force Base, Calif., scheduled to start in late 2009—thus delaying final certification and delivery of the new capability to the warfighter. “Our theme became, ‘What’s the value of a day?’” Harden said. “There was simply no time for procrastination or bureaucratic roadblocks.”

While his engineering team came up with the breakthrough concept of a combined airborne/ground-based test and evaluation facility, Harden was quick to mention they couldn’t have achieved it without a lot of timely help from sources across the enterprise.

“Boeing really came together as a company to support us,” he said. “We couldn’t have done it all ourselves—and we didn’t have to.” The Derivative Airplane Programs team in Seattle pitched in, as did the stress engineering support team in Wichita, Kan.

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— Brian Harden, program manager for the AIL

EXECUTE ‘BETTER THAN PLAN’

Harden and his team came to rely heavily on INARs, or independent nonadvocate reviews, to give them an outsider’s impartial assessment of their plans and progress. For the INARs, they recruited St. Louis colleagues from the F-15 and F/A-18 programs who had dealt with similar test and evaluation challenges.

“We all know you can get myopic in your approach and totally overlook something that can hurt your program,” Harden observed. “So we depended on these guys to find the chinks in our armor.” Harden’s team would ask the INAR reviewers two basic questions: Do we have an executable plan? If so, are we executing it?

The team also established key progress metrics early in the schedule, and worked to the watchwords: “execute better than plan.”

It wasn’t just enterprisewide support that covered their backs, Harden recalled. The open communication his team enjoyed with the U.S. Air Force customer and team partner Lockheed Martin made a huge difference. “We established an atmosphere of trust early on,” he said.

Brig. Gen. C.D. Moore, the F-22 program manager and a former Raptor test pilot, started things off with an unorthodox staffing decision. He assigned the member of his team who’d voiced the most skepticism regarding the AIL team’s success to oversee the project.

By picking this liaison, Moore figured he was less likely to hear sugar-coated progress reports or get blindsided by surprises. He asked for a weekly briefing that covered only the areas of concern and avoided routine information. “Gen. Moore knew we didn’t have time to spend working issues that weren’t issues,” Harden said.

The Lockheed Martin Raptor group initially was skeptical about the interlinked airborne/ground-based AIL solution. However, once the Seattle team convinced them it could be done—and would reduce cost and schedule risk—they jumped on board with both feet, Harden said.

THE FUTURE OF TESTING?

From its inception, this was a think-outside-the-box project. “What does your lab of the future need to look like?” was a question Harden would ask. In an era of ever-tightening defense budgets, the AIL team has found a way to use existing assets—and eliminate some of them—to provide more robust test and evaluation

capability at lower cost. But the new lab is not just about cutting costs or staying on schedule. The ultimate goal is to get new capabilities into the hands of pilots sooner—both to maximize their effectiveness and ensure their safe return from the mission. Perhaps the lab of the future has arrived. ■

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Both the 757 Flying Test Bed and the Agile Integration Lab house a full-scale F-22 cockpit. Here Brian Harden, AIL program manager (center), and Kelly Haynes, cockpit communications engineer (left), work with the FTB cockpit located in the 757’s cabin, which allows evaluation of the man-machine avionics interface under actual flight conditions.

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