

AVIATION WEEK

& SPACE TECHNOLOGY



F-22

COMBAT READY



F-22: UNSEEN AND LETHAL

Mass, speed and guile fail to score Raptor shootdowns during Alaskan exercises

As the F-22 begins its operational life, interest has turned to assessing just how well suited the stealthy Raptor is to its role as the premier air-to-air fighter, while taking a peek at some of the surprises for pilots and maintenance crews as they explore what the aircraft can do. As part of the research for this series of ar-

ticles on the F-22, Michael Fabey flew in the back seat of an F-15D while the Eagle and Raptor pilots demonstrated their aircraft's capabilities in the air-to-air ranges at Tyndall AFB, Fla. (For additional details of the Raptor's unique air-to-air capabilities, see AW&ST Sept. 6, 1999, p. 84.)

DAVID A. FULGHUM and MICHAEL J. FABEY/WASHINGTON

The F-22 is proving it's a dog-fighter after all.

While it wasn't part of a hard-turning furball, an F-22—with its Amraams and Sidewinders expended—slipped into visual range behind an F-16 and undetected made a simulated kill with its cannon during the stealth fighter's first large-scale exercise and deployment outside the continental U.S.

Those and other revelations about the F-22's emerging capabilities are increasingly important as the first combat unit, the U.S. Air Force's 27th Fighter Sqdn., begins its initial Air Expeditionary Force deployment this month to an undisclosed site. And the first F-22 unit, the 94th Fighter Sqdn., will participate in Red Flag in February.

The gun kill is a capability Air Force planners hope their F-22s won't use. The fighter is designed to destroy a foe well beyond his visual and radar range. Within visual-range combat and, in particular, gun kills are anachronisms. In amassing 144 kills to no losses during the first week of the joint-service Northern Edge exercise in Alaska last summer, only three air-to-air "kills" were in the visual arena—two involving AIM-9 Sidewinders and one the F-22's cannon.

The 27th Fighter Sqdn. aircraft—on



deployment from Langley AFB, Va.—didn't get to show off their J-Turn and Cobra maneuvers or their high-angle-of-attack, high-off-boresight (which actually will arrive with the AIM-9X) and unique nose-pointing capabilities. The reason, those involved say, was because the victims of the three encounters, flying conventional fighters, never had a clue they were being stalked by F-22s until they were "killed."

Raptor pilots agree that their preferred location for the fighter while in the battlespace is at high altitude, well above the other fighters, where they can adopt a fuel-efficient cruise, sweeping both the air and ground with radar and electronic surveillance for targets. From a superior altitude, the F-22 used sustained supercruise to range across hundreds of miles of airspace before an enemy fighter could threaten friendly high-value surveillance, command-and-control and tanker aircraft.

Perhaps the most important revelation by the 27th Fighter Sqdn. was demonstrating the F-22's ability to use its sensors to identify and target enemy aircraft for conventional fighters by providing information so they could engage the enemy sooner than they could on their own. Because of the advanced situational awareness they afford, F-22s would stick around after using up their weapons to continue providing targets and IDs to the conventional fighters.

"We always left F-22s on station to help, but we didn't designate any one aircraft to provide data," says Lt. Col. Wade Tolliver, the unit's commander. "It was critical that every F-22 out there provided all the data he had."

With its high-resolution radar, the F-22 can guarantee target altitudes to within a couple of hundred feet. Its ability to identify an aircraft is "sometimes many times quicker than the AWACS," he says. "It was a combination of high-

resolution sensors and being closer to the targets.”

The F-22's radar range is described only as being more than 100 mi. However, it's thought to be closer to 125-150 mi., which is much farther than the standard F-15's 56-mi. radar range. New, active electronically scanned radar technology—optimized for digital throughput—is expected to soon push next-generation radar ranges, in narrow beams, out to 250 mi. or more.

The ability to close on the enemy without being targeted also allowed the F-22s to operate in threat areas where conventional fighters could not survive. This enabled the Raptor to engage targets at a greater distance from the aircraft and homeland they were defending.

Raptor pilots had all the available data on the airspace fused and displayed on

observable UCAS in the battlespace. An air defense system pops up, and I click on a UCAS icon and drag it over [the emitter's location] and click. The UCAS throttles over and jams it, blows it up or whatever.”

In Alaska, because the F-22 remained far forward at high altitude, with an advanced radar it could monitor rescue missions that the AWACS 150 mi. away could not. “We could see the helicopters down in the valleys and protect them,” Tolliver says.

In addition to AWACS, the F-22 also can feed data to the RC-135 Rivet Joint signals intelligence aircraft to improve situational awareness of the battlespace.

“If a Rivet Joint is trying to get triangulation [on a precise emitter location], he can get more [voice] information” from an F-22, Keys says. “If an

The F-22's operating altitude and additional speed during the Alaska exercise also garnered praise.

“We stayed high because it gives us an extra kinetic advantage with shooting, speed and fuel consumption,” Tolliver says. “The Raptor typically flies way higher than everybody else and it handles like a dream at those altitudes.” Tolliver wouldn't confirm the operating altitude, but Pentagon officials have put it at 65,000 ft., which is at least 15,000 ft. higher than the other fighters.

“There were times we went lower, maybe to visually identify a threat or if we were out of Amraams and there was a bandit sneaking in at low altitude,” he says. “The Raptor would roll in and kill him with a heat-seeking missile.”

The lopsided combat ratio resulted because, “they never saw us,” Tolliver says. “We got there without being detected, and we killed them rapidly. We didn't do any major turning. It's not that the J-Turn maneuver isn't fun, but we didn't get a chance to use it.”

The F-22's Mach 1.5 supercruise capability also got a workout in Alaska. Because only eight F-22s were ever airborne at once during the exercise, four of them were constantly involved in refueling from tankers flying orbits 150 mi. away. Supercruise got the fighters there and back quickly. On station, the fighter would conserve fuel by cruising at high altitude.

“We also used supercruise quite a bit because the fight was on such a large scale,” Tolliver says. “The airspace was roughly 120 mi. by 140 mi. We could sit up at high altitude and save our gas and watch. We don't hang out at Mach 1.5. With our acceleration, when we saw the threats building, because we could see them so far out, we'd dump the nose over, light the burners and we were right up to fighting speed.”

During a typical day in the Alaska “war,” 24 air-to-air fighters, including up to eight F-22s, defended their aerial assets and homeland for 2.5 hr. Air Force F-15s and F-16s and Marine F/A-18s simulated up to 40 MiG-29s, Su-22s, Su-24s, Su-27s and Su-30s (which regenerated into 103 enemy sorties in a single period). They carried AA-10s A to F, Archers, AA-12 Adders and the Chinese-built PL-12. These were supported by SA-6, SA-10 and SA-20 surface to air missiles and an EA-6B for jamming. Each day, the red air became stronger and carried more capability.

As a result of all the emitters in the battlespace, the F-22's ability to map the



An F-15E, (left), F-15C and F-22 get together over one of Alaska's glaciers after racking up a combined one-day kill ratio of 83-1 during Northern Edge, the Raptor's first large-scale air-to-air exercise.

a single, easy-to-read screen.

“When I look down at my scope and put my cursor over a [friendly] F-15 or F/A-18, it tells me who they are locked on to,” he says. For example, “I could help them out by saying, ‘You're double-targeted and there's a group over here untargeted’ . . . to make sure we got everybody.” F-15 targets will be latent because of the radar sweep.

However, these messages are less and less verbal. “When you watch [tapes of the Alaska] exercise, it's fairly spooky,” says Gen. Ronald Keys, chief of Air Combat Command. “There's hardly a word spoken among Raptor pilots.” That silence also previews some of the fighter's possible future capabilities.

“Because of the way the aircraft was designed, we have the capability to do more,” Keys says. “We can put unmanned combat aircraft systems in there with Raptor. You've got three fairly low-

observable UCAS sees a heavy group 40 mi. to the north, Raptor can come up and say it's two F-18s, two F-15s and four F-16s.”

Moreover, Keys says, modifications are underway to transmit additional target parameters—such as sensitive, high-resolution infrared data—from the F-22 with a low-probability-of-intercept data link.

“Getting data into an F-22 is not hard,” Keys says. “Getting it out [while staying low observable] is more difficult. We bought the links, but we just don't have them on yet.”

The F-22's advanced electronic surveillance sensors also provided additional awareness of ground activity.

“I could talk to an EA-6B Prowler electronic attack crew and tell them where a surface-to-air missile site was active so they would immediately know where to point their electronic warfare sensors,” Tolliver says. “That decreased their targeting time line considerably.”

In addition, the F-22 can use its electronic surveillance capabilities to conduct precision bombing strikes on emitters—a capability called destruction of enemy air defenses.

“And future editions of the F-22 are predicted to have to have their own electronic attack capability so that we'll be able to suppress or nonkinetically kill a site like that,” he says.

electronic order of battle (EOB)—what’s emitting and from where—proved critical.

“I love intel, but it’s only as good as the last time [analysts] got a data update, which could have been hours or even a day earlier,” Tolliver says. An F-22 “gets rid of the time delay. I can plot an EOB in real time. I’m not saying we’re better than a Rivet Joint, but I can go places that it can’t. If he’s 150 mi. away, he’s probably not going to be able to plot a high-fidelity threat location as quickly as I can.”

The adversaries were wily and didn’t want to lose.

“We had guys running in at 500 ft. off the deck,” Tolliver says. “We had guys flying in at 45,000-50,000 ft. doing Mach 1.6, trying to shoot me before I know they are there. They would mass their forces and try to win with sheer numbers. None of it worked.”

A tactic used by the F-22s was actually developed and practiced in smaller scale at Langley before the exercise. Raptors worked in pairs, integrated with F-15Cs or F/A-18E/Fs.

“I could help target for them from behind and above,” Tolliver says. “We really don’t have a name for what we were doing other than integrated ops. I was able to look down and smartly target F-15s or F/A-18s to groups at ranges where they could not yet [detect] the target.”

Yet, there are a number of F-22 capabilities that are shrouded in mystery, including electronic attack, information warfare and cruise missile defense.

“It’s no secret that one of our mods is to put electronic attack on board and then we will play a role in combating networks,” Tolliver says. “We’re already involved in the collection part. When we come back from a mission, we have the ability to download EOB data that’s turned into intelligence pictures. This makes us an intelligence platform doing nontraditional ISR by bringing back emitter data so that teams can go out and conduct information operations.”

The next step will be to pass the detailed information about surface-to-air missile locations, capabilities and emission details (called parametrics).

“If I have characterized, say an SA-10, I can send it verbally to AWACS and they can send it out to other platforms,” says Maj. Shawn Anger, an F-22 instructor with the 43rd Fighter Sqdn. at Tyndall AFB, Fla. However, “I can’t pass the parametrics characterization. Hopefully, we’ll be able to shoot it up the radar”—a new capability for the radar, which is being developed to send large,

Turn and Burn

Raptor’s gunfighting heritage hasn’t completely disappeared

MICHAEL J. FABEY/TYNDALL AFB, FLA., and DAVID A. FULGHUM/WASHINGTON

Fighting in—or against—the F-22 is a singular event, humbling and frustrating to its victims, and often startling to its pilots, who describe each flight as a learning experience.

The first thing anyone learns about the U.S. Air Force’s Raptor is that it isn’t envisioned as a dogfighting aircraft, mixing it up with other high-performance fighters.

Its strengths—which are being explored daily by test, training and operational units—include pervasive situational awareness of what’s in the battlespace gathered by the aircraft’s active electronically scanned array (AESA) radar, electronic surveillance and infrared sensors. Moreover, information is piped into the aircraft through data links to off-board sensors and other intelligence sources. The range of its sensors out-distance those of non-AESA aircraft, allowing it to strike a foe that’s still unaware of the F-22. The Raptor’s stealth enables it to operate 150 mi. ahead of large-sensor aircraft and well above legacy aircraft, where it can use its acceleration and high-resolution view of the battlespace to greater advantage. A newly emerging strength is the F-22’s “mini-AWACS” capability that allows

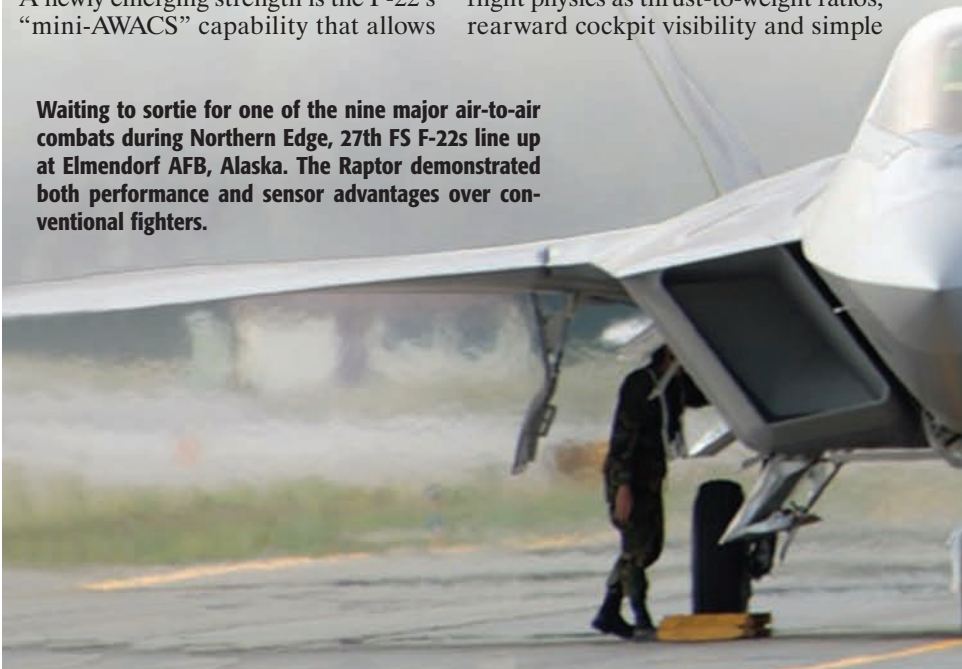
targets to be designated for conventional F-15s or F-16s.

However, the question periodically resurfaces about whether the F-22 could hold its own during a within-visual-range fight with a very maneuverable fourth-generation fighter such as the Sukhoi Su-27 and Su-30, Eurofighter or Dassault Rafale. The answer will never be obvious to an outsider. The Raptor’s high-angle-of-attack capabilities are part of the formula of classified tactics that are closely held. But, roughly, its unique maneuvering and nose-pointing options—plus the high off-boresight capabilities of the AIM-9X missile, which is to be added about 2010—give the aircraft previously unheard-of means of quickly shooting down a foe.

Nonetheless, chasing an F-22 in a two-seat F-15D—which carried reporter Michael J. Fabey—provided perspective about their comparative capabilities. A recent flight started with F-15 pilot Capt. Andy (Bishop) Jacob flying alongside an F-22 piloted by Maj. Shawn (Rage) Anger in the air-to-air ranges above Tyndall AFB, Fla.

Opponents of further Raptor procurements argue that going by such basic flight physics as thrust-to-weight ratios, rearward cockpit visibility and simple

Waiting to sortie for one of the nine major air-to-air combats during Northern Edge, 27th FS F-22s line up at Elmendorf AFB, Alaska. The Raptor demonstrated both performance and sensor advantages over conventional fighters.



aircraft size, the F-22 ranks below the F-15 and other earlier fighters.

Aerial engagements like the encounter between Anger and Jacob are supposed to help prove the Raptor's case. Still, one argument offered by F-22 opponents is that the jet's reported victories over F-15s are often scripted and unreliable gauges of Raptor superiority.

The Raptor's silhouette stood out against the thick wool of clouds building nearly 18,000 ft. up. The two airplanes lined up their noses on an imaginary starting line and accelerated from 250 kt. at an altitude of 13,000 ft.

Inside the F-15, Jacob's body slammed backward and the two fighters stayed even for about 10 sec. The F-15 hit 450 kt. in full afterburner in level flight after 20 sec. The F-22 hit 500 kt. in maximum afterburner and pulled away, ending the race. Jacob laughed. "That's it," he said. "My F-15 can't accelerate any more."

The F-15 was designed and built to be a quick, maneuverable dogfighter. It has Pratt & Whitney F100-P-W100 turbofan engines powering a lightly loaded and advanced airframe. Weighing in at about 42,160 lb., the F-15 has a thrust-to-weight ratio approaching 1.2 (when stripped and not in a combat configuration) and a wing loading of about 69 lb. per sq. ft. By comparison, the F-22 has a thrust-to-weight ratio closer to 1 and wing loading of about 80 lb. per sq. ft. But the Raptor has two Pratt & Whitney's F119 low-bypass, augmented 35,000-lb. class engines with two-dimensional vectored thrust nozzles.

Jacob circled above the Raptor as Anger put the fighter through several maneuvers. He illustrated three key tac-

tical moves—the J-Turn, high-alpha turn and the classic, Russian Cobra. There are times during an air-to-air engagement when any of them could be employed, but the J-Turn is used more than the Cobra, says Lt. Col. Wade Tolliver, commander of the 27th Fighter Sqdn.

Roughly, the J-Turn begins with the nose of the F-22 pointed up. Then, at high alpha (angle of attack), the rudder is kicked and the nose swings until pointed downhill. F-22 pilots describe a flight path mimicking the shape of a candy cane. The J-Turn is a vertical maneuver used to quickly reverse the aircraft's direction using a very small turn radius.

After a planned stall, Anger's Raptor pivoted through a rapid-minimum, 180-deg. J-Turn at 250 kt. in maximum afterburner with full aft stick. It's also known as the "Herbst Maneuver," after Wolfgang Herbst, a German proponent of using post-stall flight in air-to-air combat.

The aircraft pulled into a 60-70-deg. bank, nose high, with roughly a 60-deg. angle of attack. Anger applied full stick and pro-rudder, turning into the aircraft's roll. The Raptor's nose yawed down into the vertical.

For the second maneuver, Anger pulled the Raptor into a high-alpha loop, powering again to 250 kt. He pulled 3-4g to about 180 kt. in the pure vertical, reaching 20-30 deg. past the vertical with full aft stick. The AOA increased beyond 60-70-deg. alpha as the upward motion slowed. Normally a rapid pitch rate would stop the aircraft's nose, but thrust vectoring carried the F-22's nose back over the top, completing the loop.

In contrast, the legendary Cobra maneuver is done from the horizontal

plane, and the nose pitches up past vertical and returns to the horizontal after a pronounced deceleration.

To force an opponent to overshoot, Anger yanked the Raptor into a dynamic, nose-high attitude made possible by brute engine power—a maneuver that Russian Su-27 pilots introduced to air show crowds. First, Anger slowed to 250 kt., pushed both throttles to the military power detent, then pulled the control stick to its full-aft position. The Raptor's nose pitched up to a 60-70-deg. attitude, so the fighter's belly remained aligned with the flight path, creating enough drag to immediately slow the aircraft substantially. He then pushed the stick full forward to snap the Raptor's nose back to level flight.

The Cobra is used to "gain high ground and stop your forward travel," Tolliver says. "The Cobra is a great air show maneuver, but most of us don't typically use it during aerial combat."

Fighting—or even keeping up with the Raptor—requires extremely fast assessment and reactions. "Faster than required for any other aircraft I've flown against," Jacob says.

Anger and Jacob had planned to engage in mock combat. However, a flashing indicator light warned that something could be wrong with the F-22. But the flight was enough to make a believer of Jacob. "Maybe, with some tricks or tactics, I can beat it," he said. "But that would be a one-time set of circumstances. As for a Raptor-beating tactic—there's no such thing." ✕

For F-22 video, see www.aviationweek.com/f22



ERIC HEHS/LOCKHEED MARTIN

Away Game

First F-22 large-scale, air combat exercise wins praise and triggers surprise

DAVID A. FULGHUM/WASHINGTON

ANDY WOLFE/LOCKHEED MARTIN



The U.S. Air Force's oldest (F-117) and newest (F-22) operational stealth fighters fly together over a test range in the southwest U.S. But the Raptor brings far greater capabilities in speed, altitude and intelligence-gathering to the fight.

It's high drama. The first combat squadron of F-22s goes on its longest deployment—3,200 naut. mi. away—with an immature aircraft and a new skipper.

Despite the potential for unknown problems and the uncertainty of being far from its maintenance base in Langley AFB, Va., the 27th Fighter Sqdn. was able to go to war for two weeks with 12 F-22s. Every flying day of the Northern Edge exercise in Alaska, the truncated force was able to launch eight aircraft for a 2.5-hr. mission, return, re-arm and then launch six aircraft, says Lt. Col. Wade Tolliver, who at the time of deployment had been squadron commander for two weeks. While no more than one-third of the defending force, the F-22s generated 49% of the air-to-air kills.

And perhaps the most pleasing vindication for the F-22 design was avoiding the stealth maintenance problems that dogged the B-2 bomber during its early deployments. Repairing and curing the exterior finish of the B-2 required a special climate-controlled hangar wherever it went to ensure that it stayed low observable (LO).

"You have to maintain the signature of any LO aircraft," Tolliver says. "They were able to take care of it in Alaska with no problem. Here at Langley we have a special facility. In Alaska we did

our [stealth] repairs on the flight line or in a normal hangar."

What Tolliver didn't discuss was the F-22's Signature Assessment System.

"SAS will tell you if you can ignore the accumulated scratches and dings," says an official involved in the Raptor program. "If you have sufficient LO margin, you don't have to make immediate repairs and can simply wait until the return to Langley. The stealth signature is still not easy to fix, but the stealth coatings are not as fragile as they were in earlier stealth aircraft. It isn't damaged by a rain storm, and it can stand the wear and tear of combat without degradation."

"The biggest success at Northern Edge was maintenance," Tolliver says. "We were tasked for 105 sorties; we launched 102. That's a 97% sortie generation rate. That's incredible on an immature fighter. Since we were doing eight turn six [launching eight F-22s, then returning and launching another six] the whole time with 12 jets, that resulted in a 21.8 utilization rate. Normalized over a month, that means each plane would fly 21.8 times."

The squadron sent a relatively compact organization to Alaska to support the exercise.

"The deployment plan was two KC-10s dragging 12 F-22s from Langley to Elmendorf," Tolliver says. "It's an 8-hr.

flight and 3,200 naut. mi. We took all our people with us [218 personnel] on the two KC-10s except for the 15-member advance team we sent about three days earlier. They're there early to set up and have guys ready to catch the airplanes when the jets land."

To prepare for the trip, the squadron stopped flying three days prior to prepare the F-22s. Two days prior, they readied all the cargo. One day prior, the pilots and maintainers had a final briefing and planners finalized which 12 aircraft would be deployed.

The support package included the equipment and spare parts to maintain the aircraft for 45 days. In the mix were two extra Pratt & Whitney F119 engines. They had to take F-22-specific aircraft support equipment with them because none is distributed around U.S. bases, as is done for F-15s and F-16s.

"That equated to 63 increments of cargo [pallets carrying 170 short tons]," Tolliver says. "That's about five C-17 equivalents. What didn't go by air went by truck and then ferry to Alaska. That's about in line with what's needed for 12-15 F-15Es going to a bare base."

When the system matures, around 2010, Air Force planners hope to cut that number. They want to deploy 24 F-22s with just seven C-17s loads—about 30% less than today. However, program officials say that by summer 2009, they

want the requirement further reduced to about 50%.

"But now, we're still taking a lot of extra parts and equipment because we don't know what's going to break," Tolliver says. "As we fly more and more, we learn that. Once we get the F-22 fully deployed, some of that aircraft-specific, mission-generation equipment will be other places."

A point of pride for the 27th was that crews were able to generate local sorties the day after they arrived in Alaska at the end of their long flight from Virginia.

Northern Edge was a two-week, large-force employment exercise, the F-22's first. More than 5,000 troops from 36 units participated. There were nine large-force employment periods—each about 2.5 hr. long—during the two weeks. The F-22 flies about 1.25-1.5 hr.

without refueling, much the same as an F-15 or F-16, so the unit was involved in a lot of refuelings. The missions were mostly flown over the Pacific-Alaskan Range Complex and the Gulf of Alaska. The range is about 120 X 140 mi.

"The airspace was awesome because we had the surface to 60,000 ft., could fly supersonic, chaff and flares allowed, so everything was really good," Tolliver says. "Another big benefit was the ability to operate with joint assets. The services are busy around the world, and trying to get together and operate as a joint combat unit on this scale is tough. Taking this new fighter and integrating it with all the proven assets ensure that the first time we go to war is not the first time we've operated together."

Participants claim that everybody connected with the F-22 force did better in the exercise because of the

situational awareness that the Raptor provides.

The Langley F-22s will have another busy year in 2007. The 27th Fighter Sqdn. will make its first air expeditionary force rotation. The AEF requirement involves a 20-month cycle subdivided into four-month increments. They train for 16 months and then deploy four months. The Raptor's first AEF starts in January.

"We're anxiously awaiting our orders to deploy somewhere," Tolliver says. "We know they want us to go. The pilots and maintainers are combat-ready. I'd love to go into [the Iraq/Afghanistan] theater and contribute to the war, but I don't know. If they want us to contribute, we're ready."

Meanwhile, the 94th Fighter Sqdn., which is just becoming operational, will be the first F-22 unit to participate in Red Flag at the end of this month. ☒

EDITORIALS

Apparently the F-22 Raptor, the newest aircraft in the U.S. Air Force inventory, isn't the Cold War anachronism its detractors thought it would be. In fact, evidence to date suggests the stealthy fighter is worth more than skeptics expected.

At a current flyaway cost of \$136 million, the Raptor will never be a bargain. The procurement quantity will be an issue as long as it is in production. But the aircraft's first large-scale deployment, and its performance in the joint-service Northern Edge exercise in Alaska (see p. 46), show that taxpayers are getting high value for the high cost.

After that exercise, the F-22's advantages of speed, altitude and stealth are undeniable. The Raptor flew 10,000 ft. higher than its "opponents," and it used its supercruise capability to dash back and forth across a huge battle space. Even when the F-22 moved within visual range to "kill" an F-16 with its cannon—a weapon it may never use in combat—the "enemy" never knew it was there.

Raptor pilots never had a chance to show off their J-turns, high-alpha loops and high off-boresight capabilities. But never mind. Virtually no one believes the F-22's primary role will be mano-a-mano aerial combat against previous-generation fighters. Far more important, the aircraft showed some of its value in intelligence-gathering and surveillance, which kept it over the battlefield long after it had fired its weapons.

No Cold War Vestige, F-22 Is Proving Its Net-Centric Mettle

Loitering at high altitude, F-22s were able to identify targets accurately enough to satisfy the rules of engagement and pass them along to conventional fighter aircraft for precise, long-range kills. The F-22 can perform some surveillance/target identification and signals intelligence missions

of AWACS and Rivet Joint aircraft, respectively. But unlike those aircraft, which must stay 150 naut. mi. or more away from many hostile forces, the stealthy F-22 can fly over targets with impunity. It can build a fresh, up-to-the-moment electronic order of battle—the type and location of enemy emitters, in the air and on the ground—as it enters an area.

In the future, F-22s will analyze and pinpoint the low-power wireless communications networks that insurgents use to organize and trigger weapons remotely. Using low-probability-of-intercept data links, F-22s will send information they collect to other aircraft and intelligence networks.

This auspicious beginning shows the F-22 has much to offer in today's warfare against insurgents and less-than-superpower forces, not just the future high-tech conflicts it was designed to deter. We're looking forward to learning more about this versatile aircraft and the roles it can play in transforming more of the last superpower's combat edge, from the realm of explosives to the world of electronics and networks. ☒



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