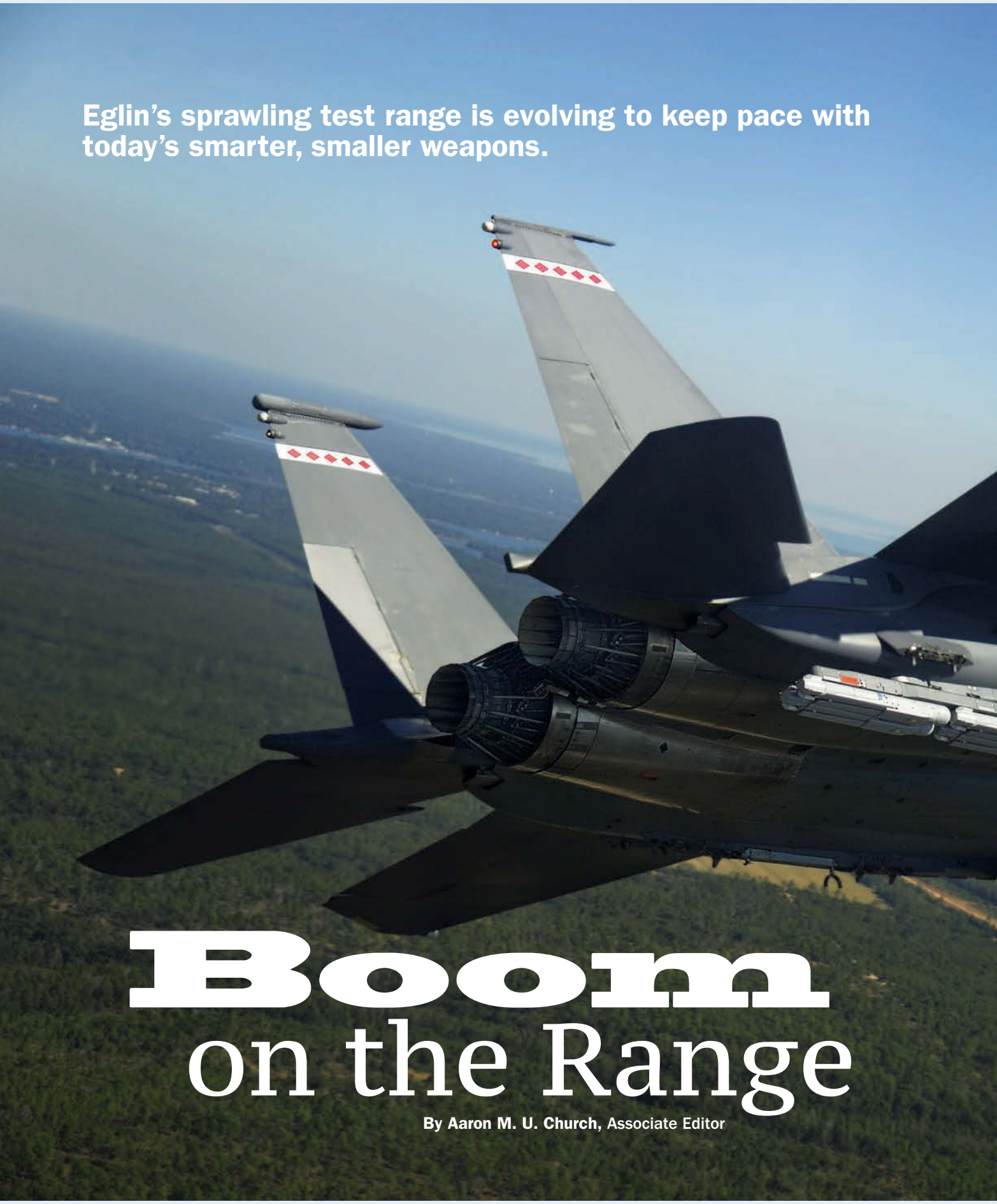
Eglin's sprawling test range is evolving to keep pace with today's smarter, smaller weapons.



Boom on the Range

By Aaron M. U. Church, Associate Editor

The Eglin Gulf Test and Training Range is considered one of the crown jewels of the Air Force. The enormous land-and-water range plays host to every phase of an aerial weapon's life, from development and testing through operational use, and the service is determined to preserve this unique capability for weapon evaluation.

Overseen by the 96th Test Wing at Eglin AFB, Fla., the range covers some 724 square miles of the Florida panhandle, and its overwater expanse stretches the length of Florida from Key West to Eglin, encompassing a mind-boggling 120,000 square miles of the Gulf of Mexico. It is the Defense Department's largest range.

"We truly believe this is ... one of the nation's treasures," 96th Range Group Director Richard Ulrich said in a recent interview. The Air Force wants to "protect this capability for our country," providing the means to test the next generation of cutting-edge weapons, he said. Longer ranged "standoff" and future hypersonic weapons demand more room for testing.

The Small Diameter Bomb II is one of the new wave of weapons pushing the range to advance and expand.

"This is one of our first adverse-weather weapons that's able to acquire, track, and defeat" moving targets, said James F. Carter, miniature-munitions engineering director of the Air Force Life Cycle Management Center's Armament Directorate. "We like to characterize it as our next generation in miniature munitions." SDB II was cleared for low-rate initial production in June, and it is wrapping up developmental testing at Eglin.

The Air Force plans to buy at least 17,000 of the 250-pound winged glide bombs, to arm the F-15E Strike Eagle by 2018, followed by the F-22 and F-35. SDB II is also the first "net-enabled weapon" that can be retargeted in flight by either aircrew or joint terminal attack controllers on the ground.

"If they decided that they don't want to hit that target, they can abort that weapon" and it will go off to some preplanned set of coordinates and self-destruct, he said. "It's a very powerful and flexible

Raytheon photo

An F-15E Strike Eagle carries a load of Small Diameter Bomb IIs on a test sortie over Eglin AFB, Fla. The F-15E will be the first aircraft cleared to employ SDB II operationally.

weapon" that must be very accurate to make its small warhead effective against a moving vehicle.

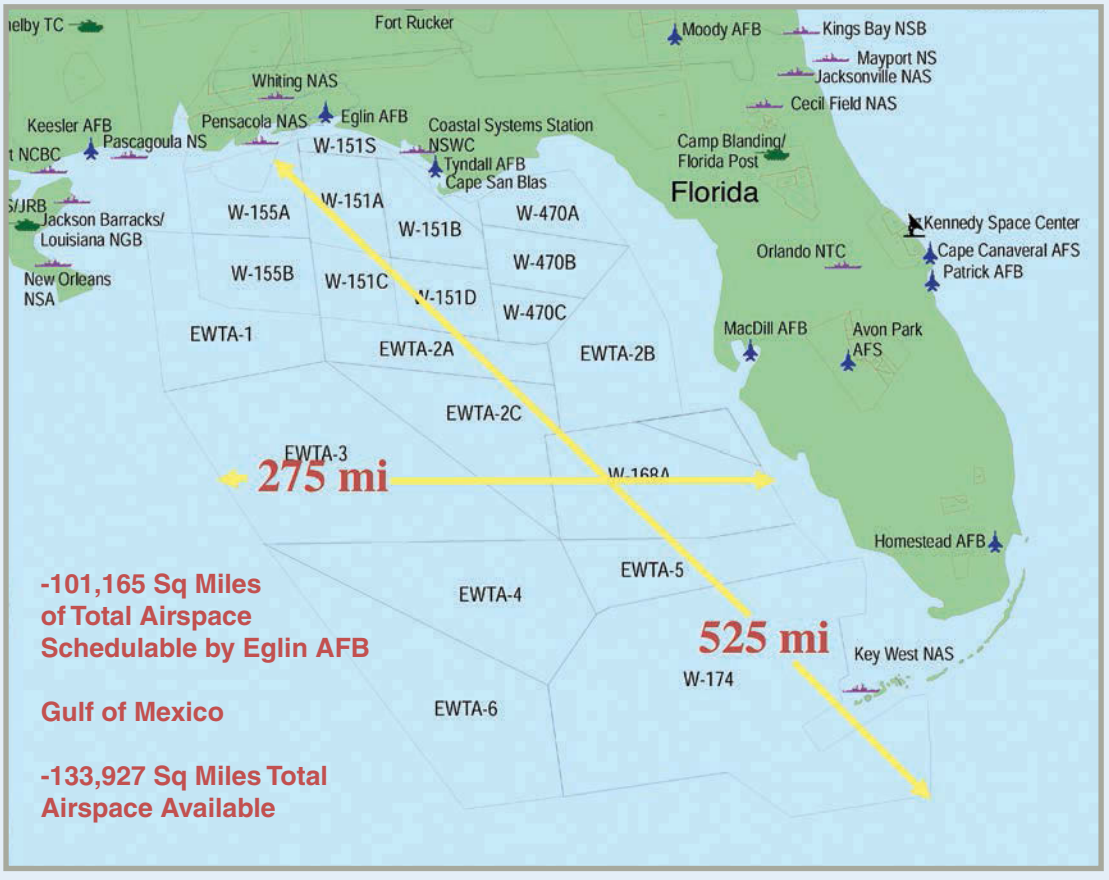
To develop and test a weapon like SDB II demands modern facilities, support, and expertise, all offered by Eglin's various tenants.

Eglin's resident 96th TW is the largest in the Air Force, and its tenant organizations encompass every facet of weapons development, testing, and support. The SDB II project "has used every bit" of those assets, said Carter.

The Air Force Research Laboratory explored concepts at Eglin that became the basis of SDB II almost 30 years ago. "They did a lot of work in the '90s on dual-mode seekers, the development of software to support those seekers, [and] research on explosives" that have all become part of today's SDB II, Carter explained. The weapons program office—also on base—is helping prime contractor Raytheon build a developmental test plan, while the test wing supplies everything to carry it out.

"They'll provide the aircrews, the maintainers, the range, the target, ... conduct the test, collect the data, and then we'll all jointly sit down and review," said Carter.

Across the street, the 46th Test Squadron maintains a dedicated test fleet of A-10s, F-15C/Ds, F-15Es, F-16s, and UH-1N helicopters. The range group furnishes everything from targets and sensor testing to range control, telemetry, and data collection. When the weapon moves to operational testing, the Air Force Operational Test and Evaluation Center Det. 2—also at Eglin—will determine its readiness for combat.



USAF map by 96th Test Wing

The Eglin Test and Training Range covers some 724 square miles of the Florida Panhandle and 120,000 square miles over the Gulf of Mexico.

SMALL DIAMETER BOMB II TEST UPDATE

The Small Diameter Bomb II took a big step forward on June 12, when Air Force officials cleared Raytheon to begin low-rate initial production, issuing a $31 million contract.

"Our first production lot—LRIP Lot 1—is for 144 weapons to support our initial fielding on the F-15E," James F. Carter, Air Force Armament Directorate miniature-munitions engineering director, told *Air Force Magazine*. Raytheon will start production next year, and plans call for 11 production lots spanning 17,000 weapons over the coming years, he said.

To date, manufacturer-led developmental testing has focused on honing the 250-pound weapon's "normal attack" mode, which pairs infrared and millimeter-wave radar to strike moving targets in all weather. "We still have to do our laser attack testing," Carter noted, and "we also have coordinated attack testing."

USAF is "anxious to get this weapon out in the field to be employed in the kind of situations that we're seeing today" against enemies such as ISIS in Iraq and Syria, he said.

After developmental testing, SDB II will undergo government confidence trials where "we're going to stretch the capability of the weapon [and] ... test the edges of the envelope," Carter added. This includes pitting the weapon against inclement weather, maritime conditions, and adversary countermeasures to "see how it performs" under stress.

The SDB II offers new challenges, but the 96th Range Group at Eglin is a test support veteran, epitomized by its mobile, unmanned target program.

"We've been doing unmanned ground vehicles [since] before unmanned ground vehicles were cool," said 96th RG engineer Maurice Bobbitt. SDB II is, however, driving a sharp uptick in demand. In 1987, "we started with 15 unmanned targets" a year, a level matched during a single one-week test in 2015. This year, for SDB II alone, "I'm building up 53 vehicles, ... so the growth has been significant," Bobbitt said.

Because SDB II is designed specifically for use against moving targets—both on land and at sea—it's "a little bit more complex" than its GPS guided predecessor, according to Carter.

To support this requirement, the range group has some 2,000 vehicle targets available—everything from pickup trucks to tanks. These vehicles provide SDB II "the moving target piece that we need when we go test," said Carter. When "customers" ask for the kinds of targets that are available to test against, Bobbitt answers, "pretty much anything you can think of on the domestic side," and "more than you think" would be available for foreign types of vehicles.

Lockheed Martin photo by David Henry

An F-22 releases four SDBs at Mach 1.6 in an earlier test. SDB II adds additional all-weather and moving-target capabilities and will eventually be integrated onto the F-22.

Bobbitt's team outfits each vehicle with instrumentation tailored to the specific data-gathering requirement of a given test shot. The target flight can also install "tele-operated" controls on anything from a Russian "T-72 tank, or a five-ton wheeled truck, or a Toyota Tacoma," Bobbitt said. The cheap, commercially available system allows operators to drive a target from the safety of a control room 20 miles away.

"It looks like a video game, so we make sure we train people heavily in Xbox," joked Bobbitt. "I haven't put it on a motorcycle or Segway yet, but I'm hoping to."

Human controllers often aren't predictable enough for scenarios that are tightly timed or require highly consistent performance. Humans also have trouble controlling remotely controlled targets at high speed. So in 2009, the group developed a semi-autonomous system that allows vehicles to run at preprogrammed routes and speeds.

"If I want it to be on time at any point within a second, it's there," said Bobbitt. The system can control vehicle targets driving up to 90 miles per hour—valuable for testing weapons like SDB II. Armed pickups—called "technicals"—of

SrA. Roderick Ponton, a 96th Aircraft Maintenance Squadron crew chief, launches an F-16 from Eglin. The 46th Flight Test Squadron operates a mixed fleet of F-16s, F-15s, A-10s, and UH-1Ns to support weapons testing on the range.

USAF photo by Samuel King Jr.

the type used by insurgents in Afghanistan, Libya, Iraq, and Syria "are becoming a big threat" and they travel much faster than average military vehicles, Bobbitt said.

Providing realism in target vehicles doesn't necessarily mean lavish spending if it's not necessary. The steering wheels and interface used to drive tele-operated targets are things "you can go to Walmart and buy," Bobbitt said. The cost of the control facility is "surprisingly low since we used existing capabilities instead of building specialized components."

The team won't destroy a hard-to-get Russian mobile air defense radar if it can be simulated instead, either. Often, the high-end equipment will provide convincing effects from a distance but "a much lower-cost target" can be the focus of the weapon, he said.

outboard engines, capable of moving at 45 knots in moderate sea conditions.

"We put this out in the Gulf of Mexico and they target it and shoot it," Bobbitt said, giving testers "a maritime presence that we simply didn't have before." The SDB II program alone will drop an estimated six live and 12 inert weapons against maritime targets this year, according to the range's 2014 environmental assessment.

Tracking multiple boats speeding in circles off the Florida coast—or damaged and drifting in Gulf currents—was another challenge overcome with a cheap, sensible solution. Unlike the tele-operated vehicles, the HSMSTs lack cameras for situational awareness, so "what we did is develop a satellite tracking system that we put on the target," Bobbitt


USAF photo by SSgt. Stacia Zachary

MSgt. Brian Mosier adjusts an SDB II pneumatic carriage system used to mount the weapon on the aircraft.


USAF photo by Samuel King Jr.

Maj. Joe McGill preflights an A-10C at Eglin. The 40th Flight Test Squadron provides in-house test support to weapon development and test programs.

With the advent of weapons like SDB II and the Joint Air-to-Surface Standoff Missile (JASSM), "maritime seems to be our biggest growth" area, driving the development of "smart" maneuverable surface targets as well, Bobbitt said. Eglin turned to the Navy to avoid developing a custom system from scratch. "We're very much into trying to save customer money, because we're blowing stuff up," he pointed out.

Eglin's Navy-developed High-Speed Maneuverable Surface Targets (HSMSTs) are 27-foot speedboats with a pair of 250 horsepower


USAF photo

A munition impacts a barrier in a sled-track test at Eglin. The 96th Range Group develops, maintains, and operates a wide variety of specialized targets, infrastructure, test facilities, and instrumentation.

said. "It's commercially available. ... It feeds back through the Internet" and uses Google Earth to display each target's position in real time. The total cost of the system was less than $5,000 and provides "situational awareness of what's out there at any point," he said.

The range's long, narrow sound along Santa Rosa Island is one of the only places that both land and sea targets can be engaged simultaneously. SDB II testers can "have vehicles that are running up and down the road and then boats that are running in the bay" at the same time. This lets testers evaluate the seeker's ability to discriminate between the targets and "be able to track both," explained Carter.

Some of the group's most advanced test capabilities aren't on the range but in the lab. Facilities like the McKinley Climatic Laboratory, where jets can run their engines in temperatures from -65 degrees Fahrenheit to 165 degrees Fahrenheit, are "unique in the world," said Jerry Griffin, technical director with the group's 782nd Test Squadron.

SDB II, with its complex seeker that bundles millimeter wave radar, infrared, and laser guidance, makes intensive use of the group's Guided Weapons Evaluation Facility (GWEF).

"What we do is take the smart end of a weapon, ... bring it into our facility and wrap a virtual world around it to fool it into thinking it's flying," Griffin said. This reduces the need to waste expensive seekers in multiple live-drop tests just to "make sure that system can work in all the targeting and engagement scenarios that it's going to encounter." The facility runs approximately 45,000 simulated weapons engagements each year at a cost of about $100 per run.

"Doing that in a flight test would be hundreds of thousands of dollars for a single engagement," Griffin said. The facility evaluates the effectiveness of US seekers and countermeasures, as well as how to thwart adversary systems.

"Every few months some new threat system will come out and we need to worry about our survivability against those systems. That's what generates that large number of runs," he noted.

Given Eglin's proximity to inhabited areas, the one thing SDB II testers can't do is over-land testing of a full-up live weapon. That work is done at White Sands Missile Range in New Mexico.

SDB II "has a 40 nautical mile range, so if something went wrong, it has a lot of area that it could cover," Carter pointed out. "We do very few all-up round live tests here at Eglin, strictly because of the kinematic footprint."

To cut down on the number of live shots at White Sands, Eglin conducts "hybrid shots" instead. A guided test vehicle—essentially an SDB II with a self-destruct system instead of a warhead—is dropped against a moving vehicle while being filmed by high-speed cameras. The cameras capture the weapon's exact orientation at the point of impact. This lets technicians "set up a static arena test" in a safer place. The weapon is placed in exactly the same position relative to an identical target, then detonated.

"Between the two, you have a very similar test to what you would've gotten out at White Sands," without as much cost or risk, Carter said.

Eglin is looking to make greater use of its overwater range space, to permit the testing of future long-range strike weapons. The range can already test long-range weapons like the Tomahawk cruise missile. Two were launched from Key West, over the Gulf to Eglin during an *Air Force Magazine* visit in June.

"What we're looking to do is to expand our testing out into the Gulf" with longer range instrumentation and telemetry, range director Ulrich explained. By networking several dispersed instrumentation sites, the range group is able to track tests across a wider area. Over the Gulf, though, even with tower-mounted instrumentation on Santa Rosa Island, testers can only gather full test data up to 26 miles offshore.

A lineup of aerial target drones await launch over the Gulf of Mexico from Eglin.

"When you look at long-range strike, with ... hypersonics and those type of things, you need a lot of area, and you need to be able to capture that" data over the entire flight path, he said. "Capturing something that flies by at very high speed is going to be challenging in the future."

Like Edwards Air Force Base in California, Eglin is struggling with an FCC decision to auction off some of the telemetry frequency bands to the telecom industry. Controllers can track chase airplanes and test articles like the Tomahawk from the southern tip of Florida, but some of the frequencies used to do that "we've lost, so we've got to replace that capability," said Chris Nixon, director of the 96th RG support squadron. This means retrofitting the wing's test aircraft with new transmitters and updating the range's telemetry receiver stations by 2023 "to make sure we can capture that data on the new frequencies."

Eglin's test mission is also suffering from physical encroachment—less from the surrounding community than from military training on the range itself.

Range crowding has been a problem since the 2005 Base Relocation and Closure (BRAC) round consolidated several units and training functions to Eglin.

Big as the land is, "we have both limited airspace and limited land ranges," Ulrich said. In addition to the 96th TW, Eglin now hosts the joint service F-35 schoolhouse and the 7th Special Forces Group that moved from Fort Bragg, N.C. "They've come here and changed the mission set on the ground ... so that is always a challenge," he said. ✪