



USAF photo by SSgt. Aaron Allmon

# JSTARS Wars

The Air Force's E-8 Joint STARS is proving to be a powerful force in the Afghanistan war.

By Rebecca Grant

**A**fghanistan's remote valleys and hills can cut off communication and make it hard for forces to see Taliban and insurgents on the move. Enter the E-8C Joint STARS, the Joint Surveillance Target Attack Radar System.

Nightly Joint STARS orbits support forces in Afghanistan and Iraq with a combination of radar surveillance and communications links, including 22 radios, eight data links, and a secure telephone, putting it in the thick of ir-

regular warfare tasks such as providing ground moving target indicator (GMTI) sensors.

"There's an insatiable demand for ground moving target indicator [data] right now," said Lt. Col. Thomas Grabowski, chief of plans and programs at the 116th Air Control Wing at Robins AFB, Ga. More than half the combat coded aircraft "are assigned to CENTCOM," he said in September.

An airborne crew of 20 or more spends their night performing tasks

such as relaying communications and building "pattern analysis" of insurgent movements across hundreds of miles.

Army personnel fly onboard for direct links with ground forces. Because it performs so many tasks simultaneously, Joint STARS is at the heart of the surge in Afghanistan and ongoing operations in Iraq.

"If you talk to the Army guy, we're kind of like OnStar and 911 all rolled up in one," said Brig. Gen. Thomas Moore, commander of the 116th ACW. "If he's lost, you can tell him where he is and where he needs to go. If he's really got a problem, then you can call in help."

It's a far cry from the early vision of Joint STARS as an airplane to monitor Warsaw Pact ground forces. "JSTARS was designed for the Fulda Gap" to counter a Warsaw Pact invasion, said Col. Brian Searcy, vice commander of the 116th.

The Joint STARS fleet has been operational since December 1997, and the 17th and final aircraft was delivered just four years ago in 2005.

But the E-8 first made its name years earlier while still a prototype. Two test aircraft, rushed to the theater, flew 49 missions during Operation Desert Storm in 1991. "JSTARS (with external



**Facing page:** SrA. Bounder Bruener, left, and SrA. Trenton Franklin, both of the 7th Expeditionary Air Combat and Control Squadron, coordinate requests from ground units during an E-8 Joint STARS mission over Iraq. Above, an E-8 test aircraft at a contractor facility in Melbourne, Fla., sports a newly installed propulsion pod system, part of a major engine upgrade.

sensor cuing) was able to detect, locate, and track high-value targets, such as Scud missile launchers, convoys, river crossing sites, logistics sites, assembly areas, and retreat routes,” found the Pentagon’s postwar report.

In that war, the new platform was credited with spotting an Iraqi attack at Khafji and verifying that Iraqi forces did not react to the great westward swing of coalition ground forces prior to the start of the ground war. When Iraq’s III Corps retreated from Kuwait in late February 1991, Joint STARS saw them. The Pentagon’s official report found that air strikes called in on the basis of E-8 information destroyed 58 of 61 vehicles in one convoy alone.

### New Challenges

Joint STARS gained more accolades for its work over the Balkans in the

1990s and in the 78-day NATO air campaign to liberate Kosovo in 1999.

When Operation Iraqi Freedom began in 2003, seven aircraft deployed. It was first typecast as an intelligence platform for watching Iraqi heavy forces, with the same duties it had performed so well in the first Gulf War. Crews played the role to perfection.

When a sandstorm all but blinded optical sensors, Joint STARS’ wide area surveillance and moving target indicator pinpointed Iraqi forces on the move.

“We were watching these guys, with the Joint STARS and the ground moving target indicator radars, coming out of Baghdad trying to reinforce the Medina Division, and the B-1s and the B-52s were up there pounding the heck out of them,” recounted then-Chief of Staff Gen. John P. Jumper.

For Joint STARS, the new challenges in Iraq and Afghanistan were just beginning.

Convoy overwatch was the first new duty. As the situation in Iraq darkened in 2004 and 2005, land forces tasked Joint STARS to sweep ahead of road convoys to watch for suspicious activity and provide communications links.

“For a couple of years after OIF, the responsibility of JSTARS was basically convoy duty,” said Searcy. “That was out of necessity.” E-8s filled the gap until the coalition established a mature communications and route structure.

“Over time, folks started realizing we were able to do much more than strictly being airborne radio overhead,” said Lt. Col. Bill Gould, commander of the 12th Airborne Command and Control Squadron at Robins. Gradually, the fact that Joint STARS was airborne and covering a large swath of Iraq led to a patchwork of emergency taskings far beyond the original missions.

Combat search and rescue participation was one. Capt. James Lopez recalled flying a routine mission over Iraq when suddenly a call went out from an aircraft in mechanical trouble. “They had to eject, and their aircraft went down, and we were able to provide support for them, point out any



**An E-8C Joint STARS aircraft from the 116th Air Control Wing lands at a Southwest Asia base on a mission for Operation Iraqi Freedom.**



**An E-8 Joint STARS maneuvers into position beneath an aerial refueling tanker during a recent training mission.**

[enemies], ... and call it out to other fighters and actually steer them that way,” Lopez said.

Quick work on radios and in chat rooms pointed out the value of Joint STARS in managing communications between forces. Soon the platform was carrying out heavy taskings from both intelligence and operations commanders.

Crews referred to the multiple roles as something of an identity crisis—in a good way. “JSTARS for quite some time has had an identity crisis,” said Grabowski. “We’re an ISR [intelligence-surveillance-reconnaissance] platform and a command and control platform. That brings a lot of synergistic capability to the warfighter, but it also confuses folks as to who owns the aircraft and how the aircraft should be employed.”

The wide area coverage spanning 19,000 square miles and onboard crew turned Joint STARS into a weapon that does both intelligence and operations all on the same mission.

“We have continually been educating CENTCOM as to the fact that you give us a collection deck, we can do dual-sided ops now, we can give you the GMTI you want, but while we’re doing that, we can still do support to named operations, we can provide [intelligence preparation of the battlespace] to forces that are on the ground, we can provide screening—there’s a lot of things that our operators onboard the airplane can do,” said Searcy.

As a result, Joint STARS data permeates today’s fight in Afghanistan and Iraq. Missions generally begin with a tasking for a collection deck to survey specific areas and targets. Crews routinely check

in with joint terminal attack controllers (JTACs) in the area and link to other strike and ISR aircraft, including other command and control aircraft such as AWACS and Navy P-3s.

### **Movements in the Battlespace**

A typical mission will fill databases with moving target information, while assisting ground forces with real-time communications needs.

Information flows to air and ground command centers. The combined air operations center plans and tasks E-8 sorties and receives direct data in real time. Operators call it “JSTARS in a box.” Army intelligence analysts receive similar information real-time at a brigade tactical operations center. Brigade intelligence staff incorporate the picture into planning.

The Joint STARS wide area view is a highly desirable commodity for ground forces. “In most cases, we preplan to be in the area and provide them with updates to enhance the situation awareness of the commander,” said Army Lt. Col. Darryl Verrett, a military intelligence officer in command of the Army Joint STARS detachment at Robins. “We can’t tell him exactly what he may have to deal with, but we can tell him we’ve got some suspicious activity and let him deal with it on his level,” he said of the Army commanders receiving Joint STARS data.

Typical data includes distance and heading, plus a depiction of the size of a column. Analysts on the aircraft can also give a strong characterization of what they believe the vehicles may be. It’s not positive identification, but over time, analysts grow skilled in judging

whether a trail of dots are people or different types of vehicles.

“On that screen capture, we will interpret what we see because we’re trained as to what the dots potentially mean,” said Verrett.

As good as Joint STARS is at immediate support, it also is developing a way to turn back the clock and glean more intelligence on insurgent operations.

Buried in the billions of pixels of data are complete information sets on movement in the battlespace. With its unique wide area coverage, the Joint STARS radar archives weeks of enemy activity.

Jewels of data jump out from the wide area scans. Properly refined, the data creates a revealing picture of enemy movement around known locations and uncovers new sites through monitoring unexpected volume of traffic. Dots that pop up out of nowhere can tip off analysts to new insurgent routes, tactics, and hideouts. It is battlespace preparation—in reverse.

Pattern analysis was first used like crime-scene forensics. Analysts can call up old moving target indicator data and focus on the site of an improvised explosive device attack or the compound of a suspected terrorist. If analysts know where to look, Joint STARS can fill them in on the patterns of movement over the time preceding an attack. By comparing tracks day after day, enemy routines come into focus.

Joint STARS coverage is so wide that as long as the aircraft’s orbit was in the right country, the old logs would reveal practically all the movement to and from a site.

In early 2007, analysts started experimenting with pulling data from a night’s mission and analyzing it in time to assist ground forces planning the next day’s operations.

Inherent in the radar scans was information that provided raw material for learning more about types and patterns of moving forces. “You get information out of dots that’s normally thrown away,” said Maj. Toby Edison with the Joint STARS program office at Hanscom AFB, Mass.

The forensics process grew from investigation after the fact to a new way to watch and control the battlespace. Instead of after-action analysis spanning days or weeks, analysts began to use the Joint STARS nightly mission tapes for both ongoing intelligence and for immediate operational planning. Analysts soon found that the trail of dots formed by the moving target indicator might

provide intelligence and warnings on new areas where ground forces had not patrolled before. Rapid, advanced exploitation of the Joint STARS tapes was key.

Recent tests conducted on dismantled targets—people—suggest that Joint STARS moving target indicator may be reaching a new level of refinement. It may be possible in the future to characterize the moving target indicator “dots” as sheep, people, cars, trucks, or other types of targets. With upgrades, “I think they can get it down to actually being able to track a relatively heavily laden human,” said Grabowski.

For the time being, the E-8 “won’t tell you what model of Toyota 4Runner the insurgents are driving, but it will tell you that there’s unusual movement in specific places,” said Loren B. Thompson of the Lexington Institute. Joint STARS can then “hand off that information for closer inspection by Predator surveillance drones or manned aircraft.”

Other customers include smaller units on the ground directly at the battle’s edge. They may be JTACs, special operations forces, or teams at firebases. Other aircraft can also receive Joint STARS data via chat or secure data links such as Link 16. Cross-cuing with Predator is common.

During a mission, the scan area and crew size enable Joint STARS to help out several of these units at once while still piping data to higher command centers. “If I’m working with a task force in one area of the country and a [brigade combat team] somewhere else, I’ve got 18 folks and all those radios and chat rooms, so I can do multiple things at once,” said Grabowski.

“That’s the beauty of wide area surveillance in a radar—the ability to cover a lot of real estate,” he added.

“The difference with us is the fact we have all those radios, we can reposition the airplane at very short notice,” said Gould. Joint STARS is also talking to far more players than originally envisioned and a lot of it is through chat, not voice.

“Right now, on any given sortie over Afghanistan and Iraq, we’re in 20 to 30 separate chat rooms,” said Grabowski. Gone are the days of depending solely on “crackly SATCOM radio or an intermittent UHF radio.”

While voice and secure radio are still important, crews praise the ability of chat to let them work with players from Predators to ground task forces to command centers and other aircraft all at once.

## The Engine Dilemma

Over the years, Joint STARS upgrade prospects have waxed and waned. E-8 aircraft are actually secondhand 707s, bought at a time when the Army funded most of the program and didn’t want to pay for new aircraft. One typical E-8 at Robins AFB, Ga., has more than 71,000 hours of flying time.

Recent studies concluded that the airframe itself is not the problem. A fleet viability board has certified Joint STARS for another 25 years of operations.

The problem is old engines. The Pratt & Whitney JT3D-3B engines produce 18,000 pounds of thrust apiece, but have been outclassed by newer engine types.

This is an issue for aircraft deployed overseas. “We pull an engine off that airplane every 3,000 to 4,000 hours, with the JT3D,” said Brig. Gen. Thomas Moore, the commander of the 116th Air Control Wing. With newer JT8D engines, that goes to 30,000 to 40,000 hours. “You think about the workload changing for the maintenance guys swapping motors out, especially over there in the desert, with the sand, the grit, the heat,” said Moore. “It’s a big deal.”

The operational payoff of new engines for Joint STARS includes faster climb rates, longer loiter time in the target area, orbit at higher altitudes, and greater fuel efficiency.

“Extra altitude gives me extra height, so I can look over valleys, ridge lines, mountain areas,” said Lt. Col. Thomas Grabowski, chief of plans and programs at the 116th. “Iraq’s a relatively flat country, Afghanistan not so much. ... I’ve got to be high enough to look down into some of those areas where we know the bad guys are, and that’s what those engines are going to do for me.”

Chat has actually become the first-choice method for communication. “When we first get on station, we check in via mIRC [internet relay chat],” said SrA. Sara Ryan of the procedures for linking with JTACs.

“It’s so quick and easy,” said Lopez of the chat relay. “I can talk to all three jets within a matter of seconds.”

### New Missions

The near future will add new capabilities. One test aircraft will have a new pod to act as a second sensor. The electro-optical picture will permit the crew to confirm target identification. Right now, Joint STARS has to pass symbology to a fighter or unmanned aircraft to get crisp visual identification.

Also in the works are radar enhancements for overwater and littoral missions. Imagine Joint STARS positioned to track dots over water—be they pirates or small boats. Brushing up the moving target indicator exploitation could also position the E-8 for the theaterwide combat identification tasks.

Grabowski told of one vivid night in late 2008 when the airborne crew picked up a “danger close” call from a JTAC in southern Afghanistan. He knew, from his experience, that “Taliban fighters are a militarily proficient force. They’re going to do a movement to contact.”

On this night, Joint STARS was in its refueling track when the call came. “The one thing you never want to hear from the JTAC is, ‘Danger close.’ We knew there was a problem,” said Grabowski.

Friendly troops were battling roughly 70 Taliban in a tree line—a date palm grove about 219 yards from their firebase. A British JTAC had sent out the alarm picked up by Joint STARS over the radio. Communications were so limited that the JTAC was having trouble contacting the CAOC to call in strike aircraft.

Onboard the aircraft, “we used our mIRC to alert the CAOC, launch alert aircraft, and get folks to [Regional Command] South where this firefight was happening,” recalled Grabowski. The aircraft gave up the gas for its next refueling to thirsty fighters in the area, and throttled back engines to stay on scene as long as possible.

“We had two A-10s come in first and Winchester out,” Grabowski said. “They basically mowed down the date palm grove.”

Other platforms, from EP-3s to the Block 40 Global Hawk, will join in the moving target indicator mission. But no current or future platform will come close to the wide area surveillance of Joint STARS—or carry the airmen and soldiers to talk the last tactical mile to troops in contact. ■

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