

The Joint STARS Challenge

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U.S. Air Force (Aaron D. Allamon II)

E-8C prepares for takeoff during Operation Iraqi Freedom

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The Ground Moving Target Indicator radar technology found in the E-8C Joint Surveillance Target Attack Radar System (Joint STARS) has provided the United States with unprecedented new capabilities and a major challenge. Thanks to Joint STARS, it is possible both to see and to target vehicles moving throughout a large area on the surface of the land as well as the water, even in darkness and bad weather.

Given the key roles that movement and motorized vehicles play in warfare, this ability to see and target moving vehicles provides the potential to transform military operations in four key ways. Joint STARS can:

- make it possible to fight jointly far more effectively by allowing a joint force commander to closely integrate air and land operations so as to defeat mechanized enemy land forces before the enemy can move powerful units into close proximity to friendly land forces
- enhance the effectiveness of air operations designed to prevent enemy land forces from maneuvering or being supported logistically
- prepare the battlespace, possibly preventing the need to fight, by providing far more precise intelligence regarding developing enemy threats and vulnerabilities created through vehicular movement
- contribute to success in unconventional warfare, when combined with other information such as human intelligence and signals intelligence, by revealing safe houses and improvised explosive device factories.



Air operations technicians conduct surveillance during Joint STARS mission

U.S. Air Force (Lance Cheung)

To fully exploit these new capabilities and change how wars are fought or prevented, it will be necessary to overcome the obstacle created by Service culture. While Service culture is a valuable “glue” providing a clear source of identity and experience, it can also be a huge obstacle when the exploitation of new capabilities depends on making major changes in Service doctrine and force structure.¹

its battle management role, the Air Force has been able to maintain greater control over the system’s employment than if it was viewed as an intelligence, surveillance, and reconnaissance (ISR) system such as Rivet Joint or the U-2. Moreover, if Joint STARS is perceived as a system to be used only for warfighting, it becomes possible to ignore the tremendous advantages of fielding enough systems to

based operations addresses how the ability to see and precisely target vehicles attempting to move throughout a large area, even in darkness and bad weather, can transform military operations by making it possible to create widespread paralysis leading to enemy defeat. Part of the problem is the Air Force’s tendency to ignore how the creation of an immense perception of danger can influence human behavior. In this case, by targeting movement it is possible to make enemy soldiers unwilling to take risk, achieving paralysis faster and more efficiently than solely through the attrition of huge numbers of enemy vehicles.

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Indeed, the histories of the tank, submarine, and aircraft show how Service culture has caused such resistance before, and now this history is in danger of being repeated with Joint STARS. As this article argues, Service culture has been preventing exploitation of the system’s immense potential. Therefore, the only feasible solution to the challenge created by Service culture is to follow the example set with special operations and transfer responsibility for the system from the Air Force to a joint organization with the authority to establish requirements and fund needed upgrades and increases in force structure.

Battle Management

Evidence of the role that Service culture plays in the failure to fully exploit Joint STARS capabilities can be found in the very different ways that the Air Force and Army have tended to view the system. To a large extent, the Air Force has seen the system only as a battle management platform supporting airpower with timely targeting information. By emphasizing

maintain persistent surveillance over potential threats, a role that could require shifting funds from the Air Force’s more highly favored fighter force structure.

Since doctrine reflects Service culture, it can help show why the Air Force has failed to exploit Joint STARS’ potential for defeating opposing land forces. An Air Force doctrinal pamphlet states that “direct attack of adversary forces in the field is a long duration, high-cost and low-payoff strategy for strategic and operational campaigns.”² Besides revealing the Air Force’s view of conventional warfare, this document fails to show any awareness of the important function that vehicular movement plays in land operations. It also shows a lack of understanding of how Joint STARS’ wide-area, real-time information on this movement has made it feasible to transform the way U.S. forces defeat enemy land forces as well as contribute to timely, reliable intelligence either directly or by cueing other sensors.

Neither this pamphlet nor numerous Air Force articles and briefings on effects-

Although the Air Force sees the system as a battle management platform, even here there have been contradictions that can be traced to Service culture. For example, the Air Force has strongly resisted any tendency to recognize that by providing timely targeting information, Joint STARS serves as a powerful force multiplier for fighters performing interdiction, since this could help make a case for reducing fighter force structure. Similarly, despite complaining that Joint STARS’ radar information is of limited value because it alone cannot provide reliable target identification, the Air Force has made no effort to allow Joint STARS to control directly the unmanned vehicles that could provide the desired positive target identification.³ Such direct control would greatly increase the effectiveness and efficiency of unmanned aircraft systems that are currently equipped with high-resolution but narrow field of view “soda straw” video sensors.

Another example of a failure to enhance the system’s battle management capability for fear of putting fighter force structure at risk was the Air Force’s failure to quickly

E-8C prepares to refuel during Iraq mission



Air Force communications technician prepares E-8C for mission in Southwest Asia

133rd Airlift Wing, U.S. Air Force (Erik Gudmundson)

U.S. Air Force (Ricky Best)

fund and deploy the capability demonstrated in the Defense Advanced Research Projects Agency's Affordable Moving Surface Target Engagement (AMSTE) program; this program showed how Joint STARS could provide such precise targeting information directly to individual weapons that moving vehicles could be destroyed without the need for the pilot of the aircraft releasing the weapon to visually acquire or even fly in close proximity to the target. With this capability, high flying bombers and unmanned combat air vehicles could perform the key task of destroying moving vehicles that until now could only be performed by a highly maneuverable fighter in good visibility through low altitude, short-range strafe or with television or laser-guided weapons.⁴ It is notable that the Air Force seemed most interested in fielding this new capability when, as was demonstrated in Operation *Resultant Fury*, it allowed weapons delivered by bombers to hit and sink moving maritime targets, a task usually reserved for the Navy.⁵

Besides weakening the case for fighter force structure, fear of strengthening the case for a surveillance role may help explain the Air Force's significant delays in approving or, if approved, fully and rapidly funding other Joint STARS upgrades, each of which would make the system an even more powerful force multiplier and surveillance system. Examples of such upgrades include the following: the active electronically scanned array Multi-Platform Radar Technology Insertion Program (MP-RTIP); the Attack Support Upgrade with Link 16 datalink connectivity; E-8 re-engining; wide-area maritime surveillance; and tools for moving target information cataloging, analysis, and distribution.⁶

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The need for the MP-RTIP is especially urgent. This upgrade would make it possible to provide far more detailed information on movement, to include tracking. It would also allow this movement information to be provided while simultaneously collecting high-resolution synthetic aperture radar (SAR)

imagery. In contrast, with the current radar's timeline, movement information cannot be provided while collecting SAR imagery.⁷

It is interesting from a culture perspective that in addressing the capabilities of the advanced MP-RTIP, Air Force officers seem to focus almost exclusively on its use in defending against cruise missiles. It is difficult to find any mention by Airmen of how this radar, with its ability to automatically track individual vehicles moving throughout its coverage area, would contribute to much more effective ground surveillance and the rapid defeat of opposing land forces, to include insurgents and terrorists employing improvised explosive devices and car/truck bombs. Some Air Force officers have even implied that because the F-22 can perform such effective surveillance, it is not an urgent necessity to upgrade Joint STARS with MP-RTIP. Such an opinion ignores the fact that the much less powerful F-22 radar would have a significantly smaller coverage area, and its surveillance would be much less persistent thanks to the fighter's more limited endurance and the likelihood that the fighter would be diverted to conduct other missions, including air intercepts.

Ground Surveillance

In contrast to the Air Force, the Army has treated Joint STARS primarily as a ground surveillance system providing information to intelligence units at the brigade level and above. These units then analyze the information before providing it to maneuver commanders and their battle staffs for refining courses of action. By making it an asset supporting the intelligence function, the Army has failed to exploit fully the advantage that Joint STARS' real-time information on movement can make to timely maneuver decisions during a battle. It almost seems as if the Army intelligence community does not think its maneuver commanders could effectively interpret raw Joint STARS' radar information on movement even when fighter pilots have demonstrated for decades the ability to maneuver their planes



U.S. Marine Corps (Andrew P. Roulis)



U.S. Air Force (Lance Cheung)

Top: Common Ground Station supports Marines during Operation *Enduring Freedom*
Above: Army airborne target surveillance supervisor communicates with ground units

rapidly in three dimensions using real-time, raw radar information on opposing aircraft.

More importantly, with its tendency to see the system only as a ground surveillance platform, the Army has ignored how it can allow its forces to fight more effectively and jointly using maneuver to avoid getting in close proximity to enemy forces while setting up those forces for attack by friendly airpower managed by Joint STARS. Used in this way, it becomes possible for a joint force commander to create an intractable dilemma: if an enemy commander attempts to reduce

his vulnerability to air attack by refusing to move for fear of being seen and targeted by Joint STARS, our land forces would possess such maneuver dominance that enemy forces could be either bypassed or overwhelmed and defeated in detail.

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The immense advantages that Joint STARS could provide to maneuver commanders as a battle management system were demonstrated in an All Service Combat Identification Evaluation Team exercise held in 1997. During this exercise, a Marine Reserve Light Armored Reconnaissance battalion commander using Joint STARS' real-time information successfully defeated an opposing force equipped with simulated T-72s. Unlike Army warfighting experiments, this exercise did not make the close battle the central event, but instead allowed airpower to attack the opposing forces *before* they could move into close proximity to friendly forces. It is important to note that, unlike Army Warfighting and Marine Hunter Warrior experiments, this exercise focused on combat identification, so the battalion commander may not have been as aware of the need to operate with an eye to how outcomes might influence the force structure debate.

During the exercise, the Marines made a number of interesting comments, such as, "Detection reports by J[oint]STARS were more accurate than our own aircraft."

Others comments included, without Joint STARS, "we're back to the 19th-century intelligence tactics. Run into the enemy, get shot at, and report where he is," and "Marines always win with J[oint]STARS on their side and lose without it." At the conclusion of the exercise, the Marine battalion commander commented that he would rather have one less company if he could have continuous Joint STARS support. Observing the Marine unit's success, an Army officer wondered if his Service should consider fielding ground stations down to maneuver battalion level (rather than having it only as low as brigade).

Experience

Cultural attitudes toward Joint STARS also help explain why the Services have been so slow to learn from combat operations on how to use the system most effectively. Culture helps explain why it was the Army and not the Air Force that called for the deployment of the two prototype Joint STARS to support Operation *Desert Storm*. The limited number of aircraft meant that only one was available to fly each night, and since it was often moved around the theater, persistent nighttime coverage of any one area was impossible. The system was further handicapped by the fact that those planning and orchestrating coalition air operations had little understanding of Joint STARS' capabilities and limitations. These handicaps, along with a widespread coalition belief that the Iraqis could not attack once coalition air operations had begun, help explain why information that Joint STARS provided of the developing threat of an Iraqi offensive at al Khafji was ignored.

Once the Iraqi offensive began, however, coalition air leaders allowed Joint STARS to play a key role in targeting airpower against

follow-on Iraqi forces, making it possible for this offensive to be defeated almost before it could begin. Joint STARS also played a key role in detecting the movement and location of Iraqi logistic units, allowing them to be targeted by air attacks. The destruction of Iraqi trucks by these attacks, as well as the precision air attacks against parked tanks, combined to create widespread fear among Iraqi soldiers who came to see their vehicles as vulnerable targets. Their fear resulted in an unwillingness to occupy their vehicles, let alone risk movement. The effects of their fear caused a logistic and training breakdown that made an immense contribution to the rapid success of the coalition's ground offensive.

Despite the major contributions Joint STARS had made to success in *Desert Storm* as well as to *Joint Endeavor* operations in Bosnia (1995–1997), the U.S. military delayed the deployment of the system to support operations in *Allied Force* (1999). When Joint STARS finally did reach the theater, the decisions on where to base it and where to locate its orbit combined to seriously limit its coverage capabilities. In large part, these decisions can be traced to a failure by the Air Force to learn from the system's *Desert Storm* combat experience.

Eventually, faced with significant problems finding Serb forces who often moved in small units during conditions when weather limited visibility, Airmen gradually began to relearn lessons regarding the value of Joint STARS in air operations targeting mobile land forces. Yet even though Airmen officially viewed the system as a battle management asset and recognized that it could not provide target identification, they failed to allow the system to control the unmanned aircraft systems and airborne forward air controllers (AFACs) that could provide the necessary target identification. When, on occasion, AFACs and fighters were cued on movement



Air battle manager students train at Tyndall Air Force Base

U.S. Air Force (Jon Quinlan)



E-8C prepares for takeoff during Operation Iraqi Freedom

U.S. Air Force (Aaron D. Allamon II)

being seen by Joint STARS, they were quick to recognize how this information made them more effective and efficient, explaining why one F-16 fighter squadron commander stated that “[j]oint STARS got to be my hero.”⁸

Once the Kosovo Liberation Army (KLA) began its offensive, Joint STARS’ ability to detect and provide timely information on movement helped create an intractable dilemma for Serb forces. If those forces attempted to move in response to the KLA offensive, they risked being seen by Joint STARS and targeted by allied airmen, but if they did not move for fear of being seen and targeted, they limited their ability to counter the KLA at an acceptable risk. This dilemma may have made a significant contribution to the Serb willingness to withdraw from Kosovo.

After *Allied Force*, the U.S. military remained slow to institutionalize the lessons relearned from combat regarding the value of Joint STARS. As a result, it did not deploy the system to support *Enduring Freedom* until well after Taliban and al Qaeda forces fled into the mountains bordering Pakistan. This failure to exploit Joint STARS’ unprecedented capabilities to detect, locate, track, and target moving vehicles when only the Taliban and al Qaeda were moving at night possibly allowed Osama bin Laden and other key terrorists to escape. With the timely information on movement occurring within a large area available only from Joint STARS, it could well have been possible either to kill these individuals with precision air attacks or to capture them through the insertion of special operations forces into ambush positions.

For a change, Joint STARS was deployed to support *Iraqi Freedom* well before the invasion began, but it is unclear who was behind this decision: civilians in the Office of the Secretary of Defense or the uniformed military. Once the invasion began, Joint STARS provided a protective overwatch of the flanks of advancing coalition forces. As these forces approached Baghdad, Joint STARS provided timely information during a severe dust storm that allowed Iraqi forces to be targeted before they could move into close proximity to advancing coalition forces. Even with these successes, it became evident that the majority of operators responsible for managing Joint STARS and other ISR systems had little experience in orchestrating such large-scale activity. Similarly, the U.S. military still had not learned to exploit Joint STARS’ ability to see and track movement and reflect that capa-

bility in their measures of effectiveness, but continued to evaluate success primarily from an attrition perspective.

As the insurgency in Iraq developed, evidence grew that the U.S. military was still failing to fully exploit Joint STARS’ unique surveillance capabilities. At one point, the House Armed Services Committee expressed concern that the system was being underutilized by assigning a number one mission priority of serving as a communications relay for convoys.⁹ An Air Force colonel admitted that until late 2004, little postmission analysis was done on movement information collected by Joint STARS surveillance. Yet despite the immense value of this information, especially when integrated with other information, in detecting and defeating threats, the Air Force still has not acted to upgrade the system with MP-RTIP even after canceling the planned follow-on E-10A. Nor has it considered reopening the Joint STARS production that it stopped at 17 systems based on the rationale that the E-8C would be replaced by the E-10A.

Meeting the Challenge

The obstacle that Service culture has presented to the funding of sufficient force structure is clearly apparent in the fact that Joint STARS is called a high-demand/low-density asset. It is worth noting that early studies projected a need for 32 of these systems. Moreover, if it had not been for congressional add-ons, the current force structure would be even smaller than 17.¹⁰ More evidence of the resistance caused by culture is found in the fact that even with the huge advances in surveillance and precision attack capabilities, the Air Force still has not recognized the need to rebalance its investment between sensors and shooters.

Given the little evidence that Service culture will allow for the full exploitation of Joint STARS, it is time to meet the challenge by transferring responsibility for the system from the Air Force. Since Joint STARS, like other ISR systems, provides a capability that crosses Service boundaries, making it feasible to fight differently and more jointly, Congress needs to continue its effort to solve the imbalance between Service and joint interests begun with the Goldwater-Nichols Act. Following the example it set with special operations capabilities, Congress needs to make a joint organization, such as U.S. Joint Forces Command, responsible for Joint STARS and other real-time ISR systems. Even the Air

Force has admitted that there is a “need to bring some unity to all ISR pieces for combatant commanders” since each Service’s ISR systems are “operating independently,” defeating the desire for a unified strategy.¹¹

As with U.S. Special Operations Command, this joint ISR organization should have authority for developing strategy, doctrine, and tactics; organizing, training, and equipping; prioritizing and validating requirements; ensuring interoperability of equipment and personnel; and monitoring personnel management. Finally, to ensure that the Service-provided forces are truly prepared to fight jointly, they would be required to be interoperable with these joint ISR systems, and all training would be required to include their employment. **JFQ**

NOTES

¹ See Don M. Snider, “An Uninformed Debate on Military Culture,” *Orbis* (Winter 1999), 13–14.

² Air Force Doctrine Pamphlet 14–118, *Aerospace Intelligence Preparation of the Battlefield*, June 5, 2001, paragraph 4.4.3.1.5, *Fielded Forces*.

³ Although the Joint STARS and Predator program offices discussed linking the two systems in 1995, it was not until 2003 that, for the first time, a Predator was linked to a manned aircraft, a C-130. See “JSTARS, Predator Unmanned Aerial Vehicle Could Be Linked Inflight,” *Inside the Air Force*, April, 28, 1995, 3; and “USAF Successfully Demonstrates Predator Control from C-130,” *Inside the Air Force* (May 23, 2003).

⁴ Bill McCall and Price T. Bingham, “Killing MOVING Targets,” *ISR Journal* (January-February 2004).

⁵ Caitlin Harrington, “Joint STARS planned for Maritime role,” *Jane’s Defence Weekly* (September 6, 2006).

⁶ “Joint STARS upgrades face uncertain future,” *C⁴ISR Journal* (May 2007), 14.

⁷ Richard J. Dunn III, Price T. Bingham, and Charles A. “Bert” Fowler, *Ground Moving Target Indicator Radar*, Northrop Grumman Corporation Analysis Center Paper, 2004, available at <www.capitol.northgrum.com>.

⁸ “Allied Force pilots say improved training key to strike operations,” *Inside the Air Force* (October 13, 2000), 8.

⁹ National Defense Authorization Act for Fiscal Year 2007 Report to Accompany H.R. 5122 (H.R. 109–452), Title XV, “GWOT Emergency Funding,” 405–406.

¹⁰ Robert P. Haffa and Barry D. Watts, “Brittle Swords: Low-Density, High-Demand Assets,” *Strategic Review* 27 (Fall 2000), 47.

¹¹ John A. Tirpak, “The Struggle over UAVs,” *Air Force Magazine* (November 2007), 33.