

BRITTLE SWORDS: LOW-DENSITY, HIGH-DEMAND ASSETS

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IN BRIEF

During the 1990s, Pentagon officials designated a number of specialized units and systems — including the EA-6B and the E-8C Joint STARS aircraft — “Low-Density/High-Demand” (LD/HD) assets. NATO’s 1999 air campaign against the Federal Republic of Yugoslavia underscored the implication of this designation — that the U.S. does not have enough of these critical systems to satisfy the war-fighting needs of theater commanders. If senior Defense Department leaders fail to raise the budgetary priority assigned to LD/HD assets by the individual services, these assets are likely to remain in short supply.

One of the dilemmas that will immediately confront the Secretary of Defense in a new administration is that of key military capabilities that are much in demand but short in supply. Termed “LD/HD,” for “Low Density/High Demand,” these assets have been defined as “force elements consisting of major platforms, weapons systems, units, and/or personnel that possess unique mission capabilities and are in continual high demand to support worldwide joint military operations.”¹ Concerns about LD/HD systems and units arose from the growing deployment and operational

demands made on these assets over the preceding decade.

Consider the E-3A Airborne Warning and Control System aircraft (AWACS). The E-3 was developed in large part because of the difficulties U.S. aircrews experienced getting adequate tactical warning of attacks by enemy fighters over North Vietnam.² Once the E-3A entered the inventory and the Air Force began to appreciate its value in providing situational awareness, worldwide deployment demands on the E-3s and their aircrews grew rapidly. AWACS units were soon spending more and

1. William S. Cohen, *Annual Report to the President and the Congress* (Washington, DC: U.S. Department of Defense, 2000), p. 35.

2. During 112 engagements from December 1971 through January 1973 in which at least one U.S. or North Vietnamese fighter was downed in air-to-air combat, over 80% of the victims were either “unaware of the

attack” until ordnance hit their airplane, or else did not become aware in time “to initiate adequate defensive action.” *Project Red Baron III: Air-to-Air Encounters in Southeast Asia* (Nellis Air Force Base, NV: USAF Fighter Weapons Center, June 1974), vol. 3, *Tactics, Command and Control, and Training*, pt. 1, p. 61.

more time deployed away from home, both to train with fighter units and to signal American interest or commitment during crises. As a result, the Air Force started collecting data on the operational and personnel tempo in the units most subject to recurring temporary deployments. One survey identified 22 Air Force units — heavily tasked platforms like C-130 gunships, U-2 aircraft and virtually all special operations units — whose deployments were projected to exceed 120 temporary duty days per year.³

The LD/HD concept gained wider recognition during the 1996 “Dynamic Commitment” wargames supporting the Quadrennial Defense Review. “Dynamic Commitment” assessed the adequacy of key capabilities to cope with anticipated commitments to simultaneous and sequential peacetime crises and smaller-scale military contingencies. The building blocks for these tabletop wargames were a pool of 50 or so vignettes based on historical operations and current contingency plans.

“Dynamic Commitment” noted the brittle nature of certain specialized units when tasked with sequential commitments and found that “uniquely configured platforms or units, in the face of force reductions, must receive careful consideration.”⁴ These conclusions reinforced the need for a “Global Military Force Policy” (GMFP) to allocate LD/HD assets across competing priorities, to flag certain systems when their deployment schedules threaten to violate guidelines, to seek waivers from the Secretary of Defense when that occurs, and to develop “options for allocating these assets in crises, contingencies, and long-term joint task force operations.”⁵ Today’s Joint Staff list of LD/HD assets contains 6 categories and 31 separate systems or units.⁶

The 1997 QDR acknowledged that LD/HD assets such as AWACS, the EA-6B electronic warfare aircraft, and the E-8 Joint Surveillance and Target Attack Radar System (Joint STARS) were likely to be used at very high operating tempos during peacetime. However, it also argued that the Global Military Force

LOW-DENSITY, HIGH-DEMAND ASSETS

Reconnaissance/Battlefield Management Assets

- E-3 AWACS
- EC-130E ABCCC
- U-2
- RC-135V/W Rivet Joint
- Sand Deck
- Ground Theater Air Control System (GTACS)
- Joint STARS
- Predator UAV

Electronic Warfare Aircraft

- EA-6B
- EC-130H Compass Call

Special Operations Forces

- Special Forces (ODA/ODB Detachments)
- 75th Ranger Regiment
- Active Civil Affairs Units
- Active PSYOP Units
- 112th Special OPS Signal Battalion
- 160th Special OPS Aviation Regiment
- Special Tactics Squadrons
- MH-53J/M Special Operations Squadrons
- MC-130P 9th Special Operations Squadrons
- AC-130H
- AC-130U
- SEAL Platoons
- Patrol Coastal (PC) Ships
- Rigid Inflatable Boats (RIB) Detachments
- Mark V Special Operations Craft (SOC)
- SEAL Delivery Vehicle Task Units (SDVTU)

Patriot

Rescue Aircraft

- HC-130
- HH-60G

Chem/Bio Defense

- 7th Chemical Company (Biological Detection)
- Technical Escort Unit (TEU)

Policy was effectively allocating LD/HD assets across competing priorities and that EA-6B deployments had been stabilized.⁷ Only three

3. “Air Force seeks stress reduction in high-tasked units,” Air Force News Service, July 3, 1997.

4. Clarence E. Carter, Philip D. Coker and Stanley Gornec, “Dynamic Commitment: Wargaming Projected Forces Against the QDR Defense Strategy” (Washington, DC: Institute for National Strategic Studies, *Strategic*

Forum, Number 131, November 1997).

5. Cohen, op.cit., p. 35.

6. Joint Staff message 061651Z December 1999, Subject: Global Military Force Policy, Change Four.

7. *Report of the Quadrennial Defense Review* (Washington, DC: Department of Defense, May 1997), p. 36.

years later, these judgments appear highly optimistic. During Operation Allied Force in 1999, the EA-6B and other LD/HD assets were stretched to their limits. The unanticipated toll on these assets in Kosovo suggests that the approach of using historical deployment patterns to establish LD/HD rotational tempos was flawed from the start. Retired Air Force General Richard Hawley noted, “The systems have been constantly overused and are in danger of becoming exhausted.”⁸

As the Department of Defense embarks on a new Quadrennial Defense Review to determine the level of investment in LD/HD systems needed to underwrite future U.S. contingency operations, the straightforward approach is simply to buy more of them. However, given procurement budget shortfalls, closed production lines, and the higher priority accorded by individual services to weapons-delivery platforms, that obvious solution is not always available or acceptable. While choices vary from one LD/HD asset to the next, options range from better resource management to developing complementary or alternative platforms to acquiring more from a warm production line.

Given that managing LD/HD assets will be high on the agendas of those conducting the QDR, an examination of the accomplishments and shortfalls of key LD/HD systems in the air war over Kosovo should prove useful. Here, we focus on only two — chosen because they were highlighted in the Department of Defense (DoD) report on Operation Allied Force and, admittedly, because they are the ones we know best.⁹ More important, they embody capabilities essential to operational success in future applications of U.S. combat forces: electronic warfare and air-to-ground surveillance and battle control.

8. “Pentagon Urged to Rethink Use of Low-Density, High-Demand Assets,” *Inside the Air Force*, December 3, 1999, p. 4.

9. Certainly there are other LD/HD assets that require attention. For example, the Commander in Chief of the Pacific Command recently noted that the U-2, Rivet Joint, and P-3 aircraft were all “stretched thin” in his area of responsibility. *Aerospace Daily*, March 8, 2000.

10. *Report to Congress. Kosovo/Operation Allied Force After Action Report*. (Washington, DC: Department of Defense, January 31, 2000), p. 66.

11. Although NATO aircraft such as the “Tornado” have very good anti-radiation missile capability (better, it is

The EA-6B and the Unanticipated Demand for Tactical Jamming

DoD’s after-action report on Operation Allied Force described the EA-6B “Prowler” electronic warfare aircraft as “absolutely important to the air operation.”¹⁰ These planes provided protection for NATO strikes and other air missions by monitoring emissions from the adversary’s air defense radars and, when detected, either jamming them or firing anti-radiation missiles. EA-6Bs are owned and maintained by the Navy and Marine Corps (although some now have Air Force crews as well), and are operated from both forward land bases and aircraft carriers. The singular contribution of the EA-6B during this contingency was not so much a tribute to jointness, however, as it was an unintended consequence of a premature decision to divest other valuable tactical jamming assets. Owing to a combination of economic, bureaucratic, and doctrinal factors, the Air Force sent its last EF-111 “Raven” to the “boneyard” in May 1998 — leaving the tactical jamming role to the Navy’s EA-6B.¹¹

When the North Atlantic Treaty Organization (NATO) initiated an air campaign against the Federal Republic of Yugoslavia (FRY) in late March 1999, the tactical jammers available consisted of 90 EA-6Bs in 19 Navy and Marine Corps squadrons.¹² A total of ten and one-half squadrons (the half squadron being called up from the Reserves) were deployed during Operation Allied Force. There were 21 EA-6Bs at Aviano air base in Italy (13 USN, 8 USMC), including those redeployed from their Northern Watch duties in Incirlik, Turkey, plus five carrier-based “Prowlers” flying from the *Theodore Roosevelt*.

NATO soon discovered that the Serbs were operating their integrated air defense system

said, than the USAF F-16J) against SAM sites, there is no tactical jamming capability equivalent to the EA-6B in any other NATO air force.

12. Of the 19 EA-6B squadrons at the time Allied Force began, 10 were carrier-based, 8 were land-based and dedicated to contingency operations such as Northern Watch, and the 19th squadron was a Reserve unit. Ideally, an EA-6B squadron has five aircraft, but maintenance and upgrades can reduce the number of available planes. Under current force planning, the fleet goal is to have six EA-6B squadrons deployed, another six preparing to rotate, and the remaining third recovering and reconstituting.

in a manner requiring more sustained tactical jamming than anticipated. The Serbs employed innovative tactics, husbanded their resources, and prevented NATO from quickly rendering their air defenses ineffective. As Air Force European commander General John Jumper testified, the Yugoslavs frequently moved missile batteries to make their locations more uncertain. And, in an unexpected tactic, the Serbs kept their tracking radars dormant, activating them only briefly to facilitate a quick shot against a passing aircraft. To give a sense of how successful the Serbs were, NATO claimed to have destroyed only three of the FRY's 22 SA-6 surface-to-air missile (SAM) batteries during the 78-day air operation.

As a result of these enemy tactics and techniques, U.S. and NATO attack aircraft were forced repeatedly to fly through active SAM engagement zones, requiring what the EA-6B crews termed the "ultimate level" of standoff and penetrating tactical jamming throughout the entire air campaign.¹³ The EA-6B crews who participated in Allied Force averaged 90 flying hours a month and their aircraft 123 hours — nearly twice the planned wartime rate.¹⁴ In the words of the Air Force Deputy Chief of Staff for Operations, "The EA-6Bs were stretched about as much as they could handle."¹⁵

The EA-6B story in Kosovo contains both good news and bad. The good news is the limited EA-6B force was able to meet simultaneously the demands for three diverse missions: stand-off jamming of kill boxes, escort and modified escort for strike packages, and "direct support" of selected F-117 and B-2 missions. They succeeded in breaking down Serbian air defenses by jamming early warning and acquisition radars and by blocking electronic hand-offs to SAM sites and fire control radars. EA-6Bs played a pivotal role, enabling NATO aircraft to strike targets with such reduced risk of losses that FRY defenses downed only two

NATO aircraft. As General Wesley Clark testified to the U.S. Senate, "We couldn't have fought this war successfully without the EA-6B contribution."¹⁶

The bad news is that nearly the entire inventory of land-based EA-6Bs available for expeditionary operations (roughly 40 airframes in 8 squadrons) was deployed during a small-scale contingency against a relatively unsophisticated adversary with 1960-vintage capabilities. No "double-digit" (SA-10 or SA-12) surface-to-air missiles, which would have made the jamming task far more difficult, were encountered. Nor was there a major contingency elsewhere placing additional demands on the EA-6Bs. Therefore, if Allied Force is any guide, the aging EA-6B fleet is too small to meet the nation's future tactical jamming requirements.¹⁷

The 1997 QDR reduced the planned JSTARS buy from 19 to 13, a decision based on an anticipated NATO buy of JSTARS

Tactical jamming for air operations is a specialized capability likely to remain in considerable demand as conflicts spread and weapons proliferate. Even stealthy aircraft such as the F-117 were provided jamming support during the Kosovo campaign, and most air planners believe that the trio of stealth, self-protection jamming, and tactical support jamming will be required in the future to replicate the degree of electronic-warfare success during Operation Allied Force. Unfortunately, with the EA-6B line closed and the EF-111s mothballed in the Arizona desert, the U.S. faces a continuing tactical jamming shortfall. With 2015 as the target for retiring the last "Prowler," it is clear

13. COMVAQWINGPAC, NAS Whidbey Island, WA, September 16, 1999.

14. Advanced training was curtailed at domestic EA-6B bases, and a "Rainbow" squadron was formed from wing staff and training crews to supplement the combat crews deployed. The Naval Air Wing at Whidbey Island estimated that if the campaign had continued until the end of September 1999, personnel shortfalls and aircraft limitations would have stretched the operation to failure. VAQWINGPAC briefing, NAS Whidbey Island, WA, July 26, 1999.

15. Lt. Gen. Marvin Esmond, USAF/XO, Air Force Association, Arlington, Virginia, July 1, 1999.

16. General Wesley Clark, SACEUR, testimony to Senate Armed Services Committee, July 1, 1999.

17. The EA-6B was first fielded in 1971 to escort A-6 and A-7 aircraft in Vietnam. A series of modifications to its jamming capabilities, most recently the ICAP-3 initiative, remedied and updated the aircraft's EW capabilities. The principal near-term challenge is inventory shortfall. See Loren Thompson, "The Future of Airborne Electronic Warfare," *Sea Power*, March 2000, pp. 40-42.

that the EA-6B will remain an LD/HD asset for many years to come.¹⁸

Joint STARS and the Value of Seeing Enemy Movement on the Ground

The E-8C Joint STARS (Joint Surveillance Target Attack Radar System) is a Boeing 707-based platform that uses synthetic aperture radar (SAR) and a moving target indicator (MTI) to detect, locate, track, classify, and target moving vehicles on the ground, much as the AWACS aircraft does for airborne vehicles. Joint STARS was first used in combat in the 1991 Gulf War, when two developmental E-8s provided air-to-ground surveillance and targeting support to coalition forces. Most notable, perhaps, was its role in the battle of Al Khafji when JSTARS detected the movement south of Iraqi armored and mechanized units, allowing friendly air forces to defeat the adversary's thrust with relatively minor contact between opposing surface forces.¹⁹ Later in the war, the Air Tasking Order allocated fighters to the E-8C so it could direct airborne attacks on moving targets of opportunity, thereby giving JSTARS an air control role.

However, because the lessons learned from Kuwait and Bosnia regarding the value of air-to-ground surveillance had not been institutionalized, the two sets of JSTARS aircrews rotated to Kosovo employed the aircraft very differently. The first set envisioned Joint STARS functioning simply as an additional "sensor feed" into the Combined Air Operations Center. After the second crew rotation took over, the E-8C began evolving into a command-and-control asset for NATO air attack operations against Serbian ground forces in Kosovo. By May, Joint STARS had demonstrated an ability to generate targets by "cross-cueing" its SAR/MTI data with those of other sensors (such as the U-2 and Predator UAV) which, according to the controllers, "no other platform could match."²⁰

In support of the Kosovo campaign, JSTARS

used its radar to provide NATO military commanders critical situation awareness by tracking enemy ground force movements throughout Kosovo. The planes did so from a single daytime orbit and with a limited on-station time from 6:00 A.M. until about 2:00 P.M. — when most of the initial Serb ground movement occurred. During the course of 83 effective Joint STARS missions from February 22 until June 28, 1999, the aircraft and crews accumulated 730.7 "on-station hours," while achieving 99% launch reliability and an 80% mission capable rate. By providing surveillance of a dynamic environment on the ground, including monitoring refugee flows and enemy force movements, Joint STARS was able to provide NATO's Supreme Allied Commander and his air and ground component commanders a theater-level understanding that enabled Allied forces to respond quickly to enemy ground movement. According to its aircrews, Joint STARS also may have had a strategic effect on the war. Apparently, as the Serbs came to understand that NATO could track large convoys and direct air strikes against moving vehicles, their army adopted small-unit tactics, limited its movements, and resorted to concealment to survive. Thus, the military resurgence of the Kosovar Albanians in the war's final weeks was enabled to some degree by the limits Joint STARS imposed on the size and tactical mobility of Serbian military forces.²¹

As was the case with the EA-6B, however, the advantages gained by employing an LD/HD system over a three-month air campaign were offset by the disadvantages of pushing the tiny force of four E-8Cs to its limit. Although the available E-8s were flown at excessive rates, the number of orbits and the time on station were judged inadequate to meet surveillance and battle-control requirements. Similarly, the length of the missions — at the time of the Kosovo Liberation Army ground offensive late in the war, one JSTARS mission stretched for 21 hours — clearly took its toll in terms of effectiveness, even on augmented crews. Again,

18. There is currently a two-year, Navy-led Analysis of Alternatives underway to examine possible successors to the EA-6B. The Navy initially favors a variant of the F-18, the Air Force is considering a long-range aircraft, and the Marines may choose the Joint Strike Fighter. See "Joint Strike Fighter Could Serve as Jammer," *Aviation Week*, July 24, 2000, p. 59.

19. See Price Bingham, "Rapidly Stopping an Invasion," *Strategic Review*, Vol. XXVI, No. 4, (Fall 1998), pp. 52-57.

20. 93rd Air Control Wing Briefing, Warner-Robbins AFB, GA, July 18, 1999.

21. Ibid. See also, "JSTARS Led Most Lethal Attacks on Serbs," *Defense Week*, July 6, 1999, p. 13.

similar to the EA-6B story, training in the U.S. was reduced to a trickle as crews were shuttled from peacetime duties to the air war's demanding personnel tempo. The predictable result was a significant amount of time expended after the war to reconstitute the force, and to fix shortfalls in aircraft engines and air-to-air communications.²²

Post-Allied Force, the JSTARS 93rd Air Control Wing now sees "air control of surface attack operations" as a much more important component of the unit's mission. The emerging capability to integrate air-to-ground surveillance platforms into networks able to detect, track, target and shoot in near-real time suggests that this system-of-systems will assume a greater role in future armed conflict. However, the lessons of Kosovo also document that the size of the currently planned Joint STARS fleet falls far short of being able to support America's global commitments. Based on AWACS requirements — an LD/HD asset which remains over-tasked despite complementary Navy E-2C and allied aircraft — early Joint STARS studies projected a total need for 32 aircraft.²³ Unfortunately, these original plans focused primarily on major theater conflicts, ignoring additional JSTARS requirements for peacetime operations including indications and warning, treaty verification, and crisis management. To make matters worse, the requirement was reduced to 19 aircraft under the assumption that JSTARS, like other LD/HD assets, could swing from one contingency to another. Ultimately the 1997 QDR — despite declaring that "modernization of our forces depends on a strong C4ISR common backbone" — reduced the planned JSTARS buy from 19 to 13, a decision based on an anticipated NATO buy of JSTARS, presumed UAV radar coverage, and a need to fund upgrades in JSTARS radar capability and communications.²⁴

22. During Allied Force, Joint STARS aircrews were augmented from 21 to 27 to cope with the duration and demands of a combat mission. Improved engines are needed on the refurbished 707s to get the aircraft higher, sooner, and therefore provide greater coverage of ground that otherwise would be masked by terrain. Some of the JSTARS operators also lamented an inadequate communications suite that had not been planned or equipped to conduct continuous air-to-air communications with fighters under their control. The Institute for Defense Analyses had documented both of these shortfalls in a study of Bosnian operations in 1995.

With that reduction in the programmed fleet, and still without the hoped-for NATO buy of a JSTARS-like airborne ground surveillance system, the U.S. and its allies face growing gaps in wide-area surveillance and battlefield management. Responding to this need, Congress has provided for the 14th and 15th JSTARS, and recently put in long-lead funding for the 16th aircraft.

Retired Air Force General Richard Hawley noted, "The systems have been constantly overused and are in danger of becoming exhausted."

Other platform and system combinations may also compensate for this looming surveillance shortfall, and should be evaluated and appropriately pursued. The Global Hawk unmanned air vehicle has some near-term capability to supplement Joint STARS coverage, particularly over highly defended areas or rugged terrain. But size and weight restrictions on its sensor package combined with its high-altitude, long-endurance design may make it a better substitute for the U-2 than for JSTARS.²⁵ Over the longer term, a space-based system such as Discoverer II may provide global access MTI, but independent studies warn that technical and fiscal constraints may delay the initial operating capability of a space-based MTI constellation until at least 2020.²⁶ In any case, UAVs and space-based systems will not provide the man-in-the-loop battle management capabilities essential for exploiting perishable information with timely attacks. Allied Force demonstrated that when JSTARS is teamed with other LD/HD assets, such as Rivet Joint, UAVs and U-2s, the sensor cross-

23. Early force planning for JSTARS postulated two MRCs, each requiring 3-4 continuous orbits. A single orbit can require up to 5 aircraft for 24-hour coverage, yielding a minimum requirement of 30 aircraft.

24. Cohen, *Report of the Quadrennial Defense Review*, op. cit., pp. 44-45.

25. See "Air Staff to brief Peters on accelerating Global Hawk, retiring U-2," *Inside the Air Force*, July 21, 2000 p. 1, and "Enhancements Ready U-2s for Years of Duty," *Defense News*, June 20, 2000 p. 66.

26. See "Space Radar on Death Row, Appeal Pending," *Defense Week*, June 19, 2000, p. 1.

cueing dramatically magnifies overall situation awareness. Thus, these different systems should be seen as complementary rather than as competitors.

Tempering the Pentagon's "Brittle Swords"

What should we conclude about the status of these and other LD/HD assets? As case studies of the LD/HD problem, the EA-6B and Joint STARS offer a range of lessons and implications. In the case of the EA-6B, simply designating the platform an LD/HD asset was not enough. With the tactical jamming mission denied adequate numbers of assets, no amount of monitoring and resource management could wring the needed capability from the limited number of airplanes. Now the services are engaged in a lengthy and expensive study to develop alternatives to a problem that never should have been allowed to develop. Unfortunately, with the EA-6B long out of production and the 123 airframes available scheduled to undergo needed upgrades and modifications, there are no quick or cheap solutions to the tactical jamming shortfall.

One step the Navy is taking is creating a new expeditionary squadron to be composed of EA-6Bs that were not previously combat coded. In addition, the services, the DoD, and the Congress need to fund, if not accelerate, enhancements to the current EA-6B fleet to ensure that it can meet the demands placed on it while alternatives are deliberated and developed. Key to this improvement and the baseline for any new tactical jamming aircraft is the Improved Capability 3 (ICAP 3) system that provides modern reactive tactical jamming and real-time, precision location of emitters.

Regarding Joint STARS, the House Appropriations Defense Subcommittee said, in adding acquisition funds for JSTARS last year:

Operation Allied Force...has also reinforced the importance of, and need to adequately budget for, a sufficient quantity of these and

other "low-density, high-demand" assets. The Joint STARS operational base of aircraft and crews is among the most stressed...and there are clearly not enough programmed to support the current strategy....²⁷

With the Joint STARS line still open, the DoD has the opportunity to avoid the mistakes made in the EA-6B program by continuing to produce, at low and efficient rates, the number of aircraft the CINCs have requested and that the Joint Staff has validated. At this writing that number is 19, but it could go higher depending on continued JSTARS use in peace operations. And, in another parallel with the EA-6B program, improvements to E-8 sensor capabilities are needed as well.²⁸ The costs, risks, timetables and contributions of complementary platforms, such as Global Hawk, business-jet surveillance platforms, and space-based MTI will also play in the decision. It also may be possible to hold the number of Joint STARS under the original requirement of 32 if NATO elects to acquire a fleet of air-to-ground surveillance aircraft. But any such decision should be made with a NATO commitment in hand. Hope is not a sound strategy for force planning.

Finally, the LD/HD problem reveals a broader management problem that cuts across service boundaries. On one hand, Joint Staff and service vision documents look to more innovative, more decisive ways of fighting that will rely increasingly on electronic warfare, advanced battlespace surveillance, and long-range precision strike. On the other hand, the individual services, left to their proclivities and traditional priorities, seem unwilling or unable to acquire adequate numbers of the high-demand systems crucial to their unique advanced warfighting capabilities. Sooner or later, senior Pentagon managers must confront this issue. If the need for LD/HD assets remains high, it is incumbent on the nation's defense leaders to match density to demand.



27. House Appropriations Defense Subcommittee markup of the FY00 defense spending bill, *Inside the Air Force*, July 16, 1999, p. 14.

28. The proposed JSTARS Radar Technology Insertion

Program will make it possible to see more ground activity, see it more accurately, and deliver that information faster in more formats. See "Pentagon Demands Radar Upgrade Accord," *Aviation Week*, August 7, 2000, p. 41.