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APY-3(V) (JSTARS Radar) - Archived 01/2008

Outlook

- JSTARS is based on U.S. Army SOTAS and U.S. Air Force PAVE MOVER radar systems, dating back to the 1970s
- Despite its lack of production, the U.S. Air Force continues to spend a large amount of money maintaining and upgrading the APY-3 and its aircraft platform. In 2005, two contracts, worth $7.8 million and $532 million respectively, were signed
- JSTARS offshoot program, the MP-RTIP radar, will eventually succeed the APY-3 in ground surveillance role

Orientation

Description. The APY-3 Joint Surveillance Target Attack Radar System (JSTARS) is an airborne, multimode, advanced synthetic aperture radar system. The Common Ground Station, the TSQ-179(V), is being fielded.

JSTARS is a primary source of intelligence data for military commanders, target data for fire control systems, and guidance data for attack aircraft and missile systems. The Common Ground Station acquires, processes, correlates, and displays in real time SAR/MTI, SIGINT data, UAV inputs, imagery, and National Sources inputs.

Sponsor

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Status. Ongoing logistics support.

Application. Airborne battlefield surveillance system and battle management command and control. The Air Force is considering mission expansion to include counter-land and counter-sea missions.

Price Range. Based on the FY99 budget, the cost of an E-8C is $289,104,500. Radar cost is about $14 million. Ground station cost is estimated at $12.1 million.

Contractors

Prime

Northrop Grumman Norden Systems	http://www.es.northropgrumman.com/es/NDS/, 10 Norden Pl, Norwalk, CT 06856 United States, Tel: + 1 (203) 852-5000, Fax: + 1 (203) 852-7698, Email: ES_Communications@ngc.com, Prime

Technical Data

	Metric	U.S.
Dimensions		
Weight	1,906.8 kg	4,200 lb
Antenna length	7.32 m	24 ft
Antenna height	0.61 m	2 ft
Characteristics		
Radar modes	Wide area surveillance Moving target indication Synthetic aperture radar/fixed target indicator Low reflectivity indicator Target classification Sector search Attack planning/attack guidance capability	
Radar range	200+ km	124 nm
Coverage	40,000 km^2	24,856 mi^2
Beam width		
Azimuth	± 60 deg	
Elevation	200 deg	
Radar MTBF	60 hr specified	75 hr reported
Operations/Control	40 hr specified	55 hr reported
Communications	50 hr specified	90 hr reported
Radar elements	Pulse compression unit Radar control unit Radar transmitter Antenna Special purpose processor Receiver A/D Combiner (power management) Exciter Antenna servo electronics	
Processors	3 load-sharing programmable signal processors (5 high-speed fixed-point distributed processors)	
Communications		
Digital datalinks	Surveillance and control data link for transmission to mobile ground stations JTIDS for Tactical Air Navigation operation and Tactical Data Information Link J (TADIL-J) generation and processing	

SATCOM	
Ground Station Module	
functions	MTI/WAS
	Target correlation
	Target tracks
	SAR
	SIGINT
	UAV
	E-Maps
Interfaces (CGS/JSWS)	JSTARS E-8
	Guardrail
	Rivet Joint
	Army aviation sensors, including Longbow
	ASAS
	AFATDS
	Predator UAV
	Outrider UAV
	Hunter UAV
	ARL
	U-2R (ETRAC)
	Other ground stations
	Imagery libraries
	National sources
Functions	Real-time surveillance
	Reconnaissance
	Situation awareness
	Target development
	Theater missile defense
	Battlefield visualization
	Battle space management
Added functions	SIDS
	Auto-indexed refs
	Multimedia databases
	Real-time video
	Administrative support
	Weather
	AI
Data	Moving Target Indicator
	Fixed Target Indicator
	Synthetic Aperture Radar
	EO/IR imagery
	Video imagery
	Signal Intelligence
	Electronic Intelligence

Design Features. The JSTARS airborne system is a militarized Boeing 707-300 aircraft that carries an advanced radar, processor, and data display system. The system locates and tracks moving ground vehicles and can discriminate tracked from non-tracked while operating day or night and in most weather conditions. The radar was designed to operate in a robust electronic countermeasures environment. JSTARS provides tactical commanders with battlefield information in real-time.

The system architecture accommodates growth to avoid technological obsolescence and adjust to changing threats and missions. The growth-oriented design allowed JSTARS to take advantage of revolutionary improvements in onboard processing.

The large size, unique design, and powerful processing capability of the APY-3(V) radar system's antenna enable it to detect slow-moving targets in heavy ground clutter. JSTARS features low minimum detectable

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velocity, precise location accuracy, and high probability of detection at long range. The antenna is located in a 26-foot radome mounted under the forward fuselage of the aircraft. It is divided into three 8-foot sections.

The 24-foot antenna produces a fairly narrow beam. In Doppler space, however, there is a reasonable spread at the lower end of the clutter return that could restrict the detection capability of the system. In theory, the radar would be able to detect a large-amplitude target in clutter if there is a sufficient amplitude return. In actual practice, however, being able to locate that target would be impossible without double processing. A distinct advantage of this technique is that it allows the system to extract low-radial-velocity targets.

Achieving the required resolution is complicated by the fact that both stationary and moving objects must be located precisely while the aircraft is moving. The characteristics of JSTARS are such that the antenna produces a narrow azimuth beam and processes a large number of range bins. The platform self-location error is virtually nil because of the use of an integrated SNU-84-3 inertial navigation unit with GPS data processed through a 12-state filter. This ensures precise platform self-location with a position error of nearly zero.

Detected pulses are processed by each of the three segments so that it is possible to observe whether an object blurs or remains stationary. The system uses data from the forward and center segments and does a clutter cancellation, followed by a center-aft data collection and clutter cancellation. This makes it possible to resolve phase ambiguities.

In addition to the moving target indicator (MTI) mode of operation, the system is capable of interleaving synthetic aperture radar (SAR) image collection and processing as requested by the 18 onboard operators or ground users via a datalink request. All radar data are processed on board in real time and displayed on the aircraft consoles, and simultaneously sent to ground stations via datalinks, in two forms: MTI target reports and SAR images. MTI target reports are essentially produced in real time, while SAR images take several seconds to collect and produce.

The radar is controlled through the Operations and Control (O&C) subsystem. The main functions of the O&C system include surveillance and threat analysis, attack planning, attack support, post-attack assessment, flight path planning and monitoring, communications management, and technical control of the JSTARS system.

Operators at the workstations have overall control of the airborne sensor. All system capabilities can be individually utilized by the operators, ensuring maximum flexibility among the mission crew. Radar imagery and target data can be displayed with digitally stored map databases and terrain features, as well as other tactical information. The consoles can provide onboard training, allowing the operators to become more proficient en route to the actual area of interest.

JSTARS uses up to 14 databases to enhance the tactical value of the radar information. The cartographic databases include primary and secondary roads, foliage, marsh areas, hypsographic and hydrographic features, political boundaries, cities and towns, and railroads. These databases provide a basis for recording and monitoring MTIs in real time and with great accuracy in relation to terrain.

The area visibility database indicates where mountains or other terrain features will interfere with the radar field of view. Obviously, this information changes with the aspect angle that the aircraft generates with respect to the area of view on the ground. Thus, the operator is constantly warned where his targets may disappear from the field of view, which allows the operator to predict when a target should reappear. This data can also be used to provide optimum orbit locations, via the flight path planning function, to minimize radar screening of the area of interest.

Operational Characteristics. JSTARS is a corps support sensor to help assess the hostile forces so combat power can be focused on destroying the enemy's ability to pick and choose when, where, and how close battle will be engaged. Information from JSTARS sensors, which are deployed up to 250 kilometers into the battlespace, will help track hostile forces and support the destruction of reserve forces and the logistics tail. Cross-cueing tracks high-payoff targets through the battlespace. The system provides the input needed for planning attack and engagement.

JSTARS can deploy to a crisis area, or to an orbit far from the aircraft's base but close to the area selected for surveillance. In flight, the aircraft can maintain altitude and continue surveillance even in the event of an engine failure. This reduces the likelihood of an orbit not being covered. The E-8C's fuel capacity, air refueling capability, and crew rest area permit missions up to 20 hours long; thus, it is possible to cover large areas with a small force.

The high-quality, timely information provided by JSTARS is derived from the tremendous capabilities of the radar. The APY-3(V) provides MTI information over a wide area through both radar- and ground-referenced coverage. In the radar-referenced coverage, the radar's field of view progresses along the aircraft's track. In this mode, up to a million square kilometers of terrain can be surveyed in a single pass. In the ground-referenced coverage, the radar is optimized to revisit, according to an established timeline, a fixed area on the ground roughly equal to a corps commander's area of interest.

The radar can perform sector searches inside this wide area field of view in either high- or medium-resolution search modes, providing both synthetic aperture radar/fixed target indication imagery and smaller area MTI display.

The radar revisits an area of interest at frequent intervals. During this time, the default mode of the radar is wide-area surveillance, revisiting the entire coverage area periodically unless tasked otherwise by the operator. Within this timeline, the radar is capable of interleaving sector search modes, entering attack planning or attack support modes, or providing synthetic aperture radar imaging within a precise scanning plan. In this way, excellent wide-area situational awareness is provided, and any of the 18 onboard operators or operators located in ground stations can send requests to the radar. It is possible to simultaneously scan a number of smaller areas inside the primary area of interest.

The JSTARS communications suite carries HF, VHF, and UHF secure/non-secure voice communications. In addition to JTIDS, it carries an anti-jam digital datalink, and the surveillance and control data link for communication with ground stations.

The ground stations are tactical data processing and evaluation centers that receive sensor data from multiple sources such as radar data from JSTARS, OV-1D Mohawk, and unmanned air vehicle platforms. The ground stations are co-located with corps/division artillery tactical operations centers, multiple launch rocket system tactical operations centers, and corps/division/brigade tactical operations centers. They distribute information to other users through the Army Tactical Command and Control System (ATCCS), which includes the All Source Analysis System and the Tactical Fire Direction System/Advanced Field Artillery Tactical Data System.

JSTARS GSM system capabilities were successfully demonstrated during every major conflict since Desert Storm. JSTARS proved that it is a major force multiplier. It was considered the single most valuable targeting and intelligence system in the Persian Gulf, Afghanistan, and Iraq.

The deployment of JSTARS to Bosnia and Kosovo proved that it has theater perspective, an important need for Joint Force commanders in a combat arena. Current USAF doctrine is being expanded to include counter-land and counter-sea missions.

By adding satellite communications to JSTARS, the usefulness and span of control for the asset have been significantly expanded. Radar and operational data can be disseminated beyond the immediate range of GSM downlinks.

The Desert Storm experience led to the development of the multidata fusion common ground station system. By merging SAR/MTI, SIGINT, UAV, and other data sources, commanders can take the initial inputs, task other sensors (such as a UAV to investigate), and clearly identify and locate targets for attack. Datalinks make it possible to link directly to the shooter, improving the effectiveness of operations against once-difficult targets.

Variants/Upgrades

E-8A. This was the prototype system developed for testing; the aircraft was used during the Persian Gulf War.

E-8C. This is the production version of JSTARS, which incorporates a variety of enhancements and upgrades. In 1989, the Air Force contracted with Grumman for this enhanced JSTARS version.

An ongoing multistage improvement program involves TADIL-J message expansion, communications improvement, and self-defense suite improvements.

Possible future improvements include:

- Enhanced radar performance
- Enhanced signal processing
- Enhanced Synthetic Aperture Radar
- Terrestrial Inverse Synthetic Aperture Radar
- Automatic Target Recognition
- Multi-lateration SAR target location
- Improved cueing and data correlation/fusion

Radar Sensor Producibility Enhancements, Phase II. This effort involved development of the

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radar sensor reference oscillator, redesign and testing of the radar master oscillator, redesign of the radar sensor printed wiring assemblies, and improving the radar sensor line replaceable units. This work was completed in 1994. Engineers also linked JSTARS to a satellite, giving the radar aircraft the ability to communicate with command and control assets more than 500 kilometers away.

Block 20. Commercial off-the-shelf high-capacity signal processing equipment was integrated into the existing system architecture to improve data and signal processing. Data display software was modified. The upgrade includes dual-redundant Mercury RACE computers from Mercury Computer Systems, and OpenVMS-based AlphaServer ES40CV systems from Compaq Computer Corporation.

The 14th E-8C was delivered to the 93rd Air Control Wing (active duty) in late 2002. This was the fourth new-build Block 20 aircraft. Future deliveries will be made directly to the Georgia National Guard 116th ACW "blended wing." The Air Force is upgrading the first 10 JSTARS to Block 20 configuration, with the first retrofit completed in February 2002 and the second late in the year.

E-8C Interoperability Modifications. These modifications augment the basic E-8C ability to interoperate with external tactical elements via changes to external communications systems. They include integrating improved data modems into the existing E-8C communications subsystem, integrating a basic UHF SATCOM communications capability into the E-8C, providing beyond line-of-sight voice and data communications with UHF-equipped platforms, and replacing the E-8C VHF ARC-186(V) radio with a VHF SINCGARS radio for better voice communications with ground and Army aviation forces.

The JSTARS manufacturer was awarded a contract to develop a computer datalink between the E-8C and the Army AH-64D Apache Longbow helicopter. Target data from JSTARS will enhance the Longbow's radar picture of the close-in battle. The first phase of the effort involved developing an improved data modem and installing it on a JSTARS test aircraft.

Operations and Control Subsystem Modifications. O&C subsystem modifications augment the operator's ability to manage the SAR imagery data, support the air tasking order (ATO), and exchange graphics data with JSTARS GSMs. As a result of these modifications, redundant sensor tasking for SAR imagery can be eliminated, as SAR imagery requests are compared with previously collected SAR data. Operational, map, coordination, and graphic data can be exchanged with the ground station, as will fire support target parameters; DMA compressed ARC digitized raster graphic and hypsographic data can be displayed at operator workstations using slope shading to illustrate terrain features; operators are able to view the overall area of interest while maintaining zoomed-in views of concentrated interest, as well as input, store, and display an ATO database; and ATO data will be able to be processed in combination with existing E-8C database information.

Obsolete production processors are being replaced with new COTS general-purpose computers.

Common Large Area Display Set Program. In September 1999, the Raytheon Marine Company Digital Display Group was awarded a firm-fixed-price contract, with options, to replace the CRT-based crew station monitors with variations of the Raytheon 21-inch digital ruggedized monitor. This was part of the USAF Common Large Area Display Set Program (CLADS), which was begun in 1995 to address the shortage of manufacturers of the large display systems used aboard AWACS, JSTARS, and ABCCC aircraft. The Common Large Area Display Set moves away from cathode ray tube technology toward digital display systems, which should have greater reliability and image clarity. AWACS and JSTARS are the initial aircraft being retrofitted under the CLADS program. A $29 million contract called for up to 1,071 displays. Deliveries began in 1999.

Radar Technology Insertion Program (RTIP). The U.S. Air Force began a $1.3 billion, preplanned product improvement (P3I) program, under which engineers would design, develop, install, test, and integrate advanced radar systems in JSTARS, taking advantage of advances in radar and signal processing technology to significantly enhance JSTARS performance and reduce life-cycle costs. These efforts were transferred to the Multi-Purpose Radar Technology Insertion Program (MP-RTIP), and are considered a separate program from JSTARS.

A JSTARS Aircraft

Source: DoD

Program Review

SOTAS Provided U.S. Army With Invaluable Experience

JSTARS is based on SOTAS and PAVE MOVER radar systems. SOTAS (Stand-Off Target Acquisition System) was an Army helicopter-borne (UH-1) radar system that was field-tested in the Federal Republic of Germany for eight years, beginning in 1977. SOTAS provided the U.S. Army with invaluable operational experience in applying a technology that can see and track moving targets while ignoring stationary ones.

Meanwhile, the U.S. Air Force was developing PAVE MOVER, an airborne radar to detect ground targets (such as tanks) and relay the target location to tactical aircraft or ground-based units. The program combined an airborne multimode radar and a wide-band datalink with a high-speed digital signal processor, display, and ground control.

Flight tests confirmed the viability of the PAVE MOVER concept of guiding attack aircraft against distant moving and stationary tank formations. Although somewhat crude, the joint Grumman/Norden effort provided a solid base for the JSTARS concept, combining target tracking, SAR imagery, weapon acquisition tracking in real time, and navigation. Two converted aircraft were delivered in July 1987 and August 1988.

After Iraq's invasion of Kuwait, General Norman Schwarzkopf requested JSTARS support for Persian Gulf Operations. On December 21, 1990, the Joint Chiefs of Staff ordered the deployment of the two prototype JSTARS aircraft from operational testing in Europe (Operation Deep Strike) to the Kuwait theater of operations. The aircraft arrived in theater on January 12, 1991, eventually flying 49 combat sorties and logging 535 mission flight hours. Commanders praised the aircraft for its ability to track enemy formations and relay that information to coalition attack aircraft. Despite their limited numbers, the aircraft were exceptional at increasing situational awareness.

When Coalition leaders discovered that JSTARS could contribute to countering Iraqi Scud missile attacks, they pressed the aircraft into an active Scud-hunting role. The major complaint was that there were not enough JSTARS aircraft. When engaged in Scud-hunting, the one aircraft available each night was limited in its direct support of ground commanders.

Pentagon Approves LRIP in 1993

After months of negotiations and compromises between the Pentagon, military commanders, and individual service branches, the U.S. Department of Defense approved a LRIP of five aircraft, lots 1 to 3, in May 1993. The decision was based on a favorable Defense Acquisition Board Review. Approval for long-lead items for Lot 4 was also given.

When NATO peacekeeping forces went into Bosnia in December 1995, JSTARS aircraft were called on to assist Operation Joint Endeavor. Two JSTARS aircraft flew 50 consecutive sorties, breaking the record set in Operation Desert Storm in 1991. The E-8A and the E-8C developmental aircraft met every assigned mission during the deployment. They flew a total of 95 operational missions and logged more than 1,000 flight hours. The aircraft and crews returned on March 29, 1996.

JSTARS Imagery Significant in Operations

JSTARS imagery in Bosnia had a significant impact on operations as well as on the outcome of peacekeeping negotiations. Copies of photographs viewed by Forecast International clearly revealed when vehicles had been moved out of the zone of separation (and when they had not). JSTARS monitoring of Sava River crossings was key to protecting the Coalition forces as they built the bridges needed to move U.N. forces.

The Pentagon sent JSTARS back to Bosnia to monitor the pullout of U.S. troops from Operation Joint Endeavor. The systems were modified to provide links to Predator UAVs flying from the base at Tazar, in addition to conducting standard JSTARS monitoring operations. Operators on JSTARS were able to control the UAVs and use them to provide detailed observations (to 1 foot) of areas screened from the APY-3(V). The UAV data were transmitted directly to ground stations.

Full Rate Production Approved in 1996

The Pentagon's Defense Acquisition Board approved full-rate production of a planned 19 JSTARS aircraft on September 26, 1996. In November 1996, the DoD deployed two JSTARS to Germany to fly missions supporting Operation Joint Endeavor.

In 1999, officials began exploring whether or not it would be practical to expand JSTARS' surveillance capabilities by equipping the Global Hawk UAV with a modular JSTARS radar. This would be an offshoot of the RTIP radar upgrade effort. Although there were no plans to replace the radar planned for the RQ-4A Global Hawk, officials were open to increasing the synergy between the two platforms by using the same basic sensor in both. The RTIP sensor for the UAV would have a smaller aperture than the original JSTARS, and thus would lack some of its capabilities.

In other test operations, JSTARS was equipped with an information system to receive sensor data from the Predator UAV. Real-time satellite feed was demonstrated in the Air Force Expeditionary Forces Experiment (EFX 98).

In late 2000, the Secretary of Defense approved Air Force plans to restructure the RTIP program, budgeting $756 million from FY02 through FY07 for R&D of four elements of the RTIP program. $479 million would be allocated for the development of a modular radar RTIP sensor for multiplatform applications, with procurement to begin in FY08. $28 million would fund a multiple-user common datalink to be completed in FY06. $81 million would go toward developing a sensor for the NATO Trans-Atlantic Advanced Radar (NATAR), to be completed in FY07. $168 million would fund sensor integration and additional EMD for Global Hawk, with procurement to begin in FY08.

The Multi-Platform Radar Technology Insertion Program (MP-RTIP) would become a stand-alone effort, and the Multi-Sensor Command and Control Aircraft (MC^{2}A) program, the E-10A.

Mission Transfers to ANG

On October 1, 2002, the JSTARS mission transitioned to the Air National Guard 116th Air Control Wing (ACW) at Robins AFB, Georgia. This wing is part of the Total Force "blended wing" concept, which combines both active duty and Air National Guard personnel in a single unit. It replaced the B-1B mission lost by the wing when the Air Force retired much of the B-1B fleet.

In October 2003, at Edwards AFB, California, Northrop Grumman successfully conducted the first communication between the U.S. Air Force's Global Hawk UAV and a manned airborne battle management platform. The company-funded event demonstrated a new architectural concept called the Advanced Information Architecture (AIA), an effort that will result in the ability of Global Hawk imagery and other mission-critical data to be rapidly disseminated in theater among battle managers, ground troops, and other tactical users. The AIA concept test shared imagery among Global Hawk, a testbed E-8C, and several ground users equipped with tactical man-pack radios and laptop computers.

JSTARS Improvement a Continuing Process

The U.S. military continues to study ways to improve JSTARS. It continues development of advanced battle management aids and information fusion to enable rapid decisions in tracking and killing time-critical targets, and helps achieve predictive battlespace awareness. Concept exploration and program definition/risk reduction efforts, as well as specialized studies, support continuous improvements in command/control and ISR (C^2ISR) capabilities. These efforts include, but are not limited to, manned and unmanned platforms, space data links, advanced Battle-Management Command, Control and Communications (BMC^3) concepts, ISR Constellation, Air Moving Target Indicator (AMTI), Ground Moving Target Indicator (GMTI), Mode 5/S, Network Centric Collaborative Targeting (NCCT), Interim Capability for Airborne Networking (ICAN), and other large airborne platform integration efforts.

JSTARS will Improve Coordination and Interoperability with U.S. Allies

These efforts include the use of a dedicated test aircraft, laboratories, and test support facilities. The result is greater mission capability, higher mission reliability, and maximum weapon system availability. The JSTARS program will coordinate with and participate in projects developing international standards (including NATO standards) to ensure joint, allied, and coalition interoperability.

This program element also funded the initial MP-RTIP development. Beginning in FY03, MP-RTIP funding was moved to PE#0207449F.

The Air Force will continue development for various fleetwide modifications throughout the life of the JSTARS weapon system using modifications to the post-production contract. Radar-specific efforts include spiral development, kill chain and integration/analysis, and interoperability.

Projections are that JSTARS will be flying until 2025. Plans are being mounted to replace the E-8C's engines, hopefully an effort that will be funded in the FY06 budget.

Funding

U.S. FUNDING

	FY05 QTY	FY05 AMT	FY06 QTY	FY06 AMT	FY07 QTY	FY07 AMT	FY08 QTY	FY08 AMT
Procurement (U.S. Air Force)								
PE#0207581F								
E-8C Mods	-	21.81	-	2.17	-	6.26	-	6.42

All $ are in millions.

Source: FY07 U.S. Budget Documents

Note: Funding for E-8C Mods cover(s) all aspects of the procurement program, including the APY-3.

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Contracts/Orders & Options

(Contracts over $5 million.)

Contractor	Award ($ millions)	Date/Description
Northrop Grumman	7.8	Sep 2005 – FPIF contract mod to definitize the change order for qualification, test, documentation, and installation design for replacement antenna servo electronics (ASE) shop-replaceable units for JSTARS, preparation of a Time Compliance Tech Order (TCTO), procurement and fabrication of an ASE-level TCTO kit, installation and "kit proof" of the TCTO kit, and integration of the modernized ASE into the APY-3. This effort redesigns and qualifies key circuit card assemblies in the ASE. This effort also includes redesign of the phase shifters to resolve current design and material issues as well as purchase of 19 phase shifters and spares. To be completed September 2007. (F12628-02-C-0022-PZ0087)
Northrop Grumman	532	Nov 2005 – Contract for the Joint Surveillance Target Attack Radar System (Joint STARS) System Improvement Program to provide systems design and development improvements to the E-8C Joint STARS fleet. The contract covers the engineering, design, development, integration, test, and delivery of various enhancements and upgrades to the Joint STARS fleet. It also includes items such as technical orders, support equipment, initial spares and training, and procurement of production and support-system retrofit kits and documentation.

Timetable

Month	Year	Major Development
1Q	FY99	Production aircraft deliveries
2Q	FY99	Advanced imagery capability developed
4Q	FY99	Follow-on OT&E start; CRP EMD first flight; Indian Springs operational demonstration of CGS
2Q	FY00	RTIP MS II; TCDL integration
3Q	FY00	RTIP EMD contract award; Milestone III; Block 10 Reliability Growth Test
2Q	FY01	Modeling and simulation
3Q	FY01	MP-RTIP Phase I definitized; MP-RTIP Integrated Baseline Review
1Q	FY02	Radar Requirements Review
2Q	FY02	Tactical Common Data Link retrofit; Radar Functional Review
3Q	FY02	MP-RTIP platform decision; RVSM contract award
1Q	FY03	Support & Training Sys Phase 1 complete; install Block 20
2Q	FY03	Complete SATCOM development; flight crew training system delivered; ABCCC Award; ASU contract award
2Q	FY04	ACI development complete (formerly ABCCC); develop Block 20 trainer
1Q-4Q	FY05-07	Spiral development – ICAN (airborne internet) Proof of Concept at Red Flag
2Q	FY05	Spiral Development – Track Mgt by Area (TMBA) Award
3Q	FY05	ASU (Link 16) Phase I Flight Test
4Q	FY05	ASU Air Control/Theater Missile Defense capability delivered
2Q	FY06	ASU Phase II Flight Test
3Q	FY07	Blue-Force Situational Awareness Flight Test, Spiral Development – TMBA Integrated S/W Release
4Q	FY07	ASU Full Battle Management S/W release
	2025	Possible retirement of JSTARS

Worldwide Distribution/Inventories

JSTARS is a **United States** program.

Forecast Rationale

Like the JSTARS aircraft, the APY-3 is no longer in production. Despite its lack of production, the U.S. Air Force continues to spend a large amount of money maintaining the radar and its aircraft platform. The money goes to both keeping the radar in working order and modifying it to maintain its supremacy on the battlefield.

High-Demand, Low-Density Asset

JSTARS is a high-demand, low-density asset in great demand for combat or contingency operations where ground surveillance is needed. It gives ground commanders access to simultaneous, real-time information on opposing ground forces regardless of darkness or weather. JSTARS provides situational awareness of the location and movement of both friendly and hostile forces over a wide area. With the information provided by JSTARS, commanders can get inside the enemy's decision cycle and achieve success with fewer forces and less risk.

Improvements include better communications for net-centric operations, and better, more effective ways to disseminate JSTARS' data to the battlefield, including the direct transmission of data to "shooters" on a mission, as well as to satellite links to distant head-quarters. The operational integration of JSTARS, AWACS, and the Airborne Battlefield Command and Control Center has become tactical standard.

JSTARS Interconnectedness Crucial

As planners and developers become more invested in net-centric operations, JSTARS interconnectedness is seen as crucial. ICAN (Interim Capability for Airborne Networking) will allow on-board personnel to "talk" to units and commanders on the ground. Initial efforts have routed these communications through existing JSTARS radios into the DoD's Secret Internet Protocol Router Network (SIPRNET), linking the operators into worldwide networks so they can take part in "live" decision-making conferences instead of having to respond to radio requests after the fact.

Other JSTARS upgrades are planned, including a major air traffic management upgrade in order to satisfy international airspace access requirements. The CNS/ATM (Communication Navigation Surveillance/ Air Traffic Management) upgrade will install hardware and software that will allow E-8Cs to operate in the increasingly restrictive domestic and international air space. It involves a significantly modernized cockpit and allows for "free flight" operations where the pilot has significant leeway in choosing routes, speeds, and altitudes real time.

MP-RTIP to Replace JSTARS

The planned E-10A and Global Hawk MP-RTIP radar will eventually replace JSTARS, even though the program is an offshoot of the JSTARS program. By taking advantage of hardware and software not available when the APY-3(V) was designed, significantly more capability is being achieved with smaller, more efficient equipment. It takes advantage of processing advance-ments, and modularity will make future change easier and faster. Recently, the MP-RTIP program has hit some bumps in the road. The U.S. military has stated it does not want a manned platform to be equipped with the radar, leaving only the Global Hawk as a recipient. This may extend the life of the E-8C but will not restart production.

Ten-Year Outlook

No further production of the JSTARS radar planned. Upgrades and improvements will continue.

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