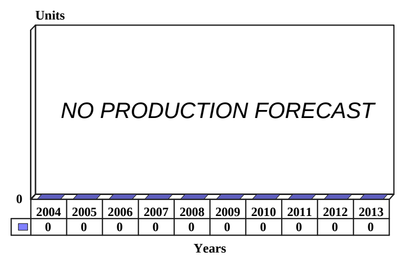
APY-6(V) - Archived 10/2005

Outlook

- Upgraded legacy systems for littoral operations
- Flown in Navy Fleet Battle Experiment sensor demonstrations
- Demonstrated the ability to find mobile missile launcher targets
- Technology will become part of new sensors

10 Year Unit Production Forecast
2004 - 2013



Orientation

Description. Air-to-ground, multimode synthetic aperture and ground-moving target radar. The latest version was given the nomenclature APY-6(V).

Sponsor
U.S. Navy
Naval Air Systems Command
NAVAIR HQ
47123 Buse Road Unit IPT
Patuxent River, Maryland (MD) 20670-1547
USA
Tel: +1 301 342 3000
Web site: http://www.nawcad.navy.mil

Status. The APY-6(V) is undergoing flight tests.

Total Produced. Through 2003, an estimated seven prototype and test versions of the APY-6(V) had been produced.

Application. The APY-6(V) was marketed for legacy mid-range air-to-surface platforms, including UAVs, for the Navy, Army, and Air Force.

Price Range. Unit price ranged from US$5.3 to US$7 million, depending on specific requirements of the platform.

Contractors

Northrop Grumman Norden Systems, http://www.es.northropgrumman.com/es/NDS/, 10 Norden Place, 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		
Original APG-76(V)		
Weight		
Pod	340.5 kg	750 lb
Radar only	284 kg	625 lb
Antenna	66 x 54 cm	26 x 21.3 in

Characteristics

Original APG-76(V)

Frequency	16.5 to 16.6 GHz	
Power	13 kW (peak)	
	400 W (avg)	
Pulse width	Four possible, including 0.4, 1.25, 3.0 µsec	
PRF	300, 800, 2,400 pps	
Duty cycle	5%	
Receiver noise figure	6.5 dB	
Receiver channels	4	
LRU	7	
Input power	7,352 W	
Antenna beam widths		
Sum AZ	2.2º	
Sum EL	3.8º	
Interferometer Az	6.8º	
Coverage		
Horizontal	+/- 60º	
Vertical	+2º to -40º	
Antenna gain		
Sum	34.5 dB	
CSC^2	31 dB	
Range		
Standard real-beam	74 km/185 km	40 nm (ideal)/100 nm (max)
Doppler mode	111 km	60 nm
Ground target tracks	64.7 km	35 nm
MTI track range (radial velocity)	5 to 55 kt	5.57 to 63.3 mph
SAR maps	148 km	80 nm
SAR resolution	1 m	3.28 ft
APY-6(V) test radar resolution	0.3 m @70 nm	1 ft @70 nm
Spot SAR/ISAR	2.9 m	9.8 ft
ground map	64.7 km	35 nm (70 nm max)
High resolution (@129.5 km/70 nm)	0.3 m	1 ft
Doppler beam sharpening	26 x 26 km area	
(54 m resolution)	14 x 14 nm area	
Coverage	+/- 60º azimuth	
	+/- 30º pitch	
Roll stabilized	+/- 110º	
Modes of operation		
APY-6(V)	SAR	
	Spot SAR	
	GMTI	
	Simultaneous SAR clutter suppression interferometry	
	3D SAR imagery (designed)	

Design Features. The APY-6(V) design grew through a series of upgrades from the original APQ-156(V) A-6E radar. It added an airborne moving target indicator, synthetic aperture, and inverse synthetic aperture capability while maintaining the ground mapping, all-weather capabilities of the older system. The analog signal converter of the APQ-148(V) was replaced by a digital processor, and the radar provided simultaneous detection, target acquisition, low-level terrain information and aircraft-to-target information and could detect moving targets in ground clutter. The radar featured frequency agility.

The cosecant squared beam antenna is scanned mechanically in azimuth. Incorporating synthetic aperture radar (SAR) technology for improved resolution and inverse SAR (ISAR) capability for ship classification increased the range at which the original radar could detect, identify, and track land, sea or air targets. Increased power output and other operational improvements, including ultra-high resolutions, led to the development of the APG-76(V).

SAR modes included a three-port clutter-suppression interferometer (CSI) for detection of slow-speed, ground-moving targets, and for the precise location of detected moving targets: the positions of the targets are indicated by symbols on the SAR image background.

An advanced version of the APQ-156(V) was selected by the Israeli Air Force to upgrade its F-4 Phantom 2000 aircraft. The features of SAR mapping were combined with a JSTARS-like ability to track moving ground targets. The antenna used a single-pulse and one-transmit array with four receive antenna arrays to combine the two capabilities. A phase interferometer located below the radar antenna parabolic plate generated an elevation-versus-range profile of the approaching terrain for terrain avoidance, following, or mapping.

Interferometric notching and tracking techniques made it possible to detect and precisely track moving ground targets with radial velocities between 5 and 55 kilometers per hour. Ground clutter was suppressed by subtracting the returns received by one interferometric antenna segment from the weighted returns received by another. This was done in the outputs of all of the Doppler filters passing frequencies determined to be within the mainlobe of the two-way antenna pattern.

A true SAR image requires the target to be fixed; moving targets are not displayed. Moving target indicator data eliminate fixed targets. The CSI was developed to produce a clutter-free image that could be simultaneously overlaid on an SAR map. One improvement to the new radar was a new exciter/ receiver unit that provided excellent SAR resolution.

Synthetic aperture mapping and ground moving target radar data can be integrated to produce a 15-second cumulative display. The picture develops in 30 seconds and then is updated continuously. The updated radar was installed in a convertible S-3 cargo pod for testing on U.S. Navy S-3 aircraft. The pod was carried under the S-3's right wing and included a long-range datalink that could transmit radar data to a ground station. This was used for the RDT&E effort, but is representative of future operational ground stations. Some testing was performed with the radar mounted on a company Gulfstream II test aircraft.

The APG-76(V) had several air-ground SAR modes. A standard real-beam mode covered a broad area out to ranges greater than 100 nautical miles, while Doppler-beam sharpening could examine an area 14 x 14 nautical miles, with 180-foot resolution. Three "spotlight" SAR modes could look at even smaller areas, with increasing definition. The ultra-high-resolution SAR gave 1-foot resolution at ranges greater than 70 nautical miles.

The radar operated in Ku-band (16.5 GHz.), in contrast to (then) Texas Instruments' X-band 9,200 MHz. The APS-137(V) ISAR is installed on S-3Bs, including those that could be selected to carry the radar. The Ku-band SAR has a greater ability to penetrate weather and a lower power consumption.

While operating in the real-beam and spotlight SAR modes, the radar can simultaneously detect and track up to 75 moving ground targets. The symbols from those targets are overlaid directly on the SAR mode images.

The sensor could be adapted to provide three-dimensional imagery and moving ground target detection in a small area by producing two images, one from the upper and one from the lower aperture. These are combined coherently, and the phase relationship evaluated on a pixel-by-pixel basis. This yields an angle that can be interpreted as altitude. Using special viewing goggles, an operator "sees the display in three dimensions," a feature that has a variety of possible uses. For example, helicopter pilots could use the goggles to view in advance the terrain over which they will be flying. A color-coded elevation data display is also possible. This capability was demonstrated with a modified APG-76(V).

Antenna stabilization is even more critical for the SAR than for the S-3B's APS-137(V) ISAR. An ISAR uses the roll motion that the sea generates to create images of the targets. Since land targets do not have that same type of motion, SAR uses the movement of the aircraft, which makes precise correction for aircraft motion essential. The ring laser gyro/GPS/INS system on the S-3B compensates for target motion, and also gives target-fix accuracy down to 20 meters. SAR accuracy of 1 meter is claimed. The APY-6(V) has a Spot SAR and ISAR capability as well, featuring 0.3-meter resolution.

Modes integrated in the sensor include SAR with resolutions of 1 to 10 feet, ground moving target indicators (GMTIs) featuring simultaneous SAR and clutter-suppression interferometry, and moving target imaging (MTI) with 1 foot resolution. The system's architecture makes possible.3-meter Spot SAR resolution and three-dimensional SAR mapping in real time. Several improvements were realized from significant advances in technology.

The APY-6(V) has a SAR resolution 20 times higher than that of the Multi-Mode Radar System (MMRS) and twice that of the Gray Wolf APG-76(V). MTI resolution is listed as 10 times higher than either of the preceding radars, and the instantaneous area coverage is 64 times greater. The radar features moving target imaging, something neither the MMRS nor APG-76(V) had. The radar can detect turning antennas in a searched area.

The system features an open software environment that allows enhancements to be added to the testbed radar, including the insertion and evaluation of software from other programs. Moving target detection was optimized for slow-moving target detection in high-clutter environments.

Hairy Buffalo. In fleet exercises, the Hairy Buffalo test aircraft showed potential to thwart "shoot-and-scoot" targets, such as tactical missile launchers. This capability has dominated operational planning since the 1991 Persian Gulf War. The ability to find, identify, and attack moving targets (primarily mobile missile systems) within 10 minutes is now within reach.

A potential solution was a U.S. Navy demonstration that combines an aging NP-3C aircraft, several off-the-shelf components, and some spin-off technologies from projects such as JSTARS. Researchers say it has essentially met the short timelines needed to find and destroy mobile, high-value targets, at least within the tactical environment of littoral warfare within 125 miles of a hostile coastline.

After about two years of work, the targeting, sensor, and communications package had been integrated enough to demonstrate that it could slash the time from first sensing a target through launching a weapon to about 15 minutes. Developers believe the time could be reduced another 5 minutes by adding a few refinements.

During Fleet Battle Experiment - India at Point Mugu, California, a test crew flying the highly modified NP-3C worked with electro-optical, camera-equipped, manned and unmanned aircraft, and was able to locate moving objects, identify them, and pass their coordinates and an image of the target to Navy F/A-18Cs and Air Force F-15Es. No weapons were actually launched, but SLAM-ER missile sensors were able to lock onto the targets. The process of finding and validating the target, followed by passing the targeting coordinates and imagery, was completed in less than 10 minutes if the identity of the target was confirmed by other sources.

Officials claimed that with some additional automation of crew activities, integration of a standoff weapon on the NP-3, and introduction of the combat identification algorithms being developed by the Defense Advanced Research Projects Agency and others, Hairy Buffalo could demonstrate a much faster end-to-end kill.

Some more complicated targeting problems, such as sorting out civilian vehicles from armored vehicles and tanks, still need to be resolved. To meet the need for fast, accurate target identification, more payloads are being added to the aircraft, such as passive millimeter-wave and multi-spectral sensors. The output from these sensors is being integrated with intelligence gathered by the aircraft or piped in from offboard collectors. Designers are working on combat identification of non-cooperative targets, and plan to include promising technologies in future demonstrations.

In addition to non-cooperative ID, efforts are under way in the areas of signals intelligence and joint communications such as Link 16 (narrow-band data), the digital modular radio, and the Army's SINCGARS (Single Channel Ground-to-Air Radio System). Also being studied is the ability to pull imagery from unmanned reconnaissance aircraft through modifications to the L-3 tactical common datalink already on board.

Operational Characteristics. The APY-6(V) can provide sophisticated, multimission, all-weather surveillance, with state-of-the-art air-to-ground capability. The typical airborne tactical radar aircraft cannot provide accurate long-range surface target information to the carrying aircraft. Most are optimized for air-to-air combat or weapons delivery. The range and accuracy of fixed target data are limited, and they do not display moving ground targets.

As naval operations move into the littoral environment, a ground mapping/ground target detection capability will be needed by first-on-the-scene forces. The APY-6(V) delivered a real-time, high-resolution assessment of surface activity, supporting tactical/reconnaissance operations in all weather conditions.

The ability to identify stationary and moving vehicles could make it possible to support operations until JSTARS can arrive on the scene. It could provide Joint Task Force commanders with a way to detect combat vehicles and ballistic missile launchers in littoral areas during the early stages of a conflict. The importance of this capability was demonstrated during the Persian Gulf War.

The APY-6(V) generates high-quality images during both clear and adverse weather. A user-friendly display allows for step-down from wide area surveillance (real beam) through a variety of high-resolution (SAR) patch sizes to provide for precise image detection. The SAR modes are operational to within +/-10 degrees of the aircraft velocity vector, with the highest resolution mode displaying an 0.8 x 0.8-nautical-mile patch (Spot SAR) divided into 10-foot-range and cross-range resolution cells.

The radar can be used in conjunction with a variety of datalinks, and transmit real-time imagery to other aircraft or ground stations. The imagery can then be used by tactical commanders for battlefield management. The sensor could become a mini-JSTARS and be able to be on the scene of a conflict before the E-8C. It would add a maritime surveillance capability as well. The S-3's APS-137(V) will provide maritime surveillance, with the APY-6(V) covering the land battlefield. Operationally, a JSTARS/APY-6(V) combination could support operations through an entire theater of operations. The capabilities and characteristics of the two aircraft are complementary.

The Hairy Buffalo's colored breath represents the multi-spectral sensor package used in Fleet Battle Experiments

Source: U.S. Navy

Original A-6 Antenna

Source: Keith Chaisson

Variants/Upgrades

The APQ-173(V) was a growth version of the original APQ-156(V) radar system planned for the canceled A-6F. Its synthetic aperture radar (SAR) design and high-resolution images for tracking, target recognition, and acquisition were transitioned into the APG-76(V).

In addition to a series of pre-planned improvements, an automatic target recognition capability is being added to the system, and the accuracy of the inertial navigation systems integrated with the radar are being improved to increase the precision of the targeting done using the APG-76(V) data.

The existing five parallel operating vector pipeline processors and two scalar data processing elements are being replaced with a commercial off-the-shelf processor-improved system. Alternatives to the podded version are being explored.

The APY-6(V) was the most recent upgrade to the APG-76(V), developed for littoral operations and as a possible replacement for legacy sensors. Its simplified design is expandable and upgradable. SAR/GMTI and ISAR high-resolution modes are featured.

As part of the Fleet Battle Experiment – India, an APY-6(V) was mounted in an NP-3C aircraft to evaluate its ability to find high-value targets within the littoral environment, 125 miles from a hostile coastline.

The Hairy Buffalo effort used data from the radar to cue strike aircraft in an attack on critical, high-priority targets. Of particular interest was whether a force would have the ability to find and destroy mobile missile launchers. The sensor suite combined the radar with electro-optical cameras. The crew could direct the camera on the airplane or in a unmanned aerial vehicle, as well as guide data collected from other ISR aircraft to investigate potential targets. Combined data were down-linked to an Army ground station.

Planners were particularly impressed with the performance of the SAR/ISAR modes in finding targets, developing a tactical picture and doing damage assessment. The effort is a technology demonstrator for the Navy's next-generation Multimission Maritime Aircraft.

Program Review

Background. The first synthetic aperture radar was the APQ-102A fielded in the mid-1960s, followed by a series of other sensors, including the successful APQ-148(V) carried by the early A-6s. The APQ-156(V) multimode radar was an updated version developed in 1976 and the system was produced through the 1980s.

In 1984, (then) Norden won an Israeli Air Force contract for 60 upgraded radar systems for the Phantom 2000 program. The radar would be known as the APG-76(V) Multi-Mode Radar System (MMRS).

After (then) Westinghouse Electronics Group and Norden Systems merged in March 1994, the radar underwent major changes. The merger combined the talents and capabilities of the two design groups, and made it possible to capitalize on software and components from JSTARS and the APG-66/68(V) family of radars. Northrop Grumman acquired Westinghouse ESD in 1995.

New software gave new life to the old radars, bringing system performance to well beyond that of the Israeli sensors, creating a JSTARS-like radar in a tactical size. The APG-76(V) combined SAR mapping with moving-target-indicator detection of moving ground targets, and resolution was significantly improved.

The Navy was seeking a carrier-based SAR/GMTI surveillance capability that could support littoral operations with a capability similar to JSTARS. The result was Project Gray Wolf. An APG-76(V) was adapted to a modified S-3 cargo pod. The pod included an upgraded production radar and datalink. The pod was carried under the wing of an S-3B for a series of flight tests.

The radar would complement the APS-137(V) radar, giving the S-3 both a maritime and land surveillance capability. Testing began in Sepember 1994. The first pod was delivered to the Navy in October 1994 and operational flight tests began in July 1995. By mid-1995 more than 100 sorties had been flown. In tests performed in 1996, the radar operators were able to distinguish an actual Scud missile launcher from a dummy using SAR images.

In fall 1994, the Air Force issued a contract to create an APG-76(V) radar pod built from an F-15 600 gallon fuel tank. It would be used for testing the radar on an F-16D. Air Force began testing the Snake Eyes system in spring 1995.

The system was flown on an F-16D aircraft, but funding for the F-15 tests did not materialize. By Sepember 1995, the Air Force had completed its initial flight tests. Results were good – the system was easy to operate, and readily detected both moving and non-moving targets. Reports indicated that the test systems detected moving targets out to 60 nautical miles and non-moving targets at beyond 80 nautical miles. The system tracked moving targets at beyond 55 nautical miles. Five planned tests could not be completed because the program ran out of money.

In 1994, an independent research and development program was created to evaluate the feasibility of using COTS processor hardware as a means of upgrading older APG-76(V) radar systems more quickly and at less cost, while saving the original investment in specialized processing software. Time and technology advancements made the radar's decade-old processor obsolete.

In the past, the development of custom-programmable processors was a significant portion of a radar's developmental cost, and the unique software developed for a one-of-a-kind system. The goal of the APG-76(V) effort was to demonstrate that a COTS processor would allow the software to be recaptured using a higher order language.

In the fourth quarter of 1994, the COTS hardware – four Mercury modules with associated ancillary cards and interfaces – was purchased. The special interface module was designed, fabricated, and tested, followed by software development through the rest of the year. The first flight tests took place in April 1996. During the rest of 1996, the SAR/MTI software was flight tested on the Northrop Grumman BAC 1-11.

The effort proved that it was possible to use a COTS processor to meet the radar processing requirements without having to redevelop all of the operational software. The software scheme put the programs into three levels, as described at the IEEE 1996 National Radar Conference. The first layer is processor-specific, completely device-dependent. The second layer of software interfaces the device-dependent program with the higher order program. This software must be modified if the host platform is changed. The third layer is the higher order, portable operational software.

The project validated the feasibility of COTS hardware for upgrades. The effort was not foolproof, since not all of the embedded software was completely "plug and play," and had to be corrected. Processor overhead exceeded requirements, and some documentation was inadequate or inaccurate. But the idea of COTS processors and portable operational software proved doable. Initial estimates put the cost and time savings roughly at a factor of four. The COTS processor was one-third the size and weight of the older, outdated processor.

In April 1995, the Air Force Joint Advanced Strike Technology program office contracted the company to demonstrate airborne targeting techniques that would improve the accuracy of striking ground-moving and time-critical targets. The demonstration featured the simultaneous SAR/GMTI modes of the APG-76(V) in flight test demonstrations that were to run 21 months.

Gray Wolf participated in a number of fleet and joint exercises from shore bases in the U.S. The Marines were impressed with the ability of the SAR/MTI to warn them of approaching convoys and to describe the convoy make-up.

Congress took notice of the program and recommended increased funding for the effort in the FY96 budget. Noting the success of the flight tests, the House of Representatives added US$15 million to the S-3 Weapon System Improvement program. The Senate added US$13.2 million to its version of the legislation, recommending that the money be used to buy an APG-76(V) radar, a ground station, and a datalink capability. There have been no specific congressional comments or directives since.

Senators recommended that the Navy modify the radar system to include a COTS processor and provide contractor logistics support for further testing. They also directed the Navy to consider making the Gray Wolf project an advanced concept technology demonstration if test results continue to be good. The Navy had hoped to have the Gray Wolf suite carrier certified by 1997, but was not able to schedule it.

The first flight test of the APY-6(V) airborne radar took place in February 1999 on the Northrop Grumman BAC 1-11 testbed aircraft. The flight on the Baltimore-based plane was deemed successful in terms of both the system's integration and the radar's performance.

During its first flight, the radar's accomplishments exceeded expectations for a brand-new system. During the testing, SAR images were successfully processed on board the BAC 1-11 in real time at resolutions of 1, 3, and 10 feet. Data were recorded in the system's moving target indicator modes for ground processing at a later time. On subsequent flights, the MTI mode was processed in real time.

In mid-2000, the Navy awarded a US$2+ million contract for Phase V of the APY-6(V) program. A contract modification issued by the Office of Naval Research called for the installation and flight check of the APY-6(V) on Navy aircraft. The contract would also include the provision of additional software, and flight evaluation of the modal software. The contractor will also help the Navy develop a training course for APY-6(V) operators, and will provide spare parts, demonstrations, and tests.

Design efforts included the development of an electronically steered array (ESA) antenna for the APY-6(V) Multi-Mode Air-Ground prototype radar. The ESA antenna is needed to extend the testbed radar system field of view and provide beam-on-demand and real-time track-while-scan capabilities for time-critical strike operations. The baseline prototype radar installed in the Hairy Buffalo testbed aircraft successfully demonstrated new capabilities for radar imaging of slow moving ground targets in both Fleet Battle Exercises and North Atlantic Treaty Organization (NATO) Project Caesar.

AMSTE. In January 2002, Northrop Grumman was awarded a US$22.9 million CPAF contract to demonstrate the next phase of the Defense Advanced Research Projects Agency's Affordable Moving Surface Target Engagement (AMSTE) program. The project is funded by the DARPA Information Exploitation Office in conjunction with the contracting agency, the U.S. Air Force Research Laboratory in Rome, New York. The Airborne Ground Surveillance and Battle Management Systems division of Northrop Grumman Integrated Systems will develop, integrate, and demonstrate system technologies required for precision engagement of moving surface threats from long range.

In August 2001, the Northrop Grumman team successfully demonstrated the capability to precisely engage a moving target with a seekerless weapon. The test, conducted in overcast conditions at Eglin AFB, Florida, scored a direct hit through the top center of a moving vehicle on the first try.

For the next phase, the team will explore equipping the E-8C Joint STARS, the Global Hawk unmanned platform, the B-2 stealth bomber, and Northrop Grumman Electronic Systems' BAC 1-11 testbed with the F-35 Joint Strike Fighter radar sensor. In addition, the team plans to use the F/A-18 and airborne P-3 testbed Hairy Buffalo equipped with the APY-6(V). Weapons being considered for the next test include a Joint Direct Attack Munition and the newly developed On-target Weapon, Long-range munition from the Lockheed Martin Corporation.

In mid-2003, Navy planners developed Hairy Buffalo II, another step in sensor technology advancement. The payload would be designed with an open avionics architecture to allow a range of communications, computers, and sensors to be installed or changed for various roles and missions. Hairy Buffalo experiments proved that the system could host a secure airborne local area network; control UAVs and their sensors in flight; serve as an airborne command and control, intelligence, surveillance, and reconnaissance (C^4ISR) collection center; and host a precision targeting workstation. This allowed direct targeting for F-15 and F/A-18 strike aircraft.

Funding

Funding is now from O&M and test funding.

Recent Contracts

No recent DoD contracts over US$5 million recorded.

Timetable

Month	Year	Major Development
	1968	APQ-148(V) multimode radar developed
	1980	Improvement to APQ-156(V) begins
Late	1986	Delivery of first APQ-156C
	1993	Project Gray Wolf initial concept
Sep	1994	Test flights begin
	1995	Joint Task Force '95 exercise, Air Force flight tests
Feb	1995	JTF 95-2 exercise
Apr/May	1995	Roving Sands exercise
May	1995	North Island NAS demonstration
Jul	1995	First operational test flight
Aug	1995	Eglin AFB demonstration
Sep	1995	All Service Combat Identification Evaluation Team (ASCIET) Gulfport exercise
	FY97	Synthetic aperture radar demonstration
Feb	1999	Initial APY-6(V) flight tests begin on the Northrop Grumman BAC 1-11 testbed aircraft
Early	2000	Phase V contracted, flight test support and software
	2001	Fleet Battle Experiment India demonstrates Hairy Buffalo sensor suite
	2003	Coalition Aerial Surveillance and Reconnaissance (CAESAR) experiments

Worldwide Distribution

The APY-6(V) is a **U.S.**-only program.

Forecast Rationale

The Gray Wolf pods developed for testing showed naval planners that they could develop a much-needed capability in a cost-effective way. The APY-6(V) can give a JSTARS-like capability to Navy aircraft, which may be the first on the scene in future conflicts. In operational testing, the APG-6(V)/APS-137(V)/S-3 combination demonstrated that it could become a vital asset for joint task force commanders, arriving on scene as quickly as a carrier battle group can be deployed. By using complementary sensors, JSTARS for land search and the new APY-6(V) for the littoral environment, joint USAF/USN operations were enhanced.

The technology upgrades improved performance by combining a variety of new components and enhanced software. Testing validated the design, and cost analysis favors the system as a way for the Navy to achieve the littoral sensor it has been seeking.

The F/A-18C/D attack jet carries a very capable radar, but does not provide simultaneous SAR/MTI imagery. The F/A-18E/F with the APG-79(V) advanced radar, which features an active array antenna and new capabilities, including SAR. But in contingency operations with smaller forces, the F/A-18s will be too busy to be dedicated to surveillance work.

An APY-6(V) or variant can be a better choice for an ancillary sensor for the Navy's Cooperative Engagement Capability. Efforts to develop an automatic target recognition capability and to improve accuracy for target location will make the system even more useful. Expanded datalink ideas could turn the system into a major combat/C^2 asset. This was the basis of the Hairy Buffalo demonstration.

The new interest in UAVs and the AMSTE effort is moving the APY-6(V) out of procurement consideration, especially as a newer, better sensor can be found. The APY-6(V) supports testing, but operational applications is doubtful. It is more likely that the mission will be accomplished by new systems, based in part on the APY-6(V) and its progenitors. Many APY-6(V) components and software will find their way into the new sensors.

Ten-Year Outlook

Further production is not likely.

* * *