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APN-217(V) - Archived 12/2007

Outlook

- Navigation radar for U.S. and foreign helicopters. It is deployed on a wide variety of helicopters, especially naval variants used in anti-submarine and anti-surface vessel warfare
- Forecast International does not expect any new production at this time. Although production has been rumored, none of the reports are detailed enough for verification
- *Federal Business Opportunities* continues to carry announcements for spare and repair parts procurement, along with engineering and other technical support, despite the end of production
- This report will be archived in 2007

Orientation

Description. U.S. Navy and Marine Corps standard Airborne Doppler navigation radar/velocity sensor.

Sponsor

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

Status. In service, ongoing logistics support.

Application. AH-1W, CH-46, CH-53E, HH-3F, HH-60H/J, MH-53E, RH-53D, SH-3D, SH-60B/F/J, S-70, UH-1N, and VH-60.

Price Range. Estimated unit cost is $120,000.

Contractors

Prime

Northrop Grumman Navigation & Space Sensors Division	http://www.nsd.es.northropgrumman.com, 21240 Burbank Blvd, Woodland Hills, CA 91367-6698 United States, Tel: + 1 (818) 715-2470, Fax: + 1 (818) 715-3368, Prime

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

Metric	U.S.

APN-217(V)

	Metric	U.S.
Dimensions		
Weight	12.7 kg	28 lb
Size	42.9 x 41.4 x 16.5 cm	16.9 x 16.3 x 6.5 in

Characteristics

General	Solid state, microprocessor controlled Single unit
Frequency	13.25 GHz A combination of six special features prevents acquisition or tracking of antenna vertical sidelobe returns, making the system suitable for coupled transitions from forward flight to hover and vice versa
Interfaces/output format	ARINC, MIL-STD-1553, 2 DC Analog
Operational	
Accuracy	Digital 0.4% of ground speed 0.4 knot heading and drift (Vh, Vd) 35 ft/min vertically (Vz) Analog 2% of ground speed 0.5 knot in heading and drift
Speed range	-40 to +400 knots along track ±100 knots drift ±4,500 ft/minute vertically
Operational altitude	To 15,000 ft
MTBF	15,257 hr
BITE	98% probability of detection

Design Features. The APN-217(V) Doppler Velocity Sensor (DVS) is a solid-state, microprocessor-controlled radar featuring a continuous wave (CW) design that, unlike modulated systems, eliminates altitude "holes" and modulation losses. The system detects and processes Doppler-shifted frequency returns from time- multiplexed radar beams to determine three orthogonal velocities in coordinated aircraft. They are heading (Vh), drift (Vd), and vertical (Vz). It was designed to provide velocity information for low-speed, rotary-wing aircraft.

The APN-217(V) is considered 100 times more sensitive than modulated radars at low altitudes. An operational computer display unit combines the functions of control and display in a single compact unit. A built-in test feature operates automatically and continuously, performing 18 sequential performance measurements without interrupting system operation or affecting its accuracy.

The design minimizes sidelobe signals to prevent operational problems over smooth water where the angle of incidence is less than 25°. In these conditions, a Doppler Velocity Sensor tends to falsely lock-on to stronger low-frequency signals from the water directly below the aircraft instead of locking on to low backscatter energy. The gain of the Doppler amplifier is reduced by 24 dB when searching for signals below 500 Hz in the SEA mode. In addition, a power mode threshold is established that requires a certain signal level be present for acquisition rather than a certain signal-to-noise, as at higher frequencies.

Operational Characteristics. A choice of navigation systems – worldwide Universal Transverse Mercator (UTM) or latitude/longitude coordinate – is available. The crew may use the system to select time, distance, and bearing to 10 or more waypoints, and the system has a memory capacity for 10 additional waypoints.

For helicopters, where the velocity can be low for extended periods of time, the navigational accuracy provided by a DVS can be superior to that of an inertial navigation system (INS), and the DVS is better suited to provide data useful for controlling the helicopter in a hover. The velocity information can be either displayed to the pilot to maintain a manual hover over a featureless sea surface, or coupled into automatic stabilization systems so that an automatic hover can be maintained. A further advantage for operations in a helicopter with a dipping sonar transducer is that hover can be maintained relative to the water surface.

Variants/Upgrades

APN-217(V)5. The APN-217(V)5 is a NAVSTAR GPS-equipped variant that combines traditional Doppler-radar navigation capability with an embedded military dual-channel P-code GPS receiver. It is a form-fit-function replacement for the original APN-217(V).

The system can function in three major modes: Doppler only, GPS only, and integrated Doppler/GPS. The embedded Doppler/GPS system is based on the Integration Processor (IP), an 80286 microprocessor-based, single-board computer that incorporates a math co-processor for double-precision floating-point numerical operations.

The IP is responsible for GPS receiver control and all navigation computations. It uses velocity data from either the Doppler processor or externally supplied inertial sensors, and provides velocity-aiding data for receiver tracking loops. The main interface between the platform and the system is a dual redundant MIL-STD-1553B databus.

The U.S. Navy reconfigured its older APN-217(V)s into the (V)5 variant.

APN-217(V)6. This is the latest variant of the system.

Program Review

Primary Nav Sensor for SH-60Bs

Development began in 1971, with the system entering production in 1981. The APN-217(V) is the primary navigation sensor for the Navy's SH-60B LAMPS III anti-submarine warfare helicopter and several other naval rotary-wing platforms. It has been procured for the U.S. Marine Corps' CH-53E helicopters and the U.S. Navy's MH-53E minesweeper helicopters.

In December 1989, (then) Teledyne Ryan completed a licensing agreement with Mitsubishi Electric Corp to produce the APN-217(V)3 for the Japanese SH-60J.

First deliveries of the improved APN-217(V)5 production units began in 1990. The Marine Corps tested the system on an upgraded CH-53E in 1994, with follow-on production in 1995. An estimated 24 aircraft were upgraded.

APN-217 Continues to Serve, Despite End of Production

Federal Business Opportunities continues to carry announcements for spare and repair parts procurement, along with engineering and other technical support, despite the end of production. The system will continue to serve in the U.S. military.

The aviation suite of the US101 (VH-71) aircraft that has been selected as the new presidential helicopter will be receiving several new components. The APN-217(V)6 was in the competition to equip the aircraft, but there has been no news since then, and it is unlikely that the APN-217 was chosen.

Timetable

Month	Year	Major Development
	1971	Start of development
	1979	Preproduction licensing to Mitsubishi
	1982	Start of deliveries of Lot I systems to USN; deliveries of APN-217(J) to Japan
	1985	Approved for full production
	FY88	Launch of AH-1T Navigation Upgrade Program
	1989	Mitsubishi licensed for production
	1990	First delivery of APN-217(V)5
	1991	APN-217(V)5 full-rate production
Dec	1995	LPI RT EMD solicitation

APN-217(V)

Worldwide Distribution/Inventories

Australia. The **Royal Australian Navy** uses the system on its S-70B-2s and UH-60 Black Hawks (designated S-70As).

Japan. The Japan Maritime Self-Defense Force (JMSDF) is replacing its fleet of 62 HSS-2 (Sikorsky SH-3) helicopters. Current plans call for production of a Japanese version of the Seahawk for the Maritime Self-Defense Force. Mitsubishi produced the Japanese Seahawk under license.

Spain. Spain uses the system on six SH-60B helicopters. The APN-217(V) also equips 11 Spanish SH-3Ds.

Taiwan. The APN-217(V) equips its 14 S-70s.

The **United States** carries the system on a variety of aircraft.

Forecast Rationale

No New Production

Although there are rumors of production of the APN-217, none of the reports are detailed enough for verification. Therefore, Forecast International is not forecasting any new production at this time. The APN-217 has successfully served militaries around the world for a long time, and will continue to do so for years to come. It will continue to be maintained, and upgrades are possible. But at this time, do not expect any new systems to be produced.

U.S. Navy helicopters normally operate autonomously during ASW operations, supported by the APN-217(V) Doppler navigation system. Although global positioning systems and inertial navigation systems are used for navigation, they do not provide the fine-grain movement information offered by the APN-217(V) for hovering and slow-moving helicopter operations. It is this capability that will keep the APN-217 in operation.

The demand for spare and repair parts and logistics support will continue at a strong pace. Because many of the systems will remain in service, money will continue to be spent on them to keep them in working order and to add new capabilities.

Ten-Year Outlook

Forecast International does not expect any new production at this time. This report will be archived in 2007.

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