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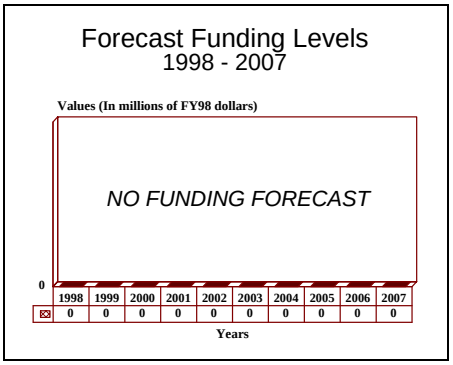
AAS-35(V) PAVE PENNY - Archived 12/99

Outlook

- Production complete
- No known upgrades pending or in progress
- **THIS REPORT WILL BE ARCHIVED IN 1999**



Orientation

Description. Laser sensor/tracker pod.

Sponsor
US Air Force
Warner Robins Air Logistics Center
Robins AFB, Georgia (GA) 31098
USA
Tel: +1 912 926 1110

Contractors
Lockheed Martin Corp
Electronics & Missiles Systems Co
5600 Sand Lake Road
Orlando, Florida (FL) 32819
USA
Tel: +1 407 356 2000
Fax: +1 407 356 9228

Status. In service, production complete.

Total Produced. A total of 833 units are estimated to have been produced.

Application. Fixed-wing aircraft for close air support (CAS) and battlefield air interdiction (BAI) missions. Platforms have included A-10, A-7, A-4, and F-16 aircraft.

Price Range. Indeterminate.

Technical Data

	Metric	US
Characteristics		
Pod Dimensions		
Diameter:	20.32 cm	8 in
Length	83.31 cm	32 in

Pod Weight:	14.51 kg	30 lb
Power Requirements:	Pod 115 V AC, 28 V DC, less than 10 amps	
Sensor Type:	Silicon Quadrant PIN Diode	
Scan Pattern:	Operator-selectable, wide, narrow, depressed, offset	
Scan Coverage		
Elevation:	-90^o to $+15^o$	
Azimuth:	-90^o to $+90^o$	

Design Features. The AAS-35(V) PAVE PENNY laser target identification set is a laser seeker system for use in close air support (CAS) and battlefield air interdiction (BAI) missions. This system provides the means for day or night detection and identification of tactical targets beyond visual ranges.

Designed to detect and track "laser-painted" targets, the AAS-35(V) is an externally mounted system consisting of the laser receiver pod, control detector adapter, and cockpit control panel. The seeker scanning patterns and limits are operator-selectable: wide, narrow, depressed, or offset within a scan coverage of -90^o to $+15^o$ in elevation and -90^o to $+90^o$ in azimuth. Operating wavelength is 1.06 microns. Scanning and built-in test (BIT) functions are controlled from the cockpit control panel. The control detector adapter contains the power supply, data conversion provisions, and BITE. It also serves as the key electronic interface between the pod, cockpit controls and aircraft.

The laser receiver (detector) pod utilizes a gimbaled telescope/detector equipped with a data processor and specialized plug-in printed circuit cards to provide long-range detection, discrimination, and tracking capabilities. A four-inch-radius, clear polycarbonate dome centered at the axes of the gimbaled optical assembly covers the system optics. The pod is pressurized with dry nitrogen to prevent optical fogging, and the internal components are EMI-shielded to protect against effects from external radiation. Minimization of implementation cost was stressed during the design effort. As a result, the laser receiver pod was designed to be capable of mounting on the forward portion of the aircraft fuselage, making it readily adaptable to a broad range of aircraft.

Operational Characteristics. Upon target illumination by an external laser designator (either by a forward air controller on the ground or in another aircraft), the AAS-35 PAVE PENNY receiver is activated to scan the surface of the ground using a pilot-selectable search pattern until it acquires the laser energy reflected from the target. Precise target line-of-sight information is then transmitted to the pilot's head-up display (HUD) in the form of a laser track signal, and to the aircraft weapons delivery computer as well. Once locked on, the AAS-35(V) continuously tracks the target, even during evasive maneuvers taken by the pilot. Using the symbology provided to the HUD, the pilot can proceed to the target and, with PAVE PENNY integrated with the weapons delivery system, the weapons are automatically released once the aircraft is within range limits.

Variants/Upgrades

ASQ-173. The AAS-35(V) gimbaled laser detector is also incorporated into the ASQ-173 Laser Spot Tracker/ Strike Camera pod produced by Lockheed Martin for the F/A-18 Hornet. The ASQ-173 pod consists of the five weapon-replaceable assemblies (WRAs): the laser detector/tracker, an interface unit with microprocessor, an aircraft adapter pylon, a Perkin Elmer 35 mm panoramic strike camera, and a camera rotary mount. The strike camera is located in the aft section of the pod. The ASQ-173 has an 8.0-inch (20.3 cm) diameter, is 90 inches (228.6 cm) long, and weighs 162 lb (73.5 kg).

Advanced PAVE PENNY. This is the AAS-35(V) earmarked for the F-16C/D MSIP effort begun in the mid-1990s. The differences or improvements this system incorporates over the version previously fielded could not be identified.

Program Review

Background. In recognition of the need for greater accuracy in weapons delivery, the US Air Force added laser-guided munitions (glide bombs and missiles) to its inventory of air-to-surface weapons. This created the requirement for a laser spotter/tracker system that would acquire the "spot" laid down by another aircraft or ground-based designator, then would enable the munitions to be guided to a precise hit upon the intended target. According to company material, the AAS-35(V) was the only operational laser spot tracker

in US service at the time of its introduction. First deliveries to the Air Force began in early 1977 aboard A-10 aircraft. Funding to incorporate the system into A-7D aircraft first appeared in 1980.

The US Air Force completed the original procurement of PAVE PENNY in the mid-1980s. The last major line-item procurement contract for PAVE PENNY was US$1 million in FY86 for an undisclosed number of adapter assemblies. Total US Air Force original procurement funding is estimated to be in excess of US$236 million over the eight-year period from 1977 to 1985. Also in the mid-1980s, an export sale reportedly occurred, to equip about 30 Singaporean A-4S Skyhawks.

In 1990, a squadron of the 174th Tactical Fighter Wing (New York Air National Guard) was converted from A-10As to F-16As dedicated to the CAS role. These aircraft are equipped with the AAS-35(V), a GPU-5 30 mm gun pod and an Automatic Target Handoff System manufactured by Rockwell Collins. An operational F-16 CAS squadron served as the testbed to validate the Air Force's choice of the F-16 as the follow-on for the long-term CAS/BAI mission.

The AAS-35(V) was also integrated with the Westinghouse Sensor Tracker System (STS) electro-optic targeting system as part of the AFTI (Advanced Fighter Technology Integration) F-16 test program. The AFTI/ F-16 was returned to flight status in 1990 outfitted with avionics for possible use in future CAS aircraft. The AAS-35(V) was added to provide the STS with laser spot tracker and automatic target cueing modes. The AFTI/F-16 CAS demonstration program was scheduled for completion by the end of FY90.

Advanced PAVE PENNY was included as an element of the Multinational Staged Improvement Program (MSIP) initiative in FY94 and FY95. The MSIP consisted of a comprehensive group of airframe, propulsion and electronics improvements which were cost-effectively consolidated to enhance the night, under-the-weather, air-to-ground attack capability of F-16C/D Block 30 and 40 aircraft.

The Air Force had originally planned in late 1991 to modify upwards of 365 General Dynamics F-16C/D Block 30 aircraft for the CAS role, to replace aging Air National Guard LTV A-7D/Ks into the turn of the century. By the beginning of 1992, citing cost factors and expected reductions in force structure, the Air Force decided that the modification of its Block 30 F-16s would be too expensive when compared to the aircraft's remaining service life. Instead, the service stated that it would implement more modest upgrades to existing Block 40 F-16s equipped with LANTIRN, and deploy them as dedicated CAS aircraft.

In May 1994 the plan was again revised so that 200 Block 30s would be modified with PAVE PENNY and 30 mm gun pods, while 200 Block 40s would receive a laser spot tracker (to be incorporated into their LANTIRN systems) and missile warning system. Both aircraft types were to receive additional modifications, including a digital terrain system/ground-collision avoidance system, the Improved Data Modem (IDM), a GPS receiver, an anti-jam radio, and night-vision goggles. June 1994 press reports gave the first indication that the Air Force would slip elements of the Block 30 CAS upgrade by three years.

It appears that Block 30 aircraft were to use the AAS-35 as a pod rather than an alternately considered embedded configuration. In addition, it has been determined that one reason the Block 40s would not receive PAVE PENNY is the lack of availability of hardpoint mounting space. The PAVE PENNY component of the MSIP was last mentioned in FY95 Air Force RDT&E funding documents. The MSIP itself last appeared the following year, placing the status of the program in question.

A related opportunity for PAVE PENNY was the NATO F-16A/B mid-life update program which, when originally agreed upon in 1992, comprised 403 European aircraft, but was later scaled down to 301 aircraft (48 Belgian, 61 Danish, 136 Dutch, and 56 Norwegian). The upgrade was to come in the form of a common modification kit – featuring a modular mission computer, APG-66 radar improvements, PAVE PENNY, and cockpit upgrades – with provisions for individual nations' customizing efforts. The US Air Force intended to acquire a portion of this package but subsequently elected not to upgrade any of its F-16 A/Bs.

Funding

The AAS-35(V) PAVE PENNY is not mentioned in current US budget documents. Refer to the Program Review section, above, for historical funding information.

Recent Contracts

There have been no recent identifiable contract actions.

Timetable

Month	Year	Major Development
Early	1970s	Development and initial production
	1977	Air Force received first PAVE PENNY/A-10 unit
	1980	Initial funding for A-7D mods
	1985	Singapore reported to have contracted for about 30 AAS-35s
	1990	Production to supply spares
	1992	NATO F-16A/B mid-life update program established
	1994	Plan for MSIP upgrade of 200 F-16C/D aircraft finalized
FY	1995	Last appearance of PAVE PENNY in Air Force funding documents (for F-16C/D MSIP)

Worldwide Distribution

The AAS-35(V) PAVE PENNY system was procured primarily for **US Air Force** A-7D/K and A-10A close air support aircraft. In 1990, the US Air Force converted one A-10 squadron of the 174th TFW (Air National Guard) to F-16As equipped for CAS, which included PAVE PENNY. The service's F-16C/D Block 30 aircraft were to incorporate the system under the MSIP, but the fate of this effort has not been determined.

Among foreign operators, only **Singapore** has been identified as equipping about 30 A-4S Skyhawks with the AAS-35(V). Lockheed Martin has stated that there are several foreign users of the system, but due to contractual restrictions, the company is not at liberty to identify them. The participants in the NATO-sponsored F-16A/B mid-life update program included four nations (**Belgium**, **Denmark**, **The Netherlands**, **Norway**), any of which may have received PAVE PENNY.

Forecast Rationale

The NATO F-16A/B and US Air Force F-16C/D upgrade efforts begun in the early to mid-1990s involved PAVE PENNY, as indicated by Air Force RDT&E budgets. These may have occurred, experienced a reduction in scale, or shelved, but PAVE PENNY is no longer an active program, according to Lockheed Martin Electronics & Missiles. The AAS-35(V) will remain in service and may require minor additional support; however, no basis for a forecast exists.

Ten-Year Outlook

There will be no further production or funding. **THIS REPORT WILL BE ARCHIVED IN 1999.**

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