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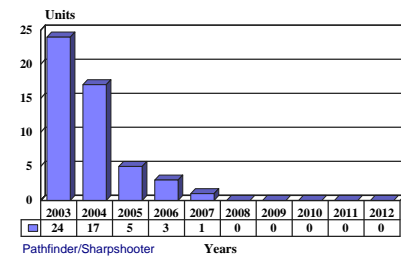
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Pathfinder/Sharpshooter - Archived 02/2004

Outlook

- Limited production for Egypt and Taiwan only
- Some possible production for the USAF for spares and replacements
- Production likely to cease in the near future

10 Year Unit Production Forecast
2003 - 2012



Orientation

Description. Navigation/attack FLIR pod (Pathfinder) and targeting FLIR pod (Sharpshooter).

Sponsor

Lockheed Martin
Missiles & Fire Control
PO Box 650003
Dallas, Texas (TX) 75265-0003
USA
Tel: +1 972 603 1000
Web site: <http://www.missilesandfirecontrol.com>
(Company-sponsored development)

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Status. In production and service.

Total Produced. Through 2002, an estimated 379 pods (167 Pathfinder and 212 Sharpshooter) had been manufactured.

Application. Airframe- and pylon-mounted navigation (Pathfinder) and attack aid (Sharpshooter) for night, low-observable missions.

Price Range. Unit cost has fluctuated greatly. In 1989, Pathfinder pods were estimated to cost US\$500,000. Sharpshooter cost was estimated at US\$1 million, but contract awards do not seem to validate either figure. Lockheed Martin said it leaves pricing and incentives offered to foreign customers to the discretion of the US Air Force.

Technical Data

Metric

US

Dimensions

Pathfinder Pod

Diameter	24.76 cm	9.75 in
Length	198.12 cm	78 in
Weight	83.99 kg	185.166 lb

Characteristics

Input Power 115 Vac, 400 Hz, 3-phase, 4-wire at 2.8 kW; 28 Vdc, 2-wire at 200 W

Design Specifications. The Pathfinder system consists of three line-replaceable units (LRUs): a navigation forward-looking infrared (FLIR) sensor, a power supply, and an environmental control unit (ECU). Unlike the LANTIRN navigation pod (see separate "AAQ-13/ AAQ-14 [LANTIRN]" report), there is no terrain-following radar subsystem. There are fewer power modules, and the ECU is smaller in size than the LANTIRN components in order to keep Pathfinder's price competitive with other FLIR systems.

The Sharpshooter pod is a derivative of the LANTIRN AAQ-14 targeting pod that provides the pilot with the ability to destroy targets from standoff ranges. Sharpshooter differs from the AAQ-14 targeting pod in that the missile boresight correlator used for target hand-off to Maverick (IR) missiles is omitted.

Operational Characteristics. The Pathfinder FLIR sensor can be slewed throughout an 840 (azimuth) x 770 (elevation) field of regard, providing a 280 x 210 wide field of view for situational awareness and navigation. Target detection range is increased by 200 percent by switching to a 9° x 7° narrow field of view (NFOV) with a 3x optical magnification and a field of regard of 77° x 84°. The NFOV is also steerable anywhere within

the field of regard. A digital scan converter enhances the FLIR sensor by automatically controlling image fidelity, while the FLIR's snap-look and look-into-turn features enhance the situational awareness for the pilot. The system is being offered with an optional automatic target cuer and can present FLIR imagery on any standard Head-Up Display (HUD) used to display flight symbols.

It should be noted that Pathfinder itself does not contain an autonomous laser target designator/spot tracker capability as do some competing FLIR pods. This capability is exclusive to the Sharpshooter pod (see below). Estimated mean time between failures is 500 hours, based on LANTIRN data.

Sharpshooter provides precision standoff weapon delivery through the use of an 8-inch-aperture FLIR which has a narrow field of view (1.7°) and a wide field of view (6°). The stabilized line-of-sight includes 150° look-back angle and continuous roll tracker capabilities which can either track stationary or moving targets or track a scene using area correlation.



US Air Force F-16 Fighter

Source: Public Domain

Variants/Upgrades

Alternate Configurations. Both Pathfinder and Sharpshooter can be configured as a pod, mounted to the airframe or embedded in an aircraft structure such as a wing pylon or wing root. The latter configuration adds rigidity to the sensor for high *g* turns. Either configuration preserves the use of existing stores stations for munitions or external fuel tanks.

B-1B Tryout. In 1989, the US Air Force (USAF) evaluated a version of the Pathfinder FLIR on a B-1B bomber as part of a demonstration program of the bomber's terrain-following system during low-level flight at night. The Pathfinder FLIR and computer were semi-embedded into the bomber and integrated with the APQ-164 terrain-following radar (TFR) and the onboard avionics cooling systems.

Program Review

Background. Developed as a scaled-down derivative of the LANTIRN (Low Altitude Navigation & Targeting Infrared system for Night) AAQ-13 navigation pod and AAQ-14 targeting pod, Lockheed Martin's Pathfinder became available for the foreign airborne FLIR market in 1988, with Sharpshooter following in 1989.

Martin Marietta (now Lockheed Martin) was able to launch Pathfinder production with a 30-pod Foreign Military Sales (FMS) order from Egypt, announced in July 1988 as part of a sale that also included 30 Sharpshooter pods. The deal included spare parts, support equipment, and technical publications, with a total contract value of US\$157 million (1988 dollars). Israel followed suit and ordered 10 Pathfinder pods and 20 Sharpshooter pods for delivery in 1992.

The Royal Saudi Air Force – once expected to receive a less capable version of LANTIRN instead of the Pathfinder/Sharpshooter pod set – decided to equip its 48 F-15S(XP) dual-mission fighters with the LANTIRN navigation pod (AAQ-13) and the Sharpshooter targeting pod. The navigation pod retained a terrain-following radar capability, though it is slightly modified with software changes.

Around 1995, Bahrain had placed a small order for three Sharpshooter pods to equip its F-16 fleet. Also around this time, Greece, which was once reported to be procuring Pathfinder/Sharpshooter, instead opted for the export version of LANTIRN for its F-16s.

By late 1996, Lockheed Martin appeared to be winding down production of the Pathfinder and Sharpshooter systems. The last orders for Egypt, Saudi Arabia, Singapore, and Israel were believed to have been filled in 1997. No production for the US was expected, especially after the US Air National Guard picked the Elta Litening pod over LANTIRN and its derivatives.

In a surprise announcement in mid-1998, Lockheed Martin issued a press release detailing additional orders for the Pathfinder/Sharpshooter pods to both Saudi Arabia and Taiwan. While the Saudi Arabian deal

would apparently go through without a problem, the Taiwan contract would face serious obstacles.

When the deal with Taiwan for 28 pod sets was announced, there was an immediate response from China regarding what it considered to be the sale of a provocative piece of hardware. Taiwan, meanwhile, rightfully pointed out that this deal had been in the works for over two years and met the requirements of the 1979 Taiwan Relations Act, which obliges Washington to provide for Taiwanese self-defense capabilities.

In an attempt to ease Chinese concerns, apparently arising out of a mid-1998 Sino-US summit, the pods were “dumbed down” by removing the critical laser designator which is required for precision strike attacks. Congress stated that the designator could be rapidly retrofitted if deemed necessary. The handling of this situation pleased no one, as China continued to protest the sale and Taiwan was angry about receiving a crippled system which would not allow real-world training of precision strikes to be conducted.

In March 2000 it was announced that the government of Egypt had requested a possible 15 LANTIRN and 15 Sharpshooter pods. The systems would be part of the Egyptian Air Force's extensive F-16 modernization program. Since the nation was already a Sharpshooter customer, it is assumed that this deal went through.

Export activity for the Pathfinder/Sharpshooter systems received another boost in June 2000 when the US Department of Defense (DoD) announced the proposed sale to the Taipei Economic and Cultural Representative Office in the US of 39 sets of the pods at an estimated cost of US\$234 million. For the time being, this seems to resolve the issue of Taiwan's satisfaction with the system.

Production continued throughout 2001 and 2002 for the most recent known Pathfinder/Sharpshooter orders to the USAF, Taiwan, and Egypt.

Funding

Pathfinder/Sharpshooter development was funded as an in-house program, based on LANTIRN development experience. An estimate of total development funding is not available.

Recent Contracts

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Lockheed Martin	115.0	Apr 1998 – Upgrade of 1,500 AIM-9L missiles and the sale of five sets of Pathfinder/Sharpshooter pods to Saudi Arabia.
Lockheed Martin	160.0	Jun 1998 – 28 sets of Pathfinder/Sharpshooter pods to Taiwan for flight testing and personnel training and including training equipment, test sets and support equipment, publication and technical data, contractor engineering and support, spare parts, etc. The units were fitted to F-16 A/Bs currently in the Taiwanese inventory.
Lockheed Martin	106.2	Nov 1998 – FFP contract for 20 Pathfinder and 20 Sharpshooter pods along with ancillary equipment. Contract was completed in October 2001. Contracting authority is the USAF Aeronautical Systems Division, Wright-Patterson AFB, Ohio. (F33657-98-C-0038)

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1983	Pathfinder development initiated
	1987	Flight demonstrations begin
	1988	Available for export; Egypt becomes first FMS sale
	1989	Sharpshooter targeting pod available
	1992	Israel receives Sharpshooter and Pathfinder pods
Oct	1995	Orders completed for 18 Sharpshooter and 18 navigation pods for F-16 aircraft for Egypt
	1998	Orders received from Taiwan, Saudi Arabia, and USAF
Mar	2000	Egypt requests 15 Sharpshooter pods
Jun	2000	Sale to Taiwan of Pathfinder/Sharpshooter pods
	2003-2007	Pathfinder/Sharpshooter production expected to continue

Worldwide Distribution

A total of 167 Pathfinder and 217 Sharpshooter pods are believed to have been procured by the following nations:

Bahrain	3 Sharpshooter pods
Egypt	61 Pathfinder pods
	76 Sharpshooter pods
Israel	33 Pathfinder pods
	30 Sharpshooter pods
Saudi Arabia	5 Pathfinder pods
	53 Sharpshooter pods
Singapore	8 Pathfinder pods
Taiwan	35 Pathfinder pods
	35 Sharpshooter pods
USA	25 Pathfinder pods

20 Sharpshooter pods

Forecast Rationale

With the dearth of new information regarding future prospects for the Pathfinder/Sharpshooter systems, it would appear that they are being retired from new production. There have been no public source announcements regarding the status of the pods since 2000. However, it is believed that production may be ongoing for the last orders for the systems. Egypt and Taiwan are most likely still in the process of receiving one or both of the variants for their respective jet fighters under these, the last known, contracts.

The Sharpshooter targeting FLIR pod is a derivative of the LANTIRN AAQ-14 targeting pod that provides the pilot with the ability to destroy targets from standoff ranges. The older Pathfinder is a navigation/attack FLIR pod consisting of three line-replaceable units (LRUs): a navigation FLIR sensor, a power supply, and an environmental control unit (ECU). It was designed

as a scaled-down version of Lockheed Martin's LANTIRN AAQ-13. Bahrain, Egypt, Israel, Saudi Arabia, and Singapore have all procured both of the pods or have expressed interest in them.

Production is now believed to be trending downward, with the only significant production being for the last known orders to Taiwan and Egypt. While it is likely that production will cease altogether by mid-decade, there is still an outside chance that some limited production will remain for replenishment, especially for those nations where the systems are already in big supply. Also, given its design proximity to the successful LANTIRN, potential export sales to more cash-strapped nations cannot be wholly ruled out. For the most part, however, any foreseeable production for export orders is covered under the "Various (Exports)" lines of the **Ten-Year Outlook** below.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Designation	Application	High Confidence Level				Good Confidence Level				Speculative				Total 03-12
		Thru 02	03	04	05	06	07	08	09	10	11	12		
PATHFINDER	(USAF)	25	5	0	0	0	0	0	0	0	0	0	0	5
PATHFINDER	F-16 A/B (TAIWAN AF)	28	7	7	0	0	0	0	0	0	0	0	0	14
PATHFINDER	VARIOUS (EXPORT)	0	0	0	3	2	1	0	0	0	0	0	0	6
PATHFINDER	Prior Prod'n:	114	0	0	0	0	0	0	0	0	0	0	0	0
SHARPSHOOTER	F-16 A/B (TAIWAN AF)	28	7	7	0	0	0	0	0	0	0	0	0	14
SHARPSHOOTER	VARIOUS (EXPORT)	10	5	3	2	1	0	0	0	0	0	0	0	11
SHARPSHOOTER	Prior Prod'n:	174	0	0	0	0	0	0	0	0	0	0	0	0
Total Production		379	24	17	5	3	1	0	0	0	0	0	0	50