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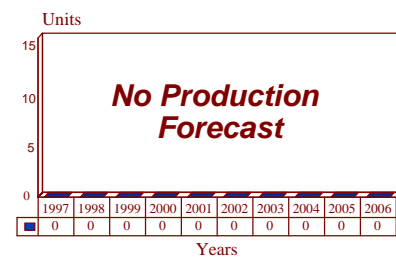
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SSPARS (BMEWS & PAVE PAWS) - Archived 8/97

Outlook

- Ongoing logistics support and upgrades continue
- Production of all systems complete, no further acquisition planned
- Support funding will continue at reduced rate

10 Year Unit Production Forecast
1997 - 2006



Orientation

Description. This is a network of missile early warning radars, displays, computers and communications nets. The BMEWS I/III and the PAVE PAWS sites are now collectively referred to as the Solid State Phased Array Radar Systems (SSPARS).

Sponsor

US Air Force
AF Space Command
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Contractors

BMEWS

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(prime)

Raytheon Co
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USA
Tel: +1 508 490 1000
Fax: +1 508 490 2822
(prime contractor for Thule upgrade)

Electronic Space Systems Corp
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(tracker radars)

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(Technical support)

TRW Space & Electronics Gp
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 USA
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 (subcontractor to Raytheon for Thule software)

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PAVE PAWS

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 (prime contractor)

Status. BMEWS and PAVE PAWS are in service, with support and limited upgrades ongoing.

Total Produced. Three BMEWS installations were built. There are four PAVE PAWS systems.

Application. Ballistic/submarine-launched missile early warning and satellite tracking.

Price Range. Estimated cost per BMEWS radar is US\$115 million. Estimated total cost per PAVE PAWS site is US\$123 million.

Technical Data

BMEWS (I & II)

	Metric	US
Dimensions		
Antenna:	122 x 50 m	400 x 164 ft
Characteristics		
Power:		5 mW (peak) 300 kW (average)
Frequency:	425 mHz	
PRF:		27 Hz
Pulse width:	2 μ sec	
BMEWS (III) Fylindales radar (FPS-123(V)5)		
Antenna diameter:	25.6 m	84 ft
Elements:	2560 active 1024 passive	
Module Peak Power:	322 W	

PAVE PAWS

	Metric	US
Dimensions		
Array diameter	22 m	72 ft
Characteristics		
Frequency:	420 to 450 MHz	
Module Peak Power:	322 W	
Peak power (per face):	600 kW	
Pulse width:	16,000 μ sec	
Sub-Arrays:	56	
T/R beamwidth:	2 $^{\circ}$	
Face tilt:	20 $^{\circ}$	
Azimuth coverage:		
One face:	60 $^{\circ}$	
Two faces:	240 $^{\circ}$	
Elevation:	3 $^{\circ}$ to 85 $^{\circ}$	
Range:	3,000 nm (10 m ² target)	

Design Features. BMEWS radar systems are located at: Thule and Sonderstrom AB, Greenland; Clear, Alaska; and Fylingdales, United Kingdom. Each site has a radar, a Missile Impact Prediction System (MIPS), checkout and switching, as well as monitoring and data equipment. The BMEWS sensors have been upgraded with new capabilities to allow the detection of multiple ballistic warheads. The upgrade incorporated new computers, new software, increased bandwidth, a larger raid tracking capability, and improvements to the communications system.

In addition to the radar modernization, the missile impact predictors at all three BMEWS sites were upgraded by replacing the original, the IBM 7090 computers, with redundant Control Data 170-876 processors. Software upgrades continue on a regular basis.

The BMEWS program was accomplished in three phases: MIPS replacement at all three sites; radar upgrade at Thule that added a phased array radar; and modernization of the Fylingdales radar.

PAVE PAWS is a phased-array, two-sided (dual-faced) radar with 1,972 transmitting elements. It was designed to detect missiles such as the 4,300-nm SSN-8 that could be

launched from areas not continuously monitored by satellites.

The detection and warning system is composed of four operating PAVE PAWS sites, the Perimeter Acquisition Radar System (PARCS) in North Dakota, the FPS-85 radar at Eglin AFB, and the FSS-7 radar at MacDill AFB. It is part of the national system for Tactical Warning and Attack Assessment.

Operational Characteristics. The BMEWS radar transmits two narrow beams at different elevation angles. They scan simultaneously over a near-horizontal sector. An intercontinental missile must pass through these beams, creating a return signal from which the trajectory, impact point, impact time and launch point can be calculated.

PAVE PAWS is steered electronically, giving it a wide look angle. It can change its focus point in milliseconds, as opposed to conventional dish radars, which took minutes. In addition, the PAVE PAWS system can track a 10 cm² target at a range of 3,000 miles. Two 102 ft diameter arrays form a 60° angle and tilt up 20° from the vertical. Each face has nearly 1,800 antenna elements, and together the arrays form a beam that reaches 3,000 miles into the ocean at 240°.

Variants/Upgrades

FPS-115. PAVE PAWS

FPS-120. BMEWS I - Thule, Greenland

FPS-126. BMEWS II - Clear, Alaska

FPS-123. BMEWS III - Fylingdales, England

Program Review

Background. Installed in the 1950s, the three original BMEWS sites became operational in the 1960-1963 time-frame. They were upgraded in FY81 and FY82. In July 1983, Raytheon received a contract to upgrade the site at Thule. In September 1983, Federal Electric was awarded a US\$47.7 million contract for operation, maintenance, and logistics support of BMEWS.

Testing of the new MIP computers was completed and operational status achieved at all three BMEWS sites in FY84. Planning for the Fylingdales radar upgrade began in FY84. Thule upgrade in-plant testing was conducted in FY85, followed by on-site installation. The modification to the Thule facility was completed and the system checkout accomplished in FY85.

Software development for the Fylingdales upgrade took place in FY86. A Memorandum of Understanding between the United States and the United Kingdom concerning modernization of the Fylingdales site was completed on October 14, 1986.

The Thule radar upgrade was completed in FY87 and the radar turned over to its operators. In FY88, the Fylingdales upgrade effort began with software development, system engineering, and equipment fabrication. A Letter of Offer and Acceptance between the United States Department of Defense and the Government of the United Kingdom Defence Procurement Office was accomplished on May 8, 1988.

The Fylingdales software development and in-house system-level-testing was completed in FY91. Facility construction was completed and the computer and radar equipment was installed.

In FY91, initial software DT&E was completed at the Fylingdales site. Hardware installation was completed and full power testing begun. In FY92 IOT&E was completed and IOC (for US purposes) was achieved. Joint System Operational Capability (JOC) was achieved in FY93. Additional upgrades were accomplished as necessary to accommodate Tactical Warning/Attack Assessment requirements.

The PAVE PAWS (FPS-115) program grew out of concern that the US mainland was vulnerable to ballistic missiles launched from submarines off the Atlantic and Pacific coasts. The Air Force issued a request for letters of interest in mid-1975. Three teams bid on the program: Raytheon/IBM, GE/TRW/Control Data, and Westinghouse. Raytheon was awarded the contract. IBM developed the software. Control Data received a contract to provide two Cyber 1972-12 computers for each site.

SSPARS RFP. On May 12, 1993, the Air Force published an RFP announcement for maintenance and support of the combined Solid State Phased Array Radar Systems (SSPARS) (previously known as PAVE PAWS/ BMEWS). According to the announcement, the 21st Space Wing would contract for maintenance and support (M&S) for the SSPARS at SLBM Sites 1,2,3,4 and BMEWS Site I. In addition, BMEWS Site I support would include a requirement for sensitive communications and Precision Measurement Equipment Laboratory (PMEL), and Site III support would require sensitive communications. The requirement specified a 60-day phase-in and phase-out period. The proposed contract was based on a basic one year contract period commencing October 1, 1994, through September 30, 1994, with four one-year options. The Statement of Work and RFP were made available on or about June 30, 1993.

ITW/AA Sensor Support. On May 25, 1993, the Air Force published a solicitation notice for Engineering Services for the Integrated Tactical Warning and Attack Assessment (ITW/AA) Sensors program. The solicited acquisition included developmental and maintenance engineering, software and hardware modifications, system programming agency (SPA) relocations, revision and development of technical orders,

survivability and vulnerability support, and independent validation and verification (IV&V) required for the control and data processing/display and telecommunication subsystems associated with the electro-optical, mechanical and phased array surveillance systems which support the ITW/AA architecture.

Specific sensor systems to be supported included the following:

- a. Electro-Optical: FSQ-114 Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) system and associated SPA.
- b. Mechanical Radars: FPS-17; FPS-79 Incirlik, Turkey; FPS-50; FPS-92 Ballistic Missile Early Warning System (BMEWS) Site 2 systems; HAVE STARE and associated SPAs.
- c. Phased Array Radars: FPS-108 COBRA DANE, FPQ-16 Perimeter Acquisition Radar Attack Characterization System (PARCS), FPS-85 EGLIN, FPS-120 BMEWS Site 1, and FPS-115 PAVE PAWS systems and associated SPAs.

This acquisition, the Air Force said, would compete under streamlined source selection procedures and would be awarded in a single indefinite quantity type contract with an ordering period of five years.

On March 3, 1994, PRC Inc, Huntsville, Alabama, was awarded a US\$97,500,000 firm fixed price contract for engineering services in support of the ITW/AA program. The contract will be completed March 2000. The Sacramento Air Logistics Center, McClellan Air Force Base, California, is the contracting activity (F04606-94-D-0071).

Funding

Funding from O&M accounts.

Recent Contracts

(Contracts over US\$5 million)

Contractor	Award (\$ millions)	Date/Description
PRC Inc	97.5	March 1994 - FFP contract for firm fixed price contract for engineering services in support of the Integrated Tactical Weapons Attack Assessment Sensors System, which includes ground-based electro-optical deep space surveillance, ballistic missile early warning system, HAVE STARE radar, COBRA DANE radar, Incirlik radar site, PARCS radar, Eglin radar, PAVE PAWS radar, the Defense Support Program, and the associated system program agencies. Expected completion March 2000. (F0406-94-D-0071)

Contractor	Award (\$ millions)	Date/Description
Raytheon	16.1	July 1994 - FFPI contract for management, operation, maintenance, and logistical support for the FPS-123 radar systems at Sea Launched Ballistic Missile Warning sites at Cape Cod AFS, MA, Beale AFB, CA, Robins AFB, GA, Eldorado AFS, TX, and the BMEWS site at Thule, Greenland and sensitive communications at the BMEWS site at RAF Fylingdales, UK, for the period 1 Aug 1994 through 30 Sept 1995. Contract is expected to be completed in Sept 1999 (F05604-94-C-9004)
Felc	21.5	Sept 1994 - Face value increase to FPIF contract for operation and maintenance of BMEWS Site II, Clear AFS, AK. Complete Sept 1995 (F05603-92-C-9994)

Timetable

BMEWS

	1950s	Program initiated
Dec	1960	Thule AFS operational
Sep	1961	Clear AFS operational
Sep	1963	Fylingdales site operational
Aug	1980	MIP computer replacement award
	1985	Upgraded Thule site operational
Jun	1988	Fylingdales upgrade contract awarded
Aug	1989	Critical Design Review
Jun	1992	Fylingdales IOC
Oct	1992	Joint Operational Capability
May	1993	ITW/AA Sensor Support solicitation
	FY93	Complete Fylingdales upgrade
Mar	1994	ITW/AA support contract awarded
Sep	1999	End of current ITW/AA management contract

PAVE PAWS

	FY75	PAVE PAWS first funded
	FY76	Source selection
Apr	1976	Initial software contract awarded
	FY77	Critical design reviews completed
Apr	1979	Otis facility operational
	1980	Beale facility operational
Nov	1986	Robins facility operational
Oct	1987	TWSTSC IOC
May	1987	Goodfellow facility operational
Feb	1988	Otis & Beale ADP upgrade contract awarded
Sep	1989	Robins site modification complete
Dec	1989	Otis site modification complete
Mar	1990	Beale site power upgrade complete
Dec	1990	Otis site computer upgrade complete
Mar	1991	Beale site computer upgrade complete
Sep	1999	End of current ITW/AA management contract

Worldwide Distribution

BMEWS is a **US/UK** only program. PAVE PAWS is a **US** only program.

Forecast Rationale

The Cold War gave birth to BMEWS and PAVE PAWS. The original 1950s technology was upgraded to meet new threats so radar upgrades and computer improvements would ensure reliable performance and better support of the national retaliatory strategy of flexible response. As a result, most of the US's strategic warning system was upgraded.

Budget constraints and changed security needs have driven major changes in the overall strategic warning philosophy and focus; it was no longer practical to maintain strategic warning systems as single mission sensors. They are not being abandoned or shut down as the OTH-B radars have been because missile warning remains an important part of the US/UK defense plan. These powerful sensors can be applied to a variety of detection and tracking missions.

A multifaceted plan for providing protection from missile attack has continued, involving a restructuring or refocusing of many of the efforts formerly included under the Strategic Defense Initiative. A key to the new philosophy is the idea of integrated tactical sensors. The award of the Integrated Tactical Warning and Attack Assessment (ITW/AA) Sensors program is an example of this new approach. The Pentagon and the Congress are not going to pull down all of the nation's warning fences.

A National Missile Defense effort has become a cornerstone of current Congressional/White House wrangling. The 104th Congress has introduced legislation requiring the Administration to deploy a Continental US missile defense system by 2003. The Pentagon has funded a study effort, with deployment decisions to come later; preferring instead to focus on developing protection from

battlefield tactical missiles, such as the Scud attacks of the Persian Gulf War.

Although many on Capitol Hill want to US to begin a major missile warning development. Unfortunately, campaigning for the 1996 presidential election has made the "To Defend America Act" a political rather than strategic issue. It has also gotten wrapped up in intra- as well as inter-party wrangling on Capitol Hill. It will probably not be until after the elections that a meaningful dialog on the issue begins. At no point has the squabbling addressed existing systems, such as SSPARS.

Affordability questions, compounded by budget cutting and deficit reduction concerns abound. A Congressional Budget Office finding that the new missile defense system could cost between US\$ 31 and US\$ 60 billion caused the House of Representatives to pull the pending legislation from the Floor where it was scheduled for a vote. Support was not there.

SSPARS will continue to serve, especially since what the most vocal missile protection development proponents want is probably unaffordable. They may have to fall back on existing systems instead of new developments.

Support funding for strategic warning systems will continue at a much reduced pace. Current SSPARS support contracts continue with options through 1999. Improvements to all of the systems will be limited to keeping pace with technological developments in hardware and software and to re-focusing the sensor mission from the narrow strategic realm that concentrated on the former Soviet Union to a more broadly defined integrated tactical sensor. The first of these upgrades is beginning with the ITW/AA Sensor Support program.

Ten-Year Outlook

Production of all systems is long finished and will not be reestablished.

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