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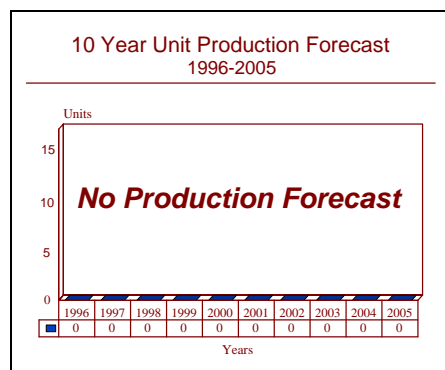
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Defender AEW - Archived 12/97

Outlook

- No client for six years
- No discernible interest in program



Orientation

Description. Lightweight airborne early warning command control system.

Sponsor

Racal Thorn Defense Systems
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Contractors

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Licensee. No production licenses have been granted.

Status. No discernible interest exists in this program.

Total Produced. Prototype aircraft only.

Application. The Defender AEW system was to have been applicable to AEW, maritime reconnaissance and battlefield surveillance missions. It was specifically designed to provide an airborne early warning surveillance system for countries without the financial or tactical justification for a full-scale AWACS-style solution.

Price Range. The price for the AEW Defender has been quoted as being "less than a quarter of the price for the Grumman E-2C." The 1987 unit procurement price for an E-2C was US\$52.7 million, indicating a unit cost of the

PBN Defender AEW at about US\$13 million. At that time, the fly-away price for a PBN Defender "green" was about US\$0.8 million, leading to the conclusion that the Defender's AEW suite costs in the region of US\$12 million per aircraft. At the roll-out of the Defender AEW in Bembridge, PBN indicated a price of about US\$8.5 million for the radar with one console, and US\$14.25 million for an aircraft with two consoles, datalink and ESM facilities.

Technical Data

Characteristics

Frequency:	I-band
Beam width in azimuth:	1.5 deg
Beam width vertical:	3 deg
Modes of operation:	
AEW look-down	Pulse Doppler
AEW look-up	Pulse
Maritime surveillance	Pulse
Nav/weather warning	Pulse

Dimensions

	Metric	US
Scanner weight:	68 kg	150 lb
Transmitter weight:	105 kg	231 lb
Tac/console weight:	70 kg	154 lb
Radome diameter:	160 cm	63.6 in
Antenna width:	137 cm	54.4 in
Antenna depth:	86 cm	34.1 in
Transmitter power consumption:	3.0 kVA	
Console power consumption:	2.5 kVA	
Tac/console power consumption:	1.5 kVA	

Performance details, Skymaster

Look-up mode:		
	Range, 10-sq-m cross-section	At least 100 nm
	Azimuth	270 deg
	Trackable targets	100+
Look-down mode:		
	Range, 10-sq-m cross-section	At least 100 nm
	Azimuth	360 deg
	Trackable targets	100+

Maritime reconnaissance role

Range at 10,000 ft, sea state 3:	Azimuth:	360 deg
	Small launch (5 sq m X section)	70 nm
	FAC (50 sq m X section)	125 nm
	Frigate (10,000 sq m X section)	200 nm

Characteristics of the Defender platform

Aircraft MTO:	8500 lb
Endurance:	6 hours

Design Features. The Skymaster radar equipping the Defender AEW was configured to reduce size, weight, power and cooling requirements. This was accomplished to the extent where airframes with a payload in excess of

900 kilograms could act as potential platforms. The Skymaster radar was also aimed at providing a part of the overall fit in multisensor systems onboard large platforms.

In the Defender AEW, the Skymaster antenna was nose-mounted in a large bulbous antenna. Behind this, and forward of the cockpit, the duplexer/diplexer unit, the RX Exciter, Inertial Navigation System (INS) and hydraulic power unit were located. The console(s) were located in the cabin between the wings and facing the tail of the Defender AEW. The transmitter driver, radar transmitter, and accumulators were situated behind the console(s) while the pressurization pack, transmitter, transmitter conditioning unit, and equipment conditioning unit were located in the tail section of the aircraft.

Racal Thorn Defense Systems, which acquired the old Thorn EMI Electronics Radar Division, is the radar manufacturer, while the Computer Systems Division produces the mobile datalink terminal. Pilatus Britten-Norman Ltd is the platform manufacturer; Normalair-Garret is responsible for lightweight console; Airtech Limited, the datalink and the ISO shelter; while Rockwell Collins provides the UHF radio systems. Ferranti Computer Systems produces the A900 trans/ control processor and Hewlett Packard the Link Y data terminal.

The Ground Display System is a complete package offered by Racal to defense commands which have no existing aircraft equipped for an AEW or surveillance role. It includes a complete package of Skymaster radar, Defender AEW, airborne datalink receiver and a Mobile Data Link Terminal (MDLT). The purpose of the MDLT is to convert message and target information from the patrolling aircraft into the data format of the ground command and control network. The Thorn EMI MDLT is either vehicle or static mounted.

Operational Characteristics. Defender AEW provides for automatic detection and tracking of targets, over-the-horizon targeting (OTHT), long range detection, accurate range resolution, multimode operation, integrated operator control and display, multirole surveillance and track-while-scan. It features a polychromatic TV display, grid referenced targets, computer assisted system control, touch-sensitive plasma control panel, ground stabilization or rolling map and tactical command facilities. Skymaster radar offers system control of radar, inertial navigation system, IFF, datalink, ESM and 1553B serial interface. The aircraft contains facilities for software control of target tracking, system control and the BITE. A training package is also available. The antenna is fully stabilized and provides for 360-degree surveillance with mechanical sector blanking.

Variants/Upgrades

Defender AEW uses a Pilatus Britten-Norman (PBN) AEW Defender. Other versions of the system have been proposed for installation in British Aerospace (BAe) Advanced Turbo-Prop (ATP), the CASA 212 and 235, the

BAe 748, Canadair Challenger, Westland Sea King and Grumman S2 Tracker.

Pilatus Britten-Norman has also proposed a version of the Defender fitted with the Kestrel ESM system.

Program Review

Background. The Skymaster radar equipping the Defender AEW platform sprung from the Searchwater. A version of Searchwater was adapted for the CED stage of CASTOR and was a prime candidate for the low-altitude MTI solution to the UK MoD's ASTOR requirement. Much of the collaborative work carried out by Pilatus Britten-Norman and Thorn EMI over the last few years has been equally applicable to both the Defender AEW and the Defender ASTOR program. A lot of the work carried out by Thorn EMI on the ASTOR program spilled over into the Skymaster radar program.

Development of the Pilatus Britten-Norman (PBN) Defender AEW began in 1984. On March 6, 1987, the complete aircraft was rolled out at PBN's Isle of Wight plant. Between those two dates, a mock-up of the Pilatus

Britten-Norman (PBN) Defender AEW was exhibited at Farnborough and Defendory.

The Defender AEW aircraft undertook a demonstration tour of the Middle East during the latter part of 1987, as a result of which the Jordanian government expressed interest in the program. This was understood to include the AEW, maritime patrol and battlefield surveillance variants. This interest eventually faded away.

In 1991 Forecast International was told that the radar was only then being installed in the Defender airframe and that it would be two or three years at least before a production decision can be taken. Few customers were prepared to wait that long for a system which, by definition, was a national priority. By 1992 no sales, or indeed serious prospects of sales, had emerged for the Defender AEW.

By this time, a new radar surveillance version of the Defender, the MSSA or multi-sensor surveillance aircraft had been introduced. This featured an APG-66 radar and an electro-optical surveillance package for maritime surveillance rather than an AEW function. The AEW control functions and datalinks were, accordingly, deleted. After a delayed and shaky start, this program has started to achieve launch orders with Poland buying one for border surveillance. A report that Australia was buying three such aircraft for maritime patrol duties has turned out to be incorrect.

During early 1994, a significant upswing in promotion attempts for the Defender AEW was noticeable. This covered both the Skymaster and APG-66 versions of the aircraft. The efforts coincided with a similar promotion campaign for the Defender 4000 aircraft and can be viewed as an attempt to maximize the market for the new variant of the Defender. While the APG- 66 version continues to attract attention, the Skymaster- equipped aircraft continued to extract a null response.

In spite of this situation, development of the basic Defender AEW concept has continued. During the 1994 Farnborough Air Show, a new variant of the basic concept was revealed. This was designated the Defender 4000 and features an enlarged wing with a 53 ft span, improved Allison Model 250-B17F turboprops, each rated at 298 kW (400 shp) and a 50 percent increase in internal fuel. All-up weight is increased to 8,500 lb of which 2,200 lb is payload. The Skymaster radar in either air surveillance or ground surveillance variants would be standard.

Between 1994 and 1996 there was no publically-revealed information on any prospective sales of this new variant of the Defender concept. However, there have been unconfirmed reports that the single prototype Defender was used for ground surveillance by the British Army. No additional information other than the simple statement is available. If correct, the timing suggests that the aircraft may have been deployed either over Northern Ireland or over Bosnia. It is also possible that the report is a garbled version of trials carried out with the British Army ASTOR program.

Funding

The Searchwater radar, from which the Skymaster radar is derived, was developed under a contract awarded by the United Kingdom Ministry of Defence. Defender AEW has been developed as a Thorn EMI company private venture. The radar side of the program is now funded by Racal.

Recent Contracts

No contractual information has been made publically available.

Timetable

	1984	Development of Defender AEW began
Jun	1985	Skymaster proposed for Australian requirement
Oct	1986	Skymaster radar exhibited
Mar	1987	Prototype roll-out
	1987	Middle East sales tour
	1988	Jordanian interest in Defender AEW

Worldwide Distribution

One prototype system is in the **UK**.

Forecast Rationale

The Defender AEW system has now been promoted for over six years without a single realistic customer emerging. Potential clients cannot be convinced that a

small airframe like Defender can carry the resources necessary to control a major air battle. All the evidence points to the conclusion that they are correct — it can't.

The importance of AEW is not getting a radar airborne, but in using the information it generates. This requires elaborate infrastructure and, viewed in a full systems analysis context, savings resulting from a Defender purchase will simply be absorbed, with interest, elsewhere.

Questions of survivability have also been raised. Small size means the Defender would have to be closer to the battle area than the E-2, yet prevents it from carrying comprehensive ECM systems. The situation has been worsened by the arrival of dedicated air-to-air anti-radar missiles, specifically targeted for AEW aircraft. Lacking the facilities to adequately control its escorting fighters, Defender AEW is meat on the table for aircraft equipped with these weapons.

The whole problem with Defender AEW is that if the problems are serious enough to warrant an AEW solution, they also warrant the expenditure required for full-scale AEW. Desert Storm showed just how futile a compromised air defense system is (and also the ineffectiveness of anything less than a proper AEW capability). We cannot conceive of countries buying the Defender AEW.

The arrival of the Swedish Erieye system, which packs proper AEW capability into a medium-sized airframe at acceptable cost, will take the market segment originally targeted for Defender AEW. The surveillance role of the Defender AEW has been taken over by the Westinghouse MSSA. The E-2C is simply too good at its job and the Swedish Erieye is too efficient and flexible a successor to the Hawkeye. In its surveillance role, Defender AEW was the right solution at the wrong time and now that the time is right, it is the wrong solution. In the cruel phrase of the market place, Defender AEW has passed its sell-by date and not achieved production status.

As the development period of Defender AEW has stretched and potential customers sought other solutions, our forecast has steadily declined. This process has now concluded with zero production now projected for the forecast period. The recent promotion surge probably represents a last attempt to gain sales for the aircraft before the program is formally abandoned. We will maintain this program in the short term against the possibility that the new Defender 4000 incarnation may attract some attention.

Ten-Year Outlook

No production is forecast.

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