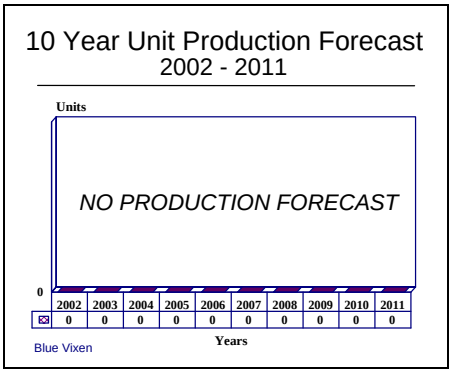
Blue Vixen – Archived 04/2003

Outlook

- With no new orders made public since the late 1990s, production has apparently ceased
- Barring any future activity, this report will be archived in October 2003



Orientation

Description. Pulse Doppler airborne radar for maritime fighter, reconnaissance, and strike aircraft.

Sponsor

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Contractors

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BAE Systems (Formerly GEC-Marconi Avionics Ltd) is the prime contractor, with Ericsson Radio Systems AB as subcontractor. Ericsson's involvement with Blue Vixen was restricted to certain subsystem development, including parts of the antenna and the electronics systems.

Licensee. No known production licenses have been granted.

Status. In service; no new production forecast.

Total Produced. Through 2000, approximately 67 radars had been produced.

Application. The Blue Vixen radar is the prime sensor on board the UK Royal Navy Sea Harrier F/A Mk 2. It is a multimode radar intended to provide air-to-air and air-to-surface surveillance, target acquisition, and engagement facilities.

Price Range. Each Blue Vixen radar is thought to cost about US$5 million, inclusive of R&D. Allowing for the usual development/procurement cost split, this indicates that the cost of a Blue Vixen is around US$1.75 million.

Technical Data

Design Features. Blue Vixen is a true multimode coherent pulse Doppler radar. It is a lightweight and flexible system, with considerable in-service growth facilities. Of modular construction, based substantially on previous equipment developed by GEC-Ferranti Defence Systems Limited, Blue Vixen was designed for complete compatibility with the AIM-120 air-to-air, Advanced Medium-Range Air-to-Air Missile (AMRAAM), destined to be primary armament on the Sea Harrier F/A Mk 2. The use of a MIL-STD-1553B databus allows some of the system's LRUs to be located away from the nose of the aircraft.

Operational Characteristics. In the air-to-air mode, Blue Vixen provides look-up, look-down, track-while-scan, and single-target-track capabilities. It operates effectively over sea and land and in all weather. Because the platform is a single-seat aircraft, Blue Vixen features head-up combat modes and is fully compatible with both infrared (IR) and radar missiles.

UK Royal Air Force Sea Harriers

Source: UK RAF

Variants/Upgrades

There have been no known variants or upgrades identified at this time.

Program Review

Background. As a result of lessons learned during the Falklands campaign, the UK Royal Navy identified a requirement for a more advanced radar system that would feature greater flexibility and higher performance than that originally specified for Blue Fox, which was fitted on FRS.1 Sea Harriers.

In April 1986, Ferranti announced that it had delivered an initial prototype Blue Vixen to the Royal Aircraft Establishment (RAE) at Bedford, England in late 1985. Flight trials were undertaken in conjunction with the Royal Signals and Radar Establishment (RSRE) Malvern Radar Flight Trials Unit and the RAE, using an experimental model radar onboard a BAe 111 fitted with the proposed Sea Harrier nose radome. The aircraft spent a year flying out of RAE Bedford in its role as a platform for the Support Technology Program until November 1987. The aircraft was joined by Ferranti's own BAe 125 fitted with a development model Blue Vixen radar for unspecified flight trials.

In trials, Blue Vixen successfully detected a variety of known cooperative airborne targets. These were detected at the predicted ranges and confirmed the anticipated signal processing performance in the low-, medium- and high-PRF modes, as well as the high-PRF velocity search mode.

In May 1990, the first Sea Harrier F/A Mk 2 equipped with the Blue Vixen radar flew, initiating the final series of radar/weapons integration trials prior to service acceptance for the type. The first service delivery of a Sea Harrier F/A Mk 2 took place in April 1993, and the first converted aircraft formally entered squadron service in May 1994. The first new-build Sea Harrier F/A Mk 2 aircraft followed in 1995, with operational deployment almost immediately to HMS *Ark Royal*.

The Blue Vixen radar has also been used in a technology demonstration program designated TIARA (Tornado Integrated Avionics Research Aircraft). In the TIARA program, an infrared search-and-track system was installed in the space freed up by replacing the Foxhunter with a Blue Vixen in the nose of a Tornado F.3. Although offering major improvements in radar performance, as well as the advantages of a multimode integrated sensor system, this aircraft was to remain a flying testbed.

In 1992, the UK MoD announced that development of the Sea Harrier family would terminate with the existing Sea Harrier F/A Mk 2 and that no additional aircraft of that type would be ordered. Instead, future development funding would be invested in ASTOVL (advanced short take-off/vertical landing) programs, probably in partnership with the US. The 1993 British defense estimates contained a commitment to fund up to 20 percent of the ASTOVL program.

These plans were modified in early 1994. In a move that represented a major shift in emphasis from the Royal Air Force (RAF) to the Royal Navy (RN), it was decided that two squadrons of Harrier GR.7 aircraft would be trained to operate from the carriers during 1996 with a possible transfer from the RAF to the RN following later.

In mid-1996, the Royal Navy Sea Harrier F/A Mk 2 aircraft started a detailed series of performance and air combat trials. The radar/airframe/AIM-120 combination proved to have satisfactory capability against sea-skimming anti-ship missiles such as the MM-38 and AM-39. Numerous real (as opposed to simulated) kills were scored. In addition, in dissimilar air-combat exercises, the Sea Harrier established an unexpected air-combat superiority over the Tornado F.3.

This was due partly to the superiority of the AIM-120 missile over Skyflash, partly to the dogfighting advantages of the Sea Harrier over the Tornado, and partly to the great superiority of the Blue Vixen radar over Foxhunter in both standoff and dogfighting modes. These results added weight to calls for the Tornado F.3 to be rebuilt with Blue Vixen.

GEC-Marconi (now BAE Systems) had entered Blue Vixen into a competition for the Hornet Upgrade (HUG) in 1997 that would bring the Royal Australian Air Force's (RAAF) F/A-18 A/Bs to the C/D configuration.

Although the Raytheon choice was preferable, the RAAF was examining Blue Vixen in the late 1990s as an effective and capable radar, less expensive than the Raytheon offering. Unfortunately, any savings had the potential of being negated depending on the cost of integrating Blue Vixen with the Hornet's mission computer.

In January 2000 the RAAF finally chose the APG-73 over Blue Vixen for its fleet of F/A-18s. This and the wide deployment of the Raytheon system on the same platform for the air forces of Finland and Switzerland seriously casts doubt on any future production of Blue Vixen.

Funding

BAE Systems (formerly GEC-Marconi Avionics) had a fixed-price development and production contract valued at about US$150 million with the UK Ministry of Defence.

Recent Contracts

Contractor	Award ($ millions)	Date/Description
McDonnell Douglas	1.5	1997 – A follow-on and more detailed risk and implication study commissioned by the Royal Australian Air Force regarding the integration of Blue Vixen with the F/A-18. Study completed September 1998.

Timetable

Month	Year	Major Development
	1985	BAe awarded Sea Harrier mid-life update contract
		Marconi wins Sea Harrier radar update contract
4Q		Marconi delivers development model to RAE
	1986	Prototype flight tests commenced on RAE BAe 111
		First flight of upgraded Sea Harrier
Jun	1988	Blue Vixen deliveries commence
May	1990	10 additional Sea Harrier FRS.2s ordered
		Blue Vixen flown in Sea Harrier FRS.2
		Originally scheduled operational service entry date of Sea Harrier FRS.2
April	1993	First Sea Harrier FRS.2 delivered to Navy
	1994	Sea Harrier F/A Mk 2 entered service
May	1995	First Blue Vixen operational deployment
	1996	GEC-Marconi's bid to equip RAF Sea Kings includes Blue Vixen derivative
	1997	RAAF evaluates Blue Vixen for possible installation on its F/A-18 A/B fleet
Jan	2000	RAAF decides on rival Raytheon system for F/A-18 A/B fleet

Worldwide Distribution

UK Royal Navy. 64 systems on Sea Harrier F/A Mk 2.

Forecast Rationale

With the crucial selection in 2000 by the Royal Australian Air Force (RAAF) of Raytheon's APG-73 radar for its F/A-18 fleet over the UK's Blue Vixen, it would appear that the market for the older radar has been exhausted. However, its successful and wide-spread installation on the UK Royal Air Force (RAF)'s Sea Harrier F/A Mk 2 fleet would indicate that Blue Vixen will remain operational and in service for some years to come. BAE Systems, Blue Vixen's prime contractor, continues to market the radar on their website.

The multimode, pulse Doppler, fire-control radar provides air-to-air and air-to-surface surveillance, target acquisition, and engagement facilities. The radar is also adaptable for use in the F/A-18 Hornet. As a key component on one of the most proven fighters in the world, the chances for export sales and modest production for spares and replacements cannot be entirely ruled out. Barring any future activity, however, this report will most likely be archived next year, October 2003.

Ten-Year Outlook

No further production anticipated.

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