

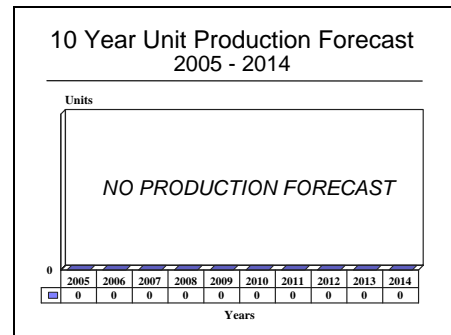
ARCHIVED REPORT

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Cutlass/Cygnus - Archived 8/2005

Outlook

- No future orders on horizon as newer systems apparently dominate the market
- System could have more life left in the replacement market for the numerous users of the systems



Orientation

Description. Cutlass(V) is a naval electronic support measures (ESM) system devised to intercept threats and provide accurate bearing information. It is most often combined with a Cygnus or Scorpion jammer system.

Sponsor

United Kingdom Ministry of Defence
 Procurement Executive
 Contracts Branch
 St. Georges Court
 14 New Oxford Street
 London WC1A 1EJ
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Licensees. No production licenses are known to have been granted.

Status. Cutlass variants in operational service. Cygnus being widely replaced with upgraded systems.

Total Produced. An estimated 151 Cutlass and Cygnus systems (combined family total) were produced through 2003.

Application. The Cutlass and Cygnus systems, together with their close variants, are suitable for installation on frigates, fast attack craft, and other small vessels.

Price Range. Based on current contractual arrangements, the cost of a stand-alone Cutlass ESM or Scorpion jammer is estimated at US\$1.5 million, with a fully integrated system (Cutlass and Cygnus or another system combined) being priced at around US\$4 million.

Contractors

Thales, <http://www.thalesgroup.com>, 45, rue de Villiers, Paris, 92526 France, Tel: + 33 1 57 77 80 00, Fax: + 33 1 57 77 86 59, Prime

Technical Data

Cutlass 242

Characteristics

Frequency range	0.6 to 18 GHz
Average radiated power	300 kW
Maximum radiated power	480 kW
Elevation coverage	+30 to -30 degrees

Azimuth coverage	360 degrees
Sensitivity	-60dBmi
Bearing resolution	1.4 degrees
Bearing accuracy	3.5 degrees

Design Features. Cutlass is an ESM suite for a very dense signal environment (up to 500,000 pps, as in the Middle East or Europe) and operates in the 1-18 GHz range, using two digital bearing and frequency discriminators (2-7.5 and 7.5-18 GHz). Signals are automatically compared with a 1,000-radar library, and the results displayed in tabular form, with threats automatically ranked. The display can show up to 150 threats on five pages, and the 40 most important threats are displayed automatically. The display also shows the level of confidence to be applied to the identifications. Selected digital data can be sent to other systems – for example, anti-ship-missile fire control. Signal analysis is by instantaneous frequency measurement (IFM), the ESM receiver operating on two channels giving frequency and bearing. The bearing channel can be used for weapons direction. A typical installation, providing all-around coverage from the masthead, consists of an omnidirectional antenna to provide an input to the IFM, and six ports for direction finding by amplitude comparison.

Cutlass generally provides: 1) bearings over the entire 2-18 GHz range, with pre-amplification over 4-18 GHz; 2) IFM over the whole range; 3) signal processing/library look-up; and 4) CW bearing and frequency measurement over 1-18 GHz. Frequency and bearing

accuracies of 5 MHz and 5 degrees were being claimed over the 0.6-18 GHz range. Cutlass can incorporate its own responsive noise jammer, which can track the target and provide either spot or barrage noise. Cutlass can also be integrated with chaff launchers and with self-defense weapons such as Seawolf. In a typical installation, Cutlass operates with a Cygnus or Scorpion directional jammer. The Cutlass system is being widely replaced with the upgraded Sabre ESM suite.

Cygnus is a naval radar jammer using narrow beamwidth to produce high-output effective radiated power. The system is effective against all types of tracking radar, fire control radar, missile guidance and early warning radar. Cygnus uses both noise and deception jamming to produce the jamming effect, and is kept on target by a built-in interferometer passive tracking system which may also be used to relay data to other platforms.

Radio frequency (RF) received by the tracking antenna is also used as the basis of transmitted RF. Modulation and power control is processor-controlled. Types of modulation available include range-gate pull-off and false target generation. Cygnus is compatible with the Cutlass ESM system, and was originally designed to be complementary with that system. The upgraded Scorpion system is replacing the aging Cygnus.

Variants/Upgrades

The Cutlass/Cygnus family of ESM and jamming systems has been marketed under a large variety of names, most of which reflect minor variations or combinations of different modules. The more significant variants include:

Cutlass B1. Variant using the Anaren D ESM antenna. Cutlass B-1 achieves much greater precision in direction, using a 41-element array for phase-analysis direction finding (2-degree rather than 7-degree accuracy).

Cutlass 242. Consists of a six RF Head Antenna Unit, a Parameter Analysis Unit, and an operator's console. Designed for smaller warships, its performance is normally associated with larger ESM/ELINT systems.

Cygnus. Directional jammer. The Cygnus system has been modified to work with the Weasel jammer in order to provide a land-based electronic warfare (EW) suite.

Octopus. Combination of Cutlass B1 ESM system with DASA threat library and the Scorpion jammer.

Outfit UAF-1. This is the U.K. Royal Navy designation for a modified Cutlass system installed on the Type 23 class frigates.

Scorpion. The next-generation derivative of the Cygnus system, the Scorpion has been developed and is now in production. Operating over the frequency range 7.5-18 GHz, it can take a customer-defined electronic countermeasures (ECM) response code corresponding to a known threat from the Cutlass ESM library, and initiate the appropriate jamming response.

Program Review

Background. The Cygnus ECM system was developed for deployment alongside the Racal Radar Defence

Systems (now Thales) Cutlass ESM/ECM management system. The two systems or variants thereof have been

procured by several navies for seagoing and land-based applications. From its inception, the system has proved particularly popular in the Middle East, with most known export sales being to that area.

Cygnus has been exported to the Bahrain, Egyptian, and UAE navies, and was also selected to equip the early British Type 23 frigates (the Duke class). It was replaced on later ships of this class by Outfit UAT, based on the Racal-Thorn Defence Systems Sceptre system. Cutlass/Cygnus also equips some of the Danish patrol vessels.

Between 1989 and 1991, the SADIE de-interleaving and central processor unit developed for the Cutlass/Cygnus system experienced serious technical problems. The unit was originally developed as a joint venture between the Admiralty Research Establishment (ARE) and Racal (now Thales). When the ARE dropped out, Racal continued SADIE development on its own, but industry sources suggest that the company lacked the resources for a proper R&D effort. However, Racal received a Queen's Award to Industry in 1992 for the SADIE program, suggesting that the more serious problems were overcome. Early Cutlass/Cygnus systems used the Kongsberg 500 processor.

In early 1993, Racal made an unsolicited offer to the U.K. Royal Navy to supply Scorpion jamming systems for use on the Type 23 frigates not equipped with onboard jammers. Because of a shortage of Type 675(2) systems and financial constraints, only a few of the Type 23 class were equipped with such systems. The feasibility of installing Scorpion on the Type 23 was demonstrated in January 1993 using an onshore test facility. Delays in delivering the Outfit UAT system resulted in additional Outfit UAF installations; the total is now nine, as opposed to the

originally planned four. The designation of the equipment then changed from Outfit UAF to Outfit UAF-1.

In 1995, the Egyptian Navy placed a contract valued at US\$3.6 million for three Cutlass/Cygnus systems to equip Ramadan class FAC-M. This put the unit cost for an integrated Cutlass/Cygnus system at US\$1.2 million. Since the Ramadan class is already listed as having Cutlass and Cygnus, the order may represent an upgrade rather than entirely new hardware.

This run of success culminated later in 1995 when Racal (now Thales) finally managed to purchase its longtime rival, the Sensors Division of Thorn-EMI, to form Racal-Thorn Defence Systems. This agreement consolidated the majority of the U.K. naval EW capability under a single roof.

In 1996, Brazil placed a US\$15.8 million order for airborne ESM, with half of the contract money earmarked for enhancements to the Brazilian Navy's Cutlass B1 ESM systems aboard its Niteroi class frigates. This was followed by a 1998 deal with the Netherlands for a Sabre system for a new-build De Zeven Provinciën class frigate.

Thales announced in January 2001 that it had been awarded approximately US\$26.6 million in orders to supply Australia and an undisclosed Far Eastern customer with various electronic surveillance capabilities. Under a contract awarded by BAE Systems, a Type 242 ESM and Scorpion ECM system would be installed on an offshore patrol vessel of the Far Eastern nation's navy.

Production for the last known Cutlass/Cygnus orders presumably carried on through 2002 and 2003.

Funding

The Cutlass/Cygnus systems were originally developed as a private venture using corporate funding. In 1983, Racal (now Thales) was awarded a US\$45 million contract to develop and reconfigure the Cutlass system for Type 23 frigates. Cygnus is usually found integrated with Cutlass.

Recent Contracts

<u>Contractor</u>	<u>Award (US\$ millions)</u>	<u>Date/Description</u>
Thales	26.6	Jan 2001 – Combined orders from BAE Systems to supply Australia and a Far Eastern nation with electronic surveillance capabilities. Order includes a Type 242 ESM system and a Scorpion system for the Far Eastern nation.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1989	West German order for 22 Cutlass systems
	1990	Ordered by Turkey
Apr	1995	Ordered by Egypt
	1995	Ordered by Denmark
Jun	1995	Upgrade of Outfit UAF-1 Systems in U.K. Royal Navy
	1996	Ordered by Brazil for enhancements to Niteroi class frigates
Dec	1998	Ordered by the Netherlands
	2000	Thomson-CSF takes over Racal Defence
June	2000	Thomson-CSF renamed Thales Defence Ltd
	2004-2005	Low-rate production for last known orders

Worldwide Distribution

The Cutlass/Cygnus is believed to be operated by **Algeria, Australia, Bahrain, Brazil, Denmark, Egypt, Germany, India, Kenya, Kuwait**, the **Netherlands, Nigeria, Oman, Qatar, Turkey**, the **UAE**, and the **United Kingdom**.

Forecast Rationale

Recent years have seen an increased emphasis on naval operations in shallow waters, otherwise known as littoral warfare. These actions can range in scope from mere surveillance of coastlines to the insertion of special operations forces into hostile territories. With the closeness to shorelines there is an increased risk. Suicide missions and sea-skimming missiles have to be considered a constant threat. To protect themselves from these risks, world navies will always turn to advanced electronic support measures (ESM) systems such as the Thales-made Cutlass/Cygnus systems.

Cutlass intercepts threats and provides accurate bearing information for frigates, fast attack craft, and other small vessels. Cygnus provides naval radar jamming

against all types of tracking radar, fire control radar, and missile guidance and early warning radar. The systems have been adopted by a wide assortment of nations, and their continued modification has ensured that they will remain at the cutting edge of naval technology.

While Thales continues to promote its relatively more advanced, next-generation systems (some of which originated as Cutlass/Cygnus variants), new orders for the older systems have become increasingly few and far between. There have apparently been no new orders for Cutlass/Cygnus since the late 1990s.

The systems are expected to remain in service for a number of customers, which could always insure a healthy replacement and upgrade market.

Ten-Year Outlook

No future production is forecast.