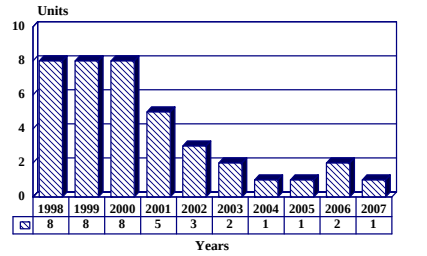
Type 1007 - Archived 7/99

Outlook

- In production and service
- UK Royal Navy retrofit activity continues
- Numerous international potential amongst various platforms



Orientation

Description. I-band navigational radar with a performance envelope suited for both UK Royal Navy and export requirements.

Sponsor

United Kingdom Ministry of Defence
Contracts Branch CB/AWL31B
Room 609
St Georges Court
14 New Oxford Street
London WC1A 1EJ
United Kingdom
Tel: +44 171 632 6014

Contractors

Kelvin Hughes
New North Road
Hainault
Ilford
Essex
United Kingdom
Tel: +44 181 500 1020
Telex: 896401

Licensee. No production licenses have been granted.

Status. Production and service.

Total Produced. An estimated 148 units of the Type 1007 radars are believed to have been produced through 1997.

Application. The Type 1007 radar is designed to act as the primary navigational radar aboard all warship types. The system has a number of secondary roles, including helicopter control and direction. Type 1007 can interface with weapon systems and can act as surveillance radar for dedicated tracking radar types.

Price Range. The price of the system has been estimated at US$0.6 million per unit (based on 1992 Royal Navy intelligence sources).

Technical Data

Characteristics

Operating frequency:	9410 MHz
Operating band:	I-band
Transmitter power	25 kW

Horizontal beamwidth 2.4 m array:	0.75 degrees
Horizontal beamwidth submarine array:	2.25 degrees
Range scales:	0.375 to 96 nm
Characteristics (continued)	
Antenna dimensions:	2.4 m single array
	2.4 m dual array

Design Features. Type 1007 is an I band navigational radar. It is available with four antenna options for deployment in a wide range of vessels including a 2.4 m single array, a 3.1 m single array and a 2.4 m dual array. Surface ship antennas can withstand winds up to 100 kts and funnel gases up to 120 degrees C. A pressure-fitted antenna is also available for submarine installations. All are horizontally polarized and feed slotted line arrays incorporating vertical polarization filters to give low side lobe and back radiation levels. The radar features a 25 kW solid-state transmitter/receiver coupled with 16-inch displays and a 12-inch raster scan auxiliary display. In addition, a data distribution unit forms the central termination point for the system. This allows for six displays to be fitted with two additional outputs for connection to other displays in a ship's total weapons system.

The transmitter uses a high-reliability compact magnetron driven by a DC resonantly charged solid-state line type modulator. The compact magnetron produces a very low stray magnetic field. The use of a high-ratio ferrite-cored modulator output pulse transformer means that the modulator pulse forming network may be operated at only 700 V. The three pulse lengths, the pulse repetition frequency, and the output frequency of the transmitter have all been chosen to be common with commercial marine radar. This avoids immediate identification of the transmission as to naval origin. The transmission may be externally synchronized, if required, to a ship's weapon system master sync generator. In the event of failure of the external synchronization signal, the transmitter will revert to an internally generated pulse repetition frequency within one second.

The Data Distribution Unit is the central termination and distribution unit for the radar system. It accepts a range of the ship's main voltages to provide power for the individual units. The ship's compass synchro format information is converted into digital form and mixed with the digital azimuth change pulses from the antenna to provide eight outputs of both true and relative antenna bearing information for displays. Eight outputs of the ship's head marker and North marker are also provided. The ship's log information in either distance runs pulse form or synchro speed form, is combined with the compass data and fed as a data stream to the displays. Sync and video from the transmitter/receiver are buffered and fed out as multiple outputs. Blanking pulses are incorporated to safeguard sensitive ESM equipment.

The main display has a 16-inch cathode ray tube with a fixed coil deflection system to present nine range scales from 0.375 nm to 96 nm. A constant CRT deflection rate, coupled with video information retiming by means of a high-resolution digital memory, allows presentation of data at uniform brightness levels on all range scales.

An auxiliary raster scan display facility is provided. This portable weatherproof display unit presents the radar picture in the television format with a resolution of 1024x1360 pixels. The display unit has similar facilities in the main display for the measurement of range and bearing, the setting of controls being presented as alphanumeric information on the CRT. Manual and automatic sea and rain clutter controls are provided. The processor uses four one-megabyte memory planes to store the alphanumeric data. Aerial rotation-to-rotation correlation is used to improve the visibility of targets in clutter and to generate artificial afterglow on the CRT. This afterglow time may be set between two minutes and infinite length.

Operational Characteristics. The Type 1007 drives a number of main operation room displays, plus any number of auxiliary displays situated about the ship. Relative motion, true motion pictures in either head-up, north-up or course-up variations, are indicated. Crystal-controlled range rings and range markers, fixed or floating electronic bearing line with digital readout of range, bearing and ships head, form the basic controls and operational features. Additional features include target track history, electronic plotting, target labeling, guard zones, electronic mapping, sector zones, helicopter tracking and sector transmission. Auxiliary video inputs are also included to allow input from simulators and helicopter transponders.

A unique feature of this main display is the track history facility. All radar echoes within a 12-nm radius of the ship may be fed into relative memory and displayed at a lower level of video. Thus relative trails of target movement are clearly shown on the CRT. The storage time of the memory may be selected from 1.5, 3 or 6 minutes, giving an immediate appreciation of target speed. The storage time may also be set to infinite. This track history facility is especially useful when tracking

small targets and also when directing a helicopter onto a warship.

Up to 16 targets may be plotted using a joystick marker and the electronic E-plot system. The marker is positioned over the target echo and its position entered into the plot system. When a second position is subsequently entered, the E-plot system will then calculate the target's course and speed from the entered positions and display a target vector in three sections on the CRT. As each new target position is entered, the vector will be updated. Up to three historical plot positions will be marked. Plot identification letters may be presented as an alternative to plot history marks. The course and speed of any plotted target may be displayed on the LED numeral indicators. When on Relative Motion display, the E-plot system performs the necessary velocity triangle calculation, momentarily displaying the true vector on the CRT screen. On True Motion the target's relative vector may also be displayed. One very great advantage of the E-plot system is that plot data is scaled to the range scale in use and therefore plotting information is not lost when scales are changed.

Two guard zones may be set up on the display at ranges between 1 and 24 nm. Any target entering the zone will activate audio and visual alarms. As an alternative, sector zones may be indicated on the CRT. The start and finish of transmission arcs may also be quickly set up where necessary to avoid detection.

Variants/Upgrades

In September 1989 it was announced that the Type 1007 displays were being upgraded by the introduction of full-color information presentation.

In 1993, Kelvin Hughes Ltd. announced the development of a small ship combat direction system, the Central Tactical Display or CTD. This is comprised of a series of Advanced Radar Plotting Aid (ARPA) terminals linked into a local area network via a databus. A developed version with improved software and displays was released in 1994.

A coastal defense variant of Type 1007 also is available. This combines the transmit/receive portions of Type 1007 with the CTD and the antenna from the Searchwater radar. This system has been sold to the UK (one set) and to Norway, where it is used to control coastal defense guns. Other systems of this type may have been sold.

Program Review

Background. Type 1007 was developed from the commercial radar systems Rad-Pak 16 and 1600 series, which had seen operational use for some time. MoD backing for the development of the new radar is a result of the high operational efficiency experienced over many years with the Type 1006 radar. The Type 1006 proved instrumental in gaining safe access to the difficult San Carlos anchorage during the Falklands campaign. Type 1006 enabled many ships to maneuver in close formation within a constricted channel unfamiliar to the personnel aboard.

The Type 1007 was developed in cooperation with the UK Royal Navy, and is similar in many respects to the Type 1006 radar — a system then standard equipment on board the entire range of UK Royal Navy combat vessels. The Type 1007 is now the designated standard equipment for the UK Royal Navy. Type 1007 was first ordered for the UK Royal Navy in June 1984. The two most widely known classes to be fitted with this radar are the Vanguard class ballistic missile submarines and the Sandown class single role minehunters.

In March 1994, the UK Royal Navy issued a requirement for a new navigational radar. (This may likely be the Type 1008.) This requirement listed specifications such as operation in the E/F-band which make it complementary to rather that a replacement for the Type 1007.

Australia specified the Type 1007 for its Collins class attack submarine while Jordan ordered the equipment for its Hawk class FAC. Type 1007 was approved by Blohm and Voss for fitting aboard its MEKO frigates. Canada installed Type 1007 navigational radars on its Halifax class frigates.

The flow of orders for the Type 1007 continues with the radar being specified for the Brazilian Inhauma class frigates, the German Type 212 class submarines, the UK's future Astute class submarines, and a host of other world navies. There have also been unconfirmed reports that the Type 1007 may be adopted by the Indian Navy for retrofit to its Russian-built elements of its fleet including Kilo (Project 877) class submarines.

Funding

Type 1007 was developed by Kelvin Hughes as a private venture to meet the requirements of a Cardinal Points Specification issued by the UK MoD.

Recent Contracts

No recent contractual information has been made publicly available.

Timetable

Year	Major Development
1971	Development program initiated
1984	MoD contract for Type 1007
	Ordered for UK Royal Navy Type 22 Batch 2 frigates
	Ordered for UK Royal Navy Type 22 Batch 3 frigates
	Ordered for UK Royal Navy Type 2400 submarine
1985	Ordered for Norwegian Ula submarines
	Ordered for UK Royal Navy Type 23 frigates
	Ordered for UK Royal Navy River minesweepers
	Ordered for UK Royal Navy Trafalgar submarines
	Ordered for UK Royal Navy Sandown minehunters
1986	Initial operational capability
	System modified and uprated
1987	Ordered for Portuguese Vasco da Gama frigates
	Ordered for UK Royal Navy Vanguard submarines
1988	Ordered for Saudi Arabian Sandown minehunters
1989	Ordered for Spanish Sandown minehunters
1992	Ordered for Malaysian frigates
1993	Ordered for Omani and Qatari corvettes

Worldwide Distribution

Australia.	6 on Collins Class submarines (3 in service, 3 under construction) 6 for proposed Huon class coastal minehunters 2 on Newport class helicopter support/tank landing ships (LPA/LST) 1 Leaf class replenishment tanker
Bangladesh.	2 on Leopard class (Type 41) frigate
Brazil.	4 on Inhauma class corvettes
Canada.	12 on Halifax class frigates
Germany.	4 on proposed Type 212 submarines
Indonesia.	4 on Kakap (PB57) class (NAV III and IV) large patrol craft 4 on Kakap (PB 57) (NAV V) large patrol craft (1 in service, 3 more proposed)
Jordan.	3 on Al Hussein (Hawk) class fast attack craft
Malaysia.	4 on Assad class frigates
Norway.	6 on Ula class submarines 6 on Modernized Kobben class (Type 207) submarines

Oman.	2 on Qahir class corvettes
Portugal.	3 on Vasco da Gama class (MEKO 200) frigates 4 on Comandante Joao Belo class frigates 3 on Albacora class (Daphne) submarines 10 on Cacine class large patrol craft
Qatar.	4 on Barzan (Vita) class fast attack craft
Saudi Arabia.	3 on Sandown class minehunters, with 1 more proposed in future
Singapore.	6 on Victory class corvettes
Spain.	4 on proposed Segura class minehunters
Thailand.	1 on Chakri Naruebet class helicopter carrier 3 on proposed Modified Khamronsin class corvettes
United Kingdom.	3 on Vanguard class submarines (1 additional proposed) 3 on proposed Astute class submarines 7 on Trafalgar class submarines 1 on Invincible class aircraft carrier (*HMS Illustrious*) 12 on Type 42 class destroyers 12 on Duke class (Type 23) destroyers (Remaining 4 out of 16 proposed Duke class possibly being equipped with Type 1008.) 6 on Broadsword class (Type 22) frigates 1 on Ocean class helicopter carrier 2 on Fort Victoria class fleet replenishment ships 2 on Fort Grange class fleet replenishment ships 1 on Sir Galahad class (LSL) 2 on Bulldog class survey ships 2 on proposed Albion class assault ships 6 on Sandown class minehunters (plus 6 for additional proposed Sandown class) 13 on Hunt class minesweeper/minehunter

Forecast Rationale

As standard equipment aboard UK Royal Navy warships of all types, the domestic procurement future of Type 1007 navigational radar is related directly to the UK Royal Navy's building program. A number of UK Royal Navy platforms, ranging from aircraft carriers to mine warfare vessels, are being fitted with Type 1007 either as original equipment or as the surface combatants come in for their mid-life refits.

The market for the Type 1007 navigational radar can be considered healthy. In addition to the system's obvious role on larger ships, they have also been reported being used as search radars on small attack craft and auxiliaries. Here the wide range of additional facilities built into Type 1007 should prove a valuable sales tool. In fact, the capability of the Type 1007 has proved so attractive that the radar has been sold across a wide spectrum of users, including some whose financial restrictions would normally have precluded the purchase of a premium system.

Regarding the Type 1008, opinion is that the announced Type 1008 navigational radar is not a replacement for Type 1007 but intended for a quite different role.

The following forecast is based upon the known construction schedules of Type 1007 platforms.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level				Speculative			
Designation	**Application**	**thru 97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**Total 98-07**
TYPE 1007	ALBION CLASS (LPD) (UK)	0	0	0	0	1	1	0	0	0	0	0	2
TYPE 1007	ASSAD CLASS (MALAYSIA)	2	2	0	0	0	0	0	0	0	0	0	2
TYPE 1007	ASTUTE CLASS (UK)	0	0	0	0	0	0	0	0	0	1	1	2
TYPE 1007	COLLINS CLASS (AUSTRALIA)	3	1	1	1	0	0	0	0	0	0	0	3
TYPE 1007	HUON CLASS (AUSTRALIA)	0	0	2	2	1	1	0	0	0	0	0	6
TYPE 1007	KAKAP CLASS NAV V (INDONESIA)	1	0	1	0	1	0	1	0	0	0	0	3
TYPE 1007	MODIFIED KHAMRONSIN CLASS (THAILAND)	0	1	0	1	0	1	0	0	0	0	0	3
TYPE 1007	SANDOWN CLASS (SAUDI ARABIA)	1	2	1	0	0	0	0	0	0	0	0	3
TYPE 1007	SANDOWN CLASS (MHC/SRMH) (UK)	6	1	1	2	2	0	0	0	0	0	0	6
TYPE 1007	SEGURA CLASS (SPAIN)	0	1	1	2	0	0	0	0	0	0	0	4
TYPE 1007	TYPE 212 CLASS (GERMANY)	0	0	0	0	0	0	1	1	1	1	0	4
TYPE 1007	VANGUARD CLASS (UK)	3	0	1	0	0	0	0	0	0	0	0	1
TYPE 1007	Prior Prod'n:	132	0	0	0	0	0	0	0	0	0	0	0
Total Production		148	8	8	8	5	3	2	1	1	2	1	39