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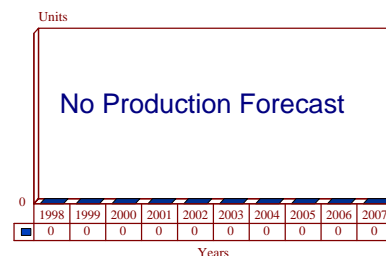
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Super Searcher - Archived 11/99

Outlook

- Most recent production for Indian and UK orders
- In competition with Ocean Master, Seaspray, and Blue Kestrel radars
- Further orders unlikely
- **Barring contract activity or news of concrete interest, this report will be archived in 1999**

10 Year Unit Production Forecast
1998-2007



Orientation

Description. I-band airborne maritime surveillance radar.

Sponsor

UK Ministry of Defence
Procurement Executive
Main Building, Whitehall
London SW1A 2HB
United Kingdom
Tel: +44 171 218 90 00

Contractors

Racal Radar Defence Systems Ltd
Manor Royal
Crawley
West Sussex RH10 2PZ
United Kingdom
Tel: +44 1293 52 87 87
Fax: +44 1293 64 46 44

Licensee

Bharat Electronics Limited (BEL)
No. 116/2 Race Course Road
Bangalore 560001
India
Tel: +91 80 226 73 22
Fax: +91 80 225 84 10

Status. In service. Super Searcher and Super MAREC are still advertised within Racal's range of radar products.

Total Produced. An estimated 227 Super Searcher and 29 MAREC II/Super MAREC radars were produced through 1997.

Application. Super Searcher naval radars act as prime sensors in the detection of surface targets for the following missions: maritime patrol, detection of surface-running submarines or periscopes in ASW, prosecution of ASuW attacks with anti-surface missiles, over-the-horizon targeting (OTH-T) for surface platform missiles, and hunter/killer group C³I in ASW. In addition, tactical display of MAD and sonar data can be carried out in ASW. It is compatible with all fire-and-forget missiles. Platform aircraft have included S-70B-2 Sea Hawk, HU-16 Albatross, Bandeirante, Sea King, and Dominie T.1.

MAREC II and Super MAREC are civilian versions of the Sea Searcher/Super Searcher radar systems, for discharging maritime patrol obligations and EEZ surveillance. Identical in many respects, save for a lack of ASW/ASuW capability to an extent stipulated by the client. Platforms have included Do 128 (MAREC II) and Do 228 (Super MAREC) aircraft.

Price Range. The most recent contract for Super Searcher (for the UK Royal Air Force Dominie upgrade) suggests a unit price of US\$3.6 million in 1992

dollars. Based on the last known contract (to India), the price of a Super MAREC radar is estimated to be US\$640,000 in 1994 dollars.

Technical Data

Characteristics	<u>Metric</u>	<u>US</u>
SUPER SEARCHER		
Typical weight:	less than 85 kg	less than 187 lb
Frequency:	I-band	
Modes:	surveillance, weather, ground mapping (optional)	
Number of transceiver pulse widths:	three	
Number of PRFs:	four	
Receiver:	logarithmic with STC	
Noise figure:	4.5 dB	
Bandwidth:	radar matched to pulse length transponder - 18 MHz	
Typical power:	1.4 kVA	
Antenna aperture:	up to 1070 x 420 mm	
Antenna gain:	34.5 dB	
Antenna scan:	360 deg at 30 rpm with sector blanking	
Stabilization:	+/-20 deg combined pitch, roll and manual tilt	
Displays:	625/525-line standard raster scan; scales 4, 8, 16, 32, 64, 128, and 256 mm; 14, 12, 10, or 8-inch color; 10 or 7-inch monochrome	
Cooling:	built-in fans	

Design Features. Super Searcher is offered as a lightweight, low-cost follow-on to the earlier Sea Searcher radar. Super Searcher's display and antenna configuration varies according to each user's specific needs, and the radar can be provided as a standalone system (operated in the cockpit or rear cabin) or integrated within a mission system. Using the display, the radar is controlled through on-screen menus, selected by a keyboard or joystick; this method of control allows expandability for varying requirements with minimum hardware alteration. Planar and reflector-type antennas are available, and can be adjusted to fit existing radomes.

In any case, the receiver and frequency-agile transmitter are combined into one unit. The radar signal processing unit (RSPU) features within-beam and scan-to-scan integration, as well as automatic track-while-scan (TWS) on multiple targets. Built-in test equipment (BITE) is also included.

Operational Characteristics. Super Searcher is an I-band maritime surveillance radar that can detect a range of targets in all sea states, including conditions of heavy sea clutter. It is compatible with all fire-and-forget

missiles, including Exocet, Sea Eagle and Penguin. The radar operates in surveillance and weather modes, with a ground-mapping mode optional.

Super Searcher's six main improvements over Sea Searcher include: signal processing to improve range performance by incorporating scan-to-scan integration, pattern enhancement and constant false-alarm rate within beam integration; automatic frequency agility to eliminate second-time-around returns and enable high transmitter pulse repetition frequencies (PRFs) to maintain high mean power, thereby providing increased range; a third short pulse rate to improve detection of small targets on high seas; scan-converted video for bright TV display with color differentiation of sensors and markers; an area moving target indicator providing an airborne early warning (AEW) system whereby moving targets are displayed in red with a blue tail to indicate past positions; and increased tracking range.

Super Searcher provides an optimum one-man airborne operations room with facilities for tracking numerous targets. As with the Sea Searcher system, the target tracker output can interface with active and semi-active missile systems to guide them onto designated targets.

Good performance in clutter is achieved by a frequency agile transceiver with microprocessor tuning although the radar can be brought under manual frequency control. As opposed to the dual system of Sea Searcher, the transceiver utilizes three pulse widths and four pulse repetition frequencies to ensure high mean power is maintained, regardless of pulse width used.

Super Searcher can present the total operational overview by displaying data derived from other sensors, including dipping sonar and sonobuoys, identification friend-or-foe (IFF), and electronic support measures (ESM). The centralization of all sensor-gathered intelligence enables confirmatory interplay between systems. Signal processing, target enhancement and noise reduction are also under operator control.

Super Searcher has specific area enlargement and picture freeze facilities, with reversion to surveillance

mode, automatically returning the display aligned with the synthetic map outline. To facilitate operational radar navigation under radar silence, the signal processing unit accepts preprogrammed synthetic map outlines that are superimposed and aligned on the real-time radar display, which can then be shut down. The aircraft's position is then continuously updated by incremental navigation data.

Appropriate for anti-submarine warfare (ASW) and anti-surface warfare (ASuW), Super Searcher may also be utilized in exclusive economic zone (EEZ) protection. Its ability to locate small targets under high-clutter conditions enables search and rescue, fishery protection, and surveillance of illegal activity. These latter roles, however, may be more suitable to the civilian versions of Super Searcher: MAREC II and Super MAREC (see Variants/Upgrades section that follows).

Variants/Upgrades

Super Searcher PC. This variant is based on the Super Searcher, but has the magnetron replaced by a traveling wave tube (TWT) transmitter. The radar also incorporates a number of other improvements, including an updated Motorola 68020-based radar signal and data processors, adapted flat-aperture antenna, radar display menu changes and full systems integration capability with MIL-STD-1553B databus.

Super Searcher GMR. Super Searcher GMR (Ground Mapping Radar) is a variant of the Super Searcher developed for the Royal Air Force Dominie T.1 upgrade program. It features improved detection range when operated from all altitudes and displays optimized to match those of front-line combat aircraft.

MAREC II and Super MAREC. MAREC II and Super MAREC are civilian versions within the Sea Searcher/Super Searcher radar family, for discharging maritime patrol obligations and EEZ surveillance. Identical in many respects, save for a lack of ASW/ASuW capability to an extent stipulated by the client.

MAREC II is basically a Sea Searcher radar system, minus some of the sophisticated software and devoid of frequency agility. Other special features stipulated by the UK Royal Navy were dropped, and the system operates on a fixed civilian frequency. Modifications to the transmitter and software will convert a MAREC II system to Sea Searcher standard. Many options are available to the potential client – for instance, Indian coast guard versions feature integrated IFF, while Royal Australian Navy Seahawks feature an unspecified display. Other options include navigation memory stored maps and coastline generation.

Super MAREC is based on the MAREC II system. The addition of a different processor, changes to the software, and the replacement of the plan position indicator (PPI) with a 14-inch color display form the basis of upgrading to Super MAREC standard. Modifications to the Super MAREC transmitter will in turn convert it to Super Searcher standard.

Program Review

Background. In 1968, ARI 5955 entered UK Royal Navy service aboard Westland Sea King HAS.1 helicopters. The radar system, developed and produced by MEL, was exported aboard Sea King helicopters to Australia, West Germany, Norway, India, Belgium, Egypt, Pakistan and Italy. ARI 5955 was also ordered for RAF Sea King HAR.3 helicopters, under a contract placed in 1976 and valued at one million pounds. A less

sophisticated paramilitary version of the full-spec military radar was made available to export clients for maritime patrol duties. Designated MARitime REConnaissance radar (MAREC), clients for this equipment included the United Kingdom and West Germany.

In July 1978, by the United Kingdom Ministry of Defence (MoD) awarded MEL a contract to develop a successor to the ARI 5955. Designated Sea Searcher, a

US\$15 million production contract followed in 1980, the equipment forming a part of the upgrade that took Sea King HAS.1 to its HAS.2 configuration. Most of these helicopters were later upgraded further to HAS.5 specification. In addition to the 50 or so systems required for the Royal Navy to update existing Sea King assets, orders for 30 more Sea Searchers were procured to equip new-build helicopters. These were ordered in three batches, the last being delivered in May 1986. Development work on the Super MAREC radar system was completed in the same year.

In July 1983, the Indian navy ordered 12 Westland Sea King Mk 42B advanced ASW helicopters equipped with Super Searcher. First flown in May 1985, the Sea King Mk 42B finally started to arrive in India during January 1989. The Royal Australian Navy selected Super Searcher for its Role Adaptable Weapon System (RAWS) naval helicopter program, which involved Sikorsky Sea Hawk S-70B-2 airframes. Eight of these were ordered in October 1984, and a further batch of eight in May 1986.

Super Searcher was also offered as an option aboard the Sikorsky H-76N Sea Eagle naval helicopter and on a new maritime patrol aircraft based on the Sabreliner airframe. No orders were announced and both projects are defunct. In November 1984, the French navy conducted a series of trials with MAREC II aboard Skyship 600. The aircraft appeared at the 36th Paris Air Show, but no further developments were announced.

MAREC II entered service with two Dornier Do 128 MPA aircraft of the Cameroon air force. MAREC II was also selected by the Indian coast guard for its fleet of HAL-built Dornier Do 228 aircraft. An initial order for three systems was placed and delivery of the first batch of aircraft took place in 1986. The Indian coast

guard subsequently ordered 14 Super MAREC radars (the most recent order, placed in September 1993, was for five systems). Twelve of the radars were destined for operational Do 228 airframes; the remaining two were for backup and training.

In September 1990, Litton and Thorn EMI Sensors announced that they would be teaming to offer the new Super Searcher PC radar to the Canadian government as part of the EH-101 equipment fit. Super Searcher PC was one of three radars selected as final contestants for this contract, the others being Blue Kestrel and the APS-504. Eventually, the APS-504 was selected on cost grounds, but the Canadian EH-101 program was canceled in 1994. In January 1998, the Canadian government selected the AW520 Cormorant, a version of the EH-101, as the winner of a contract for 15 search-and-rescue helicopters; however, Blue Kestrel has been the only radar associated with the EH-101 program.

In May 1992, the Royal Air Force ordered 11 Super Searcher GMR radars to re-equip the Dominie T.1 navigational training aircraft. This order, valued at US\$40 million, was completed in April 1996. The order was followed, in October 1993, by a Royal Air Force order for a major upgrade of existing ARI 5955 systems to full Super Searcher standards. The most recent orders for complete Super MAREC radars were placed in August 1993 (five systems) and October 1994 (five additional systems) by the Indian coast guard.

In March 1995, Racal acquired the sensors group of Thorn EMI, which had offered the Sea Searcher/Super Searcher/MAREC family of radars after acquiring developer and original producer MEL. Racal integrated the former Thorn group with its Radar Defence Systems operation.

Funding

The development and production of Sea Searcher, Super Searcher, MAREC II and Super MAREC are believed to have been funded by a combination of MoD contract and corporate resources. Specific information could not be identified.

Recent Contracts

None identified since the following:

<u>Contractor</u>	<u>Award</u> <u>(\$ millions)</u>	<u>Date/Description</u>
Thorn EMI	3.2	Oct 1994 – Indian coast guard order for five Super MAREC radars.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Jul	1978	Sea Searcher development contract announced
	1979	Sea Searcher development contract completed
	1980	Sea Searcher production contract awarded
Oct	1980	First Sea King HAS.5s handed over to UK Royal Navy
	1983	Super Searcher development completed
	1983	MAREC II ordered by Algeria for F-27 MPA
July	1983	First Indian navy order for Super Searcher
Oct	1984	Royal Australian Navy order for Super Searcher announced
Nov	1984	French MAREC II trials on Skyship 600 completed
	1985	Sikorsky proposed Super Searcher for H-76N
Jul	1986	First Indian coast guard Do 228/MAREC II delivered
Sep	1986	MEL/Sabreliner unveiled MPA proposal
	1986	First Sea King HAS.6 ordered by UK Royal Navy
Dec	1986	Indian coast guard order Super MAREC
	1986	First INAS Super Searcher delivery
Apr	1987	Brazilian order for Super Searcher reported
	1987	Super MAREC reached preproduction stage
Jul	1988	Super Searcher PC announced
Jan	1989	Indian Super Searcher/Sea King Mk 42B delivered
Feb	1989	Brazil orders Super Searcher for Bandeirante MPA
Sep	1990	Litton/Thorn EMI team offered Super Searcher for Canadian EH-101 requirement
	1992	Super Searcher ordered for Royal Air Force Dominie T.1
Oct	1993	ARI 5955 upgrade (to Super Searcher standard) for Royal Air Force Sea King helicopters announced
	1995	Thorn EMI acquired by Racal
Mar	1995	
Apr	1996	Dominie avionics upgrade completed

Worldwide Distribution

Australia (Super Searcher on S-70B-2 Sea Hawk)

Brazil (Super Searcher on Bandeirante)

Cameroon (MAREC II on Do 128)

Greece (Super Searcher on HU-16 Albatross)

India (Super Searcher on Sea King Mk 42B; MAREC II/Super MAREC on Do 228)

Pakistan (Super Searcher on Sea King Mk 45C)

UK (Sea Searcher/Super Searcher on Sea King HAS.5 and HAS.6, and Dominie T.1)

Forecast Rationale

Considering the age and technological level of Sea Searcher and its associated MAREC II – as well as the fact that their follow-ons, Super Searcher and Super MAREC, also represent mature programs – it is likely that these are no longer being produced. Adding credence to this likelihood is that Racal Radar Defence only advertises the latter two systems in its company material.

The success of the Thomson-CSF Ocean Master radar on the international market has struck a heavy blow at the prospects for the remaining members of the Sea Searcher family. Ocean Master directly competes with the Super Searcher system, yet exploits technology that is considerably more advanced and is being offered as a package with a variety of platforms. To remain a

significant rival, Racal needs to tie in with a major naval helicopter program and to upgrade the basic system technology, and such a move does not appear to be in the works.

The Indian coast guard Do 228 program has been a source for Super MAREC sales. The last publicized contract was awarded in October 1994, and procurement for this effort seems to have ended. Future exports are possible; at this point, however, it is difficult to speculate which countries have been quietly interested in the radars for their aircraft production/modernization programs.

On the domestic front, GEC-Marconi's Seaspray 3000/4000 and Blue Kestrel 5000/6000 systems have reduced

the market available to Super Searcher. Further Super Searcher orders for Royal Navy Sea Kings are unlikely, as production of the helicopter ended in 1996 to make room for the EH-101 scheduled to enter service in 1999. The EH-101 will carry Blue Kestrel.

The program to upgrade ten Dominie aircraft and one prototype in Royal Air Force service – by replacing Ekco E190 weather radars with Super Searcher GMR radars – was completed in April 1996. The manufacturer also claims that a Super Searcher variant, probably the GMR, provides navigation training aboard Royal Air Force Tornado aircraft. These applications have little relevance to sales potential, and available information does not favor future production.

Ten-Year Outlook

No production is forecast at this time. **Barring verified contract activity or evidence of concrete interest, this report will be archived in 1999.**

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