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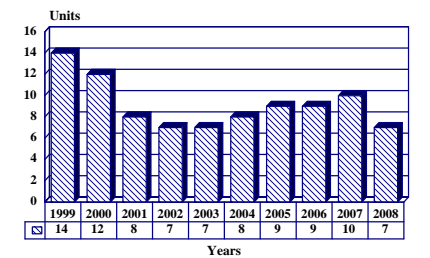
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DR-3000 - Archived 12/99

Outlook

- Pakistan reportedly ordered the system in FY98
- In FY99, a contract for DR-3000Us was awarded by the RNIN for use on its submarines
- Production expected to continue throughout forecast period

10 Year Unit Production Forecast
1999 - 2008



Orientation

Description. Modular ESM system for naval use.

Sponsor

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Contractors

Thomson-CSF
Radars Contre-Mesures
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Licensees. The DR-2000 and DR-4000 systems are being license-produced in China.

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Status. The DR-2000 is now out of production but remains in service in large numbers. The DR-3000 and DR-4000 families are in production and service.

Total Produced. It is estimated that 392 systems had been manufactured by 1998.

Application. Installations include all types of platforms, including submarines, aircraft carriers, cruisers, destroyers, frigates, corvettes, and fast attack craft, as well as maritime patrol aircraft and anti-submarine helicopters. Literature notes that the systems can also be deployed in land-based configurations, although there is no evidence that any customers have taken up this option.

Price Range. As modular systems, the unit price of the DR-2000, DR-3000, and DR-4000 systems varies greatly. However, comparison with known values for equivalent systems suggests the average unit cost for the

DR-2000 would be US\$750,000, for the DR-4000 group US\$2 million, and for the DR-3000 US\$3 million.

Technical Data

Design Features

DR-2000. The DR-2000 is an F-band analysis receiver for radar warning. It is designed to detect pulse and continuous wave signals, including those from frequency-agile radars. It has a 500-signal or 1,000-signal library against which the video signal can be compared. An automatic alarm can also be provided. Data output includes band, PRF, pulse width, power level, antenna rotation period, jitter, and bearing. A superheterodyne receiver can be incorporated to provide greater accuracy in frequency measurement. The 27 kilogram antenna array includes an omnidirectional and six-direction-finding antenna.

As an option, submarine variants can also be fitted with a 14 kilogram periscope antenna. DR-2000 is usually combined with the Dalia 500 or Dalia 1000 radar analyzer with 500 and 1,000 entry libraries, respectively. In this configuration, DR-2000 is designated ARBR-16 and is used as the current standard shipboard electronic surveillance measures (ESM) system in the French navy. In French service, ARBR-16 usually works in conjunction with the ARBB-31 or ARBB-32 jammers.

DR-4000. The DR-4000 is the export version of the French navy's ARBR-17 ESM system designed for the later French warships. Compared with the DR-2000, DR-4000 provides wider frequency coverage (C-J bands) and greater DF accuracy. The antenna array consists of one omnidirectional antenna and two groups of six directional antennas. The omni antenna is 260 millimeters in diameter, is 415 millimeters high, and weighs 9 kilograms. The DF antenna array is 480 millimeters in diameter, 415 millimeters high, and weighs 44 kilograms. The DF array can be mounted as a unit or split into port and starboard segments. In the submarine version, the 12 DF antennas surround the omni antenna, which is limited to a knob on top of the cylindrical radome.

The below-decks console carries a display, keyboard and trackball. The console is also equipped with

controls for Dagaie/Sagaie chaff launchers and ARBB-33 jammers. These can also be triggered automatically. Also included within the console are the de-interleaving module and the video processors. The displays show both raw video and a generated picture using standard Naval Tactical Data System (NTDS) symbology supplemented by a three-color coding to indicate the most urgent threats.

DR-3000. The DR-3000 is produced in three primary variants: the DR-3000A for aircraft, the DR-3000U for submarines, and the DR-3000S for surface ships. The system covers the D-K bands (DR-3000S covers the B-K bands), weighs approximately half as much as the DR-2000U (see **Variants/Upgrades** section), and utilizes the improved antenna and processor featured in that system. Both submarine and surface ship versions use masthead antenna arrays with omnidirectional elements above a series of monopulse directional antennas. The submarine version also has a separate periscope warning antenna. The maritime patrol version uses six DF antennas and an IFM antenna. All versions share a common processing unit weighing 35 kilograms and a common desktop console weighing 42 kilograms and are equipped with a keyboard and tracker ball.

Compared with DR-4000, DR-3000 uses more recent technology and a low-noise amplifier in the antenna to achieve higher sensitivity. The DR-3000 also offers better instantaneous DF accuracy of up to 1 degree for targeting, with higher resolutions available as an option. The proprietary IFM is fast enough to measure frequency within a pulse to within a few MHz accuracy. An ASIC-based window processor is used to compare received pulses with those already identified and tracked. A total of up to 256 pulses can be tracked using this technique. A comparator is used to reduce system identification workload, making it easier to acquire new signals rapidly while operating in a very dense pulse environment. An expert system approach is used for pulse identification.

Variants/Upgrades

AMASCOS. Thomson-CSF has launched AMASCOS (Airborne MARitime Situation CONTROL System) as an avionics suite for maritime patrol aircraft. The AMASCOS suite is intended to be suitable for both retrofit and new-build applications and is available in

three variants designated AMASCOS 100, 200, and 300.

Building blocks for the system include the DR-3000A ESM system, the Ocean Master Radar, a Link-W datalink, and Sextant Avionique's NADIR II inertial

navigation/global positioning system. Additional capabilities can be provided by a Thomson-TRT Clio FLIR sensor, a Creuzot MAD Mark III sensor, a Thomson-SINTRA SADANG-1000 acoustic processing system, and an HS-312S dipping sonar.

AMASCOS-100. AMASCOS-100 is the basic radar/navigation package and requires only a single operator.

AMASCOS-200. AMASCOS-200 adds forward-looking infrared (FLIR) and DR-3000A systems to AMASCOS-100 and requires two operators.

AMASCOS-300. AMASCOS-300 adds the MAD sensor and the acoustic processing and sonar suites to the AMASCOS-200. AMASCOS-300 requires three operators.

ARUD. ARUD is the alternative French navy designation for ARUR-10.

DBI-3000. DBI-3000 is the DR-3000 with integrated Salamandre jammers.

DR-2000A (TMV-026). The DR-2000A (TMV-026) is the aircraft-based version of the DR-2000S.

DR-2000H. The DR-2000H is the helicopter-based version of DR-2000A.

DR-2000S (ARBR-16). The DR-2000S is the basic surface-ship version of the DR-2000. Reports suggest that DR-2000S may be deployed in a land-based configuration.

DR-2000U (ARUR-10). The DR-2000U is a submarine-based version of the DR-2000S with a 34 kilogram dedicated antenna and a 14 kilogram periscope antenna.

DR-2000U Mark 2. An improved submarine variant of DR-2000U is the DR-2000U Mark 2. It features reduced size and increased performance. An improved lightweight antenna and more advanced processor are also used. Coverage includes the D-J bands, and DF accuracy is 6 degrees.

DR-2000U Mark 3. The DR2000U Mark 3 is an improved version of DR-2000U Mark 2 with improved sensitivity and more powerful processor.

DR-3000 Compact. This variant is a lightweight derivative of DR-3000S1 intended for fast attack craft. This version has a single 40 kilogram amplitude DF antenna and a 57 kilogram receiver/display unit. This version is being supplied to Kuwait.

DR-3000A (ARAR-12A). The DR-3000A (ARAR-12A) is a new-generation replacement for DR-2000A used on modified Alize aircraft. The system is configured with

amplitude and phase direction finding antenna units, a 45 kilogram receiver/processor, a 35 kilogram receiver, a 45 kilogram processor, and a 45 kilogram control/display console.

DR-3000N. In 1994 it was reported that the DR-3000S designation previously used for both naval and land-based configurations would be applied only to land-based versions and that naval variants would be designated DR-3000N (the N presumably standing for Navale). This was immediately contradicted by Thomson-CSF. A possible sale of a land-based version led to a proposed DR-3000M (M standing for militaire), but this was misheard and misunderstood.

DR-3000S1 (ARBR-18). The DR-3000S1 (ARBR-18) is the new-generation replacement for DR-2000S and DR-4000S. The system is configured with a 40 kilogram amplitude D/F antenna unit, a 77 kilogram receiver, a 47 kilogram processor, and a 75 kilogram control/display console.

DR-3000S1X. The DR-3000S1X is a modified version of the DR-3000S1 system being supplied to Pakistan for Type 21 frigates. It adds two 49 kilogram phase DF units to the DR-3000S1.

DR-3000S2 (ARBR-21). The DR-3000S2 (ARBR-21) is the improved version of the DR-3000S, with interferometers and two 60 kilogram amplitude DF antennas to allow increased precision in obtaining bearing accuracy.

DR-3000U (ARUR-13). The DR-3000U is a new-generation replacement for DR-2000U and DR-4000U.

DR-3012. The DR-3012 is a lightweight radar warning receiver intended as a set-on system for Dagaie decoy launchers in ships without more advanced equipment. DR-3012 has a minimal threat library of 15 systems. In spite of the similarity of designation with the DR-3000 system, it is much older, and has nothing in common with the DR-3000 series.

DR-4000A (TMV-201). The aircraft-based version of the DR-4000S is the DR-4000A (TMV-201).

DR-4000S (ARBR-17). ESM system for surface ships, designed for the French navy as ARBR-17, and subsequently made available for export as DR-4000.

DR-4000U (ARUR-11). DR-4000U is the submarine version of the DR-4000S.

NEWSY/NADS. The NEWSY/NADS systems integrate the ARBR-17 EW system with one or more ARBB-33 jammers and Dagaie/Sagaie decoy launchers. NEWSY is the French navy system with NADS the export

derivative. They are functionally equivalent to the DBI-3000.

SAPIENS. SAPIENS is a family of three integrated surveillance and alarm systems. SAPIENS-1 for small craft uses DR-2000S with a DALIA-1000 library and a Dagaie launcher, SAPIENS-2 uses DR-4000S with IFM, and SAPIENS-3 adds an integrated jamming system.

Sidewind. The Sidewind integrated EW system incorporates the DR-3000S ESM system, the Salamandre jammer and Dagaie decoy launching systems. The Sidewind central processing system is derived from that used for NADS and calculates the most effective threat response for display on a dedicated tactical console. Sidewind can either operate in stand-alone configuration or be integrated with the warship command system.

Program Review

Background. The DR-2000 system was introduced in 1977 and met with immediate success. The submarine-mounted version, DR-2000U, was selected as the standard fit on the German Type 209 submarine and this system now equips the overwhelming majority of the world's submarine-operating navies. The DR-2000S was fitted to the French Combattante FAC and to the German Lürssen-built equivalents. By the end of 1988, aircraft-based and helicopter-borne systems had been added to the family.

This probably represented the peak of DR-2000 service, and the numbers since that time have slowly declined as platforms were scrapped, sunk in action, or re-equipped with later and more capable systems. DR-2000S was introduced into the French navy service as the ARBR-16, replacing the older ARBR-10, and ARBR-11 systems. In its turn, it was replaced by the DR-4000S under the designation ARBR-17. DR2000U was standardized by the French navy as the ARUD. This continues to be fitted to French submarines in parallel with the ARUR (DR-4000U), and most French-built submarines carry both systems. In this configuration it is likely that DR-2000U acts as a periscope-mounted rapid-response radar warning system, while DR-4000U acts as a full electronic intelligence (ELINT) system.

In 1984, Thomson-CSF revealed the DR-4000 system. Unlike the DR-2000, which was developed as a commercial venture, the DR-4000 was designed to meet a French navy requirement for a capable ESM system. Under its French navy designation, ARBR-17, the DR-4000S was introduced into service in 1986 aboard the missile frigate FS *Cassard*. It was subsequently released to the export market under the DR-4000 designation, but has achieved little success. It was installed in the Saudi Arabian Madina class frigates. The DR-4000 is now being replaced by the later DR-3000.

An airborne derivative of DR-2000/4000 was developed in 1984 to meet a requirement from an African country, presumably Chad. This requirement turned out to be abortive, but development work on the DR-3000 system

continued in 1988, with the intent of packaging an improved and more capable derivative of the DR-4000S into the size and weight constraints of DR-2000. Much of the work on the DR-3000 was based on the planned Mark 2 version of DR-2000U. There were unconfirmed reports that the man-machine interface (MMI) side of DR-3000 presented considerable development difficulties.

Thomson-CSF stated that development was completed in 1991 and an official order for six systems was placed to equip the new Lafayette class frigates. The French navy designation for the system is reported to be ARBR-18. Additional orders were placed by Qatar and Oman during 1992.

In March 1992, the Indonesian company IPTN specified the Ocean Master radar as the baseline fit for the CN-235 maritime patrol aircraft developed by that company. This decision prompted the public announcement of the AMASCOS family of integrated maritime surveillance systems in October 1992. These feature the DR-3000A ESM system.

The French Direction des Construction Navales (DCN) revealed in August 1993 that the DR-3000U ESM system (designated ARUR-13 in French service) would be replacing the older ARUR and ARUD systems on all French submarines. Initial refits would be on board the Rubis class SSNs, with the Agosta class SSKs and the Amethyste class SSNs following. The two new ballistic missile submarines of the Le Triomphant class are receiving ARUR-13 as original equipment.

When the Han class SSN Number 405 was first sighted in December 1992 it was revealed to have the Israeli-designed Timnex 4CH(V)2 ESM equipment. This equipment was designed by the Israelis specifically to provide over-the-horizon targeting (OTHT) facilities for submarine-launched anti-ship missiles. Subsequently, photographs of Han class submarines numbers 403 and 404 revealed the same equipment. This would suggest a pattern where submarines with anti-ship missile capability have the Israeli system, while torpedo-attack submarines receive the DR-2000U.

In November 1993, the Pakistani navy ordered a total of nine DR-3000 systems from Thomson-CSF. Six systems were DR-3000S1X versions and were intended as part of the re-equipment of six Type 21 frigates purchased from the UK as replacements for the ex-US Navy Brooke and Garcia class ships. The latter were returned when their leases expired. This order was followed by confirmation that the four Vita class FAC-M by Vosper Thornycroft for Qatar would mount the Sidewind integrated EW system.

This series of continued orders extended through 1995 with additional contracts from Pakistan (for the DR-3000U), Indonesia (DR-3000C), and Kuwait (also

DR-3000C). Additionally, the system was shortlisted for a large number of impending contract awards, including corvette proposals from Kuwait and a number of other, less well-advanced projects. By the end of 1996, at least 45 DR-3000 systems of all types had been produced, with 15 built during 1995 alone.

In 1998, Pakistan ordered the DR-3000 for its Atlantic Maritime patrol aircraft.

Another contract, for an unknown amount, was placed in 1999 by the Royal Netherlands Navy. The DR-3000U systems are expected to be installed in the Royal Netherlands Navy's four Walrus class submarines.

Funding

DR-3000 was developed as a corporate venture using internal resources of the manufacturer.

Recent Contracts

No recent contracts have been identified through public sources.

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Thomson-CSF	N/A	August 1991 – DR-3000 ESM systems for Lafayette class frigates.
Thomson-CSF	N/A	November 1992 – DBI-3000 systems for Muheet class corvettes ordered by Oman.
Thomson-CSF	N/A	February 1994 – Sidewind systems ordered for Qatari Vita class FAC-M.
Thomson-CSF	N/A	November 1994 – Pakistan navy order for three DR-3000U systems to equip Agosta-90B class submarines.
Thomson-CSF	N/A	February 1995 – Indonesian navy order for four DR-3000S systems to equip 57 meter fast attack craft.
Thomson-CSF	N/A	April 1995 – Kuwait navy order for eight DR-3000 Compact systems for P37-BRL 42 meter offshore patrol craft (OPC).
Thomson-CSF	N/A	1999 – Royal Netherlands Navy (RNIN) contract order for DR-3000U systems to be used on its submarines. Most likely four systems ordered since the RNIN only has four Walrus class submarines.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1977	DR-2000 family introduced
	1984	DR-4000 family introduced
	1986	First service introduction of DR-4000S
	1988	DR-3000 development announced
	1990	DR-3000 declared ready for service
	1991	DR-3000 ordered for Lafayette frigates
	1992	DR-3000 ordered for Omani corvettes
	1993	French navy announces standardization on DR-3000
Nov	1994	DR-3000 ordered by Pakistan

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Feb	1995	DR-3000C ordered by Indonesia
Apr	1995	DR-3000C ordered by Kuwait
	1998	DR 3000 ordered by Pakistan for Atlantic Maritime patrol aircraft
	1999	DR-3000U ordered by the Royal Netherlands Navy

Worldwide Distribution

There are currently a total of 392 reported installations. This number may not agree with platform totals, however, since many older DR-2000 platforms have been scrapped or become war losses. Other platforms have been upgraded with new and more effective systems. In other cases again, systems have been converted to different standards, or moved from one platform to another. This confusing situation is typical of a long-standing and diverse program.

The following countries reportedly have used or are using the various DR ESM systems:

DR-2000:

Argentina, Belgium, Cameroon, Chile, China, Colombia, Denmark, Ecuador, France, Germany, Greece, Indonesia, Iran, Malaysia, Pakistan, Peru, Turkey, Uruguay, and Venezuela have all been reported as using the DR-2000 (or one of its variants) at one time or another.

DR-3000:

France, Indonesia, the Netherlands, Oman, Pakistan, Qatar, and Saudi Arabia are all reported to have, or to have had, the DR-3000, or one of its variants, in their possession.

DR-4000:

Brazil, France, Portugal, and Saudi Arabia reportedly have, or have had, a DR-4000 variant in use in their respective navies.

Forecast Rationale

The DR-3000 family of modular electronic surveillance measures (ESM) system for naval use has numerous installation platforms, including: submarines, aircraft carriers, cruisers, destroyers, frigates, corvettes, and fast attack craft, as well as maritime patrol aircraft and anti-submarine helicopters. It has also been reported that the systems can be deployed in land-based configurations; however, there are no known customers of this variant.

In 1998, the system was ordered by Pakistan for installation on the country's Atlantic Maritime patrol aircraft. The production schedule is for the Pakistani order is unknown; however, not all the systems are believed to have been delivered as of the time of this writing.

The only new known activity within the DR-3000 program during 1999 was the contract awarded to

Thomson-CSF by the Royal Netherlands Navy (RNIN) for DR-3000U systems. The DR-3000Us were reported as being procured for installation on the RNIN's submarines. The contract value, and the amount of systems being procured, was not released. However, four systems are expected to be produced in reference to the RNIN contract. This number is inferred because the RNIN only has four Walrus class submarines, and no new RNIN submarine programs have been announced.

The DR-2000 family, the DR-3000 family, and the DR-4000 family have proven themselves to be very popular, both in the French and the international market. This popularity, based on a good compromise between cost and capability, is expected to continue. These additional orders will generate the level of production of the system indicated in the following 10-year forecast.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Designation	Application	Thru 98	High Confidence Level				Good Confidence Level			Speculative			Total 99-08
			99	00	01	02	03	04	05	06	07	08	
DR-3000	DR-3000 (VARIOUS)	99	8	9	6	6	7	8	9	9	10	7	79
DR-3000	DR-4000 (VARIOUS)	54	6	3	2	1	0	0	0	0	0	0	12
DR-3000	Prior Prod'n:	239	0	0	0	0	0	0	0	0	0	0	0
Total Production		392	14	12	8	7	7	8	9	9	10	7	91