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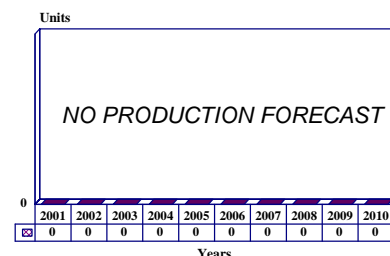
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Jupiter - Archived 02/2002

Outlook

- Production appears to have ended
- Barring any new contracts, this report will be archived in the near future

10 Year Unit Production Forecast
2001 - 2010



Orientation

Description. Family of naval long-range D-band air search radars.

Sponsor

Département de Construction Navale (DCN)
Délégation Générale pour l'Armement (DGA)
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France

Contractors

Thomson-CSF
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Licensees. No production licenses have been granted.

Status. In service.

Total Produced. A total of 38 systems are believed to have been produced through the year 2000.

Application. Air surveillance providing early warning against attacks at all altitudes.

Platform. Frigates, destroyers and larger warships, including aircraft carriers and helicopter carriers.

Price Range. A unit cost of US\$8 million is estimated, based on the known costs for comparable systems.

Technical Data

Specifications

Operating band:	D-band
Peak power:	2 MW
Gain:	29 dB
Pulse width:	2.5 microsec
PRF:	450 pps

Metric

US

L-band

Scan rate:	7.5 or 15 rpm	
Max range:	215 km	150 nm
Range resolution:	400 m	441 yd
Bearing resolution:	2 degrees	

Metric**US****Dimensions**

Antenna width:	7,54 m	25 ft
Antenna height:	3,05 m	10 ft
Antenna weight:	1.000 kg	2,200 lb
Total system weight:	1.450 kg	3,190 lb

Design Features. The current production version, the DRBV-26C Jupiter IIS, has a pulse compression transmitter (130 microsec compressed to 0.8) and is frequency agile on a burst-to-burst or pulse-to-pulse basis. The set uses a solid-state transmitter consisting of 16 modules in parallel. If desired, an additional module unit can be added to the basic array, increasing the effective range against incoming fighters from 250 to 280 kilometers. Operating voltage in the transmitter units is restricted to 50 volts.

A frequency synthesizer is used to stabilize the transmission frequency and to permit the use of more sophisticated types of signals processing, including Doppler filtering using Fast Fourier Transforms (FFT). This enables the radar to participate in long-range missile surveillance as well. Air tracks are automatically initiated and followed, while surface tracks are automatically tracked after manual acquisition. The radar can track up to 64 targets, automatically handing their coordinates over to the action information system. An identification friend-or-foe (IFF) antenna is integrated with the main antenna.

Operational Characteristics. The TRS 3011 Jupiter family of 2-D surveillance radars (French Navy de-

signation DRBV-26 for the current versions) was developed to provide greatly enhanced protection against false alarms, reduced clutter, an MTI facility, and filters for protection against nearby radars and jamming. Reliability over the earlier DRBV-23 is reported to be greatly enhanced.

The DRBV-26C version purportedly has further enhanced reliability over earlier members of the series. A mean time between failure of 6,060 hours for each module in the transmitter unit is claimed, while the transmitter unit as a whole is stated to have an MTBF of 2,180 hours. Claimed mean times to repair are 15 minutes for the transmitter and 4.5 minutes per module. Thanks to its extremely favorable graceful degradation capability, the radar can be repaired even without switching off the equipment. Thomson-CSF states that the DRBV-26C radar transmitter has a service life six times greater than earlier systems and better than 99 percent reliability.

The data provided by the radar can be processed by the TAVITAC, TAVITAC 2000 or TAVITAC NT tactical data systems made by Thomson-CSF.

Variants/Upgrades

DRBV-22/23 (Jupiter)/THD-1077. The original Jupiter air search radars, reportedly based on the US SPS-6B system. Development of this family began in 1961. DRBV-22C came with a new and much more powerful transmitter unit; that, in turn, was combined with a new elliptical stabilized antenna, resulting in the DRBV-23.

DRBV-26 (Jupiter II)/TRS-3010. The initial production version of DRBV-26 Jupiter II using a traveling wave tube transmitter unit.

DRBV-26C (Jupiter IIS)/TRS-3011. The current production version. It can be also intended for medium- or short-range air surveillance, with the addition of a separate processing channel for surface surveillance.

DRBV-26D (Jupiter ER). This extended-range system combines the below-decks electronics of the DRBV-26C and two solid-state transmitters with the antenna array of the Signaal LW.08 antenna. This particular version has been acquired for the aircraft carrier *Charles de Gaulle* and replaces DRBV-15 on exported Lafayette class frigates. Its maximum range is quoted as between 280 and 370 kilometers. All future DRBV-26s will also use the Signaal LW.08 antennas, thanks to their superior electrical and elevation coverage characteristics.

DRBV-26C/D (Jupiter-LA)/TRS-3011. The LA variant features a lightweight (750 kg) stripline antenna and only one transmitter. The range is quoted as 200

kilometers and over. The antenna's rotating speed is 6 and 12 rpm.

DRBV-21A (Mars)/TRS-3015. Mars, which in some sources is treated as a separate product line, is discussed here in the same report, sharing much of its architecture, functions and ancestry with the TRS-3011. Mars is essentially a simplified, medium-range version of Jupiter IIS intended for deployment on the Floréal class frigates. The below-decks units are compressed into a single cabinet. Mars has a two-module transmitter (as opposed to the 16 modules in Jupiter IIS), with a total of 32 rather than 16 power elements. The antenna weighs 600 kilograms and is derived from that of the DRBV-22. Instrumented range is 110 kilometers in air search, 80 kilometers in surface search. The radar has a gain of 26 dB and scans at 12 rpm.

Mars 05. An export version of the DRBV-24, using the Signaal DA.05 antenna.

DRBV-27 (Astral)/TRS-3505. A long-range, next-generation 3-D radar originally intended to act as the long-range surveillance radar system for the Project Horizon Common New Generation Frigate (CNGF). DRBV-27 combines the below-decks electronics of the DRBV-26C with a new planar-array antenna weighing 3,500 kilograms. This scans electronically in elevation from zero to 45 degrees, to a maximum range of 275 kilometers. Maximum instrumented range is 400 kilometers. The radar is fitted with automated data extraction with a capacity of 300 tracks. Astral is a digital pulse compression radar using Doppler speed filtering, the beam being elevated by phase shifters rather than frequency scanning.

Program Review

Background. The original Jupiter radars were developed in 1961, apparently on the basis of technology derived from the US Navy SPS-6B radar. The initial DRBV-22A and B systems had a maximum range of about 70 nautical miles and were installed on the frigate FS *Aconit* and the Surcouf class destroyers. During the late 1960s, this system was improved by the addition of a new elliptical stabilized antenna, resulting in the DRBV-22C. The improved system was produced in very small quantities and was, in effect, a developmental step in the evolution of the next major version, the DRBV-23. This version featured a new and more powerful transmitter unit which increased system range to 160 nautical miles. During the late 1970s and early 1980s, most DRBV-22 platforms were either scrapped or sold to other users. Few now remain in French service and those that do will shortly be sold, or replaced by the DRBV-26.

Development of the next-generation DRBV-26 Jupiter II was started in 1972 to provide a radar search capability for the next generation of French Navy missile ships. Although the new radar showed significant gains in range and resistance to jamming and interference, the major emphasis appears to have been on increasing the reliability of the system. The initial platforms for the DRBV-26B were to have been the seven ships of the Georges Leygues class. These turned out to be unreliable ships, however, and the last three ships in the class were extensively redesigned to improve their sea worthiness. This redesign involved raising the bridge by an additional deck and moving the superstructure block back 7 feet. The resulting increase in top weight prohibited the installation of DRBV-26, so the much lighter DRBV-15 was installed instead.

A further major upgrade resulted in the development of the DRBV-26C radar. This featured solid-state transmitter components in order to further enhance reliability. The DRBV-26C was originally intended to equip the Cassard class destroyers. Development problems with the new transmitter meant that the FS *Cassard* had to enter service without the radar and did not receive the set until January 1991. The FS *Jean Bart* entered service in October 1991 with the radar in place.

At the 1991 Navy League exhibition in Washington, it was revealed that a further version of the DRBV-26 had been developed. This combined the below-decks portion of DRBV-26C with the antenna of the Signaal LW.08. The resulting system is designated DRBV-26D in the French service and Jupiter 08 for export. This version has been installed on the aircraft carrier FS *Charles de Gaulle*.

In 1992, the French government finalized an order from Taiwan for Lafayette class frigates. This had first been mooted a year earlier but was canceled following objections from China. An initial order for six ships was placed. Originally the ships were to be constructed in France but delivered disarmed and completed in Taiwanese yards. This plan was abandoned, and the ships were scheduled for completion in France. Reports that all ships in this program will be equipped with the DRBV-26D Jupiter 08 radar have been confirmed.

In September 1993, the French Navy ordered three additional DRBV-21A radars. One has been equipped on the LSD *Foudre*; the second was installed on a naval base in the Pacific; and the third is used for training

purposes. An additional radar has been procured to equip the second Foudre class LSD, the FS *Siroco*.

The Jupiter series of radars have been the standard long-range air search radars in the French Navy for almost 30 years. During that period they have been progressively modified, and the latest members of the family bear

little resemblance to the original DRBV-22A. Their service in this secure environment has now come to an end. Few French warships in the size and capability bracket matching the DRBV-26D are planned, and the only plausible candidates, the six Lafayette class frigates, will be carrying the less expensive DRBV-15 Sea Tiger for this role.

Funding

The Jupiter radars were developed by Thomson-CSF under French DGA contract.

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	Sep 1993 – French Navy order for three DRBV-21A Mars radars.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1972	Development of Jupiter II started
	1979	First DRBV-26B Jupiter II in service
Jan	1990	First DRBV-26C Jupiter II radar installed
Apr	1991	Jupiter 08 revealed
	1992	Astral specified for CNGF
Sep	1993	Additional Mars radars ordered
Oct	1994	Astral de-selected for CNGF
Jun	1997	Saudi Arabia decides to upgrade three F 3000S Air-Defense Frigate with various systems including the DRBV-26 Jupiter long-range radar

Worldwide Distribution

France. One DRBV-26D Jupiter 08 on *Charles de Gaulle* aircraft carrier; one DRBV-23 Jupiter 1 on Clemenceau class aircraft carrier; one DRBV-22D Jupiter 1 on *Jeanne d'Arc* helicopter carrier; seven DRBV-26 on Leygues destroyers; three DRBV-26A on Tourville destroyers; six DRBV-21A on Floréal frigates; two DRBV-21A (Mars) on Foudre LSD class; two DRBV 26C Jupiter IIS on Cassard (C70) class; one DRBV 22C on *Ile D'Oleron*

Portugal. Three DRBV-22A on four French Commandant Riviere class

Saudi Arabia. Three DRBV-26D Jupiter II for Lafayette frigates

Taiwan. Six DRBV-26D for Kuang Hau II class (Lafayette) frigates

Uruguay. Three DRBV-22A on Commandant Rivière class frigates

Forecast Rationale

The Thomson-CSF Jupiter TRS-3011 air surveillance radar is a D-band radar that utilizes fully solid-state transmitters. This naval long-range radar was designed to provide early warning against attacks at all altitudes.

For almost 30 years the Jupiter series of radar has been the French Navy's main long-range radar. This series has seen many changes, with its latest variation showing little resemblance to its ancestors. Technology has

produced smaller and more efficient system that are better suited for modern navies. Today, the French Navy has few warships that have the size or capacity to support such a large system.

On the international market the Jupiter series made little headway. It was able to sale a total of 15 systems to four countries. Since its last contract modification with Saudi Arabia in 1996, no other international sales have been detected.

The limited number of possible platforms in France combined with the lack of any international sales in the past four years, indicate the production life of the Jupiter series has come to an end. Newer, more technologically advanced systems are more likely to be considered as an option for long-range air surveillance radar. No production is being forecast in the Outlook period and barring any new contracts, this report will be archived in the near future.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Designation	Application	Thru 00	<u>High Confidence</u> <u>Level</u>				<u>Good Confidence</u> <u>Level</u>			<u>Speculative</u>			Total 01-10
			01	02	03	04	05	06	07	08	09	10	
JUPITER	Prior Prod'n:	38	0	0	0	0	0	0	0	0	0	0	0