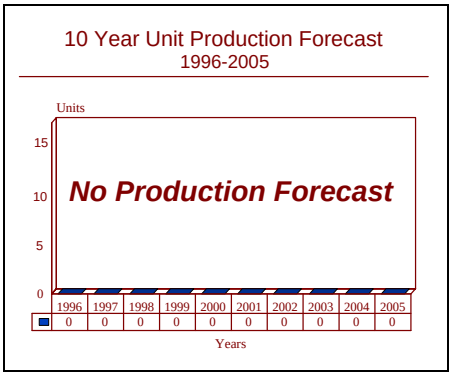
RDI Archived - Archived 11/97

Outlook

- Production ceased in 1994
- Unique to Mirage 2000C interceptor
- All future Mirage 2000 aircraft will carry RDY



Orientation

Description. I/J-band high PRF Doppler multi-mode/ single-function radar optimized for air-to-air combat.

Sponsor

Delegation Generale pour l'Armament (DGA)
10/14 Rue Saint Dominique
F-75997 Paris Armees
France

Contractors

Thomson-CSF
Division Radars et Contre-Measures (RCM)
178 Boulevard Gabriel Peri
F-922420 Malakoff Cedex
France
Tel: +33 1 46554422
Telex: 204780

Dassault Electronique
55 Quai Carnot
PO Box 301
F-92214 Saint Cloud Cedex
France
Tel: +33 1 46025000
Telex: 250787

Dassault Aviation
33 Rue du Professeur Victor Pauchet
F-92420 Vaucresson
France
Tel: +33 1 47417921
Telex: 203944

LMT Radio Professionelle
46 Quai Alphonse Le Gallo
PO Box 402
F-92103 Boulogne Billancourt Cedex
France
Tel: +33 1 46086000
Telex: 202900

SECRE
214-6 Rue du Faubourg St Martin
F-75483 Paris Cedex 10
France
Tel: +33 1 42003366
Telex: 220169

Thomson-CSF is the prime contractor with Dassault Electronique as the main subcontractor. Dassault Aviation is responsible for the radome and nose fairing, while IFF development is the responsibility of LMT Radio Professionelle and SECRE, a Jeumot-Schneider subsidiary.

Licensee. No production licenses have been granted.

Status. Production and service.

Total Produced. A total of approximately 130 RDI radars had been produced when production reportedly closed in 1994.

Application. RDI equips the Mirage 2000C all-altitude air superiority interceptor variant of the Mirage 2000. RDI is optimized for the air defense mission. RDI therefore has a single function, though its mode options include:

- Air-to-air search at all altitudes
- Long-range TWS and missile guidance
- Automatic short-range TWS for missiles and guns
- Look-down, shoot-down against targets flying as low as 30 m

Price Range. No cost figures have been officially released, but analysis of the known costs of comparable systems point to a unit value of around US$2 million. Research and development expenditure related to early problems may cause this to be substantially exceeded.

Technical Data

Characteristics	**Metric**	**US**
Range (head on):	120 km	75 miles
Range (tail aspect):	50 km	30 miles
Weight:	255 kg	561 lb
Waveband:	I/J Band	
PRF:	100 kHz+	
Transmitter output:	4 kW	
Power consumption:	10 kVA	

Design Features. The RDI high PRF doppler radar comprises 12 LRUs made up as follows:

- Radome which is not of the hinged type and is removed for access
- Nosecone fairing
- Programmable processor and display interface (Thomson-CSF)
- Front-end low-voltage power supply (DE)
- Antenna mechanism and front end microwave receiver (DE)
- Servo-mechanisms (DE)
- Tracking receiver (DE)
- Nosecone structure (Thomson-CSF)
- Transmitter (Thomson-CSF)
- Local oscillator (Thomson-CSF/DE)
- Search receiver (Thomson-CSF)
- Fuselage bay with low-voltage power supply (DE)
- Search radar processor (Thomson-CSF)
- Tracking processor (DE)
- Radar-control module (Thomson-CSF).

The local oscillator module comprises a master oscillator (Thomson-CSF) and a low-frequency synthesizer (DE). All the modules are housed in the nose except the fuselage bay equipment and the radar-control module which is located in the cockpit. The fuselage bay with low-voltage power supply contains the two processors in one module and is housed behind the nosecone bulkhead. The radome and fairing are manufactured by Dassault Aviation. The system is built around an integral databus.

RDI has a flat slotted monopulse antenna and a TWT (traveling wave tube) transmitter. The receiver uses FFT (fast fourier transform) with CFAR (constant false alarm rate) control. Its IFF interrogator was developed by LMT Radio Professionelle in cooperation with SECRE. It provides target identification in the long-range search, TWS and continuous track modes, and is integrated into the main antenna plate using four dipoles.

Operational Characteristics. RDI is compatible with the Matra Magic 1 or 2 close platform defense missile at ranges up to 10 nm. Fire control for cannon over ranges of 1000 meters is provided. Although primarily configured for the air defense role, RDI has secondary capability to carry out ranging for weapon delivery, low-altitude navigation with ground mapping (minus doppler beam sharpening) and contour mapping for terrain avoidance. As with the RDM radar equipment in the latter case, the imagery is displayed on the cockpit head-down display.

By using high PRF, ambiguous target speeds are eliminated. RDI can provide target range data in search mode as opposed to being limited to tracking mode. This process is the subject of a patent. Three types of scanning are provided for air combat:

- Narrow beam (scanning straight ahead)
- Vertical scanning (optimized for tail chase)
- Helical scanning (covering the sighting system field of view)

Variants/Upgrades

There are no known upgrades of this radar. New radar systems are being developed for the Rafale and for new variants of the Mirage 2000 family.

Program Review

Background. RDI was the first high-pulse repetition frequency doppler radar to be designed and built in France. Thomson-CSF and ESD commenced work on the project in 1976 at the request of the French Ministry of Defense. At that time, no prime contractor was appointed and much of the work was duplicated. RDI was earmarked for development in association with the ACF future combat aircraft. This large twin-engine aircraft was abandoned due to high cost and limited export prospects. Instead, the Delegation Generale de l'Armament (DGA) decided in favor of a smaller single-engine design which became the Mirage 2000.

In late 1976, Thomson-CSF was appointed prime contractor with a 70-percent share of the work. Major new modifications were absorbed into the design, one of the most significant being the adoption of hybrid circuit techniques. RDI was widely reported to be in trouble by the early 1980s. Thomson-CSF sources estimate that a two-year delay was incurred.

Flight tests commenced with RDI installed on the Mystere 20 aircraft. Satisfactory progress resulted in a decision to start production in 1985, with 10 units scheduled for delivery by the end of 1986. Initial production units of RDI were with Dassault-Breguet by June 1986. Extensive evaluation on the weapon systems test bench was undertaken at the French Air Force Test Center of Mont de Marsan. Altogether 14, including three prototype, RDI radars were built during the development program.

The eventual number of 2000Cs in the French Air Force service directly reflect the state of the French equipment budget and the program priority level. As an example, funding approved under the 1985 defense budget brought the total number of 2000Cs on order to 66. Of these, over 30 were delivered by the end of 1986. The 1986 defense budget included provision for a further 18 2000C's, but delays meant that the contracts were not placed until very late in the year. The 1987 defense budget projected a further 23 Mirage 2000B/Cs.

Appropriations were provided in the 1988 defense budget for 34 more Mirage 2000DA air-defense fighter aircraft. The first RDI equipped Mirage 2000C aircraft finally entered service in July 1988. At least 35 of the air superiority versions of Mirage 2000 destined for French Air Force service have been delivered with RDM radar. By June 1990, information from the French Ministry of Defense indicated that the Mirage 2000C production run was being cut back to 107 aircraft. The effect was to ensure termination of the RDI production run within the next two to three years, assuming a requirement for 130 RDI systems.

In mid-1991 the need to reduce expenditures resulted in the final decision to abandon plans to retrofit RDI to the RDM-equipped Mirage 2000 aircraft in French service. As we projected, this project was reinstituted two years later but provided for the installation of the new RDY radar. As far as can be determined, RDI production ceased in 1994 with the delivery of approximately 130 systems.

Funding

RDI development has been DGA-funded. Workshare (and therefore funding) has been split between Thomson-CSF (70 percent) and Dassault Electronique (30 percent). Development of the nose- mounted radome and fairing were conducted by Dassault Aviation with DGA funding.

Recent Contracts

No contractual information has been made publicly available.

Timetable

	1976	Thomson-CSF/ESD commenced RDI project studies
	1979	Thomson-CSF nominated prime contractor
	1979	First RDI prototype delivered for flight trials
	1985	Production launched
	1986	Production models scheduled for delivery
Jul	1988	First Mirage 2000 with RDI entered service

Worldwide Distribution

France (130 radars for 107 Mirage 2000C)

Forecast Rationale

Production of the RDI radar has now terminated, although a substantial market for supporting the in-service systems remains. Ex-French Air Force Mirage 2000s equipped with RDI may find their way onto the export market. This would not, of course, extend the production run but would enhance the sales/support market. Production of radars is already switching to the new RDY radar for Mirage 2000 export orders and to RBE-2 for the Rafale. Initial deliveries of Rafale will be as direct replacements for Jaguar and Mirage IIIE aircraft, with a naval version being coproduced for replacing French Navy Crusaders and Etendard IV-P.

The RDY-equipped Mirage 2000-5 has now supplanted the RDM-equipped aircraft on the export market. As we projected, the modification of French Air Force Mirage 2000 aircraft equipped with RDM will use the RDY radar, and any additional Mirage 2000 procurement (possibly as a result of delays to Rafale) will also utilize the new and much more effective RDY radar. It is also possible that some RDI-equipped Mirage 2000C aircraft will be retrofitted with RDY to give them a multi-role capability.

The following forecast reflects the termination of production for Mirage 2000Cs of the French Air Force. RDI has little future divorced from the Mirage 2000 program. It has not been specified as an original fit for any other airframe. It would be competing against a number of proven and reliable systems such as the APG-66 and APG-68 for such contracts. Qualifying such a radically different radar for a production aircraft would be excessively expensive and unjustifiable on cost-effectiveness grounds. It would seem that the future of RDI is restricted to supporting existing inventories held by the French Air Force for their Mirage 2000C fleet.

Ten-Year Outlook

No production is forecast.

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