Fox Three

Rafale INTERNATIONAL

N° 1

Rafale keeps on moving ahead

Flight testing of the Rafale has been gaining momentum in Istres in the last months with entry into service on the Charles-de-Gaulle carrier slated for mid-2001. Significant test hurdles have been cleared as the LRIP programme unfolds and intense marketing activity has taken place with more customer evaluations and out-of-country deployments. To date, the Rafale has been deployed on 17 occasions abroad, the last major two being Asian Aerospace 2000 and the hot weather trials in July 1999 in the UAE.

The programme is mature enough for the aircraft to become a familiar sight at air shows around the world, from the UK and the Netherlands to Dubai, Singapore and Seoul. Twelve countries have been visited so far, with local air force pilots and officials performing familiarization sorties, thanks to the quick-to-learn pilot interface, carefree handling and inherent safety features. In all, the Rafale has been put through its paces to date by 75 air force evaluator pilots from outside France.

The development aircraft have been joined by instrumented production aircraft to cope with the aggressive schedule of flight testing (at the Istres Flight Test Center) and demos during the past years.

Test highlights include the firing of active seeker Mica against twin targets in electronic warfare environment, and live GBU-12 firing at the Cazaux test range in southwestern France. The airframe (which has 80% commonality between all versions) has been certified to 9g with a demonstrated margin of 90% on top of that, after 10,000 hours of testing on the fatigue test rig - the cycles were typical of carrier-based operations with stress loads simulating catapult launches and arrested deck landings, more than will be endured by any land-based fighter. Separation trials of the Scalp missile have also been carried out as a risk reduction measure in anticipation of the final Scalp integration tests.

A surprising number of groundbreaking Rafale features are now considered ordinary by test pilots and specialists at the Dassault flight test center who deal with them everyday on a routine basis : the Direct Voice Input in the cockpit, the production RBE2 radar with its electronically steered array - it has been flying on the Rafale since late 1997 - and the sensor fusion which blends target data provided by the RBE2, the front sector optronic system and the Spectra EW system.

Coming up next on the flight test schedule are the conformal fuel tanks (CFTs) which have passed wind tunnel tests and are now cleared for flights. As a matter of fact, CFTs boost the deterrence value of fighters by freeing up hardpoints for extra drop tanks and/or weapons, thereby significantly increasing their range vs. weaponload performance ■

Mica and PGM live firings have been successfully completed as Rafale entry into service nears.

The Spectra: a digital revolution

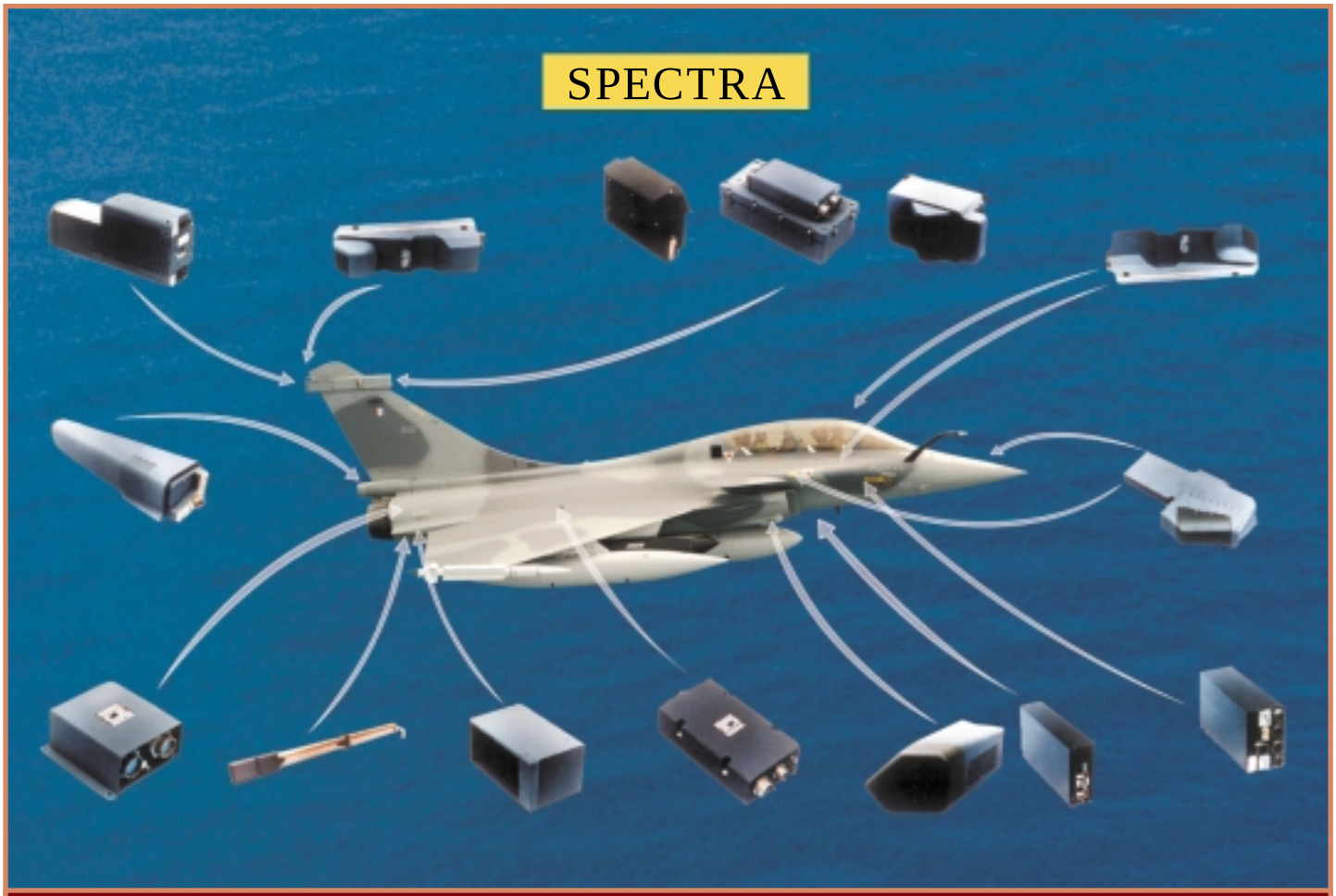
Modern air warfare places a severe requirement on aircraft self-defence capabilities, and only the most modern fighters will survive any major conflict. Dassault Aviation Mirage 2000-5 and Rafale combat aircraft are equipped with highly-automated systems which provide an unprecedented level of protection against threats likely to appear in the future.

The Spectra - Self-Protection Equipment Countering Threats of Rafale Aircraft - state-of-the-art self-defence system mounted on the Rafale is a complete and totally integrated electronic warfare suite designed and produced jointly by Thales and Matra Bae Dynamics. The system, which offers a dramatic increase in survivability against modern and emerging threats, is entirely mounted internally in an effort to keep weapon stations free, a big improvement over older designs such as Jaguars, Mirage F1s and Super Etendards which all needed external jammers and chaff/flare dispensers. It ensures efficient electromagnetic detection, laser warning, IR detection for missile warning, jamming and chaff/flare dispensing, even in the most demanding multi-threats environment. Spectra is divided into different modules and sensors strategically positioned throughout the airframe to provide all-round coverage. The latest advances in micro-electronic technology have led to a new system which is much lighter, more compact and less demanding than its ancestors in terms of electrical and cooling powers. Thanks to its advanced digital technology, Spectra provides passive long-range detection, identification and localisation of threats, and allows the pilot or system to react immediately with the best defensive

Rafale M: First two accepted into service.

In a ceremony held in December 2000 at Landivisiau Naval Air Station, the French Navy has accepted into service its first two Rafale M combat aircraft. This crucial event marks the beginning of an extensive fleet renewal programme encompassing the successive replacement of F-8E Crusader fighters, Etendard IVPM reconnaissance aircraft and Super Etendard strike fighters. A total of six pilots, including two French Air Force exchange officers, are currently involved in a Navy operational evaluation and tactics elaboration campaign which will culminate in complex air-defence exercises with multi-target multi-threat engagements.

From January 2001 onwards, Rafale fighters will be delivered at the rate of one every two months, and the first front-line Squadron, Flottille 12F, will be officially reborn at Landivisiau in June. By the beginning of 2002, this unit will have taken delivery of ten Rafales out of 60 planned by the French Navy, bringing it to full operational status.



The Spectra System and its various components, on board the Rafale.

measures: jamming, decoys, evasive manoeuvres and/or any combination of these actions. Moreover, SPECTRA features accurate Direction-finding and reduced time for signal identification.

Additionally, very high processing power gives excellent detection and jamming performance, optimising the response to match the threat: incoming electromagnetic signals are analysed, and the bearing and location of the emitters are determined with great precision.

The proliferation of new generation weapons such as man-portable surface-to-air missiles has raised concern among key decision makers. Both laser and IR missile warning systems have been mounted on the fighter. They provide 360 degree coverage and ensure detection/warning of incoming threats. The IR missile warner ensures high probability of detection and low false alarm rate, even against totally passive IR-guided weapons. Four upward-firing launcher modules for various types of decoys - are built into the airframe, and the Rafale is equipped with internal chaff dispensers. The exact location and types of systems detected by Spectra can be recorded for later analysis, giving Rafale operators a substantial built-in SIGINT/ELINT capability while completing specialised dedicated intelligence platforms.

But Spectra is much more than a traditional self-defence system as it is closely integrated with the primary sensors also supplied by Thales, the RBE2 multimode electronic scanning radar and the FSO passive front sector optronics system. As such, it considerably improves pilot situational awareness: all data obtained thanks to the various means are fused into a single tactical picture, offering the pilot a clear image of the evolving tactical situation. Spectra identifies the type of air-defence weapon, that has been detected; it takes the local terrain configuration into account and displays the lethality zones on a colour tactical screen, enabling the aircrew to avoid dangerous areas. This smart data fusion significantly increases mission success rates through enhanced crew awareness and improved aircraft survivability.

The first Spectra flight onboard a Rafale took place in September 1996, after M02 prototype had been retrofitted. Since then, the system has been thoroughly tested in very complex electronic warfare scenarios and environments. For instance, Rafale M02 was pitted against a wide variety of the latest IR-defence systems during the NATO Mace X trial organised in August 2000 in Southwest France, and its self-defence suite performed flawlessly. It is now in full production, and is already entering operational service onboard French Navy Rafale. Spectra, a particularly cost effective system, has been designed with growth in mind to keep the Rafale abreast of emerging threats ■

Rafale demonstrates Precision-Guided Munitions capabilities

GBU-12s - included here in a swing-role configuration - provide precision strike capability with minimal collateral damages.

Dassault Aviation has completed a series of test flights on the Rafale, dedicated to GBU-12s' certification. The first LGB firings were carried out with the Rafale B01 development aircraft on the Cazaux test range in south western France and involved several swing role configurations, with Mica BVR missiles and 2000 l (530 USG) fuel tanks.

The GBU-12 is a 500 lb Paveway 2 laser-guided bomb which is fast becoming one of the most widely used weapons in precision strike operations, because of its pinpoint accuracy, low cost and widespread availability. Compared to heavier conventional bombs, it has the advantage of reduced collateral damage while retaining the same lethality against point targets due to its precision guidance.

This development effort comes in the wake of the French Air Force engagements in joint operations over Bosnia and Kosovo stressing the political implications of precision strike capability. A fast track GBU-12 upgrade had to be fielded on Air Force Mirage F1CTs and Navy Super Etendards and the Rafale development agenda was also reshuffled according to lessons learned in combat by including the PGM capability into the definition of the first air force batch. One of the configurations cleared during the recent separation trials featured 4 mid-wing mounted GBU-12s together with 4 AAMs (2 Mica and 2 Magic 2 - the wing-tip Magic are to be replaced by IR-guided Mica on the production aircraft) and three 2000 l tanks. Combat radius is quoted at 800 nm unrefuelled, with up to 4 ground targets assigned and a solid self-escort capability resting on the BVR Mica. Thanks to its carrying capability, stealth performance and multisensor fusion, Rafale brings an unprecedent level of tasking flexibility and of lethality. Risk reduction work had been performed prior to the test flights, with simulation runs using computational fluid dynamics software and with in-house GBU-12 experience on other aircraft types. The PGM capability programme has been pushed on hard with guided GBU-12 releases performed in late 2000 at Cazaux using a forward air controller. Self-designation of laser guided weapons is to be performed with the Thomson-CSF Damocles LDP now in development and available for test flights from 2002, well in time for export deliveries slated for 2004 ■

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