



COMBAT
PROVEN

RAFALE
INTERNATIONAL

THE OMNIROLE FIGHTER



COMBAT-READY

Combat Proven in an incredibly short time-frame.

The Rafale, the most advanced combat aircraft in the world, has now been successfully used in combat operations by the French Air Force and the French Navy.

In March 2007, the Rafale omnirole fighter was, for the first time, deployed in combat operations in Afghanistan as part of coalition forces. Only a few days after being deployed, French Air Force and Navy Rafales dropped laser-guided bombs in support of NATO ground troops engaged by enemy forces. The aircraft met all tactical objectives on these long-range missions, flown in demanding conditions far from their normal support environment.

Thanks to the Rafale's inherent flexibility, industry was able to complete the integration of laser-guided weapons in only a couple of

months, as part of an Urgent Operational Requirement, and Navy and Air Force Rafale detachments were able to deploy into the combat theatre ahead of schedule

The Rafale first became operational with the French Navy in June 2004. It has since logged over 10,000 flying hours with French naval aviators, most of them at sea, operating in harsh weather conditions from the pitching and rolling deck of an aircraft carrier. On 27 June 2006, the first French Air Force Rafale squadron was declared fully operational in the air-defence and precision strike roles. That same day, the unit was assigned responsibility for the air-defence alert in France's south-western region, a major achievement. With its extremely short response time and its excellent climb rate, the Rafale proves ideal

for the defence of airspace sovereignty and the protection of national interests.

Since becoming combat-ready, both Navy and Air Force Rafale variants have also taken part in numerous multinational exercises, both at home and abroad. They have repeatedly demonstrated outstanding reliability and maintainability, with a 100% mission availability rate achieved during the famous NATO Tiger Meet exercise, which took place in Spain in late 2006.

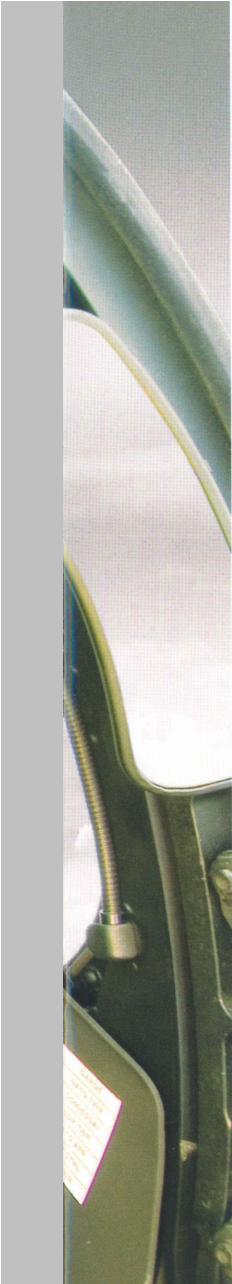
Foreign observers have been quick to acknowledge that the Rafale, with its impressive agility, its exceptional acceleration and its state-of-the-art weapon system, is more than a match for fighter aircraft currently in service.



THE **OMNIROLE** FIGHTER ■



THE OMNIROLE FIGHTER



OMNIROLE BY DESIGN

The Rafale simultaneously performs air-to-air and air-to-ground missions.



Designed as the ultimate omnirole fighter, the Rafale carries an awesome weapon load which can be used simultaneously for air-combats and ground attacks, during the same mission by the very same aircraft. Such a unique capability gives commanders an unprecedented combat flexibility, and decision-makers will rely on a reduced number of fighters to reach the same military and destructive effects.

It has the most sophisticated man-machine interface in service anywhere: with the revolutionary data fusion system, Rafale pilots can rapidly build up an unambiguous tactical picture, positively identify air and ground targets, and instantly engage them at stand-off ranges with their precision weapons. The Rafale's multichannel target acquisition / tracking concept associated with the smart sensor fusion system is a key-enabler which considerably reduces pilot workload, allowing aircrews to devote more time to tactics management. The

pilot now concentrates on the fight, not on the flight. On the Rafale, there is no primary sensor: the electronic scanning radar, the Front Sector Optronics, the Spectra electronic warfare suite, and the secure, interoperable datalink all contribute to enhanced situational awareness.

With the robust datalink, each Rafale in a formation plugs in the global military info-sphere in order to have access to the sensor data of other fighters, ground stations, or/and AWACS surveillance aircraft, thus massively ameliorating situational awareness and overall combat effectiveness. With its Spectra electronic warfare system and its 'low-observable' airframe, the Rafale is well equipped to slip undetected through dense air-defence networks and survive all engagements, even against the latest radar or infrared-guided surface-to-air missile threats. Every effort has been made by Dassault Aviation engineers to minimise its infrared signature and the

airframe has been carefully shaped to cut down its Radar Cross Section.

But low-observability is definitely not the only way to boost survivability. As radar and radio emissions can betray the position of a fighter, the designers have adopted for the Rafale a wide range of unique passive sensors and missiles: the passive Front Sector Optronics, used in conjunction with the long-range infrared-guided Mica IR missile, gives Rafale pilots unprecedented capabilities, allowing totally silent interceptions to be performed covertly. The Rafale is fitted with a discrete terrain avoidance/following system optimised to improve survivability while flying at extremely low altitude and very high speed, at night and in bad weather. For threat avoidance, the Spectra electronic warfare suite is capable of accurately detecting, jamming, decoying, localising and even targeting enemy radar emitters.



LONG REACH

Large fuel load and long-range missiles for unrivalled strike range.

With the Rafale, Dassault Aviation set new records in terms of range and payload capabilities. The twin-engine, omnirole fighter can carry nearly twice its own empty weight in fuel and weapons, providing a crucial advantage for the field commander. Overall combat flexibility is considerably improved, and the Rafale's exceptional range allows targets to be attacked deep inside enemy territory. With its outstanding 9,500 kg external payload and its 14 NATO-compatible hardpoints, the Rafale can be equipped with a very large array of missiles, precision-guided weapons and fuel tanks.

The Rafale was designed from the start to take a large fuel load, and the single-seater can carry up to

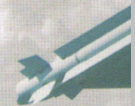
5,900 litres of internal fuel, a remarkable quantity for such a compact design. Additionally, it is fitted with no fewer than five wet points, and two types of external tanks are available: 1,250 litre supersonic tanks can be carried on any of the five wet points, and 2,000 litre drop tanks can be mounted on the centreline hardpoint and on the inner wing stations. Two powerful, responsive and fuel-efficient Snecma Moteurs M88 turbofans further contribute to its exceptional range and endurance.

For autonomous air operations, the Rafale can be equipped with a buddy-buddy refuelling pod under the fuselage and four external drop tanks under the wings, giving a

fighter strike force an embedded in-flight refuelling capability. With four drop tanks, the "tanker" Rafale has a generous fuel off-load capability over long distances. It also boasts an impressive self-defence capability, freeing fighter escort assets for other missions. French Navy Rafales routinely use buddy-buddy refuelling pods for operational missions over Afghanistan, massively extending the combat endurance of other, armed Rafales over the battlefield.

For extremely long-range strike missions, the Rafale can be armed with two Scalp stand-off cruise missiles, four Mica air-to-air missiles for self-defence, and three 2,000 litre tanks, offering unprecedented reach

and fire-power. The Rafale / Scalp combination is intended to be used against strongly defended, high-value targets. The stealthy Scalp is fitted with a powerful unitary warhead and offers unrivalled penetration capabilities against hardened and deeply buried targets. After launch, the long-range Scalp is fully autonomous thanks to its global positioning/inertial/terrain reference navigation system. Its passive IR imagery homing head is activated during the final target approach. Automatic target recognition algorithms compare the actual scene with the scene in its memory bank, identify the designated target, and select the impact point for maximum effectiveness.





THE **OMNIROLE** FIGHTER ■

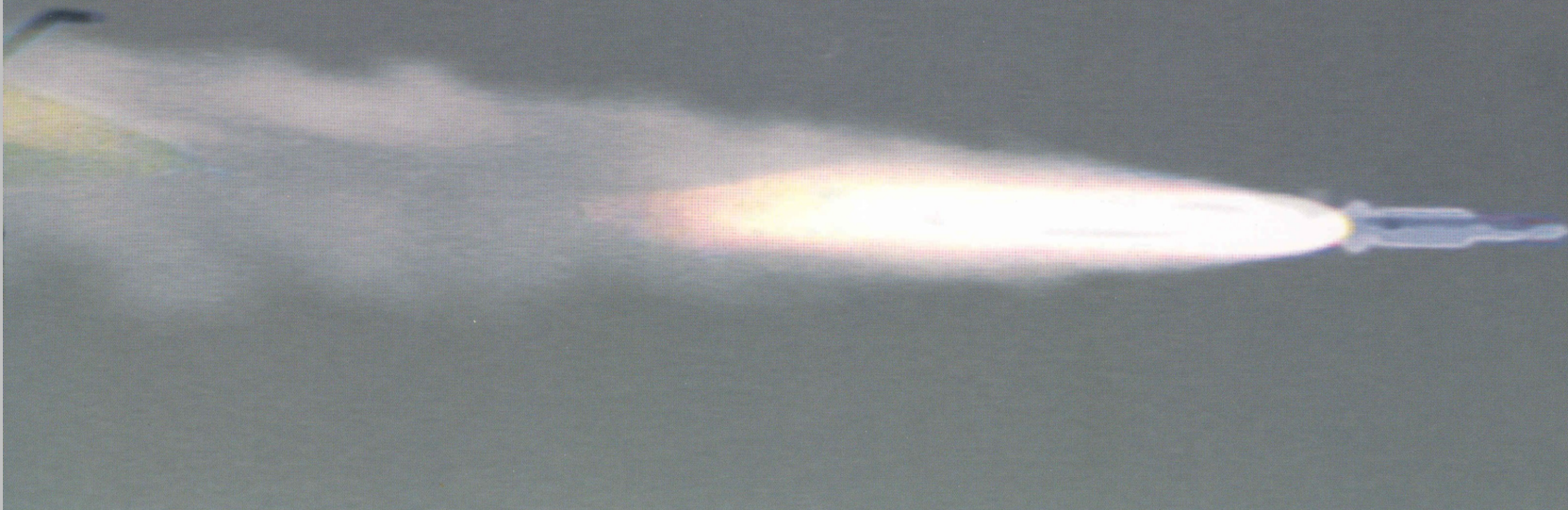
OMNIROLE FIGHTER, OMNIROLE ARSENAL

Strike hard, strike swift, strike sure.

THE **OMNIROLE** FIGHTER ■



The Rafale can be fitted with a wide array of weapons and stores, allowing a single aircraft to fly the entire spectrum of modern air-combat missions just by changing its payload. These missions range from air defence to stand-off anti-ship attacks, through air superiority, close air support, battlefield air interdiction, long-range precision strikes, suppression of enemy air defences, deterrence and reconnaissance – in fact, Rafale will provide anything that local commanders need in the way of effective airpower.





THE **OMNIROLE** FIGHTER ■

MILITARY SUPPORT

Designed from the outset with ease of maintenance in mind.

Building on the recognized track record of the Mirage 2000, Dassault Aviation engineers have designed the Rafale omnirole fighter to offer unprecedented reliability, supportability, testability, sustainability and deployability.

In accordance with stringent French requirements, the Rafale was designed with ease of maintenance as a primary goal: customer- and product-support considerations influenced the design of the aircraft from the outset, allowing the Rafale to set new standards for reliability and maintainability. Thanks to various technology improvements, the Rafale's supportability is boosted by about 30 percent compared with that of the Mirage 2000.

The aircraft is fitted with an integrated test system offering an unambiguous fault-detection capability, allowing defective equipment to be replaced in a very short time. This unique and fully automatic monitoring system helps reduce turnaround

times by easing troubleshooting and repair, drastically minimising the need for ground support equipment. Moreover, a single test bench, capable of dealing with all electronic equipment, has been developed, enabling ground crews to determine which component in a Line Replaceable Unit is defective.

Over the past 30 years, the French Armed Forces have taken part in countless overseas operations, far away from their national support infrastructure, and have gained considerable experience in forward deployment. As a direct result, the French requirement for the Rafale called for optimum built-in deployability and self-supportability, and Dassault and its partners have taken advantage of their undisputed know-how to develop a fighter with an extremely low logistic footprint.

For example, no integral engine test cell is required for the M88 turbofans. Additionally, thanks to innovative manufacturing and assembly tech-

niques, there is no need to check equipment boresighting after replacement, and no complex external test benches are required for flight line or rear echelon maintenance. For self-supportability, the Rafale is designed to require minimal ground support equipment: it is fitted with on-board oxygen generation system, and with a closed-loop cooling system for on-board coolant and nitrogen circuits.

The Rafale provides a technical edge, enhancing operational capabilities while keeping budgets under tight control. It is optimised for low life-cycle costs throughout its operational life, with numerous maintenance/support aspects contributing to incredibly low operational costs:

- no complete airframe or engine depot-level inspection is required throughout the aircraft's service life, and only specific components, such as Shop Replaceable Units, are returned for maintenance and repair;
- minimum spare part requirements allow maintainers to reduce

spares inventory, and the very high commonality between variants minimises the number of spare items.

- the aircraft is very reliable, and easy to maintain and repair, ensuring reduced manning levels (30 percent less than for the Mirage 2000), and lower ground crew training requirements.

The Rafale's outstanding sustainability represents a quantum leap which is reshaping air warfare: commanders now have a highly affordable, reliable, maintainable and interoperable fighter at their disposal, giving them the capability to significantly increase their operational tempo while keeping maintenance and support costs under firm control.





FUTURE ENSURED

Revolutionary combat systems for unmatched lethality.

In order to keep Rafale omnirole fighters on the cutting edge of technology, the French Ministry of Defence recently awarded a contract to Dassault Aviation, MBDA and Thales for the development and integration of an Active Electronically Scanned Array (AESA) for the RBE2 radar, of an improved missile approach warning system, and of a new-generation Front Sector Optronic system.

The AESA antenna will offer unparalleled detection ranges, and thus significantly enhance Rafale's combat effectiveness. Today, Rafale is the only European fighter fitted with an electronically-scanned radar.

Its remarkable RBE2 radar is in full operational service with both the French Navy and the French Air Force. The RBE2 is already far more advanced than mechanically-scanning legacy radars used by most of Rafale's competitors, whose flexibility and performance are obviously limited by the complex hydraulic drives needed to move the radar dish around.

By adopting an active antenna, the RBE2 radar's performance will be further increased: detection and tracking ranges will be significantly extended, angular coverage will be considerably expanded, and reliability will be boosted to

previously unattainable levels.

For unprecedented redundancy, the state-of-the-art active array is composed of numerous solid-state transmitter and receiver modules. These are used to point the radar beam at very high speed, substantially improving situational awareness while simultaneously reducing the aircraft's own radar signature.

The first flight of the AESA system was carried out in a production Rafale in May 2003 to validate detection performance. Although the development schedule was extremely tight, the test programme

met all anticipated milestones, on schedule.

The Front Sector Optronics-Improved Technologies (FSO-IT) and the new generation missile approach warning system will both be fitted with more accurate sensors, boosting detection ranges and reducing false-alarm rates.

With the combination of AESA, improved missile approach warner and FSO-IT, the Rafale Omnirole fighter will become more lethal, more survivable, more reliable and more affordable - all key advantages for operators in search of the ultimate fighter.



THE **OMNIOLE** FIGHTER ■



THE **OMNIROLE** FIGHTER ■



NO STRINGS ATTACHED

Tailored technology transfer packages for total autonomy.

Every political decision maker knows that guaranteed operational sovereignty is a key parameter when selecting a combat aircraft. Unlike alternative sources of late generation combat aircraft, the Rafale team is fully amenable and sufficiently flexible to establish a wide range of synergistic partnerships with its customers: sharing in the industrial programme, ability to maintain and modify the airframe locally, transfer of software source codes, integration of new or indigenous weapons and systems, adaptation to local communications requirements (datalinks, for example) and more.

Operating the most modern fighter in the world is certainly the surest way to protect one's airspace, but customers also deserve the best support package to ensure that their Rafale front-line squadrons remain fully operational in all conditions. This is

why Dassault Aviation is firmly committed to providing support throughout the entire life of the aircraft.

The main step towards independence being the ability to carry out maintenance 'in-country', Rafale fleet management and support can be accomplished in situ. Extensive know-how and technology transfers, added to comprehensive training packages, will ensure that customers remain capable of operating their Rafales over the long term.

Dassault now offers its customers comprehensive, fine-tuned industrial packages of services encompassing training and simulation, spare parts supply, calibration of equipment, overhaul and repair of components, and documentation and technical assistance. This type of fixed-price programme for contractor logistic support

packages also contributes to long-term cost management while providing guaranteed results.

Full scale in-country maintenance will be carried out by customers, whose national industry will benefit from technology transfers: French authorities have already approved source codes transfers, and even sensitive materials can be maintained locally. The electronic warfare suite can be programmed by customer personnel, and new weapons can be easily integrated.

Moreover, effective and easy-to-use mission preparation and restitution tools significantly contribute to national autonomy and, thanks to the associated electronic warfare programming system, existing threat libraries and jamming/decoying sequences can be updated and controlled by local specialists.

D a s s a u l t A v i a t i o n • S n e c m a • T h a l e s

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