

RAFALE 
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FOX THREE

DASSAULT AVIATION - SNECMA - THALES // N° 17



Editorial

In the 17th issue of Fox Three,

The Rafale Team is proud to present a host of new systems and technological innovations that will increase even further the omnirole fighter's already impressive lethality on the modern battlefield: a new radar, a new long-range air-to-air missile, new air-to-surface guided weapons, new squadrons... A lot is currently happening on the Rafale programme thanks to the unconditional financial support provided by the French Ministry of Defence, the French Air Force and the French Navy. The new systems now being fielded will provide massively increased firepower, combat efficiency and operational flexibility.

As demonstrated during countless missions, the combat-proven Rafale always stands ready to react to developing strategic situations: the fighter successfully took part in combat operations in Afghanistan and in Libya. More recently, French Air Force Rafales were engaged at short notice in Mali, first conducting a long-range raid to strike hostiles' strongholds: four Rafales took off from Saint-Dizier air base, navigated to the target area and carried out the attack before landing in Chad to be rearmed and readied for other sorties, proving once again in action how versatile the French fighter really is.

The 'FOX THREE' Team

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KING OF THE DESERT

After Afghanistan and Libya, the Rafale omnirole fighter has now successfully been engaged over Mali.

When the Rafale programme was launched, decision makers were adamant that the new fighter had to be easily deployable and had to be able to operate in harsh environments:

- at sea, from the pitching deck of aircraft-carriers where salt could prove an issue.
- In cold weather conditions, where frost, sleet, snow and freezing rain all cause special problems, such as the formation of icing on aircraft.
- in the tropics, where humidity and heat could have detrimental effects on availability.
- in the desert, where sand, dust and heat all affect performance.

Thankfully, Dassault Aviation engineers took all these constraints into account when designing the Rafale and the end-result is a fighter that can deploy anywhere on the planet at short notice and operate for extended periods of time from bare forward operating bases. This translates into increased effectiveness, as demonstrated in Afghanistan, Libya and, more recently, Mali.

Strategic bomber

Such is the endurance of the Dassault Aviation omnirole fighter that, during the opening days of the conflict in Mali, French Air Force Rafales flew long-range missions that are usually dedicated to strategic bombers. The first such raid was launched on 13 January 2013 when four Rafales departed Saint-Dizier Air Base, in eastern France, to attack enemy support infrastructure in northern Mali. No fewer than six air-to-air refuellings were required for the missions and the four fighters landed in N'Djamena, in Chad, after spending 9 h 35 min in the air. In all, 21 targets were struck, including training camps, ammunition dumps and command centres. A second long-range raid was launched from Mont-de-Marsan a couple of days later. For these raids, the participating

Rafales were loaded with GBU-12 laser-guided bombs or Sagem HAMMER (standing for Highly Agile and Manoeuvrable Munition Extended Range) low-cost, all-weather, fire-and-forget missiles "I consider that the main advantage of the HAMMER lies in its simultaneous impact capability explains Lieutenant-Colonel Tricot, Commander of Escadron de Chasse 2/30 'Normandie-Niemen'. *In one of the raids we carried out, we had to destroy all our assigned targets in one go with a salvo of twelve HAMMERs. We recorded twelve hits with devastating results as the enemy had no prior warning, no time to hide and no time to run away. It certainly was a big shock for the hostile forces. The two other Rafales provided cover and did real-time battle damage assessment with their targeting pods. They were ready to re-attack should one of the HAMMERs have missed, but that did not prove necessary.*"





Air cover

Rafales were heavily engaged in Mali and the fighters provided top cover for the air assaults on Timbuktu and Gao. These daring operations, which involved massive paradrops by Transall and Hercules tactical airlifters, proved decisive to push back north hostile elements and to liberate the two towns which, until then, had been used as forward operating bases by enemy forces. *"It was a 'night D-Day', For the Timbuktu raid, we maintained four fighters (split into two two-ships) airborne all the time. As a result, we had*

an enormous firepower available as each Rafale was armed with six GBU-12 laser-guided bombs, which translates into a total of twelve smart weapons for a flight of two. We circled above the airlifters, ready to react but we were not needed. We feel that our presence constituted a strong deterrence and that the excellent joint interaction between Air Force and Army units helped things go on very smoothly. "The distance between N'Djamena and the ops area is about 1400 km one way, or 2800 km for a round trip, and Rafale are nearly always flown with two or three 2,000-litre external drop tanks. Nevertheless, in-flight refuellings are required

to extend the range of the fighter: "fuel is the key point for the operations over Mali as we need 'playtime' on station, stresses Lieutenant-Colonel Tricot. We have to rely on tanker support and fuel is provided by an assortment of assets. Interoperability is definitely not a problem, and taking fuel from various types of French and foreign tankers is just like training. Typically, missions from N'Djamena last anything from 5 h 30 min to just over 9 h. The Rafale's cockpit is extremely well laid, intuitive to use and very comfortable, and we easily remain focussed during the whole duration of the mission."

Air Support

Rafales often fly air support missions to protect friendlies on the ground. In Mali, air support is divided into protection, convoy escort and deterrence. During protection missions, Rafale loiter above friendly bases or positions and stand ready to react to any attack. Convoy escort is more or less the same mission, but above friendly forces on the move, the Rafales then using their sensors (including their Thales Damoclès targeting pod) to keep an eye on any abnormal activity ahead

Reconnaissance and intelligence gathering

With its comprehensive suite of sharp sensors, the Rafale proves to be a very effective ISTAR (Intelligence, Surveillance, Tactical Acquisition and Reconnaissance) tool. In close cooperation with the other systems available in the theatre (satellites, French Air Force Harfang unmanned aerial vehicles, French Navy Atlantique 2 maritime patrol aircraft used in the land surveillance/forward air control roles, Armée de l'Air Mirage F1CR reconnaissance fighters, radar reconnaissance aircraft), the Rafales help build up a comprehensive, unambiguous, up-to-date tactical image.

For ISTAR missions, Rafales fly from N'Djamena with two 2,000-litre drop tanks under the wings and with a Pod Reco NG (New Generation Reconnaissance Pod, also known on the export market as AREOS, for Airborne REconnaissance Observation System) under the fuselage. The Thales Pod Reco NG is used for pre-strike reconnaissance, battle damage assessment and video reconnaissance. "We fly reconnaissance missions round the clock thanks to the Pod Reco NG's day and night capabilities,

of the convoy. Anything unusual, such as trenches or vehicles hiding below trees, is immediately reported to the convoy commander. When enemy forces are detected, Rafales either fly deterrence runs, performing a show of presence (remaining at medium altitude, but making noise so that the enemies know they are there) or a show of force (with a very low-level high-speed pass to demonstrate determination). Alternatively, weapons are dropped to obtain a kinetic effect. "Rafales and other French fighters fly round the clock and we always have assets available at very short notice to provide fire support, reveals Lieutenant-Colonel Tricot.

says Lieutenant-Colonel Tricot. Such are the qualities of its sensors that reconnaissance runs are usually flown at anything between 25,000 and 30,000 feet and we do not really need to go any lower, even for oblique shots. We stack Harfang UAVs, Atlantique 2 MPAs and Rafales one above the other, with the Rafales always on top."

Soon after the beginning of the hostilities, the French Air Force decided to set up a datalink receiver in Niamey, the capital of Niger, so that Rafales could downlink their images during their transit back to Chad: "having a ground station in Niamey helps us accelerate

We cooperate with forward air controllers on the ground, or with airborne Forward Air Controllers flying onboard Atlantique 2 Maritime Patrol Aircraft."

For air support missions, Rafales are usually armed with up to six HAMMERs or GBU-12s, and with a full load of 30 mm ammunitions for their 30M791 cannon which could prove particularly well-suited to engage light vehicles and troops in the open. At the time of writing, only Mirage F1CR fighters had the opportunity to use their gun but, however, Rafales could soon find themselves using their own cannon for close air support.

the OODA (Observation Orientation, Decision, Action) loop, notes Lieutenant-Colonel Tricot. Decision-makers have images much sooner and they can reach a decision earlier to achieve the desired tactical effect on the ground."

Compared to the Mirage F1CR, the Rafale offers massively improved recce capabilities. It has a much longer range, better self-escort capabilities, is inherently more reliable thanks to its twin-engine configuration, is better equipped to plug into digital command and control networks and is fitted with a recce pod relying on state-of-the-art digital technology instead of outdated wet films.







Difficult condition

In Africa, Rafales sometimes fly in quite difficult weather conditions: sand storms are a common occurrence and visibility is often reduced to a few hundred metres. Diversion options are few and far between and air traffic control in northern Mali is non-existent. For the operation, the French Armed Forces have adopted special procedures to ensure 3D de-confliction between the fighters and artillery fires, and AWACs occasionally provide a 'picture' to the fighters. Civilian air traffic is very light but, for enhanced situational awareness, Rafale aircrews use their RBE2 electronic scanning radar to monitor all airborne contacts in the area and their L16 datalink system to share tactical data. Aircrews also rely on the ROVER (Remote Operations Video Enhanced Receiver) system video downlink capability

to 'talk' and exchange imagery with Forward Air Controllers on the ground.

After Afghanistan and Libya, the conflict in Mali has demonstrated that the Rafale is a modern, powerful, reliable and flexible combat tool that can be engaged in an extremely wide array of combat scenarios, from peacekeeping / counter-insurgency missions to high-end, high-intensity combat operations. The Rafale is optimised to offer a small logistical footprint and a Rafale forward operating base (FOB) was very quickly set up in N'Djamena. The Rafale detachment in the Chadian capital soon peaked at eight aircraft used for pre-planned attacks, close air support sorties or reconnaissance missions. Such is the reliability of the fighter that availability remains at 90%, even with the fighters operating thousands of kilometres away from their traditional support infrastructure.

SHARPENING THE RAFALE'S CLAWS

The last few months have been extremely busy for the Rafale community, with numerous new systems and weapons being tested or delivered to the French Armed Forces.

The French Air Force and the French Navy are continuously, and massively, investing to stay ahead of the threat and improve the Rafale's overall lethality and combat effectiveness. New systems, hardware and software versions are regularly introduced to reduce operating costs and improve supportability and interoperability.

First series AESA radar in service

In early October 2012, Dassault Aviation delivered to the French Air Force single-seater C137, the first Rafale omnirole fighter fitted with a Thales Active Electronically Scanned Array (AESA). This significant event marked the first

time a production European fighter is equipped with the AESA technology. The following month, C137 started flying with the French Air Force Evaluation Centre, at Mont-de-Marsan, where Air Force pilots began evaluating the new radar system in a wide number of realistic air-to-air and air-to-surface scenarios. Aircrews are now busy designing new

tactics to take advantage of the outstanding detection and tracking capabilities and improved angular coverage offered by the new plug-and-play AESA. These tactics will allow aircrews to have a much better situational awareness and a better understanding of the tactics used by the enemy, giving French aviators the edge in modern air warfare.

Nowhere to hide

Compared to the previous passive array that already offered exceptional performance, the new AESA is optimised for even longer detection and tracking ranges against both surface and airborne targets, even in severe electronic warfare environments against low radar cross section targets, as demonstrated during a comprehensive trial programme spread over four years: during hundreds of test sorties,

the AESA was thoroughly tested in all conditions against the widest range of targets that could be imagined, including fighters equipped with dedicated jammers.

In the air-defence role, the AESA matches the kinetic performance of the future Meteor missile, giving unprecedented reach against hostile fighters. For ground attacks and anti-ship strikes, the multimode AESA offers impressive precision and resolution and even small, hidden surface targets can be easily localised. The AESA also proves

considerably more reliable and easier to support than mechanical scanning radars and passive electronic scanning arrays. During the tests at Mont-de-Marsan, the new array was moved from single-seat C137 to two-seater B304 and B305 as required for the various tactical and technical trials, the change from PESA to AESA configuration taking only a couple of hours. Full AESA operational capability with the French Air Force is now planned for late 2013, with the French Navy to follow soon afterward.

Meteoric revolution

Another significant event took place in early October 2012 when the first two MBDA Meteor separation trials were conducted from a Rafale. To be used in conjunction with the Rafale's new AESA radar, the ramjet-propelled Meteor missile will offer a consi-

derably expanded interception envelope/no escape zone compared to the current Mica missile. The Meteor is designed to cruise at extremely high speeds and engage airborne targets at stand-off ranges. It will be capable of defeating a wide array of threats: fighters, helicopters, tankers, AWACS and even cruise missiles flying at very high speeds and very low level. Under current

plans, each Rafale will carry two Meteors under the rear fuselage hardpoints, but this is likely to be expanded to four missiles in the future, with a further two Meteors mounted under wing pylons. A total of 200 Meteors were ordered by the French Armed Forces in 2010, with the new weapon to enter service in 2018.



GBU-49 Enhanced Paveway tested on Rafale

The French armed forces have integrated onto the Rafale a large array of French and foreign weapons. Over the past few years, the GBU-12 Paveway II, GBU-22 Paveway III and GBU-24 Paveway III laser-guided bombs have all been cleared for use from the twin-engined Rafale, thus demon-

strating the omnirole fighter's remarkable interoperability with other NATO nations.

The 250-kg GBU-49 Enhanced Paveway was first tested from the Rafale in July 2012. The weapon is already in service with French Air Force Mirage 2000D fighters and French Navy Super Etendard Modernisé carrier-borne strike fighters and clearance for use from the Rafale will broaden the French armed forces overall combat flexibility. Thanks to its dual GPS/laser

guidance system, the GBU-49 can be fired through clouds or smoke with good accuracy, or be guided via the traditional laser beam with even greater precision if direct view of the target is not blocked by obstructions. A key aspect of the demonstration undertaken for the Rafale was to make sure that the GBU-49 could be easily integrated using Raytheon's plug-and-play WiPAK (Wireless Paveway Avionics Kit), and this proved to be entirely satisfactory.



Laser-guided AASM IOC

The final qualification firing for the laser-guided variant of the Sagem Armement Air-Sol Modulaire (AASM, or modular air-to-surface armament) was conducted on 12 December 2012 from a Rafale, paving the way to the entry into service of the precision weapon with the French Armed Forces in 2013. The laser-guided AASM is the third variant of the AASM family that also includes GPS/INS and GPS/INS/Infrared versions which have been used operationally from French Navy and French Air Force Rafale omnirole fighters in Afghanistan and Libya. It will be known as the SBU-54 HAMMER (Highly Agile and Manoeuvrable Munition Extended Range) within NATO.

The final trial conducted by the DGA confirmed the weapon's excellent agility, range and accuracy. It was performed by a Rafale (fitted with a Thales Damoclès targeting/laser illumination pod) which fired a single laser-guided AASM at a remotely-controlled vehicle travelling over rough terrain. A direct impact was recorded on the 4 x 4 vehicle speeding at 50 km/h.

The experts of the French Air Force Evaluation Centre, at Mont-de-Marsan, conducted a full-scale experiment of the weapon in early 2013 as part of an urgent operational requirement for Mali and the SBU-54 was recently granted initial operational capability on the Rafale, paving the way to full service entry. The weapon has now been rushed to the Mali theatre of operations, demonstrating how easily new capabilities can be introduced on the Rafale. Having the flexibility to integrate new weapon systems on the omnirole fighter at short notice will prove to be a decisive advantage for all future customers.



INDEPENDENCE

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When a single country makes your aircraft from nose to tail, you know exactly what you're getting into. Rafale is not subject to multinational controls. It also offers unrestricted access to key weapon systems technologies, spare parts, and know-how. Rafale offers superior operational effectiveness and failsafe worldwide support, yet isn't delivered wrapped in red tape. Or with strings attached. *Rafale*. The **OMNIROLE** fighter ■