

Rafale Aircraft—the Untold Story: Part I



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Introduction

'Rafale Aircraft' became popular during the run up to the last Parliament election and thereafter. Thanks to the politicians who were instrumental in making it popular. The aircraft further climbed the popularity chart after the recent orders from the Supreme Court.

'Rafale' means 'gust' in French language, a name that suits to the very basic character of this Aircraft which has the features of a Fifth-Generation Fighter Aircraft (FGFA). Though familiar with the name 'Rafale', we have not ventured enough to know more about this war machine. This is an attempt to explore Rafale and to understand some 'untold' facts about it.

During the eighth edition of 'Aero India' held in Bangalore in February 2011, prima facie, the fighter appeared to the author little small in size compared to its counterparts. But during the air display, the aircraft was found very agile, manoeuvrable with an extra thrust.

Dassault Aviation, the manufacturer of Rafale, believes that the shortlisting of Rafale by the highly professional Indian Air Force pilots is a major milestone for this aircraft. Apart from the Indian Air Force, Egypt and Qatar have placed orders for this versatile machine. The UAE is also in the process of acquiring Rafale.

So Far So Good

Rafale entered into active service with the French Navy in the year 2004 and French Air Force by the year 2006. Currently, France has close to 180 Rafale in both the Navy and Air Force put together. French Navy and Air Force were engaged in countless combat missions in Afghanistan, where they could test and prove every system on-board as well as the weapons fitted on this aircraft.



This twin-jet engine aircraft is capable of carrying out a variety of short and long-range missions, including ground and sea attacks, reconnaissance, high-accuracy strikes, deep strike missions, interceptions and even as a second strike platform for nuclear counter attack. Dassault Aviation boasts the aircraft as an ‘Omnirole’ platform. Rafale has proven its mettle in air operations over Libya’s Benghazi and Tripoli, Mali and Chad so far. The aircraft has also been cleared for deck operations from the US carrier ships for joint operations.

Variants

Currently, there are three variants being manufactured since its inception. Rafale C, the air force version; Rafale M, the naval version and Rafale B, twin seater. Rafale A was a prototype demo version. Rafale M is being operated from the deck of French carrier ‘Charles de Gaulle’ for quite some time. Rafale B has a role of trainer also.

Rafale C



Rafale B



Rafale M



Basic Features

Some of the basic features of Rafale fighter aircraft are given below:

Sl	Features	Value
a	Wing span	10.9 mtrs
b	Length	15.3 mtrs
c	Height	5.3 mtrs
d	Wing area	45.7 sq mtr
e	Max speed	1.8 mach (2222 km/hr)

f	Overall empty weight (excluding weapons and fuel)	10 tons
g	Maximum takeoff weight	24.5 tons
H	Fuel internal	4.7 tons
i	External payload/weapons	9.5 tons
J	Service ceiling (max height it can fly)	15.24 kms
k	Max thrust by both engines (2X75KN)	150 KN
l	Weapon storage stations (belly and below wing)	14
m	Max range of flight (without drop tank)	3700 kms
n	Combat radius	1850 kms
o	Snecma M88 turbofan engines (Safran make)	2 nos

Advanced Features

Though Rafale was a fourth-generation aircraft in the inception stage, it has got upgraded with features of the fifth-generation fighter aircraft. Following are a few advanced features of Rafale:

(a) **Stealth Design:** This design of contours of the airframe would define the RCS (Radar Cross Section) of the aircraft. When the RCS value is low, the chance of getting spotted by enemy radars is very remote. Rafale can always take the enemy by surprise. Composite materials are extensively used in Rafale and they account for 70 per cent of the airframe area.



(b) **Air-to-Air Refuelling:** The aircraft can continue the missions, without landing, with the support of a tanker in the skies. This will facilitate continuous availability of the aircraft during combat.



(c) **14 Hard Points:** Hard points are stations under the belly/wing of the aircraft where we can engage payload/weapons. It could be bombs, missiles or even a fuel drop tanks or

reconnaissance pods. Rafale can have a variety of mix and match combination of weaponry suiting to the mission.



(d) **Faster Turnaround:** This is something to do with the speed at which the aircraft can turn around for subsequent sortie after landing back. This is very important for uninterrupted combat operation. Rafale has very less turnaround time between adjacent missions.



(e) **Anti-ship Missiles:** Majority of land-borne Air force fighter jets cannot counter sea-borne threats. Thanks to Rafale, it has the ability to carry and launch anti-ship missiles if a situation arises.



(f) **Advanced Multimode AESA Radar:** AESA (Active Electronically Scanned Array) radar brings superior detection and tracking and has the ability to track multiple targets in the search domain. This is a multimode /multifunction radar which can also play the role of a weapon radar.



(g) **Self-Protection Suits (SPS):** SPS provides the aircraft an envelope of protection from enemy radars and weapons. The system ensures early detection of threats and provides the crew with full EW (Electronic Warfare) situation awareness, to avoid hostile threats. The ESM (Electronic Support Measures) system on board Rafale detects the enemy presence/threats much earlier than the enemy detecting Rafale.

(h) **Capable of Carrying Nuclear Missiles:** Since our neighbouring enemies have acquired a sizable number of nuclear weapons, we have been debating for a reliable second strike nuclear missile platform. We can now vouch for Rafale, which is a proven platform for delivering heavy nuclear arsenals.



Engines Snecma M 88

The twin engines are made by Safran, France. They are highly efficient turbo fan engines with after burners designed specifically for fighter jets. The engines have a good amount of autonomy since Full Authority Digital Engine Control (FADEC) is in place. Some of the features of the engine are given below:

Sl	Parameters	Value
a	Thrust with afterburner (lbf)	16,860
b	Dry thrust (lbf)	11,240
c	Specific fuel consumption with afterburner [(lb/lbf.h)]	1.66
d	Specific fuel consumption without afterburner [(lb/lbf.h)]	0.78
e	Bypass ratio	0.30
f	Length (in)	139.29
h	Inlet diameter (in)	27.40
i	Weight (lbs)	1,977.55

Peer Comparison

We always compare our military assets with that of peers to ascertain how better we are viz a viz that of enemy assets. There are many apprehensions about why the Indian Air Force (IAF) chose Rafale over Eurofighter aircraft. Eurofighter may appear to be a better aircraft than Rafale on paper. IAF pilots, who did extensive field trials, have a different take altogether. The table below shows a comparison of the features of Rafale with the main contender Eurofighter aircraft.

Sl	Features	Eurofighter	Rafale
a	Length	15.95 m	15.27 m
b	Height	5.3 m	5.3 m
c	Wingspan	10.95 m	10.80 m
d	Thrust/weight ratio	1.15	1.13
e	Rate of climb	315 m/s	300 m/s
f	Ceiling	20 kms	17 kms
g	Speed	2.3 mach	1.8 mach
h	Economy	0.68 km/l	0.70 km/l
i	Operational cost per hour	32400 USD	28000 USD
j	Unit Cost	175.000.000 USD	130.000.000 USD
k	Wing area	51.2 sq m	45.7 sq m

Why is Rafale Preferred over Eurofighter?

It is apparent that both aircraft have a similar profile, but the last three parameters listed in the above table could have been the reasons why the Indian Air Force went for Rafale. Apart from these, the air combat performance played a major role in shortlisting Rafale by the Air Force. It is understood from various sources that the IAF pilots are very impressed with the 'Dog fight' capabilities of Rafale, which will be very handy in interception missions.

Note: Weapon capabilities and avionics suits of Rafale will be dealt in the following articles (Part II and III)

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Views expressed are personal and need not reflect or represent the views of Centre for Public Policy Research

Reference sources for the research, photos and tables are given below:

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