

DASSAULT AVIATION Rafale in Falcon 4.0. Free Flacon 3



WARNING: Information included in this document are not related to any "Real Life" planes, but only to the flight model (FM) built to be used in the Falcon 4.0 simulator. This flight model has been built only from public data, it does not refer to any classified nor confidential information.

Special thanks to testers and reviewers:

- HighSpeed (C6)
- Jojo (C6)
- Mav-JP (C6)
- JimG (FF)
- Saint (FF)

General Description.

Rafale is a light (10 tons) Omni-Role (AA and AG) fighter, twin engine (50 / 75kN each), with high-end weapon and navigation system (Multi target BVR, data link, Optronic sensors, Stand Off and Laser Guided AG weapons capabilities)

Its advanced aerodynamic configuration and full digital flight control system provide a very high level of maneuverability.

Its Speed range (750 Knots IAS , Mach 1.8) is more affordable (with supersonic capabilities without After Burner and/or with external tanks), than wide in itself (compared to Mach 2.2 of Mirage 2000-5 for example)

Versions

The airframe of the Rafale is declined as of today in 4 versions:

- Rafale C : single seat, Air Force
- Rafale B : two seats, Air Force
- Rafale M : single seat, Navy
- Rafale N : two seats, Navy

Main differences are:

- The difference between Air Force and Navy versions flight model is very light and do not need to be taken into account in F4.
- Naval versions (N,M) have only 13 hard points, when Air Force has 14.
- Naval version (N,M) front landing gear is different from the land based one, and have a landing hook.
- Two seats navy version (N) does not have internal gun (DEFA 30mm) that is on other.

Any plane of every airframe version can be operated with a given "System level". This concept is different from the U.S. Block system: A F16-C block 40 is the frozen combination of a given airframe and system, this will not change until a complete retrofit (system and airframe). A Rafale M/F1 can be upgraded to F2 standard with only system changes.

As of today, 3 standards are identified:

- F1: AA only, the today's (20003-2004) standard of Rafale M (French Navy)
- F2: F1 AA: MICA-IR + AG stand off weapons (Scalp-EG and AASM), first standard for B and C versions (French Air Force)

F3: improved AA with Helmet Mounted Cueing System (High Offset Boreseight for MICA-IR), improved AG with Laser Guided weapons (with Damocles Pod) and Nuclear missile ASMPA, Air-Sea capabilities...

Basic data

- Dry weight : 9,060 kg / 19,973lb (B/C), 9,670 kg / 21,319 lb (M/N)
- Max Take Off weight: 24,500 kg
- Internal Fuel Capacity : 4,750 kg / 5,650 l / 10,500 pounds
- Reference Area : 45.70 m² (498 sq.ft)
- Max Mach Number : 1.8
- Max Indicated Air speed (VNE) : 800 Keas
- Ceil: 55,000 ft
- Approach speed : 120 Keas
- Max. Load Factor : +9 / -3.6G (CAT-I); +5.5/-3 (CAT-III)

Engine SNECMA M88-2

- Dry Thrust : 50 kN (11,250 lb)
- AB Thrust: 75 kN (17,000 lb)

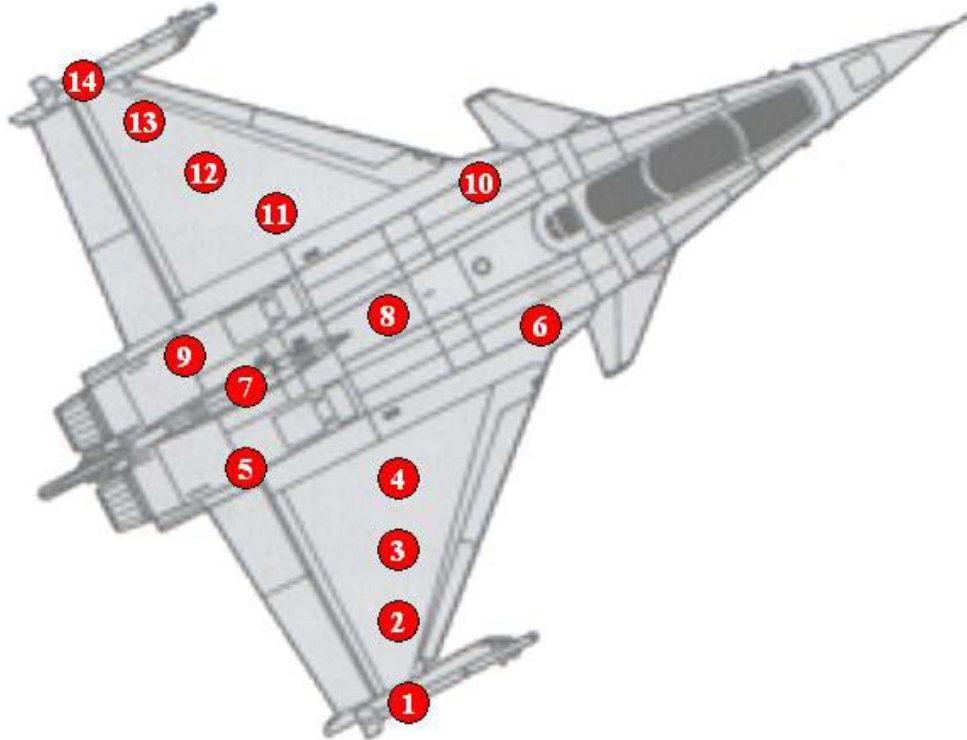
Radar: THALES RBE-2, AG (TFR) and AA mode, Multiple targets following (with missile data link allowing firing 2 fox-3 without missile seeker lock, and 6 other fox-3 with lock prior to launch) , Look down-Shoot down, high range (60 Nm for SER of 5 m², over or under flight level) .

Electronic Counter Measures: Internal (no Pods): SPECTRA combining passive sensor, active jamming and shaff / flare dispensers (4)

Weapon Loads

Internal Gun: one (right side) DEFA 791B with 125 rounds (fire rate of 2,500 rd/min), for all versions excepted navy twin seat (N).

14 hard points for B and C, 13 for M and N (HP-7 not available)



Rafale F1

HP	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Magic-2	1													1
MICA-EM	1		1		1				1			1		1
RPL-711 1250L				1				1			1			
RPL-751 2000L				1				1			1			

Rafale's Flight Model by J.M. LANGERON
Version: 4.02

Rafale F2

HP	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Magic-2	1													1
MICA-EM	1	1			1		1		1				1	1
MICA-IR	1	1			1		1		1				1	1
AASM			3									3		
SCALP-EG			1					1				1		
Mk-82			3									3		
BSU-49			3									3		
BLU-107B			3									3		
RPL-711 1250L				1				1			1			
RPL-751 2000L				1				1			1			

Rafale F3

HP	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Magic-2	1													1
MICA-EM	1	1			1		1		1				1	1
MICA-IR	1	1			1		1		1				1	1
AASM			3									3		
SCALP-EG			1					1				1		
Mk-82			3									3		
BSU-49			3									3		
BLU-107B			3									3		
BGL-250			3									3		
BGL-1000			1									1		
Laser POD (DAMOCLES)						1								
AM-39			1									1		
AMSP-A			1					1				1		
RPL-711 1250L				1				1			1			
RPL-751 2000L				1				1			1			

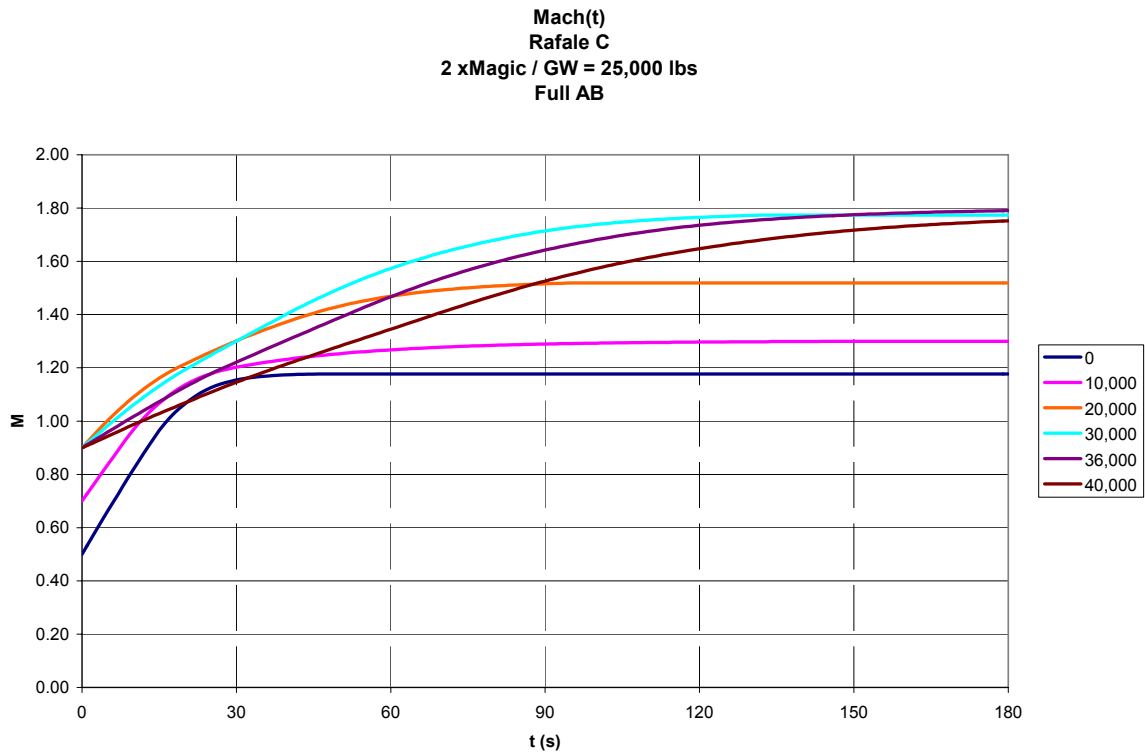
Flight Model

Speed Limitations for specific configurations

- Rafale B, 2 Magic-II + 2 Mica-EM + 1 RPL-711: Total mass 16,400kg (36,203 lbs), Fuel Capacity 6550 liters ,
 - Maximum Mach number : 1.6
 - Take off speed (rotation) 130 Keas

1G Acceleration table

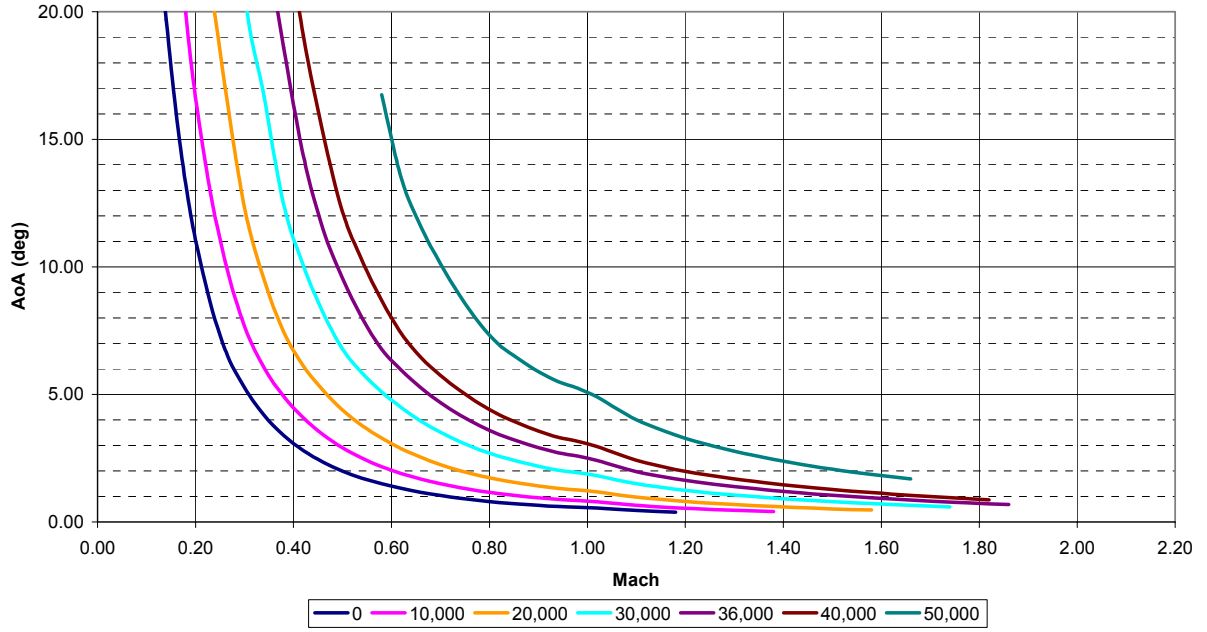
Set of curves giving Indicated speed or Mach number along time for Mil power and full AB (2 tables) at stabilized flight level (1G) Rafale-C, 50% Internal Fuel, no external Load, 25,200lbs, Full AB



Mach number versus Angle of Attack

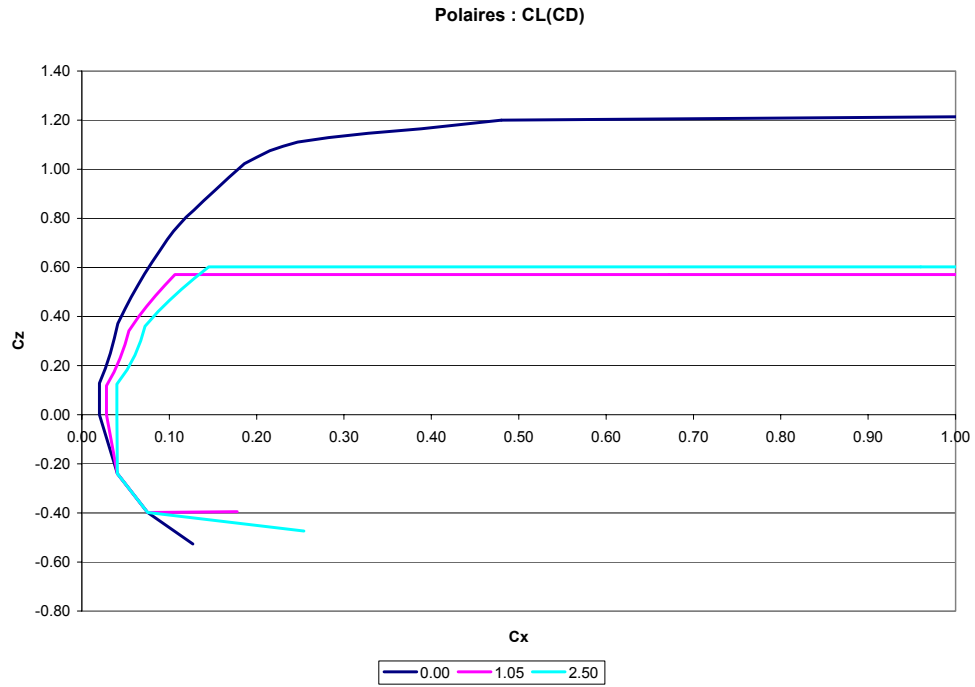
Set of curves giving Mach number versus Angle Of Attack, at stabilized flight level (1G), 50% internal fuel, no external load, for a given altitude (from 0 to 50,000 ft, step 10,000 ft)

Rafale C
Drag Index : 0 / GW = 24,700 lbs
AoA(Mach)

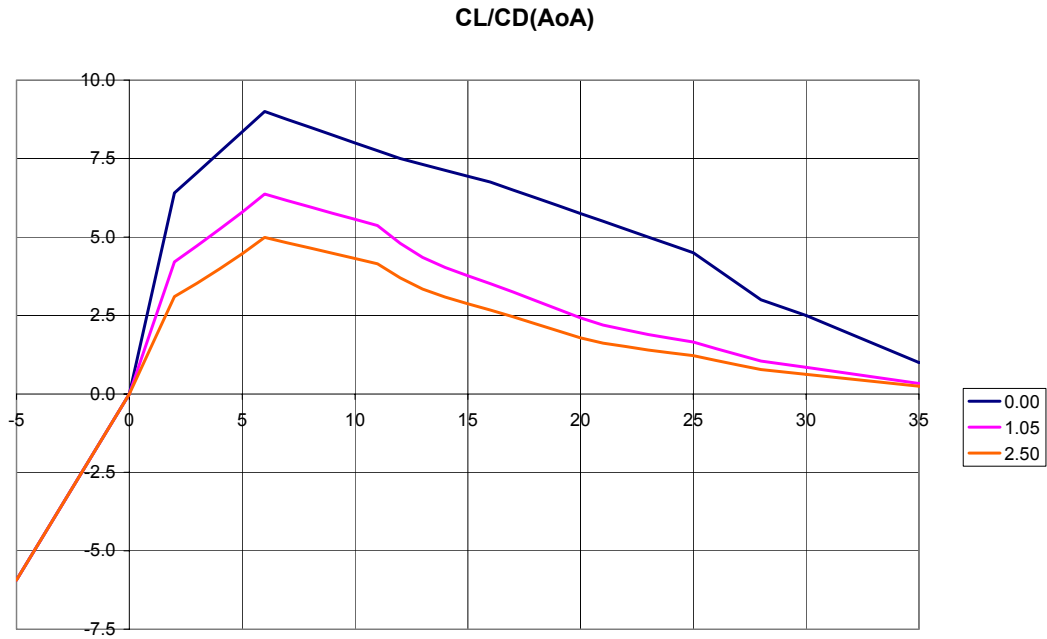


Aerodynamics coefficients

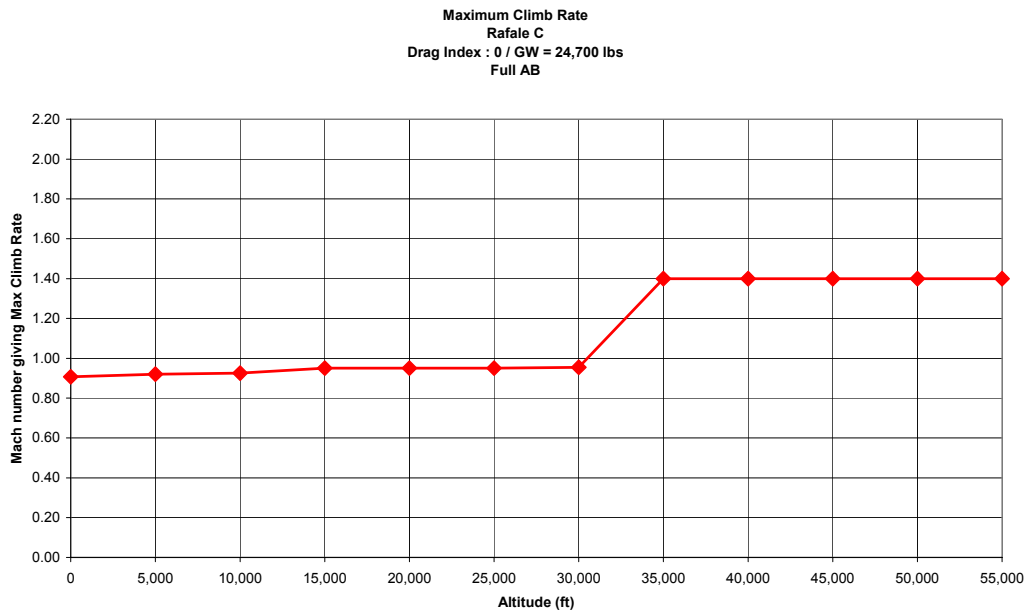
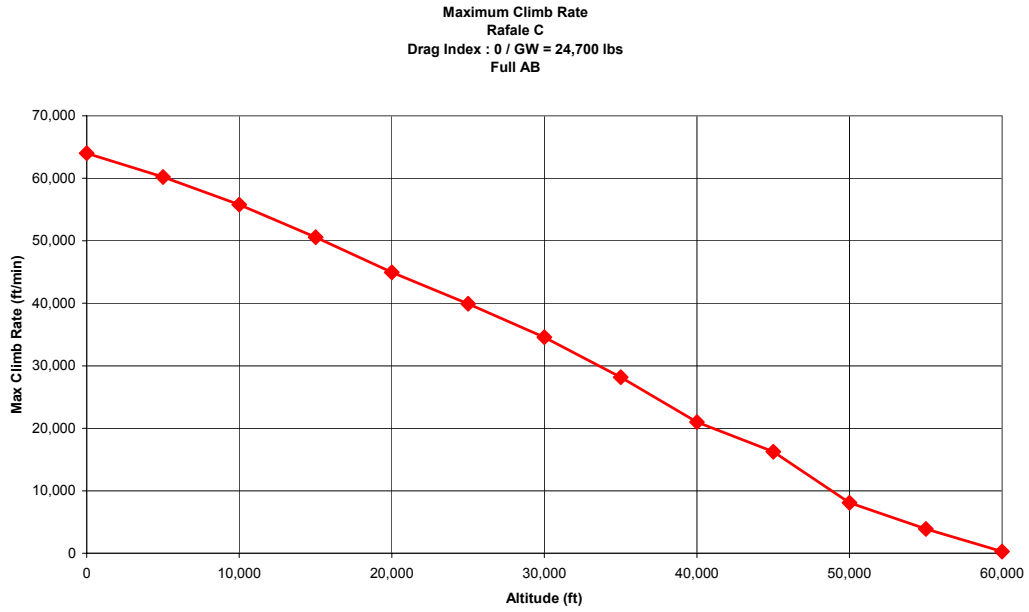
Cz (Cx)



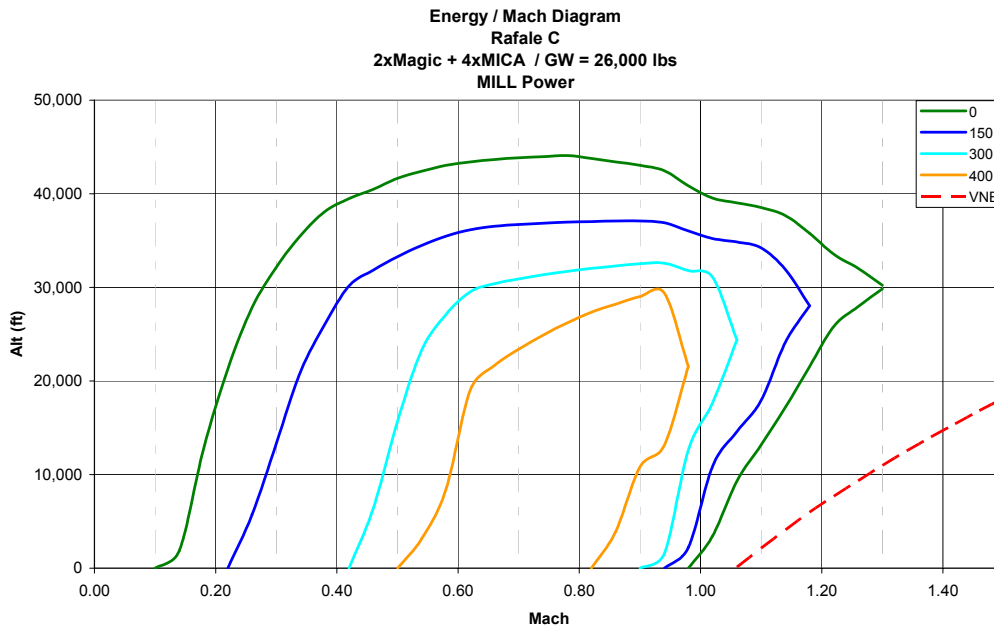
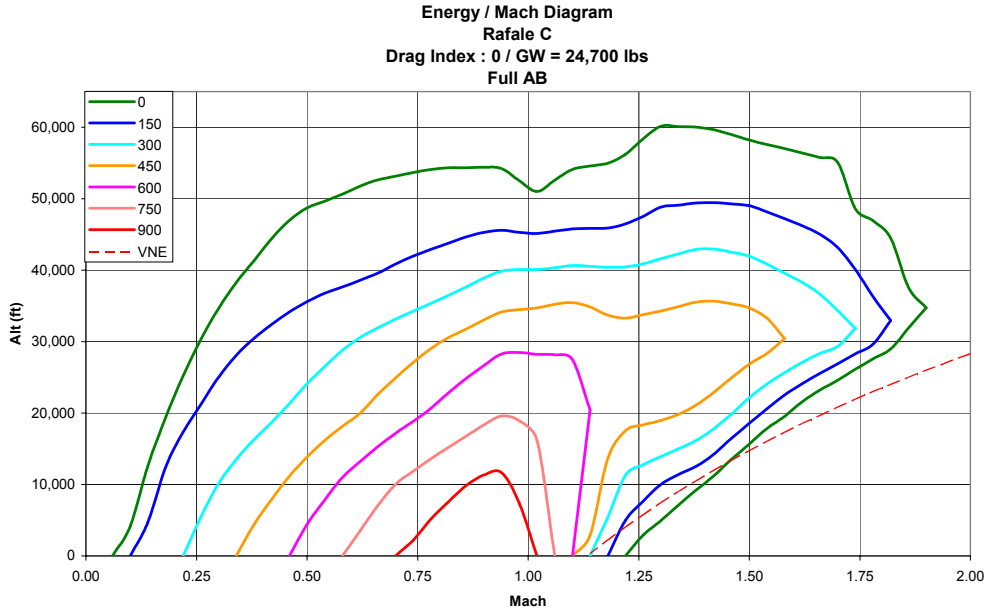
Cz/Cx (AoA)



Climb Rate

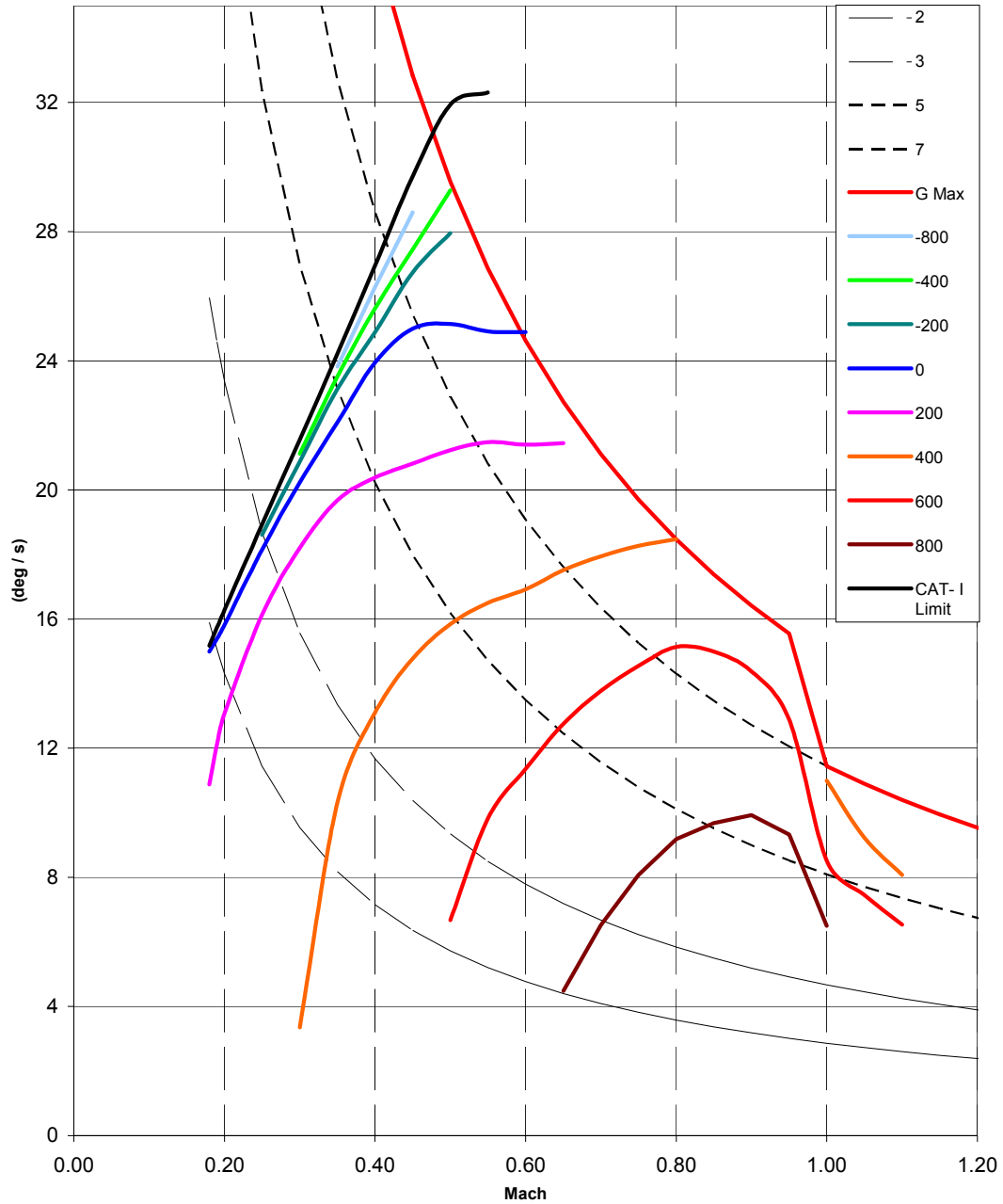


Energy / Mach Diagram

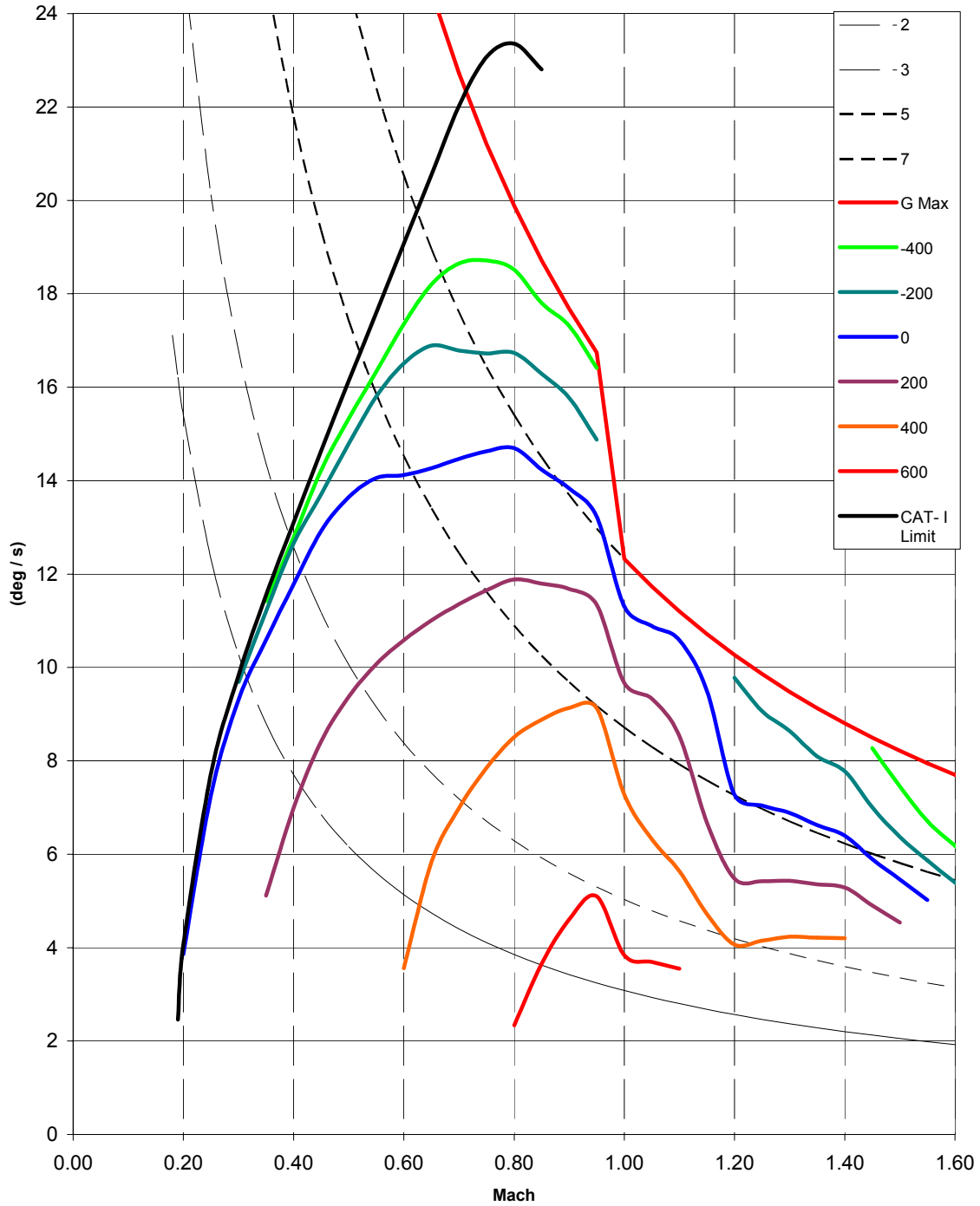


Turn Rate versus Mach number Diagram

Turn Performance at Sea level
Rafale C
Drag Index : 0 / GW = 24,700 lbs
Full AB



Turn Performance at 20,000ft
Rafale C
Drag Index : 0 / GW = 24,700 lbs
Full AB



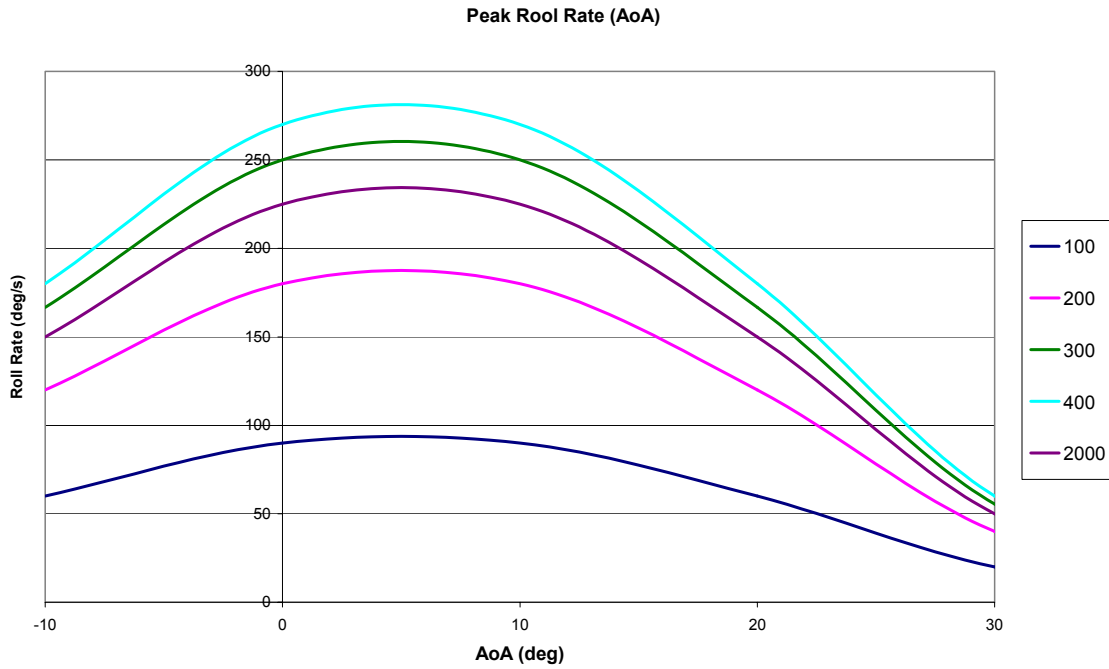
Roll Rate versus AoA

Set of curves giving Maximum roll rate (deg/seg) and time to roll 90deg at constant speed versus Angle of Attack

Maximum Roll Rate:

- CAT I : 280 deg/s
- CAT III : 160 deg/s

Peak Roll rate function of Angle of attack (for a given Dynamic pressure in Qbar), Clean configuration, 50% internal fuel



Thrust and Fuel Consumption table

