DCS: M-2000C

The information provided in this manual is preliminary and subject to revision.

By RAZBAM

Table of Contents

Introduction

The M-2000C is a French single engine fourth generation fighter. Designed in the late 1970s as a lightweight fighter for the French Air Force (*Armée de l'Air*). Later evolved into a multirole aircraft with several variants developed, with sales to a number of nations. Over 600 aircraft were built and it has been in service with nine nations.

The M-2000 was initially intended to replace the previous generation Mirage III for the export market, and was smaller and cheaper than the aircraft proposed to the French Air Force, called the Avion de Combat Futur ACF (Futur Combat Aircraft).The project was first known as the “Super Mirage III”, then “Delta 1000”, “Delta 2000”, “Super Mirage 2000” to finally settle for “Mirage 2000”.

Unlike the ACF, which was a strike aircraft with secondary capabilities as interceptor, the M-2000C was designed as an interceptor. When the ACF project was cancelled the M-2000C was offered as a cheaper alternative to the French government and was approved on December 1978.

The M-2000C was also designed to compete with the General Dynamics F-16 in the lucrative European market, which was interested in small, but agile, lightweight fighters.

The M-2000C features a low-set thin delta wing with cambered section, 58 degrees leading-edge sweep and moderately blended root; area-ruled; two small canard wings, fixed, placed just behind the air intakes. The flight surfaces on the wings are composed of four elevons and four leading edge slats. Its neutral point is in front of its Center of gravity of an aircraft, giving the fighter relaxed stability to enhance maneuverability. It incorporated negative stability and fly-by-wire controls with four analog computers. Airbrakes are fitted above and below each wing in an arrangement very similar to that of the Mirage III and IV. A noticeably taller tailfin allows the pilot to retain control at higher angles of attack, assisted by the small strakes mounted along each air intake.

The aircraft uses retractable Tricycle type landing gear. A runway tailhook or a fairing for a brake parachute can be fitted under the tail, which can operate in conjunction with the landing gear's carbon brakes to shorten landing distances. A removable refueling probe can be attached in front of the cockpit, offset slightly to the right of center.

Cockpit

The Mirage 2000 is available as a single-seat or two-seat multi-role fighter. The pilot flies the aircraft by means of a center stick and left hand throttles, with both incorporating hands-on-throttle-and-stick (HOTAS) controls. The pilot sits on a license-built version of

the British Martin-Baker Mark 10 Zero-Zero ejection seat. Unlike in the F-16, the pilot sits in a conventional position, without the steep backward slope of the F-16 seat.

The instrument panel is dominated by the Head-up display which presents data relating to flight control, navigation, target engagement and weapon firing, and the radar screen located centrally below it. To the lower left is a stores management panel, above which are the navigation instruments and altimeter. The right half of the instrument panel accommodates the engine and systems displays. Located on the left side of the cockpit, just ahead of the throttle, are controls for the communications equipment.

Engines

The SNECMA M53 afterburning turbofan was developed for the ACF, and was available for the M-2000C project. The first 37 aircraft were equipped with the SNECMA M53-5 engine version; later aircraft were equipped with the SNECMA M53-P2 version.The M53-P2 provides 64.3 kilonewtons (14,500 lbf) of thrust dry and 95.1 kilonewtons (21,400 lbf) in afterburner. The first 37 aircraft were equipped with the SNECMA M53-5 engine version; later aircraft were equipped with the SNECMA M53-P2 version. The air intakes are fitted with an adjustable half-inlet cone-shaped center body, which provides an inclined shock of air pressure for highly efficient air intake. Total internal fuel capacity is 3,978 litre (1,051 US gal). There are also provisions for a jettisonable 1,300-litre (340 US gal) centerline fuselage fuel tank and for a 1,700-litre (450 US gal) or 2,000-litre (528 US gal) drop tank under each wing.

Payload and armaments

The M-2000C is equipped with built-in twin DEFA 554 30 mm revolver-type cannons with 125 rounds each. The cannons have selectable fire rates of 1,200 or 1,800 rounds per minute.

The aircraft can carry up to 6.3 tons (13,900 lb) of stores on nine pylons, with two pylons on each wing and five under the fuselage. External stores can include Matra Super 530D medium-range semi-active radar-guided air-to-air missile on the inboard wing, and Matra Magic II short-range infrared-seeking AAM on the outboard wing pylons.

Sensors and avionics

Avionics for the M-2000C include the Sagem ULISS 52 inertial navigation system (INS), TRT radio altimeter, Dassault Electronique Type 2084 central digital computer, Digibus digital data bus and Sextant Avionique Type 90 air data computer. The communication equipment package includes the LMT NRAI-7A IFF transponder, IO-300-A marker

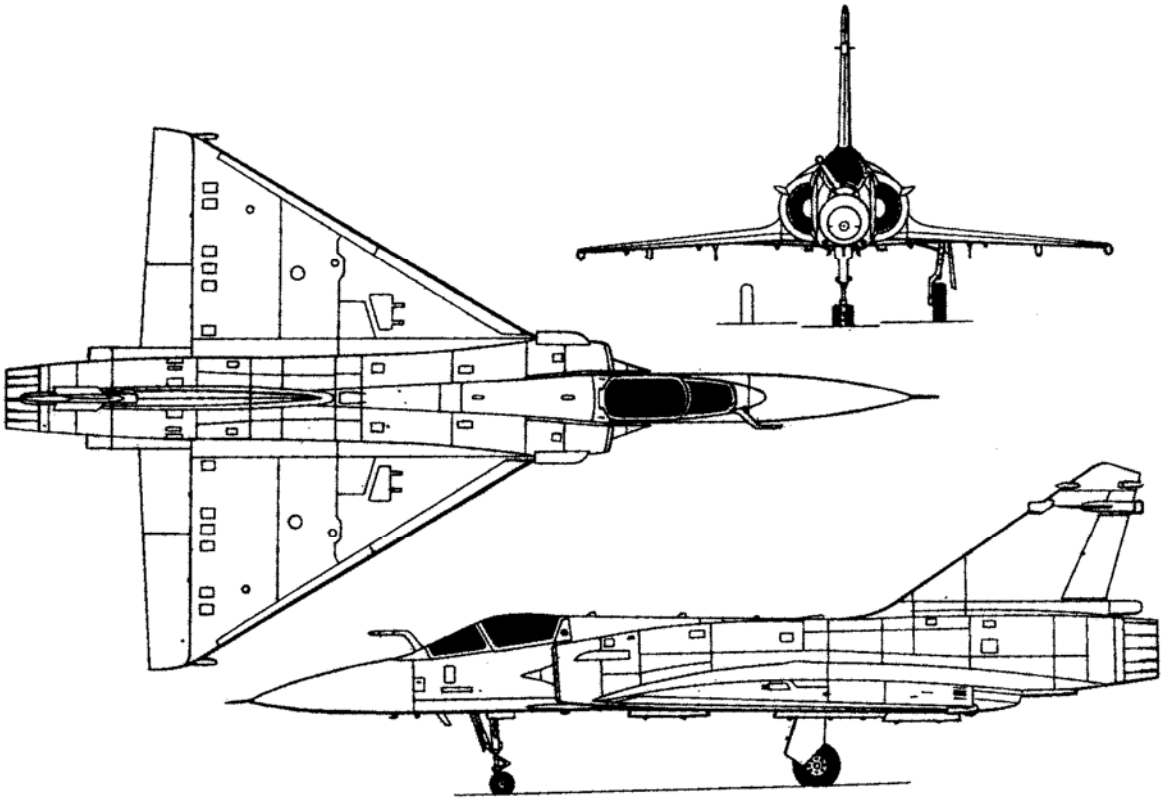
beacon receiver, TRT ERA 7000 V/UHF com transceiver, TRT ERA 7200 UHF or EAS secure voice communications.

The aircraft has a redundant fly-by-wire automatic flight control system, providing a high degree of agility and easier handling, together with stability and precise control in all situations. The fighter's airframe is naturally unstable, and so it is coupled with FBW commands to obtain the best agility; however, in override mode it is still possible to exceed a 270 deg/sec roll rate and allows the aircraft to reach 11 g (within the 12 g structural limit), instead of 9 g when engaged.

The aircraft uses the RDI pulse-Doppler radar with an operating range of 54 nm (100 km / 62 miles). This unit was an evolution of Cyrano radars, with more modern processing units and look-down/shoot-down capabilities.

The M-2000C is equipped with a Radar warning receiver (RWR) with antennas on the wingtips and on the rear of the top of the tailfin. It is also equipped with the Sabre radar jamming and deception in a pod below the bottom of the tailfin, with the antenna in a fairing on the front of the tailfin. Countermeasures are provided by Spirale dispensers, each fitted on the extensions behind the rear of each wingroot, giving a total capacity of 112 chaff cartridges, the flares dispensers are located under the wing roots with a total of 16 cartridges.

General Characteristics



Primary function:	Interceptor with some CAS (Close Air Support)
Power plant:	1 × SNECMA M53-P2 afterburning turbofan
Thrust:	**Dry thrust:** 64.3 kN (14,500 lbf) **Thrust with afterburner:** 95.1 kN (21,400 lbf)
Wingspan:	9.13 m (29 ft)
Length:	14.36 m (47 ft 1 in)
Height:	5.20 m (17 ft)
Weight:	**Empty weight:** 7,500 kg (16,350 lb) **Loaded weight:** 13,800 kg (30,420 lb)
Maximum takeoff weight:	17,000 kg (37,500 lb)
Fuel capacity:	3978 litres (1050 US gallons; 875 Imp gallons)
Speed:	Mach 2.2 (2,530+ km/h, 1,500+ mph) at high altitude/ 1,110 km/h (690 mph) at low altitude
Range:	1,550 km (837 nmi, 963 mi) with drop tanks
Ceiling:	17,060 m (59,000 ft)
Armament:	**Guns:** 2× 30 mm (1.18 in) DEFA 554 revolver cannon, 125 rounds per gun

Hardpoints: 9 total (4× under-wing, 5× under-fuselage) with a capacity of 6,300 kg (13,900 lb) external fuel and ordnance
Rockets:
2x Matra 68 mm unguided rocket pods, 18 rockets per pod
Air-to-air missiles:
2× Matra R550 Magic-II and
2× Matra Super 530D
Bombs:
8× Mk.82
8x Mk.82SE
9x GBL-66 Belouga cluster bombs
1x BAP-100 anti-runway dispenser.
4x GBU-12
1x GBU-16
1x GBU-24

Crew: 1

Acknowledgments

We would like to take a moment first to thank the following people involved on the project and who made possible the release of this aircraft.

RAZBAM Team

Ronald “Prowler” Zambrano – Team lead.

Tim Taylor, Metal2Mesh – 3d modeler and texturizer.

Larry “Zeus” Zambrano – Cockpit Coder.

CJ “CaptSmiley” Soques – Flight Model Coder.

Eagle Dynamics

Alex O’kean, for all the help above and beyond.

Matt Wagner, for opening doors to us.

Others

Joël L. – Data miner, beta tester and M-2000C enthusiast.

Also, big thanks to Colombia for its coffee, the soda companies, for their heavily caffeinated products, although we could do without all the sugar, and to Cable TV for keeping us company in the long working nights.

Keyboard Map

Seat adjustment

Button	Function	DCS Function	Key
	Seat Adjustment	Seat Up	LShift + S
		Seat Down	LShift + LAlt + S
	Cockpit Camera	Camera Up	RCtrl + RShift + Keypad Up Arrow
		Camera Down	RCtrl + RShift + Keypad Down Arrow
		Camera Left	RCtrl + RShift + Keypad Left Arrow
		Camera Right	RCtrl + RShift + Keypad Right Arrow

Fly-By-Wire System

Button	Function	DCS Function	Key
		FBW G Limiter AA/Charges	LCtrl + LShift + G
		FBW Spin Switch	LCtrl + LShift + V

Autopilot System

Button	Function	DCS Function	Key
		Autopilot On/Off	A
		Barometric Altitude Hold	H
		Selected Barometric Altitude Hold	LShift + H
		Autopilot Standby	LAlt + A
		Autopilot Disconnect/Hard Stop Enable	LShift + A
		Approach Hold	F

Weapons Manager

Button	Function	DCS Function	Key
	Master Arm	Master Arm Switch	
	TR Button 1	PCA Button 1	
	TR Button 2	PCA Button 2	
	TR Button 3	PCA Button 3	
	TR Button 4	PCA Button 4	
	TR Button 5	PCA Button 5	
	Gun Mode	Gun Mode Select	
	BR Weapon 1	Magic II Select	
	BR Weapon 2	Stores 2 Select	
	BR Weapon 3	Stores 3 Select	
	BR Weapon 4	Stores 4 Select	
	Emerg. Jett.	Emergency Jettison	LShift+E

HOTAS

Button	Function	DCS Function	Key
		Cannon Select	
		Magic Select	
		Close Air Combat Mode ON /Cycle modes	
		CACM/GAM Off	
		Ground Avoidance Mode On	
		Main Radio Select	LShift + Num+
		Aux Radio Select	LAlt + Num-
		TDC Up	;
		TDC Down	.
		TDC Left	,
		TDC Right	/
		TDC Center	
		Target Lock	Enter
		Target Unlock	Backspace
		NSW / IFF	S

Sensors

Button	Function	DCS Function	Key
		Radar Antenna Up	
		Radar Antenna Down	
		Radar Antenna Left	
		Radar Antenna Right	
		Radar Range Increase	=
		Radar Range Decrease	-

System

Button	Function	DCS Function	Key
		Master Caution Reset	LCtrl + R
		Wheel Brake On/Off (In Air: Control Hard Stop	W

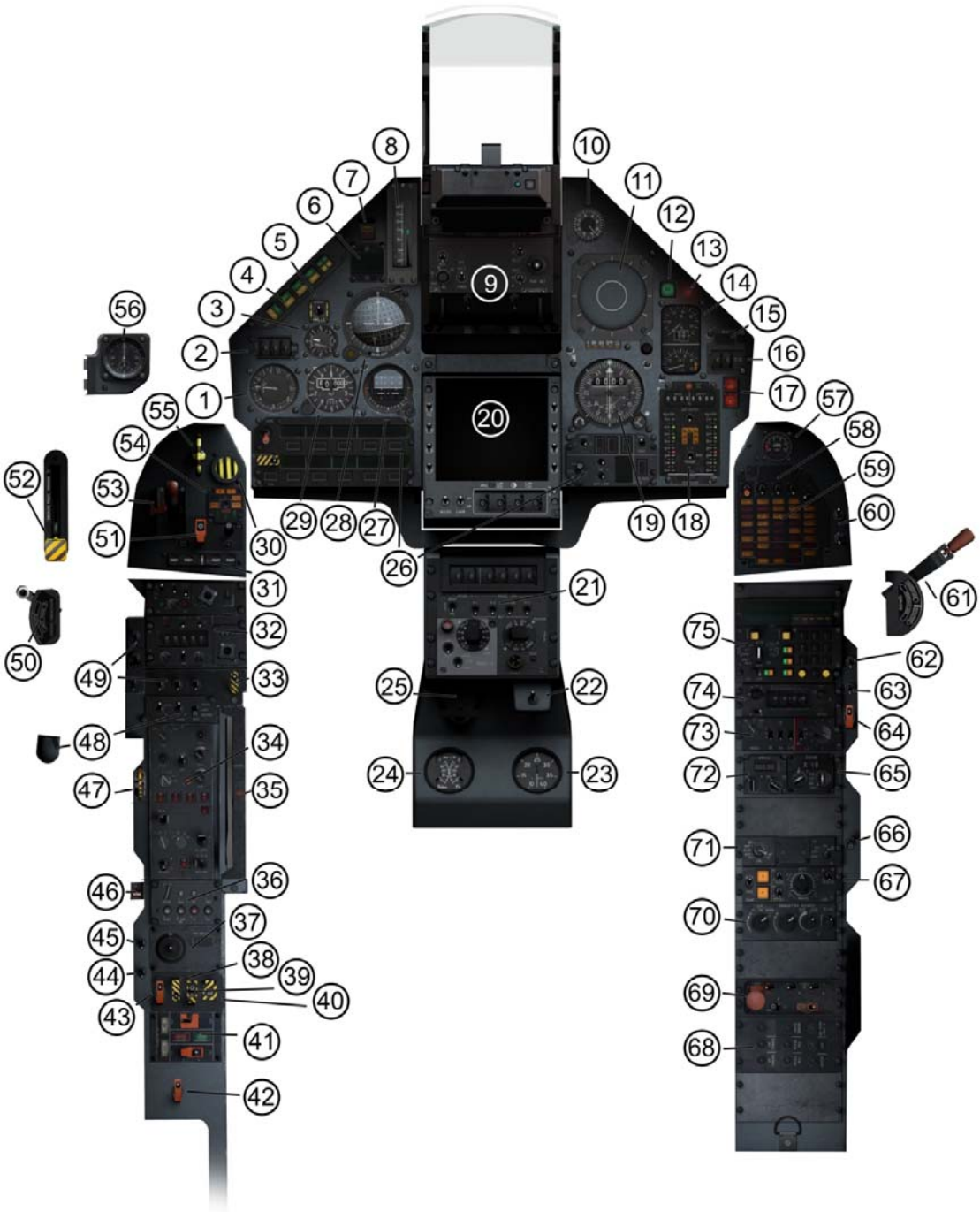
Illumination

Button	Function	DCS Function	Key
		Toggle Flashlight On/Off	LCtrl + LAlt + L

Note: The functions that have a blank space in the key combination column do not have a default key combination. You can choose your own.

Chapter 1: Instruments Layout

Instruments Panel Map.



Main instruments panel and center console

1. *Airspeed Indicator* — Displays indicated airspeed in knots and mach.
2. *Autopilot Altitude Selector* — Adjust autopilot altitude hold value.
3. *Vertical Velocity Indicator* — Displays vertical velocity in feet/min.
4. *Autopilot Controls/Indicator Lights* — Pushbuttons that enable/disable the autopilot functions and indicates the system status.
5. *Fly-By-Wire Spin switch* — Two position switch:
   - Norm: FBW system is in control
   - Vrille (Spin): FBW limiter is overridden. To be used only in emergencies during a flat spin stall.
6. *Radio Frequency display* — Indicates the selected frequencies in both radio transmitters. V/UHF main radio on top. UHF auxiliary radio on the bottom.
7. *Master Caution/Warning Lights* — Two tones lights that indicate the presence of a warning/caution condition:
   - Amber light: indicates that there is a problem but aircraft safety is not immediately imperiled.
   - Red light: indicates that there is an emergency condition that requires urgent action. Aircraft safety is compromised.
8. *AOA Indicator* — Indicates the aircraft's current angle of attack in degrees.
9. *HUD Pedestal* — Contains the HUD controls and the HUD itself.
10. *G Meter* — Indicates current vertical acceleration forces in G.
11. *Radar Warning Receiver (RWR)* — Shows any radar emitters around the aircraft.
12. *Afterburner Status Light* — Indicates when the engine is using the afterburner.
13. *Engine Start Light* — Indicates that the engine is starting-up.
14. *Engine Instruments* — Indicates engine RPM and Temperature.
15. *Fuel Flow Indicator* — Indicates current engine fuel flow in Kg/min
16. *Bingo Fuel Selector* — Adjust the value for the Bingo Fuel warning.

17. Engine Fire Warning Lights	Two lights that indicate an overtemp, possible fire condition. They correspond respectively to the engine center and the engine tailpipe.
18. Fuel Control Panel	Indicates current fuel quantity in Kilograms and controls the tanks crossfeed valve.
19. HSI	Horizontal Situation Indicator.
20. VTB/HDD	Radar display.
21. IFF Panel	Information Friend of Fore control panel.
22. Hydraulic Pressure Selector	Selects the hydraulic pump for the hydraulic pressure indicator.
23. Cabin Pressure Indicator	Indicates current cabin pressure in bars.
24. Hydraulic Pressure Indicator	Indicates hydraulic pressure for both System 1 and System 2 in bars.
25. Rudder pedals adjustment lever	Adjusts the height of the rudder pedals.
26. Weapons Management Panels	Consists of two panels on both sides of the VTB. PCA (Poste de Commande Armement – Weapons Control Panel): This panel controls weapons selection and navigation parameters. It also controls HUD display modes. PPA (Poste de Préparation Armement – Weapons Configuration Panel): This panel controls how the selected weapon will be used.
27. Standby Attitude Indicator	Auxiliary attitude indicator. Only shows pitch and roll.
28. Main Attitude Indicator	Show pitch, roll and heading. Additionally, it has glideslope and course deviation bars for use during ILS landings.
29. Altitude Indicator	Indicates barometric altitude (MSL) in feet up to 49,999 feet.

Left instruments panel

30. *Emergency Jettison Button*	The emergency jettison button, drops all weapons except the Magic missiles.
31. *Trim Indicators*	Indicate trim position for the control surfaces in the wings and tail.
32. *Communication Radios*	Both main (VHF/UHF) and auxiliary (UHF) radios. The main radio can be identified by the manual frequency selectors.
33. *Anti-Skid Switch*	Enable/disables the anti-skid system.
34. *Radar control panel*	Controls and configures radar operational parameters.
35. *Engine shutdown button*	Allows the throttle to be retarded from the Ground-Idle position back to the Stop position.
36. *Audio control panel*	Control the volume of the following components: Communication radios, TACAN, VOR/ILS, Markers, Magic seek and lock tones.
37. *Trim control panel*	Emergency pitch/roll trim control (overrides the trim hat of the stick) and yaw trim control.
38. *Emergency Oil pump switch*	Enable/disables the emergency oil pump.
39. *Emergency Computer switch*	Activates an emergency computer if the main computer fails. It is a get-you-home system.
40. *Fuel dump switch*	Dumps all the fuel that exists in the external tanks (if mounted).
41. *Fly-By-Wire and Autopilot test panel.*	Tests the FBW and Autopilot controls. Must be performed after engine start and before flight.
42. *Fly-By-Wire Emergency Channel*	The FBW emergency channel is a last resort system in case of total FBW failure. The aircraft is put in a get-you-home condition. Not to be used for normal flight.
43. *Afterburner cutoff switch*	Enable/disables the engine afterburner.
44. *Radar Ground Emitting Authorization switch*	Used by maintenance personnel only. It overrides the safety system that prevents the radar from emitting while on the ground.
45. *Tape Recorder Switch*	Self-explanatory.

46. *Mid-Air startup switch* — Starts the engine while in flight.

47. *Emergency Throttle* — Secondary throttle control, to be used in emergency situations.

48. *Flight controls panel* — Controls the aircraft's automatic flight control surface:
Souris = Engine shockwave cones.
Pelles = Engine scoops that force airflow into the auxiliary intakes for increased air circulation at high AOA.
Becs = Wing slats that are controlled by the FBW system.

49. *Exterior Lights panel* — Switch bank for the Navigation, Anti-collision strobe and Formation lights.

50. *Drag chute deploy handle* — Deploys the aircraft drag chute when installed.

51. *Flight-By-Wire limiter switch* — Selects FBW operational mode:
A/A – For air-to-air combat (Default).
CHARGES (Stores) – For carrying any load heavier than air-to-air missiles and empty central tank.

52. *Canopy breaking handle* — To open the canopy if the handle fails.

53. *Landing Gear Lever* — Actuates the landing gear.

54. *Configuration indicator panel.* — Indicates brakes, landing gear, hook, NWS and Anti-Skid status.

55. *Emergency Landing Gear Lever* — Lowers the landing gear in case of primary system failure.

56. *Clock* — Analog clock with current ZULU time.

Right instruments panel

57. *Oxygen Quantity Indicator* — Indicates Oxygen supply quantity.

58. *Power Switches* — Activates the aircraft's electrical power system:
BATT – Activates the main battery.
ALT1 – Engages Alternator 1.
ALT2 – Engages Alternator 2.
TRN – Enable power transfer between buses.

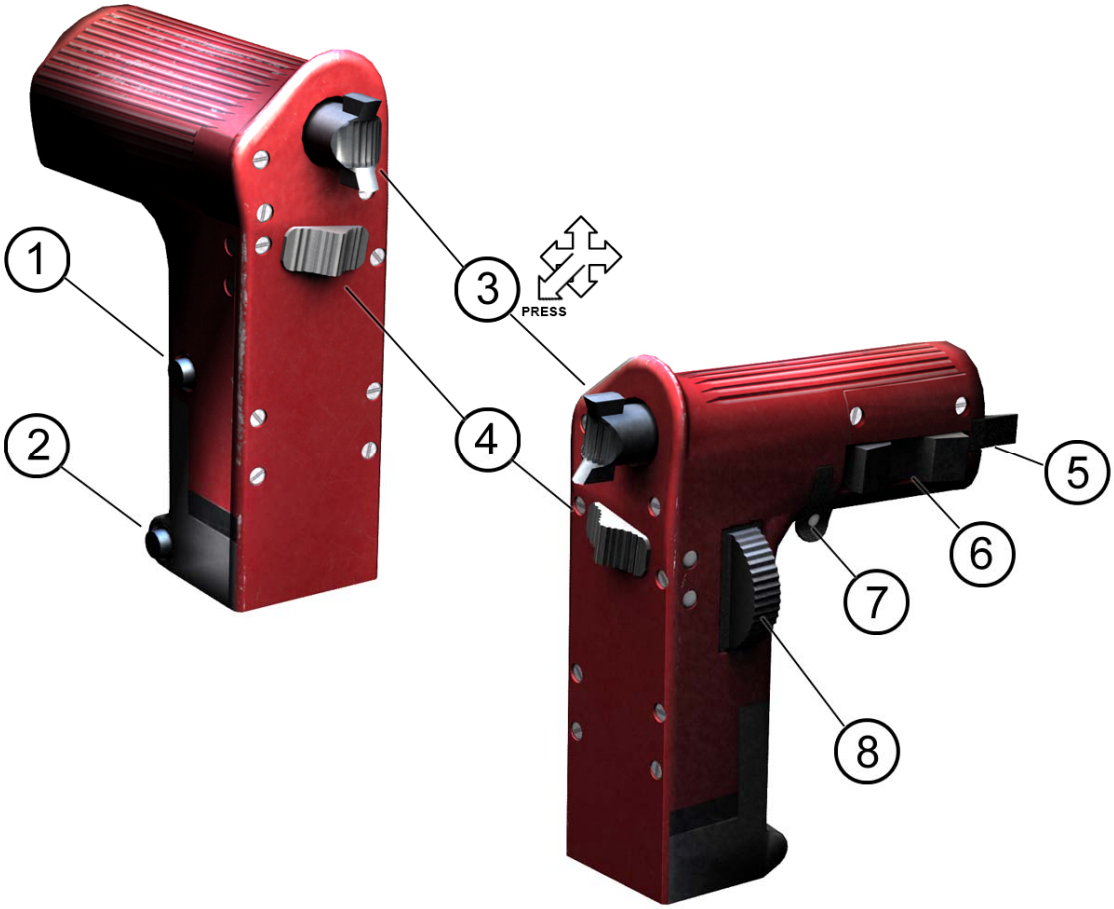
59. *Caution/Warning Advisory Panel* — Indicates emergency/anomalous conditions in the aircraft. It is tied to the Master Caution/Warning lights.

	Amber lights are caution lights indicating an anomalous condition. Red lights are warning lights indicating emergency situations that put the aircraft in peril.
60. Blank Switch	Not used.
61. Canopy Unlock/Lock handle	Locks/unlocks the canopy.
62. Emergency Hydraulic Pump Switch	Enables/disables the emergency hydraulic pump. Three position switch: Off – Auto – Test.
63. Audio Alert Switch	Enables/disables the aircraft's audio alerts. It does not control landing gear, AOA and missile tone.
64. Pitot Anti-Ice Switch	Enables/disables the pitot anti-ice system.
65. TACAN panel	Controls the TACAN radio.
66. Emergency Horizon Switch	Activates an emergency artificial horizon.
67. Environment control panel	Controls the cockpit and instruments air conditioning system.
68. Circuit Breakers	Electrical circuit breakers.
69. Engine Start panel	Controls engine fuel pumps and startup system. It also has the engine fuel shut-off valve switch ("robinet coupe-feu").
70. Interior Lights panel	Controls the interior lights system.
71. INS PSM/MIP Panel	Controls INS operation. Also has the access port for navigational data cartridges.
72. VOR/ILS Panel	Controls the VOR/ILS radio.
73. Electronic Warfare Panel	Controls the RWR, Jammer, Missile launch detector and Chaff/Flares operation.
74. Radar IFF panel	Controls the radar IFF interrogation system.
75. INS Panel	Display and data entry panel for the INS system.

Hands-On-Throttle-And-Stick (HOTAS) System

The M-2000C has an integral HOTAS system that allows the pilot to control multiple functions.

Button	Function	DCS Function	Key
1	Trigger safety		
2	Magic Search/NAV Vertical Update	Target Unlock	BackSpace
3	Trim/AP Guidance	Trim Up	S
		Trim Down	W
		Trim Left Wing Down	A
		Trim Right Wing Down	D
4	Decoys	Dispense Flares (manual mode)	Delete
5	Weapons System CMD	Close Air Combat Mode Special Modes Deselect Ground Avoidance Mode	
6	Trigger	Fire Weapon	Space
7	Auto Pilot Engage/Disengage	Autopilot Standby	LAlt + A
8	Radar Modes	Target Lock (TWS/STT)	Enter
9	Auto Pilot Off	Autopilot Hard Disconnect	LShift+A
10	NWS/Radar IFF	Nose wheel Steering Button (with landing gear down). Radar IFF interrogator switch (with landing gear up).	S



Button	Function	DCS Function	Key
1	Radio Selector	Main Radio Select Aux Radio Select	LShift + Num+ LAlt + Num-
2	Decoy release	Dispense Chaff	Insert
3	TDC	TDC Up TDC Down TDC Left TDC Right TDC Center	
4	Airbrake	Toggle Airbrake	B
5	Police Light		
6	AA Guns/Magic CCM Selection.	Cannon Select Magic II Select	
7	Weapons system designator		
8	Radar Antenna Up/Down	Radar Antenna UP Radar Antenna DOWN	

Ejection Seat

The M-2000C uses a licensed version of the Martin Baker Mk10 Zero-Zero ejection seat.

The seat can be raised or lowered as the Pilot sees fit.

Button	Function	DCS Function	Key
	Seat Adjustment	Seat Up	LShift + S
		Seat Down	LShift + LAlt + S
	Cockpit Camera	Camera Up	RCtrl + RShift + Keypad Up Arrow
		Camera Down	RCtrl + RShift + Keypad Down Arrow
		Camera Left	RCtrl + RShift + Keypad Left Arrow
		Camera Right	RCtrl + RShift + Keypad Right Arrow

Chapter 2: Engine

SNECMA M53-P2 Engine Information

The M-2000C uses SNECMA M53-P2, afterburning turbofan engine. The M53 is single shaft driving both the turbofan and compressor. The M53 is relatively older in design in comparison to the newer engine design of the same generation, it retains very desirable traits for military use. This can cut maintenance and cost for service and reliability.

The Single spool design of the turbofan engine has it's draw backs. When one compressor section stalls on a single-spool fan, it directly effects the entire spool. With the two-spool engine, if the one compressor stalls, the remaining compressor and turbine continue to function independently, maintaining partial thrust, making it easier to get the stalled compressor working again, without having to rely on "wind milling" for engine to start.

The M53 is the only known single-spool turbofan extant as of 2013, while SNECMA transitioned to a more conventional two-spool design such as the M88.

General characteristics M53-P2

Type:	Afterburning single-shaft turbofan
Length:	5,070 mm (199.60 in)
Diameter:	796 mm (31.33 in) inlet
Dry weight:	1,515 kg (3,340 lb)

Compressor: 8-stage axial compressor
Combustors: annular
Turbine: 2-stage axial turbine
Dry thrust: 64.7 kN (6,600 kgp / 14,500 lbf)
Afterburning thrust: 95.1 kN (9,700 kgp / 21,400 lbf)

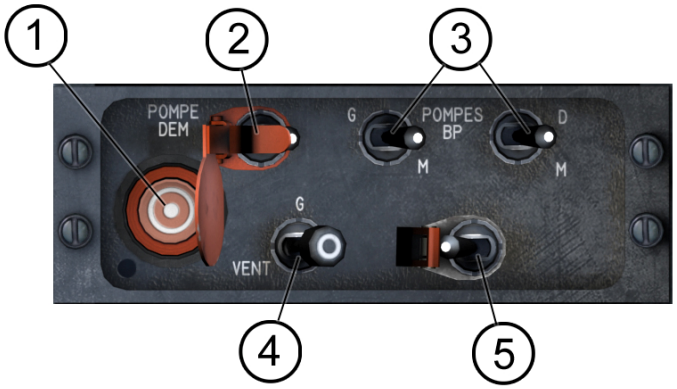
Engine Control

The engine throttle is located on the left instrument panel. The throttle is controlled by a lever in the center of the throttle quadrant.

Engine Startup Panel

The M-2000C does not have an Auxiliary Power Unit, instead it relies on a jet starter to start the SNECMA M53-P2 engine. The jet starter uses both internal fuel and battery power to do its job, although a Power Cart is preferred to prevent draining the battery of all power.

To control the start of the engine, there is a startup and control panel on the right console that will allow this operation.



1.	Starter button	Starts the engine.
2.	Starter fuel pump	Used to supply fuel to the engine during start sequence.
3.	Boost fuel pumps	Left (G) and Right (D) boost fuel pumps.
4.	Ignition/Ventilation Switch	Allows ventilation during ignition during engine start. Three position switch: VENT(default), Left (G) and Right (D)
5.	Fuel Shut-Off Valve Switch	Set the shut-off fuel valve in the closed (left) or open (right) position.

Engine Instruments

The M-2000C engine instruments consist of 3 indicators that display engine RPM and temperature.

1. Engine RPM (N) Needle.
2. Engine RPM (N) Display.
3. Engine T7 Temperature indicator.

Engine Warning Lights

Start Up Light

The Start Up is located on the upper right area of the main panel. When the engine is in start mode the light will illuminate, once the engine has started the light will go out.

Afterburner Status Light

The Afterburner Status light is located on the upper right area of the main panel (next to the Start Up Light). When the Afterburner is in use the light will illuminate.

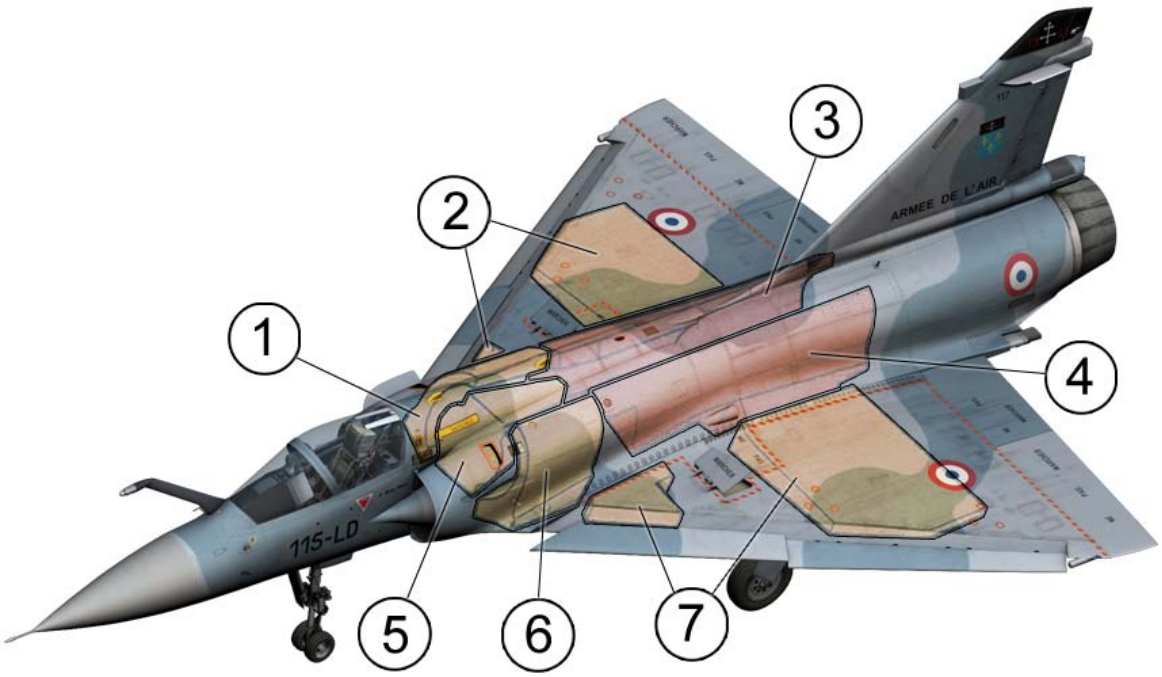
Engine Fire Warning Light

Illuminates when there is a Fire in the Engine's Secondary and or Afterburner Chambers.

Figure 1Engine panels locations

Chapter 3: Fuel System

The M-2000C fuel system consist of a left and right fuel groups consisting each one of a wing tank, a feeder tank and a forward tank in the fuselage. Also in the front of the aircraft, just aft of the cockpit the engine central tank is located. All fuel tanks are part of the aircraft structure. The aircraft also has three wet points, under each wing and under fuselage in the centerline, for three external fuel tanks that can duplicate total fuel load.

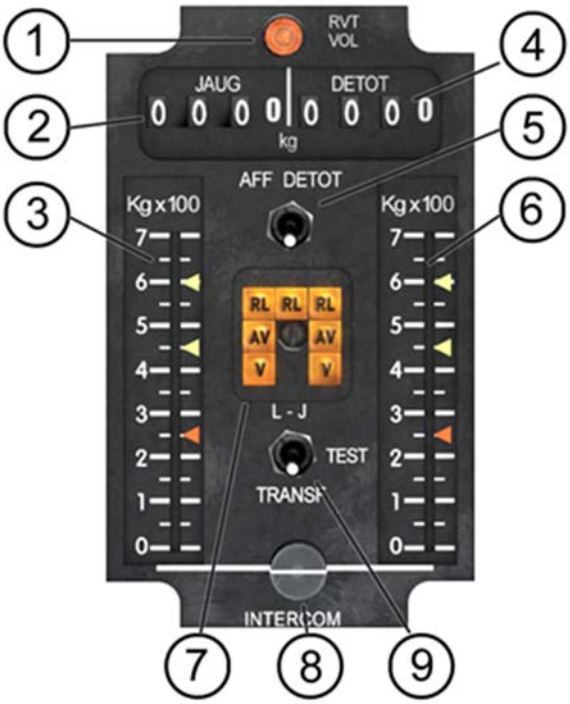


	Description	Capacity			
		Kg	Lbs	US Gals	Liters
1	Right group forward tank	304.0	670.0	101.7	385.0
2	Right group wing tank	523.0	1154.0	175.0	662.5
3	Right group feeder tank	592.5	1306.0	198.1	750.0
4	Left group feeder tank	592.5	1306.0	198.1	750.0
5	Center tank	320.0	705.0	107.0	405.0
6	Left group forward tank	304.0	670.0	101.7	385.0
7	Left group wing tanks	523.0	1154.0	175.0	662.5
	Total Internal fuel:	3160.0	6966.0	1056.6	4000.0
	RP-522 centerline tank	995.0	2194.0	332.9	1300.0
	Total Internal + RP-522 fuel:	4155.0	9160.0	1389.7	5260.0
	RP-541 wing tank (each)	1580.0	3482.3	528.6	1700.0
	Total Internal + 3 ext. fuel:	7315.0	16122.26	2446.9	8660.0

The aircraft has aerial refueling capability using a detachable probe on the starboard side just in front of the cockpit.

Fuel Gauge

Displays the fuel weight and controls transfer of the fuel system. All values displayed in this gauge are in Kilograms.



1. Refuel Transfer Light
Displays when Aerial Refueling Switch is on.

2. JAUG Fuel Amount Counter
Displays Total Internal fuel amount. This number is a measure by sensors mounted inside the internal tanks (except wing ones, which are estimated).

3. Left feeder fuel level indicator
Displays the left feeder tank fuel amount.

4. DETOT Fuel Amount Counter
Displays Total fuel available to the aircraft, internal + external tanks. This number is the result of subtracting the (measured) fuel consumption from the starting total (value set before engine start).

5. AFF DETOT Fuel Display Switch
Displays/refresh information for the DETOT Fuel counter.

6. Right feeder fuel level indicator
Displays the right feeder tank fuel amount.

7. Fuel warning Lights
Indicates when a fuel tank is empty.

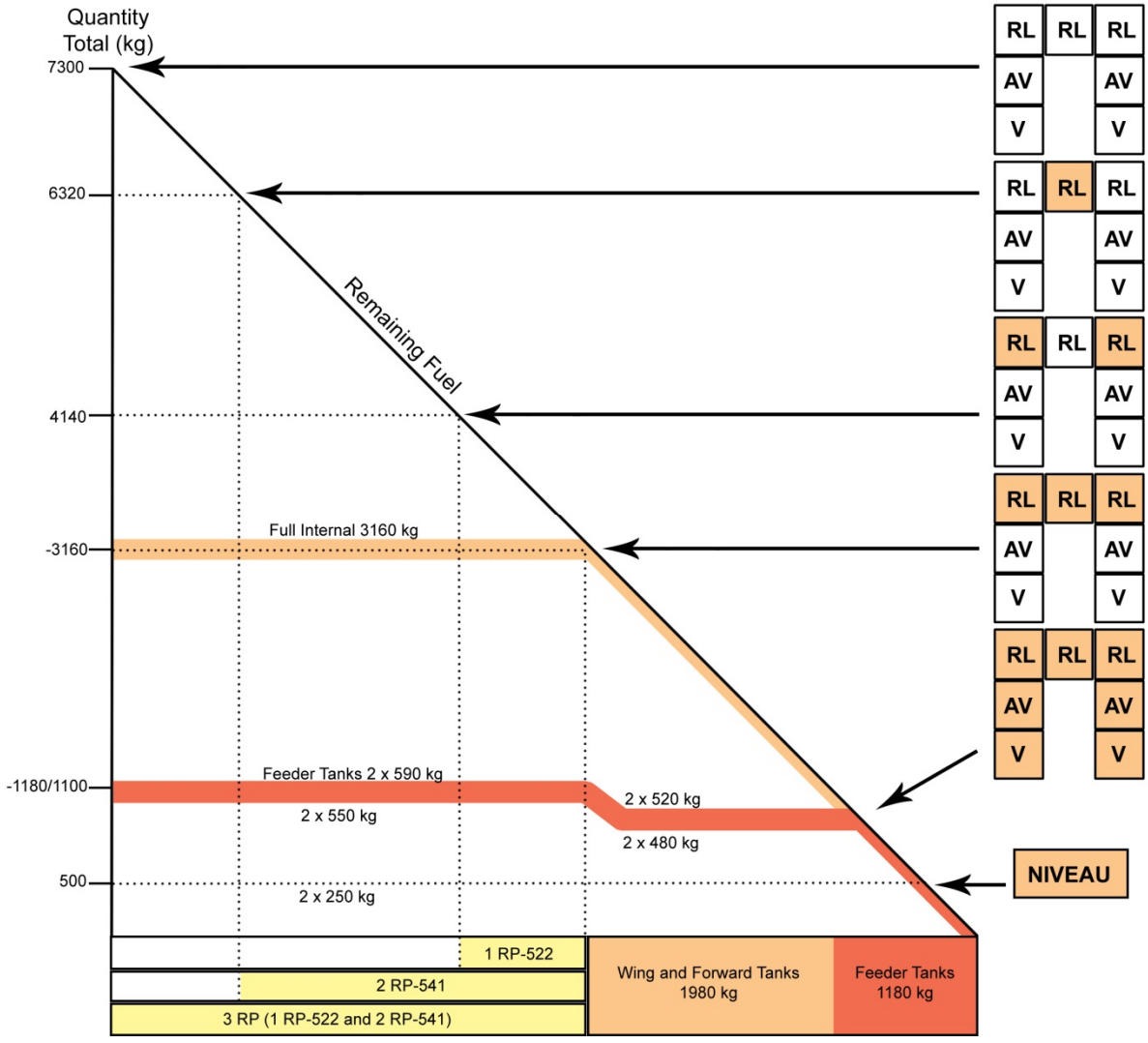
8. Internal Fuel Transfer Control
Allows the Fuel transfer to keep fuel level balanced.

9. TRANSF Test Switch
Test Fuel Transfer circuit.

Fuel warning lights

The fuel warning lights indicates when a given fuel tank is empty. It consists of three groups:
RL = External fuel tanks. There is one light for each tank.
AV = Forward fuselage tanks. There is one light for each group: Left and Right.
V = Wing fuel tanks. There is one light for each group: Left and Right.

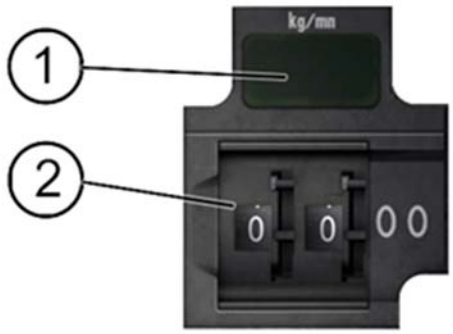
The following image show when each group of lights are lit and the amount of fuel remaining at the time.



The Master Warning **NIVEAU** light will turn on when the fuel remaining fells below 500 Kgs. At that time, you have a few minutes before flameout.

Fuel Flow Gauge and Bingo fuel selector

Located on the Main Panel it displays the fuel flow and controls the Bingo fuel alarm.



1. Fuel Flow
Displays the engine fuel consumption in kilograms per minute Kg/mn

2. Bingo fuel selector
The drums are used to activate the Bingo Fuel Alarm

Note: "Bingo" is used to indicate the minimum amount of fuel required for a safe return to base. If an aircraft keeps flying after the "Bingo" mark it will require air refueling to return.

External tanks fuel dump switch.

The M-2000C can only dump the fuel that exist in the external tanks. The switch that controls the fuel dump is located in the rear of the left instrument panel, above the FBW and Autopilot Test Panel. It is a guarded switch with a yellow/black stripped cover. Once opened, you cannot close the dump valve.

Fuel Dump Times:
RP-522 = 2m30s
RP-541 = 4m

Fuel boost pumps.

The aircraft has two boost pumps to ensure fuel flow into the engine during inverted flight. The time of inverted flight is limited to 15 seconds and only if the level in the feeder tanks is equal or above 320 Kgs each when inverted flight is entered.

The switches for the fuel boost pumps are located in the Engine Start Panel.

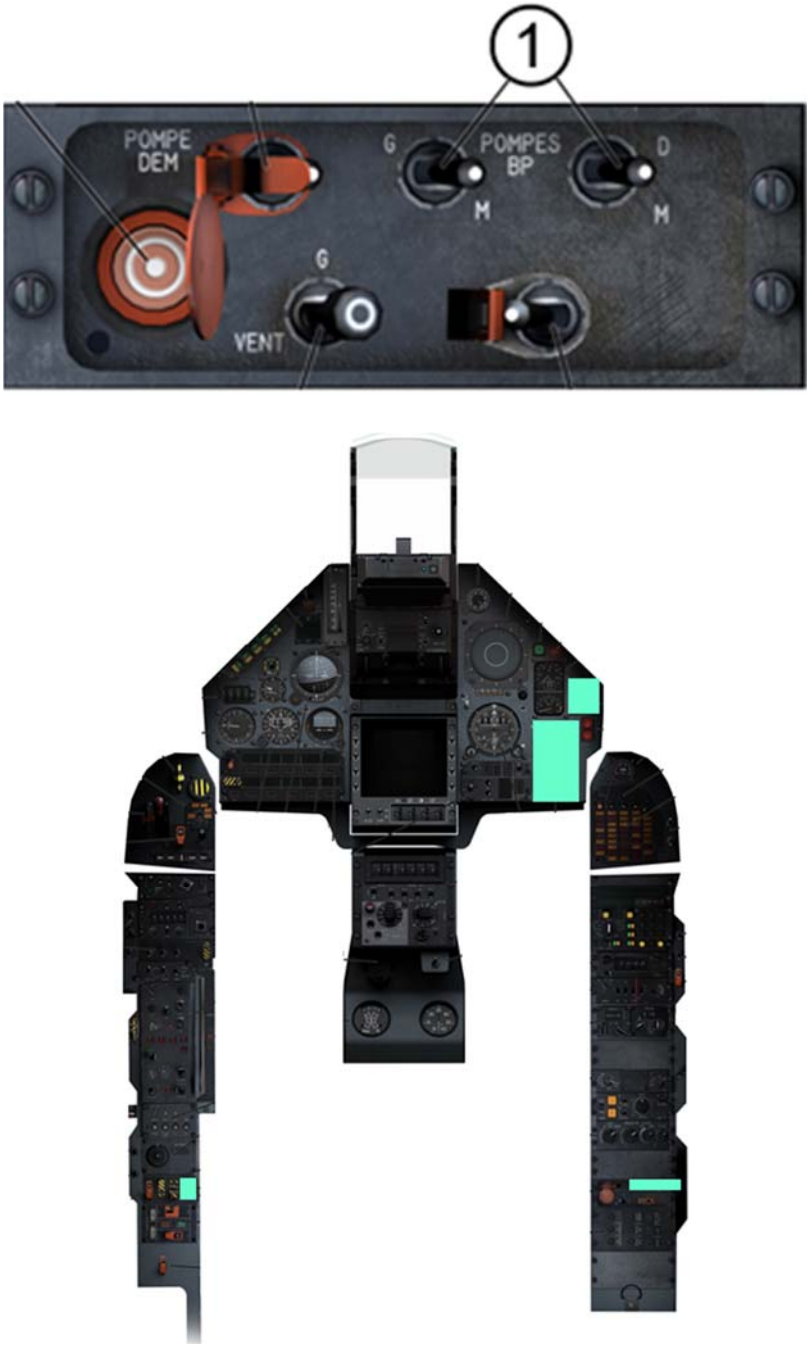


Figure 2 Fuel panels locations

Chapter 4: Electrical Power Supply System

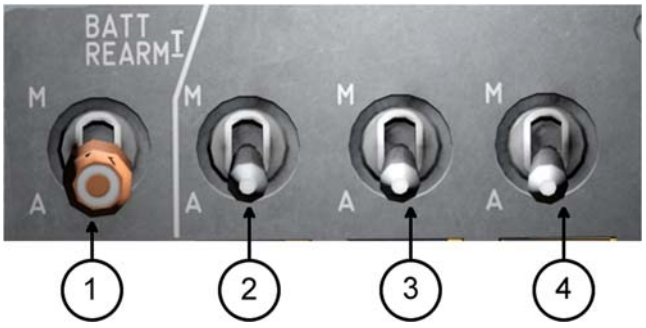
The M-2000C power supply system consists of an alternating current (AC) and a direct current (DC) circuits.

- 2 115/200 volts 20 KVA triphasic alternators (57 A per phase).
- 2 150A/28V transformers- regulators (one for normal use, the other for emergencies).
- 1 24 volts 40A/h rechargeable battery.
- 1 200VA power converter.
- 1 100 VA triphasic converter for the flight computer.

The aircraft also has connectors for external power supply (very often used when on the ground, to keep battery life up)..

Electrical Power Controls

The aircraft power supply is controlled by a four switch bank located on top of the right instruments panel, just above the Warning/Caution Lights panel.



1. Master Battery Switch
2. Main Transformer Switch
3. Alternator 1 Switch
4. Alternator 2 Switch.

Figure 3Circuit breaker panel

Figure 4 Power Supply panels

Electrical Power Warning Lights

ALT 1	Alternator 1 is disconnected
ALT 2	Alternator 2 is disconnected
BATT	Main battery is disconnected
TRN	Transformer contact is open.

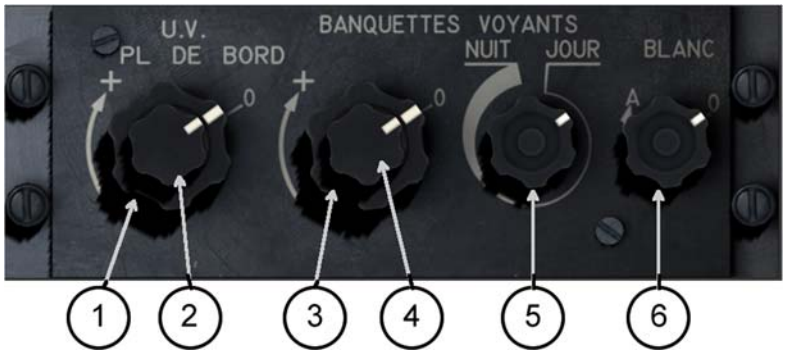
Chapter 5: Lighting

Interior lights.

The interior lights consist of:

- Main panel instruments backlighting
- Side panels instruments backlighting
- Red flood lights for low vision use.
- White flood lights.

The panel is located on the right instruments panel, below the Air Conditioning panel. Interior lights are fed from the battery

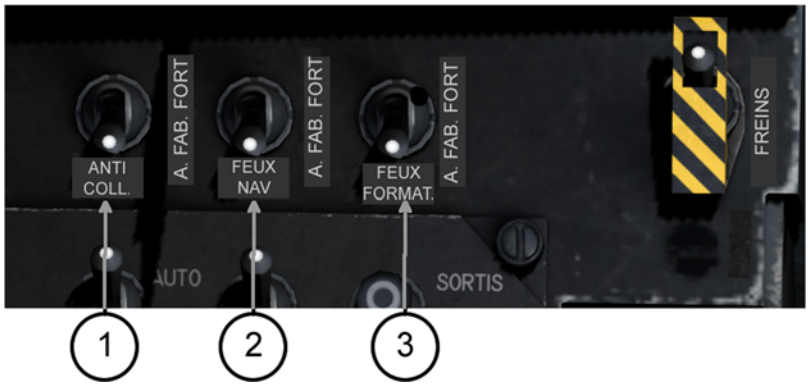


1. Cockpit flood lights (red)
2. Main Instruments panel backlight.
3. Cockpit flood lights (white)
4. Side Instruments panels backlight.
5. Not used.
6. Not used.

Exterior lights.

The exterior lights consist of:

- 3 navigation lights, controlled by the “FEUX NAV” switch.
- 6 formation lights, controlled by the “FEUX FORMAT” switch.
- 2 anti-collision lights, controlled by the “ANTI COLL” switch.
- 1 Police searchlight on the left side of the aircraft. Used to identify unknown aircrafts. The switch is located in the left instruments panel, labeled “PHARE POLICE”. When On, the trigger at the left of the throttle controls the searchlight On/Off (otherwise this trigger:
    - 2 air-refueling lights:
    - 1 foldable light mounted on the right-hand fuselage to light the basket and
    - 1 Light on the tip on the aircraft nose, at the bottom of the air refueling probe, to enlighten the tip of the probe; both are enabled by the “RVT” mode switch, and their intensity controlled by the “PHARE RAVIT” knob.)
- 2 Landing/taxi lights in the nose wheel, controlled by the “PHARES” switch in the left instruments panel. The switch has three positions: Off, Taxiing and Landing. The lights are automatically disconnected when the landing gear is raised.



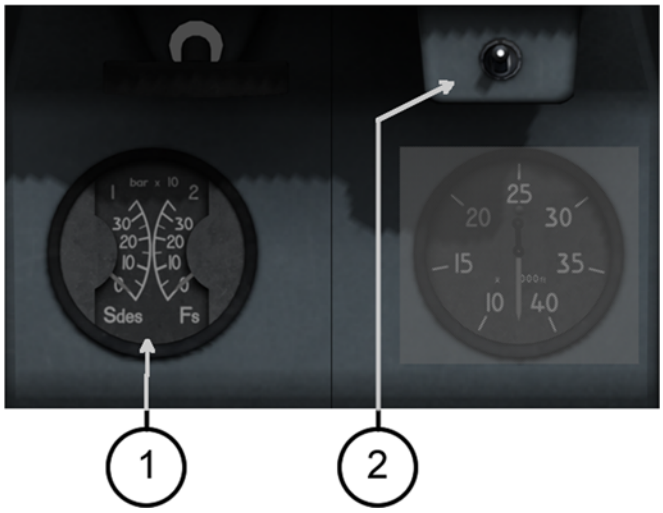
1. Anti-collision lights.
2. Navigation lights
3. Formation lights

Figure 5 Internal and External lights panels

Chapter 6: Hydraulic System

The aircraft's hydraulic system includes two independent systems with the same power. Each system has a 110 liter/min self-regulating pump with 280 bars of pressure. Additionally, there is a reserve electrical pump (EP) which is connected to system 2 and that automatically starts when the pressure in system 2 fells below 160 bars. This pump provides 190 bars of pressure only, for flight controls and parking brake/emergency brakes accumulator.

Hydraulic System Controls and Gauges



1. Hydraulic Pressure Gauge
2. Hydraulic System selector (for gauge display).

Hydraulic System feeds description

System 1	• Air brakes • Slats (becs) • Engine shock cones (souris) • Engine scoops (pelles) • Landing gear (normal) • Wheel brakes (normal).
System 2	• Emergency landing gear actuator. • NWS • Emergency brakes • Parking brakes.

Hydraulic System Warning Lights

HYD 1	System 1 pressure is below 195 bars
HYD 2	System 2 pressure is below 195 bars
HYDS	System 2 pressure is below 140 bars, or the EP switch is in Off.
EP	The reserve pump (EP) is active.

Figure 6 Hydraulic System Panels

Chapter 7: Flight Controls

Description

The M-2000C has a Fly-By-Wire (FBW) system with 4 channels of control plus a fifth emergency one. The FBW allows the aircraft to:

- Control an unstable aircraft, especially when carrying external stores which have a significant impact on performance.
- Help the pilot to prevent loss of control by overriding flight commands that are outside their parameters.

Mobile surfaces.

- 4 elevons for pitch and roll control.
- 1 rudder
- 2 pairs of automatic slats (becs).

The elevons and the rudder are controlled by an electro-hydraulic servo connected to the two hydraulic circuits (HYD1 and HYD2). The servos are connected to two motor-servos (NORMAL and EMERGENCY).

The slats are controlled by a pair of motors that are actuated by HYD1 and move depending on the flight conditions.

Normal Operation

Elevators

Stick displacement:

Up	Elastic stop at 43.2 mm Mechanical stop at 54 mm.
Down	Mechanical stop at 30 mm.

The elastic stop provides a restraint that limits the load factor or AOA while allowing override during hard maneuvers.

The stick movement is filtered and reduced so that the total displacement + trim does not exceed the elastic stop unless that is the pilot's will. The deflection order has an airspeed limiter to prevent high loads.

Flight commands are regulated to avoid high Gs when speeds are above 300 knots.

The control stick allows the pilot to control the load factor.

At low airspeed, the AOA is the primary parameter for flight control.

The aircraft stabilization is a function of load factor, pitch angle, AOA and dynamic pressure.

Ailerons

Stick displacement: ±12º

The stick movement is filtered and reduced to maintain the roll speed limit, as a function of elevator command and load factor in order to reduce the roll speed and acceleration during high AOA and wing loads.

The aileron trim is added to the stick movement.

Aircraft stabilization is achieved as a function of roll angular speed.

Rudder

Pedals displacement: ± 28.5 mm.

Rudder authority is limited by stick pull-up command.

A transverse accelerometer provides static stabilization.

A yaw gyro provides with dynamic dampening.

There is a yaw stabilization function that maintains zero lateral acceleration during steady flight (no cross maneuvers). If active, rudder trim is redundant since both devices tend to cancel each other out. Yaw stabilization is particularly important in aiding fast rolling and turning coordination to prevent departure from controlled flight.

ATTENTION

The rudder has a limited role in steering the aircraft. It is unnecessary except in certain regiments as during air refueling, air-to-ground targeting or crosswind landing. To cover the latter case, the authority of the rudder is increased when the landing gear is down.

Fly-By-Wire

Slats (becs)

The automatic slats are controlled by AOA. They begin to operate at α = 4º and are fully extended when α = 10º. Extension depends on speed and mach. The slats are automatically retracted when the landing gear is down.

> **ATTENTION**
> To cover certain cases when landing speed is too low due to engine damage, the slats can be extended manually, when the landing gear is down, by clicking the **BECS** switch to the **SORTIS** position.

The **DECOL** (DÉCOLLAGE/TAKE-OFF CONFIG) warning light turns on if:

- The cover for the FBW test switch is open.
- The FBW test warning light is red.
- The aircraft is not trimmed for take-off
- Emergency trim is selected.
- **BECS** switch is not in the **AUTO** position.
- **ANEMO** switch is in the **OFF** position

Figure 7 BECS (slats) switch

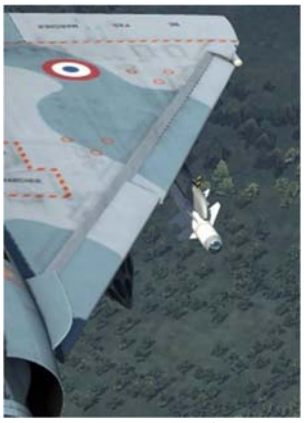


Figure 8 Wing slats

FBW Modes Switch

The FBW mode switch is used by the pilot to adapt the FBW system to the stores loaded into the aircraft. There are two modes Air/Air and Charges (Load).

Air/Air Mode (Default)

- Limits load factor for the elevator elastic stop to 8.5 g (± 0.5 g).
- Limits AOA to 27º when speeds are under 100 knots, otherwise the limit is 29º
- Limits the roll speed and angular acceleration to 270º/sec.
- Audio warning when alpha >= 29º, stick at full aft position, or indicated air speed below 100 knots.

This mode is allowed when the aircraft is clean (no loads), or with a load limited to air-to-air missiles (Magic and/or 530D) and an empty centerline fueltank.

Charges Mode

- Limits load factor for the elevator elastic stop to 5.5 g (± 0.5 g).
- Audio warning when alpha >= 20º. The pilot must abide to this limit by himself.
- Limits pilot roll command based on load factor.
- Limits roll angular speed to 150º/sec.

This mode must be used when the aircraft carries any of the following load: non-empty centerline droppable fuel tank, any wing droppable fuel tank, any bomb or rockets pod.

Degraded mode operation

To be described in full release manual

Emergency mode operation

To be described in full release manual

Controls

Figure 9 FBW Mode switch

Figure 10FBW Mode switch location

FBW Warning Lights

MAN	Damage to the control gyros (roll and yaw).
DOM	Damage to flight control surfaces control.
BECS	Slats functionality is compromised
GAIN	Emergency FBW computer in use
US EL	“LAST EMERGENCY” enabled.
DECOL	Take-Off configuration incorrect (refer to the Slats entry).
α	Damage to AOA sensors.

Trim System

To be described in full release manual

Automatic Pilot

Description

The Automatic Pilot (AP) have two operational modes:

Basic mode

Attitude hold (pitch and heading). If the roll angle is higher than 10º when the AP is engaged, then instead of heading hold, the AP will hold the roll angle.

NOTE: WHEN AP IS ENGAGED, THE PILOT CAN USE THE TRIM HAT OF THE STICK TO COMMAND A TURN OR A CLIMB/DIVE.

Advanced mode

- Current altitude hold.
- Selected altitude hold.
- Localizer and Glideslope hold (Approach hold). In this mode the AP automatically follows an ILS course and glideslope to the runway threshold (Autoland).

Normal Operation

Operational limits

Max altitude	50,000 feet	
Max pitch angle	40º	
Max AOA	18º	
Max Roll	65º (will return to 60º when engaged)	
Max speed	50 KIAS less than the operational limit for current configuration	
Minimum speed	200 KIAS	
Minimum altitude	Normal mode:	500 feet
	Localizer and Glideslope hold	200 feet
	Selected altitude hold	1,000 feet

AP engagement/disconnect.

1. Click on the P A button in the PA control panel. The P light will turn on, indicating that the PA system is armed.
2. Click again on the P A button. The P light will turn off and the A light will turn on, indicating that the PA system is engaged.

Current Altitude Hold.

1. Click on the ALT button. The light turns on indicating that the system is armed.
2. Click again on the ALT button. The ALT light turns on and the aircraft will level at the current altitude.

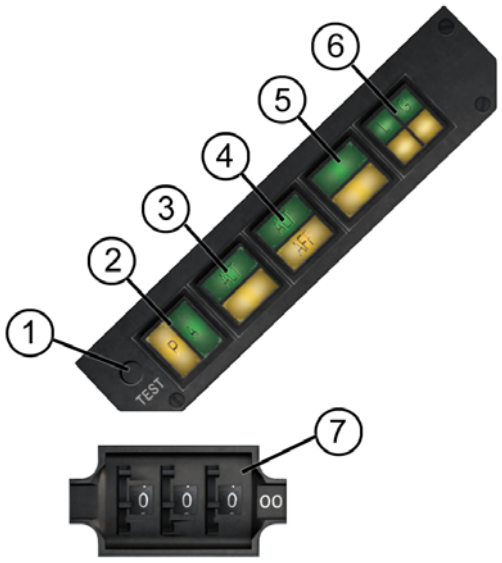
Selected Altitude Hold.

1. Select the desired altitude by clicking on the selector drums. Minimum altitude is 1,000 feet.
2. Click on the ALT AFF button. The AFF light turns on indicating that the system is armed.
3. Click again on the ALT AFF button. The ALT light turns on and the aircraft will level at the selected altitude.

Localizer and Glideslope Hold.

This AP function is not available on the Beta version.

Controls



1. Autopilot test button.
2. Autopilot Master Switch.
3. Altitude Hold button.
4. Selected Altitude Hold button.
5. Not used.
6. Localizer and Glideslop Hold button.
7. Altitude Selector Drums.

Figure 11 Autopilot panel location

Warning Lights

The **AP** light will turn on in case of any problem with the AP system.

Chapter 8: Landing Gear

The M-2000C has a tricycle landing gear. The nose wheel is composed of two small tires and has a steering assembly. The main gears have a single large tire and are equipped with carbon disk brakes. The aircraft is equipped with an anti-skid system and a parking brake.

They are operated by the HYD1 system with the HYD2 for emergency use.

Controls

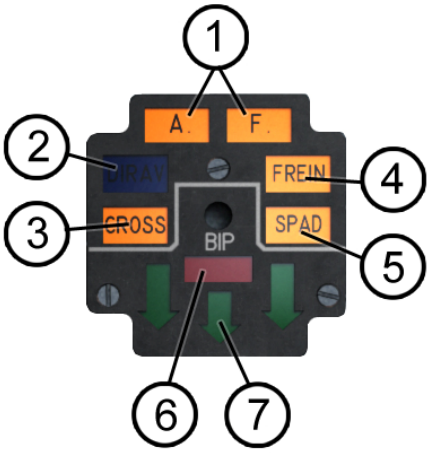


Figure 12 Landing gear panel

Figure 13Landing gear controls locations

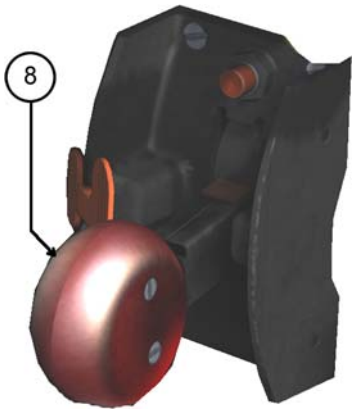


Figure 14Landing gear lever

Figure 15Anti-Skid switch

1. AF (short for Aéro Freins, Air brakes advisory lights.
2. DIRAV (short for Dirigeabilité Roue Avant, Nose Wheel Steering) advisory light.
3. CROSS (short for Crosse, Tailhook) advisory light
4. FREIN (Brakes) advisory light
5. SPAD (Système Perfectionné Anti-Dérapant, Anti-Skid) warning light
6. 3xLanding Gear in transit advisory lights
7. Landing Gear Down and Locked advisory light
8. Combination Landing Gear Handle and Landing Gear Warning light.

Warning Lights

- The A and F advisory lights turn on when the airbrakes are activated.
- The DIRAV advisory light turns on when the NSW system is engaged. Be aware that the light remains ON when it automatically disconnects when ground speed is over 40 knots.
- The FREIN advisory light turns on when wheel brakes are applied.
- The SPAD warning light flashes when the landing gear is in transition. Remains On if the anti-skid system automatic test fails.
- The PARK warning light turns on when the parking brake is set.
- The landing gear warning light flashes when:
    - Landing gear is down and speed is above 260 KIAS.
    - Landing gear is up and speed drops below 230 KIAS.
    - The warning light is accompanied by a warning horn. The warning horn is only active when the aircraft systems are in NAV or APP modes.

Precautions

- The NWS is very sensitive, especially at speeds above 30 knots GS.
- The NWS automatically disconnects when speed is over 40 knots GS.
- After landing AVOID applying brakes until your speed is below 100 knots. Prefer aero-braking at higher speeds.
- The braking should be made with “press and release” technique: apply brakes one second, release for one second, apply again… and so on.
- The aircraft is very sensitive to rudder when rolling for take-off or landing, even if the NSW is not active.

Chapter 9: Flight Instruments

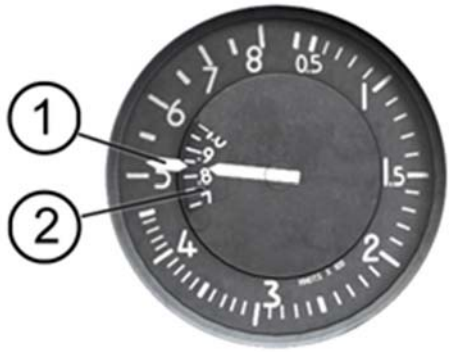
Altitude Indicator

The Altitude Indicator displays the Aircraft's barometric altitude in feet above mean sea level in feet. The readings are taken from the pitot tube on the nose of the aircraft.

1. Hundreds feet indicator.
2. Thousands feet indicators
3. Barometric setting adjustment knob.
4. Barometric setting display (in millibars).

Airspeed Indicator

The Air Speed Indicator displays the Aircraft's speed in knots and mach. The needle rotates around the indicator to 800 Knots. While the Mach wheel rotates underneath, correlating to the knots' needle position to display the mach.



1. Knots indicator
2. Mach indicator

Vertical Velocity Indicator

Displays the aircraft vertical velocity in feet/min. The number represents 1000 feet.

Attitude Direction Indicator ADI ("Boule")

The Attitude Direction Indicator displays the Aircraft's pitch, bank, and compass heading direction. The pitch markings on the sphere are in graduations of 5°, the Bank markings begin at 10° increments with major markings at to 30°, then 45°, and 60°. Signals are received from the pitot and INS system.

The ADI also displays Localizer and Glide slope information for ILS landing and steer modes.

1. Roll angle indicator
2. Off flag
3. Aircraft symbol (fixed)
4. Marker light
5. Turn slip ball
6. Course deviation needle
7. Glideslope deviation needle
8. Cage knob

AOA Indicator

The AOA Indicator displays the Aircraft's Angle of Attack. The markings go from -2º to 32º of AOA, with a green mark at 14 degrees for optimal glide pitch during landing approaches.

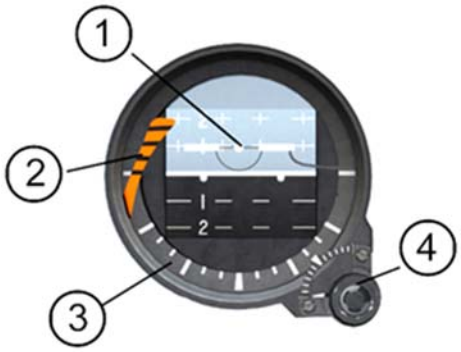
The AOA Indicator sounds an alarm when AOA values approach the aircraft flight limits. The AOA limits are configured depending on the FBW's mode switch.

The warning sound cannot be switched off and will remain on while the extreme flight condition remains.

An OFF flag appears when for any reason the AOA indicator is not operational.

Standby Attitude Indicator

The Standby attitude indicator is an independent instrument that provides pitch and roll information in case of the main ADI failure



1. Aircraft symbol (adjustable).
2. OFF flag.
3. Roll angle indicator.
4. Cage/Aircraft symbol adjustment knob.

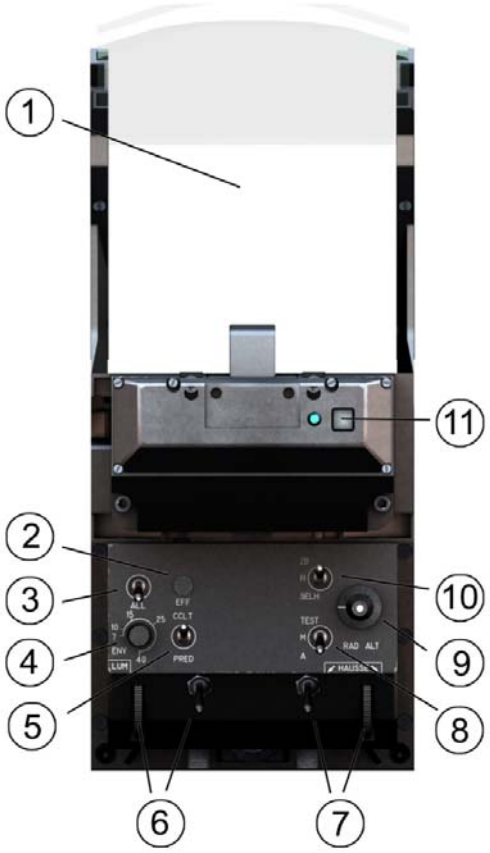
G Force Indicator

Displays the vertical acceleration forces experienced by both the aircraft and the pilot.

Chapter 10: Heads Up Display HUD

The HUD control panel is located on the center and top of the Main Instruments panel. The HUD displays navigation, flight control and weapons delivery information in symbolic and alphanumeric format. HUD navigation, flight and weapons symbols are positioned depending on display mode (Master Mode) selected.

Controls



1. Reticle glass.
2. EFF switch.
3. Symbology de-clutter switch.
4. Target wingspan scale.
5. Gun piper selector.
6. Power switch and brightness control.
7. Backup fixed sight and boresight adjustment.
8. Radar altimeter switch:
9. Minimum altitude selector
10. Altitude display selector:
    a. ZB: Barometric.
    b. H: Radar altimeter.
    c. HG: Minimum altitude.
11. Gun camera switch.

Operation

To turn on the HUD, click on the power switch once. The next click will activate the self-test.

Altitude display

By default, only barometric altitude, Mean Sea Level altitude, is shown, if you require Above Ground Level altitude you must activate the radar altimeter:

1. Click on the radar altimeter switch once. The next click will activate the self-test.
2. Click on the altimeter selector switch. By default, it will be in the ZB (barometric altitude) position. Click once to put it in the H (radar altimeter) position.
3. Both the barometric and radar altitudes will be visible in the HUD.

Be aware that the radar altimeter has a limit of 5,000 feet AGL. Asterisks will be displayed when the aircraft AGL altitude is above 5,000 feet. Asterisks will also be displayed whenever the aircraft roll angle is higher than 20º, since at that angle the radar altimeter beam cannot give a reliable measure.

Minimum Altitude display

The Minimum Altitude (MA) display indicates the minimum safe altitude that you can fly. During landings and when the HUD is in APP (approach) mode, the MA also works as the Decision Height selector.

To operate the MA you need to have the radar altimeter activated. To activate it, you only need to click the altimeter selector to the HG position. The MA display will appear below the AGL altitude display.

To select the desired MA value, click on the knob located between the radar altimeter and the altimeter selector switches. The values will change in tens of feet.
Left click increases the value.
Right click decreases the value.

De-clutter switch (ALL)

The de-clutter switch suppresses some of the HUD's symbols in order to clear the display for a better view forward. By default, it is in the Off position.

Target Wingspan scale (ENV)

See Guns under AA mode.

Gun piper selector

See Guns under AA mode.

Backup fixed sight and boresight adjustment

Not available in Open Beta.

Operational Modes

The HUD display information based on the current operational mode, also known as Master Mode. The HUD current Master Mode is selected by the Armament Control Panel.

There are three main Master Modes and each one have their own sub-modes:

1. Navigation NAV
    a. Normal, (or Taxi/Take-Off, engaged automatically by weight-on-wheels sensor)
    b. Approach APP
2. Air-to-Air AA
    a. Guns
    b. Magic
    c. 530
3. Air-to-Ground
    a. Guns/Rockets
    b. CCRP
    c. CCIP
4. Interception Director
5. Auxiliary Gunsight

HUD Display

No matter what Master Mode/Sub-mode is active all of them share the following data:

Note: The HUD's waterline, the aircraft's vertical reference against which several readings are compared, is located slightly below the Heading scale. There are no visible representations of its position in the HUD. In the image below, the dotted red line indicates the waterline position.

1. **Indicated Air Speed (IAS)**
   Located to the left of the Heading Scale, it shows the current aircraft speed in knots. The display is only shown when the airspeed is above 30 knots.

2. **Heading Scale (HS)**
   The Heading Scale moves horizontally against a fixed caret index indicating aircraft magnetic heading from 0º to 360º. The scale is numbered every 10 degrees, with a dot representing the 5 degree halfway mark between two numbers. The two-digit display is expressed in degrees x 10; e.g.: 10º is displayed 01 and 250º is displayed 25.

3. **Barometric Altitude (BA)**
   Located to the right of the Heading Scale, it shows the current aircraft altitude above sea level. The numbers representing values below one hundred are shown in a smaller font.

4. **Flight Path Marker (FPM)**
   The Flight Path Marker also known as the Velocity Vector Indicator (VVI) is an aircraft shaped symbols that shows in the HUD where the aircraft's instantaneous flight path with respect to the earth. The wings of the symbol always remain parallel to the wings of the aircraft. The vertical relationship between the waterline and the FPM indicates true AOA. The FPM displacement from the HUD centerline indicates drift.

5. **Horizon Line (HL)**
   A component of the Flight Path Pitch Ladder, it indicates the relative position of the horizon. The higher the aircraft's altitude, the higher the position of the HL with respect of the actual horizon. When the FPM is at the same level of the HL, the aircraft is in level flight neither climbing nor descending.

6. **Flight Path Pitch Ladder (FPPL)**
   The vertical flight path angle of the aircraft is indicated by the position of the FPPL relative to the position of the FPM. The aircraft pitch attitude is indicated by the position of the HUD waterline with respect to the FPPL about the stabilized wings of the FPM. The HL and the FPPL angle lines are displayed for each 5º with the angle value being displayed every 10º between 0 and ±90º. Positive pitch lines are solid and negative pitch lines are dashed. The tabs at the end of each segment points towards the horizon.

7. **Acceleration Vector (AV)**

   The Acceleration Vector chevrons indicate the aircraft longitudinal acceleration. It is a way to display aircraft's current energy state visually. The AV chevrons move in relation to the FPM: when the chevrons and the FPM are at the same level, the aircraft is flying at a constant speed. If the chevrons are above the FPM, then the aircraft is accelerating. If the chevrons are below the FPM, the aircraft is decelerating. Chevron position above or below the FPM is relative to the acceleration rate.

8. **Mach number**

   The Mach number is displayed in all modes and only when the value is above 0.6 Mach.

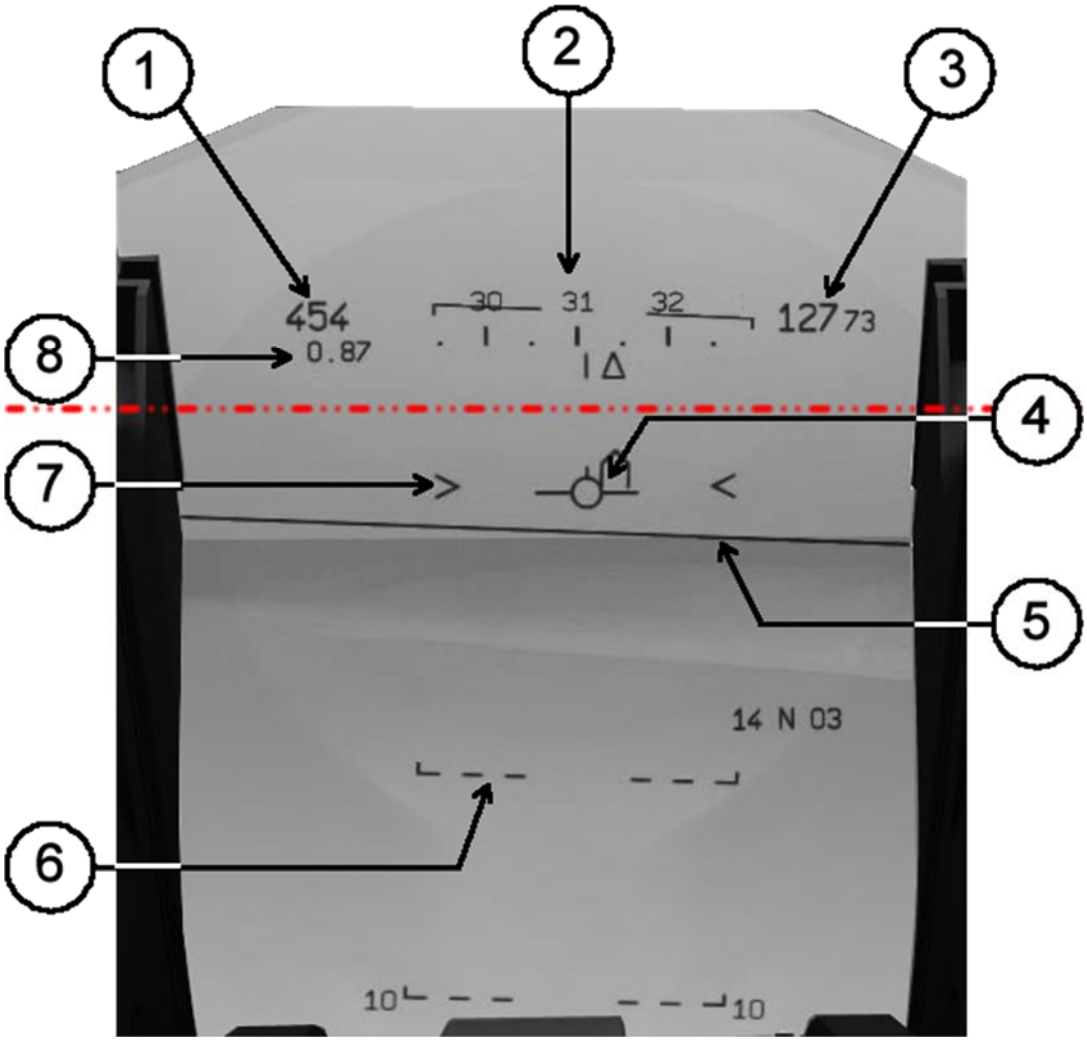
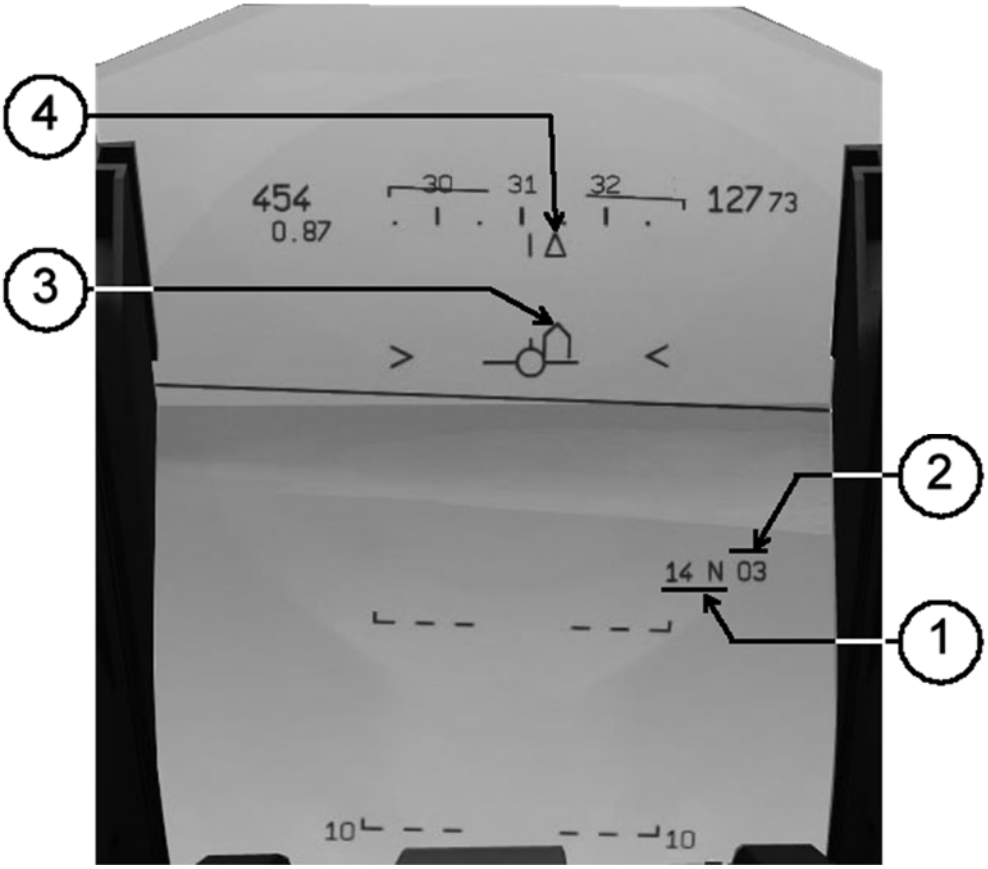


Figure 16 HUD common symbols. The waterline position is marked as a red dotted line (only as a reference, it is not visible in the aircraft).

NAV

Navigation model (NAV) is the aircraft's default Master Mode. It displays navigation data and provide steer instructions as indicated by the INS.



1. Distance to Waypoint (in nautical miles).
2. Waypoint number.
3. Waypoint track angle error.
4. Selected route (for Auto-Pilot).

Notes:

a. The waypoint track angle error follows the height of the FPM in the HUD.
b. When the distance to the waypoint is less than 10 nautical miles, the waypoint track angle error is substituted by a target cross which is placed at the exact geographical position of the waypoint.
c. When the distance is below 4 nautical miles, the waypoint symbols will tend to drift. This is normal since it is a secondary effect of the large circle navigation calculations being made by the INS.

d. The waypoint automatically changes to the next when distance is below 1.5 nautical miles.

APP

It is a sub mode of NAV and is used during landings. In this mode the HUD display ILS cues.

> **Note**: In APP mode the BA, HS and IAS move from the top of the combiner glass down to the center. In APP mode is necessary to move the seat up in order to increase the field of view.

Before glideslope capture

1. **Angle of Attack guide.**
   Indicates the optimum angle of attack for landing the aircraft. You must place both the FPM and the AV chevrons within the brackets for a perfect landing.
   The brackets represent an AOA value of 14º ± 0.5º

   Note: The analog AOA indicator (refer to the flight instruments chapter) also has the AOA for landing zone marked in green.

2. **Localizer deviation.**
   Indicates the angle of deviation to the localizer signal. It is visible only after the localizer capture.

3. **Localizer Symbol**
   The open box symbol represents the localizer station position in the horizon. It moves laterally depending on the signal angle of deviation. It is only visible after the localizer is captured.

4. **Runway Symbol**
   Represents the position of the runway on the horizon.

5. **Angle of Attack reading.**
   Displays current AOA value.

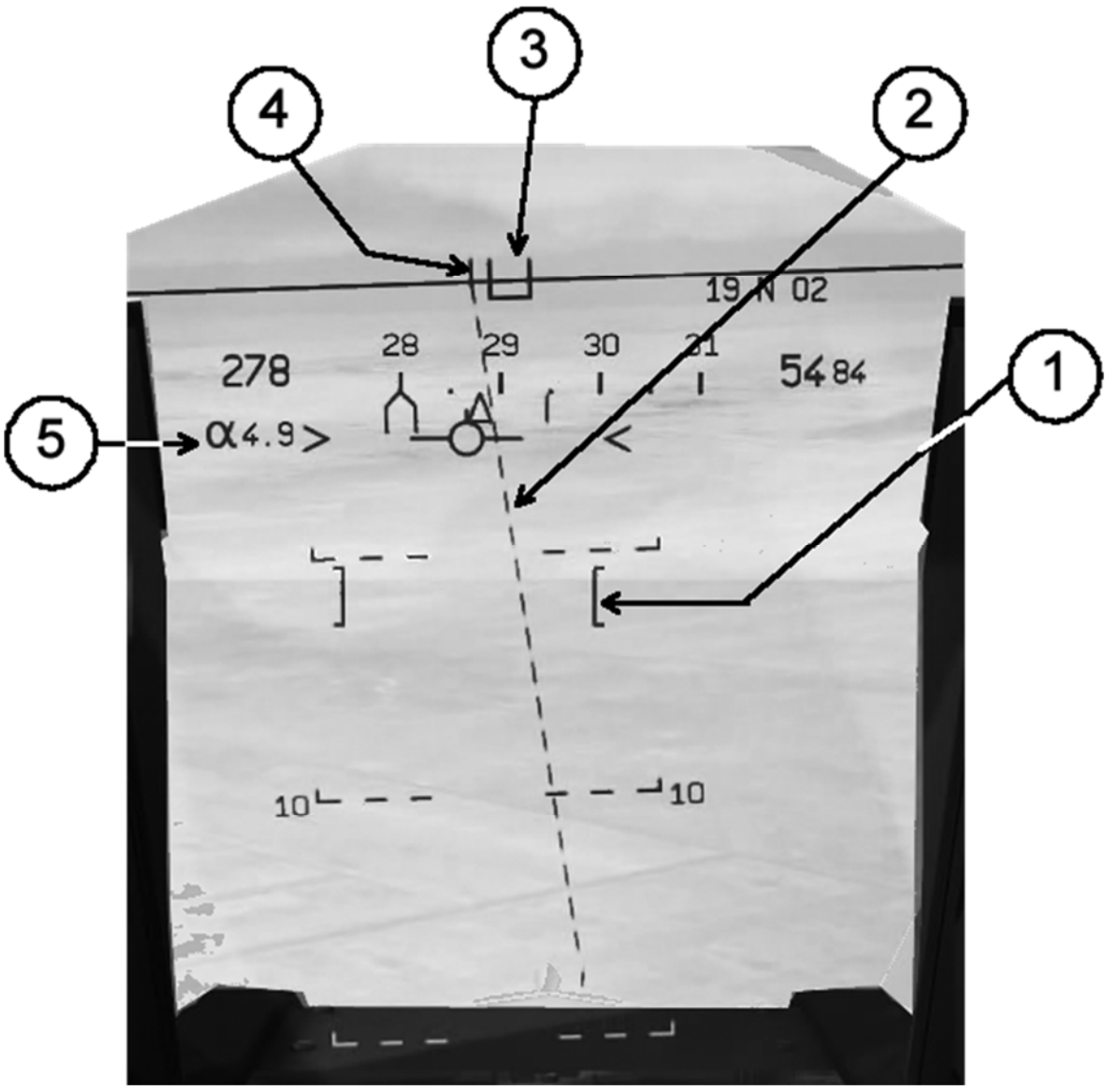


Figure 17HUD ILS display after localizer capture and before glideslope capture.

After glideslope capture

1. **ILS Guide**
   Visible only when both localizer and glideslope have been captured. It moves in relation to the FPM showing both glideslope and course deviation. To maintain a perfect approach, you have to place the FPM inside the box.

   If the deviation from either glideslope or course is too large, a flashing triangle (not shown) will appear indicating that a course/elevation change is required.

2. **Synthetic Runway**
   The synthetic runway symbol is an aid for locating the real runway, especially during low visibility conditions. It is only visible when:

a. The INS is on.
b. The airport is the current fly-to waypoint.
c. The runway data (heading and glideslope) were entered.
d. Both localizer and glideslope have been captured
e. The runway is less than 10 nautical miles away.
f. Lateral deviation is less than 7º.

The synthetic runway will be overlaid on top of the runway and the rectangle will grow as the distance to the runway decreases.

The synthetic runway is removed from the HUD as soon as there is weight on the landing gear's wheels.

3. Marker Symbol

The flashing "M" symbol is shown when the aircraft's system detects the airport's Outer, Middle and Inner markers.

4. Radar altitude

Shown below the FPM if the radar altimeter is On and when the radar altitude is below the Decision Height value.

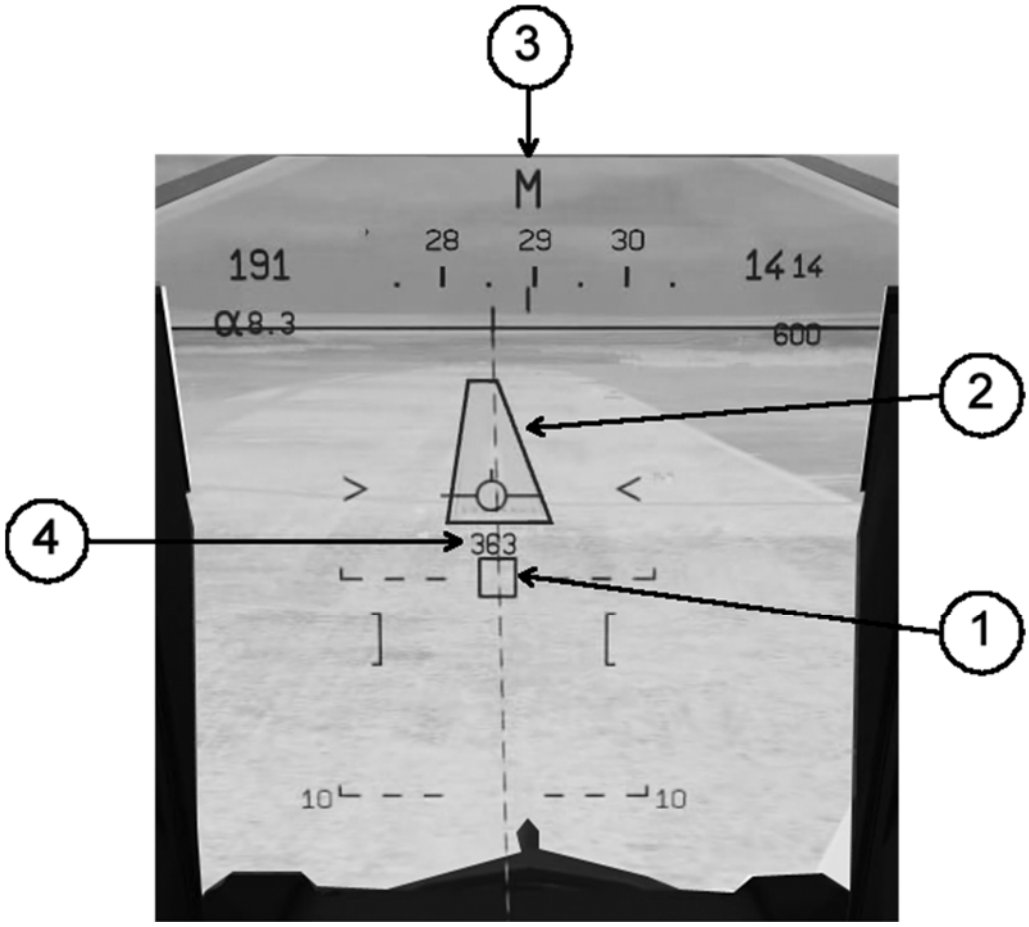


Figure 18 HUD ILS display after glideslope capture.

AA

As it names implies it is used for air-to-air combat. It has two weapons based sub modes: guns and missiles. No Navigation data is displayed in this mode.

Guns

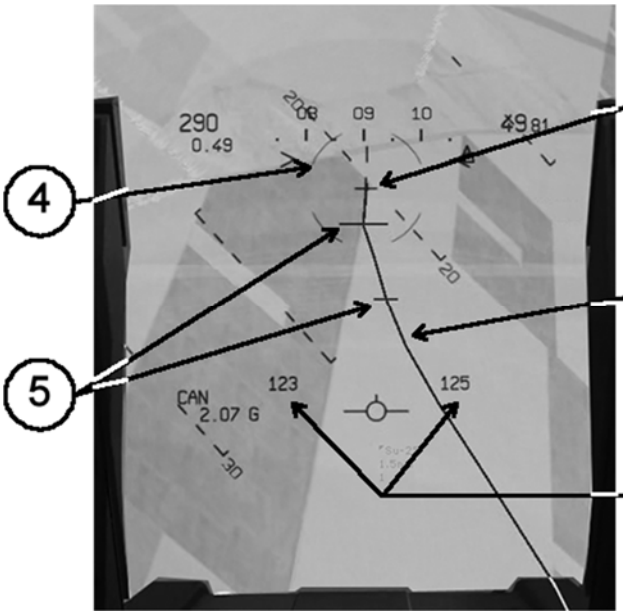


Figure 19 HUD AA Gun mode: No radar lock

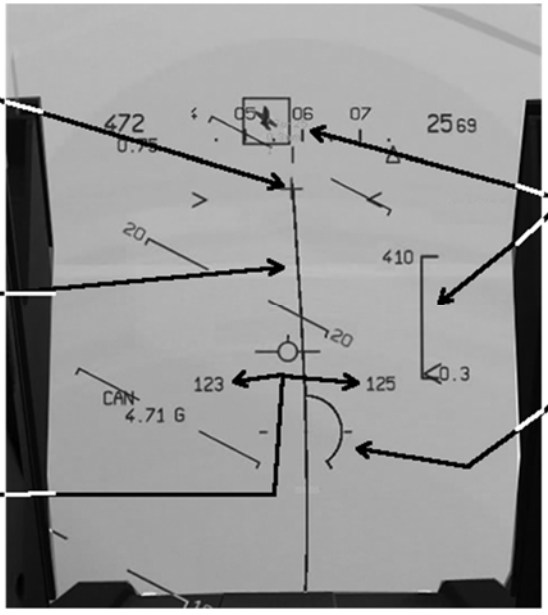


Figure 20 HUD AA Gun mode: No radar lock

1. **Gun Cross**
   Indicates the guns' boresight. It is placed on the conjunction of the HUD centerline and the aircraft's waterline. The boresight has a max range of 200 meters.

2. **Bullet path prediction (Gun Snake)**
   The gun snake shows the flying path of a stream of bullets fired for 25 seconds. It has a max range of 1,000 meters.

3. **Ammo count**
   Shows the current count of 30 mm ammunition for each gun.

4. **Close Combat mode designation**
   Indicates which close combat mode is being used.

5. **Wingspan markers**
   These lines are placed at the 300 and the 600 meter range in the gun snake and are used to represent a target wingspan in order to help determine its range. The wingspan marker are not static and its width can be dynamically changed by using the ENV knob (ENV is short for *envergure*, wingspan in French). The ENV knob

changes the wingspan marker width to represent a target from 7 meters up to 40 meters.

The wingspan markers are visible only when there is no radar lock.

6. **Radar gun piper**
   The radar gun piper indicates the exact range to an air target that has a radar lock. It moves alongside the gun snake, indicating the exact position of the target in the bullet stream.

7. **Radar lock elements**
   Please refer to the radar chapter for a description of these elements.

How to use the "gun snake"

The gun snake is an air gunnery targeting help. It depicts the path of a bullet stream fired for 25 seconds. The "tail" of the snake is located at the gun cross. The "head" of the snake ends at the 1000 meter range.

To hit a target you must put the gun snake alongside its flight path. You must take care of placing the target at the correct snake position based on its range. The closer to the gun cross, the lower the range.

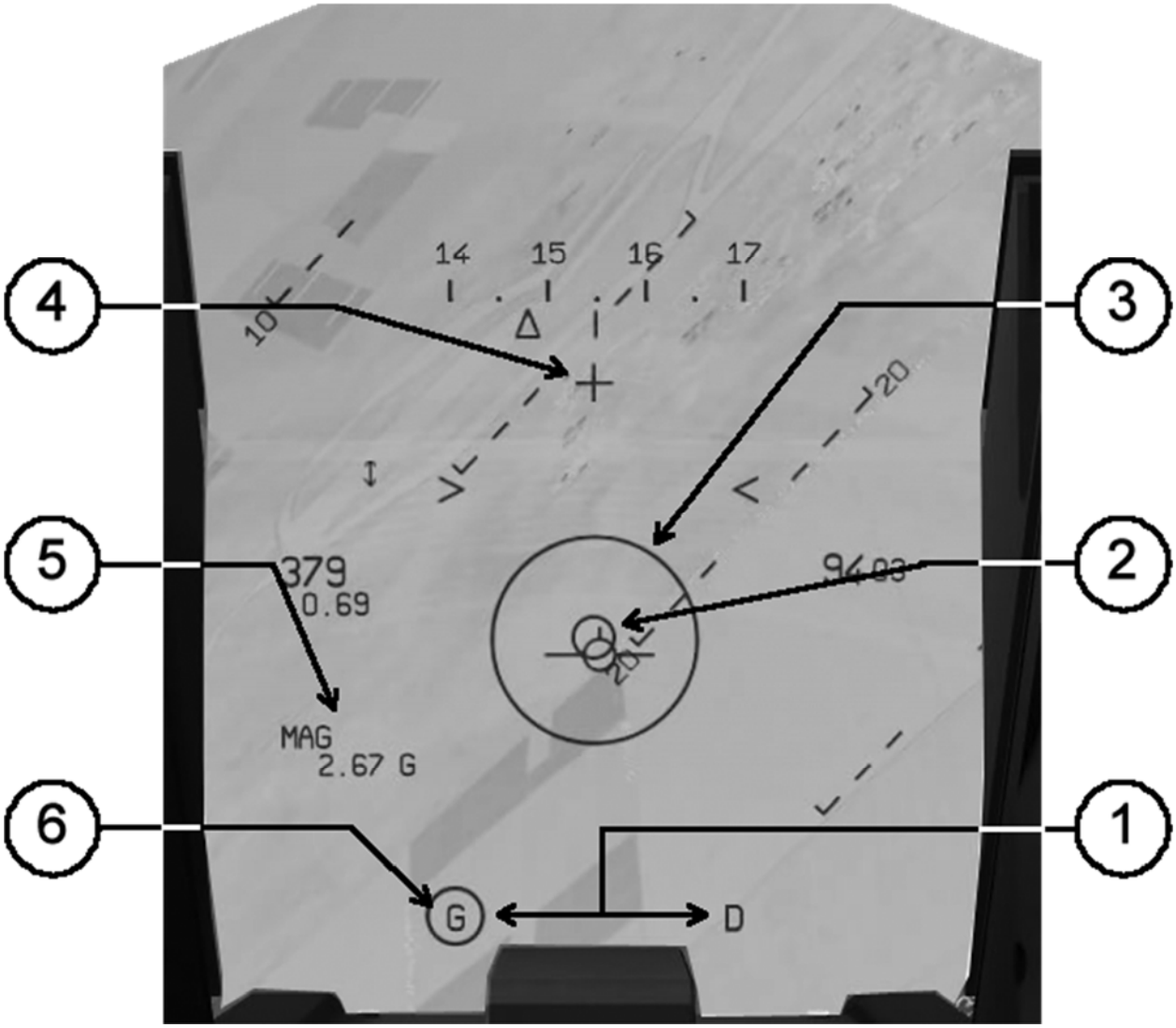
The wingspan markers are helpers to determine target range without the use of radar. When you manage to place a target's silhouette on the wingspan markers you can calculate a range approximation based on how wide the target is versus the wingspan marker's width. As you can see, a basic precondition is that you must know the approximate wingspan of your target and to adjust the wingspan marker to that value.

Once you have determined range to target, you place the target at the snake position where a hit is assured.

If you are using radar and your target has radar lock, the wingspan markers are replaced by the radar gun piper. The radar gun piper makes the gunnery easier by indicating the place in the gun snake where a hit is certain. You only have to put your target on the spot in the snake marked by the radar gun piper.

> Remember that the closer the target is to the gun cross, the lower the range. If you place a small silhouette near the gun cross you will miss since the actual range is higher. Conversely, if you place a large silhouette near the head of the snake, you will also miss since the range is lower.

Missiles



1. **Available missiles**
   Indicates how many missiles are available. G = Left (Gauche) and D = Right (Droit). The letter disappears when the corresponding missile has been fired.

2. **Seeker**
   Represents the missile seeker head. It only appears for Magic II missiles when a target is locked. The seeker will always move towards the selected target position.

3. **Flight Director Ring**
   Refer to the Interception Director subtitle for more details.

4. **Gun cross**
   Indicates aircraft boresight. It is located at the conjunction of HUD centerline and aircraft's waterline. Only available when Magic IIs are selected. This is the aiming point for the Magic II missiles.

5. **Attack mode data**
   Indicates selected weapon (name flashes when the Master arm switch is in the SAFE/OFF position). Aircraft G load and aircraft AOA.

6. **Selected weapon**
   Indicates which missile is ready to be fired. By default, the system selects first the left missile and later the right missile, but this order can be changed in the Armament Configuration Panel.

> **Note**: When Magic II missiles are selected, both the BA and IAS drop to the center of the HUD. The Heading Scale remains in its position at the top.

AG

This is the mode used for Air-to-Ground attacks. There are three weapons based sub modes: Guns/Rockets, CCRP and CCIP. For more information about CCRP and CCIP please refer to the Weapons Management chapter.

Guns/Rockets

This mode is used by both guns and Matra rockets because although they are different weapons, they share the same ballistics characteristics.

1. **Ammo count**
   Displays the current count of 30mm ammunition or 68 mm SNEB rockets.

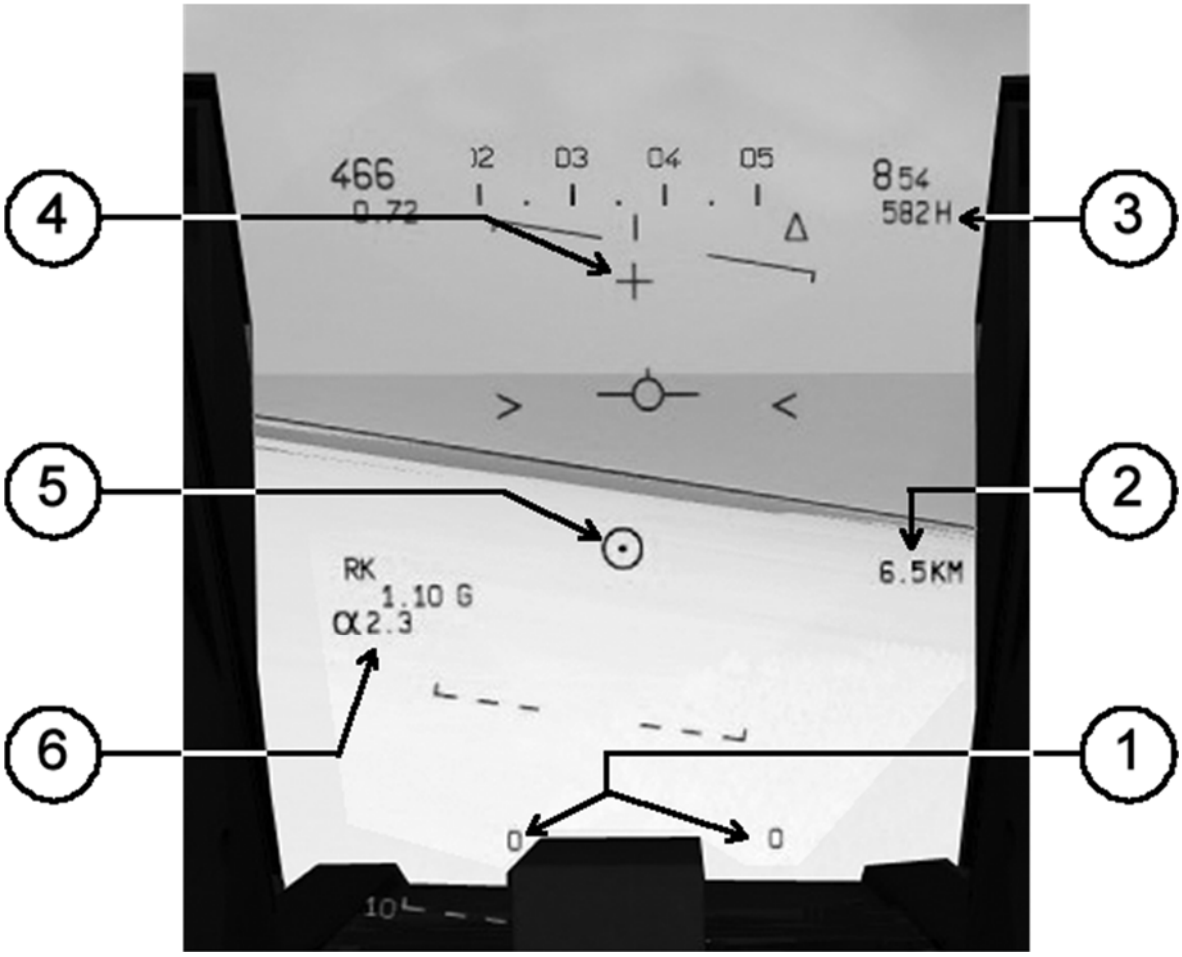
2. **Range to ground**
   Displays the current slant range to the ground at the point the piper is aiming. For more information, refer to the Weapons Management chapter.

3. **Radar altitude**
   Displays current altitude above ground level (AGL). The radar altitude is not automatically displayed and must be manually selected by clicking the appropriate switches in the HUD control panel.

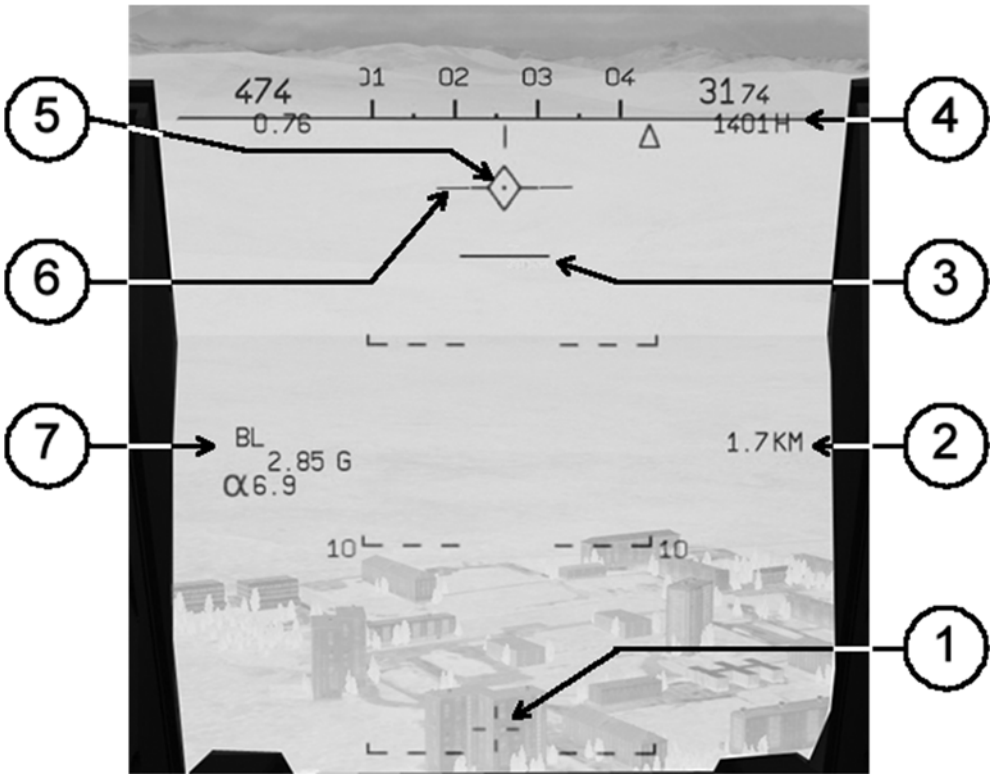
4. **Gun cross**
   Indicates aircraft boresight. It is located at the conjunction of HUD centerline and aircraft's waterline.

5. **Gun/Rocket piper**
   Indicates the point in the ground where the gun shells/SNEB rockets will hit. The aiming point is continuously calculated by the ballistics computer. For more information, refer to the Weapons Management chapter.

6. **Attack mode data**
   Indicates selected weapon (name flashes when the Master arm switch is in the SAFE/OFF position). Aircraft G load and aircraft AOA



CCRP



1. **Target cross**
   Shows the selected target position.

2. **Range to target**
   Indicates slant range to the target position.

3. **Release cue**
   The release cue moves from the target cross towards the CCRP piper. The bomb(s) must be released when the cue is at the center of the piper. The cue is time based and appear when time to target is 15 seconds.

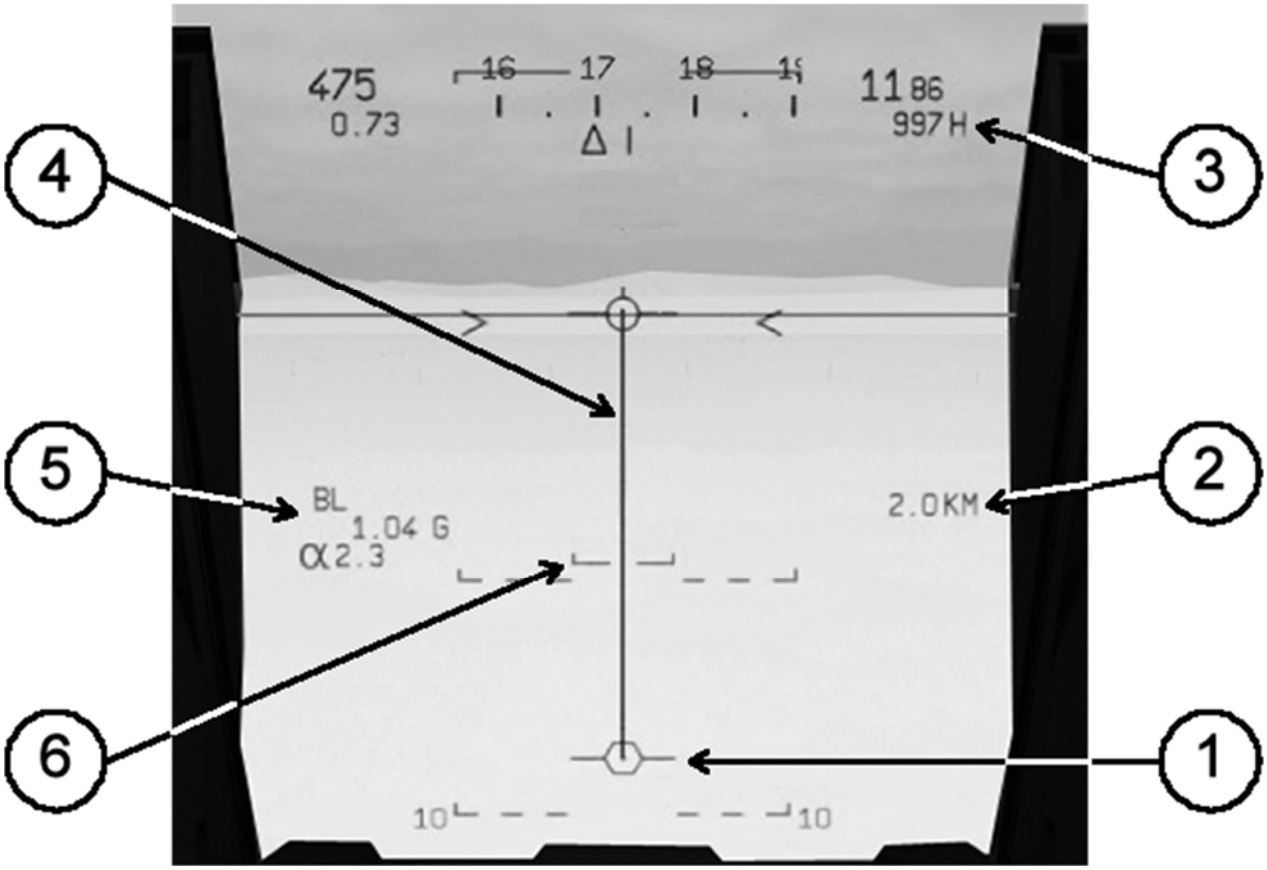
4. **Radar altitude**
   Displays current altitude above ground level (AGL). The radar altitude is not automatically displayed and must be manually selected by clicking the appropriate switches in the HUD control panel.

5. **CCRP pipper**
   It remains at a fixed point and replaces the FPM when in CCRP mode. Before target selection, it is used to select a point in the ground as the target. After target selection, it is used to give the bomb release order.

6. **CCRP steering cues**
   They appear only after a target point has been selected. They are centered on the CCRP piper and rotate to show deviation from the course to target. The aircraft is flying directly to the target when they are level.

7. **Attack mode data**
   Indicates selected weapon (name flashes when the Master arm switch is in the SAFE/OFF position). Aircraft G load and aircraft AOA

CCIP



1. **CCIP pipper**
   Aiming point where the bombs will impact.

2. **Range to ground**
   Displays the current slant range to the ground at the point the piper is aiming. For more information, refer to the Weapons Management chapter.

3. **Radar altitude**
   Displays current altitude above ground level (AGL). The radar altitude is not automatically displayed and must be manually selected by clicking the appropriate switches in the HUD control panel.

4. **Bomb Fall Line (BFL)**
   Displays the path that the bombs will follow upon release.

5. **Attack mode data**
   Indicates selected weapon (name flashes when the Master arm switch is in the SAFE/OFF position). Aircraft G load and aircraft AOA

6. **Minimum release altitude cue**
   Indicates the minimum altitude at which bomb release is safe. It moves from the CCIP piper to the FPM. If the cue reaches the FPM, it is not safe to release the bombs since there is a high probability of taking damage from their detonation. For more information, refer to the Weapons Management chapter.

   Note: The CCIP pipper will only appear if the Radar Altimeter is in the On (M) position.

INTERCEPTION DIRECTOR

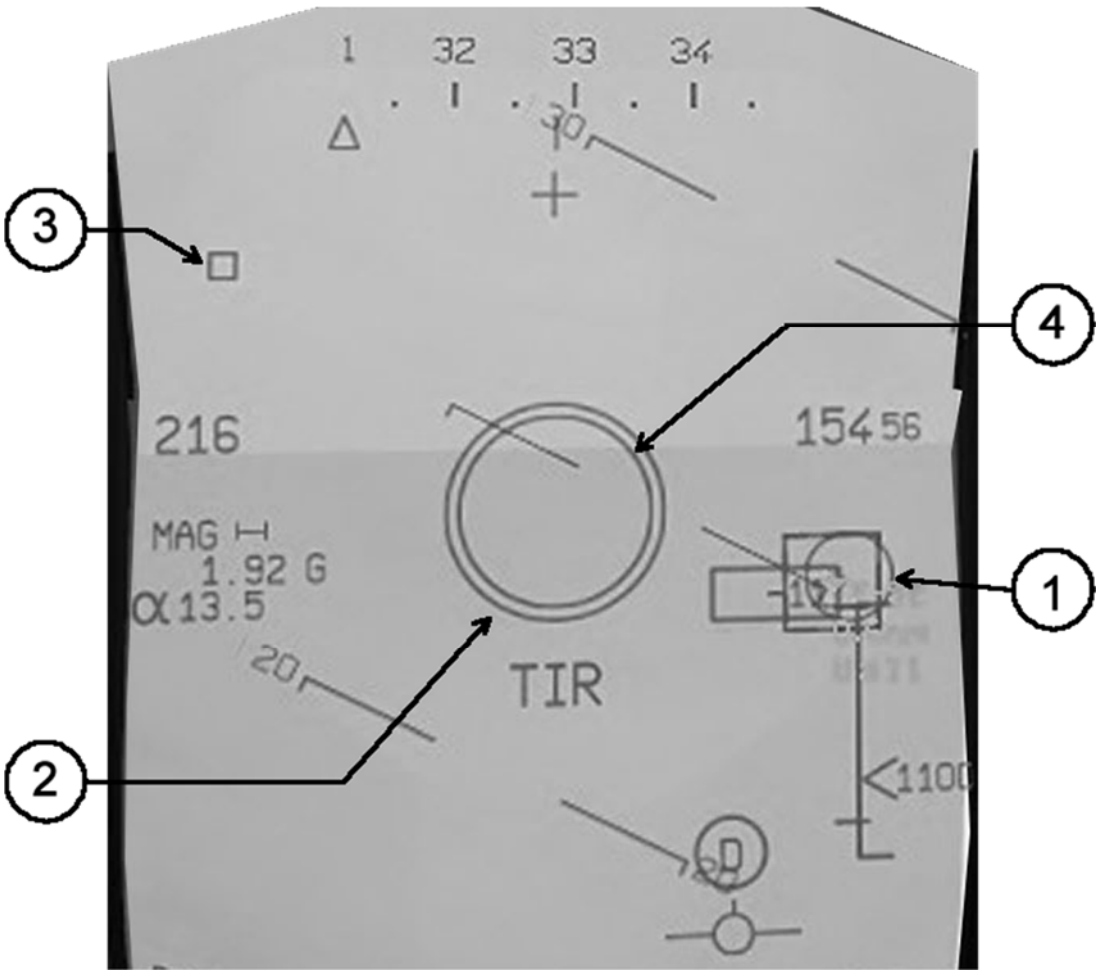
The interception director is a special tool available only in Air-to-Air or POL modes. For a more thorough description of POL mode please refer to the Weapons Systems chapter.

The interception director appears only when there is locked radar target regardless of radar mode (TWS or STT). It consists of two elements:

1. **The Flight Director Ring**: Located at the center of the HUD FOV, it indicates the optimal interception zone for the target.

2. **The Interception Flight Director**: It is a small square symbol that represents the point in space towards which the target is flying.

The objective is to maneuver the aircraft so the Interception Flight Director is placed inside the Flight Director Ring. In this way you can be sure that you are flying an optimal interception path towards the target.



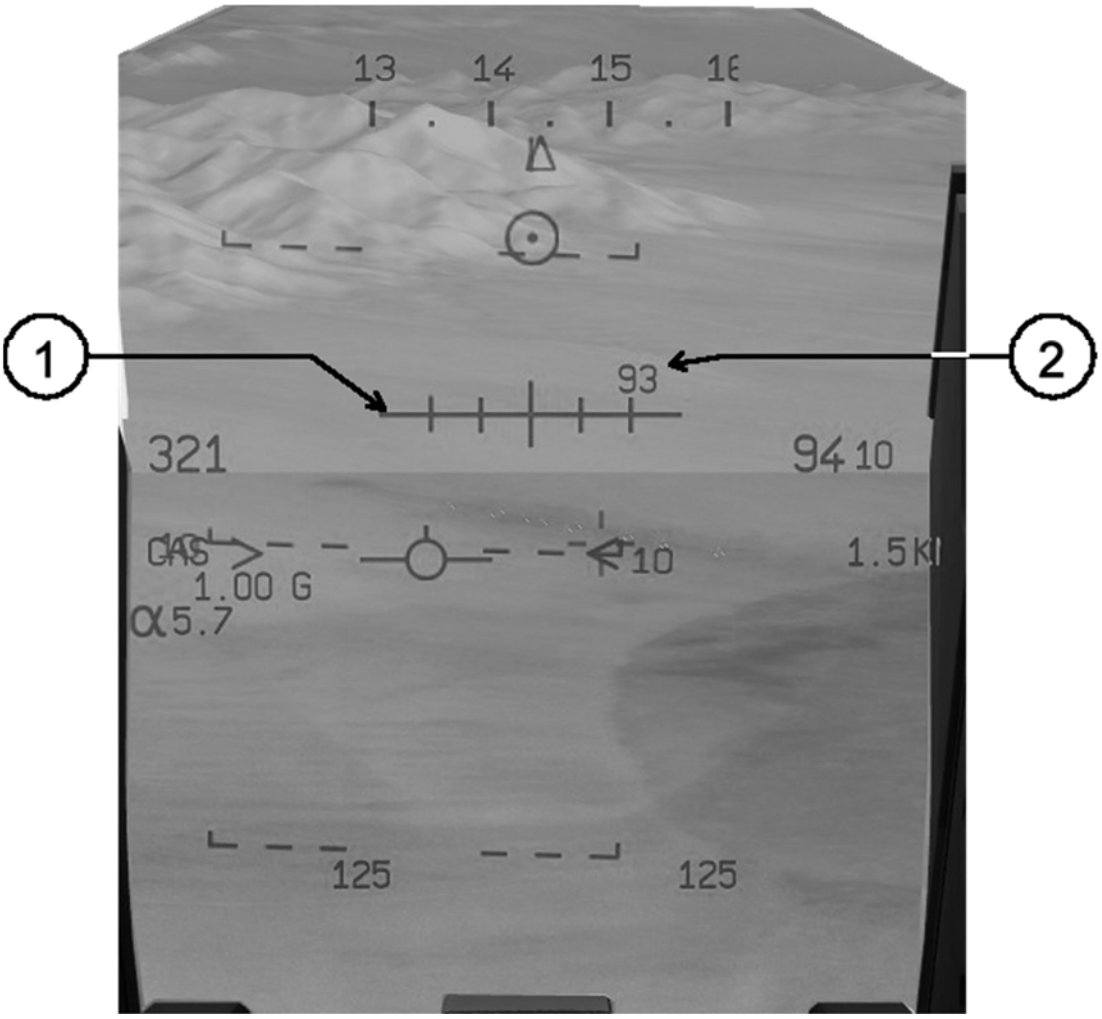
1. **Locked radar target.**
2. **Flight Director Ring.**
3. **Interception Flight Director.** Indicates the point towards where the target is flying
4. **In Range Ring.** Only appears for missiles and indicates that the target is in weapons range.

The Interception Director is not bound to any specific weapon and will appear for all Air-to-Air weapons. There is a special case for Air-to-Air guns, the Interception Director will remain visible as long as the range towards the target is above 1200 meters, in order to prevent clutter in the HUD when the enemy aircraft is within gun range.

Note: While the Interception Director will provide you with the best path to close the range with your target, use your own judgment to decide when to fire the selected weapon.

AUXLIARY GUNSIGHT

The auxiliary gunsight is selected by the pilot. It is available in all modes except Approach. The gunsight is fixed in the horizontal plane but can be moved in the vertical plane to accommodate gun deflection based on ballistic tables for the desired range. The deflection can be modified from 0 to 300 mils.



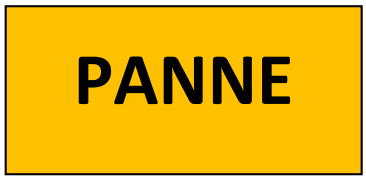
1. **Auxiliary Gunsight.** To activate it, click on the HAUSSE switch located on the right side of the HUD control panel.

2. **Angle of deflection value.** To modify the deflection click on the HAUSSE knob located on the right side of the HUD control panel, to the right of the HAUSSE switch.

Chapter 11: Warning System

Master Caution Lights

They are located at the Top left of the main instruments panel. Consists of two lights: One Amber for cautions and one Red for warnings.



When caution occurs:

- Master Caution light: **On**
- Audio warning (see note): **On**
- System specific light on the alarm panel: **On**

When pilot acknowledges caution (by pressing Master button)

- Master Caution light: **Off**
- Audio warning: **Off**
- System specific light on the alarm panel: **On**

When caution is no longer valid:

- Master Caution light: **Off**
- Audio warning: **Off**
- System specific light on the alarm panel: **Off**

Note on audio warning: No warning will be heard when the caution occurs, but a chime will be heard every 20 seconds until the caution is acknowledged or no longer valid.

When failure occurs:

- Master Warning light: **On**
- Audio warning (continuous): **On**
- System specific light on the alarm panel: **On**

When pilot acknowledges failure (by pressing Master button)

- Master Warning light: **Off**
- Audio warning (continuous): **Off**
- System specific light on the alarm panel: **On**

When failure is no longer valid:

- Master Warning light: **Off**
- Audio warning (continuous): **Off**
- System specific light on the alarm panel: **Off**

Alarm Lights Panel

The alarm lights panel works in conjunction with the Master Warning and Master Caution lights. Like the Master Warning and Master Caution they are divided in two colors, Amber for Cautions and Red for Warnings.

In this case, each individual light indicates the specific system/subsystem that is affected by the failure/anomalous condition. The light remains on for as long as the caution / warning condition exists.

Chapter 12: Operational Limitations

Engine

Max RPM (including afterburner): 103% rpm
Max Tt7 Temperature (including afterburner): 900ºC

Airframe

Chapter 13: Aircraft Procedures

These are the procedures that must be followed before and after a flight. The procedures listed here are a subset of the ones followed by the pilots of the actual aircraft.

Preflight Checklist

Left Instruments Panel

Ln	Description	Position
1	FBW/PA Auto test	Off (cover closed)
2	Emergency Afterburner Cutoff	Off (cover closed)
3	Emergency Oil Pump	Off (cover closed)
4	Emergency Flight Computer	Off
5	Fuel Dump	Off (cover closed)
6	Tape recorder	As desired
7	FBW GAIN	Norm
8	Emergency Trim	N
9	Audio volumes panel	Check and set
10	Inflight relight switch	Off
11	Throttle	Stop
12	Radar	Off
13	Pelles, Souris, Becs switches	Auto
14	External lights	Off
15	Brakes Switch (SPAD)	On (cover closed)
16	“Emergency fuel” engine mode	Off
17	V/UHF radio	On – Transmitting
18	UHF radio	On – Listening
19	Landing Gear Lever	Down and secured
20	FBW NORM/ULT.SEC Switch	NORM (cover closed)
21	FBW Mode AA/Charges	As required
22	Emergency canopy lever	Towards the rear
23	Parachute lever	Towards the front

Main Instruments Panel

Ln	Description	Position
1	Master Arm switch	Off
2	Selective Jettison	Off (cover closed)
3	Auxiliary Attitude Indicator	Uncaged
4	FBW NORM/VRILLE switch	Normal
5	HUD and HDD	On
6	Radar altimeter	As desired
7	IFF	Out-3A-C
8	HSI	NAV (Cm or Cv)

9	Fuel Panel	Check – Crossfeed closed
10	BINGO Selector	Insert BINGO value
11	FIRE warning light	Test
12	Caution/Warning Lights	Test

Right Instruments Panel

Ln	Description	Position
1	Alert Network Switch	Off (Down position)
2	Electric pumps (all three of them)	Test then off
3	Sound warning	Off
4	Canopy sealing	Lever forward (If canopy is closed)
5	VOR/ILS - TACAN	Off
6	Fuel pumps	Off
7	Ignition/vent selector	G or D
8	Fuel Shut-Off Valve Switch	Closed (cover closed)
9	Breakers panel	Check
10	INS	Off

Engine Start

Before Engine Start

Ln	Description	Position
1	BATT Switch	On
2	TRN Switch	On
3	INS	Align

Engine Start sequence

Ln	Description	Position
1	Parking Brake	Set
2	Fuel Shut-Off Valve Switch	Closed (cover open)
2	Fuel pumps “D” and “G”	On
3	Ignition/Vent selector	G or D as required.
4	Ignition switch cover (Check that the starting fuel pump is in the “On” position)	Open
5	B.P. warning light	Off
6	Press ignition switch.	
7	When the RPM reach 10% move the throttle towards the Ground IDLE position.	
8	Check RPM and engine temperature.	
9	HUILE T7 warning lights	Off

10	BP.G BP.D HYD.1 HYD.2 caution lights	Off
11	ALT 1 ALT 2 caution lights	On at 40% RPM and their switches in Off
12	ALT1 and ALT2 switches	On at 40% RPM

Post-Engine Start Checklist

Ln	Description	Position
1	INS	NAV (if aligned, otherwise align)
2	Hydraulic pressure	Check that HYD lights are off
3	Power supply switches	All On
4	BATT TRN ALT 1 ALT 2 caution lights	Off
4	VOR and TACAN	On
5	Emergency Hydraulic Pump	On.
6	HYDS warning light	Off
7	IFF	STBY
8	HUD	Check configuration
9	FBW and AP	Test
10	FBW and AP test lights	Green
11	All FBW warning lights	Off
12	Anti-Collision Light	On
13	Rudder deflection	Check
14	Flight Controls Surfaces	Check
15	Airbrakes and Wing slats (Becs)*	Check

* To test the wing slats click the BECS switch to OUT. The slats should actuate out. Click the switch back to AUTO. The slats should return to its stowed position.

TAXIING

Checklist

Ln	Description	Position
1	Parking Brake	Release
2	PARK caution light	Off
3	Warning Sounds switch	On
4	Caution/Warning Lights panel*	All Off
5	NSW	Activate
6	DIRAV advisory light	On

* The CAB warning light, indicating that the canopy is open, may remain lit at this stage.

You can now increase throttle until the aircraft rolls out. Do not exceed 20 knots ground speed while taxiing.

TAKE OFF

Checklist

Ln	Description	Position
1	Canopy	Down and locked
2	CAB warning light	Off
3	Caution/Warning Lights panel	All Off
4	NSW	Secured
5	DIRAV advisory light	Off
6	Full throttle into max afterburner	Check acceleration (Jx) in HUD
7	PC advisory light	On
8	Rotate at 120 Knots	Place horizon on the rotation pitch marker in the HUD.
9	Retract and stow landing gear	Before 260 Knots.

LANDING

Checklist

Ln	Description	Position
1	Landing Gear Down	Below 230 knots
2	Landing Gear warning lights	Green
3	Anti-Skid	Check
4	HUD	APP Mode
4	Landing Lights	On
6	AOA final approach	14º
7	Wheel brakes	Below 130 knots*
8	NWS	Below 40 knots

* Whenever possible, use wheel brakes only when speed is below 100kt, to lessen brakes wear.

RUNWAY VACATED

Checklist

Ln	Description	Position
1	Landing Lights	Taxi

2	IFF	Off
3	VOR/ILS	Off
4	TACAN	Off

PARKING

Checklist

Ln	Description	Position
1	External power supply	Connected
2	HUD	Off
3	INS	Off
4	Engine	Stop button
5	When engine has stopped: Fuel pumps G and D	Off
6	Fuel Shut-Off Valve Switch	Closed (cover open)
7	All air conditioning equipment	Off
8	All external lights	Off
9	Radios (V/UHF and UHF)	Off
10	ALT1 and ALT2 switches	Off
11	BATT and TRN switches	Off

Chapter 14: Navigation

The Inertial Navigation System INS

The INS is the heart of the M-2000C navigation system. It allows the aircraft to know its position in the world and to plot a course to a geographical point. The INS displays its information in both the HUD and the HDD.

The INS can store the following information:

- 20 navigation waypoints (Latitude, longitude and altitude) and its associated data:
  - Offset waypoint (delta latitude, delta longitude and delta altitude).
  - Runway magnetic heading (QFU).
  - Runway approach glideslope (PD – *Pente Désirée*).
  - Desired arrival time (HD – *Heure Désirée*).
  - Desired arrival track (RD – *Route Désirée*).
- 3 marked geographical points along with the mark time.
- The magnetic declination

The INS provides the following information:

- Aircraft geographical position (Latitude and Longitude).
- Horizontal components (Vx, Vy) of the inertial speed.
- Ground Speed.
- Ground Track.
- Bearing.
- True Heading.
- Magnetic Heading.
- Acceleration components (Ax, Ay, Az).
- Bearing and distance to a waypoint.
- Track error.
- Magnetic lateral deviation from desired track.
- Track error from desired track.
- Approach glideslope.
- Remaining time to reach waypoint.
- Time difference between remaining time and desired arrival time in order to maintain a constant speed.
- The aircraft load factor.

The INS is composed of two elements:

- The Poste de Commande Navigation PCN (Navigation Control Panel)
- The Poste Sélecteur de Modes PSM (Mode Selector Panel)

The PSM

The PSM is the control panel for both the PCN and the INS

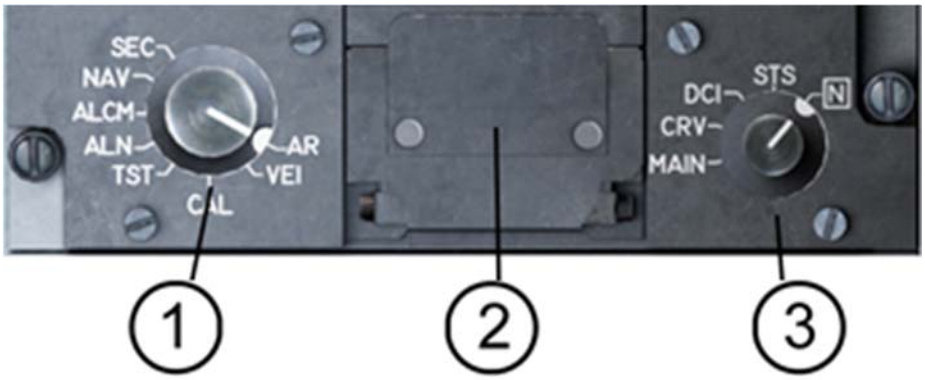


Figure 21 The INS' PSM panel

The PSM is divided in three sections:

1. The INS/PCN Mode Selector:
   a. **AR** (*Arrêt*): Turns Off both the INS and the PCN
   b. **VEI** (*Veille*): The gyros remain off but the system is powered and thermal regulation is on. The PCN is available for data entry.
   c. **CAL** (*Calibration*): Reserved for maintenance.
   d. **TST** (*Test*): Reserved for maintenance.
   e. **ALN** (*Alignement normal*): Normal INS alignment procedure (refer to INS alignment).
   f. **ALCM** (*Alignement sur cap mémorisé*): Memory INS alignment procedure (refer to INS alignment).
   g. **NAV**: Navigation
   h. **SEC** (*Secours*): Emergency operation, the INS provides only gyroscopic information (attitude and heading).

2. The Data Cartridge Insertion Module (*Module d'Insertion de Paramètres* MIP)

3. The PCN operational mode:
   a. **N** (Normal): Default position.
   b. **STS** (Status): The PCN display the current INS alignment status
   c. **DCI** (*Données Codées Inertielles*): Inertial Codes Input; To visualize or enter certain paremeters into the INS memory.
   d. **CRV** (*C/R de vol*): Used for maintenance only
   e. **MAIN** (Maintenance): used for maintenance only

The PCN

The PCN is responsible for the interface between the pilot and the INS. It has the following functions:

- Visualization of the navigational data in the memory of the INS
- Data input into the memory of the INS
- Visualization of the INS alignment status.
- Control of saved points, register and offset waypoints.

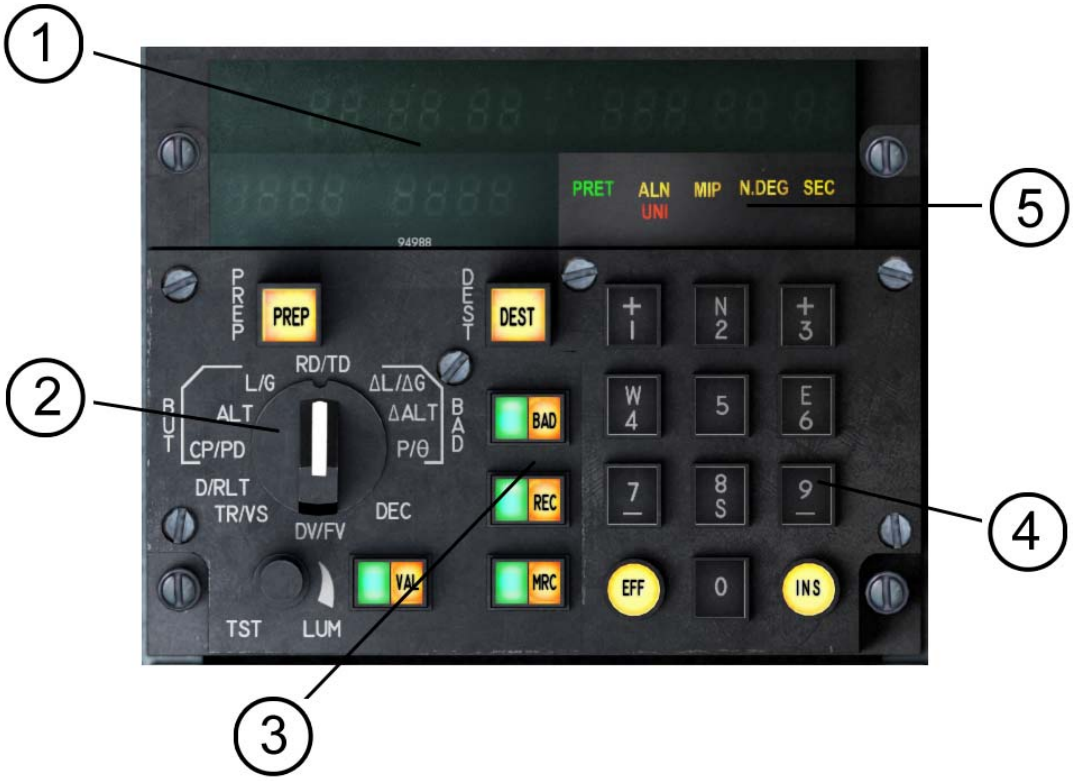


Figure 22 The INS' PCN panel

1. LCD Displays
2. Parameter Selector

Editable Data		
Waypoint	CP/PD	Runway magnetic heading / Desired Glideslope
	ALT	Altitude
	L / G	Latitude / Longitude
RD/TD		Desired track / Desired arrival time at waypoint
Offset Waypoint	ΔL / ΔG	Offset Latitude / Longitude
	ΔALT	Offset altitude
	ρ / θ	Distance / Bearing to offset waypoint.
DEC		Magnetic declination.

Read Only Data	
DV/FV	Wind direction/speed
TR/VS	Time remaining to waypoint/Ground Speed
D/RLT	Distance / Bearing to waypoint or offset waypoint.

3. Function Keys
   - **PREP**: Selects the waypoint EDIT mode.
   - **DEST**. Selects the waypoint Navigation mode (read only).
   - **MRQ**: Marks a geographical position.
   - **VAL**: Validates the alignment data.
   - **BAD**: Selects the OFFSET waypoint as destination.

4. Numeric Keypad
   Used to enter data into the INS. Consists of:
   - 10 numeric keys, from 0 to 9. Including keys to designate North, South, East, West, + and -.
   - **EFF** (Effacement) key: Clears the input errors in the system.
   - **INS** (Insertion) Key: Enters the data in the system.

5. Status Lights
   - **PRET** (green): INS is ready.
   - **ALN** (yellow): INS is aligning
   - **MIP** (yellow): A data cartridge has been inserted.
   - N.**DEG** (yellow): The INS needs alignment.
   - **SEC** (yellow): The INS is in emergency mode
   - **UNI** (red): The INS is damaged.

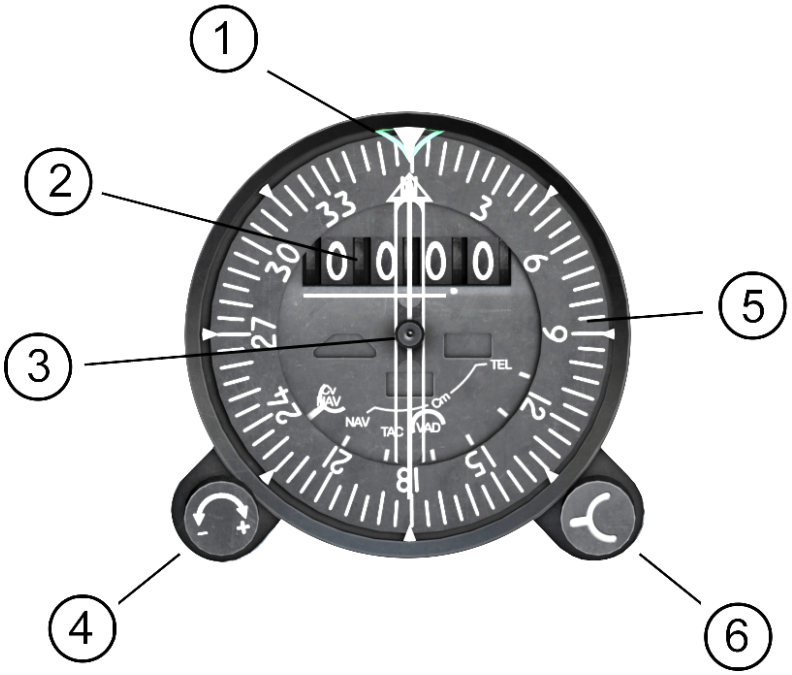
   PRET and ALN are only active during the alignment process.

PCN Utilization

The INS will be fully described upon final release

Radio Navigation System

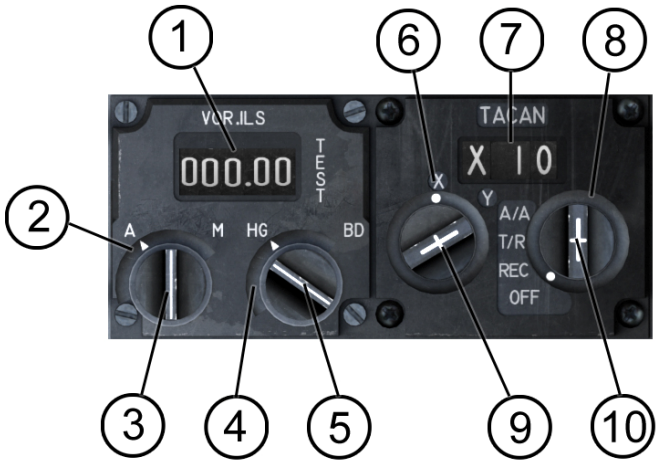
The Horizontal Situation Indicator HSI



1. Selected Heading indicator
2. DME display
3. Needles
   - **Needle 1**: Wide.
   - **Needle 2** Thin.
4. Heading selector
5. Compass Rose
6. HSI mode selector
   - **Cv NAV**
   - **Cm NAV**
   - **TAC**
   - **VAD**
   - **ρ**
   - **θ**
   - **TEL**

HSI Information							
Mode Indicators	**Cv NAV**	**Cm NAV**	**TAC**	**VAD**	**ρ**	**θ**	**TEL**
Compass Rose	True Heading	Magnetic Heading					
CAP Flag	Fail						
Needle 1	Waypoint Bearing		TACAN Bearing	Offset Bearing	Mark True Heading	Mark Magnetic Heading	Target Bearing
Needle 1 Flag	Bearing Failure flag						No radar lock
Needle 2	VOR Bearing						Intercepti on Course
Needle 2 Flag	VOR Fail						No radar lock
DME	Waypoint distance		TACAN distance	Offset Distance	Mark Distance	Magnetic Bearing	Target Distance
DME Flag	Distance Fail						No radar lock
Selected Heading Indicator	Automatic Pilot Heading						

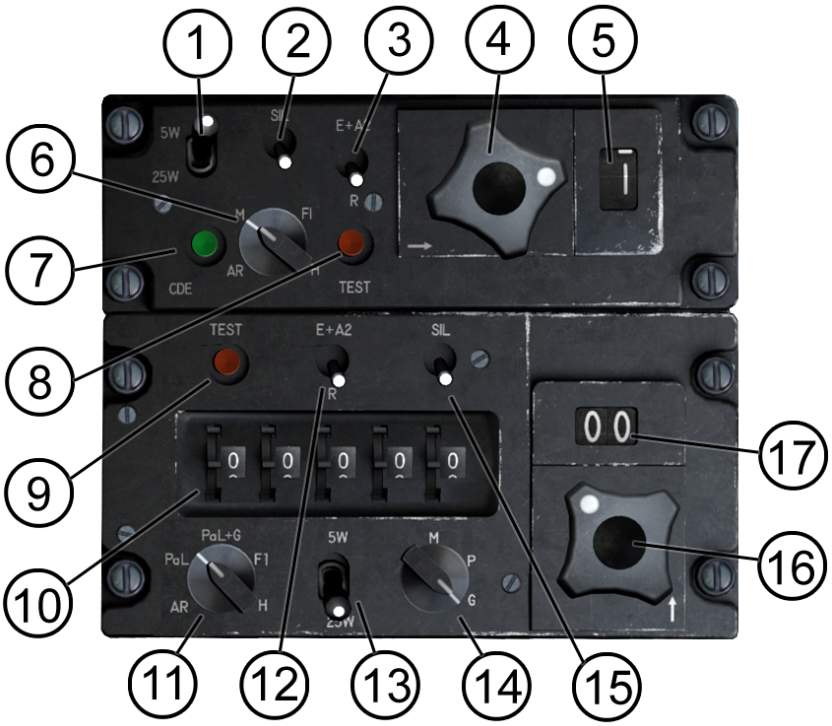
VOR/ILS and TACAN



1.) VOR/ILS Indicator
2.) Power Selector
3.) Frequency Selector
4.) TEST L/R Selector
5.) Frequency Selector
6.) XY TACAN Band Selector
7.) TACAN Indicator
8.) TACAN Mode Selector
9.) Frequency Selector
10.) Frequency Selector

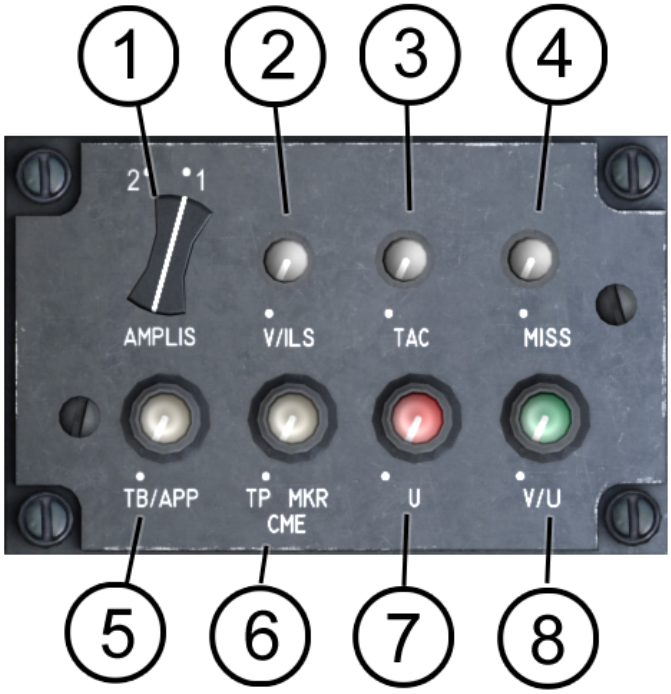
Chapter 15: Communications

VHF/UHF Radios



1.) UHF Receiver/Transmitter Inverse Selector.
2.) UHF SIL/Mute Switch.
3.) UHF Secure Channel Encryption.
4.) UHF Channel Preset Selector.
5.) UHF Channel Indicator.
6.) UHF Operation Mode Selector.
7.) UHF Secure Encryption Receive Light
8.) UHF Test Button.
9.) V/UHF Test Button.
10.) V/UHF Frequency Selector.
11.) V/UHF RX Mode Selector.
12.) V/UHF Channel Encryption.
13.) V/UHF Receiver/Transmitter Inverse Selector.
14.) V/UHF TX Modes.
15.) V/UHF SIL/Mute Switch.
16.) V/UHF Channel Preset Selector.
17.) V/UHF Preset Channel Indicator.

Volume Control Panel

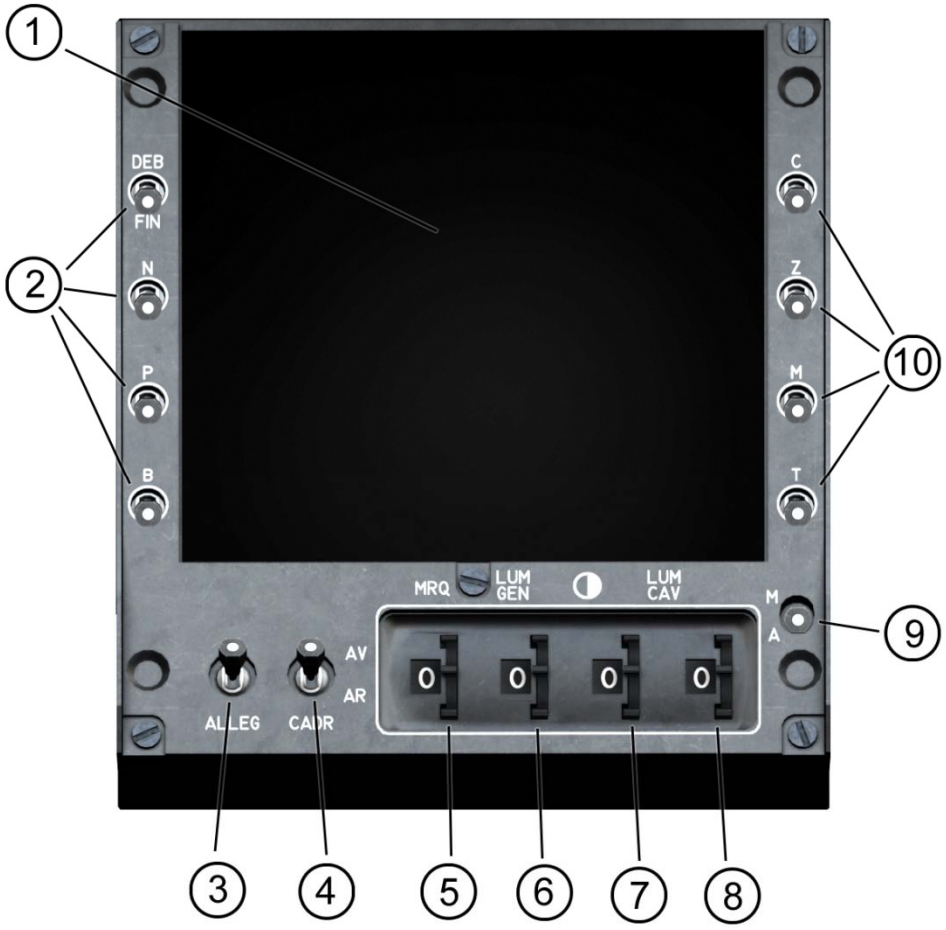


1.) COMM Select.
2.) ILS Volume.
3.) TACAN Volume.
4.) MAGIC Tone Volume.
5.) Approach Volume.
6.) Marker Volume.
7.) UHF Volume.
8.) V/UHF Volume.

Chapter 16: Electronic Warfare

The VTB/HDD

The Visualisation Tête Basse (VTB) or also known as the Head Down Display (HDD), displays radar information along with navigation, target designation and aircraft load out.



1. Display Screen
   Displays the Radar.

2. Parameter Input Select (Left)
   4 switches that allows the left side parameter input for Target Designation.

3. De-Clutter VTB/HDD
   De-Clutters VTB/HDD Symbology .

4. Radar Map Display Select
   Displays the Radar map.

5. MRQ Marker Brightness Adjust
   Adjusts the VTB/HDD's Marker (MRQ)Brightness.

6. Backlight Brightness Adjust
   Adjusts the VTB/HDD's Backlight Brightness.

7. Contrast Adjust
   Adjusts the VTB/HDD's Contrast.

8. Brightness Adjust
   Adjusts the VTB/HDD's Brightness.

9. Power ON/OFF
   Turns On/Off the power of the VTB/HDD.

10. Parameter Input Select (Right)
    4 switches that allows the left side parameter input for Target Designation.

The RDI Radar

RDI stands for Radar Doppler à Impulsions, it is a specialist air-to-air radar based on the RDM (Radar Doppler Multifunction).

For air-to-air combat, the RDI provides a 120° cone of coverage, the antenna scanning at either 50 or 100°/s, with ±60, ±30 or ±15° scan. For air-to-air gun attacks, the 3.5° beam can be locked to the target at up to 19 km (10 nmi) range, with automatic tracking within the head-up display field of view, or in a 'super-search' area, or in a vertical search mode. The system can look up or down, range while searching, track-while-scan, provide continuous tracking, generate aiming signals for air combat and compute attack and firing envelopes. For the strike role it provides real-beam ground-mapping, terrain-avoidance and air-to-ground ranging.

The manufacturers claim that RDI will detect 90% of 5m² RCS fighter-sized targets out to 66 nmi (122 km) in clear air using a four-bar search pattern over 120° in azimuth, and 60 nmi (111 km) with a single-bar pattern over 30° in azimuth, dropping to 50 nmi (93 km) in pulse-Doppler look-down mode.

Control Panel

1. Power Switch
2. Screen Mode
3. Range Selector
4. Azimuth Selector
5. Bar Selector.

Note: Only those switch that are functional in the Open Beta are identified.

Power Switch

The Power Switch controls the Power and Emissions of the Radar's Function. The Selections are as follows, OFF - Warm Up (P.CH) - Standby (SIL) – ON (EM). The screens for each selection are displayed below.

Radar OFF

Radar Warm Up

Radar Stand By

Screen Mode

The RDI radar has two screen modes to display radar information:

- **Plan Position Indicator (PPI)**: In the PPI display, the radar emitter is at the center of a circle. The radius of the circle represents the range of the radar. The contacts are points inside the circle. The PPI display is the most accurate representation of a contact position in relation to the emitter.
- **B-Scope**: In this mode, the circle is flattened into a square with the bottom representing the emitter position. This mode is the common mode for all radar displays in US aircrafts.

PPI Mode

B-Scope Mode

Azimuth Selector (Balayage)

The RDI radar has three horizontal aperture settings: ±60º, ±30º or ±15° in azimuth. These provide 120º, 60º and 30º horizontal coverage respectively. The default value is 60º.

To change the azimuth value, you must click on the Balayage switch. Left click moves from 60 -> 30 -> 15. Right click moves in the other direction 15-> 30 -> 60.

Bar Selector (Lignes)

The RDI radar has three vertical aperture settings. Each setting is determined in Bars. One bar equals 3º, which is the diameter of the radar antenna. The bars setting available are 4, 2 or 1 bars. Equivalent to 12º, 6º and 3º horizontal aperture respectively.

To change the bar value, click on the Lignes switch. Left click moves from 4 -> 2 ->1. Right click moves in the other direction 1 -> 2 -> 4.

Range Selector (Distance)

The RDI radar has the following range settings: 5, 10, 20, 40 and 80 nautical miles. The default range is 20 nmiles.

To increase the range, left click on the Distance switch. Right click if you want to decrease it.

Note: There is a key mapped to increase/decrease radar range. Please refer to the Keyboard Map.

Radar Coverage

The RDI has antenna limits that are 60º in azimuth and 60º in elevation. That creates a horizontal arc of 120º and a vertical one of 120º.

Furthermore, the RDI radar has three horizontal aperture settings: 60, 30 and 15 degrees; while it has a vertical search option of 4, 2 and 1 bars. One bar = the radar search cone diameter. The RDI antenna provides a search cone with a diameter of 3º. So in this context you have a 12, 6 and 3 degrees vertical search pattern.

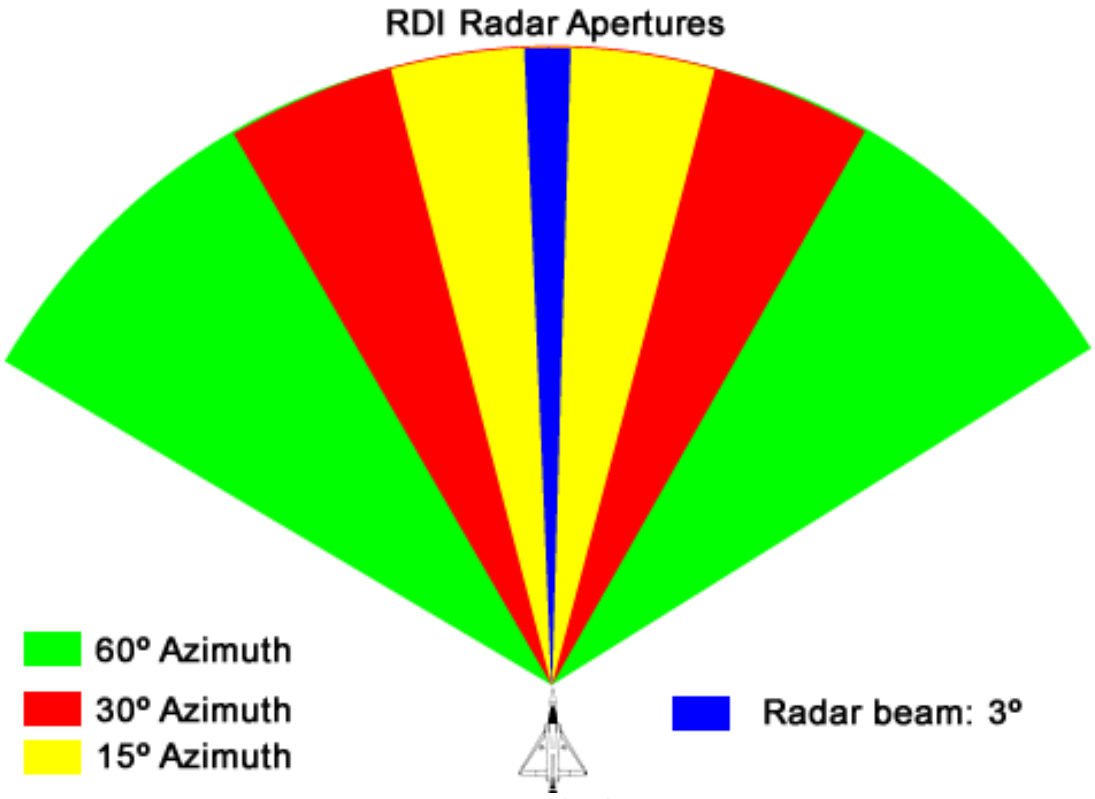


Figure 23Horizontal Radar aperture

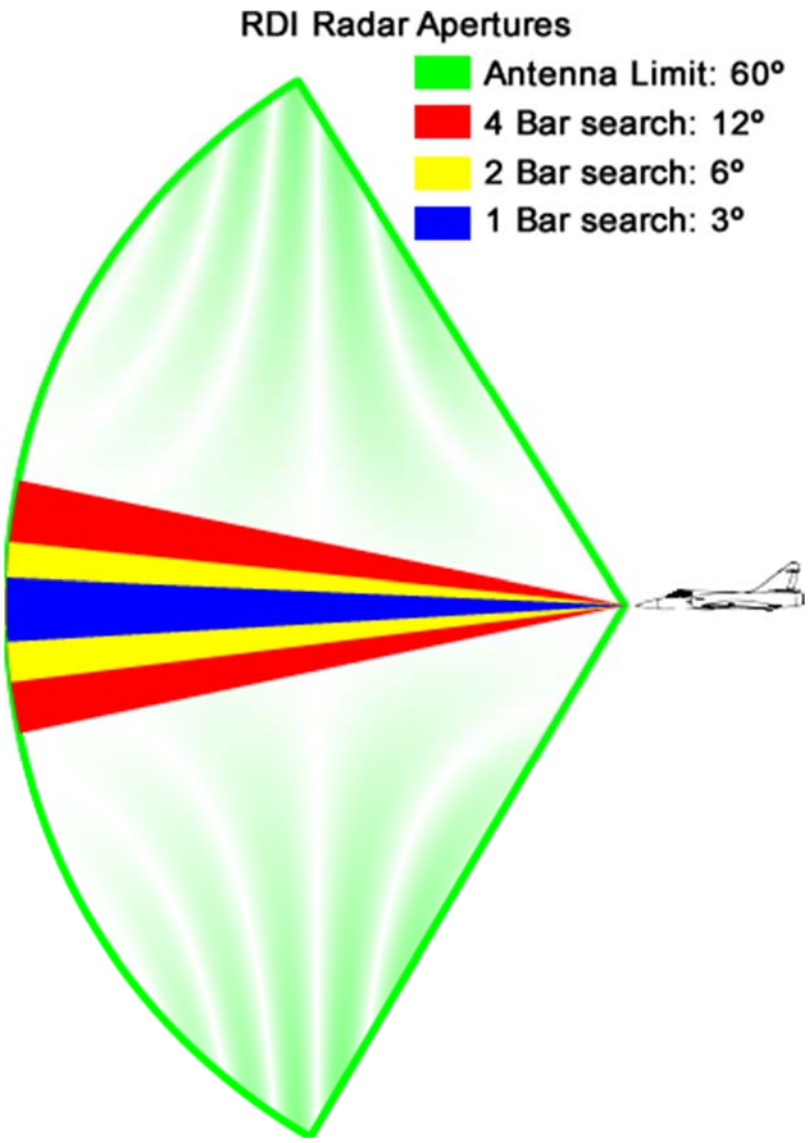


Figure 24 RDI radar vertical coverage

The images show that while the search pattern of the RDI radar manage to cover the entire horizontal arc with the 60º azimuth aperture, in the vertical it barely manages to cover 12º out of the 120º arc.

Having this in mind, be aware that it is very possible that an enemy aircraft will fly above or below the vertical radar coverage while in paper being inside its search radius. This also means that a bandit that is detected at max range can drop out of the radar because it flew below the search cone.

Also, in order to cover the entire search volume of space, the antenna has to move. This movement takes time and while fast, it is slow enough that a bandit track may be gone by the time the antenna returns to where it was before.

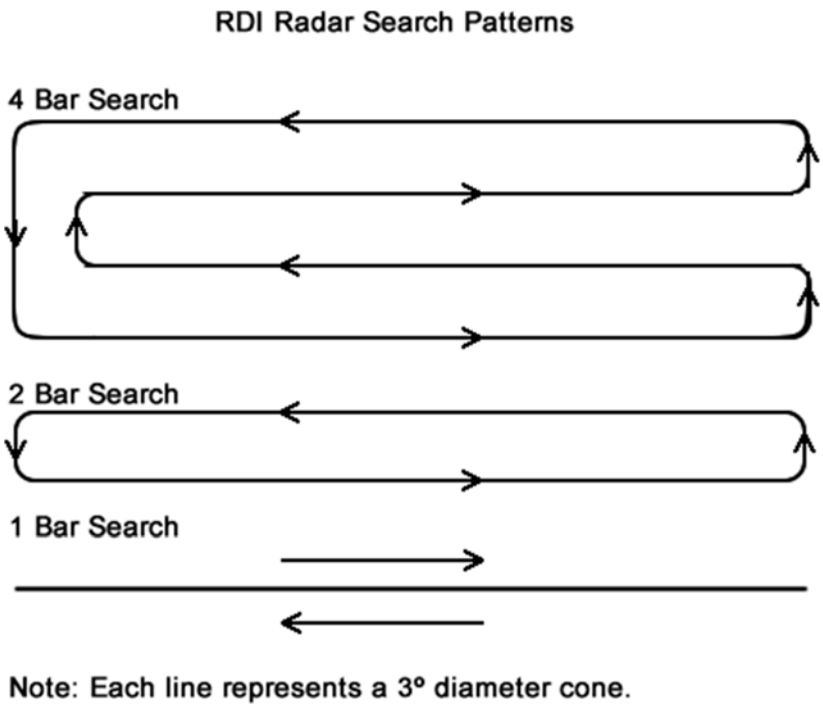


Figure 25 RDI radar antenna search pattern.

Scan Modes

The RDI radar has three scan modes: RWS (Range While Search), TWS (Track While Scan) and STT (Single Target Track).

In RWS, the antenna follows the designated search pattern and informs you of all the tracks discovered in one sweep. One sweep meaning completing its search pattern as indicated by the bars selection. The RDI only provides the following information: range, azimuth and closing velocity in Mach number.

In TWS, you lock the radar to a track but at the same time the radar keeps searching its designate volume looking for new tracks. In this case, the radar will provide you with more information specific to the locked track (heading, speed, altitude) but the antenna will move exactly as if it were in RWS mode in order to follow all the other unselected tracks. Because the antenna is moving away from the locked track, it is not possible to guide weapons in this mode.

In both RWS and TWS, track information is slowly updated, you can notice this because the track symbols "jump" to a new position when the antenna sweeps the space where they are located.

In STT, the radar dismisses all other tracks and redefines the locked track as weapons target. The antenna is locked to the position of the selected target in order to provide continuous tracking information to guide weapons. Be aware that while you can engage bandits in this mode, you are also blind to the other bandits in the area.

Special Modes

The RDI radar has several special modes available, depending on the tactical situation. For Air-to-Air combat it has what it is called "Close Combat Mode" (CCM).

Close Combat Mode or CCM, as its name implies is a special operational mode for the RDI radar for close encounters with enemy aircraft. In this case close means any bandit within 10 nautical miles (18 Km) of your aircraft. The CCM consists of three special search and track modes and it is only available for close range weapons like the DEFA guns or the MAGIC II missiles. Choosing the Super 530Ds while in CCM mode will disconnect the mode and revert to normal RWS mode.

The CCM modes are preset configurations and cannot be changed by the pilot, if you change one of the configuration parameters, CCM is cancelled and the radar revert to normal operational mode.

Now, the three special search and track modes are: Horizontal Scan, Boresight and Vertical Scan. All modes sets the radar range at 10 nautical miles.

- **Horizontal Scan**: Sets the radar at 15 degrees azimuth (30 degrees cone) and 1 bar (3 degrees aperture) search pattern. This is the fastest search pattern for the RDI.

- **Boresight**: As the name implies, it cages the radar antenna looking at the front of the aircraft in line with the waterline. Basically you get a 3 degrees search cone. This is the narrowest search pattern and it just turns the RDI into a gunnery radar.

- **Vertical Scan**: Instead of scanning horizontally, the antenna moves vertically with 60 degrees elevation and 3 degrees of azimuth (the antenna does not move laterally on its own). The 60 degrees elevation provides coverage from -10 to +50 degrees. This mode is basically a specialized MAGIC II search mode, since it is usually used in conjunction with the MAGIC II missiles by slaving their seekers to the antenna.

CCM also has another feature: autolock. The radar will go from RWS to STT as soon as it detects a target. If it detects several it will follow these rules:

1. First engage the priority target. This mean the target whose closing velocity is the highest.
2. If all velocities are the same, engage the nearest one.

Note: Both Autolock and MAGIC II seeker slave features are not available in open beta. You have to manually lock a target by pressing the lock key. The radar will go from RWS to STT immediately.

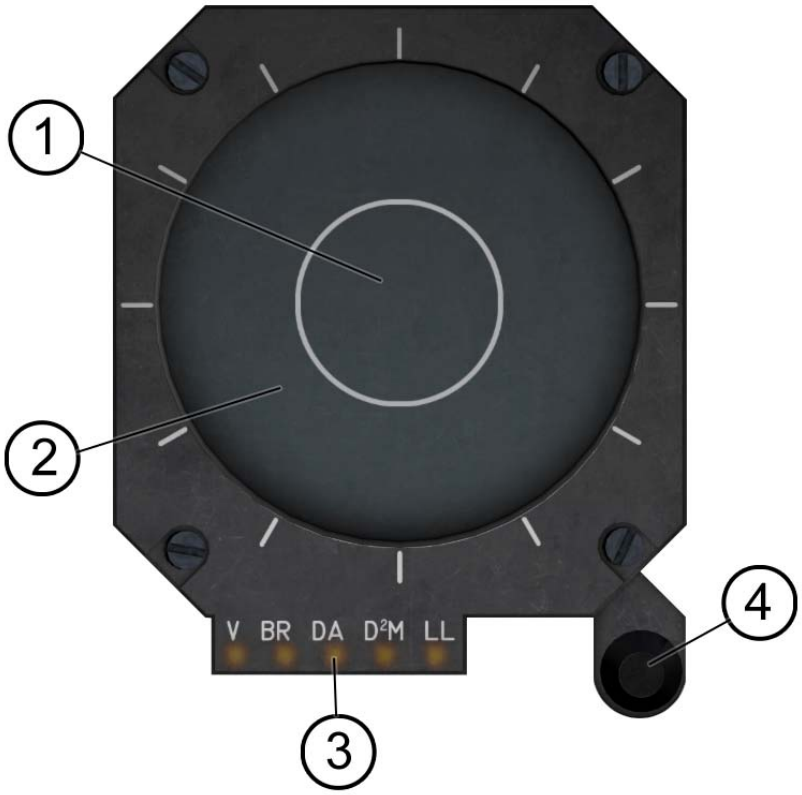
To select CCM you must press the key "V" or assign it to a button in your HOTAS equipment. Remember that the only weapons available in CCM are the guns and the MAGIC II missiles. To return to normal mode, press the key “D”

Radar Display

1.) Target Information
2.) Objective Designation (Left)
3.) Aircraft Pitch Scale
4.) Aircraft Symbology
5.) Azimuth Angle Guides
6.) Aircraft Airspeed
7.) Aircraft Heading Compass
8.) Aircraft Altitude
9.) Objective Designation (Right)
10.) Antenna Direction
11.) TDC
12.) Range

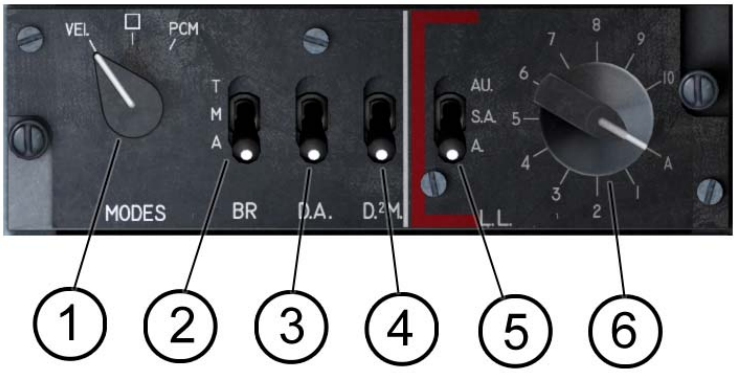
The RWR

RWR Display



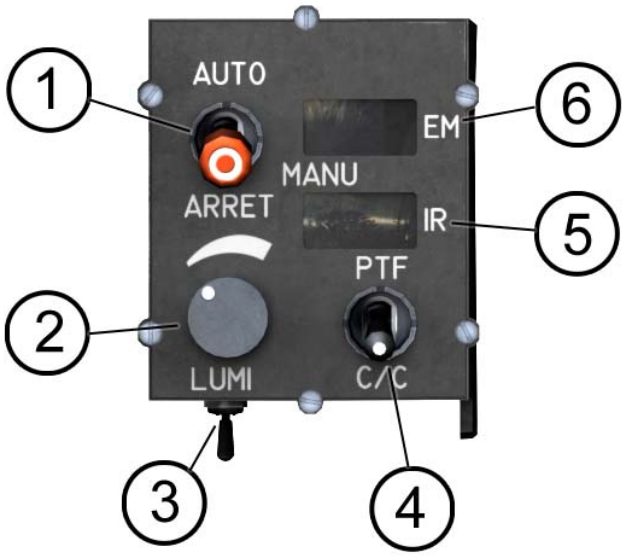
1.) High Priority Threat Area
2.) Low Priority Threat Area
3.) EW System Status Lights
4.) BRT Adjust

ECM Control Panel



1.) Jammer mode Selection
2.) Jammer
3.) RWR
4.) D2M
5.) Decoy Launcher
6.) Decoy programs

Éclair Control Panel



1.) Power Mode Selection
2.) BRT Adjust
3.) Light Power
4.) Program Selector
5.) Flare Counter
6.) Chaff Counter

Note: The Éclair ECM pod is not available in open beta.

Chapter 17: Weapons System

The M-2000C is considered a multirole fighter due to its capability to use both Air-to-Air (AA) and Air-to-Ground (AG) weapons. However, you must be aware that the aircraft was designed as a lightweight interceptor and thus it is heavily specialized towards the air combat role at the expense of AG capabilities, so instead of being a specialized multirole fighter, it should be considered as an Interceptor with secondary Close Air Support (CAS) capabilities.

Weapons

The M-2000C can load the following weapons:

Air-to-Air

- R.550 Magic IIs IR guided missiles.
- Matra Super 530Ds Semi Active Radar Homing missiles.

Air-to-Ground

- Mk-82, 500 pounds unguided low-drag general purpose bomb.
- Mk-82 SE, 500 pounds unguided low-drag retarded general purpose bomb.
- GLB-66, unguided low-drag cluster bomb.
- BAP-100, anti-runway cluster bomb with 18 rocket accelerated penetrators.
- GBU-12, 500 pounds laser guided bomb.
- GBU-16, 1,000 pounds laser guided bomb.
- GBU-24, 2,000 pounds laser guided bomb.
- Matra SNEB rocket pod with 18 68 mm unguided rockets per pod.

Additionally, some export versions were fitted with the following Air-Surface Missiles (ASM):

- AS-37 Martel
- AS-39 Exocet

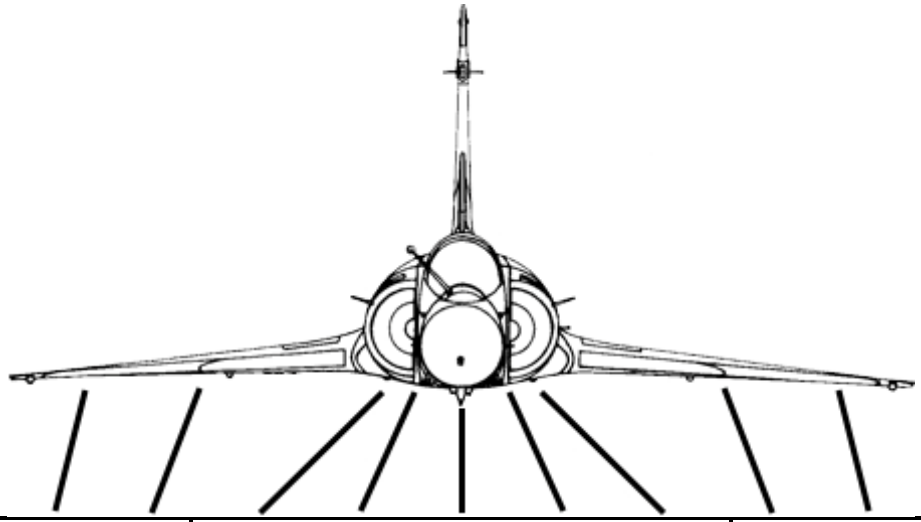
Internal weapons

2 DEFA 554 30 mm revolver cannons with 125 rounds each.

Weapons Configuration

The following table shows the allowed weapons configuration:

Table 1 Loadout configuration.



		WING (kg)		FUSELAGE (kg)					WING (kg)	
		RIGHT		*FWD*	*REAR*	*CENTRAL*	*REAR*	*FWD*	*LEFT*	
WEAPON	**PCA CODE**	**300**	**1800**	**450**	**450**	**1800**	**450**	**450**	**1800**	**300**
		9	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
AA Pylons										
R550 Magic 2	MAG	1								1
Super 530D	530		1						1	
AG Pylons										
Mk-82	BL1		1/2*	1	1		1	1	1/2*	
Mk-82SE	BF1		1/2*	1	1		1	1	1/2*	
BLG66 Belouga	*BF4*		*1/2**	*1*	*1*	*1*	*1*	*1*	*1/2**	
LRF4	RK3	1	1						1	1
BAP 100	*BF8*					*18***				
GBU-12	EF1					1/ 2*				
GBU-16	EF1					1				
GBU-24	EF1					1				
Fuel Tanks										
RP522	RP					1				
RP541	RP		1						1	

Notes:

* 2 bombs can be loaded by using the twin rack RAFAUT AUF2

** This bomb uses the special 30-6-M2 rack.

Note: The aircraft ballistic computer can only handle one type of Air-to-Ground weapon. Do not load Air-to-Ground weapons mix (e.g.: rockets and bombs, or Mk-82s and Belougas, etc.) since it is probable that the system will not be able to handle the configuration.

Open Beta Notes:

In the open beta version, the following weapons are not available and in some cases a temporary substitution is used:

- BLG-66 Belouga, substituted by MK20 Rockeyes.
- BAP-100, not available.
- SNEB 68 mm rocket, substituted by HYDRA 70 rockets.

Weapons Management

Weapons management is carried out by two panels located in the Main Instruments panel: The Weapons Manager Panel (PCA, French acronym for *Poste de Commande Armement*) and the Weapons Configuration panel (PPA, French acronym for *Poste de Préparation Armement*).

The PCA

The PCA is located to the left of the radar display. It consists of a panel with one open switch, one guarded switch, and two rows of five LCD displays with buttons below them.

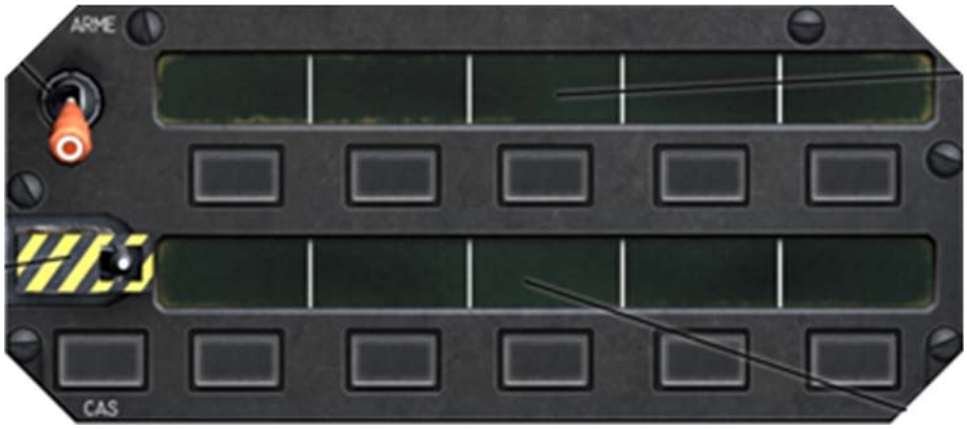


Figure 26 The PCA

The PCA controls the aircraft's Master Modes of operation and is used for all aspects of the aircraft's flight.

The big orange open switch is the Master Arm switch and it changes the aircraft from NAV to Attack mode, either Air-to-Air or Air-to-Ground. Attack modes are weapons based, if you select an Air-to-Air weapon, the system sets itself to Air-to-Air mode and the same works for Air-to-Ground weapons.

The guarded switch is the Selective Jettison consent switch, and it is used to jettison selected weapons from the aircraft.

The two rows of LCD displays with their associated buttons are used to configure aircraft flight parameters and Master Modes. The top row is used to configure the system while the bottom row is used for weapons/stores selection.

The PCA Top Row

The PCA is also used for aircraft system configuration and the options displayed change based on system Master Mode. The associated buttons have a backlit S in the center, that turns on when an option has been selected.

The options displayed in the top row change based on the system Master Mode. Most of the options are exclusive, meaning that selecting one will deselect the previous one.

The PCA Bottom Row

Unlike other systems, the PCA does not display an individual weapon and its position in the aircraft, instead it groups them by type. Since the LCD cannot display the full weapon name a code is assigned to each weapon (please see loadout configuration table for the PCA weapons code), this code is also displayed in the HUD when it is in attack mode. Additionally, the PCA sorts the loaded weapons based on their assigned priorities, basically AA weapons to the left and AG weapons to the right based on type.

Table 2 PCA weapons code display priority.

1	2	3	4	5
MAG	-	-	-	-
-	530	-	-	-
-	BL1/ BF1/BF4	BL1/ BF1/BF4	BL1/ BF1/BF4	BL1/ BF1/BF4
-	RK3	RK3	RK3	RK3
-	RP	RP	RP	RP
-	-	EL1	EL1	EL1
-	-	BF8	BF8	BF8

The associated buttons have two markings: S and P. S stands for selected and P for ready (it is the first letter of the word Prêt).
Weapons selection is done by clicking on the button below the selected code, when a weapon is selected the letter S will light and after an interval of time based on the weapon type, the letter P. When both S and P are lit, the selected weapon is ready for use.

In the bottom row there is an additional button with two markings: K1 and K2, located below the Selective Jettison switch. This button controls the DEFA 553 guns targeting mode: K1 is for air-to-air combat and K2 for air-to-ground attacks.

The bottom row display is static and does not change, but he LCD display will go dark when the associated weapon/store has been expended/jettisoned.

PCA Modes display

NAV Master Mode

<table>
<tr><td colspan="2">ARME
OFF</td><td colspan="2">TOP</td><td colspan="2">POL</td><td colspan="2">APP</td><td colspan="2">RD</td><td colspan="2">OBL</td></tr>
<tr><td colspan="2"></td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td></tr>
<tr><td>SEL</td><td></td><td colspan="2">MAG</td><td colspan="2">530</td><td colspan="2">RP</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>K1</td><td>K2</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td></tr>
</table>

This is the default mode and the options displayed are all related to the aircraft navigation.

1. **TOP**: Guidage en Vitesse, Speed guidance. A special navigation mode not available in open beta.

2. **POL**: Police mode. The system provides guidance to a locked target for identification. No weapons are available in this mode, even if the Master Arm switch is in the ON position.
3. **APP**: Approach mode. The system is configured to follow an instruments landing.
4. **RD**: Roue Desirée, desired route. A special navigation mode not available in open beta.
5. **OBL**: Recalage Oblique de la Centrale, Radar based INS calibration. Not available in open beta.

Air-to-Air modes

1. Super 530D mode

<table>
<tr><td colspan="2">ARME
OFF</td><td colspan="2">RDO</td><td colspan="2">POL</td><td colspan="2">TAF</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2"></td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td></tr>
<tr><td colspan="2">SEL</td><td colspan="2">MAG</td><td colspan="2">530</td><td colspan="2">RP</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>S</td><td></td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td></tr>
</table>

2. Magic II mode

<table>
<tr><td colspan="2">ARME
OFF</td><td colspan="2">RDO</td><td colspan="2"></td><td colspan="2">TAF</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2"></td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td></tr>
<tr><td colspan="2">SEL</td><td colspan="2">MAG</td><td colspan="2">530</td><td colspan="2">RP</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>S</td><td></td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td></tr>
</table>

3. Gun mode

<table>
<tr><td colspan="2">ARME
OFF</td><td colspan="2">RDO</td><td colspan="2"></td><td colspan="2">TAF</td><td colspan="2">LEN</td><td colspan="2">RAP</td></tr>
<tr><td colspan="2"></td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td><td colspan="2">S</td></tr>
<tr><td colspan="2">SEL</td><td colspan="2">MAG</td><td colspan="2">530</td><td colspan="2">RP</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>K1</td><td>K2</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td><td>S</td><td>P</td></tr>
</table>

1. **RDO**: Ralliement Designation Poursuite, Target pursuit mode. It is automatically entered when locking a radar contact.
2. **POL**: Police mode.
3. **TAF**: Not known at this time. Not available.
4. **LEN**: Low fire rate (guns only). Set the guns to fire 1,200 rounds per minute.
5. **RAP**: High fire rate (guns only). Set the guns to fire 1,800 rounds per minute.

Note: The P symbol is only lit when the missile seeker is tracking a target.

Air-to-Ground modes

1. Bombs (all types).

Free fall bomb in direct attack.

Free fall bomb attack using a designated Initial Point.

2. Rockets

3. Guns

ARME		TAS		RS				LEN		RAP	
OFF											
		S		S		S		S		S	
SEL		MAG		RK1		RP					
K1	K2	S	P	S	P	S	P	S	P	S	P

1. **TAS**: Uses the radar to obtain slant range to ground and calculate impact point.
2. **RS**: Uses the altitude provided by the radar altimeter to calculate slant range to the ground. Less accurate since it cannot take into account changes in terrain level.
3. **PI**: Sets the Initial Point for a bomb run
4. **ZBI**: Used in conjunction with the IP to calculate impact point. This mode depends on the INS.
5. **EXT**: Unknown, probably simultaneous rocket release. Not available in open beta.
6. **INT**: Unknown, probably individual rocket release. Not available in open beta.
7. **LEN**: Low fire rate (guns only). Set the guns to fire 1,200 rounds per minute.
8. **RAP**: High fire rate (guns only). Set the guns to fire 1,800 rounds per minute.

The PPA

The PPA is located to the right of the radar display and below the HIS. It is used to configure selected weapons options, like bomb fuse type, cooling the Magic II seeker, etc.

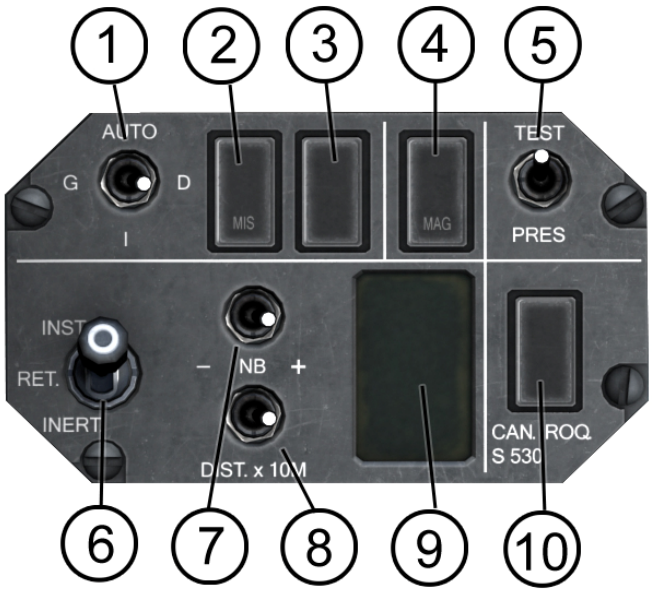


Figure 27The PPA

1. Missile Pylon selector
2. Super 530D Standby
3. Missile Fire selector
4. Magic II cooling standby
5. System self-test/Load out display
6. Bomb fusing options
7. Release quantity selector
8. Release interval selector
9. Selected Quantity and Interval display
10. Guns/Rockets firing options.

Note: For open beta only the bomb release quantity is operational.

Bomb release quantity

To increase/decrease the bomb quantity of bombs to be released you have to click on the release quantity switch. A left click will increase the value and a right click will decrease it.
The values are increased in pairs: 0, 2, 4, 8, 10. For the PPA 0 is equivalent to 1.

Bomb release priority

In order to maintain aircraft load balance, the bombs are dropped in matching pairs from the outwards pylons to the internals. The release order is: 2, 8, 4, 6, 3, 7, 5.

If a release quantity larger than 1 has been configured, the bombs will be released in matching pylon pairs, e.g: 2+8, 4+6, etc. If a pair is incomplete the quantity configuration is disregarded and the bombs are released one by one in the usual order.

Weapons Utilization

The aircraft weapons can only be used when the Master Arm switch is in the ARMED position. The system will put everything else, like navigation, on standby and will dedicate itself to the selected Master Mode

Magic II

The R.550 Magic II is a fire and forget IR guided missile. It does not need the radar to seek and intercept a target. To use it you only need to click on the MAG button in the PCA or click on the HOTAS button,

A low buzz-like sound will be heard while the seeker is searching. The buzz will be replaced by a louder tone when the seeker has locked on a target. In the HUD, the seeker symbol will move towards the position of the locked target.

If the target is also locked on radar, a smaller circle will appear inside the seeker search area circle indicating that the target is in the NO ESCAPE zone.

A no shoot cross will appear when the G-load is too high to fire the missile.

Super 530D

The Matra Super530D is a semi-active homing radar missile, also known as a beam rider. To successfully use this missile, you need two conditions:

- A locked radar target
- To always keep the target in your screen during the flight time the missile needs to intercept it.

Note: The Super 530D is not a fire and forget missile. You need to keep the aircraft in a easily predicted flight path until the missile either intercepts or misses, which will put you in a disadvantage for the entire missile flight time.

To select the Super 530D, click on the 530 button in the PCA.

Bombing Procedures

There are two modes to release bombs:

- **CCRP, or Continuously Computed Release Point**. In this mode the pilot selects a point in the ground as the target and the ballistic computer calculates the specific time when the bombs should be released in order to hit the target.

- **CCIP, or Continuously Computed Impact Point.** In this mode, the ballistic computer displays in the HUD the point at which the bombs would hit the ground based on aircraft altitude, speed and pitch. To hit a target, you have to place the impact point over the target and release the bombs.

In the M-2000C, the bomb release mode is determined by the bomb type.
MK-82s, GBU-12, GBU-16 and GBU-24 all use CCRP.
MK-82SE, BGL-66 and BAP-100, all use CCIP.

Both methods require the same ingredient: slant range to the ground. There are three ways to get this value: By radar ranging, calculating it from the aircraft altitude above ground and from the INS system.

- **Radar ranging**: To obtain radar ranging data, you need to click on the TAS button. The radar screen will go dark and the words TAS will appear in the upper right corner.
- **Altitude above ground**: To obtain altitude above ground you need to activate the radar altimeter.

- **INS calculation**: In this mode you need to first select an initial point and the INS will calculate the range to ground. This mode is not available in Open Beta.

CCRP Procedure

To do a CCRP bomb run the following procedure must be followed. (For symbols description please refer to the HUD chapter).

1. Minimum altitude should be 2000 feet AGL.
2. Fly in a slight dive towards your target. It shouldn't be more than 15º.
3. Place the CCRP piper over your target
4. Click on the TARGET LOCK button (refer to HOTAS title in Chapter 1).
5. Pull up and resume level flight.
6. The target cross will remain over the target.
7. Fly towards the target.
8. When you are 15 seconds from the release point, the release cue will appear.
9. Release the bombs when the release cue intersects the CCRP piper.
10. Free the system by clicking on the TARGET UNLOCK key (refer to HOTAS title in Chapter 1).

CCIP Procedure

To do a CCIP bomb run the following procedure must be followed. (For symbols description please refer to the HUD chapter).

1. Upon activating the CCIP, raise the seat so your downwards view is better
2. Minimum altitude should be 1500 feet AGL. 3000 AGL feet is better, especially if you are going to do a high dive.
3. Minimum indicated airspeed should be 400 KIAS.
4. The CCIP piper will appear at the bottom of the HUD.
5. When nearing your target, fly in a dive. The steeper the dive the better. 20º to 25º dives are very precise.
6. Check the safe altitude cue position.
7. Release the bombs when the CCIP piper is over your target
8. Pull up.
9. DO NOT release the bombs if the safe altitude cue intersects the FPM or is above it.

Stores Jettison

There are two ways to jettison the stores loaded in the aircraft: Selective Jettison and Emergency Jettison.

Selective Jettison

With selective jettison you can release a specific store type without affecting all the others, like jettisoning external fuel tanks.

1. Click the Selective Jettison switch cover to the open position.
2. Click the Selective Jettison switch to the left position.
3. Select the store to be jettisoned in the PCA.
4. Click the Master Arm switch to the ARMED position
5. Pull the trigger.
6. Click the Master Arm switch to the OFF position
7. Click the Selective Jettison switch to the right position
8. Click the Selective Jettison switch cover to the closed position.

Emergency Jettison

With emergency jettison all the stores in the aircraft will be released except for the Magic II missiles. The emergency release includes the Super 530Ds if they are loaded.