DCS GUIDE

JF-17 THUNDER BLOCK 1

BY CHUCK

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DISCLAIMER

This document has been created for recreational purposes only. Do not use for training or real life flying.

The author of this document has never had access to restricted or classified documentation on the JF-17. The author has never had access to OEM (Original Equipment Manufacturer) data related to the JF-17, its armament systems nor its defensive systems. All the information within this document is taken from public documentation (i.e. JF-17 Early Access Manual by Deka Ironwork) and non-official tutorials (player-made videos on Youtube).

The procedures listed in this document are deliberately simplified for gameplay purposes due to the limitations of the DCS World simulation environment and the limitations of the DCS JF-17 module by Deka Ironwork.

This document is merely a free, personal project that is used for entertainment. This document is not meant nor designed to teach someone to fly a real JF-17.

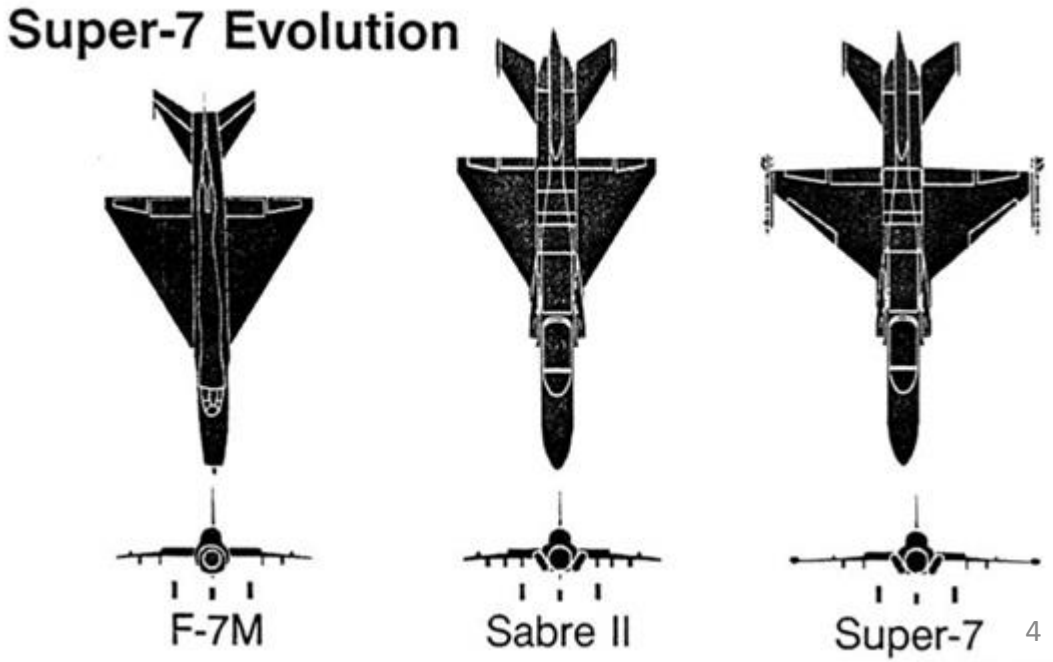
TABLE OF CONTENTS

Special thanks to Paul "Goldwolf" Whittingham for creating the guide icons.

The **PAC JF-17 Thunder** is a lightweight, single-engine, multi-role combat aircraft developed jointly by the Pakistan Aeronautical Complex (PAC) and the Chengdu Aircraft Corporation (CAC) of China. The JF-17 can be used for aerial reconnaissance, ground attack and aircraft interception. Its designation "JF-17" by Pakistan is short for "Joint Fighter-17", while the designation and name "FC-1 Xiaolong" by China means "Fighter China-1 Fierce Dragon". The JF-17 is to become the backbone of the Pakistan Air Force (PAF), complementing the General Dynamics F-16 Fighting Falcon at half the cost. The PAF inducted its first JF-17 squadron in February 2010.

The JF-17 was primarily developed to meet the Pakistan Air Force requirement for an affordable, modern, multi-role combat aircraft as a replacement for its large fleet of Dassault Mirage III/5 fighters, Nanchang A-5 bombers, and Chengdu F-7 interceptors, with a cost of 500 million USD, divided equally between China and Pakistan.

By 1989, because of economic sanctions by the US, Pakistan had abandoned Project Sabre II, a design study involving US aircraft manufacturer Grumman and China, and had decided to redesign and upgrade the Chengdu F-7. In the same year, China and Grumman started a new design study to develop the Super 7, another redesigned Chengdu F-7. The initial design of the Super 7 was originally an improved, modified version of the J-7/F-7, which was a copy of the MiG-21 Fishbed.



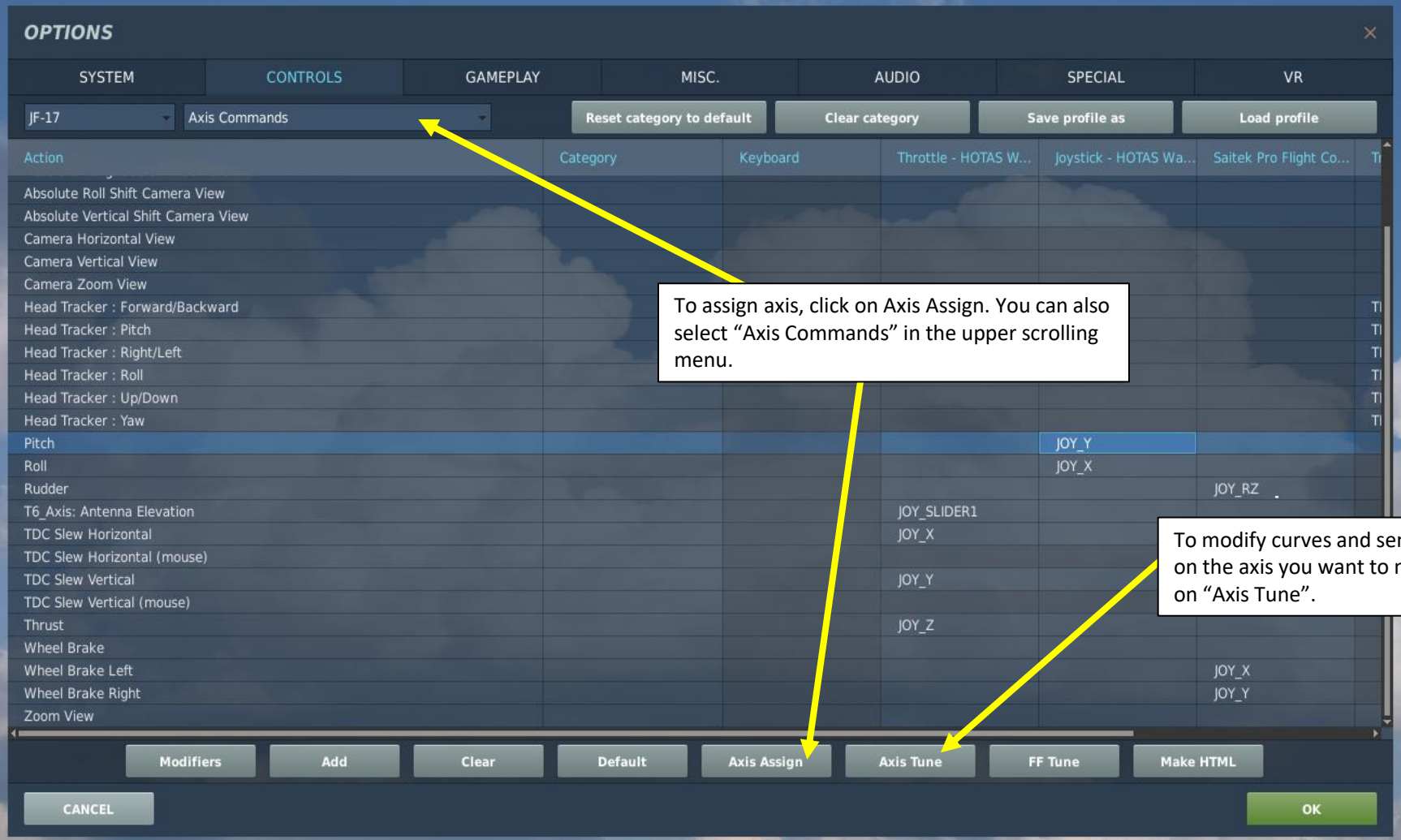
Grumman left the project when sanctions were placed on China following the political fallout from the 1989 Tiananmen Square protests. After Grumman left the Chengdu Super 7 project, the Fighter China project was launched in 1991. In 1995, Pakistan and China signed a memorandum of understanding (MoU) for joint design and development of a new fighter, and over the next few years worked out the project details. In June 1995, Mikoyan had joined the project to provide "design support", this also involved the secondment of several engineers by CAC.

The Thunder has a complex DNA; it integrates many technologies from existing aircraft; a cannon from a MiG-21, an engine derived from a MiG-29's, and various sets of avionics and HOTAS similar to the F-16's, which facilitated the transition of Pakistani pilots flying F-16s.The JF-17 has a bubble canopy with a great view, a strake-wing layout and advanced avionics that allow the use of very modern armament like precision-guided munitions, laser-guided rockets, anti-ship, Man-In-The-Loop cruise missiles, and much more. The KLJ-7 radar provides excellent air to ground, air-to-sea and air-to-air capability. The WMD-7 targeting pod is a useful tool to define a SPI ("Sensor Point of Interest") that can be used by other sensors as well. Although the Joint Fighter is relatively small and nimble when compared to modern fighter jets. Keep in mind that size isn't everything when functionality and mission versatility are considered. This functionality is noticeable with the impressive array of Chinese and western ordnance available, but it also extends to the cockpit itself, which consists mainly of three digital displays that contain dozens of sub-menus. On top of all these bells and whistles, a functioning DTC (Data Transfer Cartridge) is a very nice touch that allows you to use preset countermeasure programs, flight plans and even weapon programs like the complex CM-802AKG missile.

The Deka Ironwork team simulated the most modern fighter jet in DCS World so far. The Fierce Dragon has a rich heritage and will very likely become a formidable ally to have on your wing… or a foe to be reckoned with on multiplayer servers.

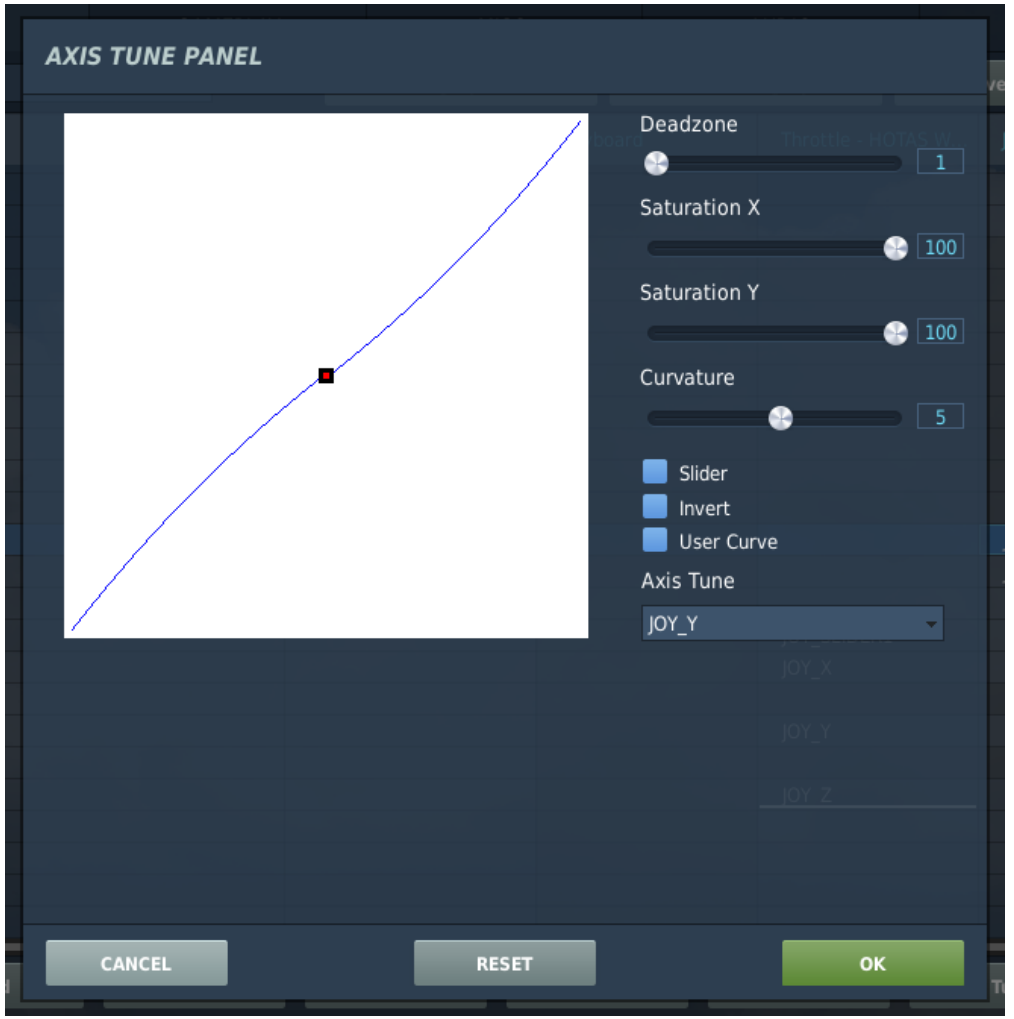
PART 1 – INTRODUCTION

Note: In your controls, make sure you check your “Trim” controls since the default version of the game has your trim hat set to changing your view rather than trim the aircraft. Since most of you are probably equipped with a TRACKIR already, I suggest you make sure the Trim Hat Switch is set up properly.



Bind the following axes:

- PITCH (DEADZONE AT 1, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 5)
- ROLL (DEADZONE AT 1, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 5)
- RUDDER (DEADZONE AT 0, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 0)
- THRUST – CONTROLS ENGINE RPM
- TDC SLEW HORIZONTAL
- TDC SLEW VERTICAL
- T6_AXIS VERTICAL ANTENNA
- WHEEL BRAKE LEFT / RIGHT



WHAT YOU NEED MAPPED

S5 – Change Weapon Station/NWS (Grey button on RHS)

S3: Weapon Launch

S4: Fire Main Gun

↑ S1 (Sensor Selection) Sw. FWD
→ S1 (Sensor Selection) Sw. RIGHT
↓ S1 (Sensor Selection) Sw. AFT
← S1 (Sensor Selection) Sw. LEFT
P

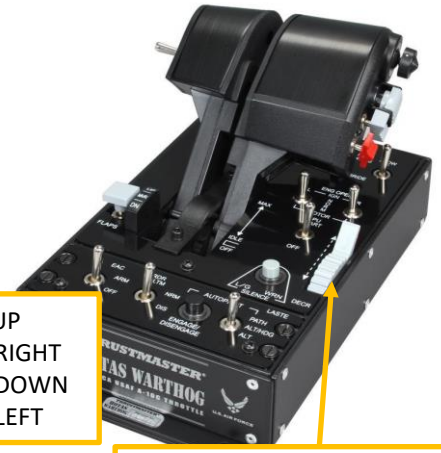
S8 – Change Weapons

S7 – Autopilot OFF

↑ S6 UP – Trim Nose DOWN
→ S6 RIGHT – Trim RIGHT
↓ S6 DOWN – Trim Nose UP
← S6 LEFT – Trim LEFT

↑ ZOOM IN SLOW
→ T5 (TDC) Press (ENTER)
↓ ZOOM OUT SLOW
← S2 (Sensor Control) PRESS

↑ S2 (Sensor Control) UP
→ S2 (Sensor Control) RIGHT
↓ S2 (Sensor Control) DOWN
← S2 (Sensor Control) LEFT



T6 Axis: Antenna Elevation

↑
→T4 FWD – Radio COMM1
↓
←T4 AFT – Radio COMM2
P T4 PRESS – IFF Interrogation

T2 PRESS

↑ TDC SLEW VERTICAL
→ TDC SLEW HORIZONTAL
↓ TDC SLEW VERTICAL
← TDC SLEW HORIZONTAL

← T3 FWD – Speed Brake ON

→ T3 AFT – Speed Brake OFF

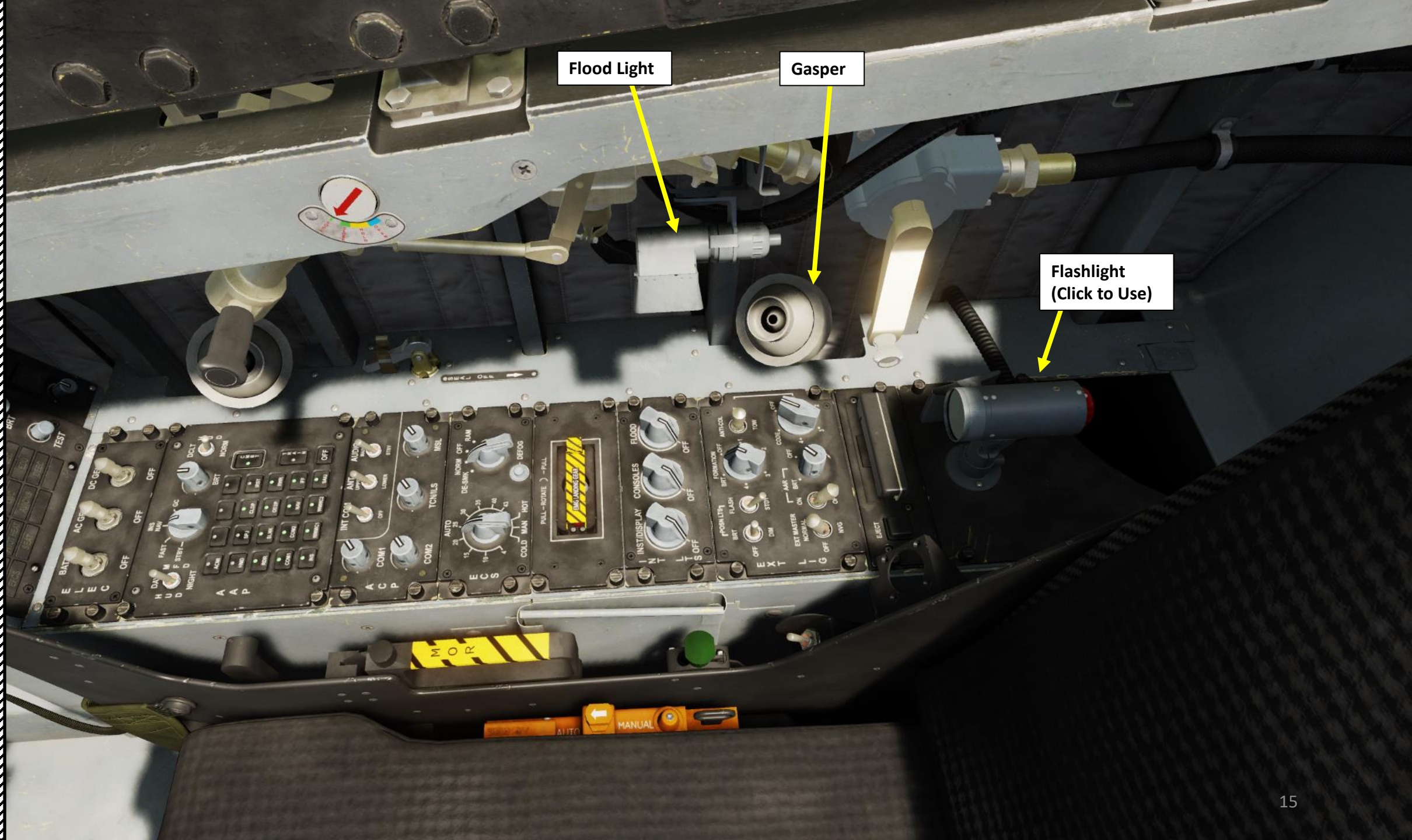
↑ T1 BACK (MMS AG)
→ T1 CENTER (MMS NAV)
↓ T1 FWD (MMS INTC)
←

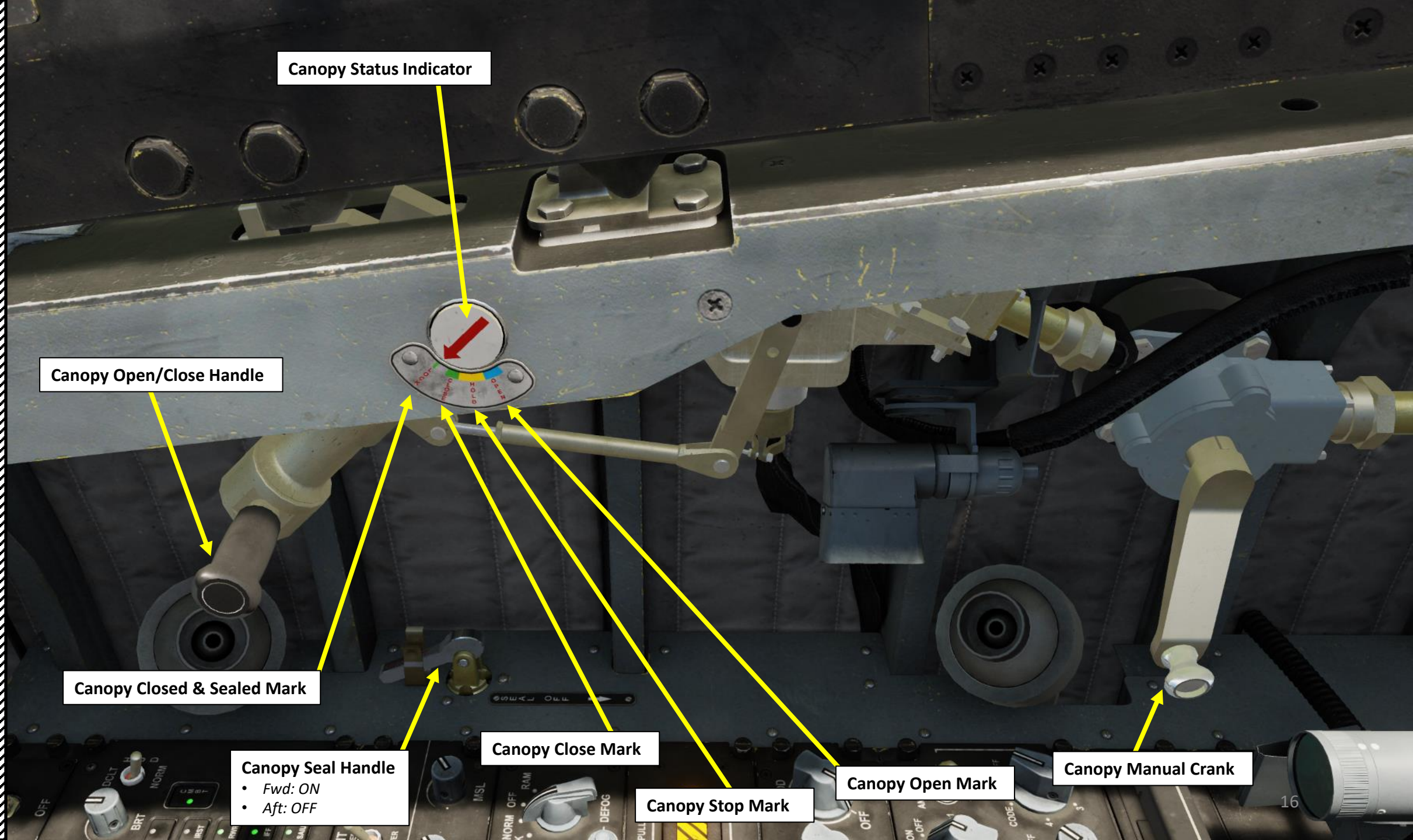
← T2 AFT – Countermeasures Dispense
→ T2 FWD – SPJ Standby/Jam

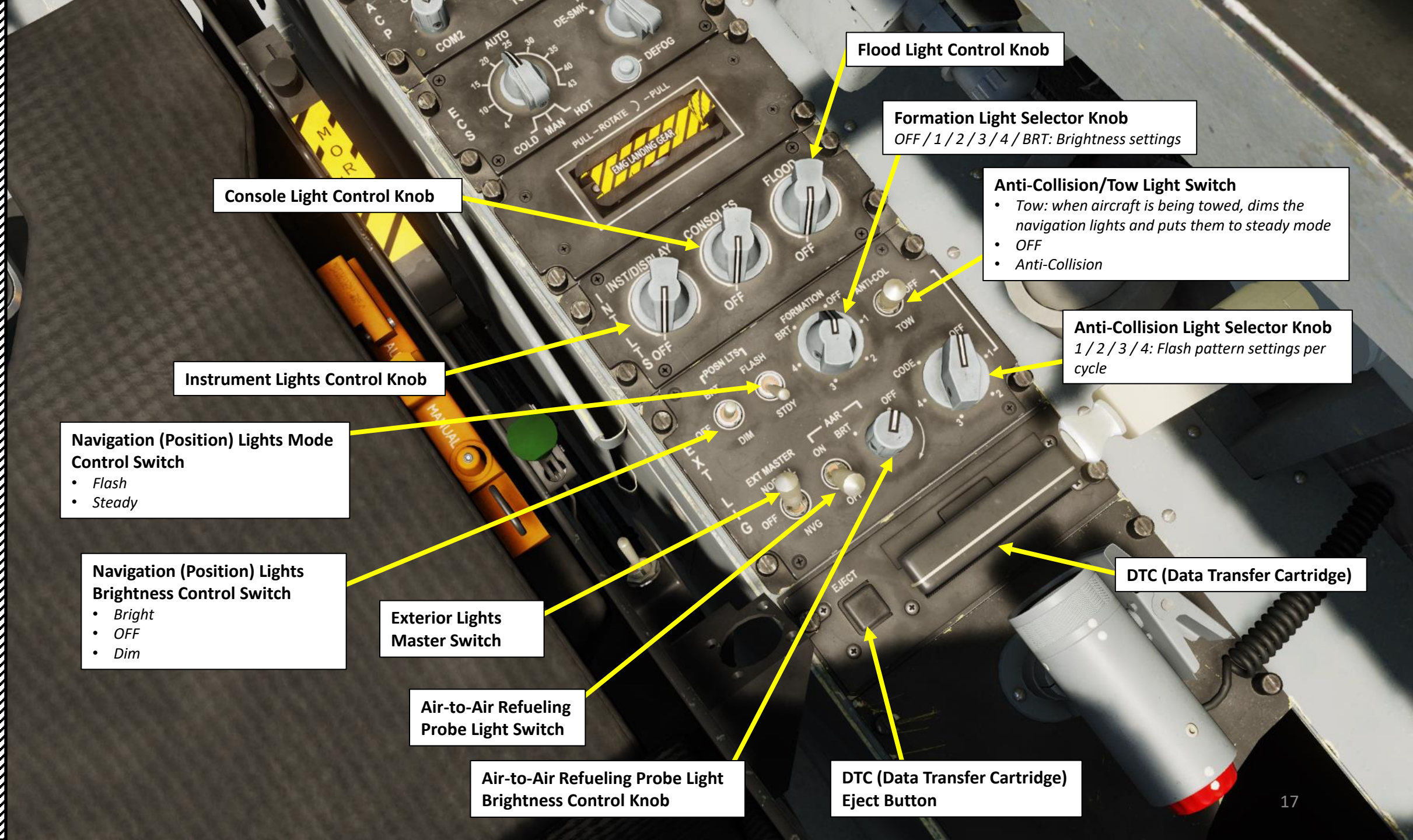
+ TOE BRAKES (MAPPED ON PEDALS)

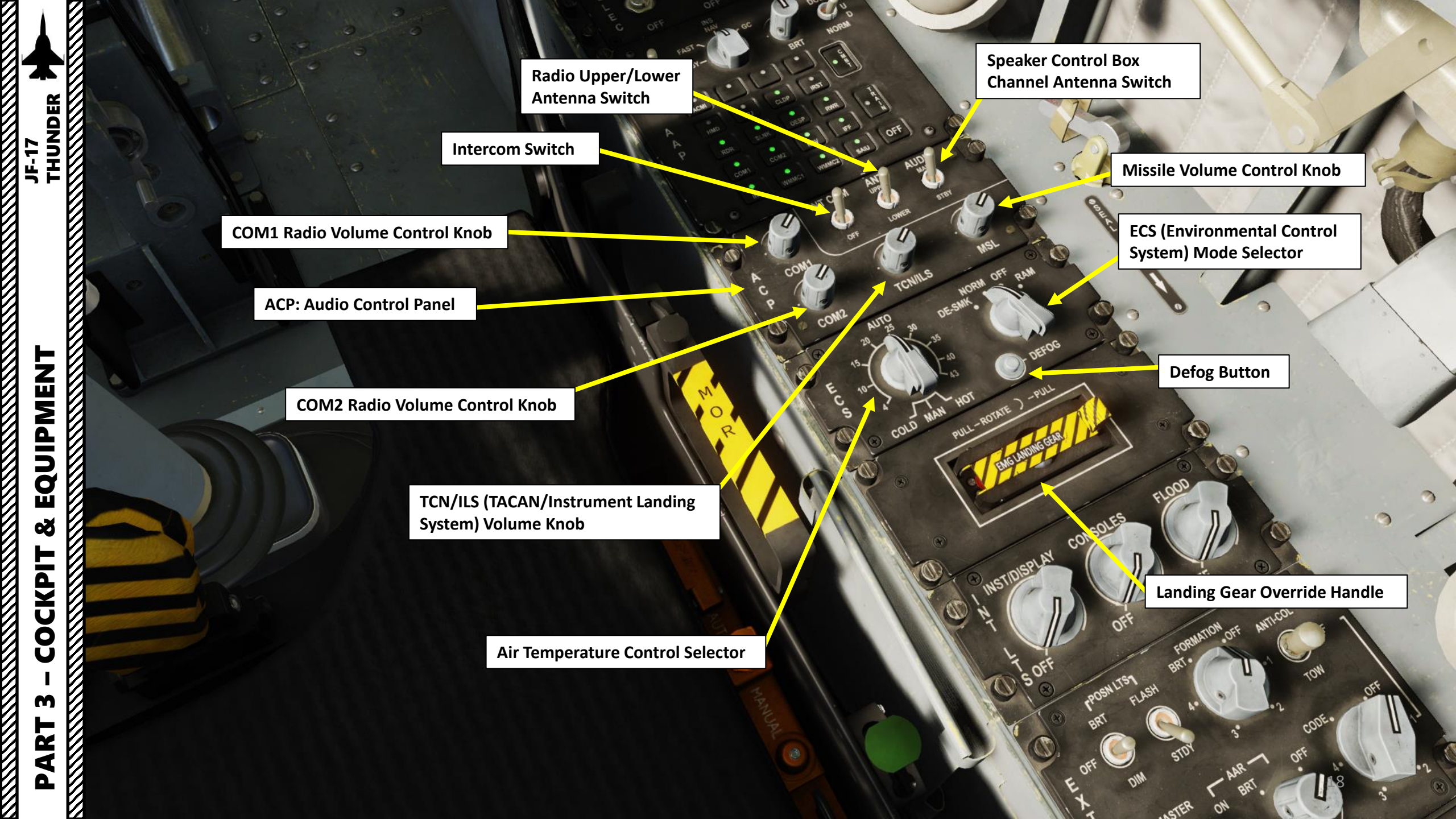

FP-A 01
CAS MAN
001 001
COM1 COM2
+4550
27.972
27.9
OXYGEN
PNEUMATIC

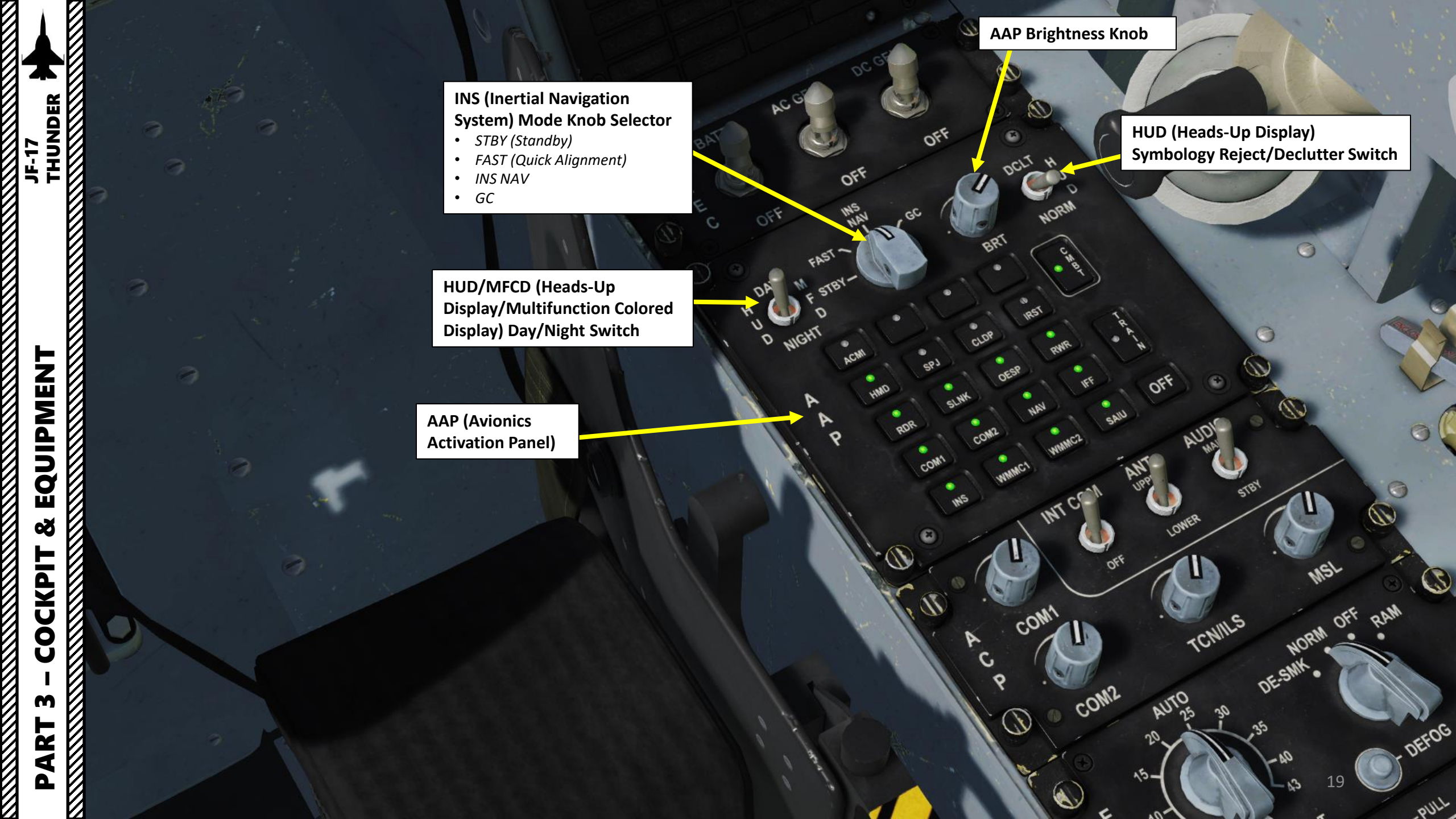
PART 3 – COCKPIT & EQUIPMENT


Flood Light
Gasper
Flashlight
(Click to Use)


Canopy Status Indicator
Canopy Open/Close Handle
Canopy Closed & Sealed Mark
Canopy Seal Handle
• Fwd: ON
• Aft: OFF
Canopy Close Mark
Canopy Stop Mark
Canopy Open Mark
Canopy Manual Crank

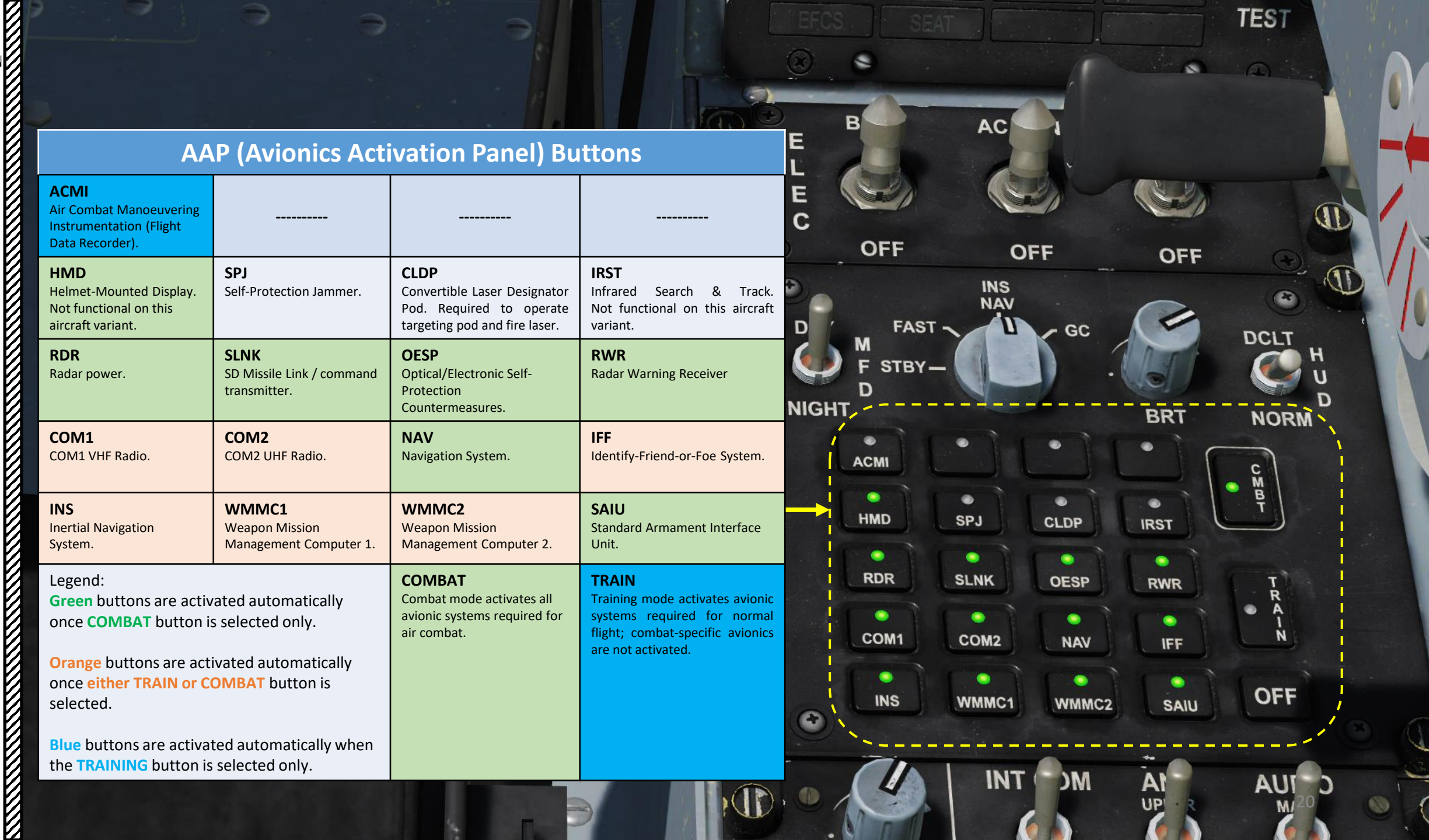

Flood Light Control Knob
Formation Light Selector Knob
OFF / 1 / 2 / 3 / 4 / BRT: Brightness settings
Anti-Collision/Tow Light Switch
Tow: when aircraft is being towed, dims the navigation lights and puts them to steady mode
OFF
Anti-Collision
Console Light Control Knob
Anti-Collision Light Selector Knob
1 / 2 / 3 / 4: Flash pattern settings per cycle
Instrument Lights Control Knob
Navigation (Position) Lights Mode Control Switch
Flash
Steady
Navigation (Position) Lights Brightness Control Switch
Bright
OFF
Dim
Exterior Lights Master Switch
DTC (Data Transfer Cartridge)
Air-to-Air Refueling Probe Light Switch
Air-to-Air Refueling Probe Light Brightness Control Knob
DTC (Data Transfer Cartridge) Eject Button

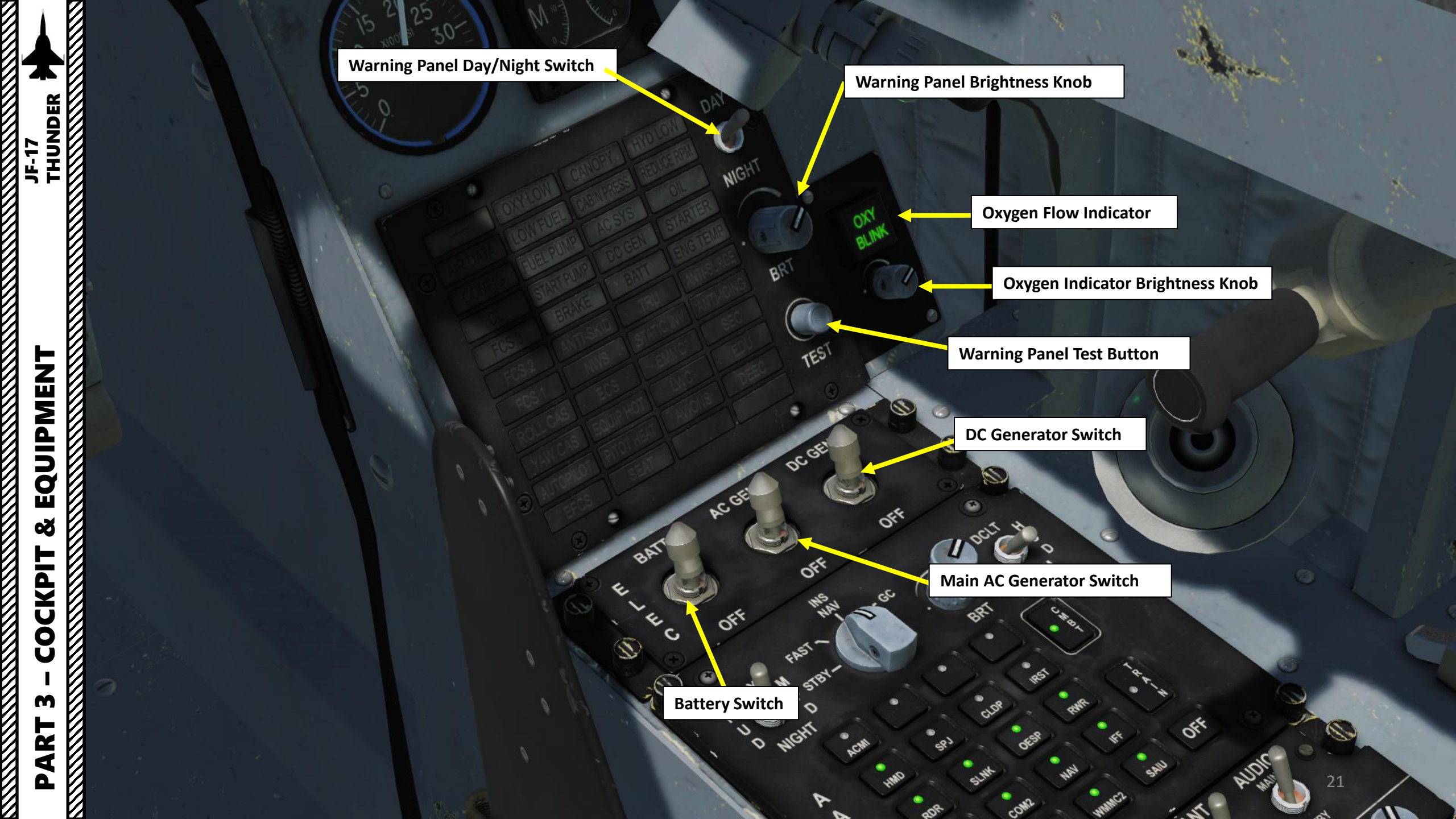

Radio Upper/Lower Antenna Switch
Speaker Control Box Channel Antenna Switch
Intercom Switch
Missile Volume Control Knob
COM1 Radio Volume Control Knob
ECS (Environmental Control System) Mode Selector
ACP: Audio Control Panel
Defog Button
COM2 Radio Volume Control Knob
TCN/ILS (TACAN/Instrument Landing System) Volume Knob
Landing Gear Override Handle
Air Temperature Control Selector


AAP Brightness Knob
INS (Inertial Navigation System) Mode Knob Selector
• STBY (Standby)
• FAST (Quick Alignment)
• INS NAV
• GC
HUD (Heads-Up Display) Symbology Reject/Declutter Switch
HUD/MFCD (Heads-Up Display/Multifunction Colored Display) Day/Night Switch
AAP (Avionics Activation Panel)
OFF
INS NAV
GC
FAST
STBY
NIGHT
DCLT
NORM
BRT
COM1
COM2
TCN/ILS
MSL
LOWER
STBY
AUTO
DE-SMK
NORM
OFF
RAM
DEFOG

AAP (Avionics Activation Panel) Buttons

ACMI Air Combat Manoeuvering Instrumentation (Flight Data Recorder).	----------	----------	----------
HMD Helmet-Mounted Display. Not functional on this aircraft variant.	**SPJ** Self-Protection Jammer.	**CLDP** Convertible Laser Designator Pod. Required to operate targeting pod and fire laser.	**IRST** Infrared Search & Track. Not functional on this aircraft variant.
RDR Radar power.	**SLNK** SD Missile Link / command transmitter.	**OESP** Optical/Electronic Self-Protection Countermeasures.	**RWR** Radar Warning Receiver
COM1 COM1 VHF Radio.	**COM2** COM2 UHF Radio.	**NAV** Navigation System.	**IFF** Identify-Friend-or-Foe System.
INS Inertial Navigation System.	**WMMC1** Weapon Mission Management Computer 1.	**WMMC2** Weapon Mission Management Computer 2.	**SAIU** Standard Armament Interface Unit.
Legend: **Green** buttons are activated automatically once **COMBAT** button is selected only. **Orange** buttons are activated automatically once **either TRAIN or COMBAT** button is selected. **Blue** buttons are activated automatically when the **TRAINING** button is selected only.		**COMBAT** Combat mode activates all avionic systems required for air combat.	**TRAIN** Training mode activates avionic systems required for normal flight; combat-specific avionics are not activated.



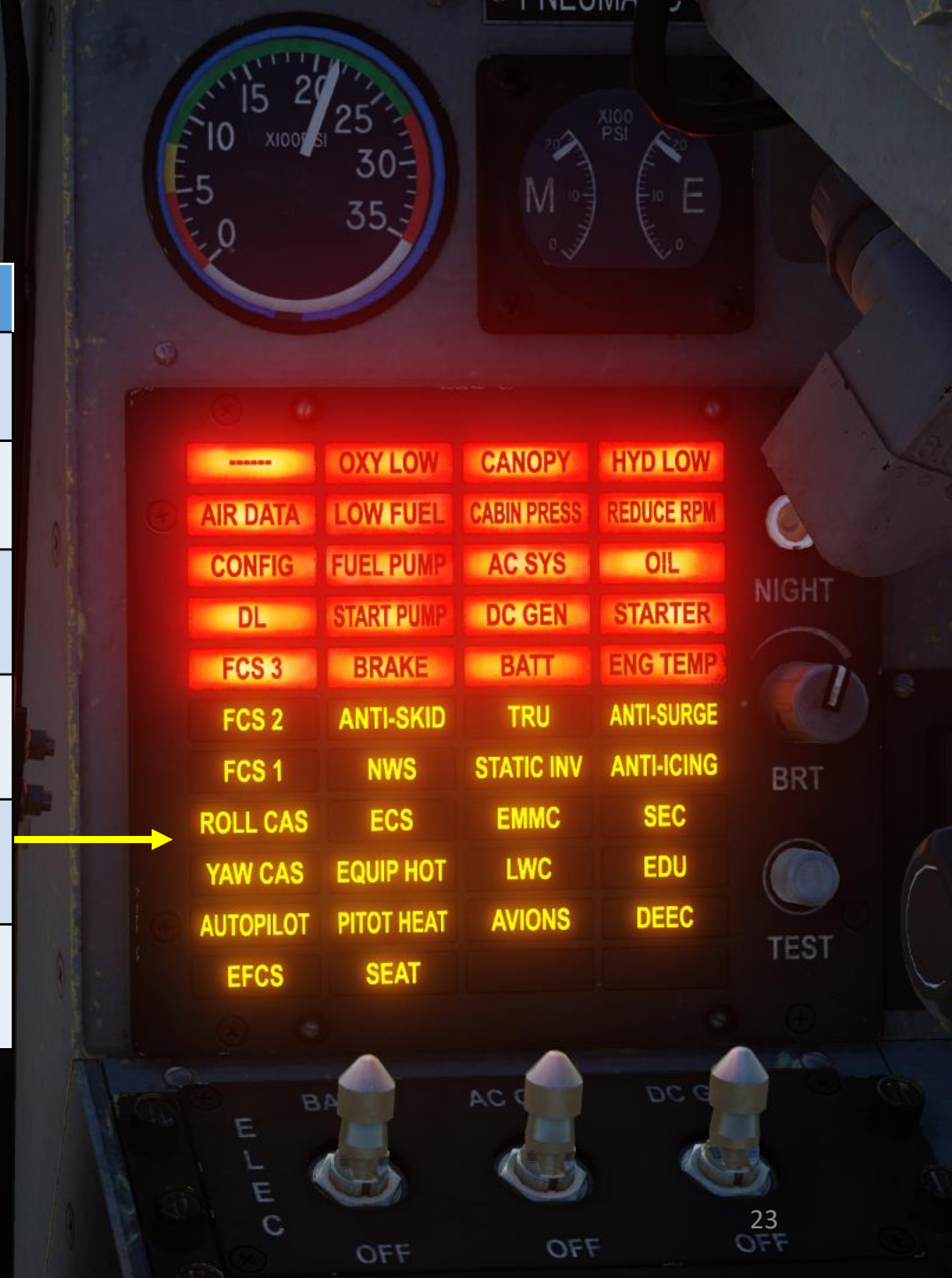

Warning Panel Day/Night Switch
Warning Panel Brightness Knob
Oxygen Flow Indicator
Oxygen Indicator Brightness Knob
Warning Panel Test Button
DC Generator Switch
Main AC Generator Switch
Battery Switch
DAY
NIGHT
BRT
TEST
OXY BLINK
BAT
OFF
DCLT

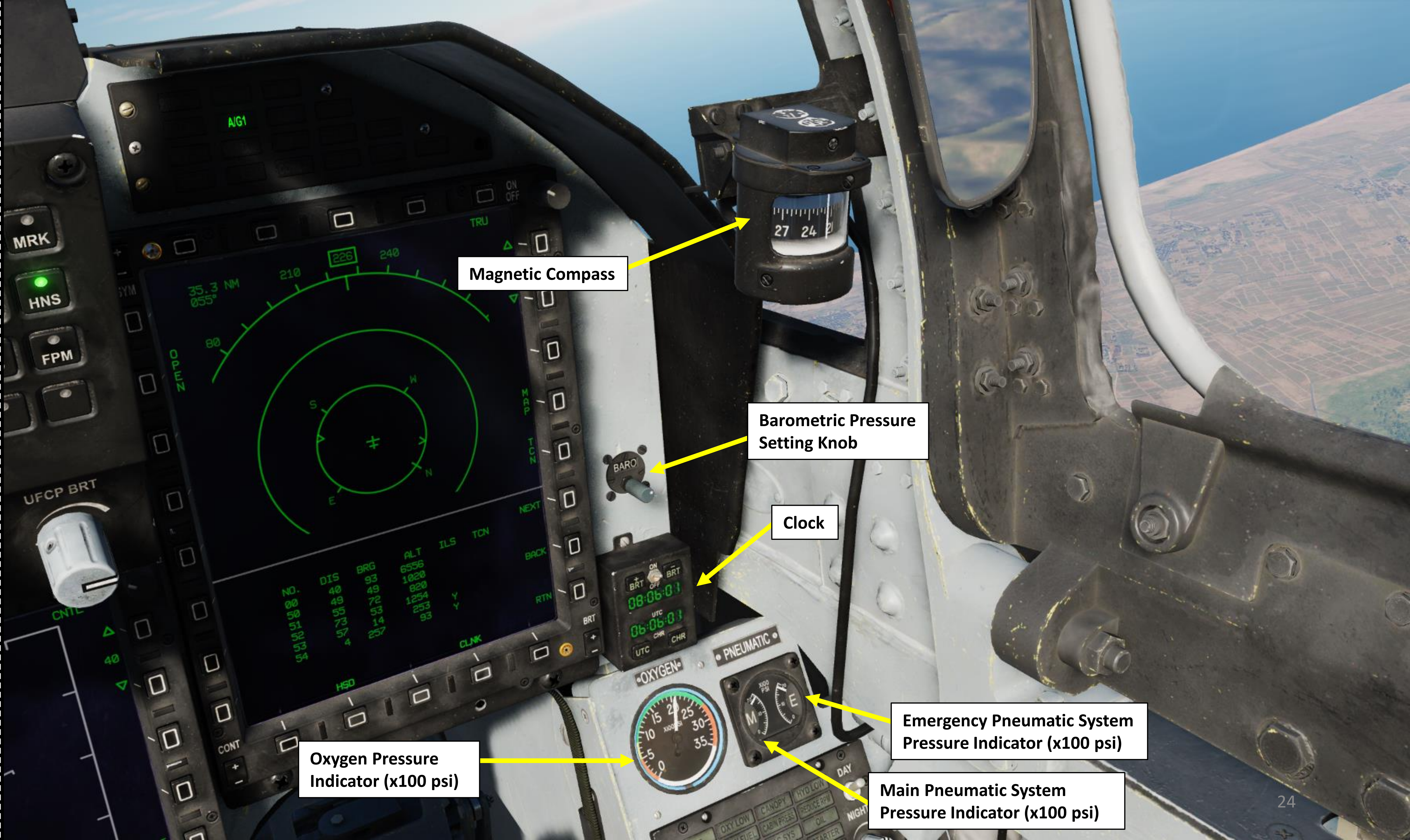
Warning Lights

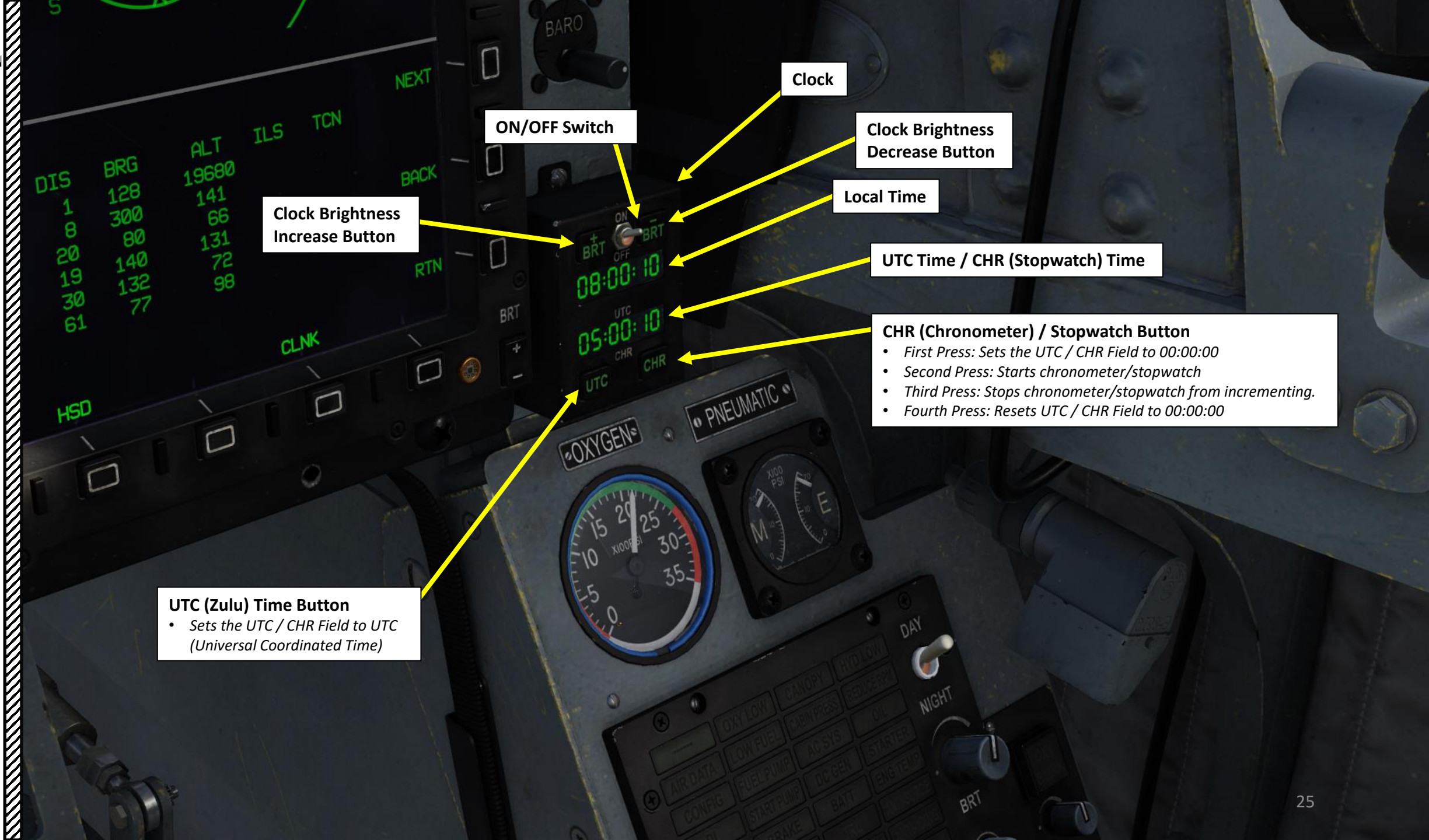
----------	**OXY LOW** Oxygen tank level is low.	**CANOPY** Canopy is not sealed.	**HYD LOW** Low hydraulic pressure detected
AIR DATA Air data system malfunction detected.	**LOW FUEL** Low fuel level is detected.	**CABIN PRESS** Cabin pressure decrease is detected.	**REDUCE RPM** Engine RPM is reduced.
CONFIG Aircraft Flight Control System configuration switch error is detected.	**FUEL PUMP** Fuel pump malfunction is detected.	**AC SYS** Main AC electrical system malfunction is detected.	**OIL** Low oil pressure detected
DL Direct link Flight Control System configuration mode is selected.	**START PUMP** DC electric pump malfunction is detected.	**DC GEN** DC generator malfunction is detected.	**STARTER** Engine starter malfunction
FCS 3 Flight Control System level 3 status.	**BRAKE** Brake malfunction is detected.	**BATT** Battery malfunction is detected.	**ENG TEMP** Engine temperature overheat detected.

Caution Lights

FCS 2 Flight Control System level 2 status.	**ANTI-SKID** Anti-skid system malfunction is detected.	**TRU** Transformer Rectifier Unit malfunction is detected.	**ANTI-SURGE** Anti-surge valve malfunction detected.
FCS 1 Flight Control System level 1 status..	**NWS** Nosewheel steering system malfunction is detected.	**STATIC INV** Static inverter malfunction is detected.	**ANTI-ICING** Anti-icing system malfunction detected.
ROLL CAS Roll CAS (Control Augmentation System) is OFF.	**ECS** Environment control system malfunction is detected.	**EMMC** EMMC (Electro Mechanical Management Computer) malfunction is detected.	**SEC** Secondary engine control malfunction is detected.
YAW CAS Yaw CAS (Control Augmentation System) is OFF.	**EQUIP HOT** Equipment overheat detected.	**LWC** Warning light malfunction detected.	**EDU** Engine Diagnostic Unit – Engine Controller / Regulator Failure detected
AUTOPILOT Autopilot is OFF.	**PITOT HEAT** Pitot tube heater malfunction detected.	**AVIONS** Avionics malfunction detected.	**DEEC** Digital electronic engine control malfunction is detected.
EFCS EFCS (Emergency Flight Control System) malfunction is detected.	**SEAT** Ejection seat safety is ON.		



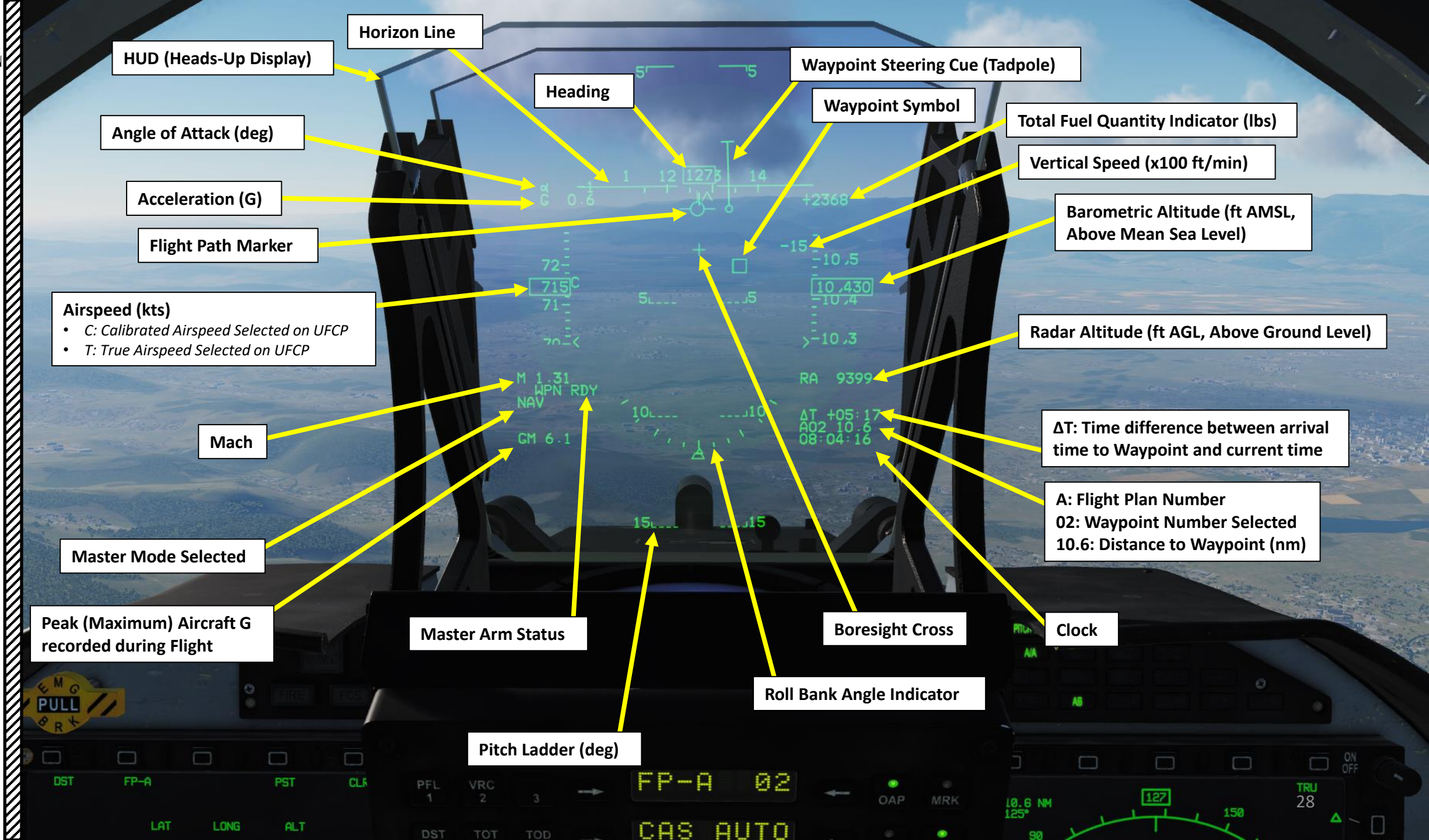

Magnetic Compass
Barometric Pressure Setting Knob
Clock
Emergency Pneumatic System Pressure Indicator (x100 psi)
Main Pneumatic System Pressure Indicator (x100 psi)
Oxygen Pressure Indicator (x100 psi)
MRK
HNS
FPM
UFCP BRT
BARO
OXYGEN
PNEUMATIC

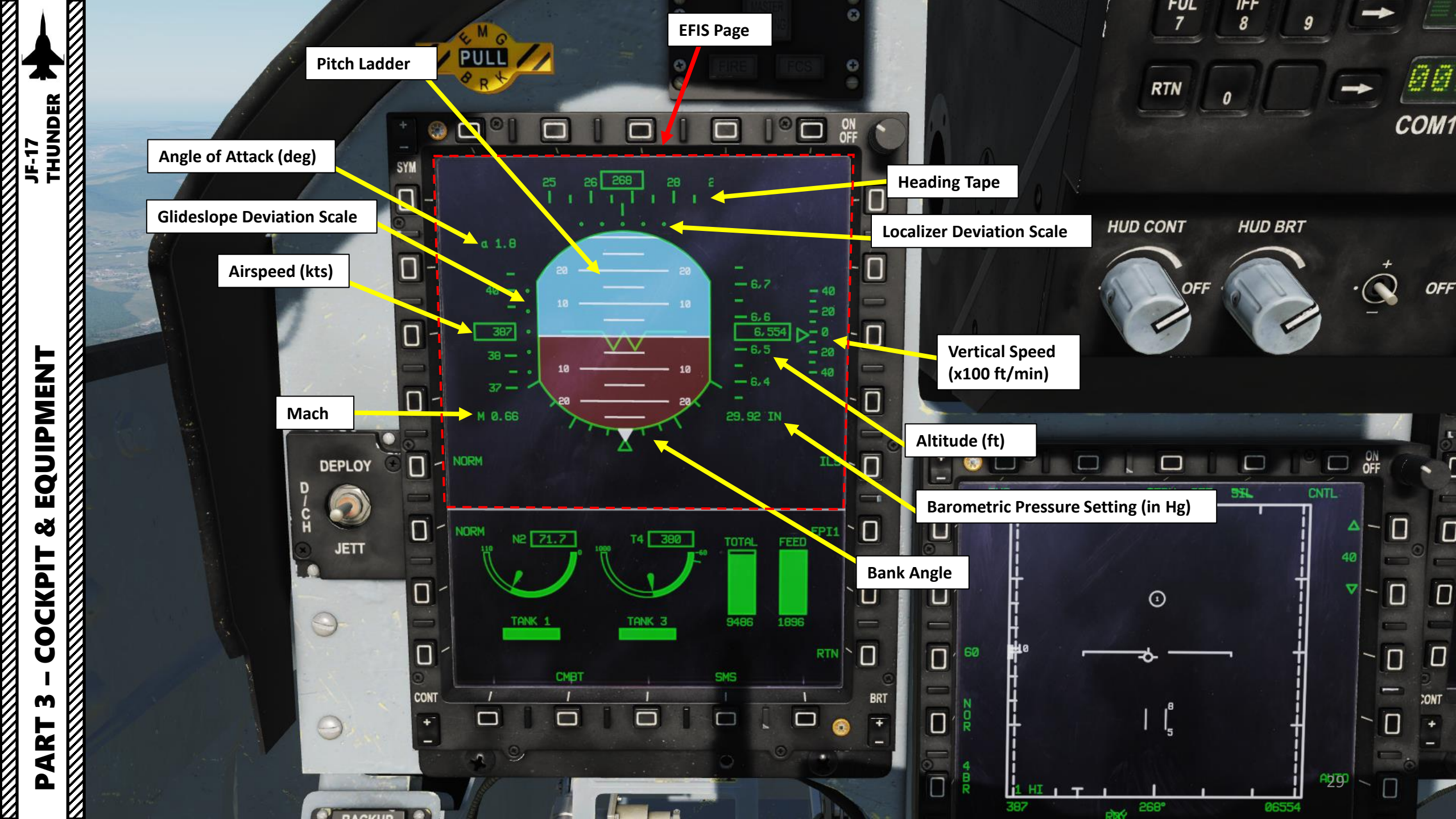

Clock
ON/OFF Switch
Clock Brightness Decrease Button
Clock Brightness Increase Button
Local Time
UTC Time / CHR (Stopwatch) Time
CHR (Chronometer) / Stopwatch Button
• First Press: Sets the UTC / CHR Field to 00:00:00
• Second Press: Starts chronometer/stopwatch
• Third Press: Stops chronometer/stopwatch from incrementing.
• Fourth Press: Resets UTC / CHR Field to 00:00:00
UTC (Zulu) Time Button
• Sets the UTC / CHR Field to UTC (Universal Coordinated Time)
BARO
NEXT
BACK
RTN
CLNK
HSD
BRT
ON
OFF
08:00: 10
UTC
05:00: 10
CHR
OXYGEN
PNEUMATIC
DAY
NIGHT


PFL 1
VRC 2
3
DST 4
TOT 5
TOD 6
FUL 7
IFF 8
9
RTN
0
FP-A 01
CAS MAN
001 001
COM1 COM2
OAP
MRK
P.U
HNS
A/P
FPM
HUD CONT
HUD BRT
OFF
STBY RET
OFF
UFCP BRT
PULL
DEPLOY
JETT
BACKUP
BOMB
IR
OFF
GUN
NORM
ILS
TANK 1
TANK 3
TOTAL
FEED
CMBT
SMS
RTN
CONT
BRT
RWS
CNTL
HSD
CLNK
NEXT
BACK
08:00:50
05:00:50
OXYGEN
PNEUMATIC
WPN REL
TRIM

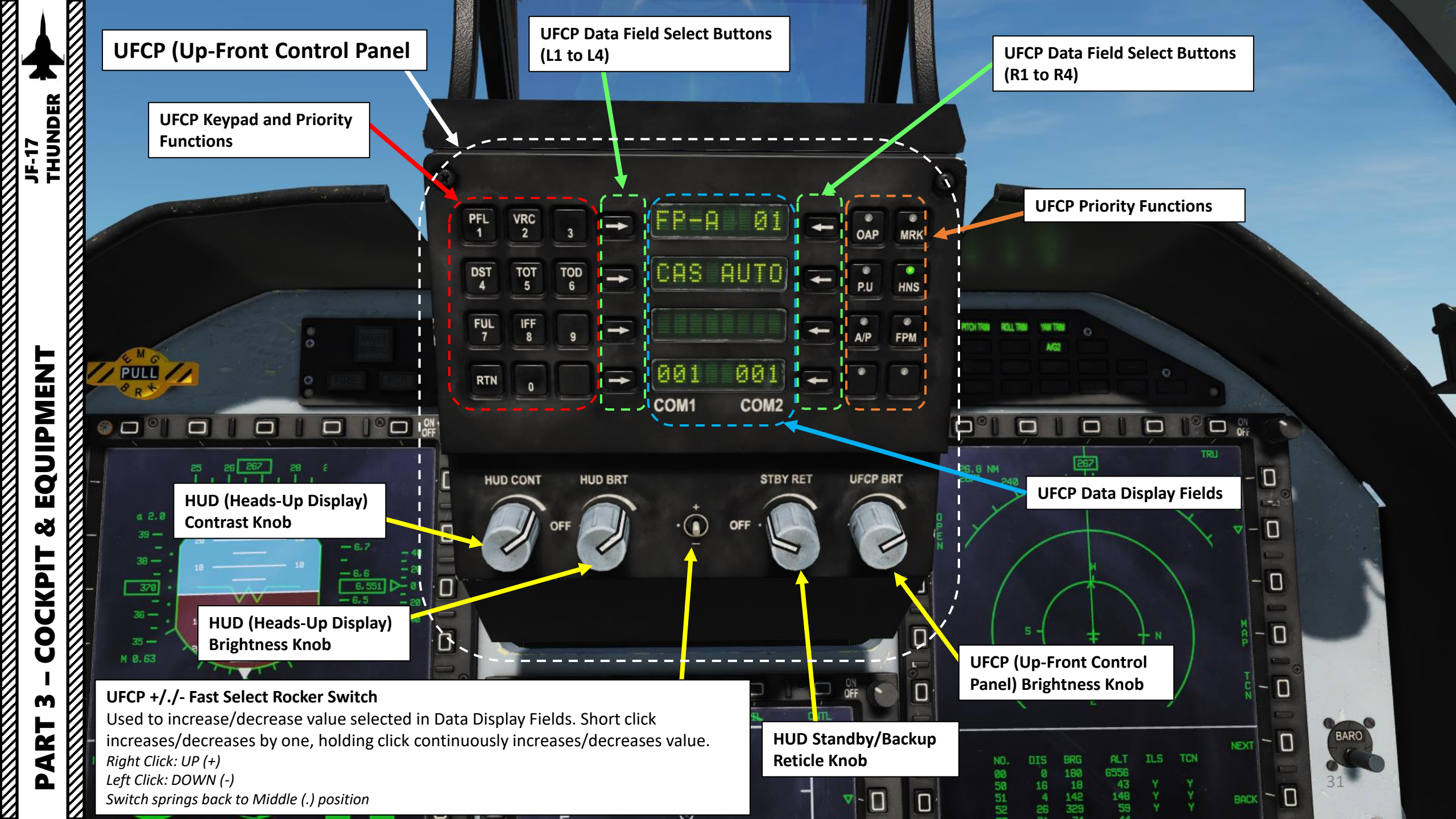
Status Lights

PITCH TRIM Pitch trim neutral position.	**ROLL TRIM** Roll trim neutral position.	**YAW TRIM** Yaw trim neutral position.			
A/A Air-to-Air Flight Control System Configuration Selected	**A/G1** Air-to-Ground 1 Flight Control System Configuration Selected	**A/G2** Air-to-Ground 2 Flight Control System Configuration Selected	**EFCS** Emergency Flight Control System is ON.		
NO.3 TANK No. 3 fuel tank empty.	**NO.1 TANK** No. 1 fuel tank empty.	**WING D/T** Wing drop tank empty.	**CTR D/T** Center drop tank empty.	----------	
START Engine start is active.	**AB** Afterburner is ON.	**COMBAT** Combat mode is active.	**EMG HYD** Emergency hydraulic pump is ON.	**NWS** Nosewheel Steering is ON.	**ADVISORY** SHARS (Strapped-down Heading Attitude Reference System) malfunction is detected.


Horizon Line
HUD (Heads-Up Display)
Heading
Waypoint Steering Cue (Tadpole)
Waypoint Symbol
Total Fuel Quantity Indicator (lbs)
Angle of Attack (deg)
Vertical Speed (x100 ft/min)
Acceleration (G)
Barometric Altitude (ft AMSL, Above Mean Sea Level)
Flight Path Marker
Airspeed (kts)
• C: Calibrated Airspeed Selected on UFCP
• T: True Airspeed Selected on UFCP
Radar Altitude (ft AGL, Above Ground Level)
Mach
ΔT: Time difference between arrival time to Waypoint and current time
Master Mode Selected
A: Flight Plan Number
02: Waypoint Number Selected
10.6: Distance to Waypoint (nm)
Peak (Maximum) Aircraft G recorded during Flight
Master Arm Status
Boresight Cross
Clock
Roll Bank Angle Indicator
Pitch Ladder (deg)
M 1.31
WPN RDY
NAV
GM 6.1
RA 9399
ΔT +05:17
A02 10.6
08:04:16
+2368
10,430
FP-A 02
CAS AUTO


EFIS Page
Pitch Ladder
Angle of Attack (deg)
Glideslope Deviation Scale
Airspeed (kts)
Mach
Heading Tape
Localizer Deviation Scale
Vertical Speed (x100 ft/min)
Altitude (ft)
Barometric Pressure Setting (in Hg)
Bank Angle
HUD CONT
HUD BRT
OFF
DEPLOY
JETT
NORM
TANK 1
TANK 3
TOTAL
FEED
RTN
CMBT
SMS
CONT
BRT
COM1


Canopy Detonation Cord
Detonates to shatter canopy to allow pilot ejection
Mirror
Mirror
Mirror



UFCP +/./- Fast Select Rocker Switch
Used to increase/decrease value selected in Data Display Fields. Short click increases/decreases by one, holding click continuously increases/decreases value.
Right Click: UP (+)
Left Click: DOWN (-)
Switch springs back to Middle (.) position

UFCP Keypad & Priority Functions

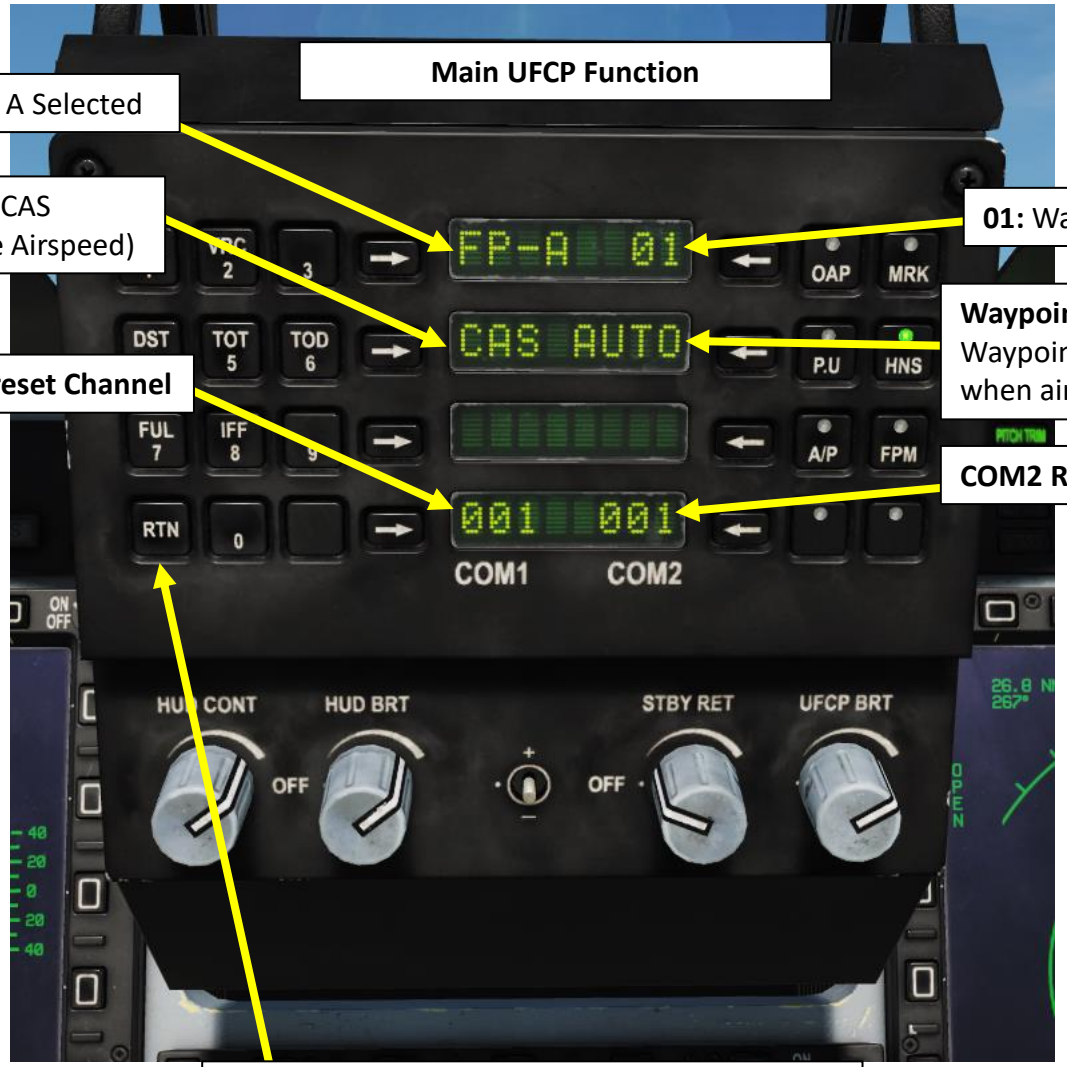
- **PFL:** Pilot Fault List displayed on MFCD
- **VRC:** Video Recorder settings
- **DST:** Destination Information display on UFCP and DST page on MFCD.
- **TOT:** Time on Target Data display on UFCP
- **TOD:** Time of Day & Date Data display on UFCP
- **FUL:** Fuel Data display on UFCP
- **IFF**: Identify-Friend-or-Foe System information displayed on UFCP

- **0-9: Keypad**

- **RTN:** Return Button displays Main UFCP page

UFCP Priority Functions

- **OAP:** Offset Aiming Point Configuration Data display on UFCP
- **MRK:** Creates markpoint
- **P.U.:** Position Update, used to re-align Inertial Navigation System in-air
- **HNS:** Hybrid Navigation System, allows use of both GPS and INS, or INS only.
- **A/P:** Autopilot Mode Selector
- **FPM:** Flight Path Marker cage/uncage function on HUD. Useful for high crosswind situations where the FPM may move out of the HUD.



Main UFCP Function

FP-A: Flight Plan A Selected

CAS: Toggles speed value between CAS (Calibrated Airspeed) and TAS (True Airspeed)

COM1 Radio Preset Channel

01: Waypoint 1 Selected

Waypoint Update AUTO/MANUAL Setting: Toggles Waypoint switching automatically to the next waypoint when aircraft is less than 2 nm from selected waypoint

COM2 Radio Preset Channel

UFCP Keypad & Priority Functions

- **RTN:** Return Button displays Main UFCP page

Main UFCP Function

DST UFCP Function

TOD UFCP Function

IFF UFCP Function

VRC UFCP Function

TOT UFCP Function

FUEL UFCP Function

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OAP UFCP Function

P.U. UFCP Function

A/P UFCP Function

MRK UFCP Function

HNS UFCP Function

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Center MFCD (Multifunction Colored Display)
Left MFCD (Multifunction Colored Display)
Right MFCD (Multifunction Colored Display)
HUD CONT
HUD BRT
STBY RET
UFCP BRT
COM1
COM2
OXYGEN
PNEUMATIC


MFCD OSBs
(Option Select Button, U1 to U5)
MFCD Symbology Brightness Control
MFCD (Multifunction Colored Display) Power Knob
ON/OFF
MFCD OSBs
(Option Select Button, R1 to R8)
MFCD OSBs
(Option Select Button, L1 to L8)
MFCD Brightness Control
MFCD Contrast Control
MFCD OSBs
(Option Select Button, D1 to D5)
A/P
FPM
COM2
STBY RET
UFCP BRT
OFF
ON
OFF
SYM
CONT
BRT
BARO
RWS
STBY
IFF
CNTL
2 HI
HI
SUKHUMI
BABUSHARA
OCHAMCHIRA

MFCD (Multifunction Colored Display)

Upper Menus

- **HSD:** Horizontal Situation Display
- **EFIS:** Electronic Flight Instrument System
- **CLNK:** Datalink Group Setting
- **DATA (See Sub-pages)**
  - **RLS:** Stores latest 10 ordnance release operations
  - **NAV:** Navigation Data
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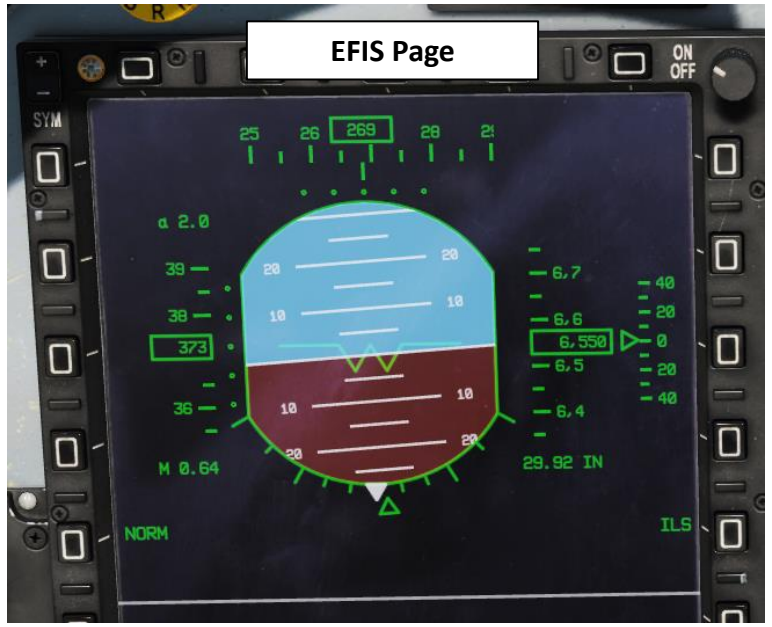
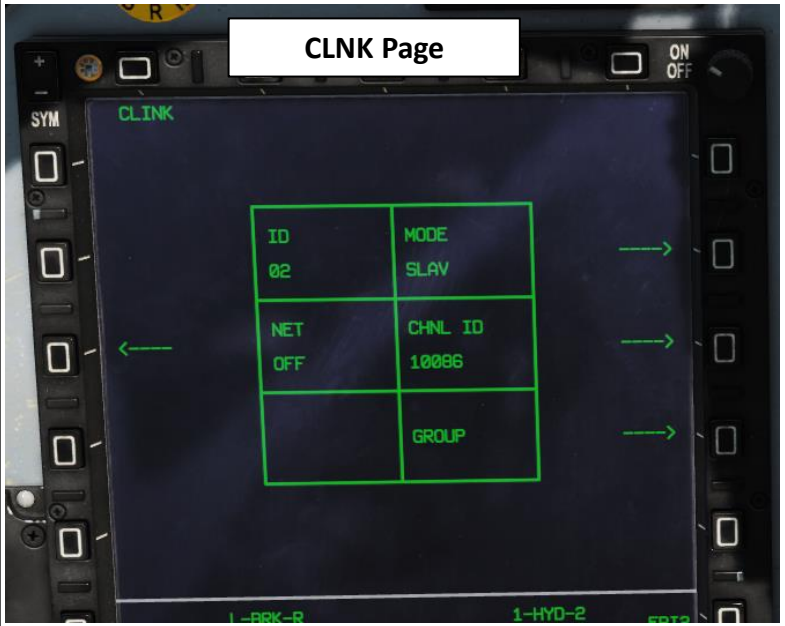
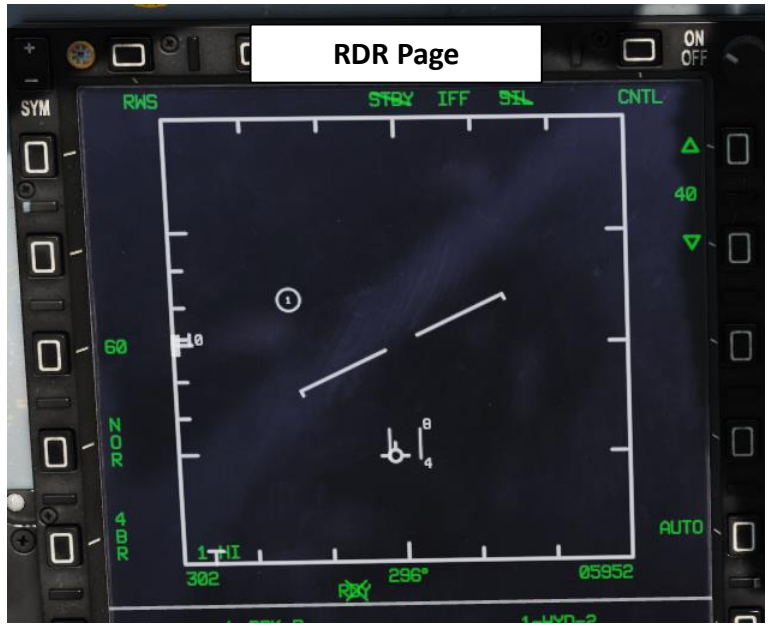
  - **FCS:** Flight Control System
  - **ENG:** Engines data
  - **DTC:** Data Transfer Cartridge
- **RDR:** Radar
- **INS:** Inertial Navigation System
- **TACAN:** Tactical Air Navigation Navaid
- **APR:** Approach
- **POD:** Targeting Pod
- **SMS:** Stores Management System
- **BIT:** Built-In Test
- **CHKLS:** Checklists (Not Implemented)
- **PFL:** Pilot Failure List

Lower Menus

- **AFD:** Airfield Data
- **SMS:** Stores Management System
- **EPI1:** Engine Performance Indicator 1. Engine RPM (N2), exhaust gas temperature (T4) and fuel quantity
- **EPI2:** Engine Performance Indicator 2. Hydraulic & brake pressure.







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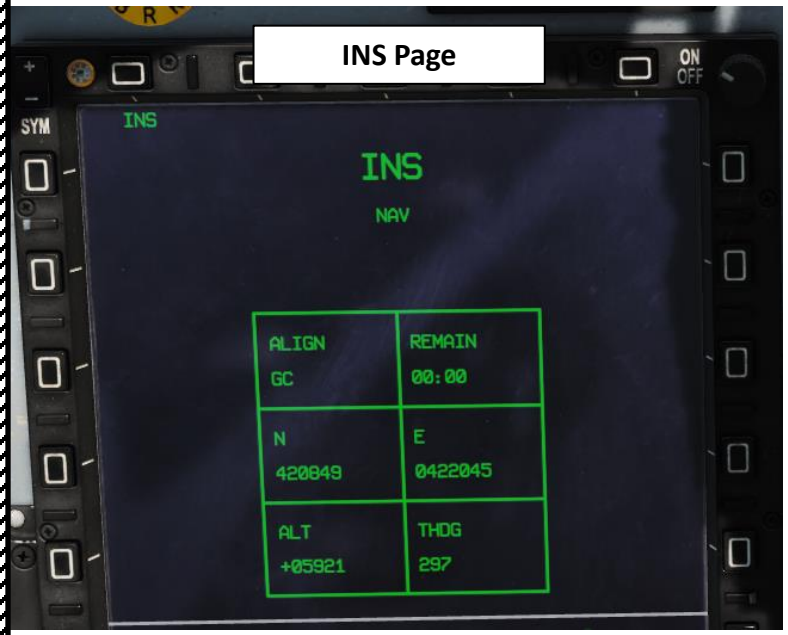
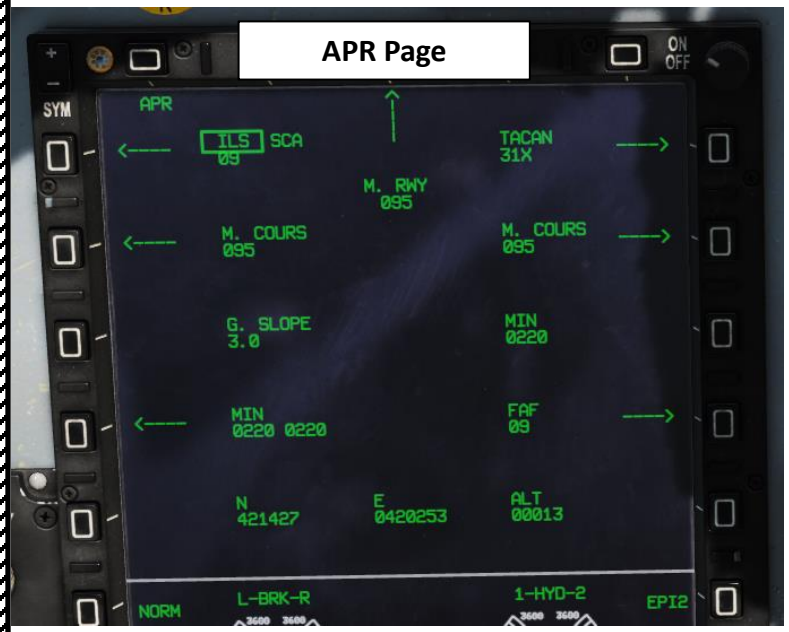
INS Page

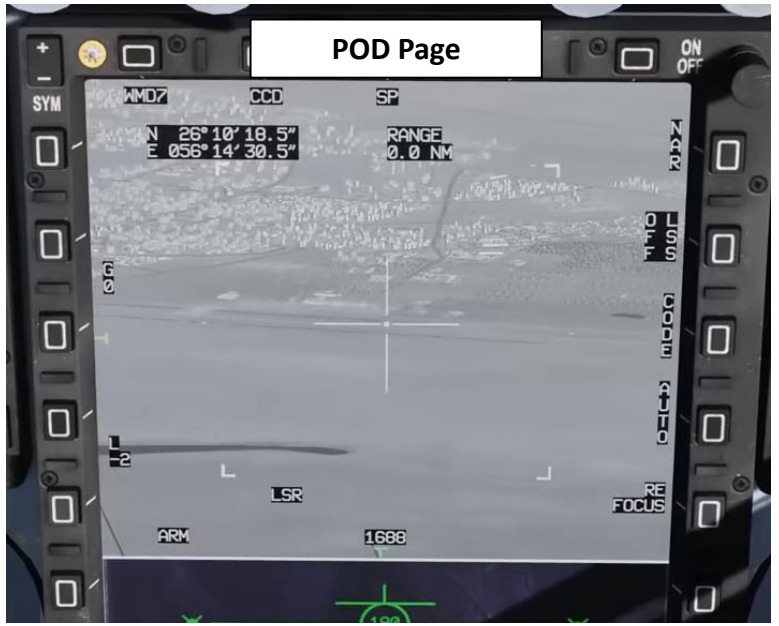


TACAN Page

APR Page



POD Page



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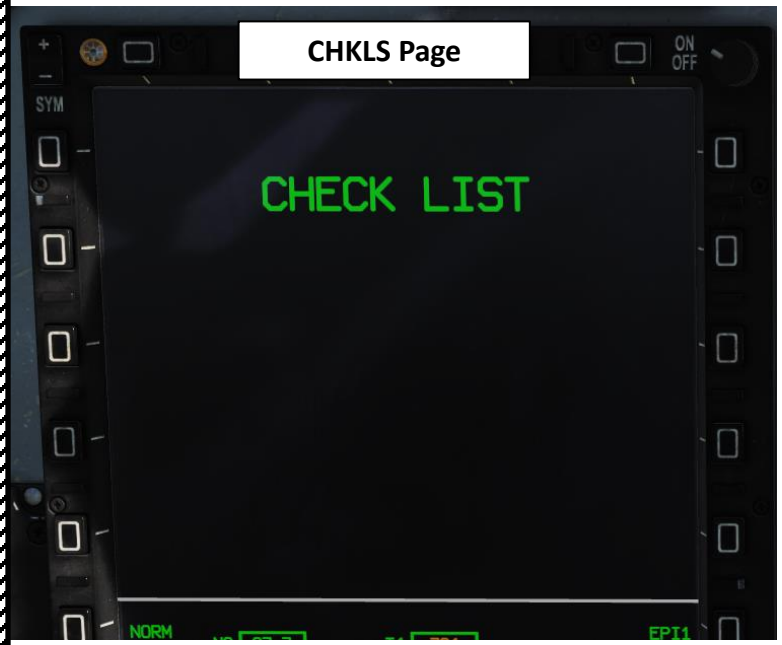
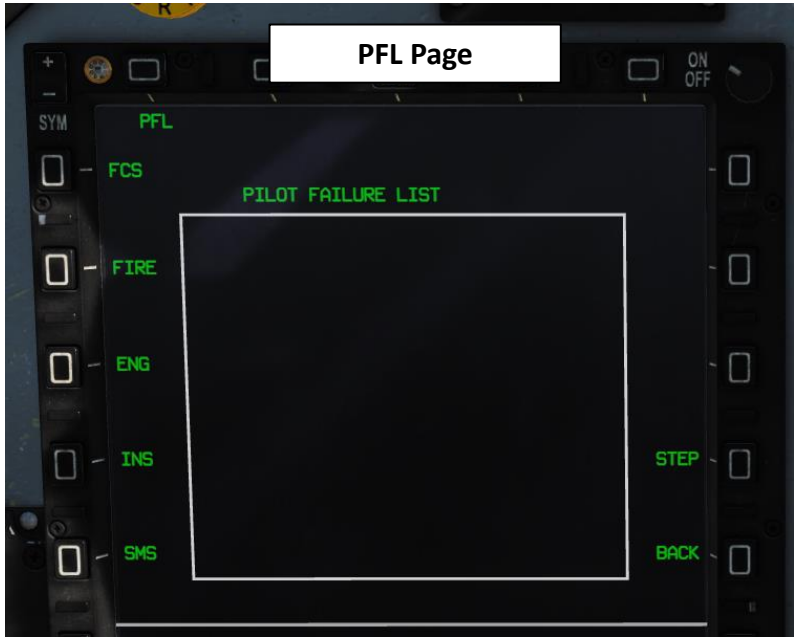
SMS Page

BIT Page

CHKLS Page



PFL Page



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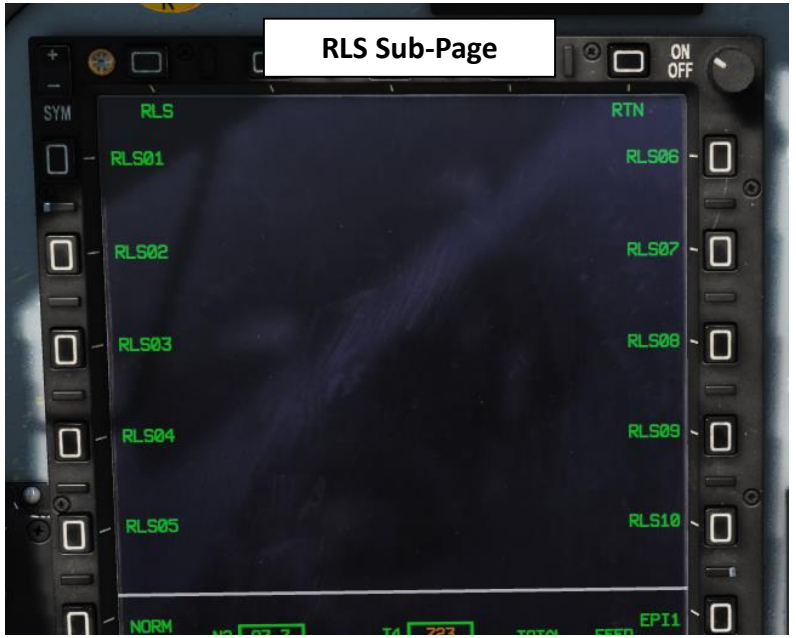

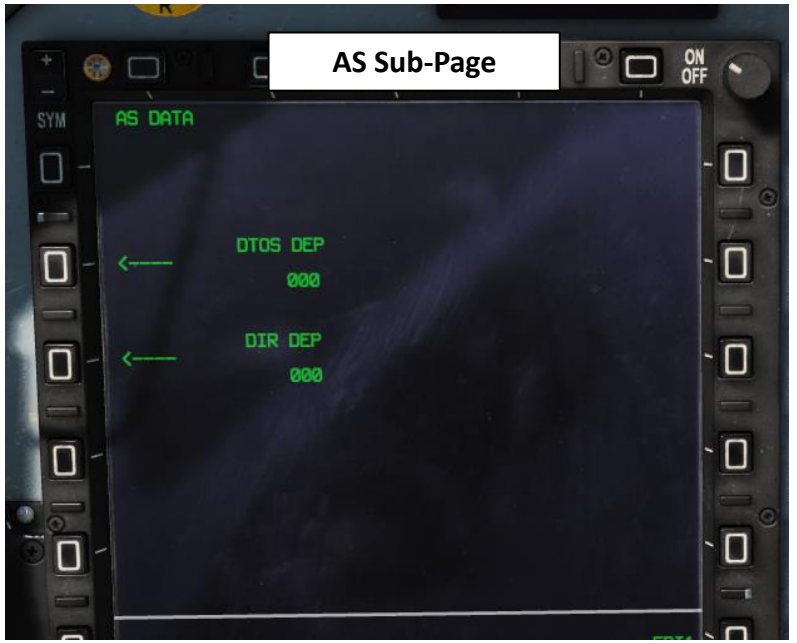

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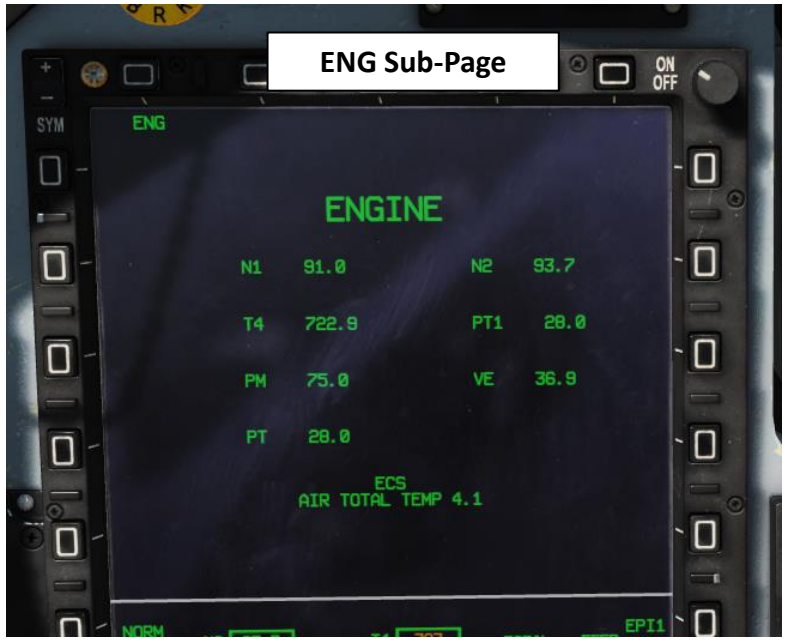

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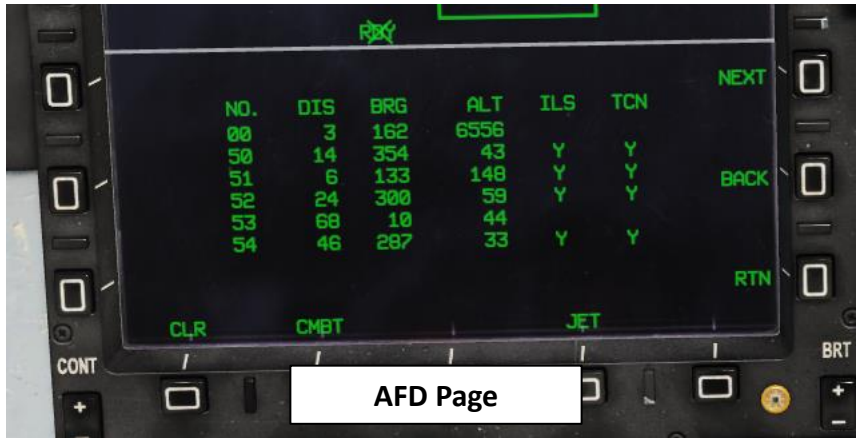
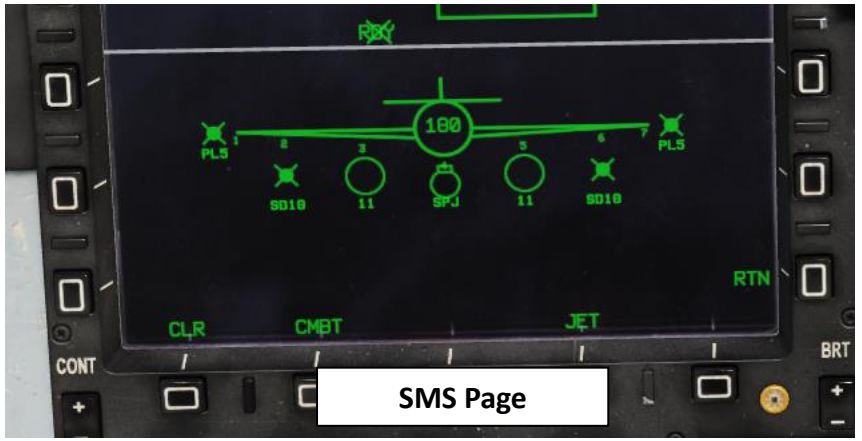
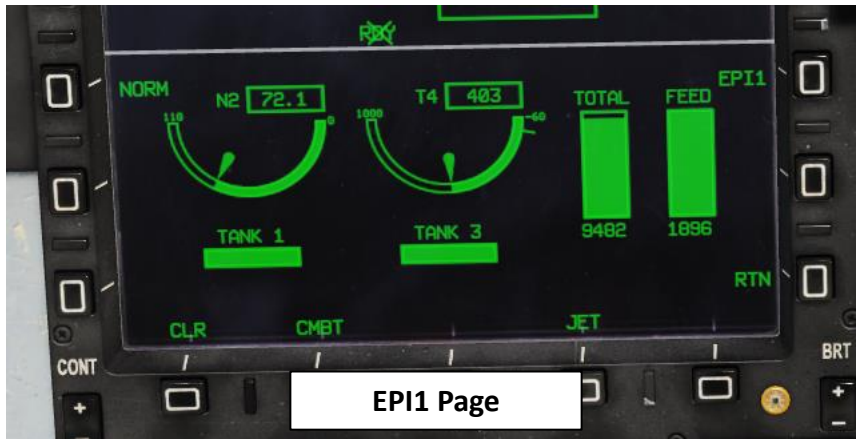


AFD Page



SMS Page



EPI1 Page

EPI2 Page

From any selected page, you can use the CMBT and SMS Quick Access page.

CMBT (Combat) Page Quick Access Button

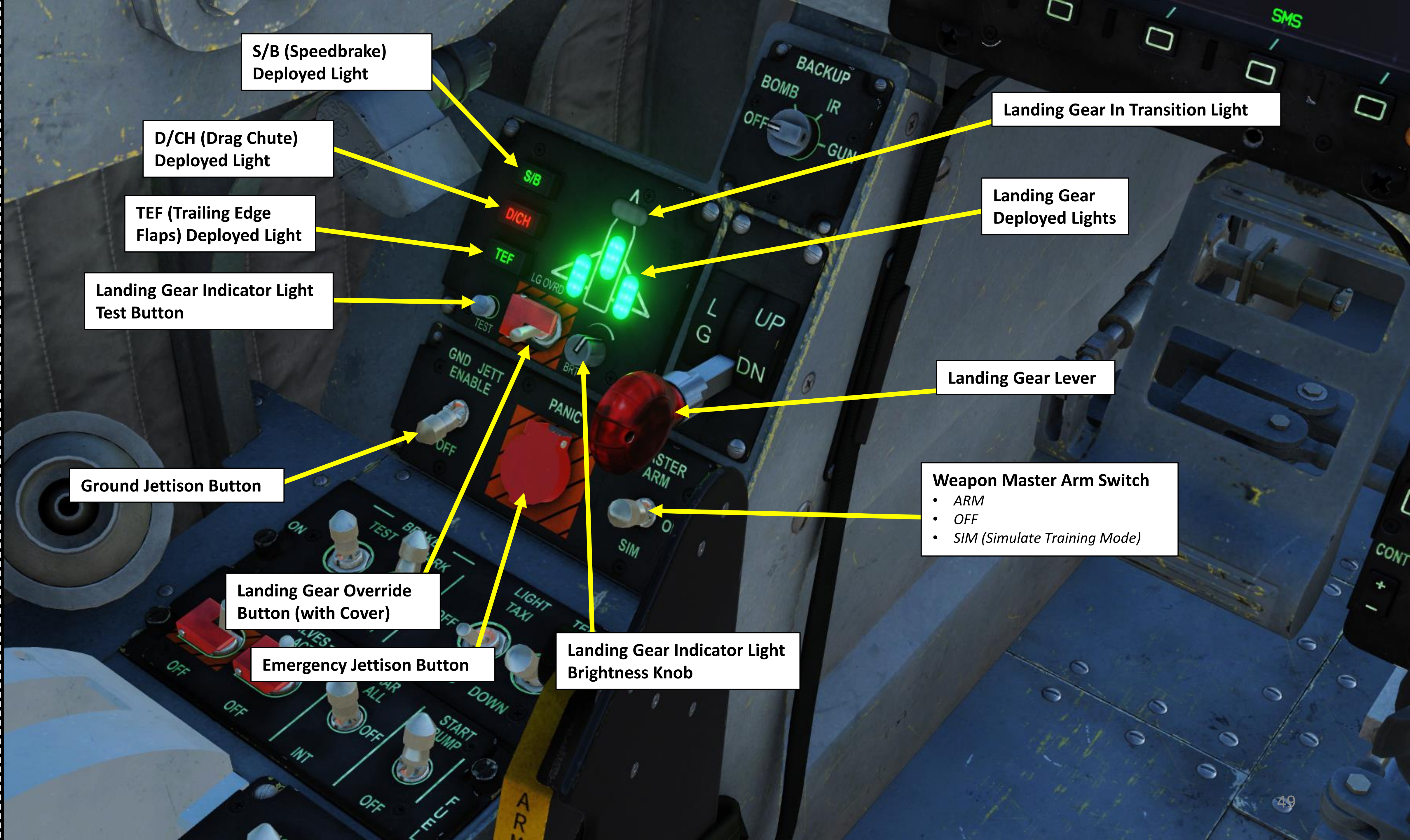
SMS (Stores Management System) Page Quick Access Button

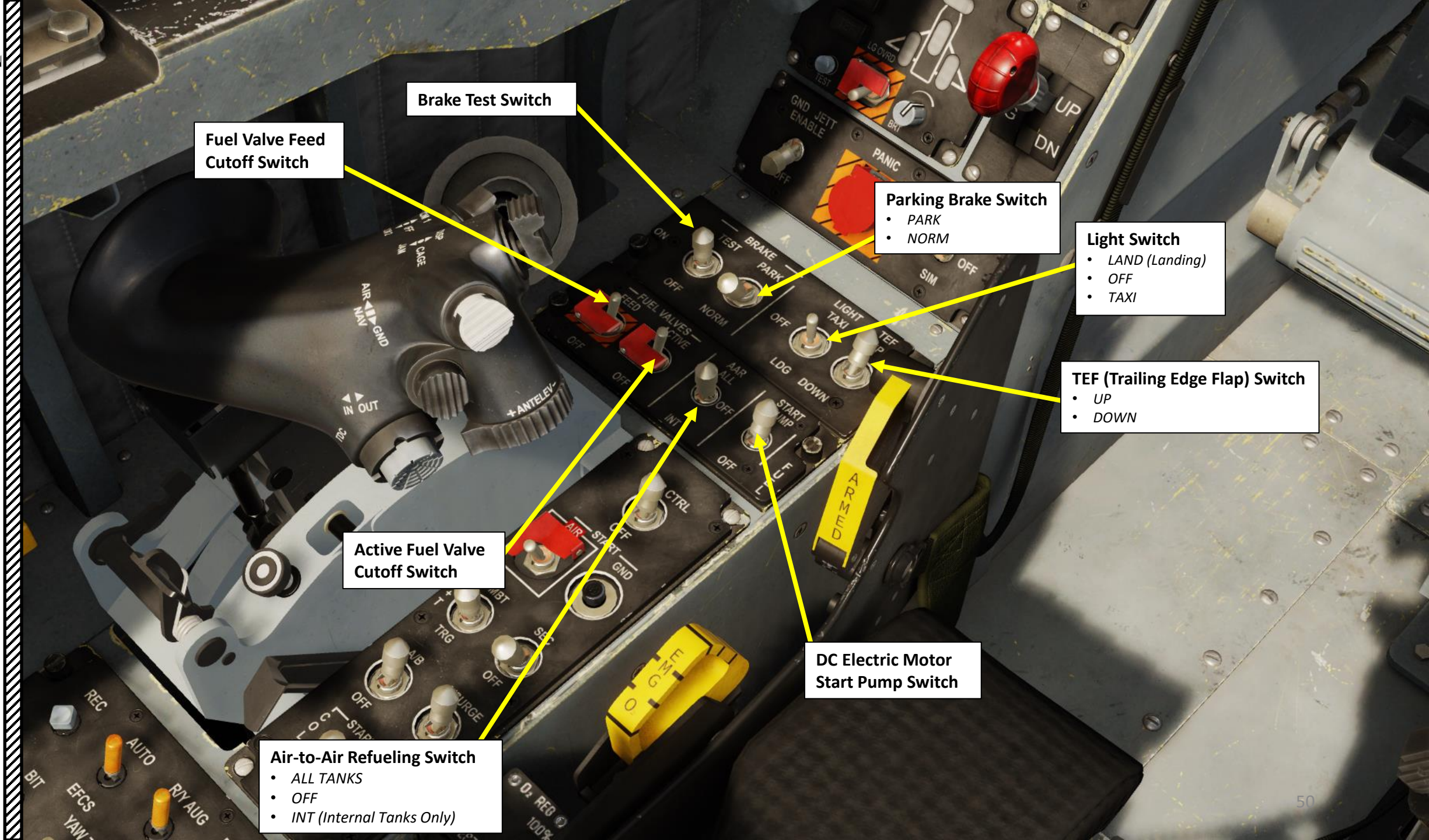
CMBT (Combat) Page Quick Access

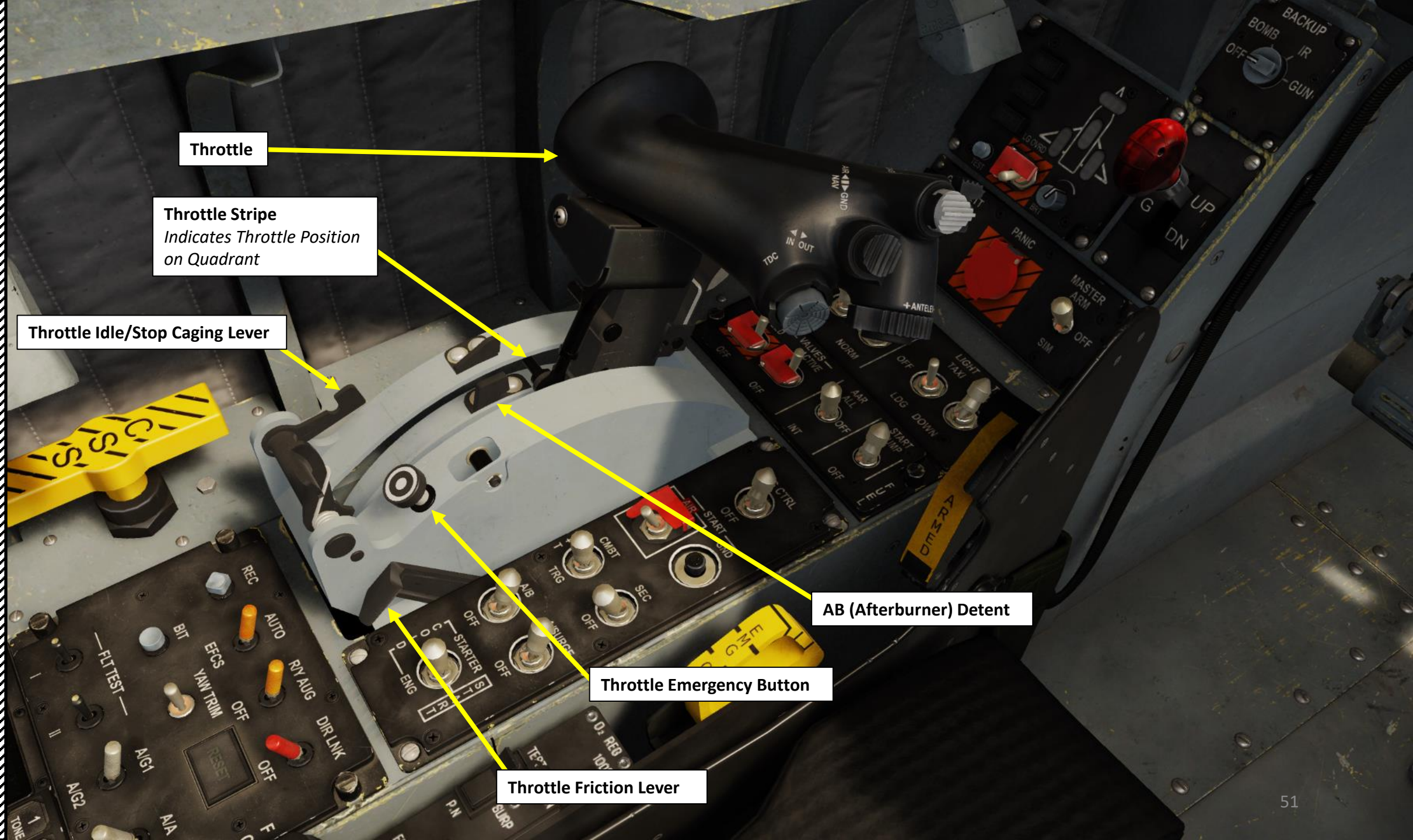
SMS (Stores Management System) Page Quick Access

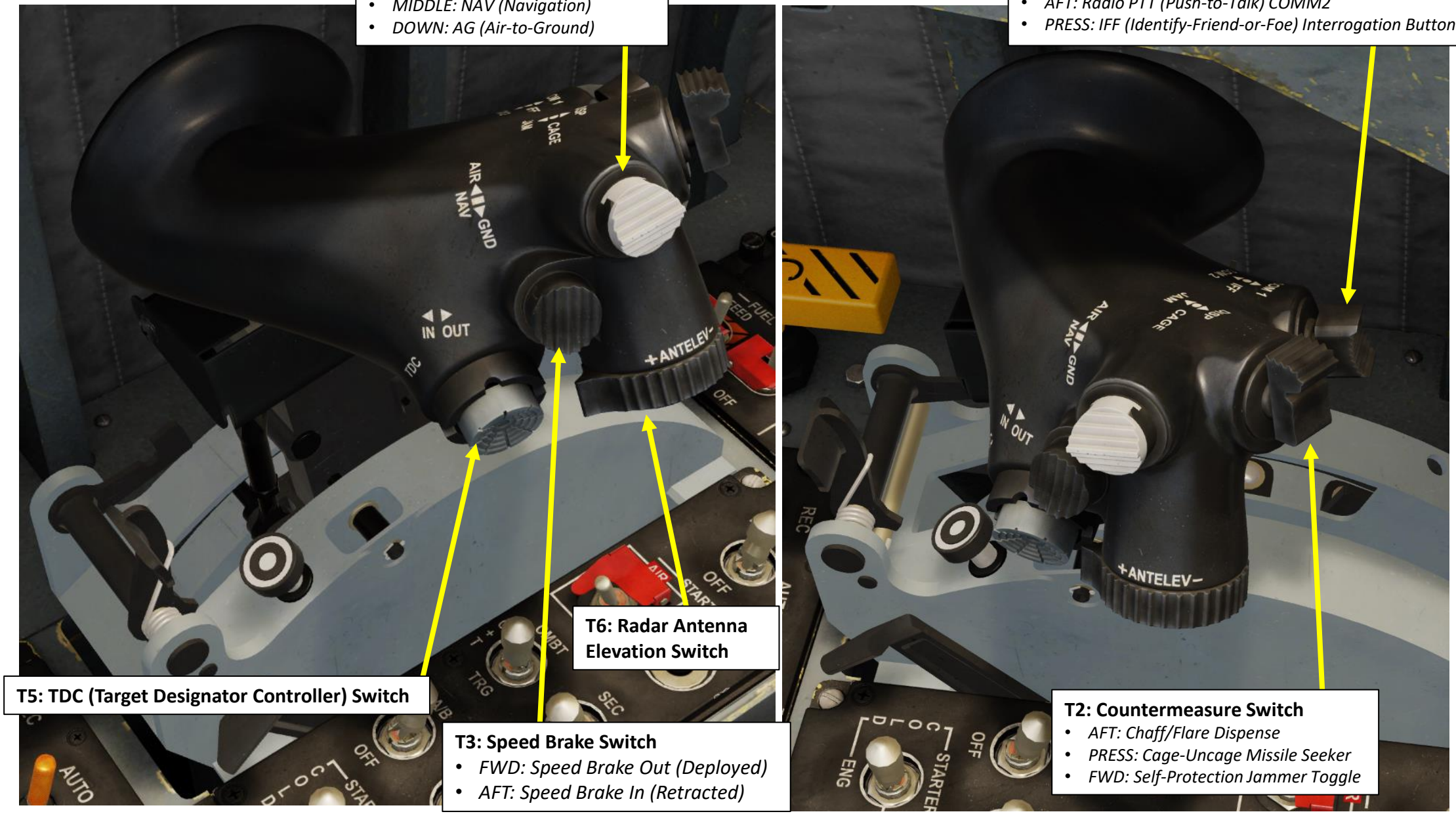

Master Warning (Push to Reset)
Engine Fire Warning
Emergency Brake Handle
FCS (Flight Control System) Failure Warning
MASTER WARNING
FIRE
FCS
EMG BRK PULL
FP-A 01
CAS MAN
COM1
COM2
HUD CONT
HUD BRT
STBY RET
UFCP BRT
DEPLOY
JETT


Deploy/Jettison Drag Chute Switch
Backup SAIU (Standard Armament Interface Unit) Knob Selector
• OFF
• BOMB
• IR (Infrared Missile)
• GUN
DEPLOY
JETT
BACKUP
BOMB
IR
OFF
GUN
FP-A 01
CAS AUTO
001 001
COM1
COM2
HUD CONT
HUD BRT
STBY RET
UFCP BRT
MASTER ARM
PANIC
GND JETT ENABLE


S/B (Speedbrake) Deployed Light
D/CH (Drag Chute) Deployed Light
TEF (Trailing Edge Flaps) Deployed Light
Landing Gear Indicator Light Test Button
Ground Jettison Button
Landing Gear Override Button (with Cover)
Emergency Jettison Button
Landing Gear Indicator Light Brightness Knob
Landing Gear In Transition Light
Landing Gear Deployed Lights
Landing Gear Lever
Weapon Master Arm Switch
• ARM
• OFF
• SIM (Simulate Training Mode)
S/B
D/CH
TEF
LG OVRD
TEST
GND JETT ENABLE
OFF
PANIC
BACKUP
BOMB
IR
OFF
GUN
LG
UP
DN
SIM
SMS


Brake Test Switch
Fuel Valve Feed Cutoff Switch
Parking Brake Switch
• PARK
• NORM
Light Switch
• LAND (Landing)
• OFF
• TAXI
TEF (Trailing Edge Flap) Switch
• UP
• DOWN
Active Fuel Valve Cutoff Switch
DC Electric Motor Start Pump Switch
Air-to-Air Refueling Switch
• ALL TANKS
• OFF
• INT (Internal Tanks Only)


Throttle
Throttle Stripe
Indicates Throttle Position on Quadrant
Throttle Idle/Stop Caging Lever
AB (Afterburner) Detent
Throttle Emergency Button
Throttle Friction Lever



T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

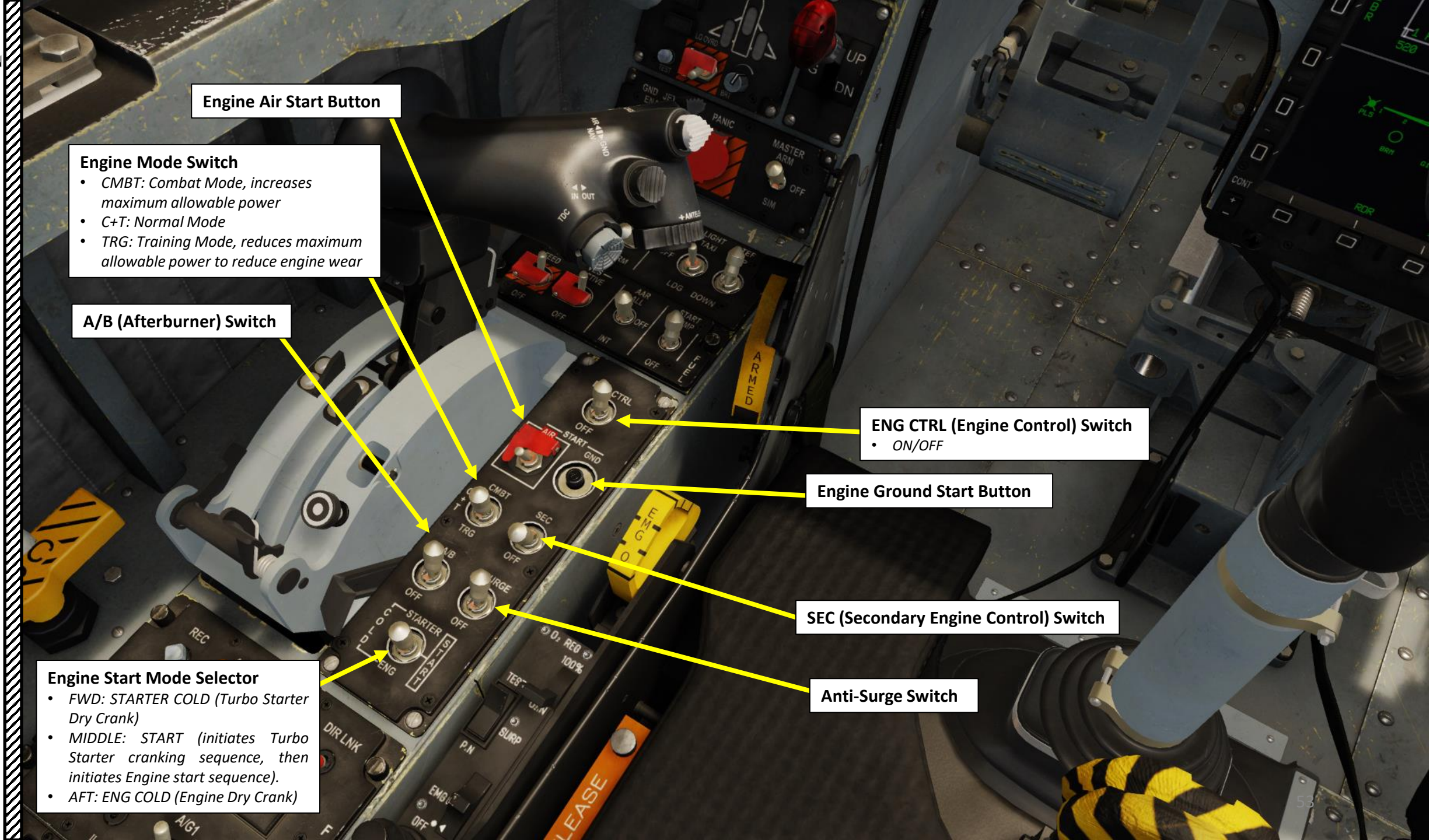
T4 Switch
- *FWD: Radio PTT (Push-to-Talk) COMM1*
- *AFT: Radio PTT (Push-to-Talk) COMM2*
- *PRESS: IFF (Identify-Friend-or-Foe) Interrogation Button*

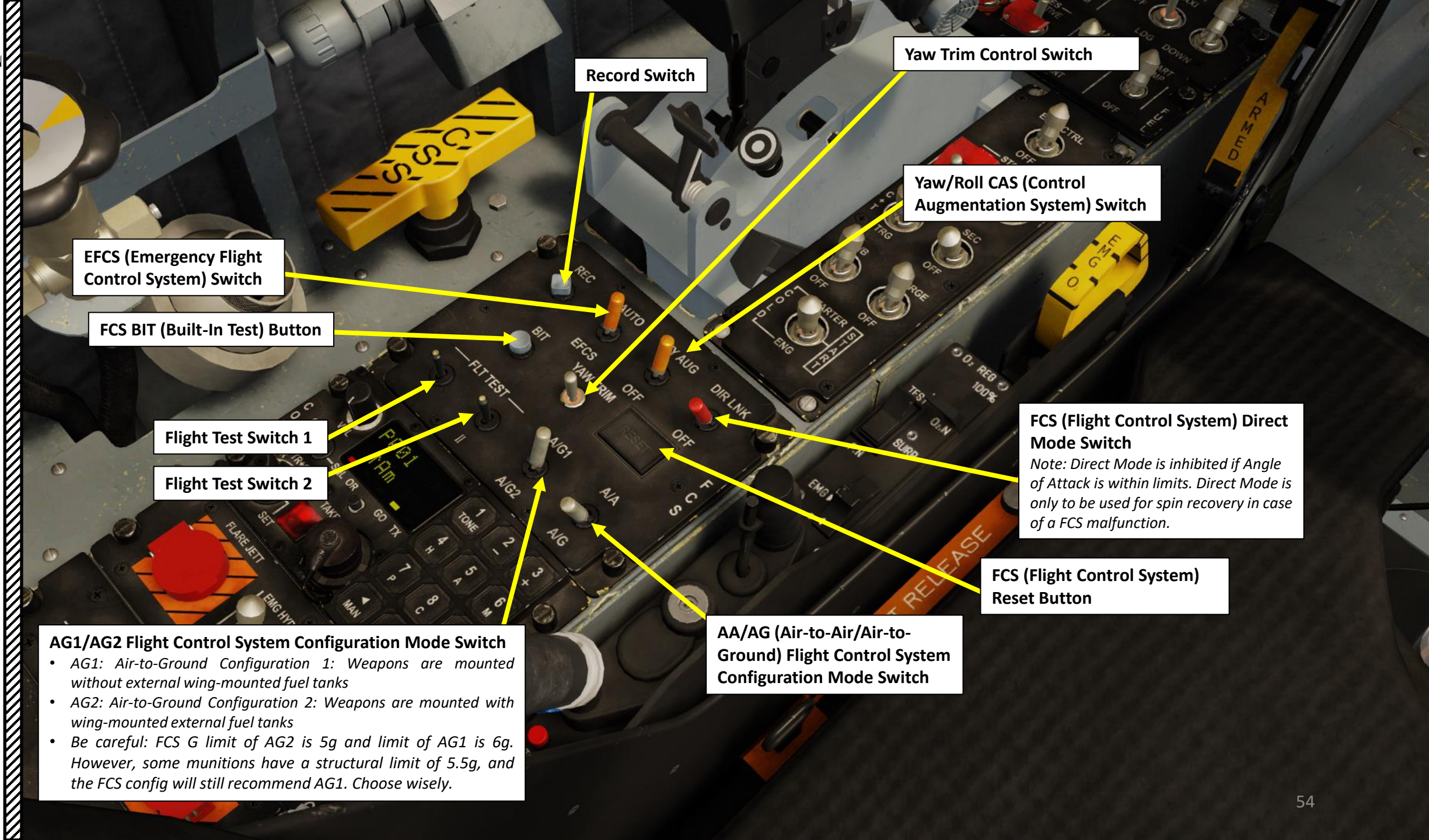
T5: TDC (Target Designator Controller) Switch

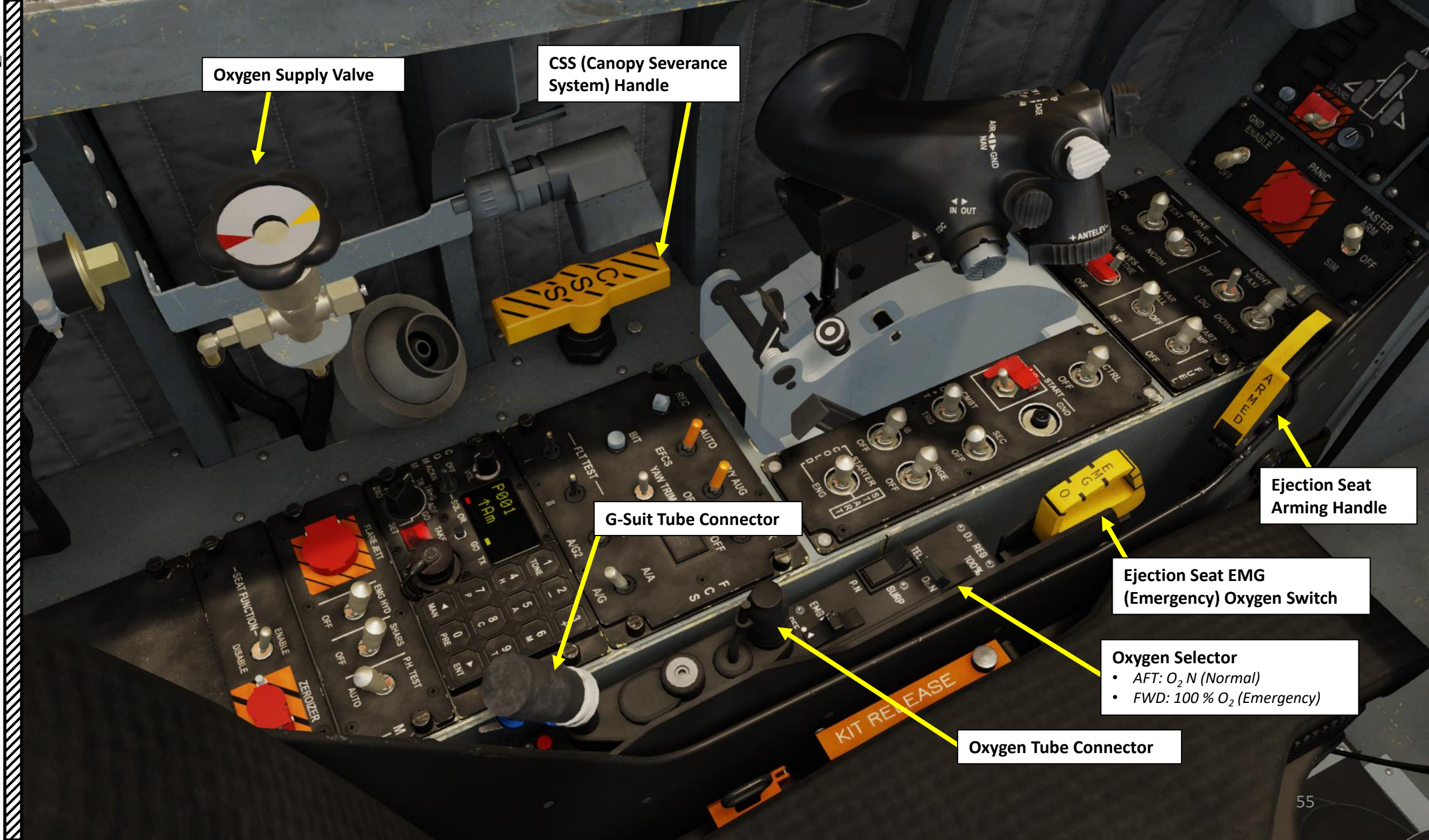
T6: Radar Antenna Elevation Switch

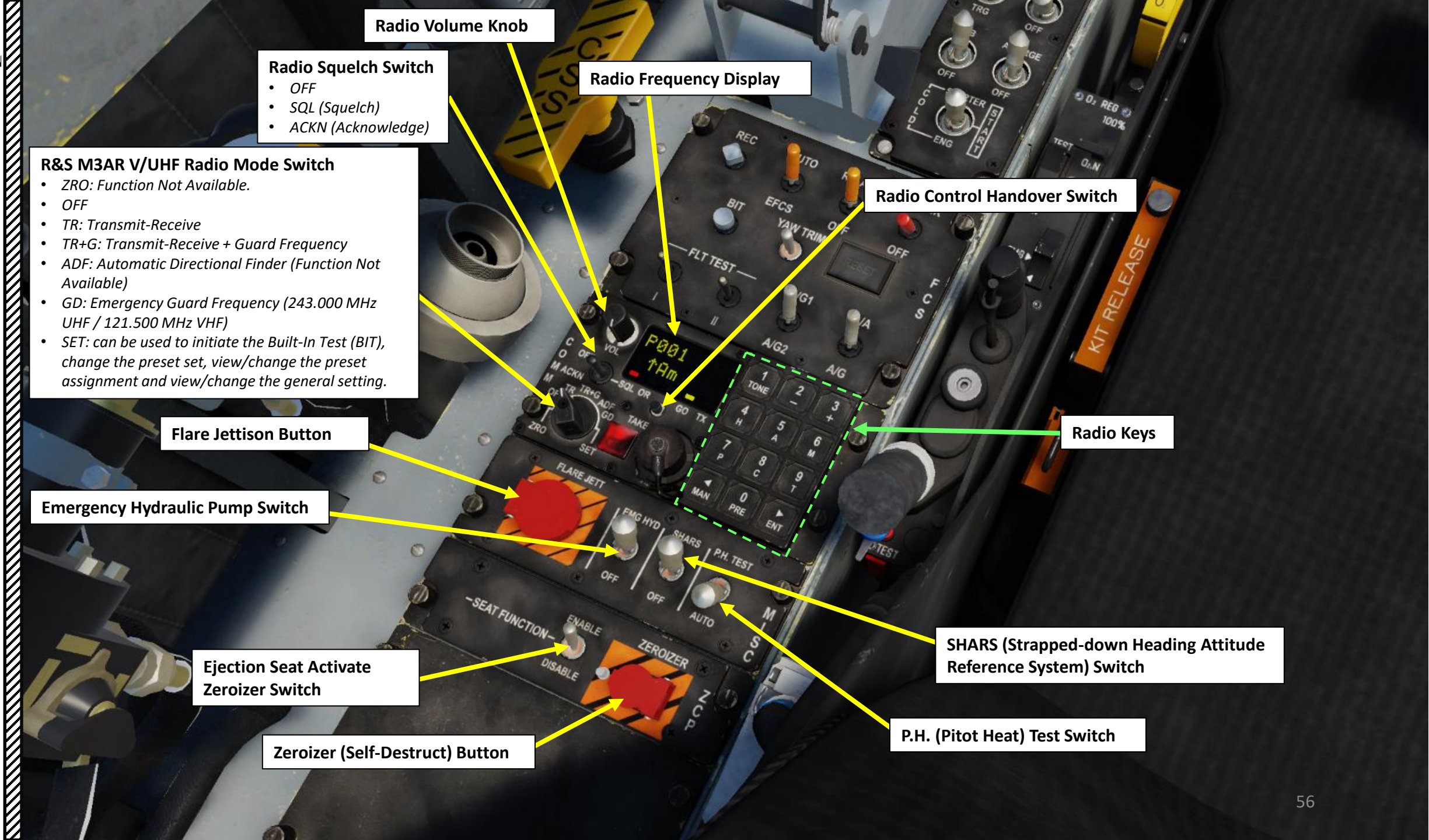
T3: Speed Brake Switch
- *FWD: Speed Brake Out (Deployed)*
- *AFT: Speed Brake In (Retracted)*

T2: Countermeasure Switch
- *AFT: Chaff/Flare Dispense*
- *PRESS: Cage-Uncage Missile Seeker*
- *FWD: Self-Protection Jammer Toggle*


Engine Air Start Button
Engine Mode Switch
• CMBT: Combat Mode, increases maximum allowable power
• C+T: Normal Mode
• TRG: Training Mode, reduces maximum allowable power to reduce engine wear
A/B (Afterburner) Switch
ENG CTRL (Engine Control) Switch
• ON/OFF
Engine Ground Start Button
SEC (Secondary Engine Control) Switch
Anti-Surge Switch
Engine Start Mode Selector
• FWD: STARTER COLD (Turbo Starter Dry Crank)
• MIDDLE: START (initiates Turbo Starter cranking sequence, then initiates Engine start sequence).
• AFT: ENG COLD (Engine Dry Crank)

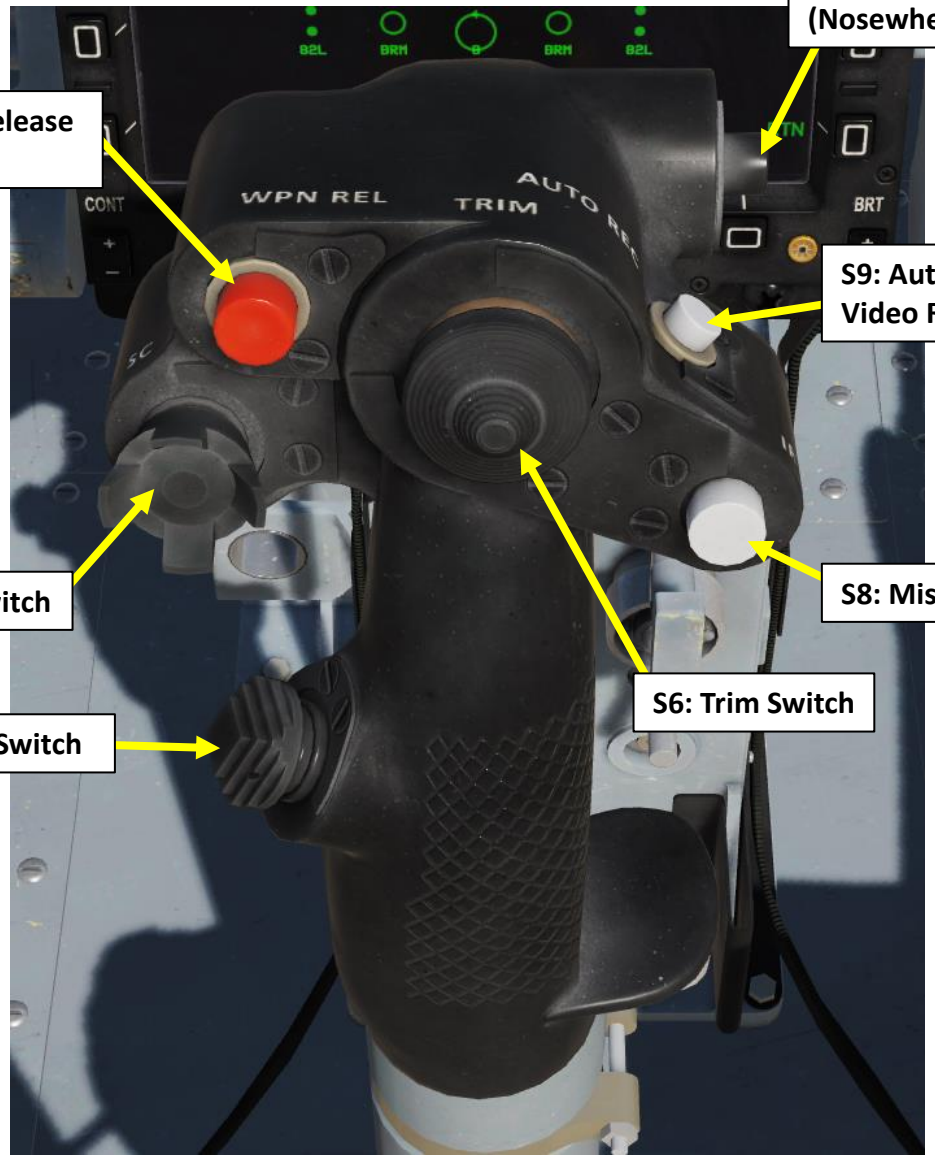

Record Switch
Yaw Trim Control Switch
Yaw/Roll CAS (Control Augmentation System) Switch
EFCS (Emergency Flight Control System) Switch
FCS BIT (Built-In Test) Button
Flight Test Switch 1
Flight Test Switch 2
FCS (Flight Control System) Direct Mode Switch
Note: Direct Mode is inhibited if Angle of Attack is within limits. Direct Mode is only to be used for spin recovery in case of a FCS malfunction.
FCS (Flight Control System) Reset Button
AA/AG (Air-to-Air/Air-to-Ground) Flight Control System Configuration Mode Switch
AG1/AG2 Flight Control System Configuration Mode Switch
AG1: Air-to-Ground Configuration 1: Weapons are mounted without external wing-mounted fuel tanks
AG2: Air-to-Ground Configuration 2: Weapons are mounted with wing-mounted external fuel tanks
Be careful: FCS G limit of AG2 is 5g and limit of AG1 is 6g. However, some munitions have a structural limit of 5.5g, and the FCS config will still recommend AG1. Choose wisely.


Oxygen Supply Valve
CSS (Canopy Severance System) Handle
G-Suit Tube Connector
Ejection Seat Arming Handle
Ejection Seat EMG (Emergency) Oxygen Switch
Oxygen Selector
• AFT: O_2 N (Normal)
• FWD: 100 % O_2 (Emergency)
Oxygen Tube Connector


Radio Volume Knob
Radio Squelch Switch
• OFF
• SQL (Squelch)
• ACKN (Acknowledge)
Radio Frequency Display
R&S M3AR V/UHF Radio Mode Switch
• ZRO: Function Not Available.
• OFF
• TR: Transmit-Receive
• TR+G: Transmit-Receive + Guard Frequency
• ADF: Automatic Directional Finder (Function Not Available)
• GD: Emergency Guard Frequency (243.000 MHz UHF / 121.500 MHz VHF)
• SET: can be used to initiate the Built-In Test (BIT), change the preset set, view/change the preset assignment and view/change the general setting.
Radio Control Handover Switch
Flare Jettison Button
Radio Keys
Emergency Hydraulic Pump Switch
SHARS (Strapped-down Heading Attitude Reference System) Switch
Ejection Seat Activate Zeroizer Switch
P.H. (Pitot Heat) Test Switch
Zeroizer (Self-Destruct) Button


C S S
FLT TEST
+ANTELEV-
STARTER
FUEL VALVES


Ejection Seat Firing Handle



S3: Weapon Launch/Release Button

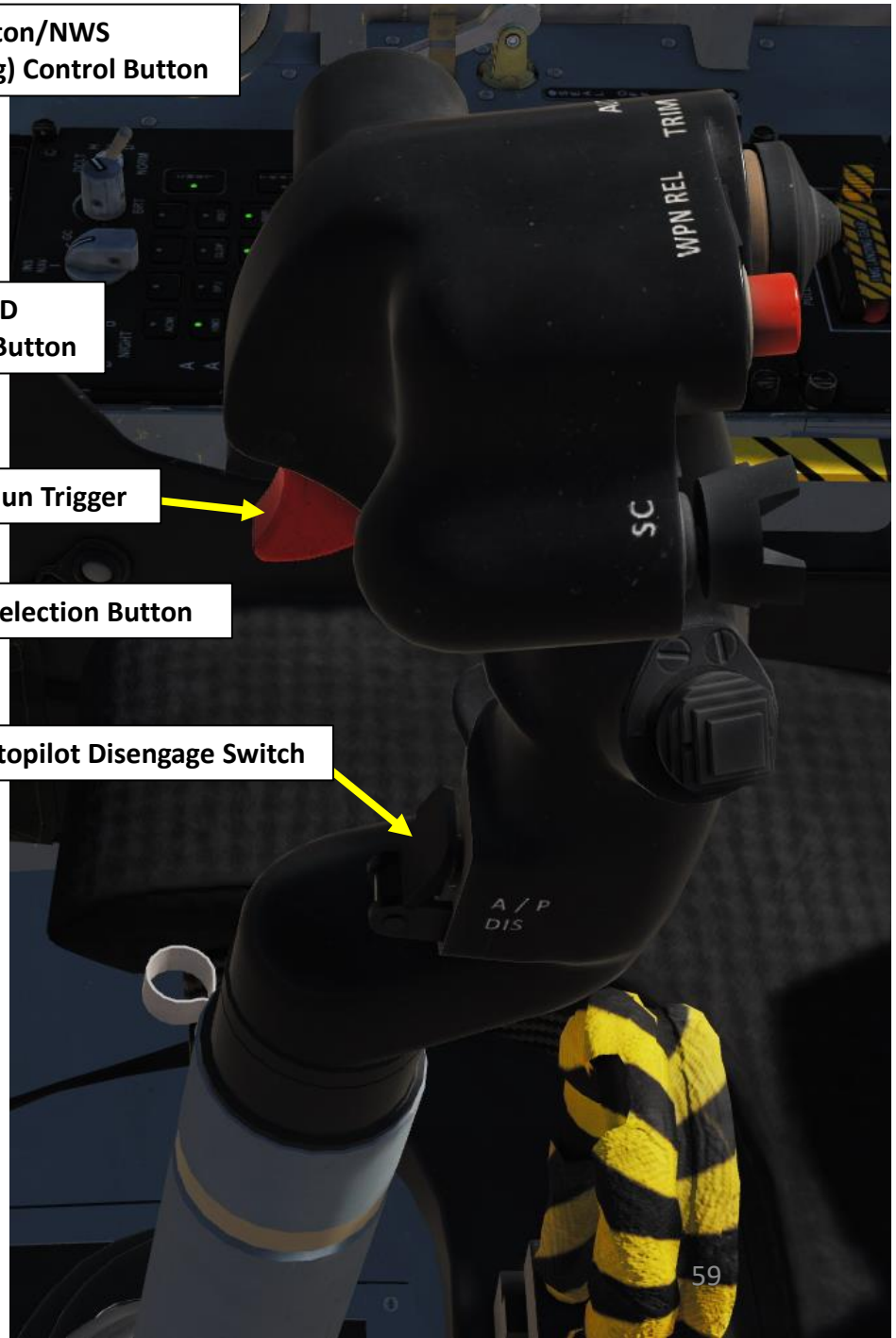
S5: Missile Step Button/NWS (Nosewheel Steering) Control Button

S9: Automatic HUD Video Recording Button

S2: SC (Sensor Control) Switch

S6: Trim Switch

S1: SS (Sensor Selection) Switch



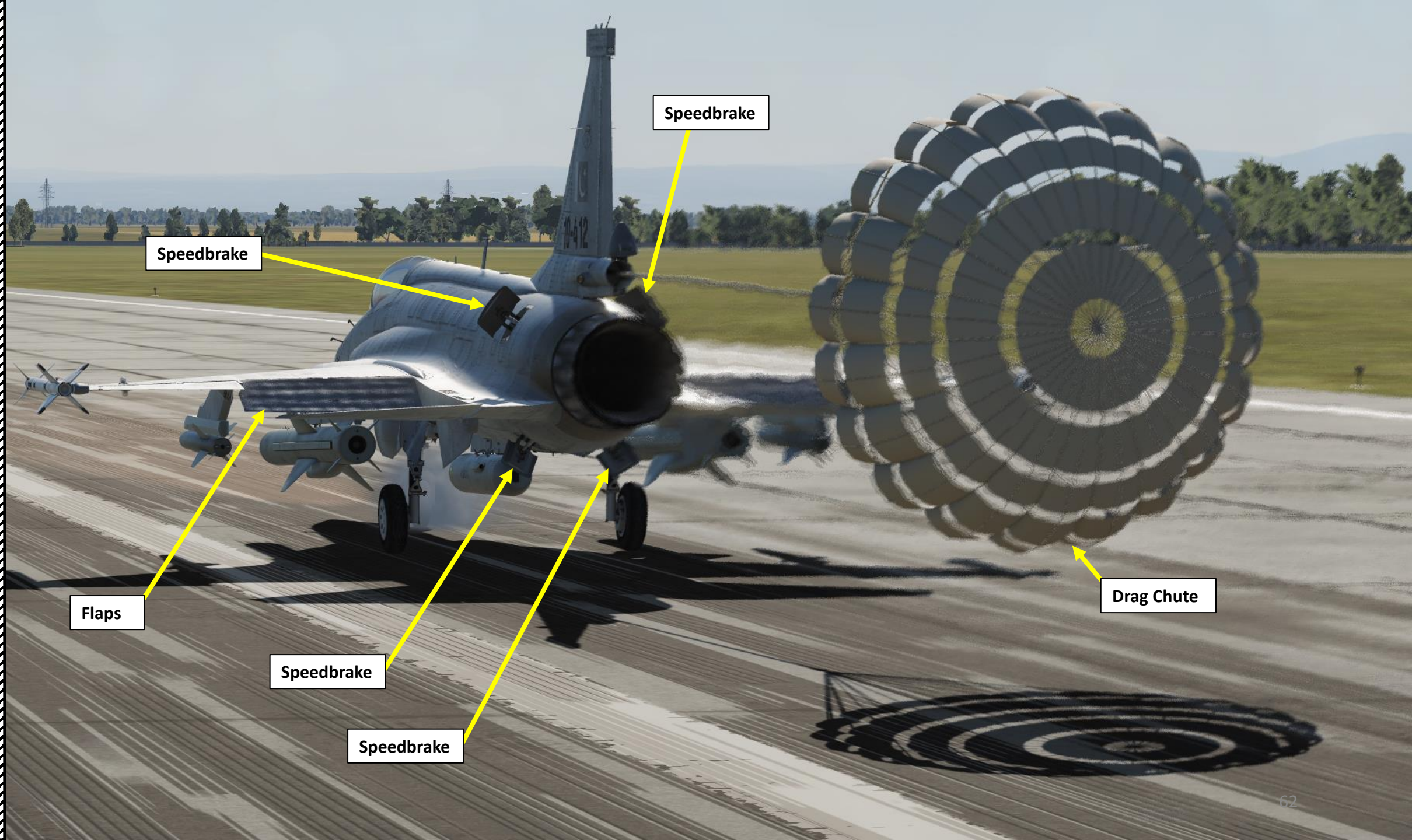
S4: Gun Trigger

S8: Missile Type Selection Button

S7: Autopilot Disengage Switch


HUD (Heads-Up Display) Recorder

PART 3 – COCKPIT & EQUIPMENT


Speedbrake
Speedbrake
Flaps
Speedbrake
Speedbrake
Drag Chute

Formation Light

Taxi Light

Landing Light

Formation Light

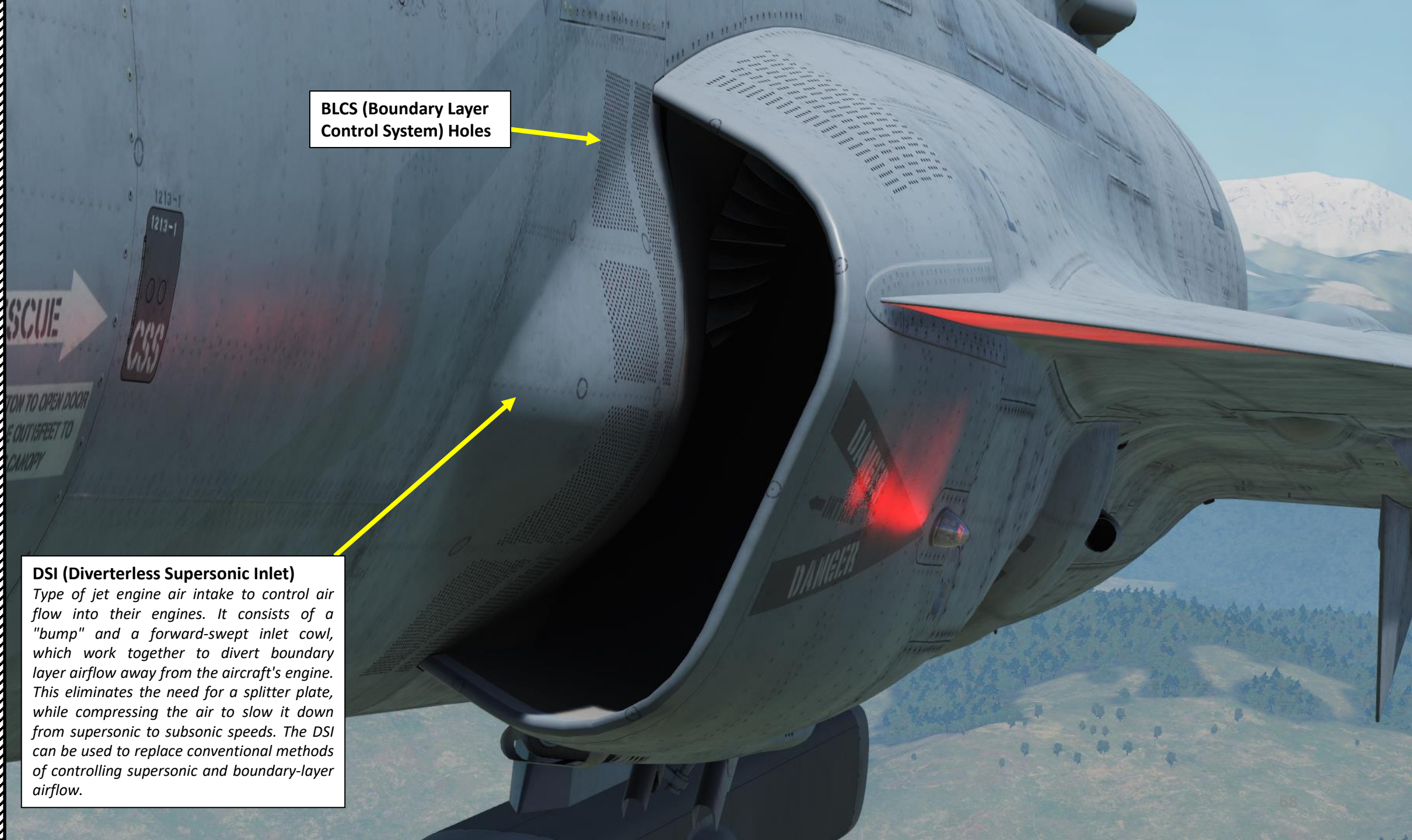

Anti-Collision Light
Navigation/Position Light

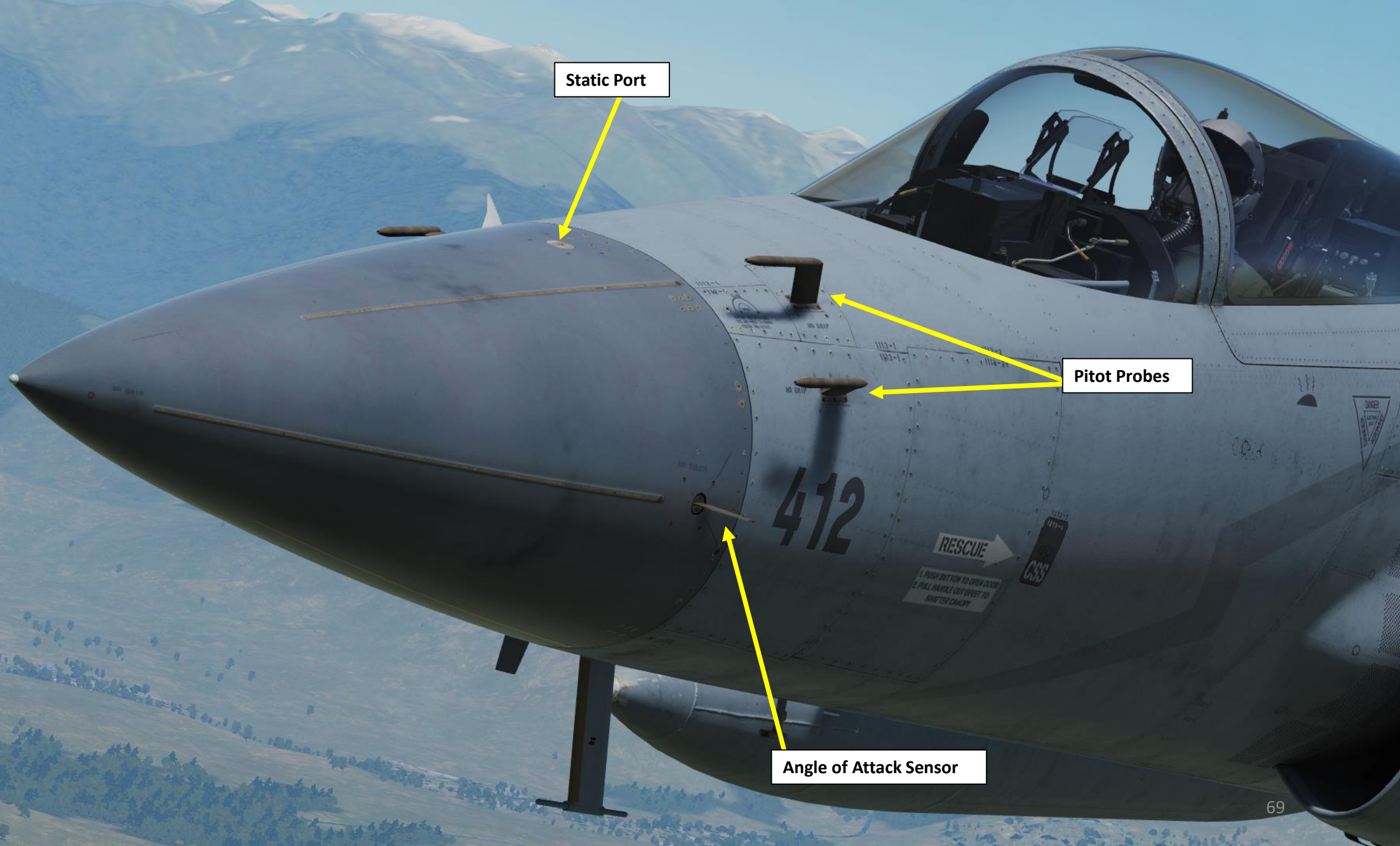

Formation Light
Formation Light
FORMATION
EXT LIGHTS
EJECT

Navigation/Position Light

Navigation/Position Light

Air-to-Air Refueling Light


BLCS (Boundary Layer Control System) Holes
DSI (Diverterless Supersonic Inlet)
Type of jet engine air intake to control air flow into their engines. It consists of a "bump" and a forward-swept inlet cowl, which work together to divert boundary layer airflow away from the aircraft's engine. This eliminates the need for a splitter plate, while compressing the air to slow it down from supersonic to subsonic speeds. The DSI can be used to replace conventional methods of controlling supersonic and boundary-layer airflow.
1213-1
CSS
DANGER

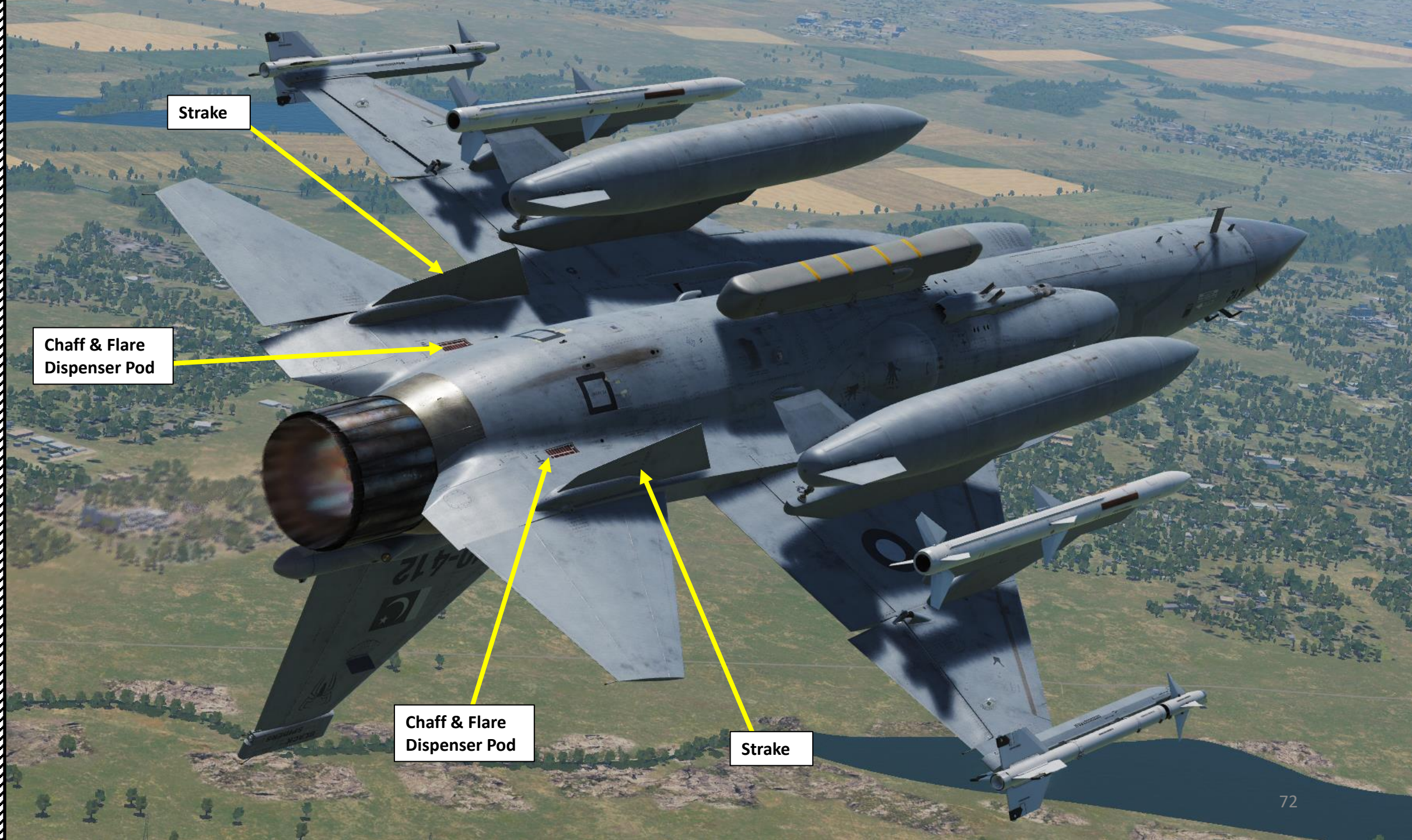

Static Port
Pitot Probes
Angle of Attack Sensor
412
RESCUE


COM1 Upper VHF Radio Antenna
GPS & Navigational Antennas
IFF (Identify-Friend-or-Foe) Antenna
COM1 Lower VHF Radio Antenna

Electrostatic Energy Dispensers

Also known as "static discharger", they are high electrical resistance devices with a lower corona voltage than the surrounding aircraft structure. They control the corona discharge into the atmosphere. They are used on aircraft to allow the continuous satisfactory operation of onboard navigation and radio communication systems during precipitation (p-static) conditions.

Precipitation static is an electrical charge on an airplane caused by flying through rain, snow, ice, or dust particles. When the aircraft charge is great enough, it discharges into the surrounding air. Without static dischargers, the charge discharges in large batches through pointed aircraft extremities, such as antennas, wing tips, vertical and horizontal stabilizers, and other protrusions.


Strake
Chaff & Flare Dispenser Pod
Chaff & Flare Dispenser Pod
Strake

Night Vision Goggles (NVG) Controls:

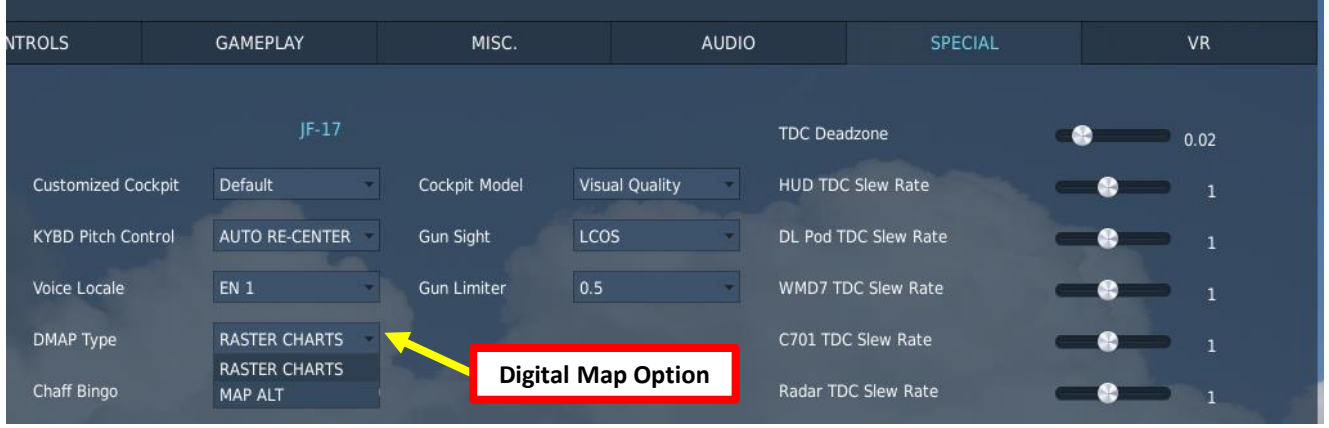
- *RSHIFT+H: On/Off*
- *RSHIFT+RALT+H: Gain Night Vision Goggles Down*
- *RSHIFT+RCTRL+H: Gain Night Vision Goggles Up*

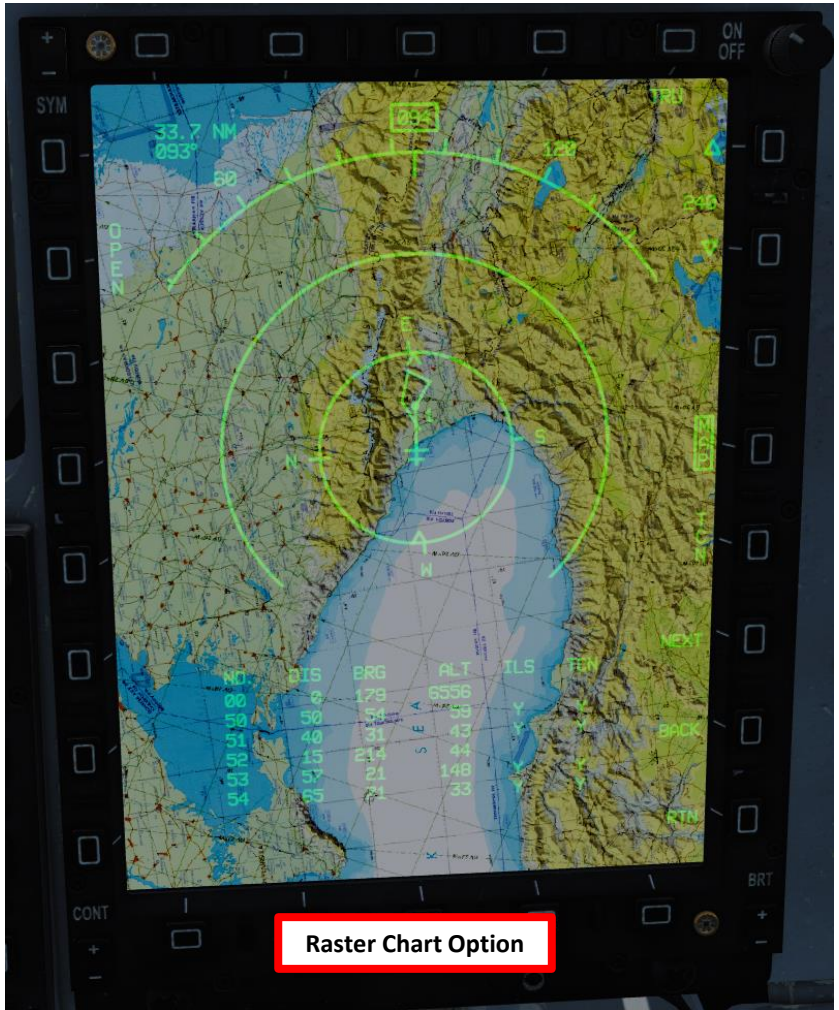

FP-A 01
CAS MAN
001 001
COM1 COM2

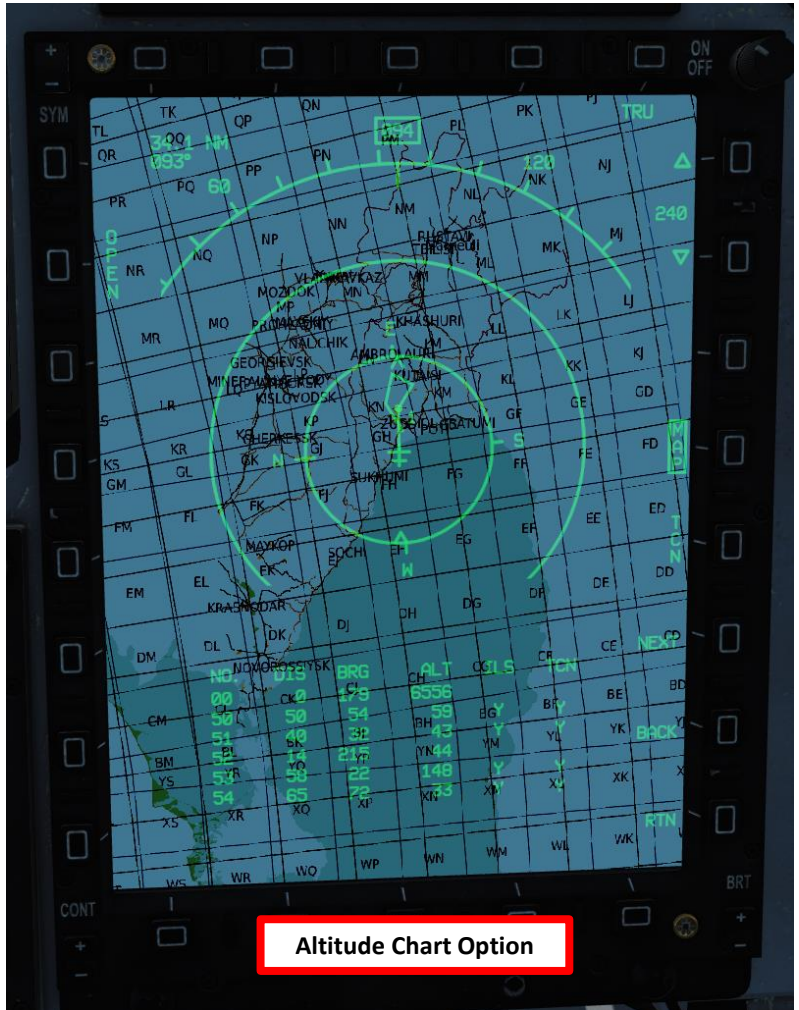
DIGITAL MAP OPTIONS

In the real aircraft, digital map databases vary from operator to operator. In the “Special” Options tab, you can select a number of different options on the aircraft.

As an example, you can choose whether to use Raster Charts or Altitude Charts. Raster charts are what is typically used in the A-10C Warthog or the F/A-18C Hornet. Altitude charts are more similar to what you have in the Ka-50 Black Shark.

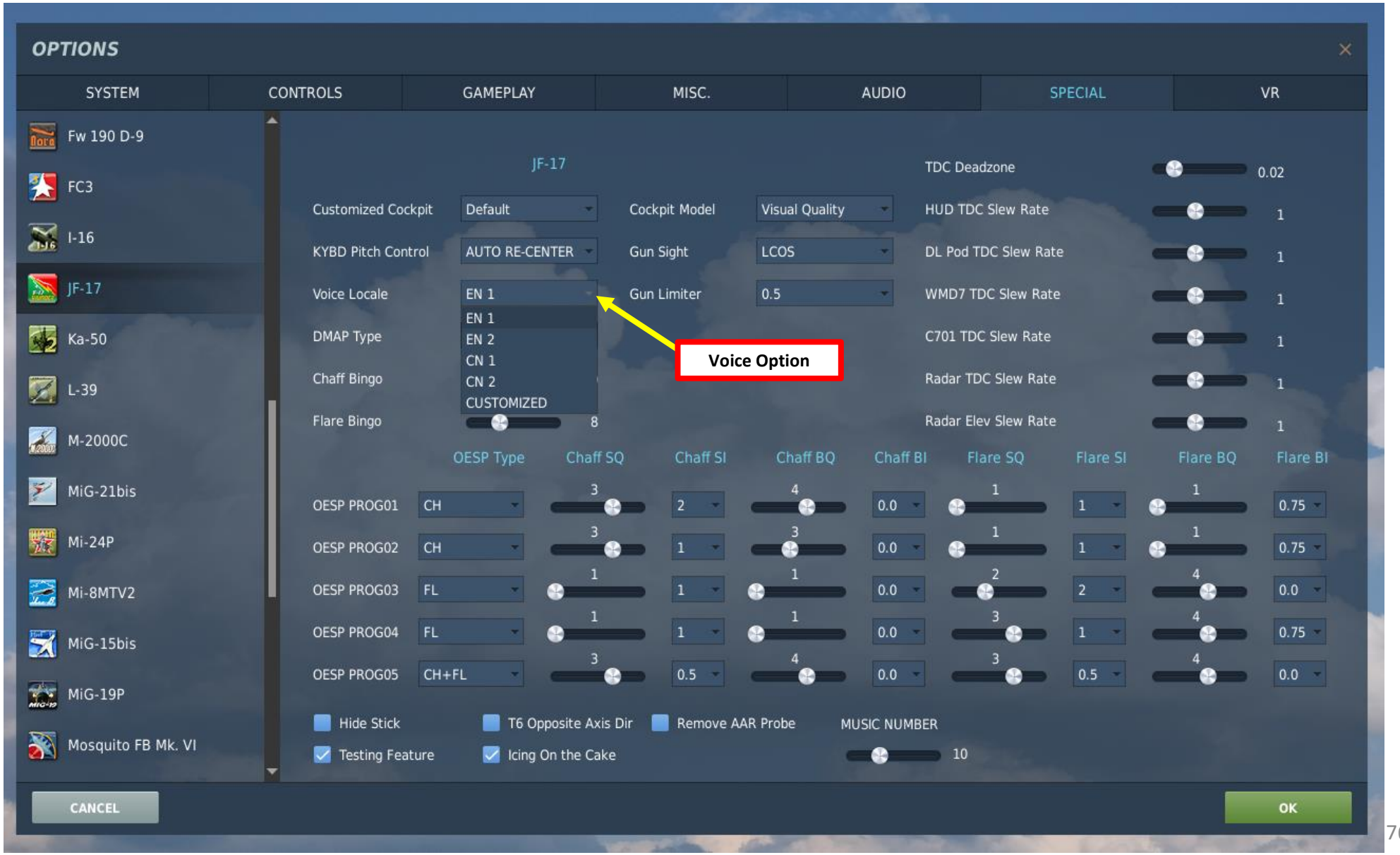






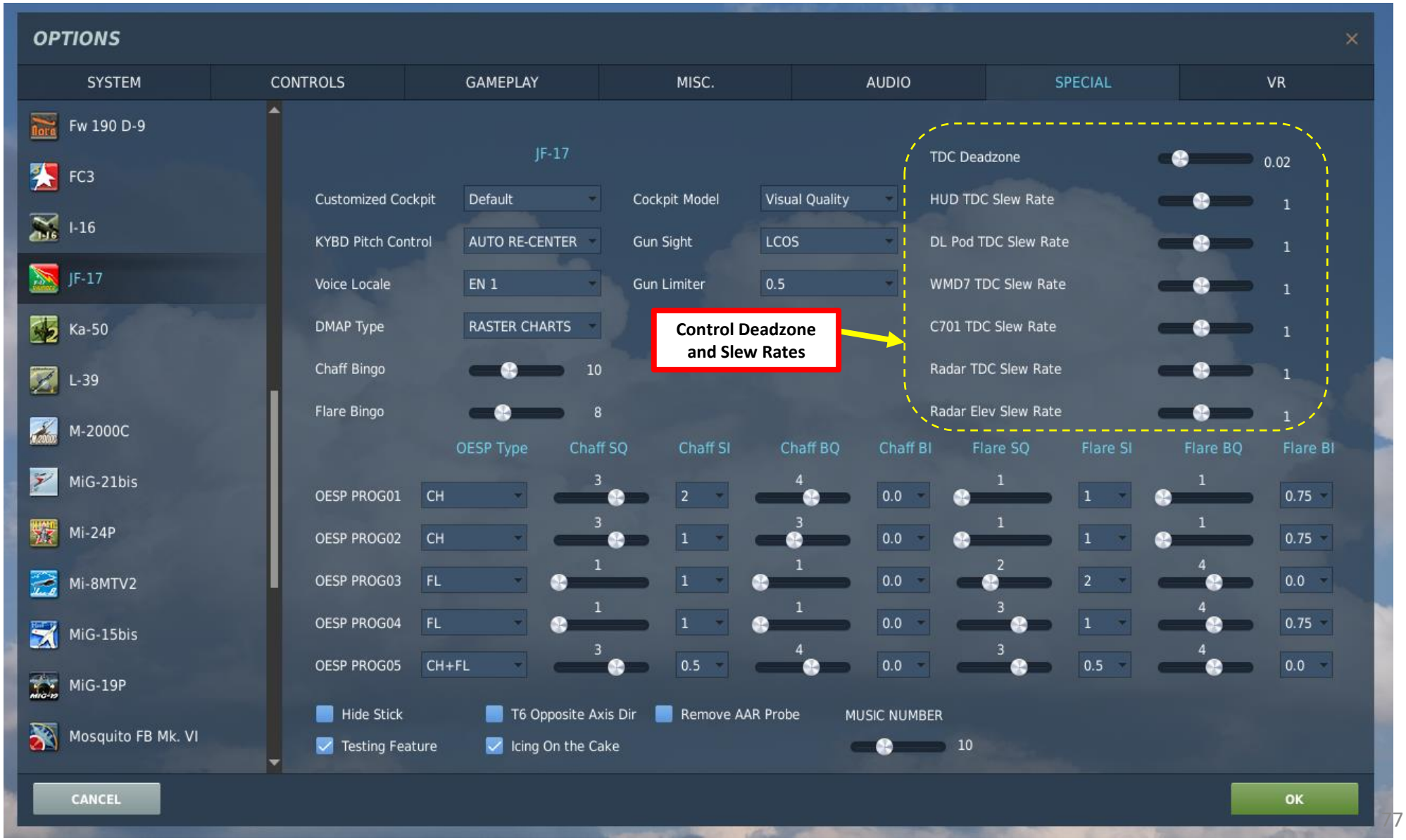
VOICE WARNING SYSTEM

A custom voice set can be selected for various warnings.



CONTROL SLEW RATES

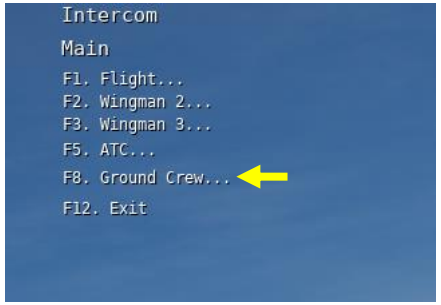
Slew rates and deadzones can be set for various controls.

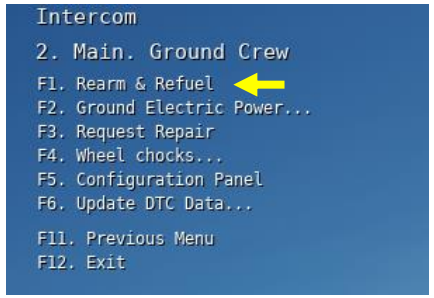


PART 5 – START-UP PROCEDURE

AIRCRAFT SETUP

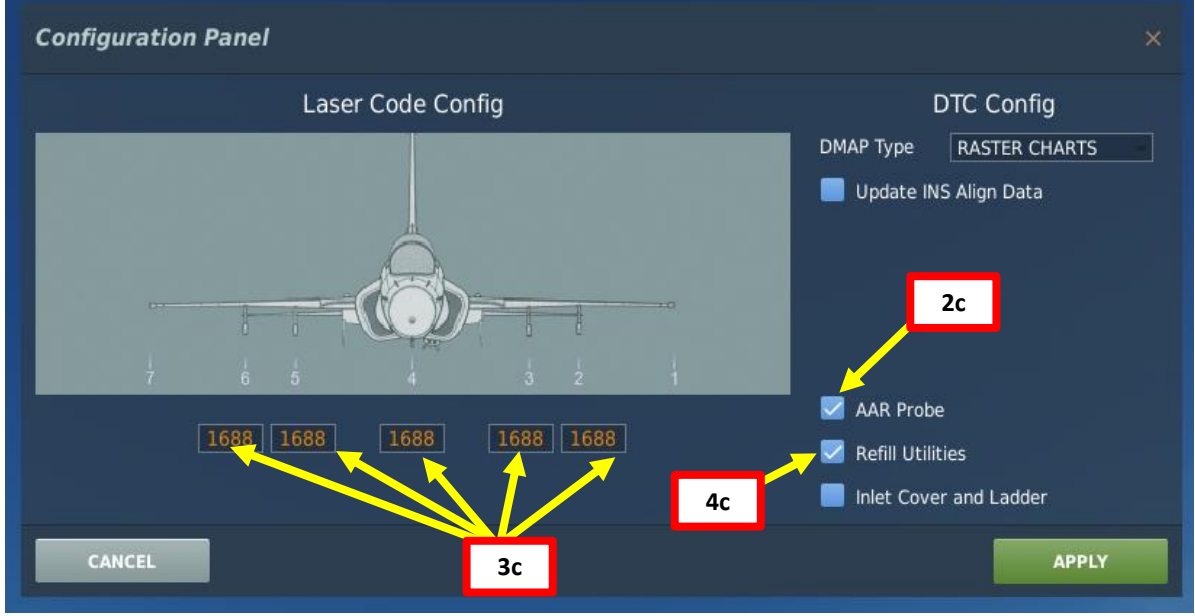
1. Contact ground crew and select your desired loadout by pressing « \ », then pressing F8 (Ground Crew), and F1 (Rearm & Refuel).

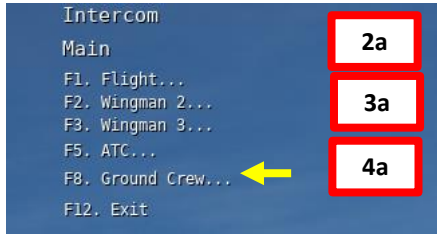


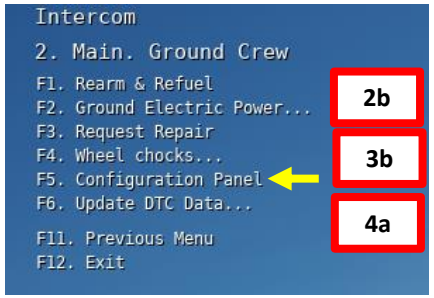


AIRCRAFT SETUP

2. If you want to install/remove the air refueling probe, contact ground crew by pressing « \ », then pressing F8 (Ground Crew), and F5 (Configuration Panel). From the Configuration panel, select or un-select « AAR Probe ».
3. Update Laser Codes as required if using laser-guided ordnance. Contact ground crew by pressing « \ », and F5 (Configuration Panel). From the Configuration panel, modify laser codes if needed.
4. Refill Utilities (Drag Chute, Oxygen Bottles, etc.). Contact ground crew by pressing « \ », then pressing F8 (Ground Crew), and F5 (Configuration Panel). From the Configuration panel, select « Refill Utilities».



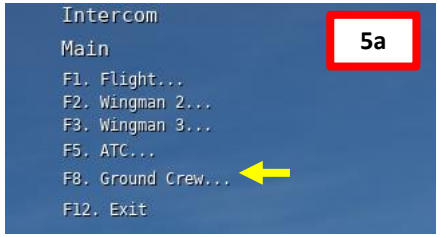


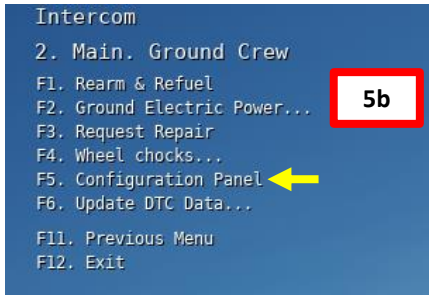


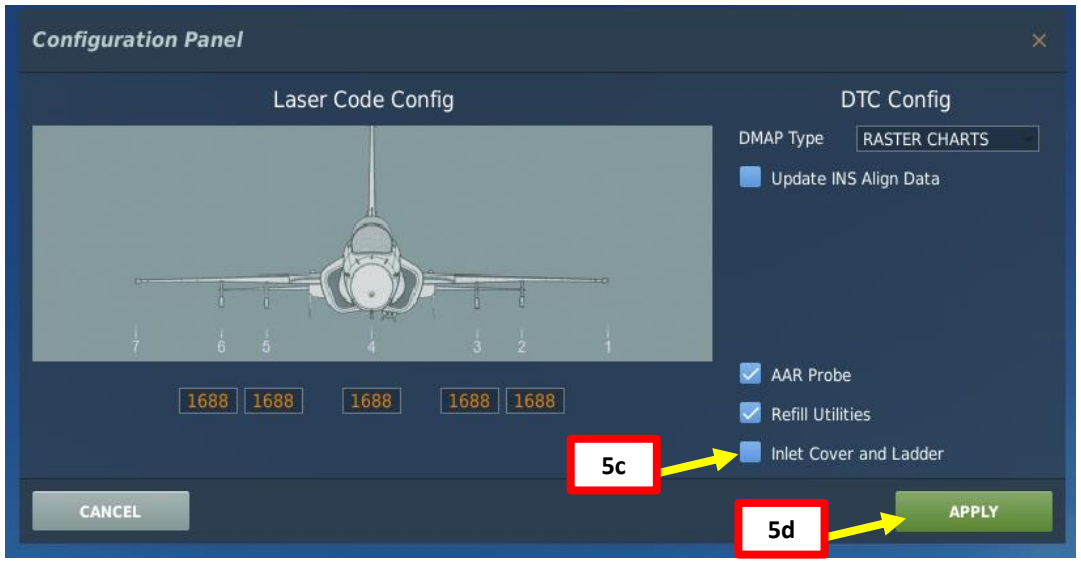
Note: You can request the ground crew to install or uninstall the **air refueling probe**. However, the engine **needs to be shut down prior to doing that**.

AIRCRAFT SETUP

5. Remove Engine Inlet Covers and Ladder. Contact ground crew by pressing « \ », then pressing F8 (Ground Crew), and F5 (Configuration Panel). From the Configuration panel, un-select « Inlet Cover and Ladder », then click APPLY.

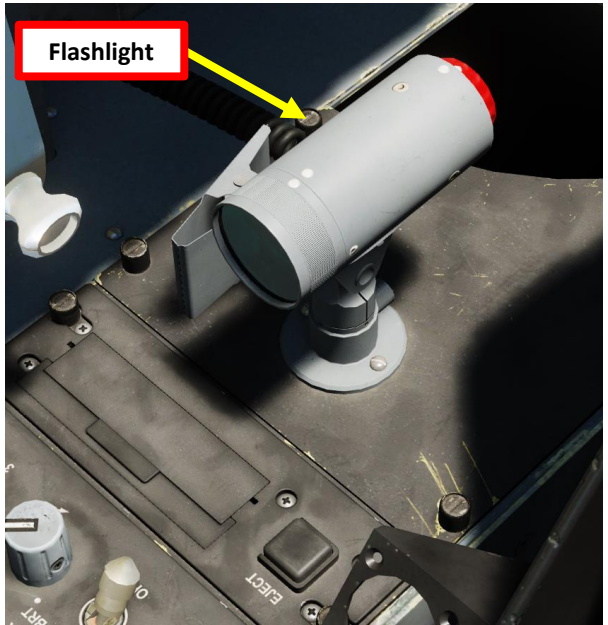






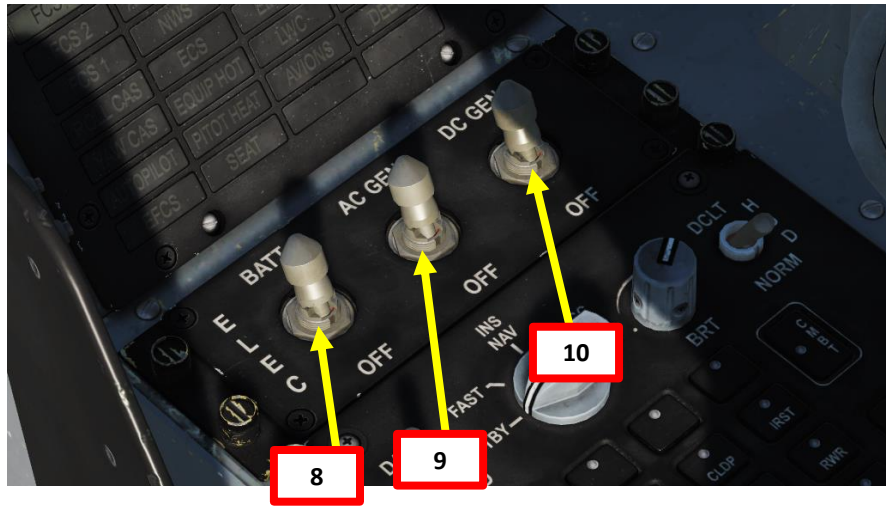
AIRCRAFT SETUP

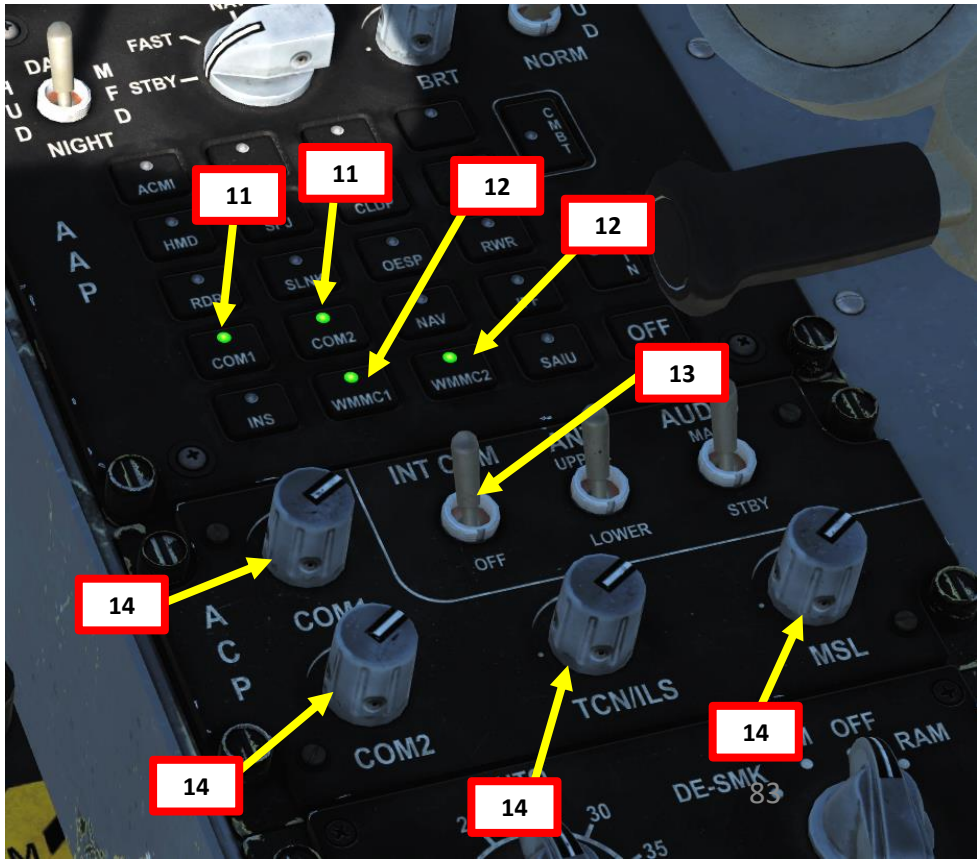
6. For night operations, click on the Flashlight to use it.
7. You are now ready to begin the aircraft power-up sequence.



BEFORE START-UP

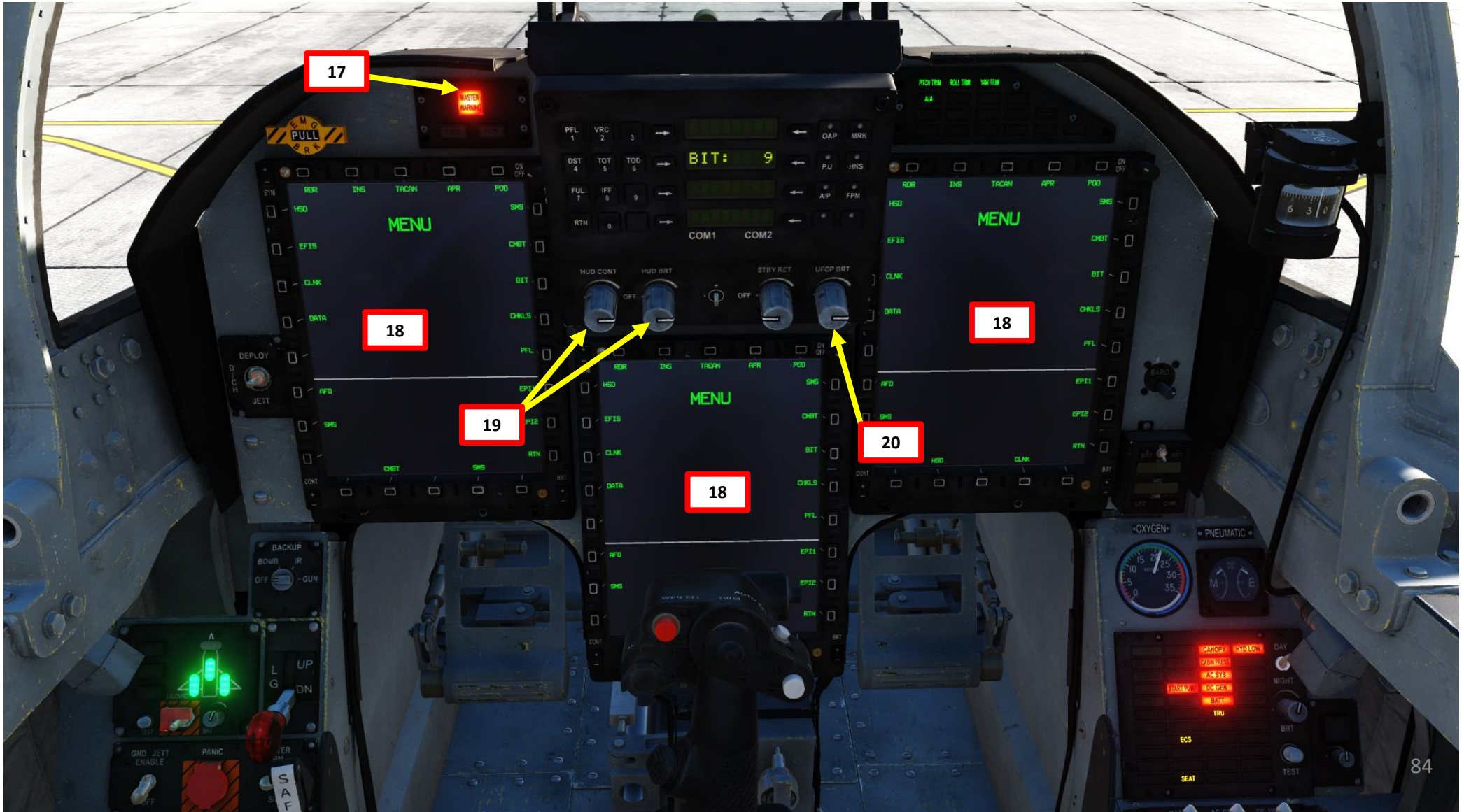
8. Set Battery Switch – ON (FWD)
9. Set AC Generator Switch – ON (FWD)
10. Set DC Generator Switch – ON (FWD)
11. On AAP (Avionics Activation Panel), set COM1 and COM2 power supply switches ON.
12. Provide power to MFCD, HUD and UFCP by setting WMMC1 (Weapon Mission Management Computer) and WMMC2 switches ON.
13. On ACP (Audio Control Panel), set INT COM (Intercom) Switch – ON (FWD)
14. Set COM1, COM2, TCN/ILS and MSL (Missile) Volume Knobs – As required (Right = Volume Up).
15. Set Warning Panel Brightness Knob – BRT
16. Set Oxygen Indicator Brightness Knob – BRT





BEFORE START-UP

17. Press MASTER CAUTION button to inhibit the “Warning” aural cue.
18. MFCDs (Multi-Purpose Colored Display) should already be powered ON by default.
19. Power up the HUD (Heads-Up Display) – Turn HUD CONT knob RIGHT and HUD BRT knob RIGHT.
20. Power up UFCP (Up-Front Control Panel) – Turn UFCP BRT knob RIGHT.



BEFORE START-UP

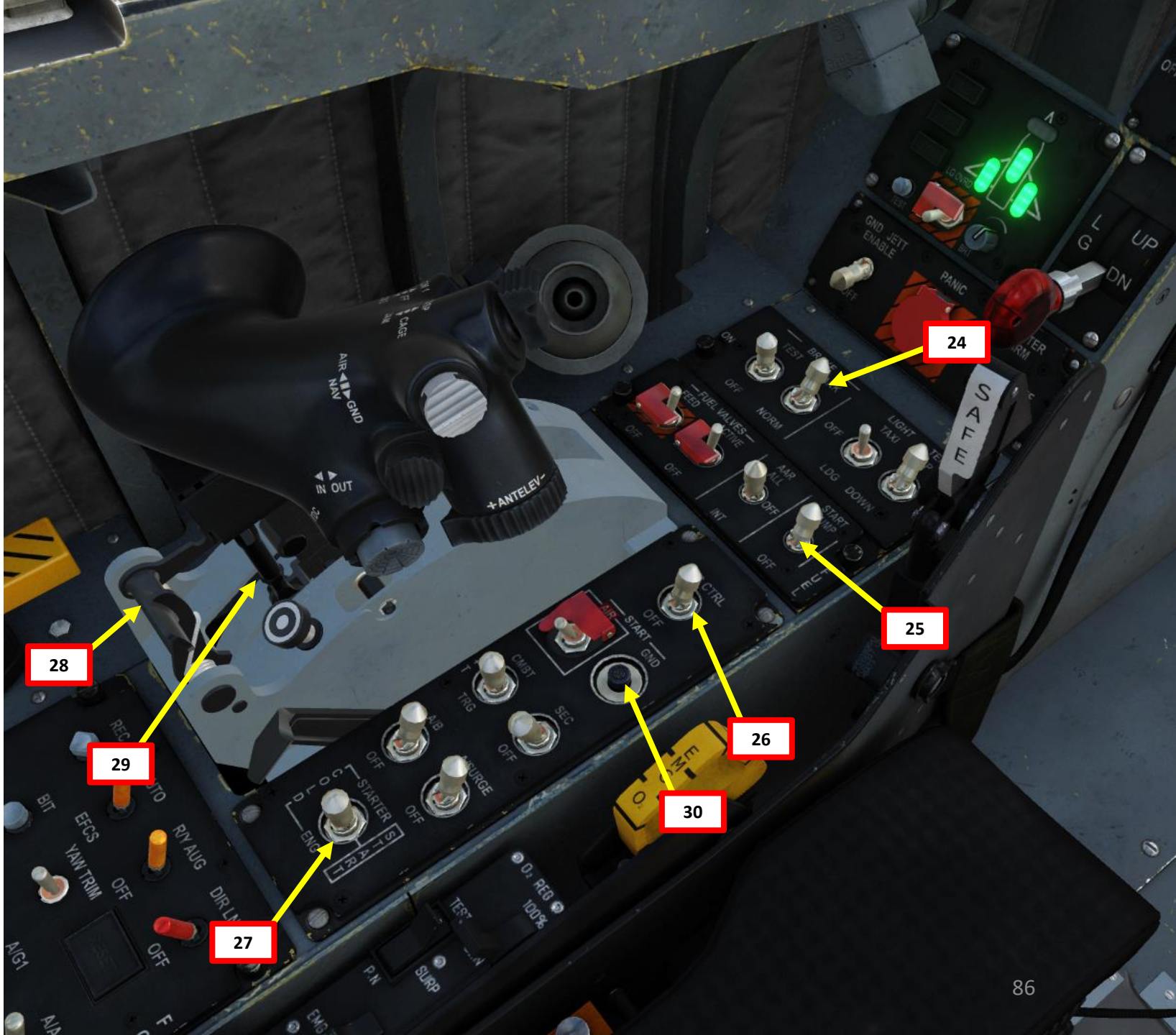
21. Enter NAV Master Mode by setting MMS (Master Mode Switch) to the MIDDLE position (control binding is mapped to "1" by default).
22. In NAV Master Mode, Left MFCD (Multifunction Colored Display) will display the EFIS (Electronic Flight Instrument) page, Center MFCD will display the Radar page, and Right MFCD will display the HSD (Horizontal Situation Display) page. Ensure MFCD Power knobs are set to ON.
23. Set V/UHF Radio Mode selector to T/R (Transmit-Receive) and turn up the Radio Volume knob.

T1: MMS (Master Mode Switch)

- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

ENGINE START-UP

24. Before attempting an engine start, verify that Parking Brake switch is set to PARK (FWD)
25. Set Fuel Pump Switch – START PUMP (FWD)
26. Set ENG CTRL (Engine Control) Switch – ON (FWD)
27. Set Engine Start Mode selector – START (MIDDLE).
28. Click on the Throttle Idle/Stop Caging Lever to uncage the lever from the STOP position.
29. Once Idle/Stop Caging Lever is released, throttle will move from STOP position to IDLE position. Do not move the throttle further forward or the throttle will exit the IDLE range and the engine will not be able to start.
30. Press and hold the GROUND START button for approx. 4 seconds. This will initiate the Turbo Starter cranking sequence, then the Engine start sequence will follow after. When engine start sequence is engaged, the START status light is visible.

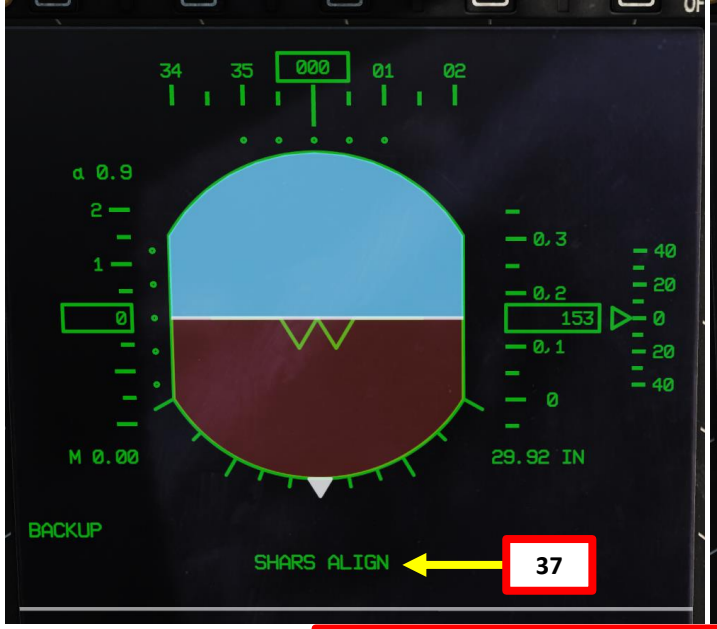


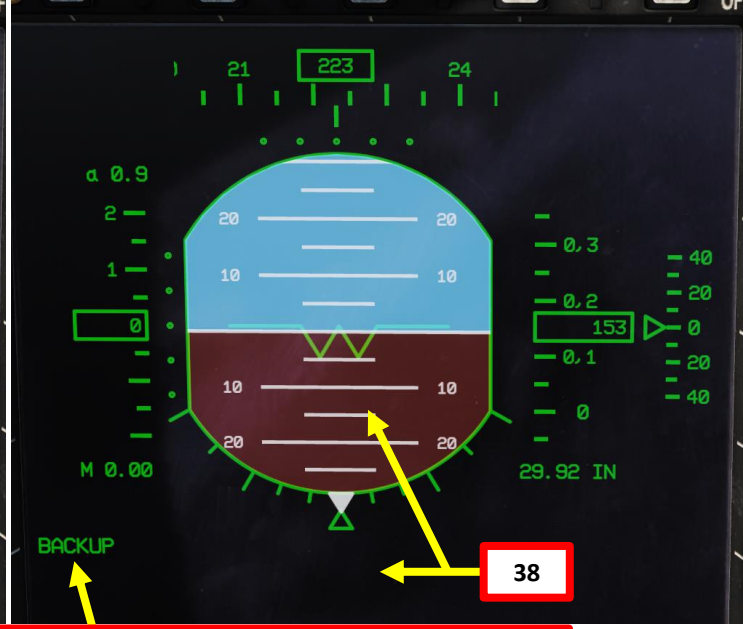
ENGINE START-UP

31. On the EPI1 (Engine Performance Indicator) page (Lower Left MFCD), monitor engine N2 (High-Pressure Turbine Speed, % RPM) and verify it increases. HYD LOW, AC SYS, DC GEN and TRU cautions will remain illuminated as long as N2 remains below 60 % RPM.
32. Engine lightoff should occur at approx. 10 % N2. Fuel valve will open and igniters will activate. T4 (Turbine Inlet Temperature) should start increasing.
33. Once start-up sequence is complete and engine reaches Idle state, engine parameters will stabilize to 70 % N2 and T4 < 500 deg C.
34. The Engine-drive Hydraulic pump will automatically activate when N2 is approx. 60%, “HYD LOW” warning light should extinguish.
35. Set ECS (Environmental Control System) Switch to NORM. ECS air flow is required to cool down avionics; failing to do so within a reasonable timeframe will cause overheat issues, which cause uncommanded MFCD failure. When ECS is ON, ECS and CABIN PRESS caution lights should extinguish.

POST-START-UP

36. Set SHARS (Strapped-down Heading Attitude Reference System) switch – ON (FWD)
37. SHARS Alignment will take approx. 1 minute. Alignment status can be monitored on the EFIS (Electronic Flight Instrument System) page ("SHARS ALIGN" blinking message). Take note that SHARS alignment is independent of INS alignment.
38. When SHARS alignement is complete, pitch scale lines will appear on the EFIS ADI (Attitude Director Indicator) and SHARS ALIGN message will disappear.
39. On AAP (Avionics Activation Panel), set INS (Inertial Navigation System) power supply switch ON.
40. The INS will start a BIT (Built-In Test) that lasts approx. 30 seconds. Wait until the left MFCD displays the DST (Destination) page, and the center MFCD displays the INS (Inertial Navigation System) page.

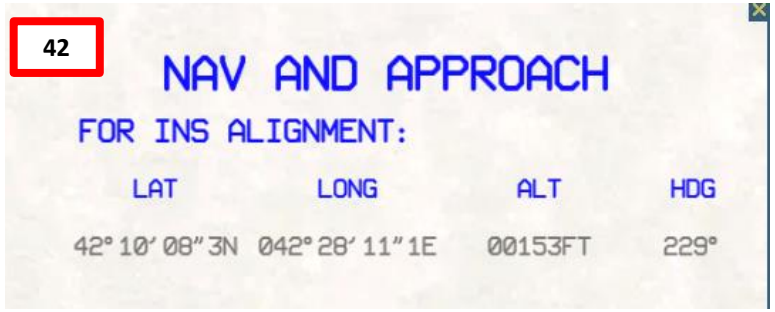




BACKUP indicates aircraft attitude data is obtained from the SHARS. NORM indicates aircraft attitude data is obtained from the INS (Inertial Navigation System)

POST-START-UP

41. On UFCP (Up-Front Control Panel), press the DST (4) button to enter the UFCP DESTINATION menu.
42. Open your kneeboard (RSHIFT+K) to the NAV & APPROACH page. Your current coordinates (Longitude, Latitude, Altitude and Heading) will be displayed there. As an example:
    - LATITUDE : **42°10'08.3'' North** (deg, min, sec)
    - LONGITUDE: **042°28'11.1'' East** (deg, min, sec)
    - ALTITUDE: **00153 (ft)**
    - HEADING: **229 deg**
43. Verify DST Channel 00 is selected (DST Channel 00 stores coordinates used for INS alignment).
44. Enter Latitude:
    a) Press arrow left of Latitude Data Field to select Latitude coordinates
    b) Enter Latitude coordinates on the UFCP keypad: "4210083" for **42°10'08.3'' North**.
    c) Press arrow left of Latitude Data Field to enter Latitude coordinates
    d) Press arrow right of Latitude Data Field to select North/South



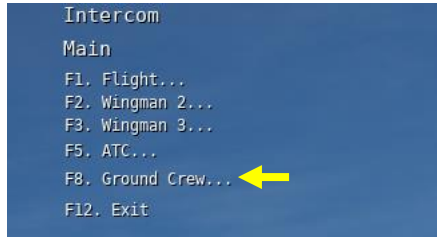
POST-START-UP

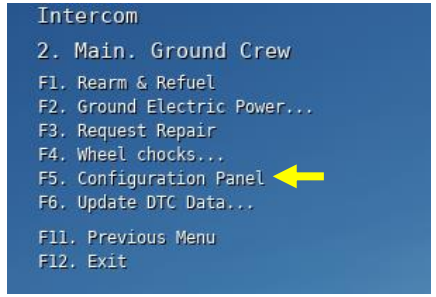
- LATITUDE : **42°10’08.3’’ North** (deg, min, sec)
- LONGITUDE: **042°28’11.1’’ East** (deg, min, sec)
- ALTITUDE: **00153 (ft)**
- HEADING: **229 deg**

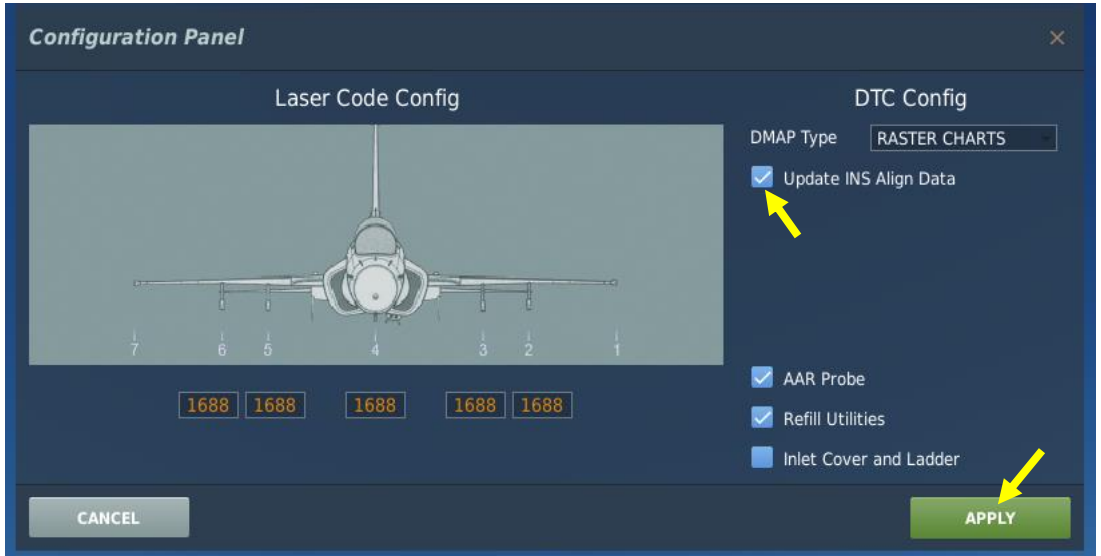
45. Enter Longitude:
    a) Press arrow left of Longitude Data Field to select Longitude coordinates
    b) Enter Longitude coordinates on the UFCP keypad: “04228111” for **042°28’11.1’’ East**.
    c) Press arrow left of Longitude Data Field to enter Longitude coordinates
    d) Press arrow right of Latitude Data Field to select East/West
46. Enter Altitude:
    a) Press arrow right of Altitude Data Field to select Altitude
    b) Enter Altitude on the UFCP keypad: “00153” for **153 ft**.
    c) Press arrow right of Altitude Data Field to enter Altitude
    d) Press arrow left of Altitude Data Field to select either + or – as required

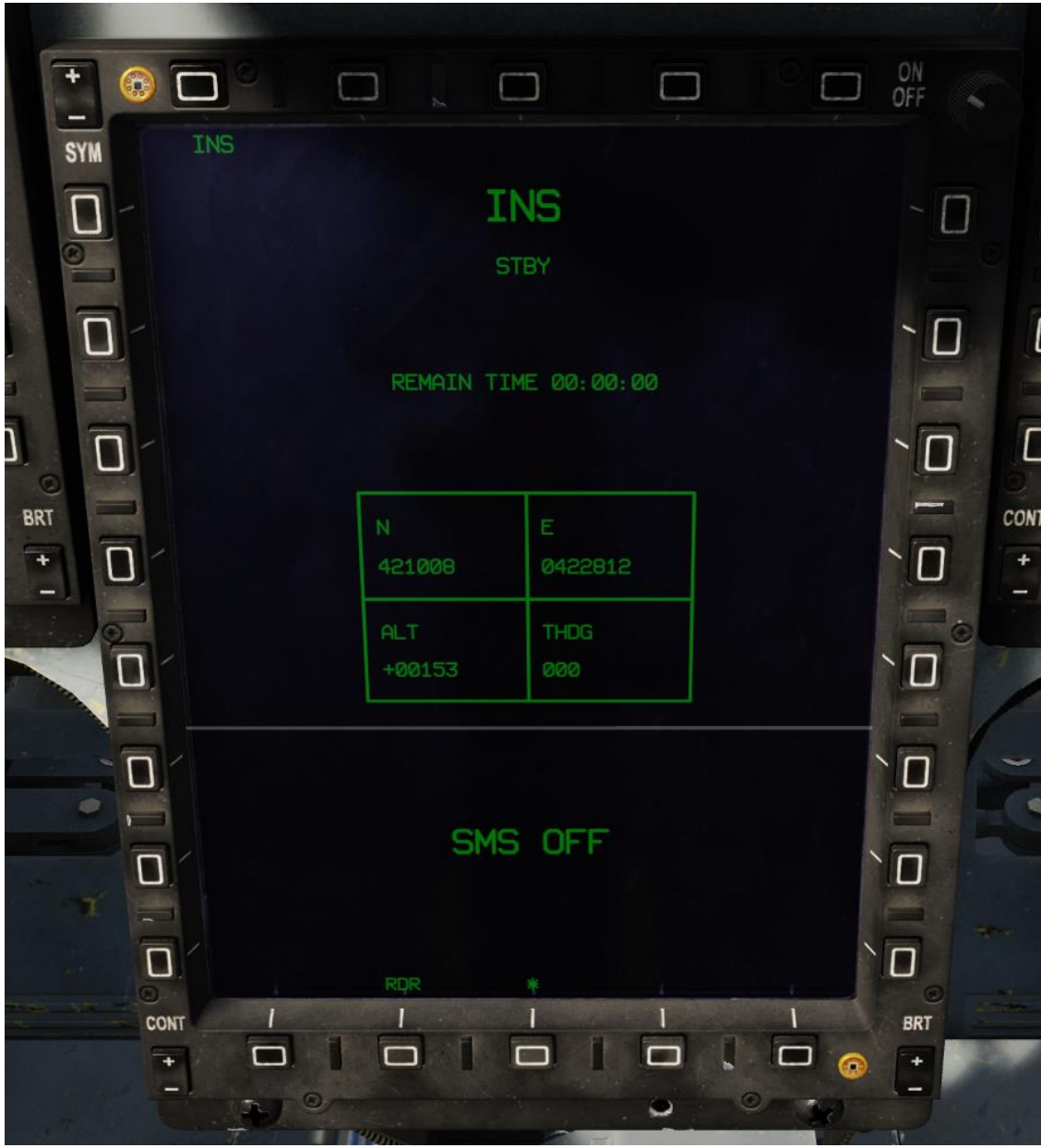
POST-START-UP

47. Note: it is possible to request the ground crew to enter INS Alignment data for you. To do so, contact ground crew by pressing « \ », then pressing F8 (Ground Crew), and F5 (Configuration Panel). From the Configuration panel, select « Update INS Align Data », then click APPLY.
    - Keep in mind that the coordinates entered by the ground crew include longitude, latitude, and altitude… but **not** THDG (True Heading). The THDG parameter still needs to be entered manually.





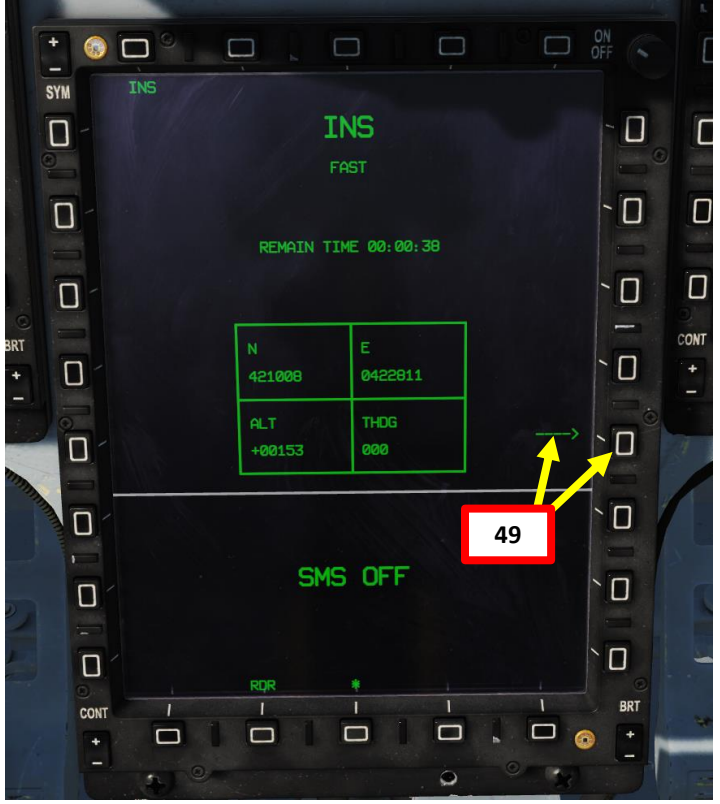


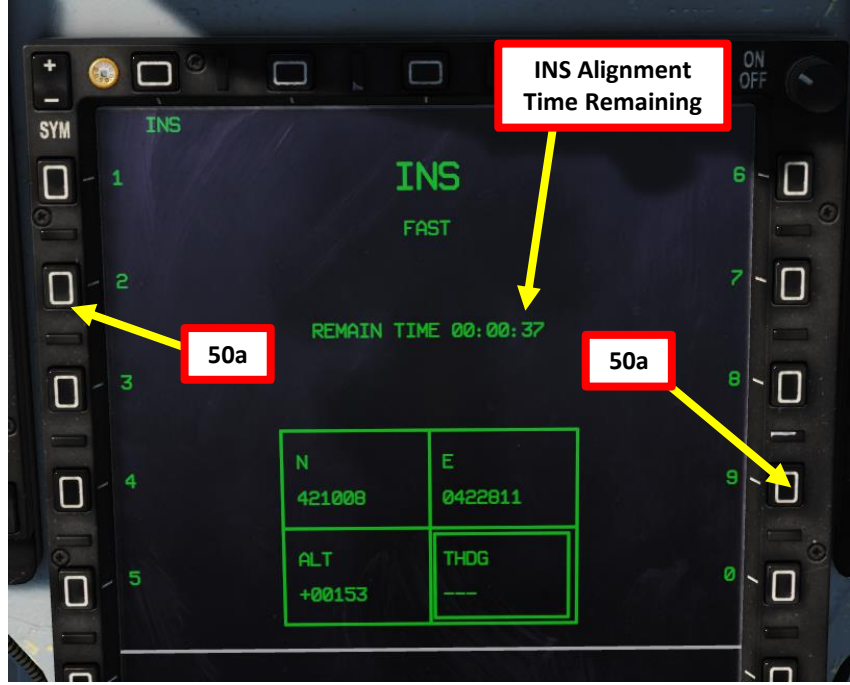


POST-START-UP

- LATITUDE : **42°10’08.3’’ North** (deg, min, sec)
- LONGITUDE: **042°28’11.1’’ East** (deg, min, sec)
- ALTITUDE: **00153 (ft)**
- HEADING: **229 deg**

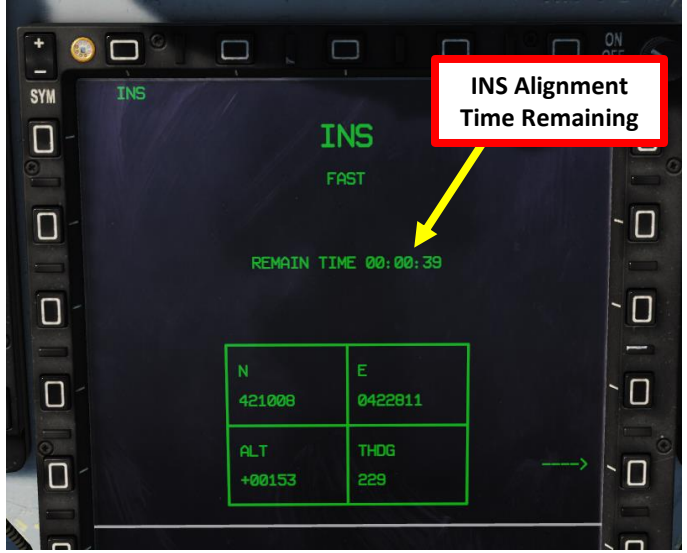
48. Start INS Alignment by setting the INS Mode Selector switch to FAST (Quick Alignment).
    Note: You could also set the switch directly to NAV, which will automatically start FAST alignment and then switch to NAV once alignment is complete.
49. A green arrow will appear next to THDG since FAST INS alignment requires True Heading to be entered during the alignment phase. On Center MFCD INS page, press the OSB (Option Select Button) next to “THDG” to enter MFCD EDIT mode.
50. Press the OSBs next to the numbers indicated on the side of the MFCD to enter your **True Heading of 229**.
51. Once True Heading is entered, INS FAST alignment will restart automatically and take approx. 30-40 seconds to complete.

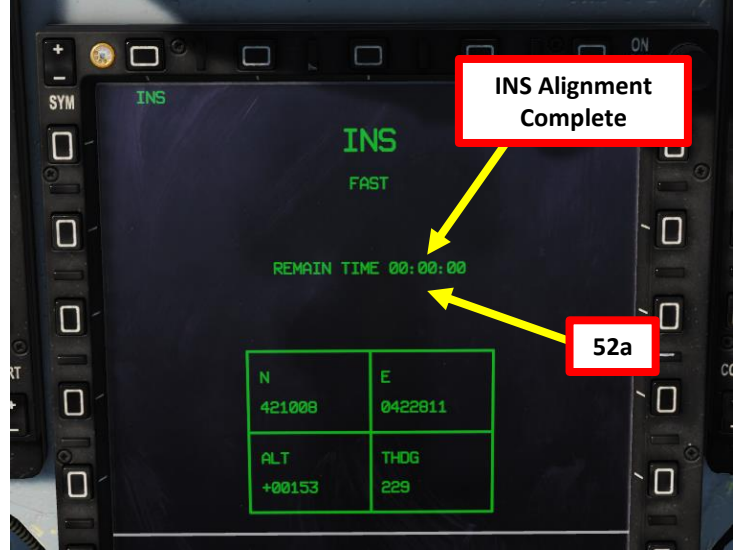


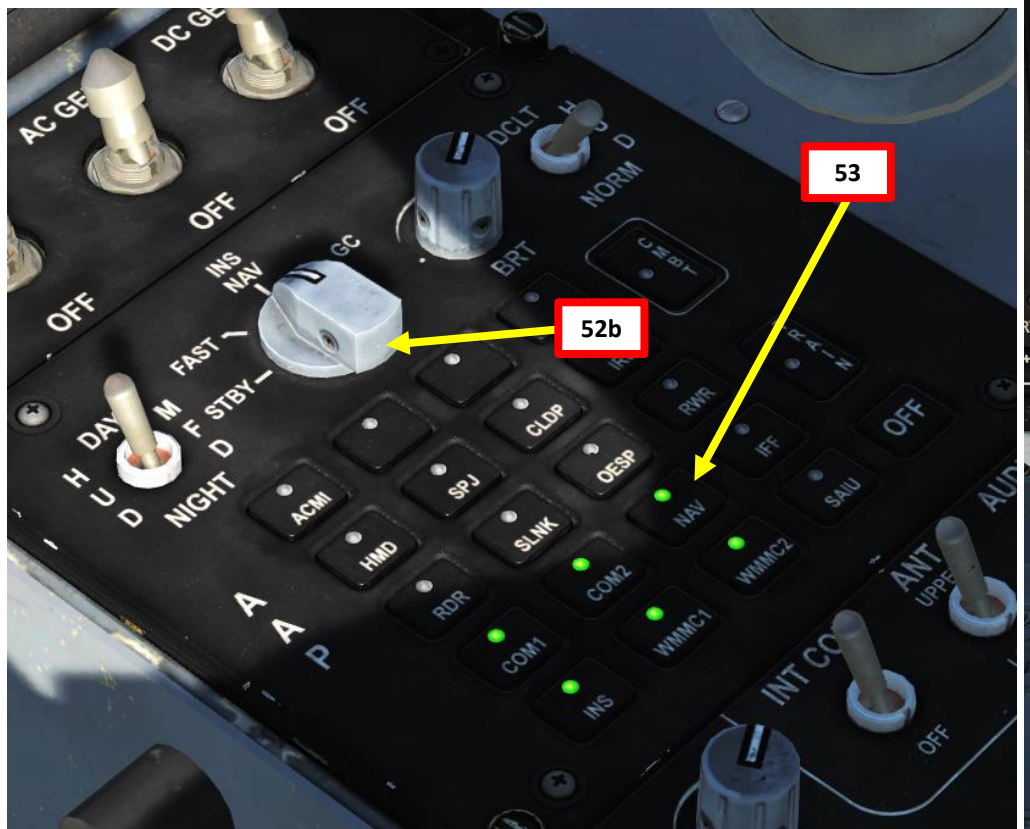


POST-START-UP

52. Once REMAIN TIME indication reaches 00:00:00 and FAST indication blinks on the INS page, set INS Mode Selector switch to NAV. FAST indication will change to NAV.
53. On AAP (Avionics Activation Panel), set NAV power supply switch ON.

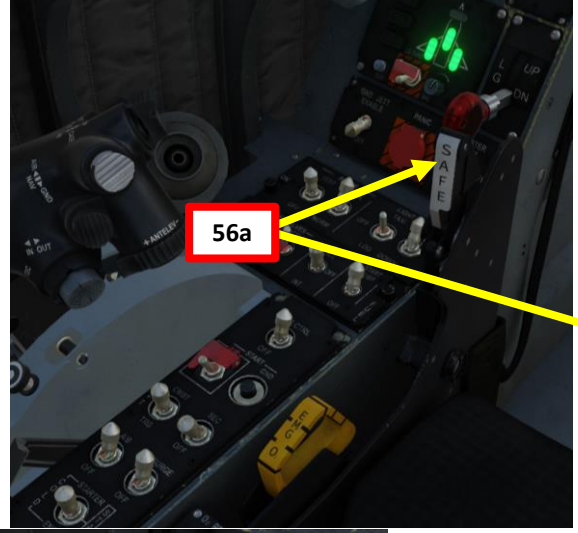


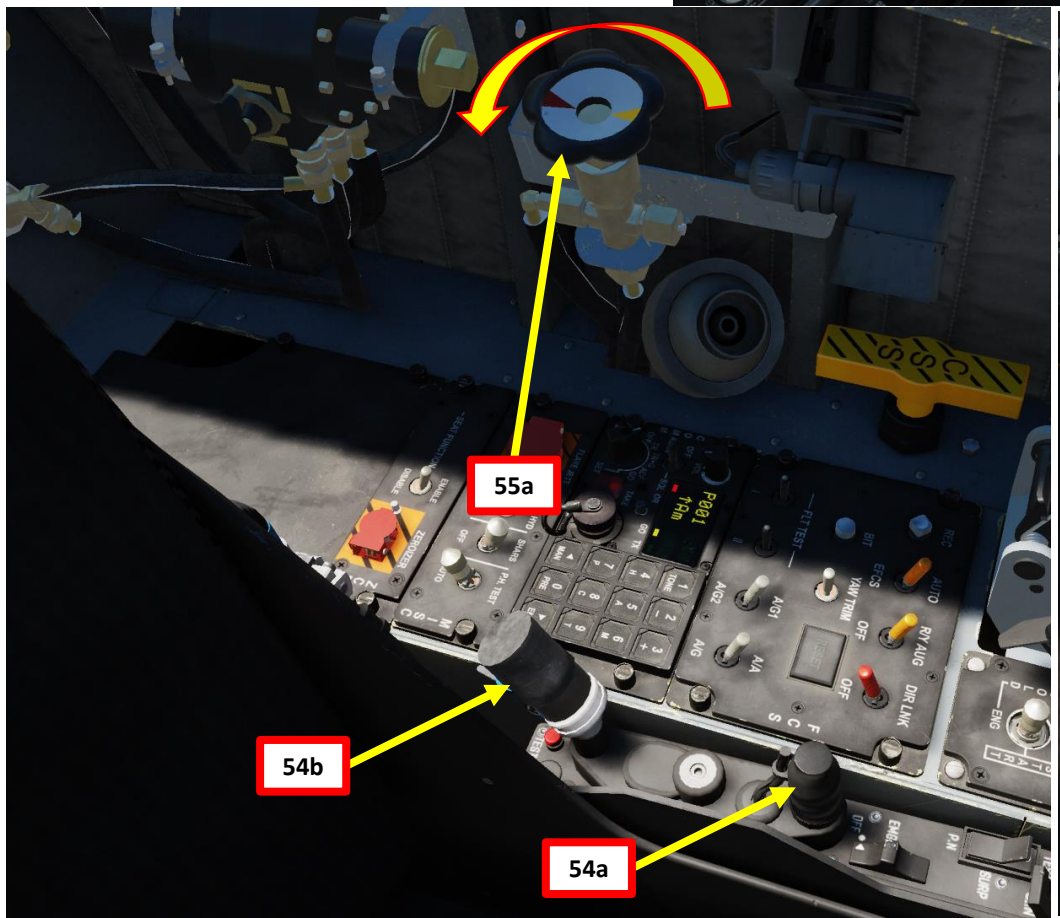




POST-START-UP

54. Connect Oxygen Tube to Oxygen Connector (a) and G-Suit Tube to G-Suit (b)
55. Open Oxygen Valve with mousewheel scroll. Rotate Valve handle Counter-clockwise to open the valve. Check that the OXY BLINK caution blinks to confirm that the oxygen mask functions properly.
56. Arm Ejection Seat Handle. Verify that SEAT advisory extinguishes.
57. Remove Ejection Seat Firing Handle safety pin.



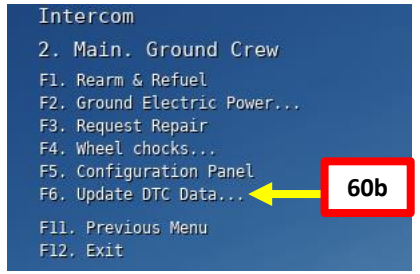


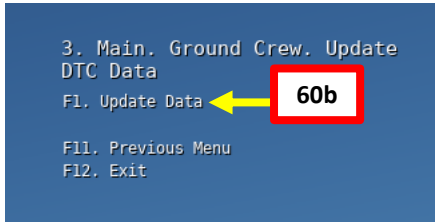
POST-START-UP

58. On AAP (Avionics Activation Panel), activate remaining avionic systems required for the mission:
    a) The AAP will display what systems are ON and what systems are OFF
    b) Press the CMBT (COMBAT) button to activate remaining avionic systems required for an air combat mission. This will automatically power on:
        - RDR (Radar)
        - SLNK (SD-10 Missile Link / Command Transmitter)
        - OESP (Optical/Electronic Self Protection Countermeasures)
        - RWR (Radar Warning Receiver)
        - IFF (Identify-Friend-or-Foe)
        - SAIU (Standard Armament Interface Unit)
    c) If a targeting pod is equipped, press the CLDP (Convertible Laser Designator Pod) button.
59. Set Emergency Hydraulic Switch – ON (FWD). This will arm the pump but not activate it (unless a sudden loss of engine power occurs, which will automatically activate it).

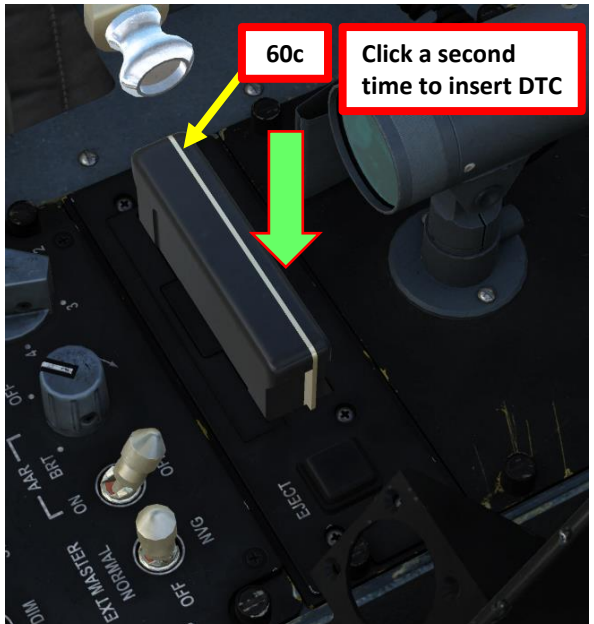
POST-START-UP

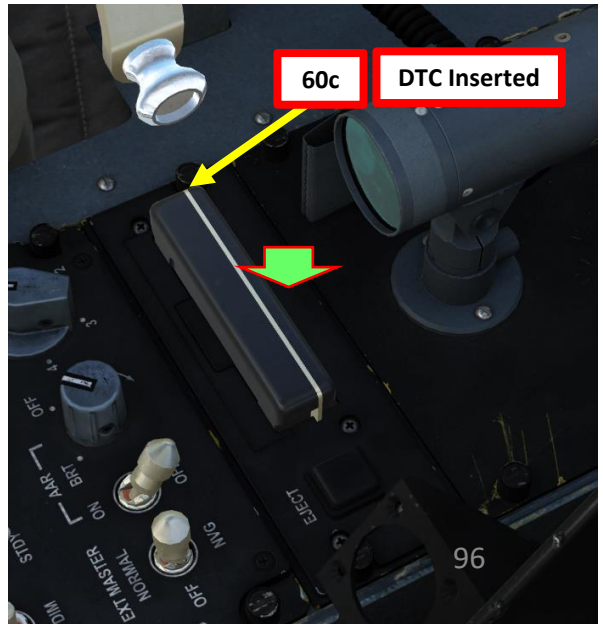
60. Load DTC (Data Transfer Cartridge) into the aircraft. The DTC is used to transfer weapon data, navigation data, approach data and electronic warfare system data to the airplane. Marked points on the F10 map (e.g. RP1, RP2… RP6 Route Points for 802AKG anti-ship missile and PP1, PP2… PP4 Pre-Planned Points for Precision-Guided Munitions like the LS-6 and GB-6) will also be entered via the DTC.
    a) Make sure DC Power is available (engine is started and DC GEN switch is ON) and DTC card is unmounted.
    b) Open canopy, then contact ground crew and request a DTC Data Update by pressing « \ », then pressing F8 (Ground Crew), F6 (Update DTC Data), then F1 (Update Data).
    c) Once DTC is updated, click twice on the DTC slot to insert the cartridge.
    d) Once DTC is inserted, left MFCD will automatically display to the DATA – DTC Sub-page with the « DTC LOCKED » message.
    e) Press OSB (Option Select Button) next to « ALL » to select all data fields to be updated (boxed when selected).





60b





POST-START-UP

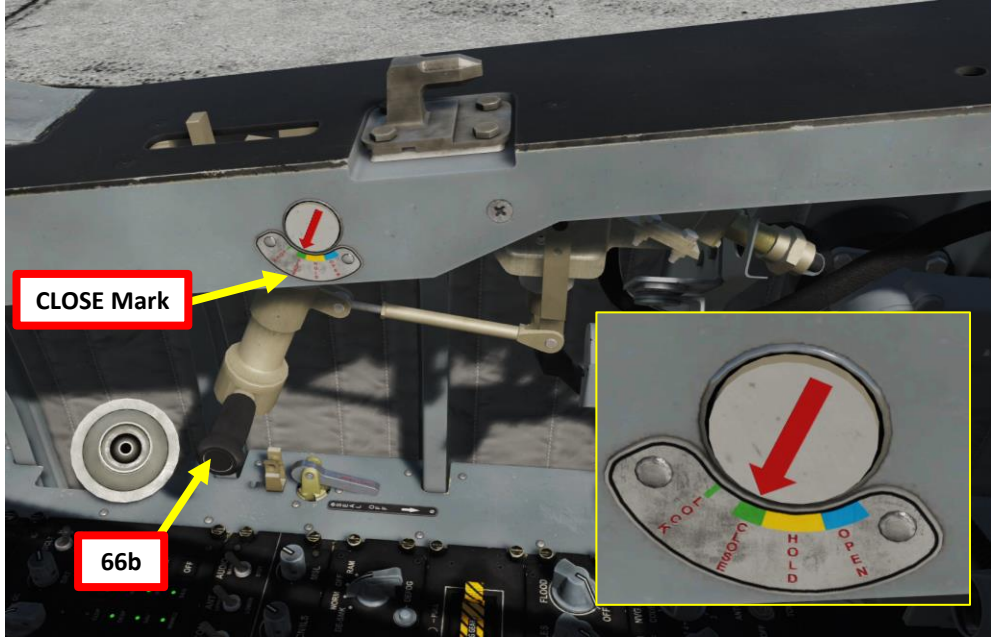
60. Load DTC (Data Transfer Cartridge) into the aircraft. The DTC is used to transfer weapon data, navigation data, approach data and electronic warfare system data to the airplane. Marked points on the F10 map (e.g. RP1, RP2… RP4 Route Points for 802AKG anti-ship missile and PP1, PP2… PP6 Pre-Planned Points for Precision-Guided Munitions like the LS-6 and GB-6) will also be entered via the DTC.
    f) Press OSB (Option Select Button) next to « ENT » (Enter) to transfer data.
    g) « DTC TRANS » message will indicate information transfer is in progress.
    h) « DTC LOCKED » message and unboxed data fields will indicate that the information transfer is complete.

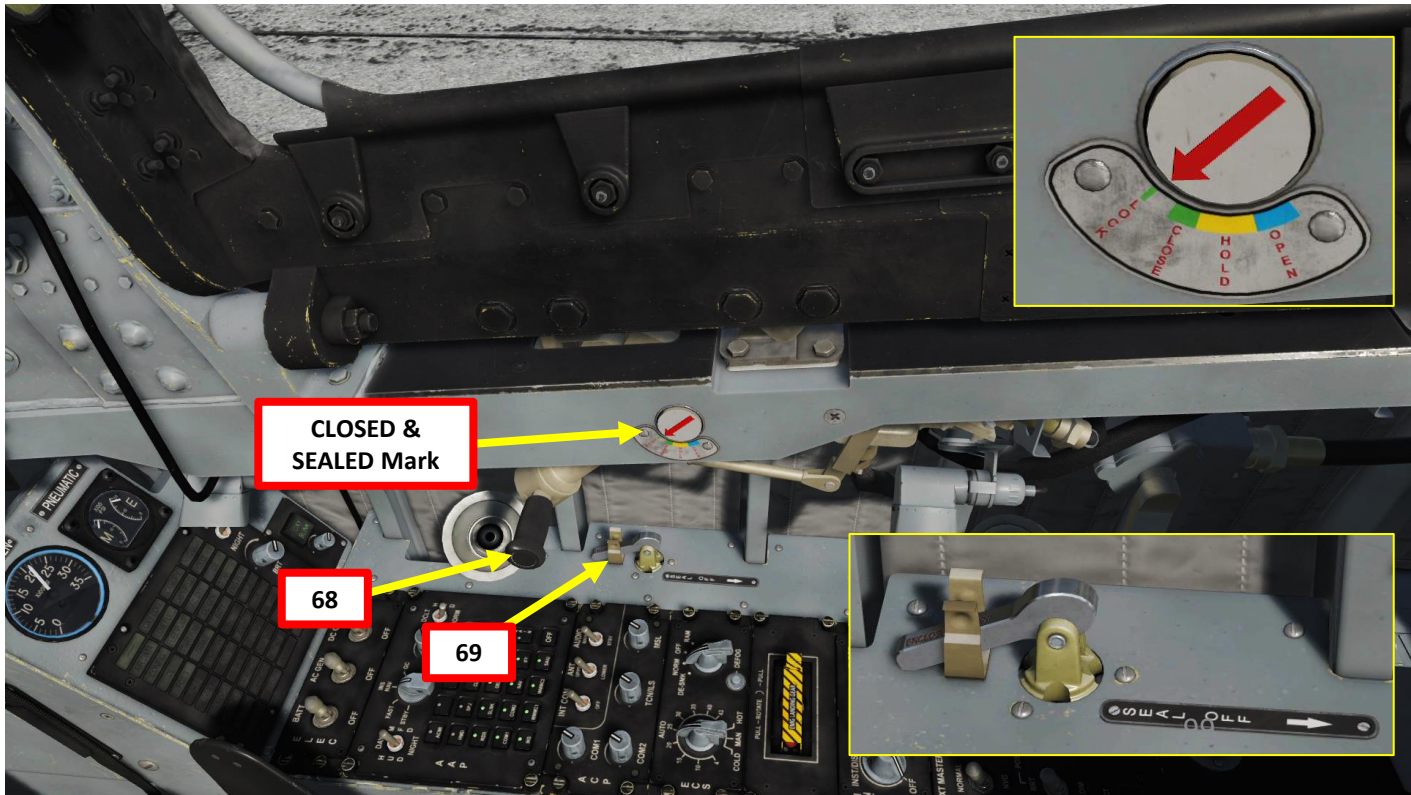
POST-START-UP

61. Check your configuration loadout on the SMS (Stores Management System) Lower Page of the Center MFCD.
62. Set AA/AG FCS Configuration Switch to AA if no external fuel tanks are mounted and air-to-air missiles are equipped. Otherwise, set AA/AG switch to AG (Air-to-Ground).
63. Set AG1/AG2 FCS Configuration Switch to AG1 if air-to-ground weapons are mounted without external wing fuel tanks. If external wing fuel tanks are mounted, set AG1/AG2 switch to AG2.
    - In our case, we have air-to-ground weapons with a central external fuel tank (no wing-mounted external tanks). Use AG1.
    - When in doubt, always make sure the AA/AG and AG1/AG2 switches are set in order to have the CONFIG caution extinguished.
    - *Be careful: FCS G limit of AG2 is 5g and limit of AG1 is 6g. However, some munitions have a structural limit of 5.5g, and the FCS config will still recommend AG1. Choose wisely.*
64. Check FCS (Flight Control System) Configuration. If the Warning Panel still displays a blinking “CONFIG” advisory, you are in the wrong configuration.
65. Set EFCS (Emergency Flight Control System) – AUTO (FWD)

POST-START-UP

66. Click on Canopy Handle (FWD). Canopy Status arrow will then point to the CLOSE mark.
67. Wait until canopy is completely closed.
68. Click on Canopy Handle to lock canopy. Canopy Status arrow will then point to the CLOSED & SEALED mark.
69. Confirm that Canopy Seal Handle is at the SEAL (FWD) position.
70. Verify that no CANOPY advisory is displayed on the Warning Panel.





POST-START-UP

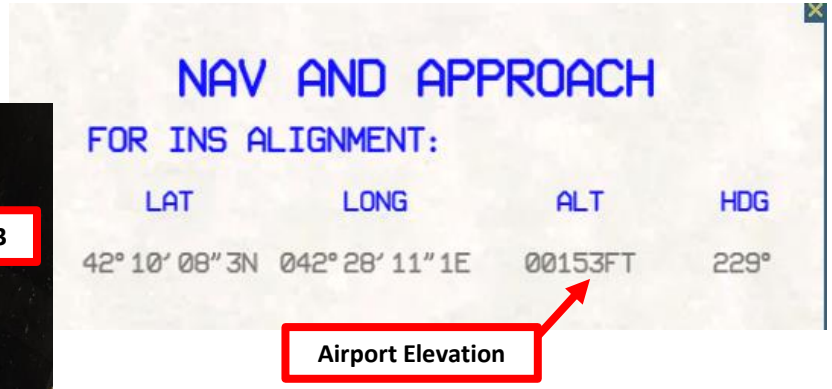
71. Set the Left MFCD (Multifunction Colored Display) page to the EFIS (Electronic Flight Instrument) page. I recommend the Center MFCD to be set to the Radar page, and the Right MFCD to be set to the HSD (Horizontal Situation Display) page. These pages will be memorized as the default pages for the Navigation Master Mode (NAV). As a verification, you can cycle across master modes with the T1 MMS (Master Mode Switch) on the throttle.
72. Set HNS (Hybrid Navigation System) mode to GPS and INS, which correlates the inertial navigation system (INS) with the satellite global positioning system (GPS). This is crucial when employing pre-planned precision-guided munitions.
    a) Press HNS button
    b) Toggle OSB next to INS until INS+GPS is selected
    c) "HNS" should be illuminated
    d) Press RTN button on UFCP

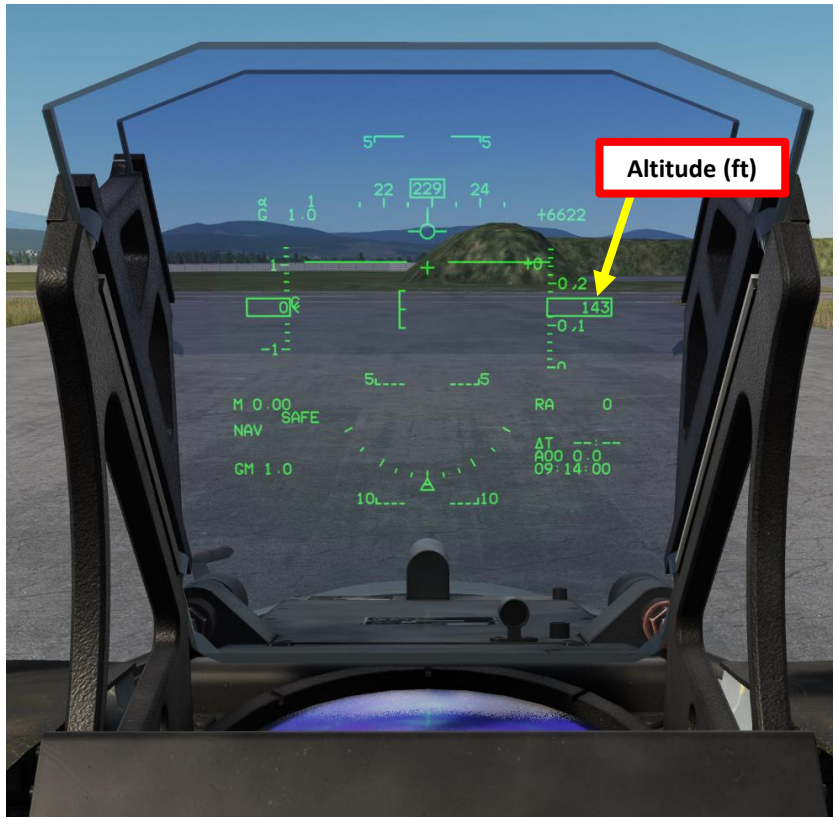
T1: MMS (Master Mode Switch)

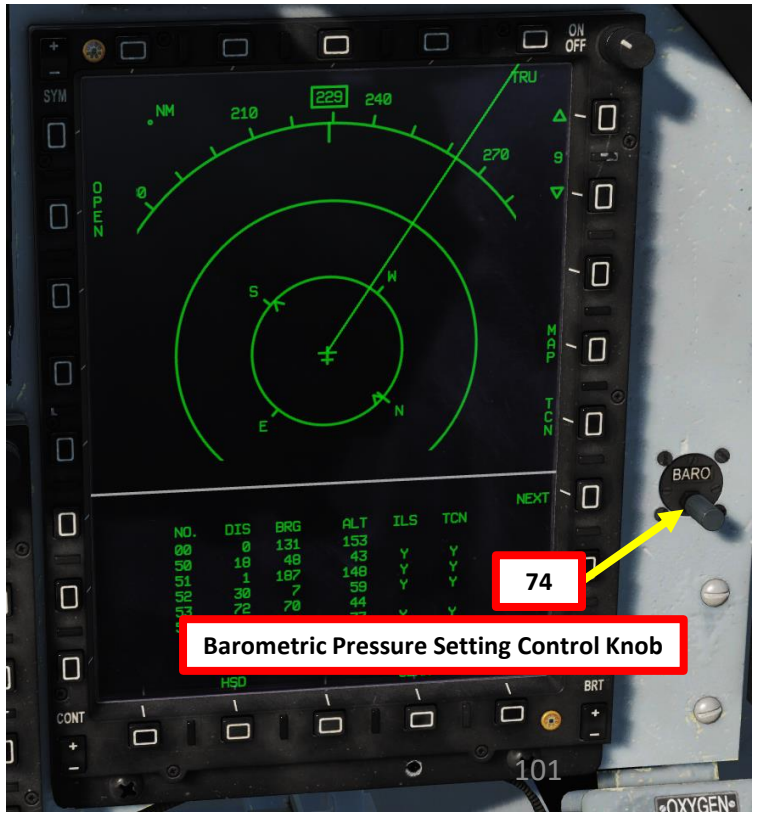
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

POST-START-UP

73. Turn on the clock.
74. Adjust Barometric Setting Knob as required. Barometric Altitude displayed on the HUD and EFIS should match the airport elevation we entered during the INS alignment.

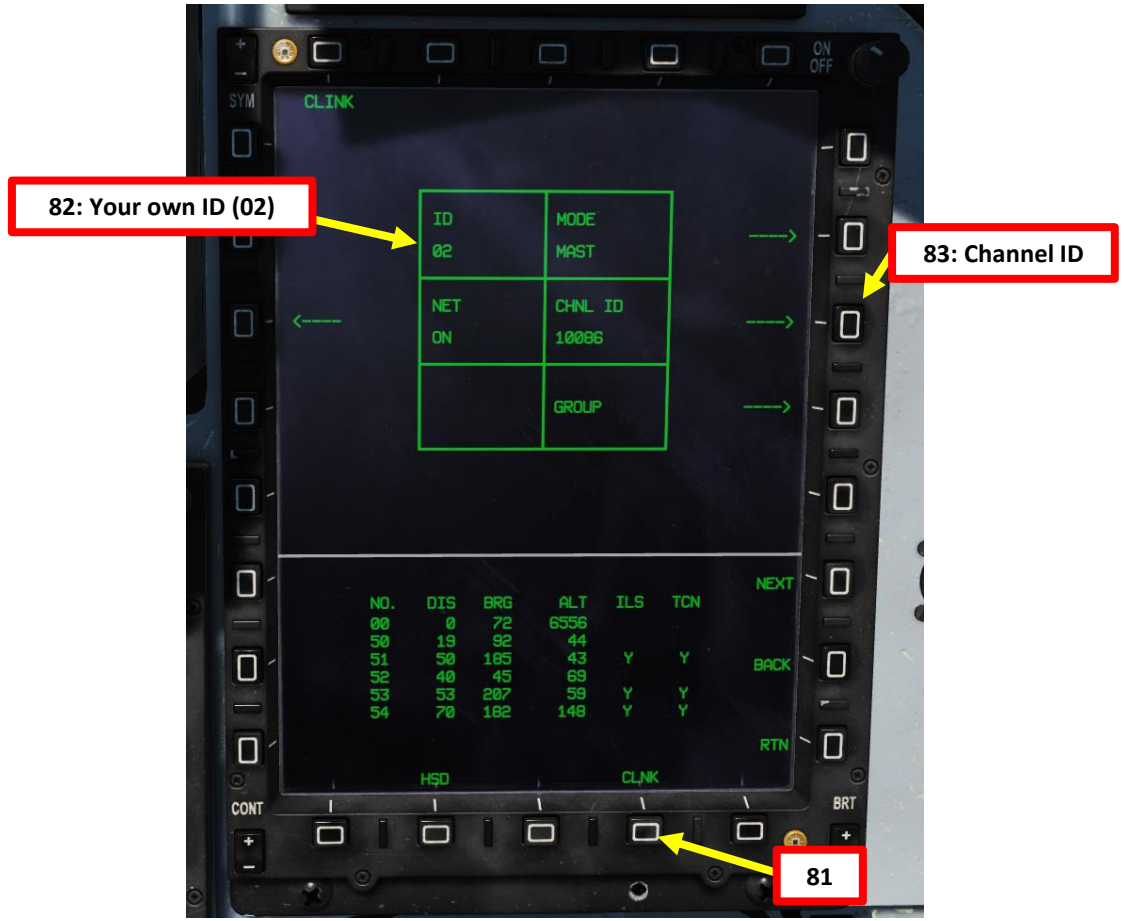






POST-START-UP (DATALINK)

75. On the UFCP, press RTN to go to the main menu.
76. Press on the Arrow Select button next to COM2 to select COM2.
77. Press on the Arrow Select button next to COM2 a second time to edit COM2 channel.
78. Enter Channel 199, then press Arrow Select button next to COM2. This channel is reserved exclusively for Datalink and must remain at this channel at all times.
79. Press on the Arrow Select button next to SLAV to toggle Datalink Mode to MASTER (HOST) if no Master is available on the Network (will most likely be the case in multiplayer servers).
80. Press on the Arrow Select button next to NE- to turn on the network. NET setting will change from NE- to NES (ON).
81. Click on the CLNK OSB to select the CLINK (Datalink) page. You will see your ID, mode, Datalink setting, Channel ID and Group.
82. Your ID is already set and cannot be changed. This will be how you are displayed on other people on the network.
83. Set Datalink Network Channel ID required by your coalition (should be available in the mission briefing).



POST-START-UP (IFF)

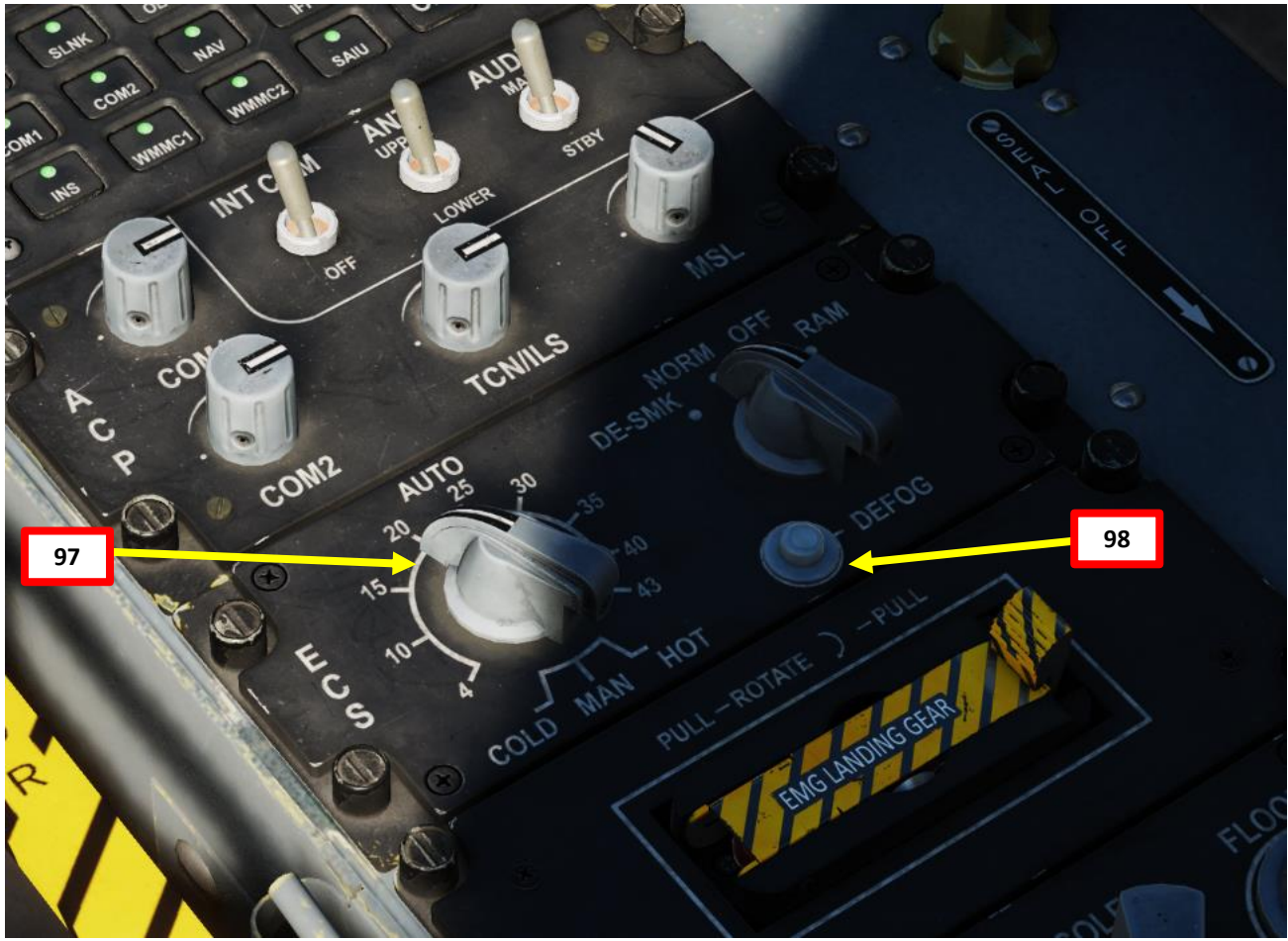
84. Verify IFF (Identify-Friend-or-Foe) system is powered on the AAP (Avionics Activation Panel).
85. Press “IFF” on the UFCP.
86. INT indicates that we are in the IFF Interrogation Menu (INT).
87. Press Arrow button next to the desired Interrogation Mode. This will determine what interrogation signal we send to the transponders of other aircraft. In our case, we will choose Mode 6.
88. A « + » next to « M6 » will indicate Mode 6 is selected.
89. * An Interrogation Code is required when scanning another JF-17 type. Press the Arrow button next to CODE.
90. * Select code for desired mode. We will choose A for Mode 6.
91. * Press BACK to return to Interrogation menu.
92. Press on the Arrow button next to the dot to select the IFF Transponder Menu (TRS).
93. Press Arrow button next to the desired Transponder Mode. This will determine what response signal we send when our own aircraft is interrogated. In our case, we will choose Mode 6.
94. * A « + » next to « M6 » will indicate Mode 6 is selected. A Transponder Code is required when being interrogated by other aircraft that are not of the JF-17 type. Press the Arrow button next to CODE.
95. * Select code for desired mode. We will choose A for Mode 6.
96. * Select IP+ option if desired. It will swap A and B encryption keys interleavely to allow other Mode 6 interrogators with A key to recognize you if you have your B key on.

NOTE:
Steps preceded by * are not mandatory if flying in Single Player or flying against JF-17s with the “Simplified IFF” setting.

Interrogation Code (Who are you?)	Transponder Code (Who am I?)
Mode 6	Mode 6
A	A

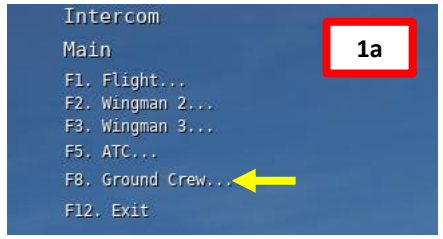
POST-START-UP

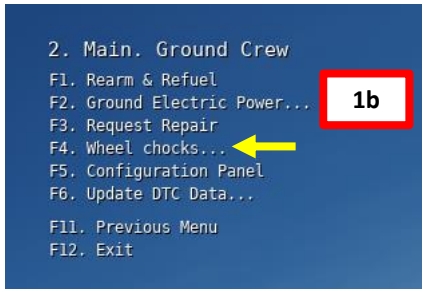
97. Set Air Temperature Control Selector to desired cockpit temperature. 20-25 deg C is a good temperature.
98. If cockpit is fogged, press the Defog button to initiate defogging sequence. Press button a second time when fog has been cleared from the canopy, or wait until the defogging sequence finishes automatically after a few minutes.

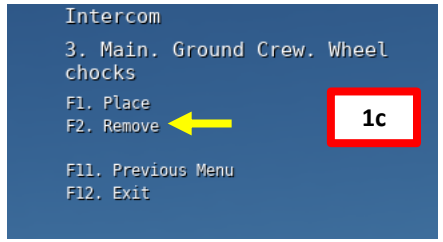


TAXI

1. Remove Wheel Chocks. Contact ground crew by pressing « \ », then pressing F8 (Ground Crew), F4 (Wheel Chocks) and F2 (Remove).

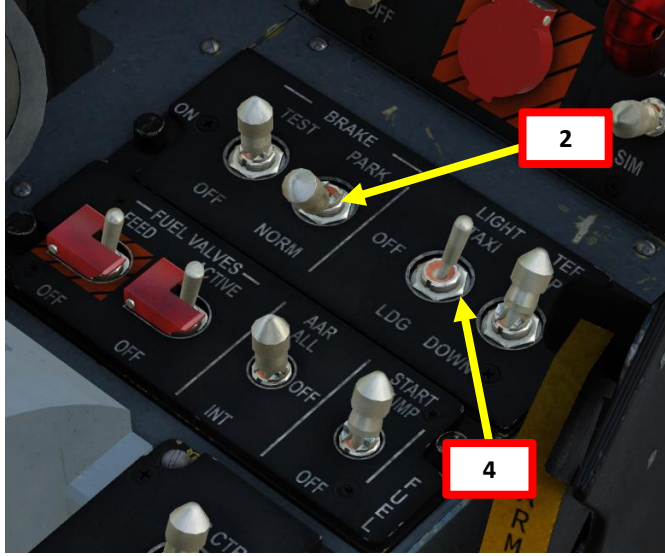


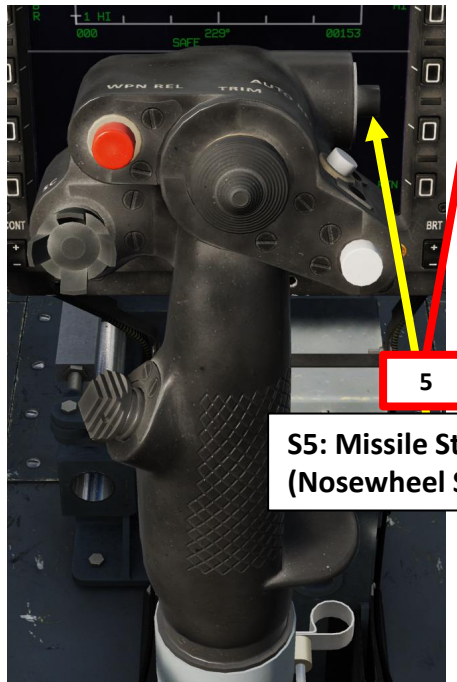




TAXI

2. Parking Brake Switch – DISENGAGED (NORM/AFT)
3. Set Formation, Anti-Collision & Position Lights – As Required. Take note that Position Lights should be set to FLASH when parked or taxiing and STEADY after takeoff.
4. Turn on Taxi Light (switch FWD)
5. Press the S5 (Missile Step Button / Nosewheel Steering) to engage nosewheel steering for taxiing; this will allow you to turn using rudder pedals. The “NWS” Status light indicates nosewheel steering is active. The JF17’s turning radius is 8 meters.



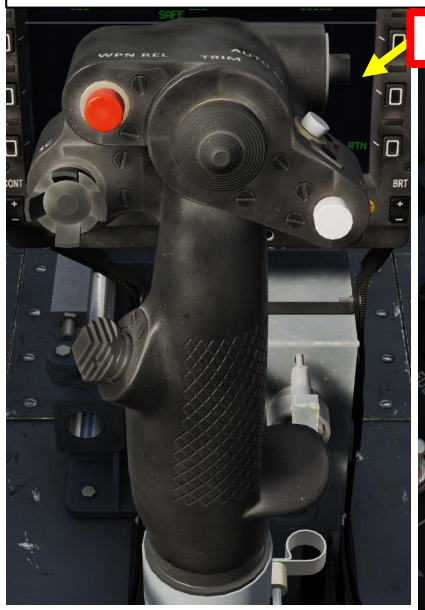


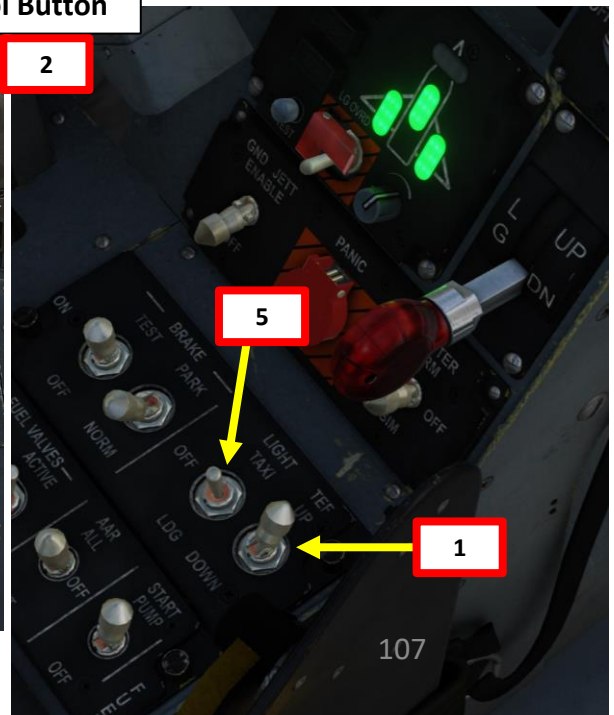
S5: Missile Step Button/NWS (Nosewheel Steering) Control Button

TAKEOFF

1. TEF (Trailing Edge Flaps) are not required for takeoff unless aircraft is in a very heavy configuration.
2. Once lined up with the runway, press the S5 (Missile Step Button / Nosewheel Steering) to disengage nosewheel steering. Confirm that the “NWS” Status light is extinguished.
3. Turn on the A/B (Afterburner) switch (FWD).
4. Check the Status panel and confirm that correct Flight Control System mode is selected.
5. Turn OFF taxi light.

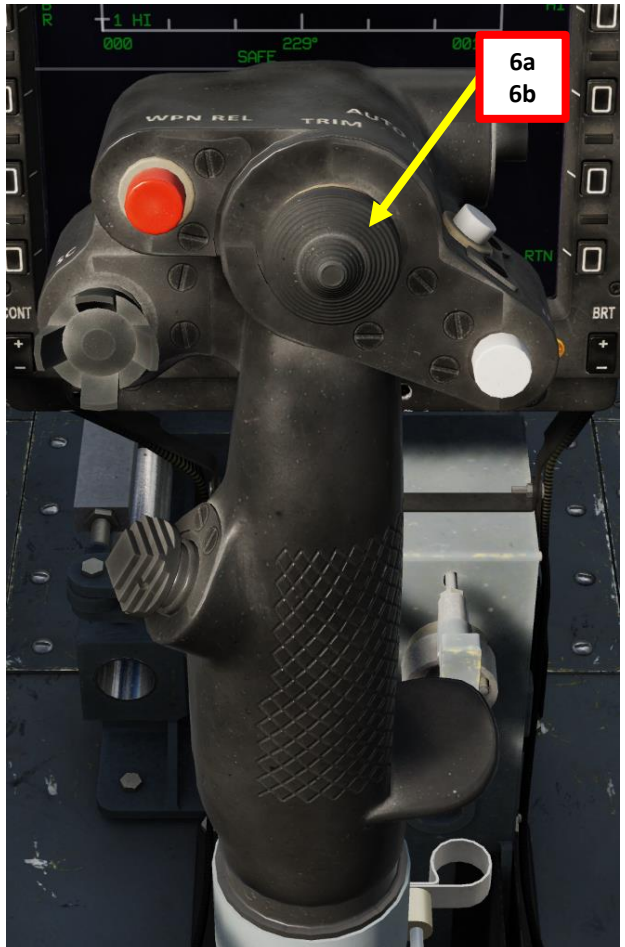
S5: Missile Step Button/NWS (Nosewheel Steering) Control Button

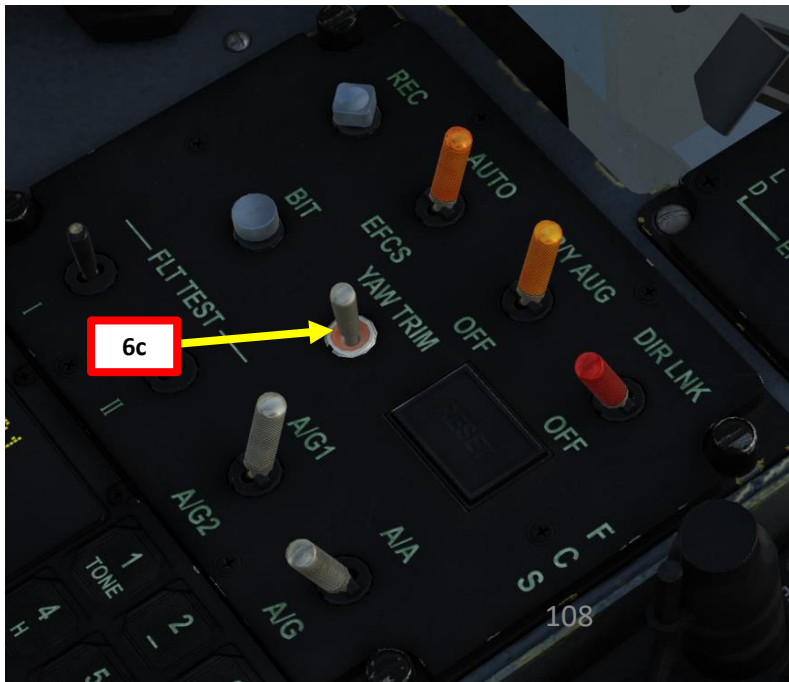




TAKEOFF

6. Set takeoff trim
    a) Use S6 Hat Switch on the stick UP/DOWN to trim the elevator/pitch up or down until the PITCH TRIM status light is visible. This means that the pitch trim is set to Neutral.
    b) Use S6 Hat Switch on the stick LEFT/RIGHT to trim the aileron/roll axis left or right until the ROLL TRIM status light is visible. This means that the roll trim is set to Neutral.
    c) Use Yaw Trim switch LEFT/RIGHT to trim the rudder axis left or right until the YAW TRIM status light is visible. This means that the rudder trim is set to Neutral.



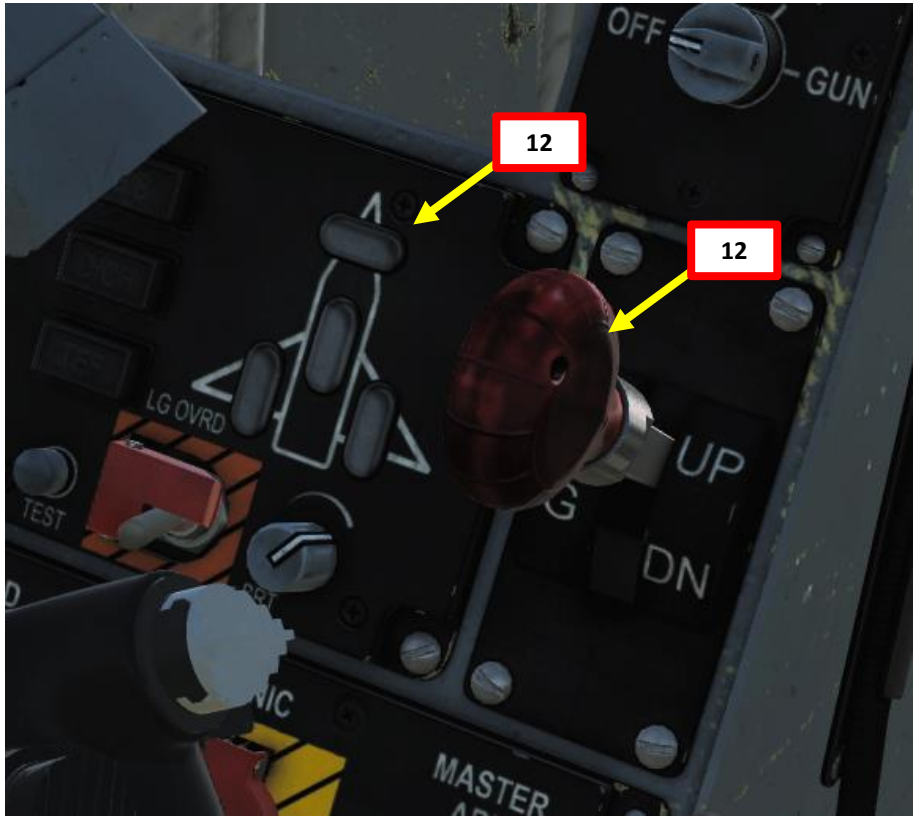


TAKEOFF

7. Hold brakes and throttle up to 80 % RPM. Verify there are no out lights.
8. Release brakes and increase power with the throttle. For light loadouts, set takeoff power to 90 % RPM. For heavy loadouts, set throttle fully forward to engage afterburner.

TAKEOFF

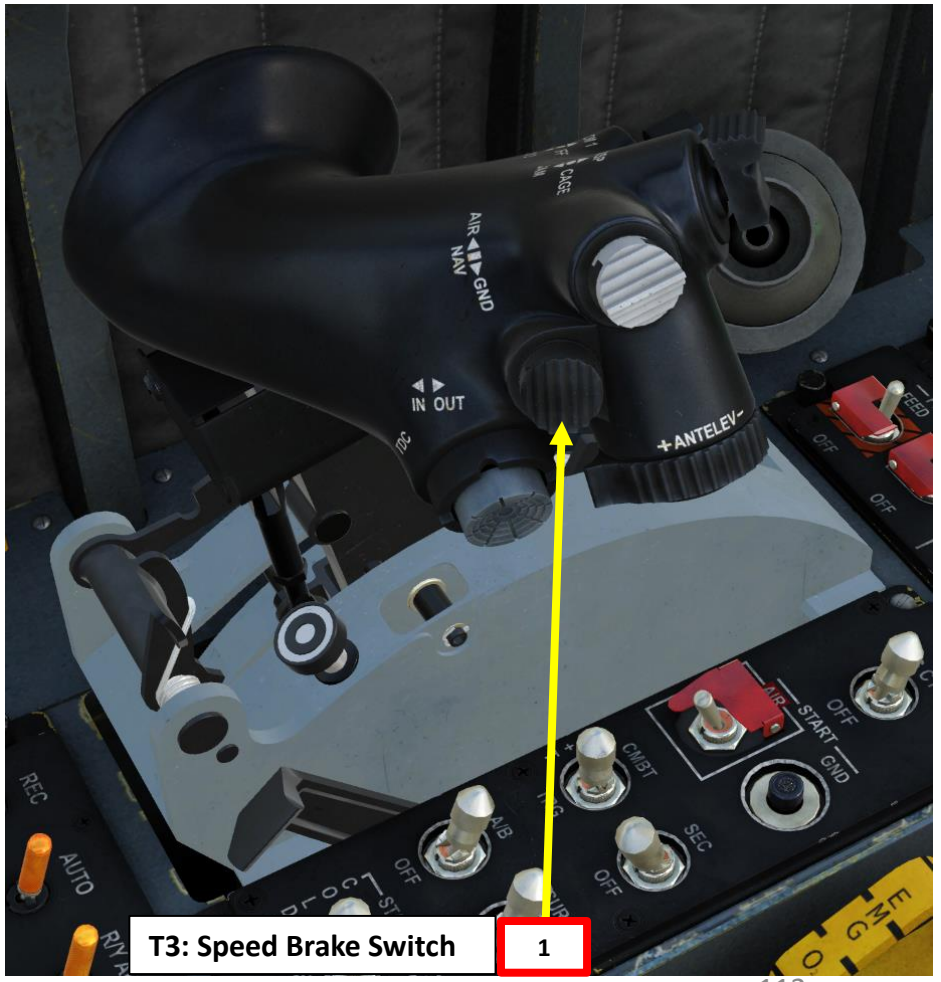
9. An automatic take-off trim function will activate when your wheel speed exceeds 41 kts. The system will start deflecting the horizontal stabilizer 8 degrees when airspeed reaches 108 kts.
10. At 120 kts, gently pull the control stick to establish takeoff attitude (10 deg of pitch angle).
11. Rotate at approx. 140 kts.
12. Raise landing gear when 30 ft above the ground. Make sure the landing gear is retracted below 300 kts or the gear will jam in position.



TAKEOFF

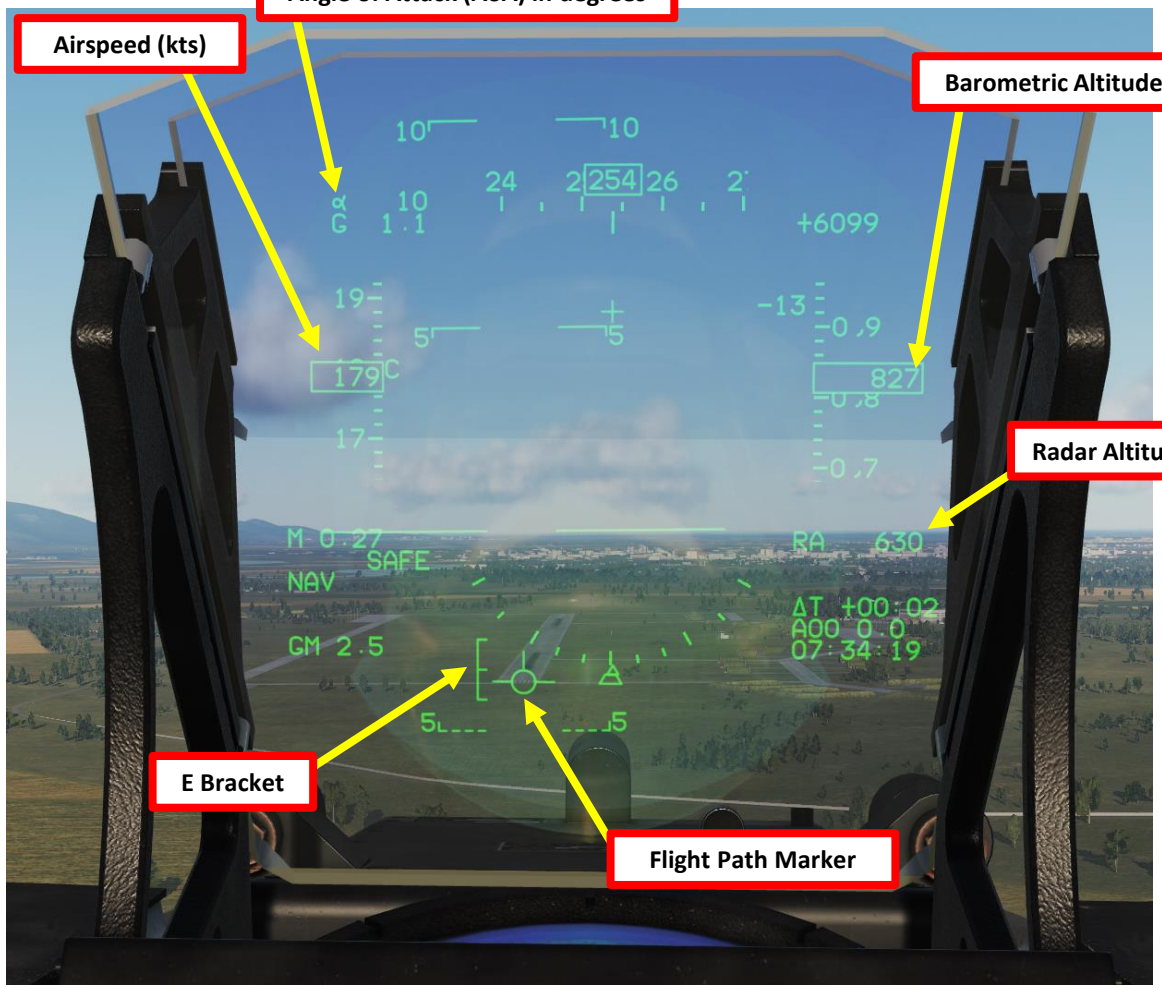
LANDING

1. Slow down using throttle and speed brakes
2. Deploy flaps (TEF, Trailing Edge Flaps) and landing gear when below 300 kts
3. Turn on LANDING Light (AFT)



LANDING

3. Adjust power and trim to maintain an “On Speed” AoA (Angle of Attack) of about 10 degrees. The Flight Path Marker should remain within the “E” bracket on the HUD.
4. Use Radar Altitude as a reference.

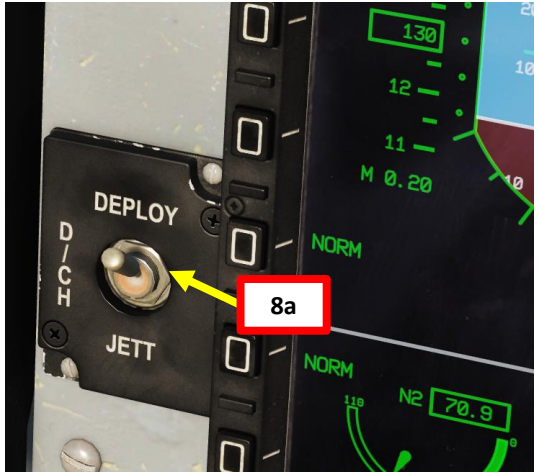


LANDING

5. Flare at 3 ft above ground level. The two main wheels should touch the ground first.
6. During touchdown, maintain your Angle of Attack (10 deg) to perform an aerobraking landing and set throttle to IDLE. This manoeuver will bleed speed in the process (your wings will act as a huge airbrake).

LANDING

7. As the aircraft slows down, the nose gear will touch the ground by itself. Gently apply brakes when aircraft airspeed is below 145 kts.
8. When aircraft slows down to 135 kts, deploy drag chute by setting the D/CH switch to DEPLOY (UP).
9. When airspeed is below 20 kts, jettison drag chute by setting the D/CH switch to JETT (DOWN). For subsequent flights, the drag chute will have to be installed again by the ground crew once re-arming and re-fueling is performed.



LANDING

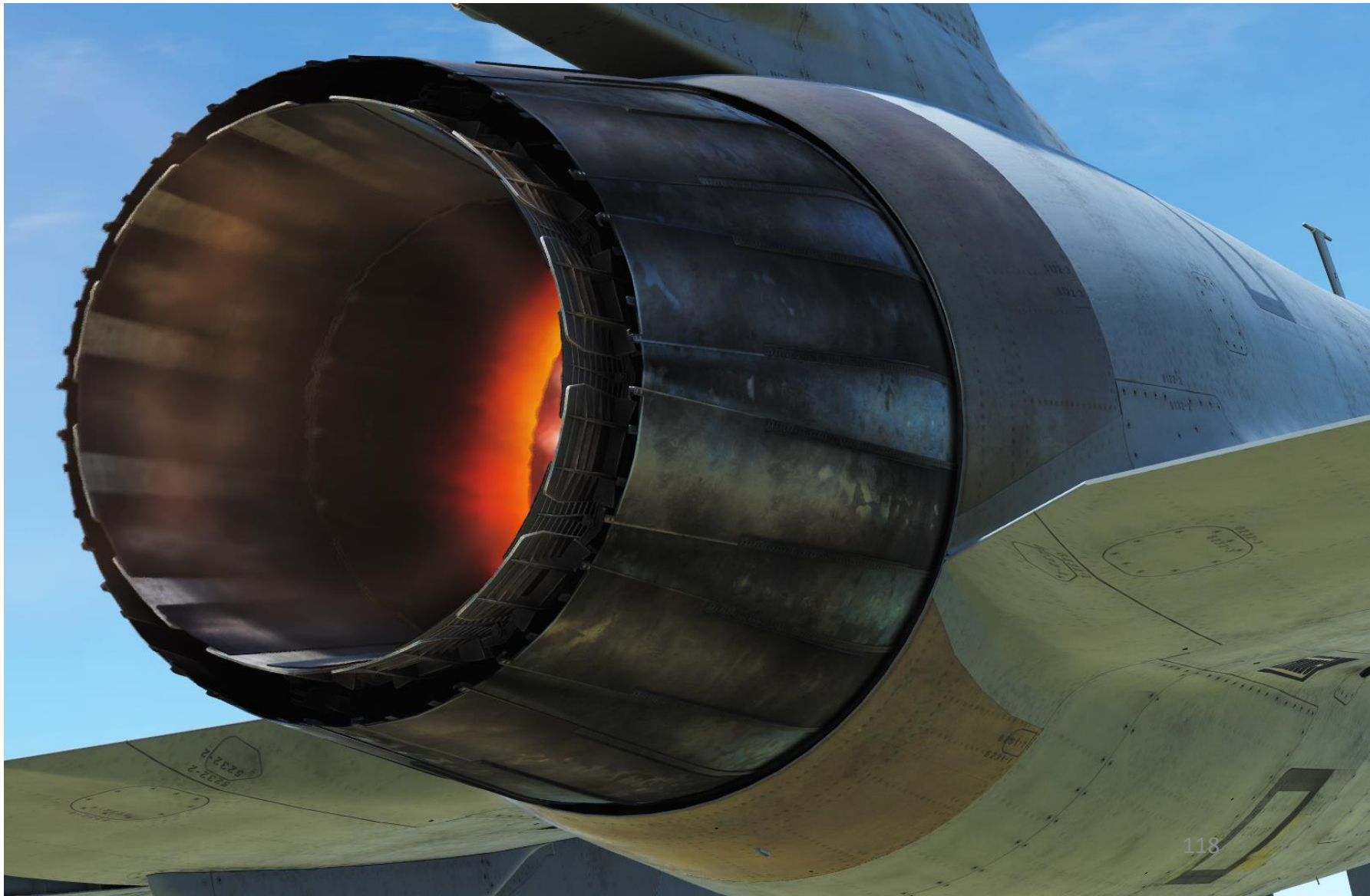
PART 8 – ENGINE & FUEL MANAGEMENT

KLIMOV RD-93 ENGINE

The JF-17 is powered by the Klimov RD-93, which is a variant derived from the RD-33 turbofan engine used for the MiG-29. The main difference between the RD-93 and the RD-33 is that the gearbox was repositioned along the bottom of the engine casing. Klimov advertised the increased thrust of the engine to be 49.4 kN (11105 lbf) for Military Power (Dry Thrust) and 85.3 kN (19180 lbf) with Afterburner (Wet Thrust). This thrust increase comes at the expense of a decrease in service life from 4000 hours on the RD-33 to 2200 hours on the RD-93.

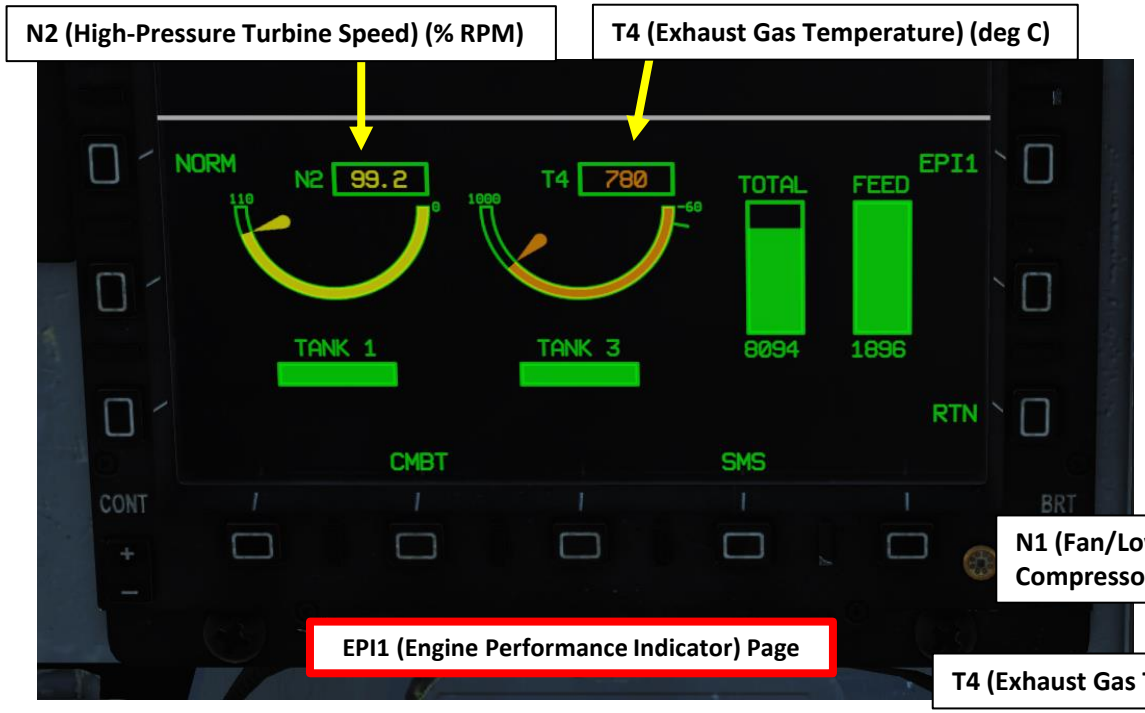
The RD-33 was developed in OKB-117 led by S. P. Izotov (now OAO Klimov) from 1968, with production starting in 1981. Previous generations of Russian supersonic fighters such as the MiG-21 and MiG-27 used turbojets, but western fighters such as the F-111 and F-4K introduced the use of afterburning turbofans in the 1960s which were more efficient. The RD-33 was the first afterburning turbofan engine produced by the Klimov company of Russia in the 8,000 to 9,000 kilograms-force (78,000 to 88,000 N; 18,000 to 20,000 lbf) thrust class. It features a modular twin-shaft design with individual parts that can be replaced separately.

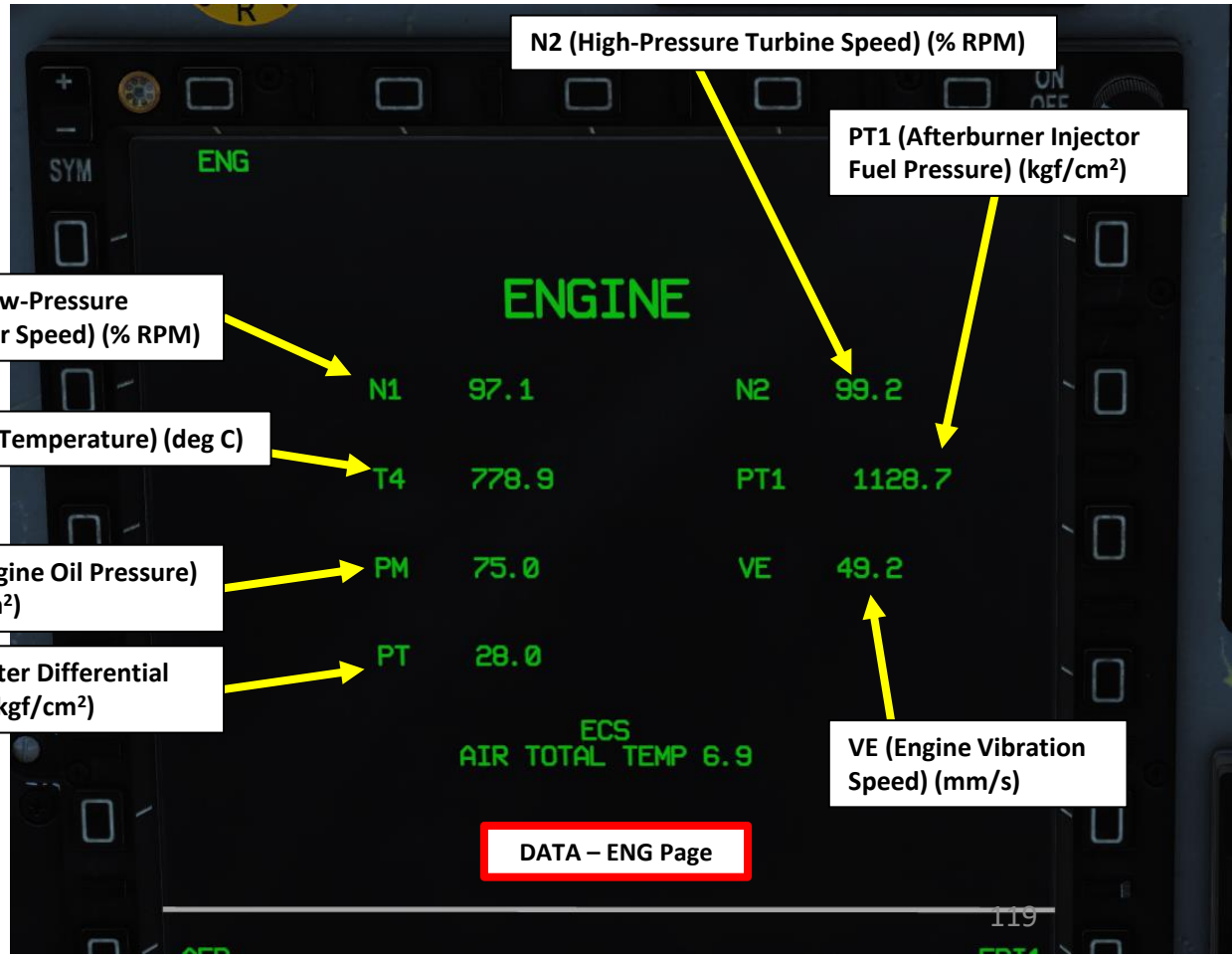
The first few series of the basic RD-33 version had some issue with the oil system, where a leakage caused a series of problems for the test pilots, because the oil leakage generated toxic particles in the air conditioning system. After the production line was going, these kinds of teething problems were solved. The only disadvantage was a low service life, and heavy smoke, which was fixed only in the later models.



ENGINE PARAMETERS

Engine parameters are listed on the EPI1 page (primary parameters) and on the DATA – ENG sub-page (secondary parameters).

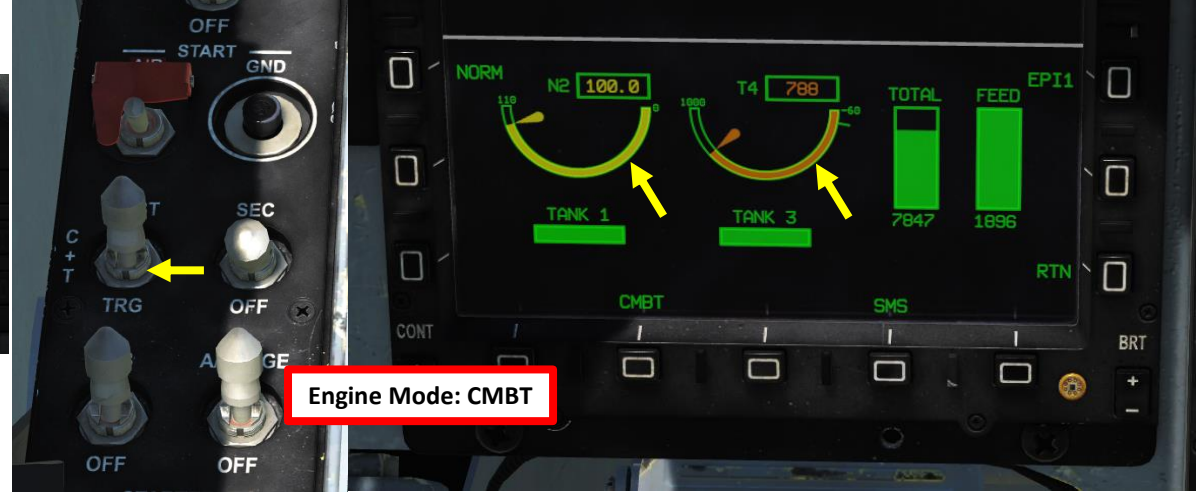




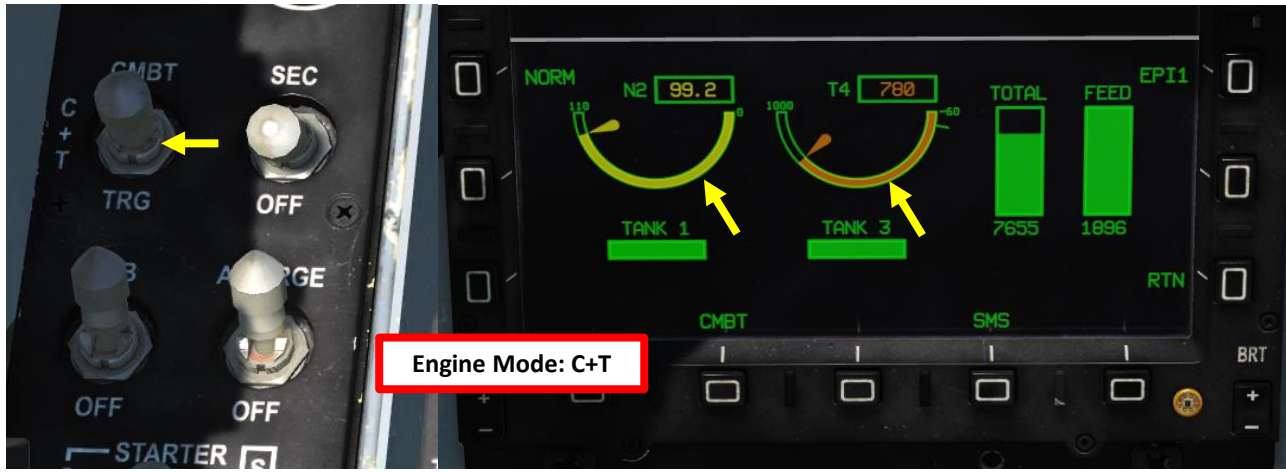
ENGINE CONTROL MODES

There are three main engine modes, which are controlled by the Engine Mode switch:

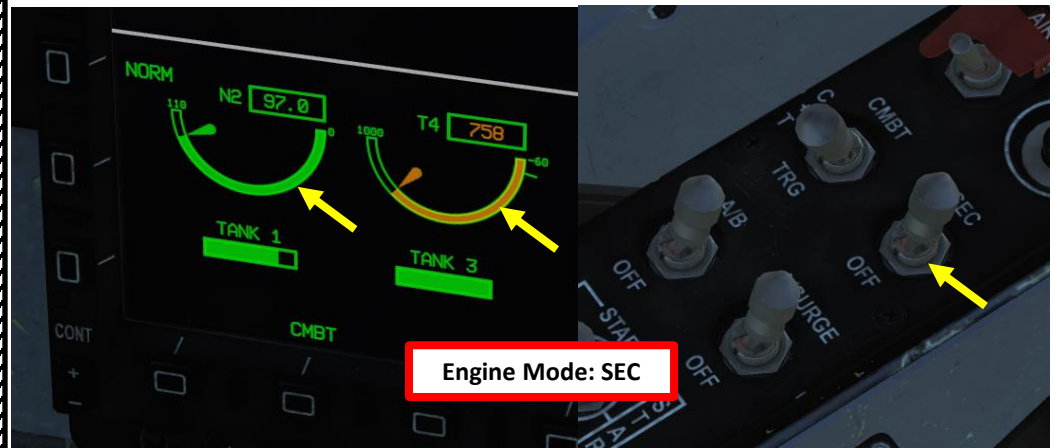
- **CMBT (Combat):** Increases maximum allowable power to 100 % N2 but also increases engine wear.
- **C+T (Normal):** Maximum allowable power is limited to 99.2 % N2, which is a happy medium between CMBT and TRG.
- **TRG (Training):** Reduces maximum allowable power to 98.6 % N2 , which reduces engine wear and help prolong engine life.
- **SEC (Secondary Engine Control):** This hybrid mechanical backup mode is selected in the case of failure of the engine-mounted digital computer that controls scheduling of engine fuel flow. This mode will inhibit every other mode (including afterburner operation) and limit N2 to 97 % RPM.



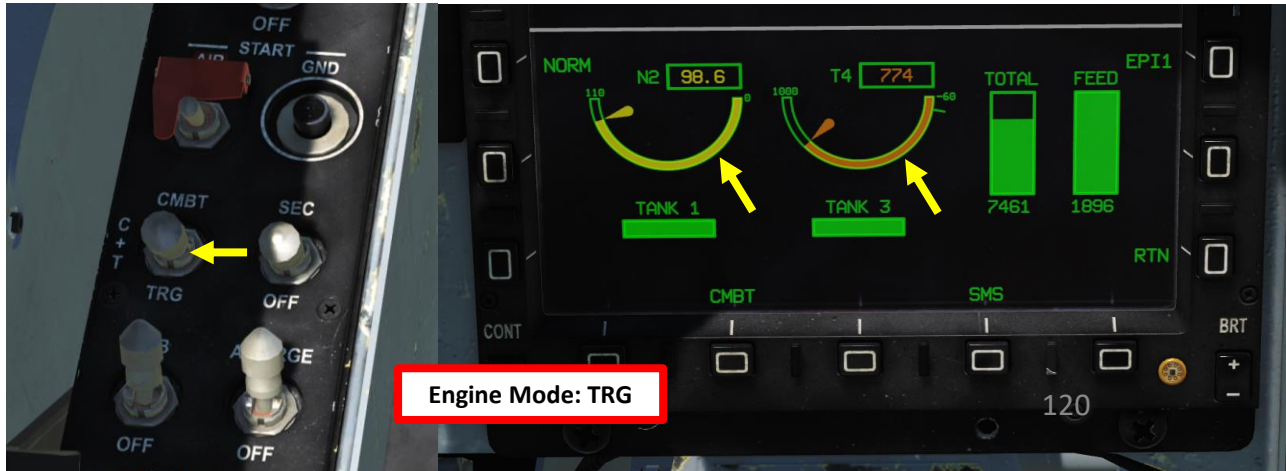
Engine Mode: CMBT



Engine Mode: C+T



Engine Mode: SEC



Engine Mode: TRG

AFTERBURNER & ANTI-SURGE

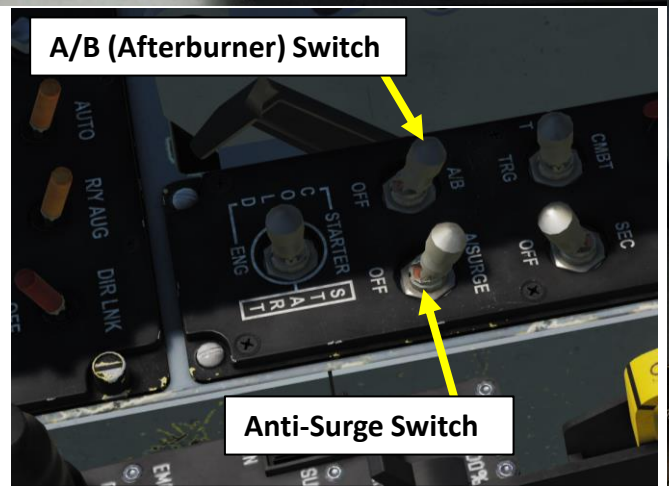
The **afterburner** requires the A/B switch to be ON before throttling past the MIL (Military) Power gate on the throttle quadrant. Once engaged, the AB Status Light illuminates. Do keep in mind that the fuel flow consumption will increase dramatically; keep an eye on those fuel gauges.

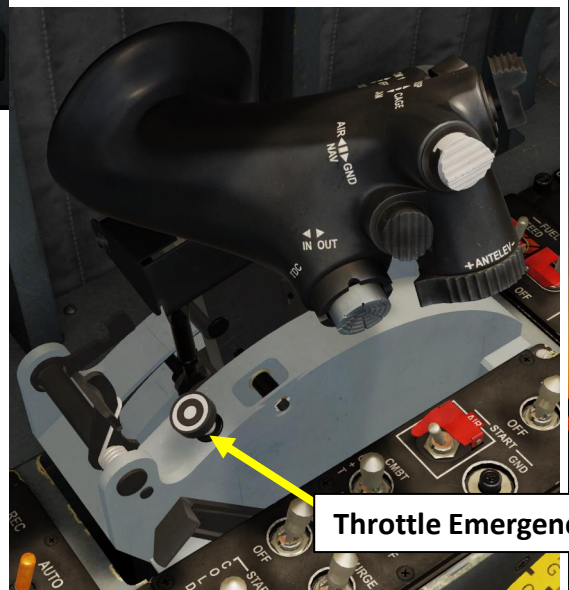
Very important: if airspeed is greater than Mach 1.35 and afterburner is engaged, an interlock will physically block the throttle from going from the afterburner zone to the IDLE-MIL zone. In this situation, you can bypass the interlock by pushing down the **Throttle Emergency Button** and throttling down. Throttling below AB at fast speeds may cause an engine surge or an engine flameout.

The **Anti-Surge** switch should be ON at all times. Engine surge is the increase in RPM of a stalled compressor, which results in the complete disruption of the airflow through the compressor.

The severity of the phenomenon ranges from a momentary power drop barely registered by the engine instruments to a complete loss of compression in case of a surge, requiring adjustments in the fuel flow to recover normal operation. Interruption of airflow in jets can be caused by abrupt maneuvering, ingestion of foreign matter, or excessive application of throttle. Much has been done to eliminate this issue in modern jets, but the nature of the design still makes it possible. If air flow is interrupted to the compressor, the jet can literally backfire, creating a loud "bang". A large yellow flame may also be seen coming from the back of the jet as the fuel/air mixture is now excessively rich due to insufficient air. If the engine is not damaged, it can be re-started the same way we unstall a wing, by re-establishing proper airflow angle of attack. This is done by lowering pressure BEHIND the compressor by reducing the throttle setting. Provided the engine is not damaged, throttle can be carefully restored.

In the same manner, the Anti-Surge system will automatically reduce engine power if a compressor stall is detected.

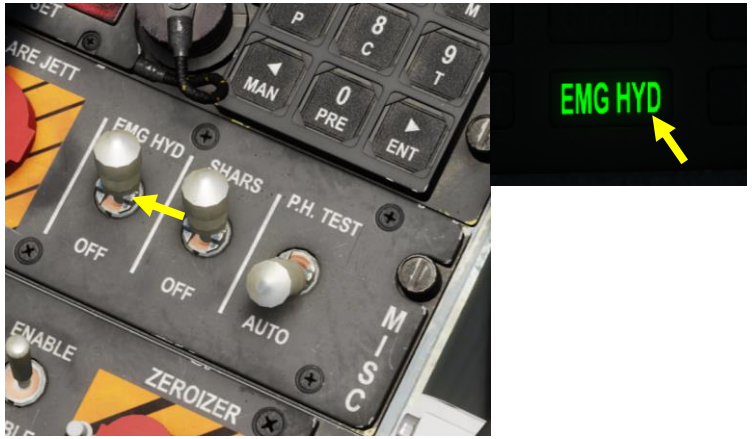




ENGINE FLAMEOUT CONSIDERATIONS

If for some reason the engine flames out, you need to take into consideration the following things:

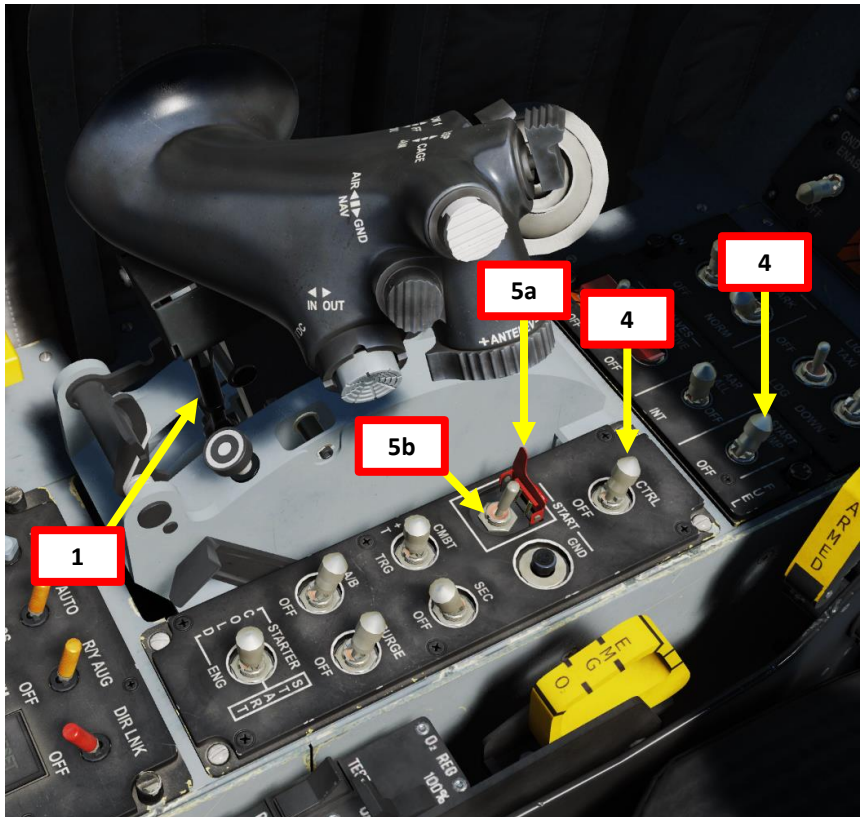
- The JF-17 does not have an APU (Auxiliary Power Unit) or EPU (Emergency Power Unit) to provide power; most of your avionics and navigation systems will run on the battery alone. You will have roughly 10 minutes of battery power available before the battery is completely drained.
- Once a loss of RPM is detected, the emergency hydraulic pump will kick in (provided it is armed with the EMG HYD switch) and provide you enough hydraulic pressure from an accumulator for the flight control surfaces to be usable.
- The ECS (Environment Control System) in NORM mode runs on engine bleed air. In case of an engine flameout, this bleed air pressure will decrease to a point where it is not sufficient to supply your air systems like air conditioning (which is a necessity when the outside air temperature is -50 deg C). You will need to use ram air instead by setting the ECS switch to RAM.
- In this particular case, failing to use ram air at high altitudes may cause your pilot to suffer from hypothermia or suffocation. Your first action during an engine flameout at high altitude should be to descend as soon as possible.



ENGINE RELIGHT PROCEDURE

To perform an engine relight while in flight:

1. Throttle back to IDLE
2. Immediately nose down to gain enough airspeed for the engine's compressor blades to generate enough RPM due to windmilling (air flow drives compressor blades). If the engine has flameout has occurred, the emergency hydraulic pump will kick in and provide you enough hydraulic pressure for the flight control surfaces to be usable.
3. Set aircraft flight parameters within engine relight envelope:
    - If altitude is below 26200 ft, maintain an airspeed greater than 215 kts.
    - If altitude is between 26200 ft and 39370 ft (max altitude for relight), maintain an airspeed greater than 240 kts
4. When engine N2 RPM is windmilling at more than 12 %, verify that Fuel Pump Switch is set to START PUMP (FWD) and ENG CTRL (Engine Control) Switch is set to ON (FWD).
5. Set Engine Air Start cover guard UP, then set Engine Air Start switch ON (FWD). START status light indicates engine start is in progress.
6. Confirm N2 increase (confirms engine starter is active) and wait for T4 to increase (engine lightoff).
7. Once engine start is successful and engine has resumed normal operation, set Engine Air Start switch OFF (AFT)

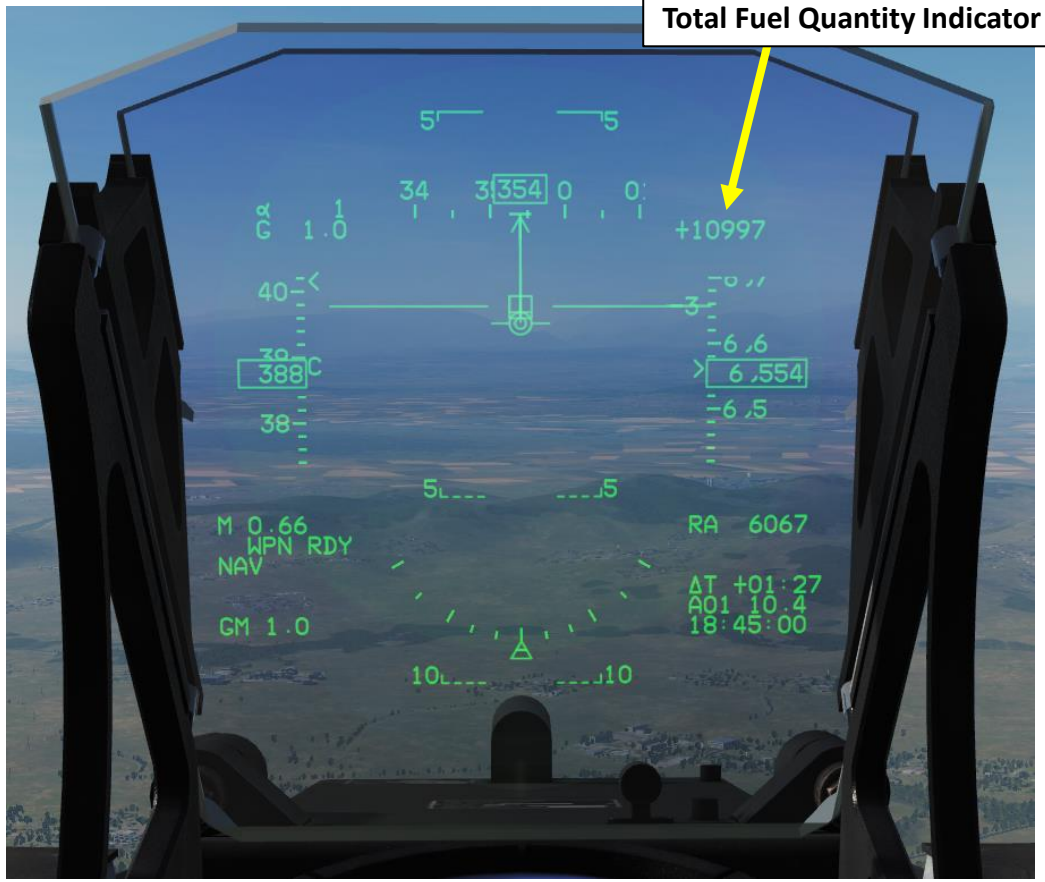


FUEL SYSTEM

The JF-17 is equipped with 3 internal fuselage tanks, 2 internal wing tanks. External fuel tanks can be equipped under the fuselage (800 L) and under the wings (800 L or 1100 L). Total fuel quantity is displayed on the Heads-Up Display, while the Total Quantity and T2 Fuselage Feed Tank Quantities are indicated on the EPI1 page.

To have a more thorough breakdown of fuel quantities for individual tanks, you can consult the DATA – FUEL sub-page.

Note: Keep in mind that there can be an engine flameout if the afterburner is engaged for over 5 seconds during a negative G condition (or for over 12 seconds in zero G condition).



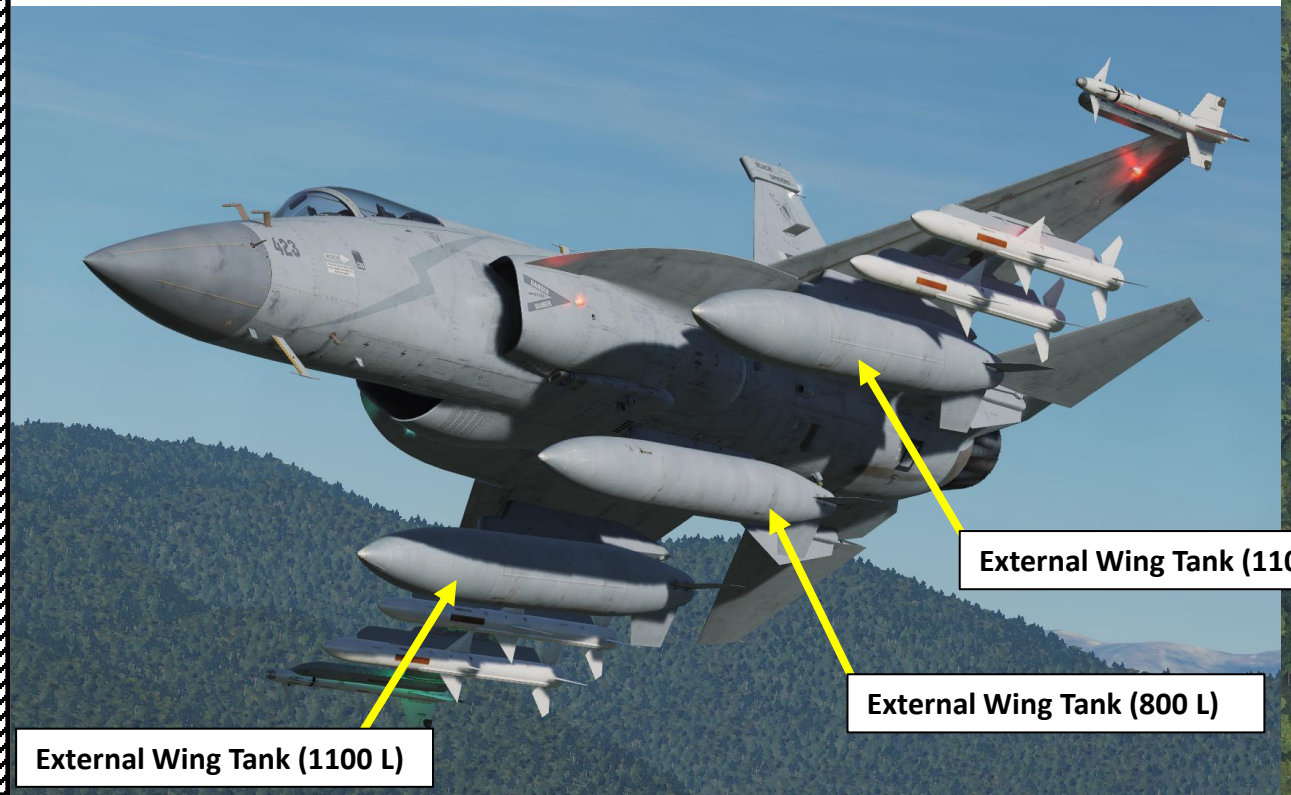
FUEL SYSTEM

FUEL TANK OVERVIEW

- TOTAL (includes external tanks): 10997 lbs

- LEFT WING TANK: 535 lbs
- RIGHT WING TANK: 535 lbs
- T1 FRONT FUSELAGE TANK:1091 lbs
- T2/FEED CENTER FUSELAGE TANK: 1896 lbs
- T3 AFT FUSELAGE TANK: 1069 lbs

- EXTERNAL WING LEFT TANK (1100 L): 2180 lbs
- EXTERNAL FUSELAGE CENTER TANK (800 L): 1510 lbs
- EXTERNAL WING RIGHT TANK (1100 L): 2180 lbs



FUEL SYSTEM

External tanks are automatically consumed first. To jettison these tanks, go in the SMS page, select JET (Jettison) sub-menu on the lower section of the MFCD, select the external tanks with their respective OSBs, set Master Arm ON and press the Weapon Release button to jettison the tanks.

See the Weapons & Armament section for more details.

FUEL SYSTEM

Your “BINGO FUEL” can be set by pressing “FUL” on the UFCP. Bingo fuel is the fuel quantity required to make it back to base.

When fuel state falls below BINGO fuel limit, a FUEL caution will appear in the HUD and the UFCP FUL menu will automatically appear.

AERODYNAMICS & AIRCRAFT LIMITS

AIRSPEED LIMITS

Maximum indicated airspeed at low altitude is 702 kts or Mach 1.6 at high altitude. This speed may be exceeded, but the aircraft will likely suffer from severe aeroelastic problems (i.e. flutter, which is a dynamic instability of an elastic structure in a fluid flow) and aerodynamic overheating.

AOA (ANGLE OF ATTACK) LIMITS

During takeoff and landing, the angle of attack must not exceed 12 deg. If the aircraft carries a heavy payload (i.e. a GBU-12 or 800 L fuel tank on the center pylon), it is recommended to keep the AoA at 10 deg or below. When in AA (Air-to-Air) FCS configuration, the maximum allowable angle of attack is 27 deg.

G LIMITS

- Structural Limits for the aircraft are +8 G / - 3 G.
- When in AA (Air-to-Air) FCS configuration, maximum G loading is 8 G. When over Mach 0.85 (transonic speeds), maximum allowable G loading is 6.5 G.
- When in AG (Air-to-Ground) FCS configuration, maximum G loading is 6 G, but this limit only protects your aircraft. Your payloads may be damaged at lower Gs (e.g. 5.5 G for C-701 TV missiles).
- There can be an engine flameout if the afterburner is engaged for over 5 seconds during a negative G condition (or for over 12 seconds in zero G condition).

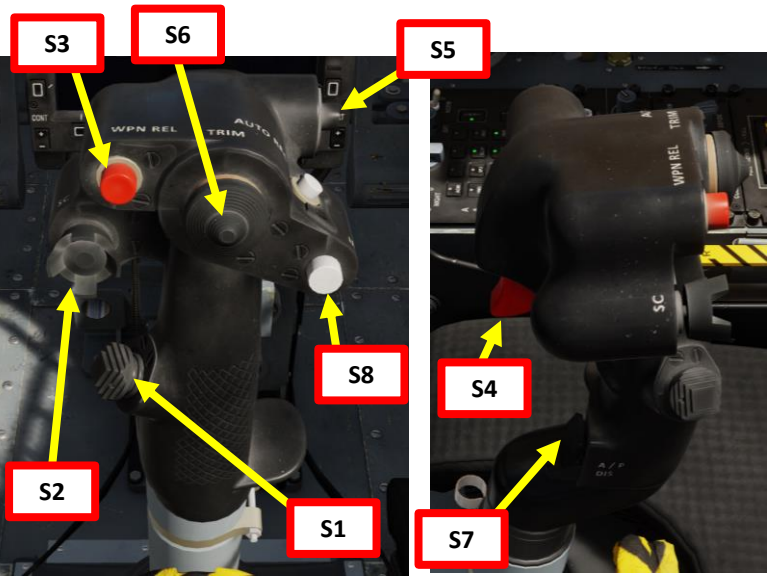
WEIGHT LIMITS

Maximum Takeoff Weight: 29750 lbs (12383 kg)

FLIGHT ENVELOPE

Service Ceiling: 55500 ft

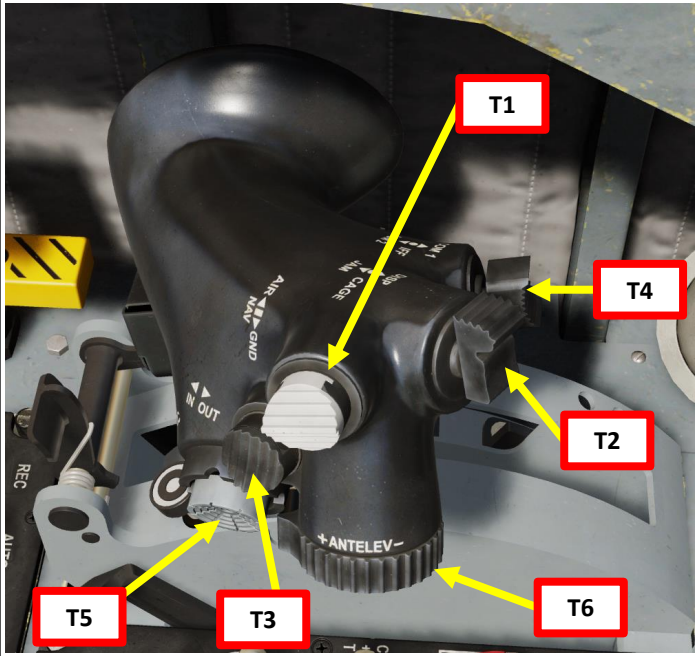
HOTAS STICK CONTROLS



- **S1**: Sensor Selection (SS) Switch
- **S2**: Sensor Control (SC) Switch
- **S3**: Weapon Launch/Release Button
- **S4**: Gun Trigger
- **S5**: Missile Step Button / Nosewheel Steering Control Button
- **S6**: Trim Hat Switch
- **S7**: Autopilot Disengage Button
- **S8**: Missile Type Selection Button

Button/Switch	Function	Operation	Master Mode (NAV)	Master Mode (AG)	Master Mode（AA）						
					Intercept Mode (INTC)					ACM Mode (DGFT)	
					w/o Locked Target	w/ Locked Target					
					RWS/TWS/VS	HPT	SAM	DTT	STT	w/o Locked Target	w/ Locked Target
S1	Sensor Selection (SS)	Forward	Select ACM Mode, then Cycle Gun Reticles							-	
		Backward	Cycle HUD/Center MFD		Select Center MFD				-	-	
		Right	Select Right MFD						-	-	
		Left	Select Left MFD						-	-	
		Push	-	-	-	Allow Enter DTT	Allow Enter DTT	-	-	Return to Previous Master Mode	
S2	Sensor Control (SC)	Forward	Increase Display Distance	Increase Display Distance (Except AGR Mode)	Increase Display Distance		-	-	-	BS	BS
		Backward	Decrease Display Distance	Decrease Display Distance (Except AGR Mode)	Decrease Display Distance		-	-	-	VERT	VERT
		Right	Change Azimuth Scan Range (Except TWS Mode)	Change Azimuth Scan Range or Cancel DBS/EXP	Change Azimuth Scan Range (Except TWS Mode)			-	-	HA	HA
		Left	Depends on Radar Mode	In MAP Mode, Cycle EXP/DBS; In GMTI, SEA and TCN Mode, Select EXP	Cycle RWS/TWS/VS	Select RWS	Cycle SAM/NAM Sub-mode	Switch HPT/SPT	-	-	-
		Push		Unlock Target	MFD Refresh	Unlock HPT	Unlock HPT, Enter RWS	Unlock SPT, Enter SAM	Return to RWS/TWS/VS	Enter WIDE/NAR Mode	Unlock Target
S3	Weapon Launch/Release	Press	-	Weapon Release	Launch PL5E/SD10						
S4	Gun Trigger	Press	-	Gun Fire	-					Gun Fire	
S5	Missile Step / NWS	Press	-	-	Unselect Current Missile and Auto-select Next Missile in Same Type						
S6	Trim	4-Direction	Pitch/Roll Trim								
S7	Auto-pilot Disengage	Press	Manual Disengage Auto-pilot	-							
S8	Missile Type Selection	Press	-	-	Cycle PL5E/SD10						

HOTAS THROTTLE CONTROLS



- **T1**: Master Mode Switch
- **T2**: Countermeasure Switch: Chaff Flare Dispense/Cage-Uncage Switch
- **T3**: Speed Brake Switch
- **T4**: Radio PTT/IFF (Push-to-Talk/Identify-Friend-or-Foe) Interrogation Button
- **T5**: TDC (Target Designator Controller) Switch
- **T6**: Antenna Elevation Switch

Button/Switch	Function	Operation	Master Mode (NAV)	Master Mode (AG)	Master Mode（AA）						
					Intercept Mode (INTC)					Intercept Mode (INTC)	
					w/o Locked Target	w/ Locked Target				w/o Locked Target	w/ Locked Target
					RWS/TWS/VS	RWS/TWS/VS	RWS/TWS/VS	RWS/TWS/VS	RWS/TWS/VS		
T1	Master Mode Switch (MMS)	Up	AA Master Mode (INTC)							-	
		Middle	Nav Master Mode (NAV)							-	
		Down	AG Master Mode (AG)							-	
T2	Countermeasure Switch/Chaff-Flare Dispense	Forward	SPJ Pod Emission Switch								
		Backward	Flare/Chaff Dispense								
	Cage	Push	-	Select Manual Sub-mode	Missile Seeker Cage						
T3	Speed Brake	Up	Speed Brake On								
		Press	Speed Brake On/Off Switch								
		Down	Speed Brake Off								
T4	Radio PTT/IFF Interrogation	Forward	Comm 1 PTT								
		Push	IFF Interrogation Start/Stop								
		Backward	Comm 2 PTT								
T5	TDC	4-Direction	-	Move TDC/Cursor	Move TDC				-	-	-
		Press		Ranging Sensor Slave to Selected Sensor or LOS of Target	Enter SPOT from RWS/VS Mode	-	Enter SPOT Mode	-	-	-	-
		Release		Target Mark/Sensor Lock	Enter SAM Mode from RWS; Enter STT from VS; Return to Previous Mode; Mark Target in TWS Mode	TDC Hovers On HPT: Enter STT; Otherwise: Switch HPT	TDC Hovers On HPT: Enter STT; Otherwise: Enter DTT	TDC Hovers On HPT/SPT: Enter STT; Otherwise: N/A	Entered STT from RWS: Enter SAM Mode; Entered STT from VS: Enter VS Mode.	-	Unlock Target
T6	Antenna elevation	Up		Scan Elevation Up (Except AGR mode)	Scan Elevation Up	-					
		Down		Scan Elevation Down (Except AGR mode)	Scan Elevation Down	-					

SECTION STRUCTURE

1.1 – INTRODUCTION TO SENSORS

The JF-17 is by definition one of the most versatile aircraft when it comes to armament and sensors. Here is an overview of how the Thunder can "see" the outside world.

- **KJL-7 Radar**: pulse-Doppler, look-down/shoot-down radar with both BVR (Beyond Visual Range) and close in ACM (Air Combat Maneuvering) modes of operation for air-to-air combat. Air-to-Ground and Air-to-Sea modes are also implemented, which makes it a very powerful tool at your disposal.
    - Air-to-Air Modes currently implemented are RWS (Range While Search), TWS (Track While Scan), VS (Velocity Search), SAM (Situational Awareness Mode), STT (Single Target Track), DTT (Dual Target Track) and ACM (Air Combat Maneuvering).
    - Air-to-Ground Modes include MAP (Ground Mapping) and GMTI (Ground Moving Target Indicator).
    - Air-to-Sea Modes include SEA1 (searches both moving and non-moving targets) and SEA2 (searches moving targets only).

- **WMD-7 Targeting Pod**: Targeting system developed to provide precision strike capability. Target designation is achieved by using a laser designator/range finder. It is also capable of displaying a FLIR (Forward-Looking Infrared) thermal imagery.

- **CM-802AKG & C-701 TV-Guided Missile** Seeker Head feed: These air-to-ground missiles have seeker heads that have video capability and that can be used as supplemental sensors.

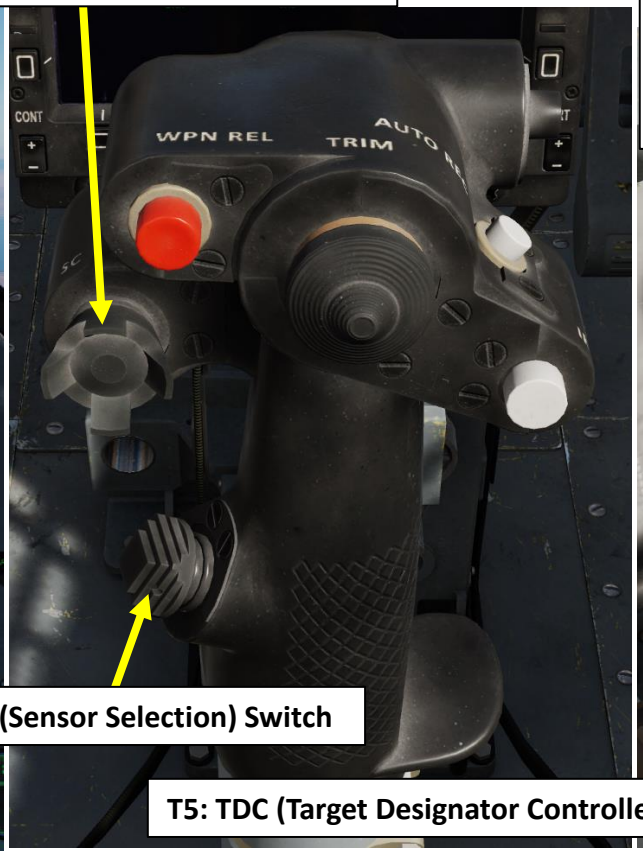
- **Datalink Pod**: This pod is used to allow TV-Guided missiles like the CM-802AKG to be controlled remotely (Man-In-The-Loop).

1.1 – INTRODUCTION TO SENSORS

This section will introduce you to various sensors. You will get the « what », but the « how » will be demonstrated later in the Weapons section since the use and application of sensors will make more sense to you once you start using them for a specific purpose. Just keep in mind that your sensors can be monitored from the HUD (Heads-Up Display) and various displays, while they can be operated from the HOTAS stick and throttle.

AAP (Avionics Activation Panel)

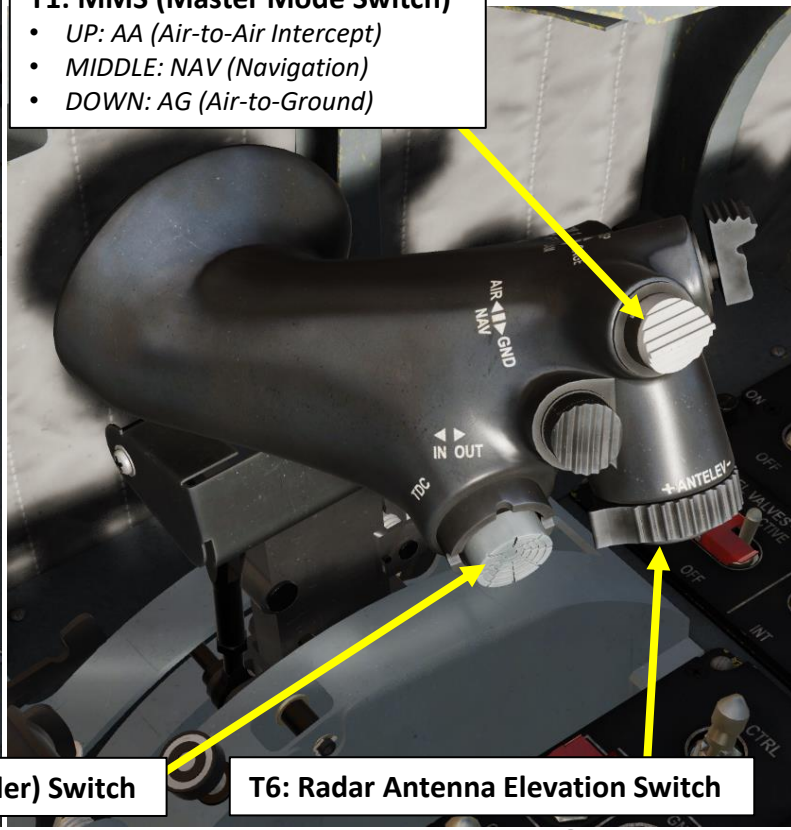
S2: SC (Sensor Control) Switch



S1: SS (Sensor Selection) Switch

T1: MMS (Master Mode Switch)

- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



T5: TDC (Target Designator Controller) Switch

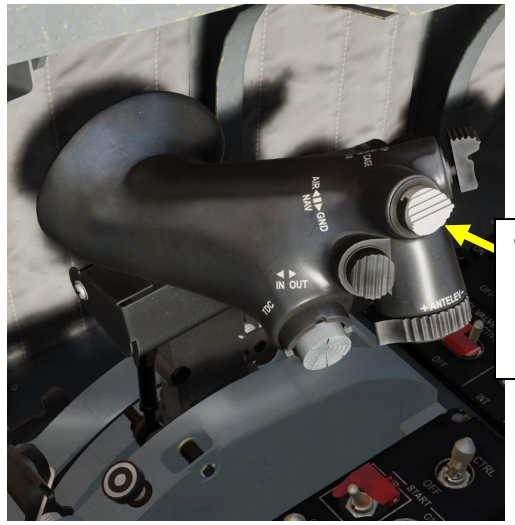
T6: Radar Antenna Elevation Switch

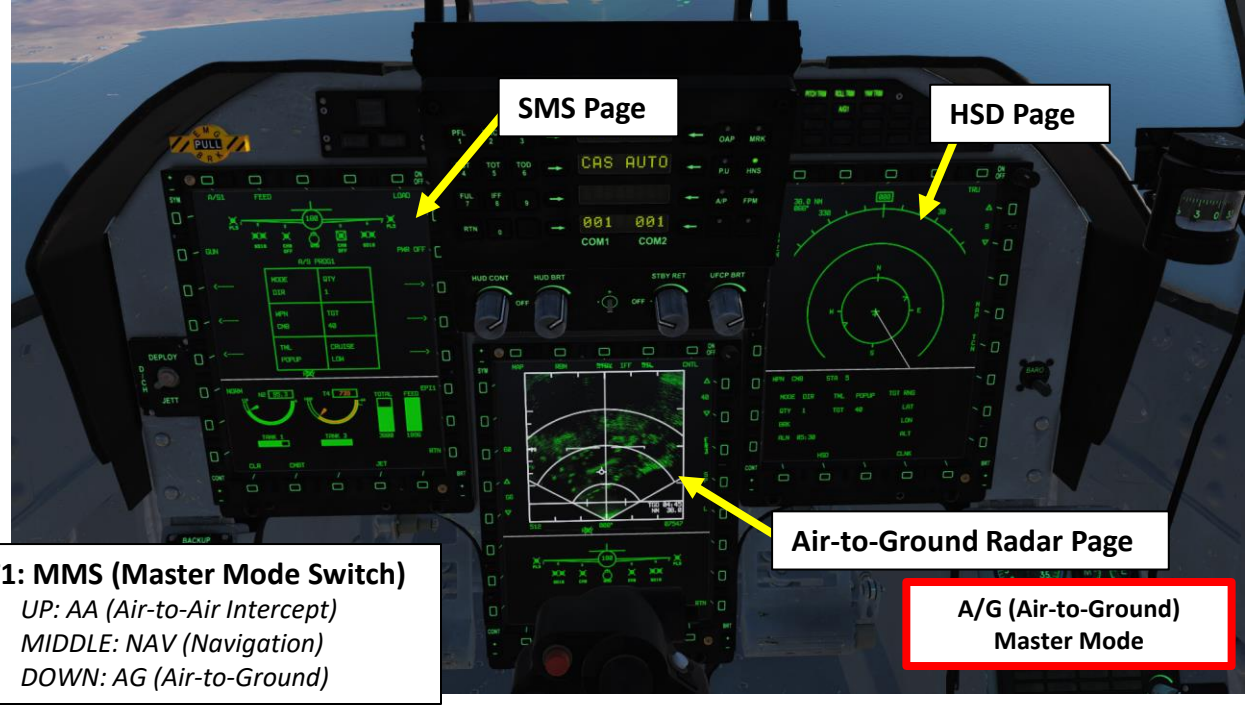
1.1 – INTRODUCTION TO SENSORS

1.2 – SENSORS DISPLAY SELECTION

The MMS (Master Mode Switch) is used to set up the MFCDs in preset configurations.

- In **A/G (Air-to-Ground)** mode the switch sets your Air-to-Ground Radar, SMS (Stores Management System) and HSD (Horizontal Situation Display) pages.
- In **INTC (Air-to-Air Intercept)** Mode, the Air-to-Air Radar, SMS and HSD pages are selected.
- In **NAV (Navigation) Mode**, the Air-to-Air Radar, EFIS and HSD pages are selected.



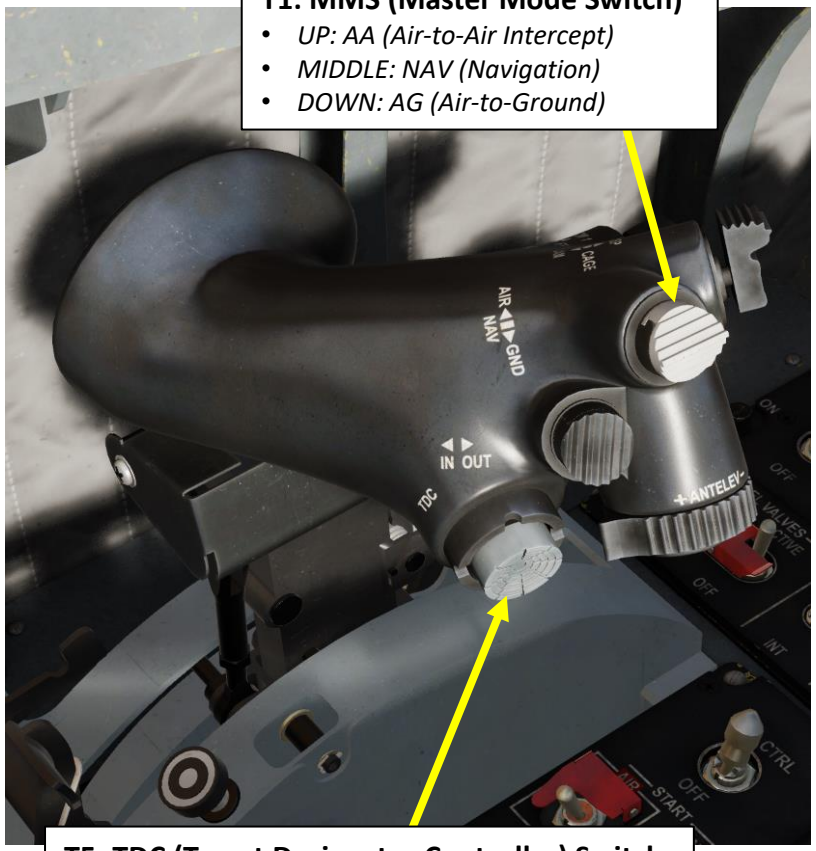


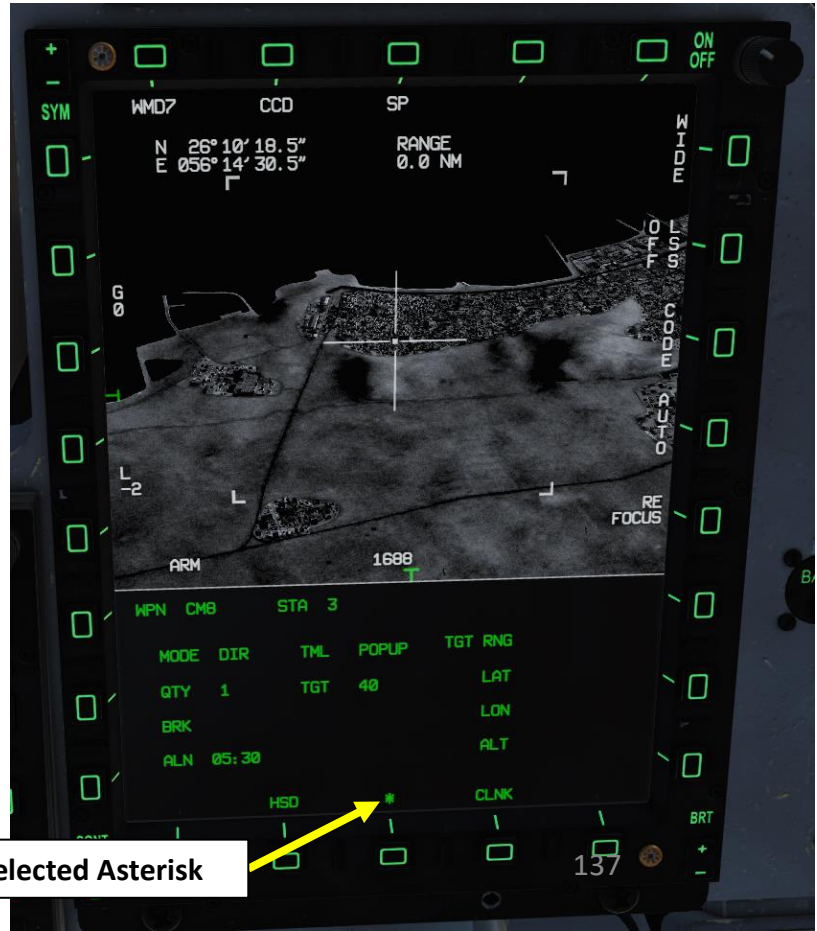
1.2 – SENSORS DISPLAY SELECTION

For those familiar with the A-10C, F/A-18, and F-16, the S1 Sensor Selection Switch is similar to setting a SOI (Sensor of Interest).

- **S1 (Sensor Selection) Switch** functions:
  - **UP/FWD** selects air-to-air radar ACM (Air Combat Manoeuvering) modes, then cycles gun reticles.
  - **DOWN/AFT** cycles SS (Sensor Selection) Asterisk between HUD and Center MFCD in NAV and AG Master Modes. It selects Center MFCD when in INTC Master Mode.
  - **RIGHT/LEFT** selects either the right or left MFCD.
- Selecting a particular display allows you to us the TDC cursor. You will know what sensor is selected with a Sensor Selection Diamond on either the selected MFCD or the HUD.

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*





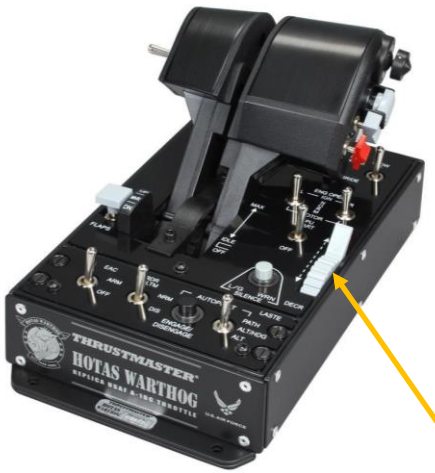
1.3 – MY SENSORS CONTROL SETUP

- ↑ S2 (Sensor Control) UP
- → S2 (Sensor Control) RIGHT
- ↓ S2 (Sensor Control) DOWN
- ← S2 (Sensor Control) LEFT

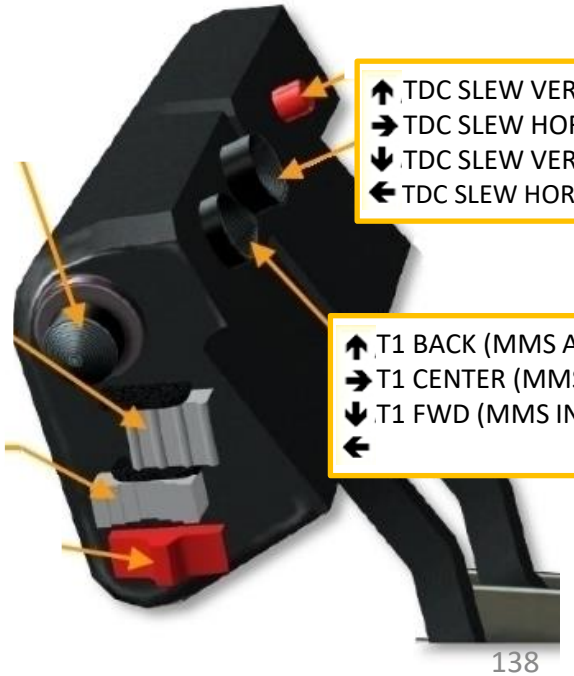
- ↑
- → T5 (TDC) Press (ENTER)
- ↓
- ← S2 (Sensor Control) PRESS

- ↑ S1 (Sensor Selection) Sw. FWD
- → S1 (Sensor Selection) Sw. RIGHT
- ↓ S1 (Sensor Selection) Sw. AFT
- ← S1 (Sensor Selection) Sw. LEFT

P



T6 Axis: Antenna Elevation



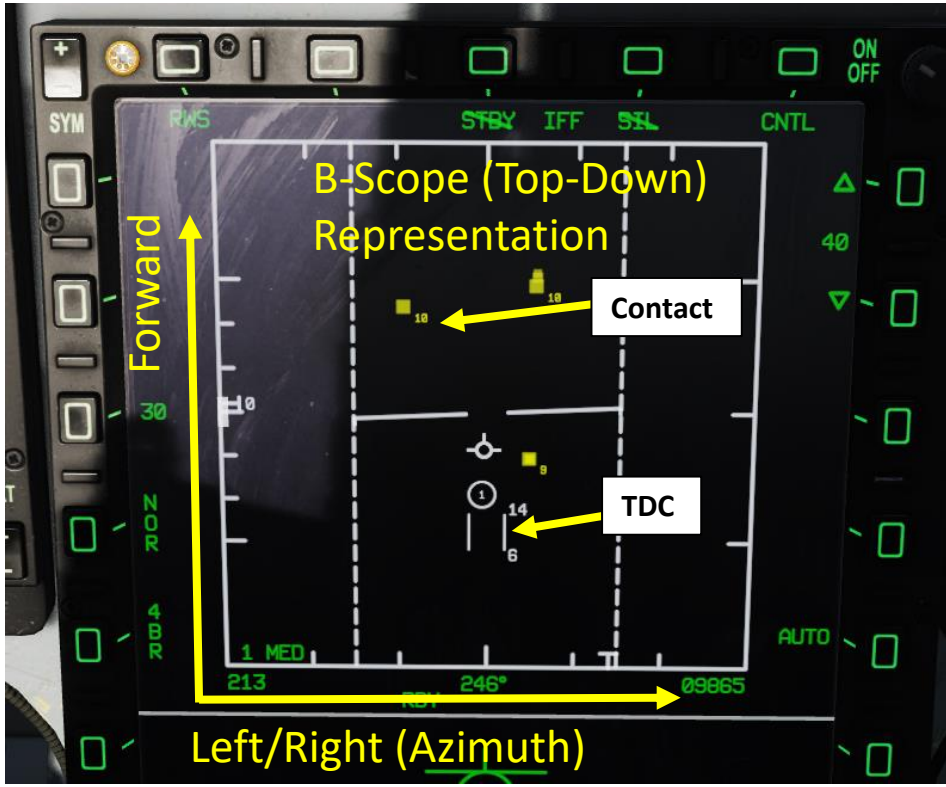
- ↑ TDC SLEW VERTICAL
- → TDC SLEW HORIZONTAL
- ↓ TDC SLEW VERTICAL
- ← TDC SLEW HORIZONTAL

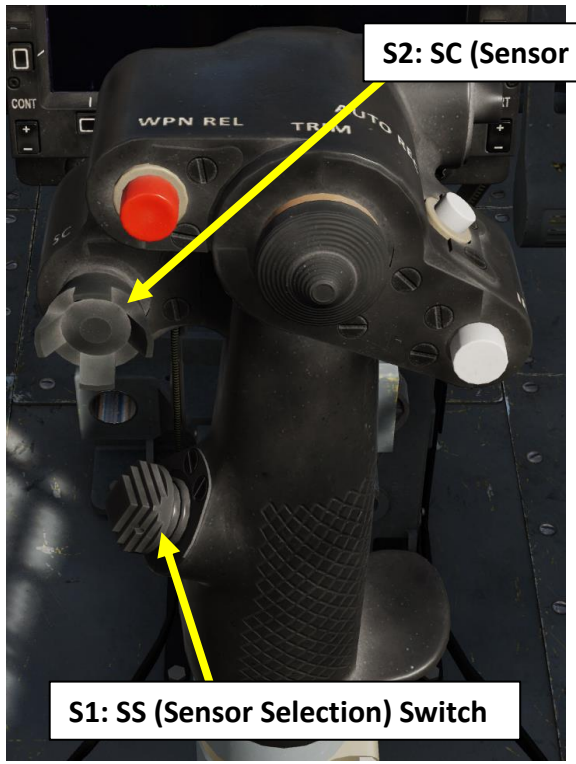
- ↑ T1 BACK (MMS AG)
- → T1 CENTER (MMS NAV)
- ↓ T1 FWD (MMS INTC)
- ←

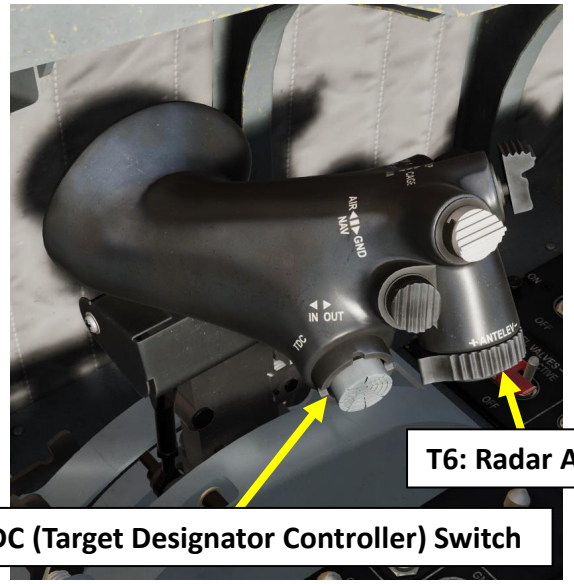
KJL-7 RADAR
2.1.1 – Air-to-Air Radar Display & Performance

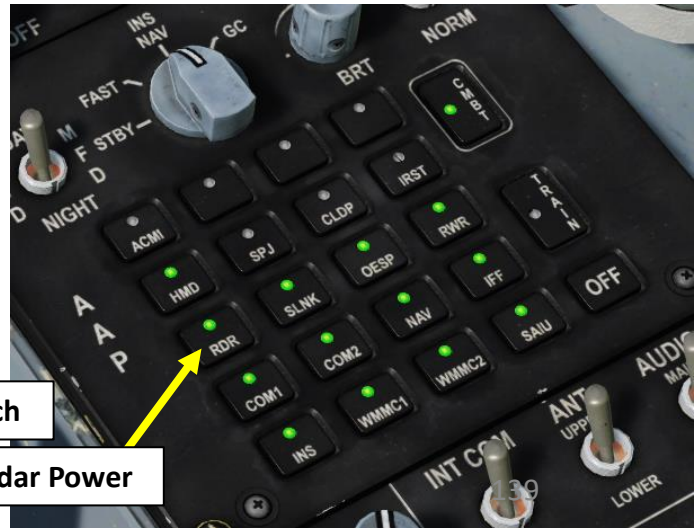
The air-to-air radar uses a B-Scope representation, which is a top-down view of what's in front of you.

- You can slew your radar and lock a target using the TDC, or Target Designator Controller.
- Radar Data can be shown on the RDR page and on the HUD (Heads-Up Display).
- The S1 Sensor Selection Switch is used to set up which display is selected (left MFCD, right MFCD, center MFCD or HUD) or which radar mode you will be using.





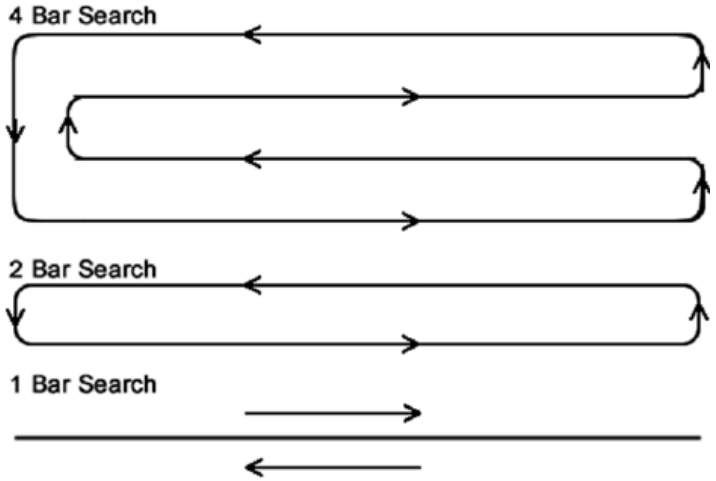


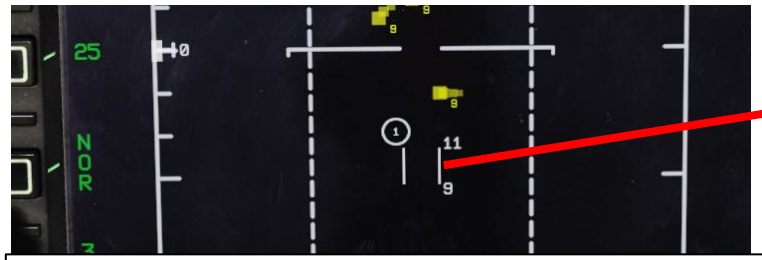


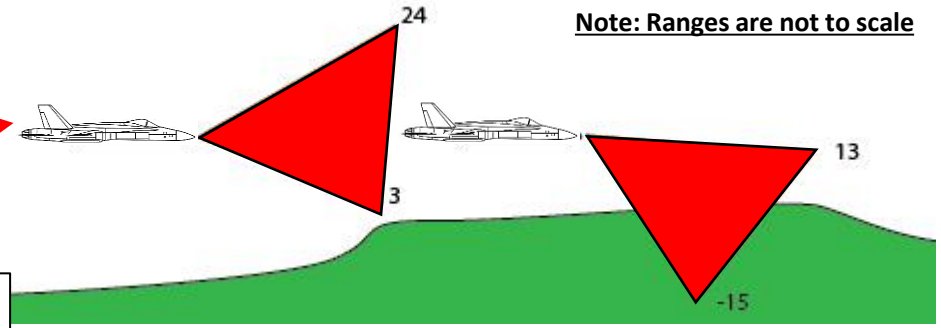
KJL-7 RADAR
2.1.1 – Air-to-Air Radar Display & Performance

The JF-17's radar has a range of 55 nautical miles, a horizontal arc of 120 degrees and a variable vertical arc that is customizable. You can control the radar scan pattern (bars), which will give you a narrower or wider scanning area.

The numbers next to the TDC correspond to the altitudes (in thousands of feet) of the top and bottom of the radar beam at the distance of the target designator. As you move the target designator closer and further you will see the numbers change. The practical application is that the radar will not detect targets above or below these altitudes which is why you need to slew the radar antenna up and down to do a complete search.



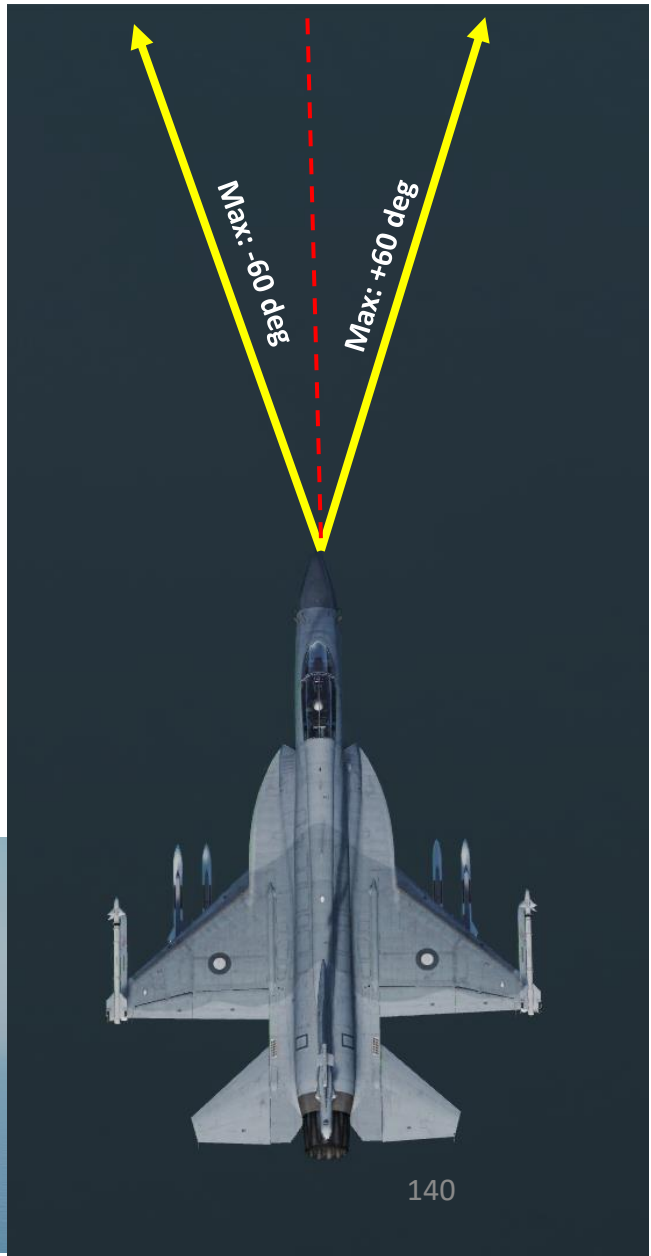




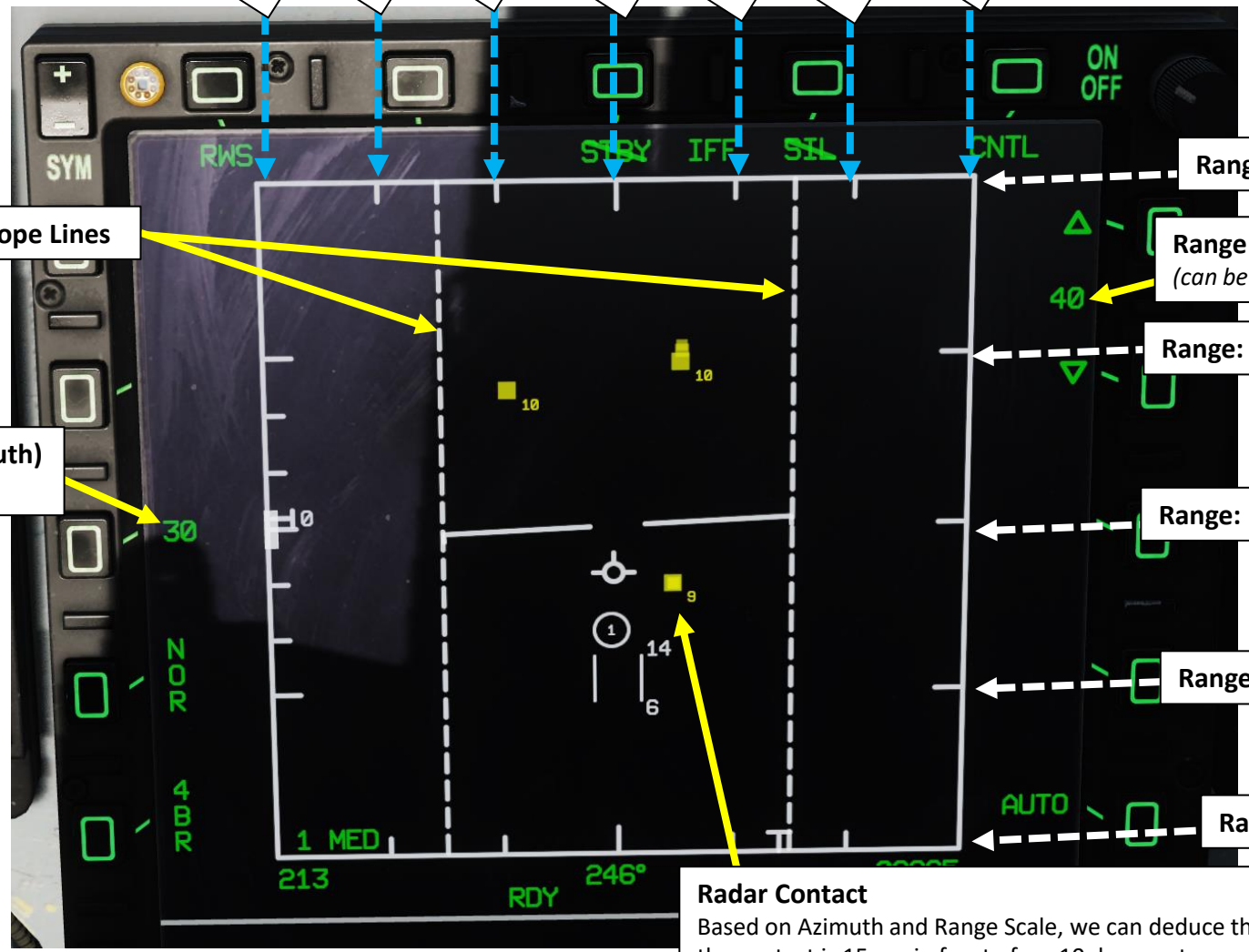
Note: Ranges are not to scale

TDC (Throttle Designator Controller) Acquisition Cursor
Upper number: Upper altitude covered by radar (11000 ft)
Lower number: Lower altitude covered by radar (9000 ft)

Range: 55 nm
Total Azimuth: 120 deg



KJL-7 RADAR
2.1.1 – Air-to-Air Radar Display & Performance



Radar Scan Envelope Lines

Radar Azimuth (Coverage for half the total azimuth)
(can be set to 10/25/30/60 deg)

Range: Full Scale (40 nm)

Range Scale Reference: 40 nm
(can be set to 10/20/40/80 nm)

Range: 3/4 Scale (30 nm)

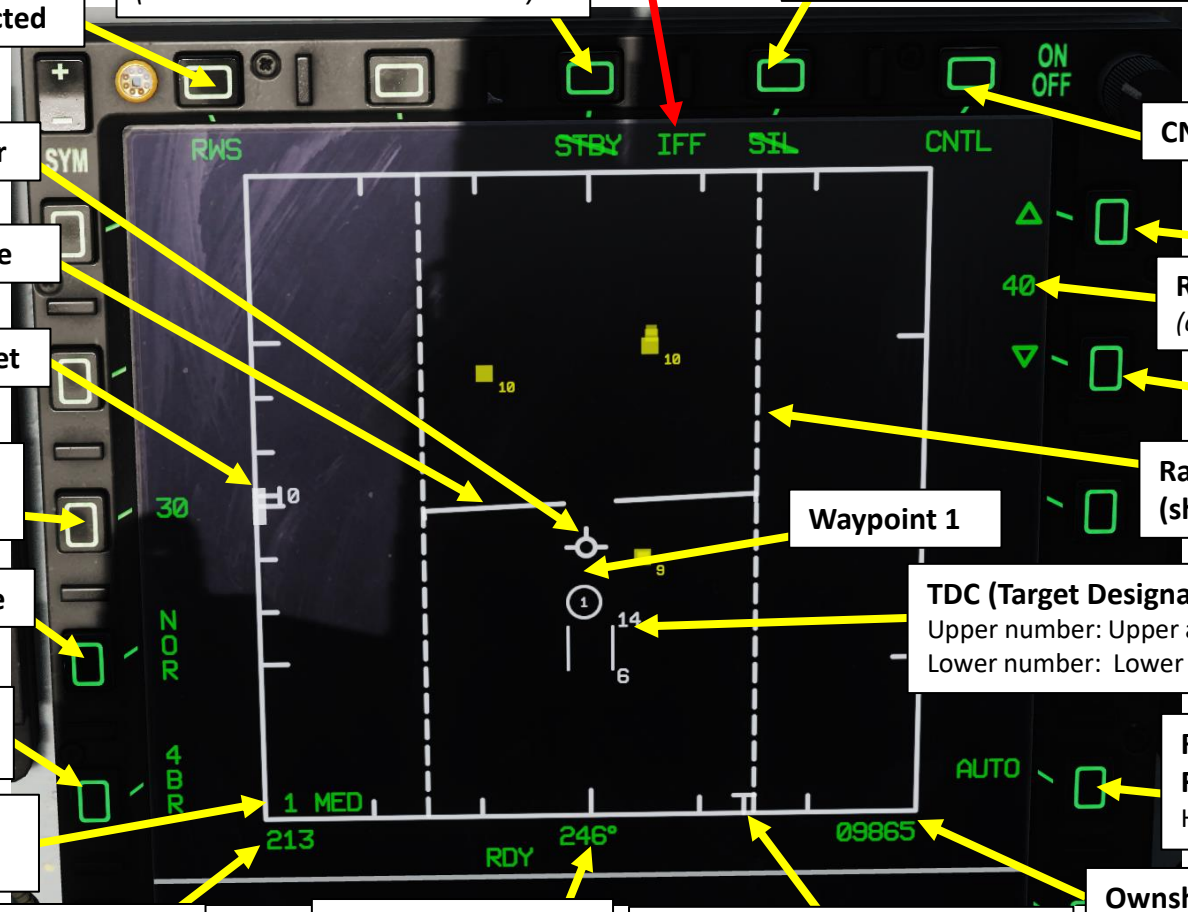
Range: 1/2 Scale (20 nm)

Range: 1/4 Scale (10 nm)

Range: 0 ft

Radar Contact
Based on Azimuth and Range Scale, we can deduce that the contact is 15 nm in front of us, 10 degrees to our right. The "9" number indicates the aircraft is at 9000 ft.

KJL-7 RADAR
2.1.1 – Air-to-Air Radar Display & Performance



IFF (Identify-Friend-or-Foe) Status

Radar Standby/ON Selector
(STBY Crossed Out = Radar ON)

Silent (SIL) Mode: Radar ceases operation and placed in STANDBY mode.

Radar Mode Selected

CNTL: Radar Control Menu

Flight Path Marker

Increase Range Scale

Horizon Line

Range Scale Reference: 40 nm
(can be set to 10/20/40/80 nm)

Antenna Elevation Caret

Decrease Range Scale

Radar Azimuth (Coverage for half the total azimuth)
(can be set to 10/25/30/60 deg)

Radar Antenna Azimuth Limits (shown: 30 deg)

Waypoint 1

Radar Altitude Stabilization Mode

TDC (Target Designator Controller) Acquisition Cursor
Upper number: Upper altitude covered by radar (11000 ft)
Lower number: Lower altitude covered by radar (9000 ft)

Elevation Bar Scan
Cycles between 1, 2, 3, 4 bars of faster scanning.

Radar PRF (Pulse Repetition Frequency) Selection
HI/MED/AUTO

PRF (Pulse Repetition Frequency)
Medium/High

Ownship altitude (ft)

Ownship Airspeed (Kts)

Ownship Heading

B-Sweep (T symbol shows instantaneous azimuth position of radar antenna)

KJL-7 RADAR
2.1.1 – Air-to-Air Radar Display & Performance

Take note that if the aircraft is connected to a datalink network, the radar scan cone and SD-10 missile range will be visible on the HSD (Horizontal Situation Display). We will talk about this further in the Datalink section.

KJL-7 RADAR
2.1.2 – Air-to-Air Radar Main Modes Overview

The radar has the following main modes: **BVR** (Beyond Visual Range, used for long-distance engagements), and **ACM** (Air Combat Maneuvering, used for close air engagements).

BVR Search sub-modes include:

- **RWS** (Range While Search): RWS radar mode allows for detection of contacts in a large volume. It is the default search mode for air-to-air or when an air-to-air missile is placed in priority. RWS mode provides all-aspect (nose-on, tail-on) and all altitude (look-up, look-down) target detection. The display shows range as the vertical axis and azimuth angle on the horizontal. While in RWS mode, the radar can maintain up to 10 trackfiles.

- **TWS** (Track While Scan): TWS maintains an actual track on several aircraft while still searching for others. The radar allocates part of its power to tracking the target or targets while part of its power is allocated to scanning, unlike the straight tracking mode, when the radar directs all its power to tracking the acquired targets. In the TWS mode the radar has a possibility to acquire additional targets as well as providing an overall view of the airspace and helping maintain better situational awareness. Since the radar is sharing its computing time between targets, the accuracy is less precise than for a single target track (STT) mode of operation.

- **VS** (Velocity Search): A high PRF (Pulse Repetition Frequency) Pulse Doppler waveform is used for long range detection primarily against nose aspect targets, giving velocity and azimuth information, but no range information. Although velocity search can work against tail-on targets, the Doppler return is weaker, consequently the maximum detection range is also much less. When the target is in the beam (flying perpendicular to the fighter), the closure (Doppler) is the same as ground return and target return is almost zero.

- **SAM** (Situational Awareness Mode): SAM mode is a hybrid mode between RWS and STT. When locking a target in RWS mode, the radar enters SAM mode. In SAM mode, radar will periodically scan the locked target while scanning the whole area. In SAM mode, the controls are basically same as RWS.

Available Azimuth/Bar Elevation Settings (per Radar Mode)	
RWS	Azimuth: 10, 30 or 60 deg (with any BAR) Bars: 1, 2 or 4 bar (with any AZ)
TWS	Setting 1: 25 deg with 3 Bars Setting 2: 60 deg with 2 Bars

KJL-7 RADAR
2.1.2 – Air-to-Air Radar Main Modes Overview

The radar has the following main modes: **BVR** (Beyond Visual Range, used for long-distance engagements), and **ACM** (Air Combat Maneuvering, used for close air engagements).

STT (Single Target Track): STT mode is a traditional radar "lock" where the radar continuously scans a single target, resulting in a very high update rate; this makes it the primary method of providing guidance to air-to-air weapons. STT maintains a trackfile and the radar is slaved to this trackfile; as such, manual antenna elevation control is inhibited and the B-sweep follows the trackfile. Only the trackfile that is placed in STT is visible and all onboard trackfiles are dropped.

DTT (Dual Target Track): In this mode, radar can track an HPT (High Priority Target) and a SPT (Secondary Priority Target). HUD will only show HPT's TD box. Using S2 (Sensor Control Switch) left will switch between HPT and SPT.

KJL-7 RADAR
2.1.2 – Air-to-Air Radar Main Modes Overview

The radar has the following main modes: **BVR** (Beyond Visual Range, used for long-distance engagements), and **ACM** (Air Combat Maneuvering, used for close air engagements).

ACM sub-modes include:

- **VT** (Vertical Scan): Radar will scan in a 10°× 50° vertical area.
- **BS** (Boresight): Radar will scan in cone with a diameter of 4°.
- **HA** (Heads-Up Display Area): Radar will scan the whole HUD area.

KJL-7 RADAR
2.1.3 – Air-to-Air Radar RWS Mode

RWS (Range While Search) is a mode where the antenna follows the designated search pattern and informs you of all the tracks discovered in one sweep. You can then select a specific track and lock it into STT mode.

RWS is selected in the following manner:

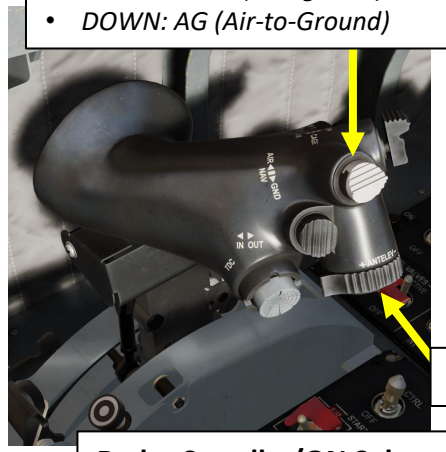
1. Press the MMS (Master Mode Switch) UP to INTC (Intercept). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Press the Radar Mode Selector OSB (Option Select Button) until radar mode is cycled to RWS.

In RWS mode, the **S2 Sensor Control Switch** has the following functions:

- FWD: Increases Display Distance
- AFT: Decreases Display Distance
- LEFT: Cycles between RWS, TWS and VS modes
- RIGHT: Changes Azimuth Scan Range
- DEPRESSED (PUSHED): MFCD Refresh

T1: MMS (Master Mode Switch)

- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

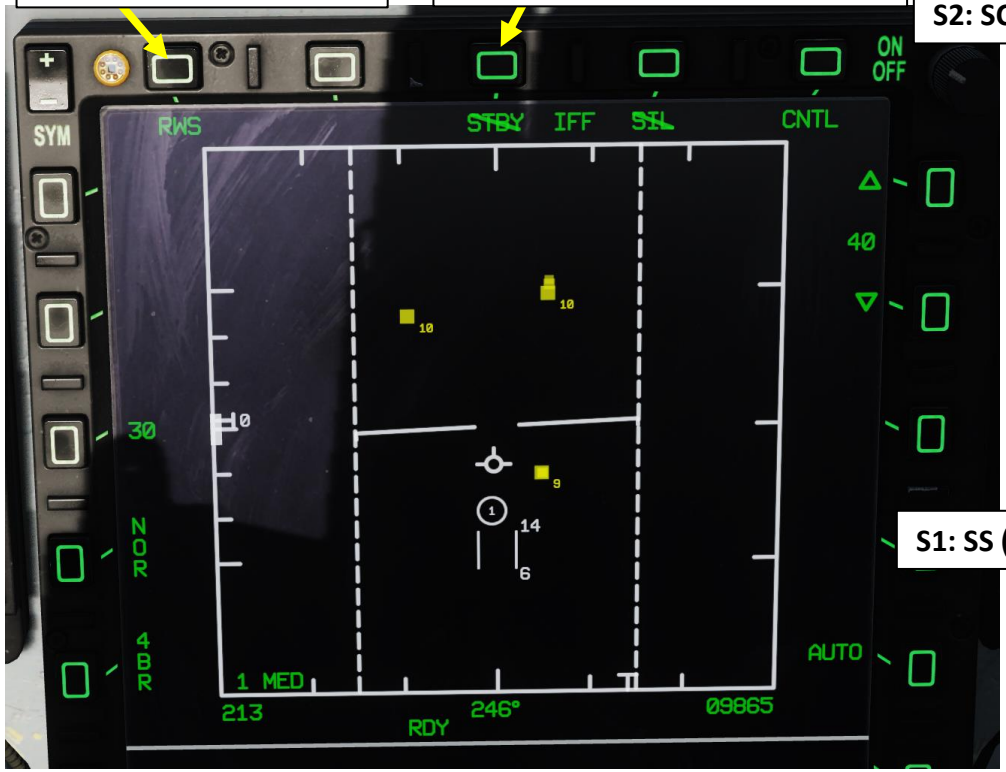


T6: Radar Antenna Elevation Switch

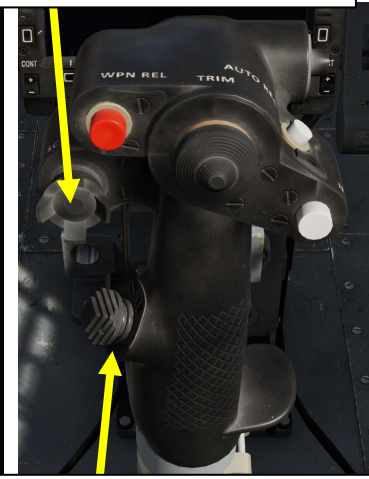
MFCD Selected Asterisk

Select Radar Mode OSB

Radar Standby/ON Selector
(STBY Crossed Out = Radar ON)



S2: SC (Sensor Control) Switch



S1: SS (Sensor Selection) Switch

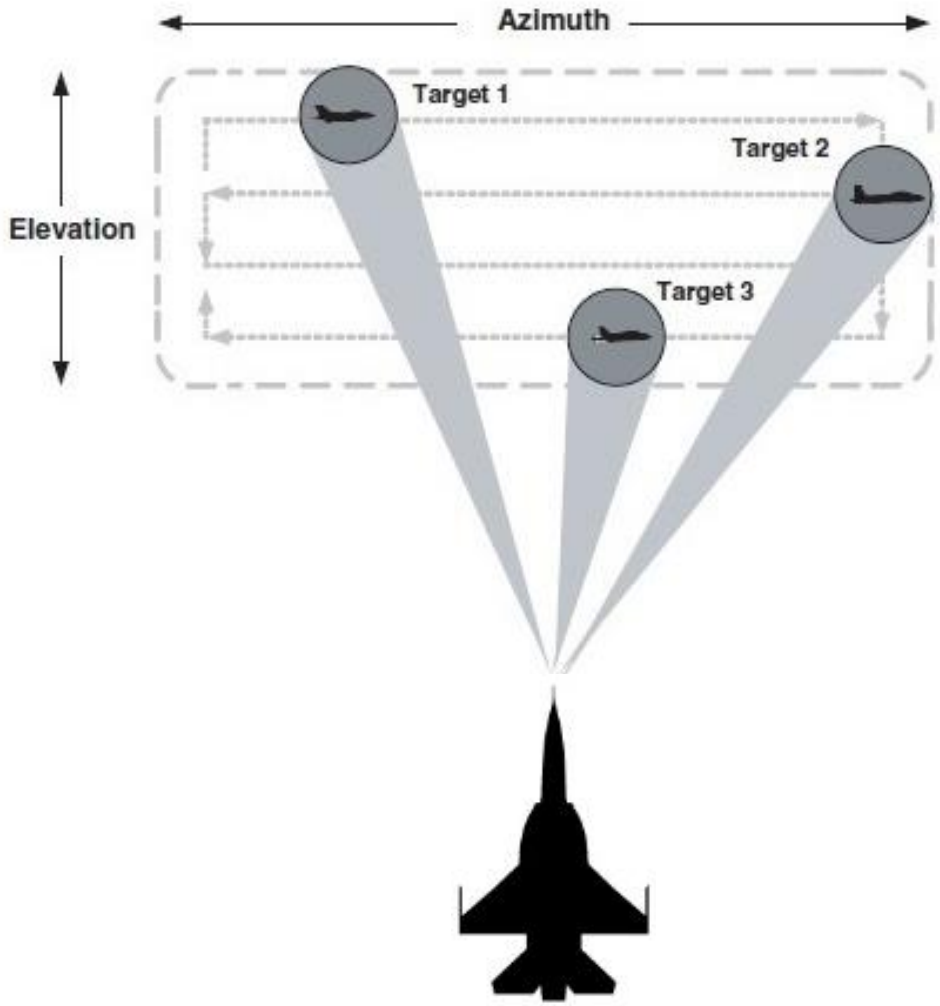
KJL-7 RADAR
2.1.4 – Air-to-Air Radar TWS Mode

TWS is the default search mode when INTC (Intercept) Master Mode is selected for air-to-air combat.

TWS (Track While Scan) mode combines the information unique to RWS and STT (Single Target Track) modes. Generally, the TWS display is very similar to the RWS display, however, each contact has a vector line that points in the direction of the contact's heading and a digital altitude indication below it. It permits having detailed target data on a contact while still being able to scan for other targets. Radar can track up to 10 targets at once in TWS mode.

When combined with the SD-10, TWS provides a powerful ability to engage multiple targets quickly. Nevertheless, the target tracking reliability is less than that of SAM and even more so than STT. Unlike STT though, a TWS launch with SD-10 will not provide the enemy aircraft with a radar lock and launch indication. As such, the first warning the enemy pilot will likely get is when the active radar seeker of the SD-10 missile goes active near the target.

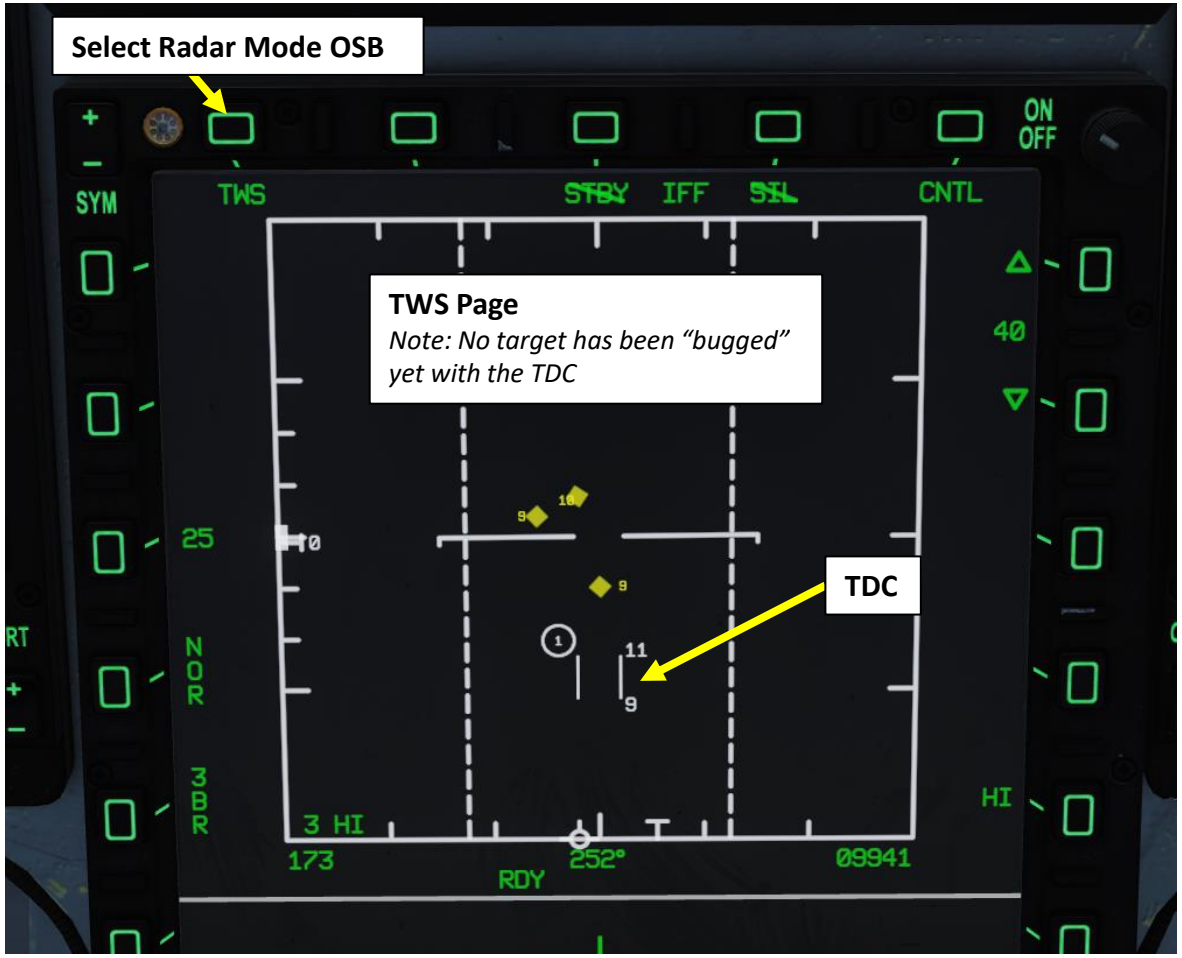
TWS has several restrictions. The radar will attempt to build track files for each contact, but given a large scan volume, there will be a sizable refresh time between scans. During each scan the radar will try to predict the position of the contact for the next scan. If, however the target takes evasive, high-G maneuvers and quickly changing its trajectory and speed, the radar can lose the track by making an incorrect track file prediction. Using such a defensive tactic, the hunter can quickly become the hunted.

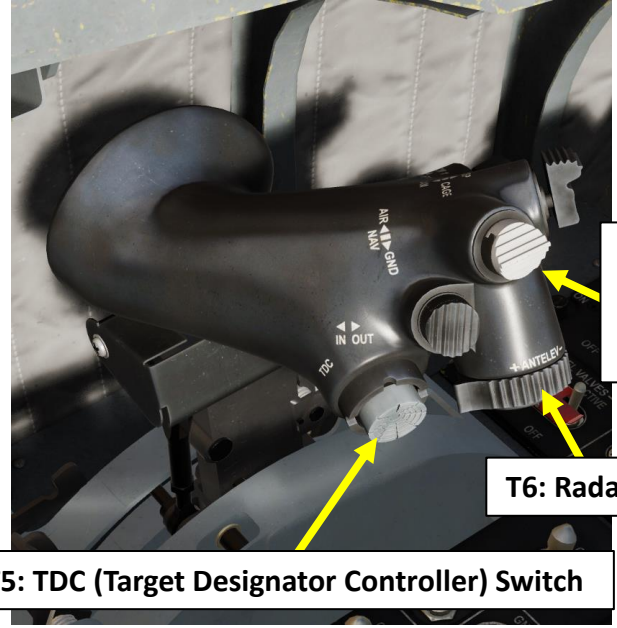


KJL-7 RADAR
2.1.4 – Air-to-Air Radar TWS Mode

In TWS mode, the **S2 Sensor Control Switch** has the following functions:

- FWD: Increases Display Distance
- AFT: Decreases Display Distance
- LEFT: Cycles between RWS, TWS and VS modes
- RIGHT: No function.
- DEPRESSED (PUSHED): MFCD Refresh, resets default MFCD menus for selected mode

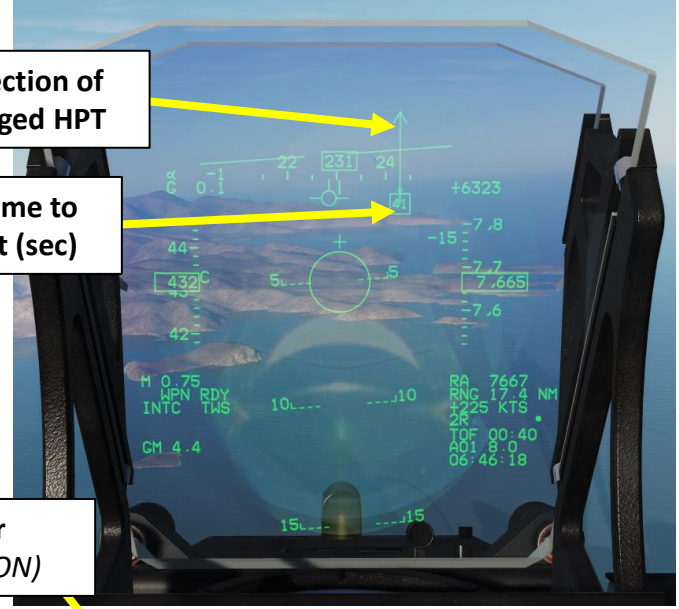


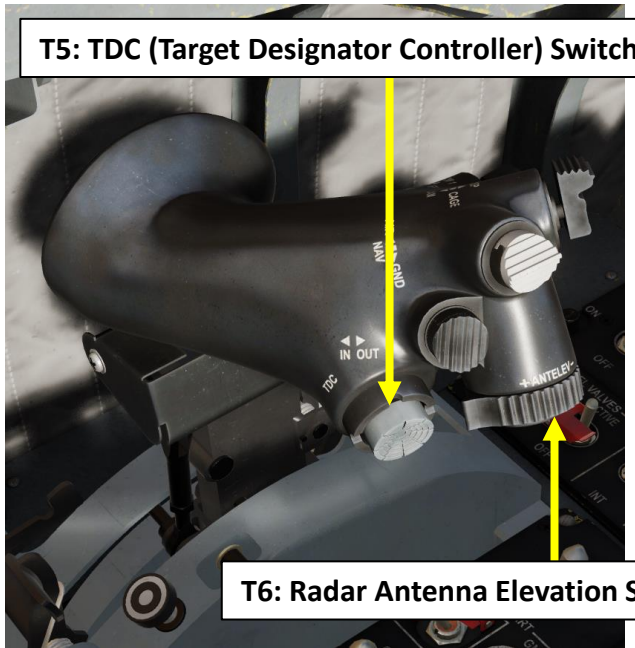


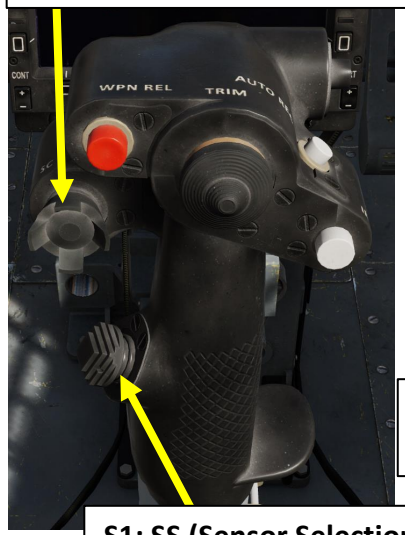
KJL-7 RADAR
2.1.4 – Air-to-Air Radar TWS Mode

TWS is used in the following manner:

1. Set MMS (Master Mode Switch) to INTC. TWS is selected by default.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Verify that Center MFCD is set as the Sensor of Interest (SOI). An asterisk will indicate the radar screen is the SOI. If another sensor/display is set as the SOI, press Sensor Select Switch AFT.
4. Slew the **TDC (Target Designator Controller)** over a desired target and "bug" him by pressing the T5/TDC PRESS (ENTER). This is NOT a radar lock; you have merely set a target as the HPT (High Priority Target), which is represented as a circle. Other SPTs (Secondary Priority Targets) will be displayed as well without a circle.
    - Note: to cycle between the HPT (High Priority Target) and SPT (Secondary Priority Target), press the Sensor Control (S2) switch LEFT.
5. If you press the TDC (ENTER) a second time, you will radar lock the desired target to STT (Single Target Track) mode.





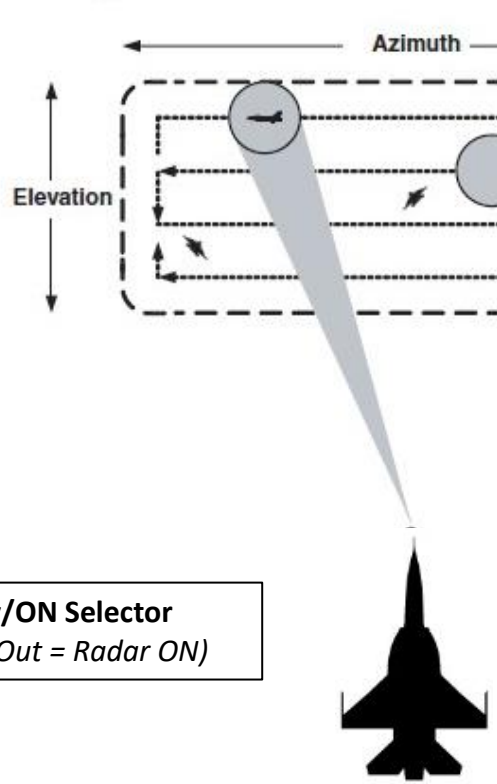


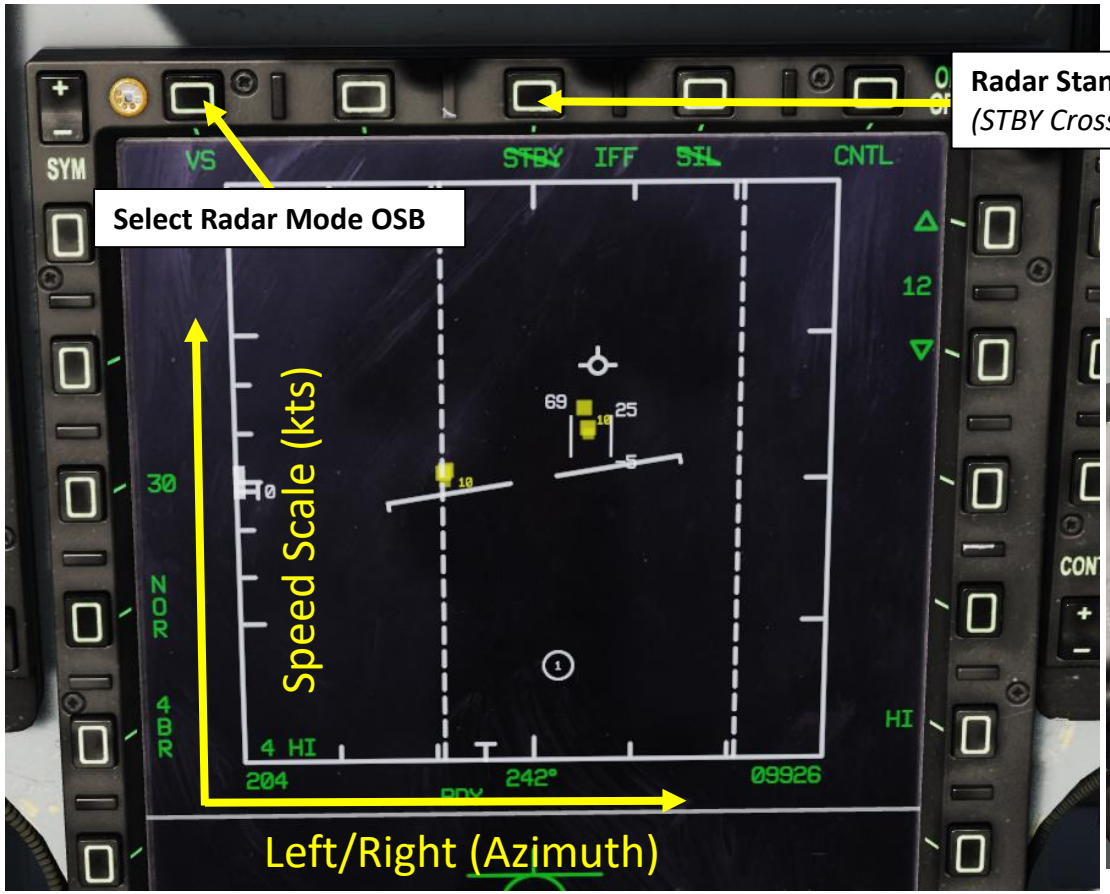
KJL-7 RADAR
2.1.5 – Air-to-Air Radar VS Mode

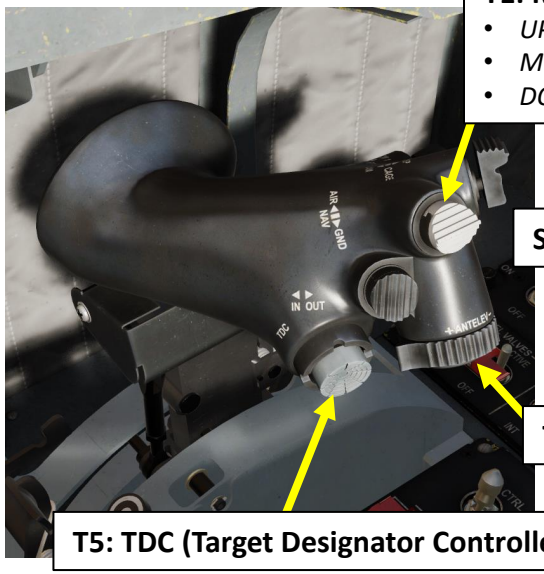
Velocity Search mode is used for long range detection primarily against nose aspect targets, giving velocity and azimuth information, but no range information. The vertical scale on the screen will be in terms of airspeed.

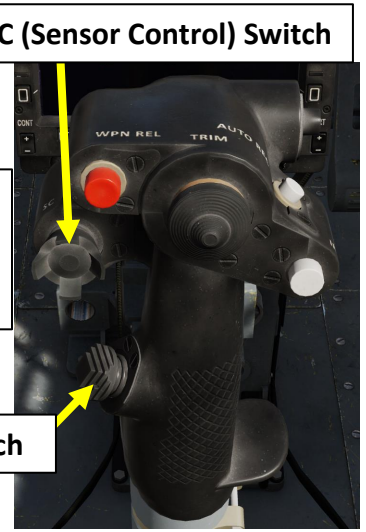
VS is selected in the following manner:

1. Press the MMS (Master Mode Switch) UP to INTC (Intercept). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Press the Radar Mode Selector OSB (Option Select Button) until radar mode is cycled to VS.









KJL-7 RADAR
2.1.5 – Air-to-Air Radar VS Mode

In VS mode, the **S2 Sensor Control Switch** has the following functions:

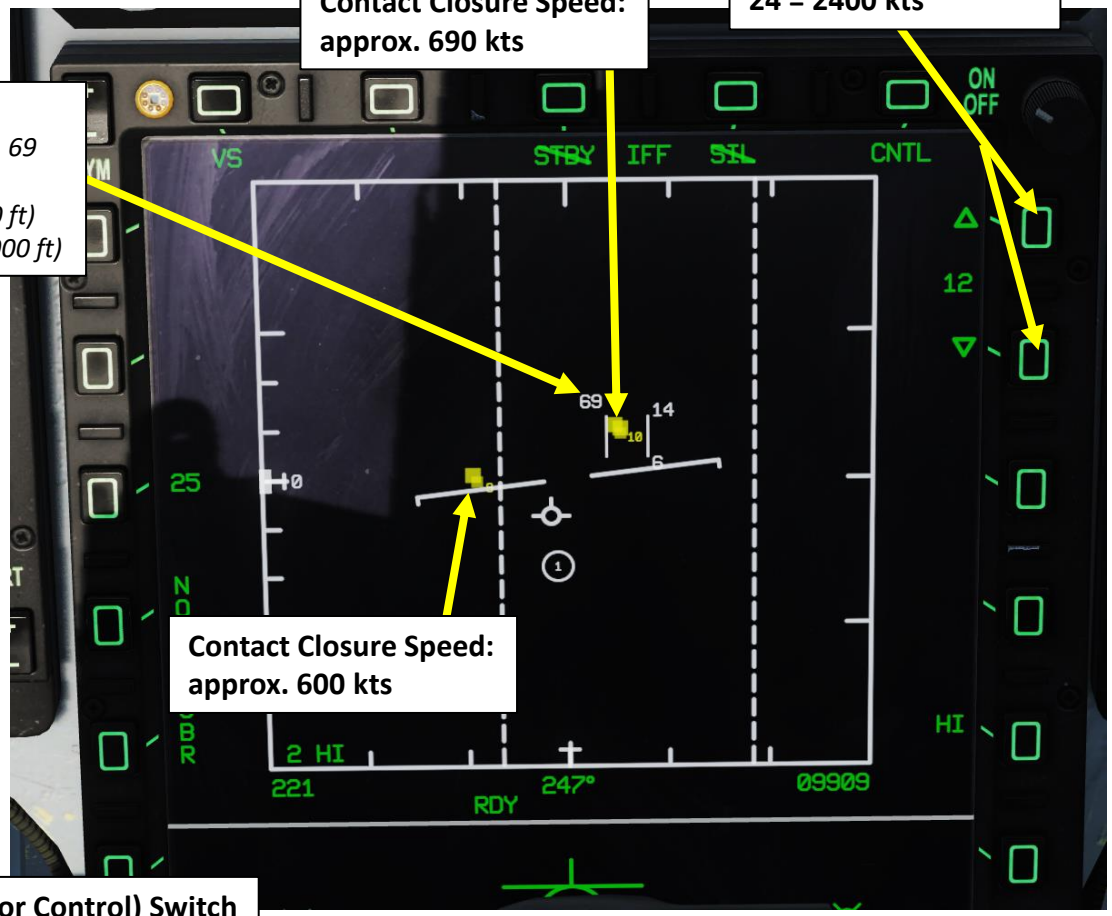
- FWD: Increases Display Distance
- AFT: Decreases Display Distance
- LEFT: Cycles between RWS, TWS and VS modes
- RIGHT: Changes Azimuth Scan Range
- DEPRESSED (PUSHED): MFCD Refresh

VS Cursor (Controlled by TDC)

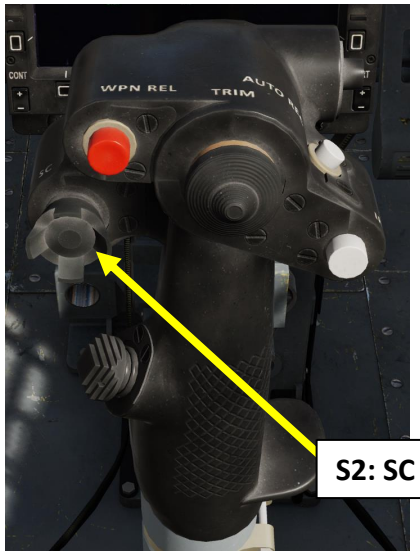
- *Top Left: Closure Speed (x10 kts). 69 means a 690 kts closure speed.*
- *Top Right: Upper Altitude (14000 ft)*
- *Bottom Right: Lower Altitude (6000 ft)*

Contact Closure Speed: approx. 690 kts

Speed Scale Selector
12 = 1200 kts
24 = 2400 kts



Contact Closure Speed: approx. 600 kts



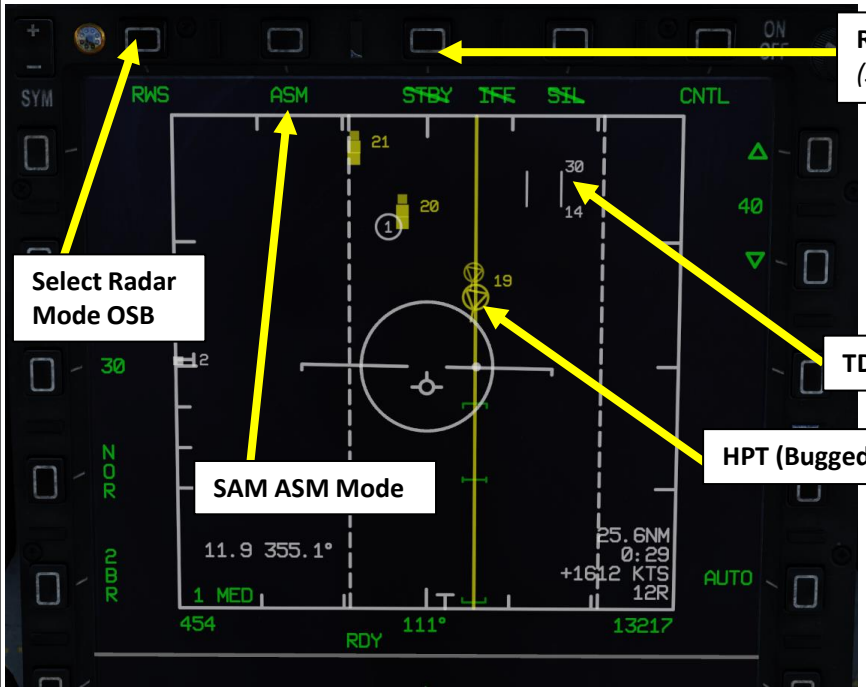
S2: SC (Sensor Control) Switch

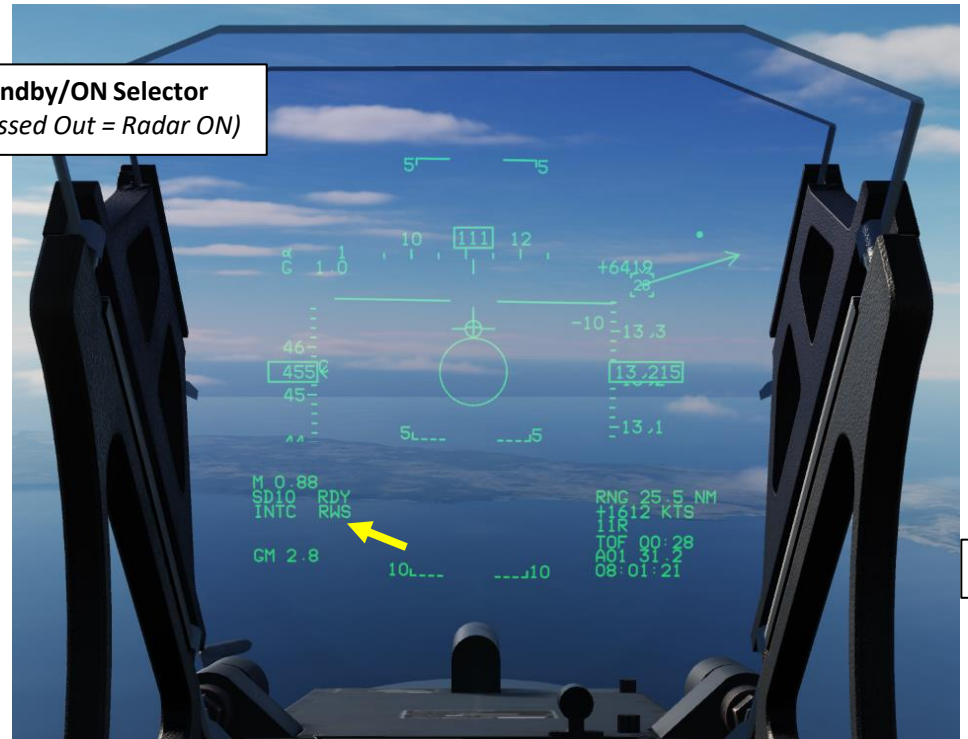
KJL-7 RADAR
2.1.6 – Air-to-Air Radar SAM (ASM/NAM) Mode

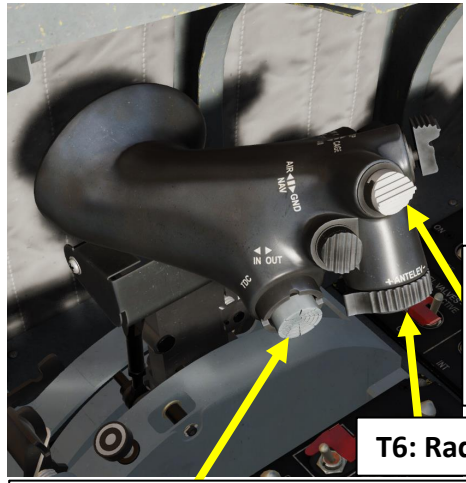
SAM (Situational Awareness Mode) is a hybrid mode between RWS and STT. When locked a target in RWS mode, radar enters SAM mode. In SAM mode, radar will periodically scan the locked target while scanning the whole area. In SAM mode, the controls are basically same as in RWS.

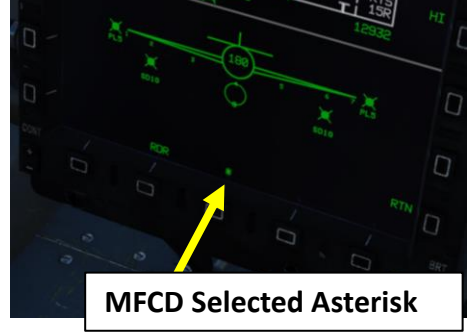
To enter SAM/ASM (Automatic Situational Mode):

1. Press the MMS (Master Mode Switch) UP to INTC (Intercept)
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Verify that Center MFCD is set as the Sensor of Interest (SOI). An asterisk will indicate the radar screen is the SOI. If another sensor/display is set as the SOI, press Sensor Select Switch AFT.
4. Press the Radar Mode Selector OSB (Option Select Button) until radar mode is cycled to RWS.
5. Slew the TDC over a target, then use the T5/TDC PRESS (ENTER) to "Bug" the contact.
6. Radar mode will transition from RWS to SAM/ASM (Automatic Situational Mode). This sets a target as the HPT (High Priority Target), which is represented as a circle.
7. ASM will automatically set radar scan width and bars based on range:
    - If Range is greater than 20 nm: ASM sets a 30 deg scan with 2 bars.
    - If Range is less than 20 nm: ASM sets a 15 deg scan with 4 bars.

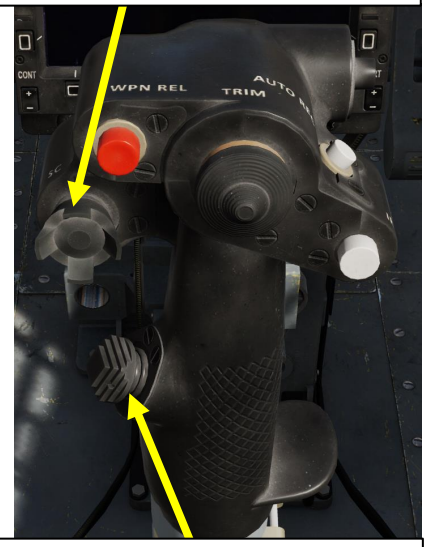








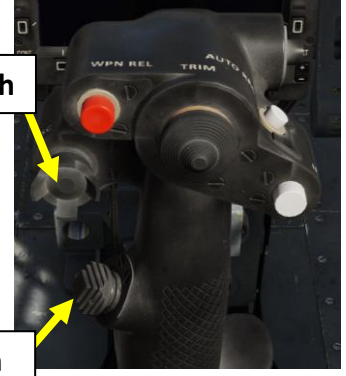
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

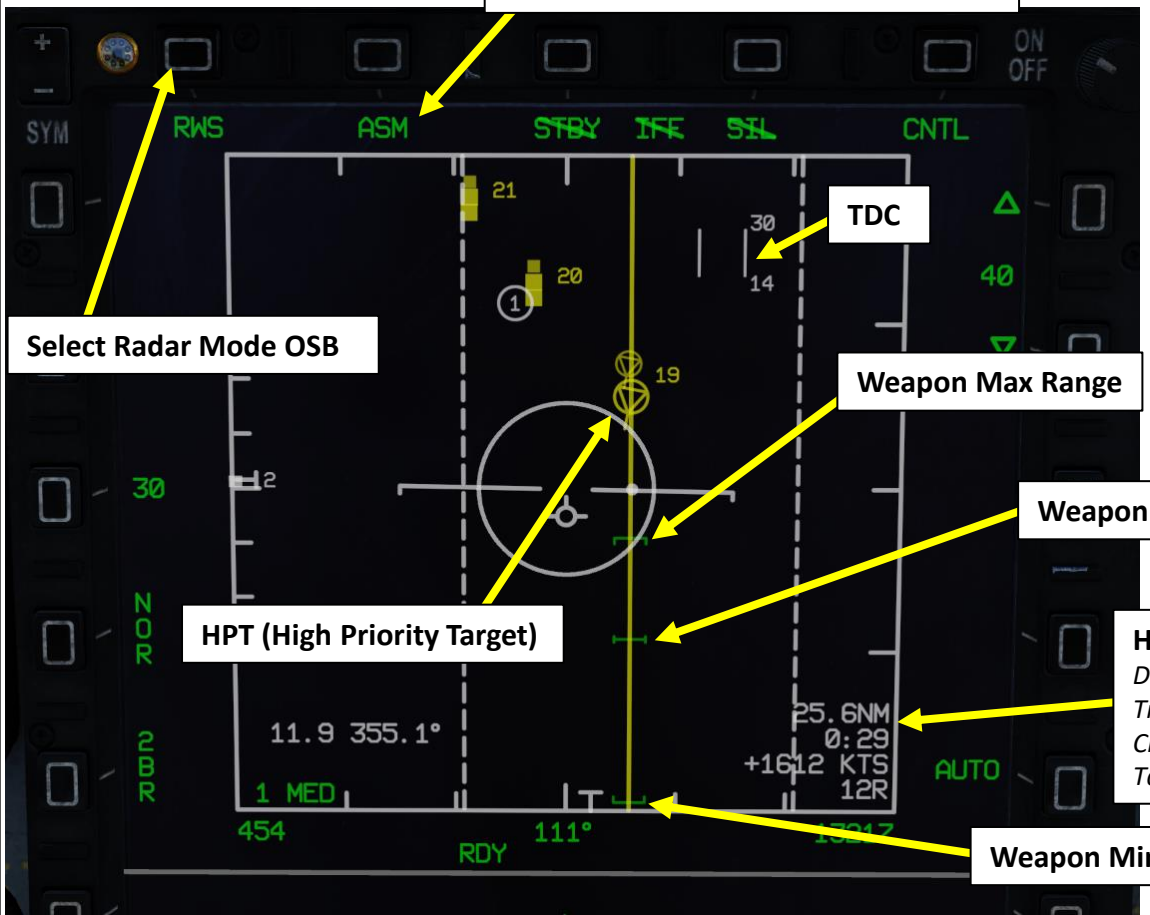


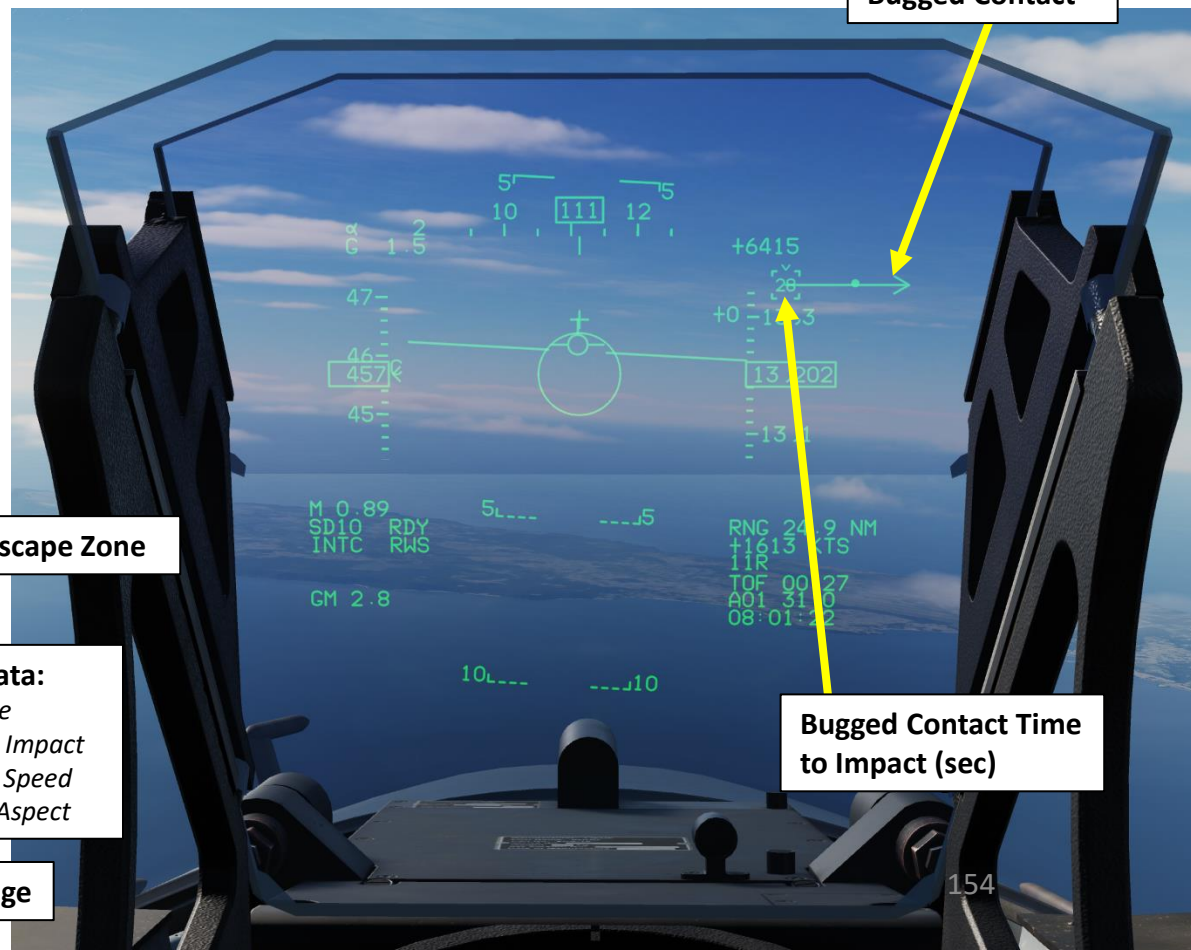
KJL-7 RADAR
2.1.6 – Air-to-Air Radar SAM (ASM/NAM) Mode

In SAM mode, the **S2 Sensor Control Switch** has the following functions:

- LEFT: Cycles between SAM (Situational Awareness Mode) ASM (Automatic Situational Mode) sub-mode and NAM (Normal Awareness Mode) sub-mode
- RIGHT: Changes Azimuth Scan Range
- DEPRESSED (PUSHED): Unlocks HPT (High Priority Target)



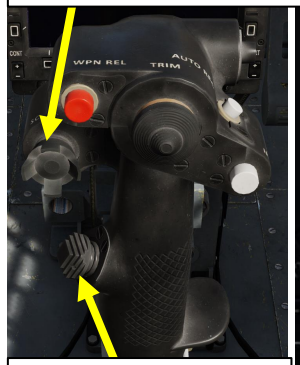


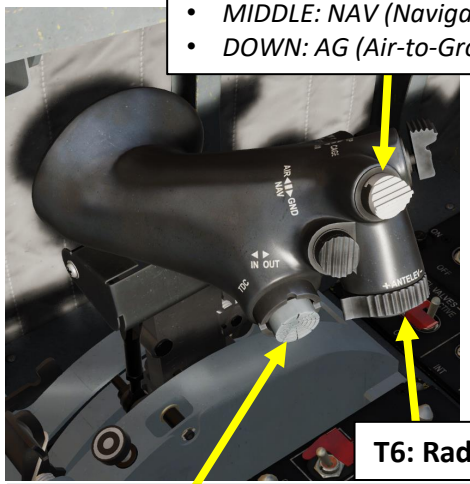


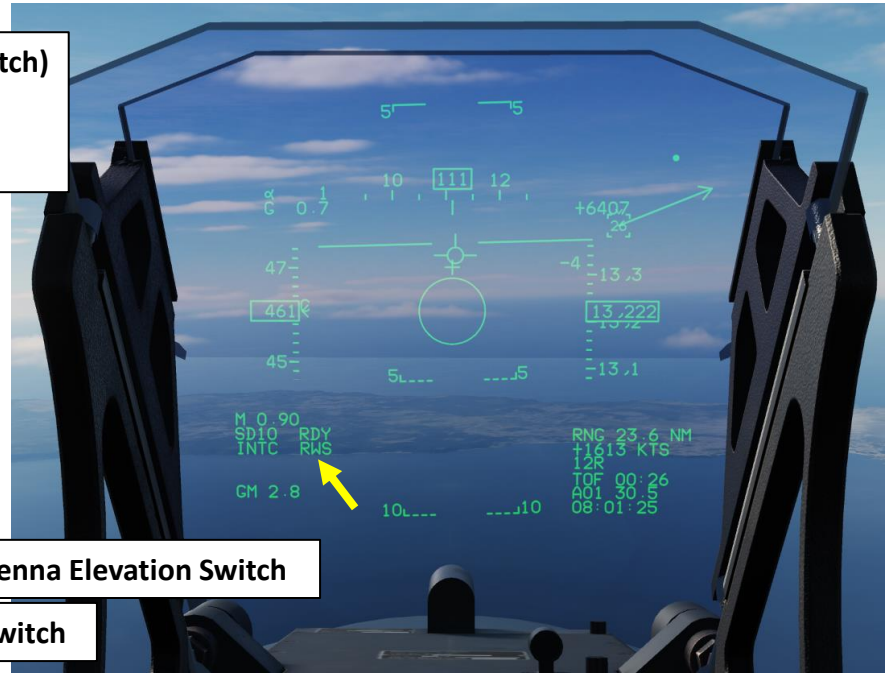
KJL-7 RADAR
2.1.6 – Air-to-Air Radar SAM (ASM/NAM) Mode

To enter SAM/NAM (Normal Awareness Mode):

1. Press the MMS (Master Mode Switch) UP to INTC (Intercept)
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Verify that Center MFCD is set as the Sensor of Interest (SOI). An asterisk will indicate the radar screen is the SOI. If another sensor/display is set as the SOI, press Sensor Select Switch AFT.
4. Press the Radar Mode Selector OSB (Option Select Button) until radar mode is cycled to RWS.
5. Slew the TDC over a target, then use the T5/TDC PRESS (ENTER) to "Bug" the contact.
6. Radar mode will transition from RWS to SAM/ASM (Automatic Situational Mode). This sets a target as the HPT (High Priority Target), which is represented as a circle.
7. Press S2 Sensor Control Switch LEFT to cycle between SAM (Situational Awareness Mode) ASM (Automatic Situational Mode) sub-mode and NAM (Normal Awareness Mode) sub-mode.
8. NAM will allow you to keep changing radar scan azimuth and bar setting as desired.





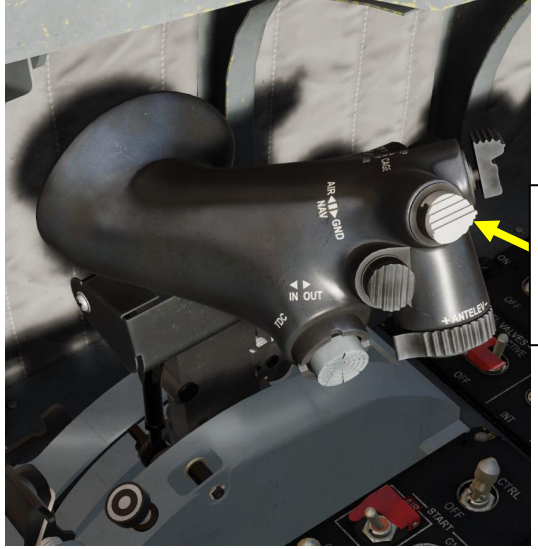


KJL-7 RADAR
2.1.7 – Air-to-Air Radar ACM Modes
2.1.7.1 – VT (Vertical Scan) Mode

VT (Vertical Scan) Mode will scan in a 10°× 50° vertical area.

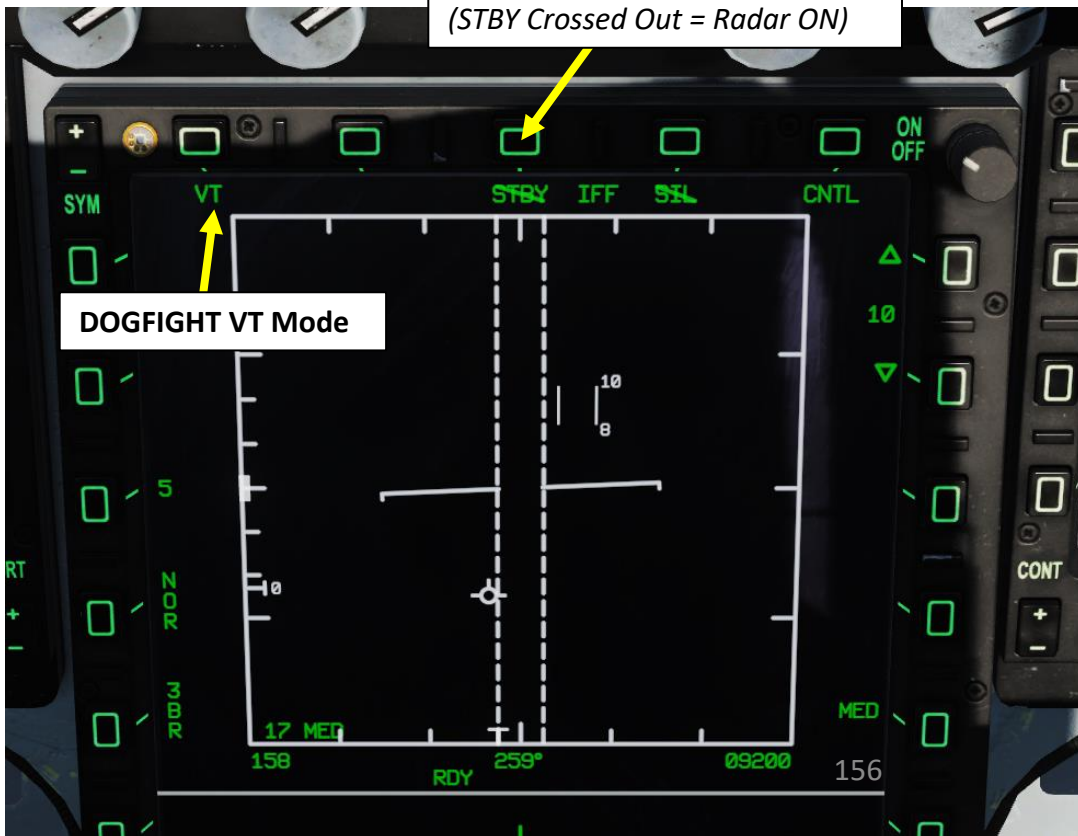
To enter ACM VT mode:

1. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
2. Select ACM Mode by pressing the S1 Sensor Selection Switch FWD.
3. Select ACM VT Sub-Mode by pressing the S2 Sensor Control Switch AFT.
4. In ACM sub modes, radar will automatically scan and lock target with a max lock target range of 10 nm. When a target is locked, radar will exit ACM mode automatically and go in STT (Radar Lock).
5. You can exit ACM mode by pressing the MMS (Master Mode Switch) UP to INTC (Intercept)

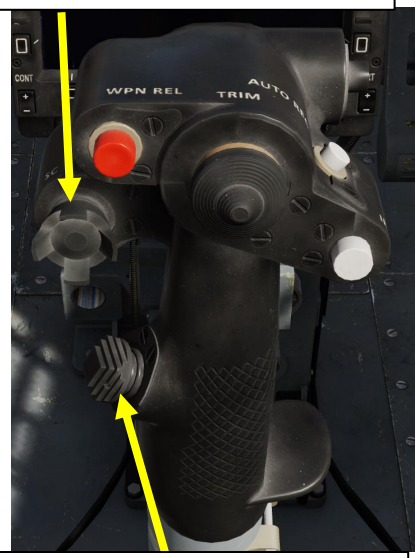


T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

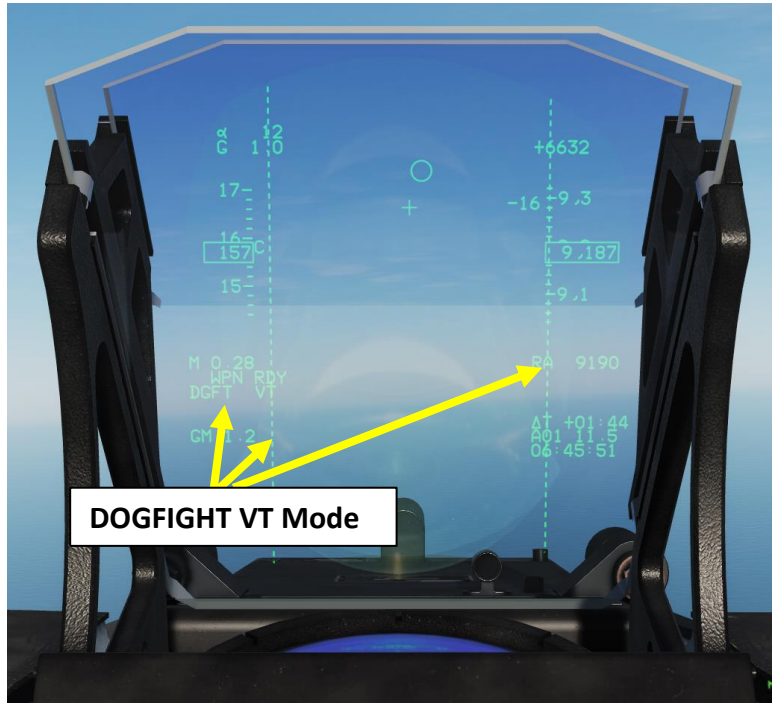
Radar Standby/ON Selector
(STBY Crossed Out = Radar ON)



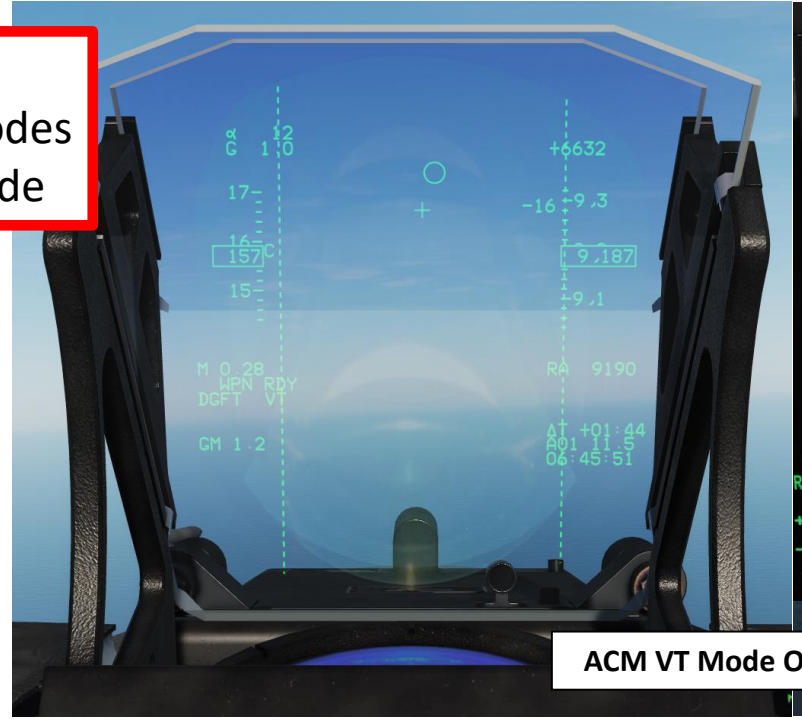
S2: SC (Sensor Control) Switch

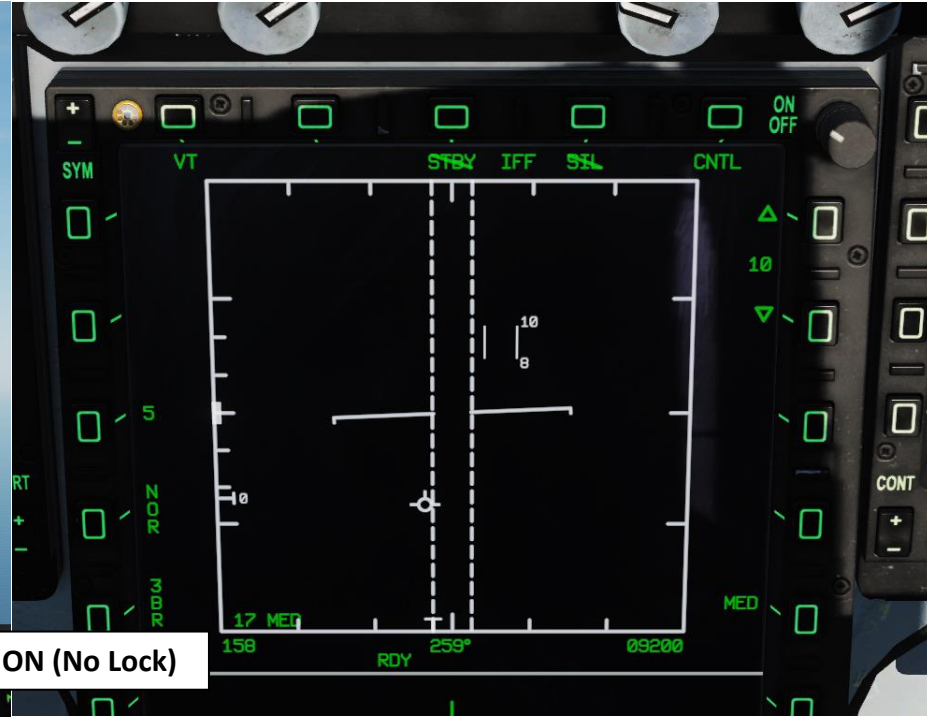


S1: SS (Sensor Selection) Switch



KJL-7 RADAR
2.1.7 – Air-to-Air Radar ACM Modes
2.1.7.1 – VT (Vertical Scan) Mode





ACM VT Mode ON (No Lock)

ACM VT Mode ON (With STT Lock)

KJL-7 RADAR
2.1.7 – Air-to-Air Radar ACM Modes
2.1.7.2 – BS (Boresight) Mode

BS (Boresight) Mode Radar will scan in cone with diameter of 4°

To enter ACM BS mode:

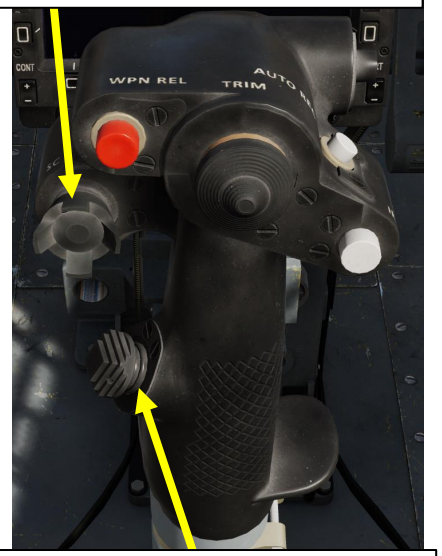
1. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
2. Select ACM Mode by pressing the S1 Sensor Selection Switch FWD.
3. Select ACM BS Sub-Mode by pressing the S2 Sensor Control Switch FWD.
4. In ACM sub modes, radar will automatically scan and lock target with a max lock target range of 10 nm. When a target is locked, radar will exit ACM mode automatically and go in STT (Radar Lock).
5. You can exit ACM mode by pressing the MMS (Master Mode Switch) UP to INTC (Intercept)

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

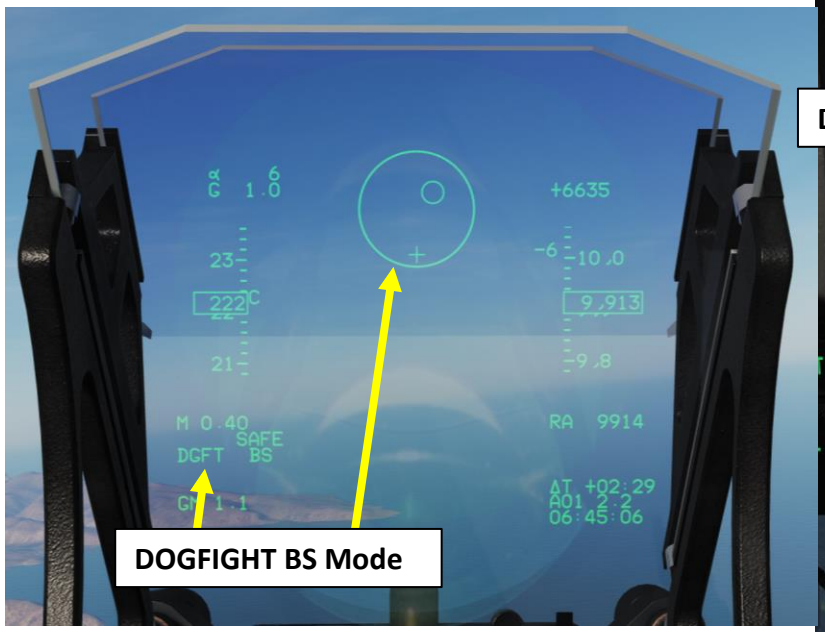
Radar Standby/ON Selector
(STBY Crossed Out = Radar ON)

DOGFIGHT BS Mode

S2: SC (Sensor Control) Switch

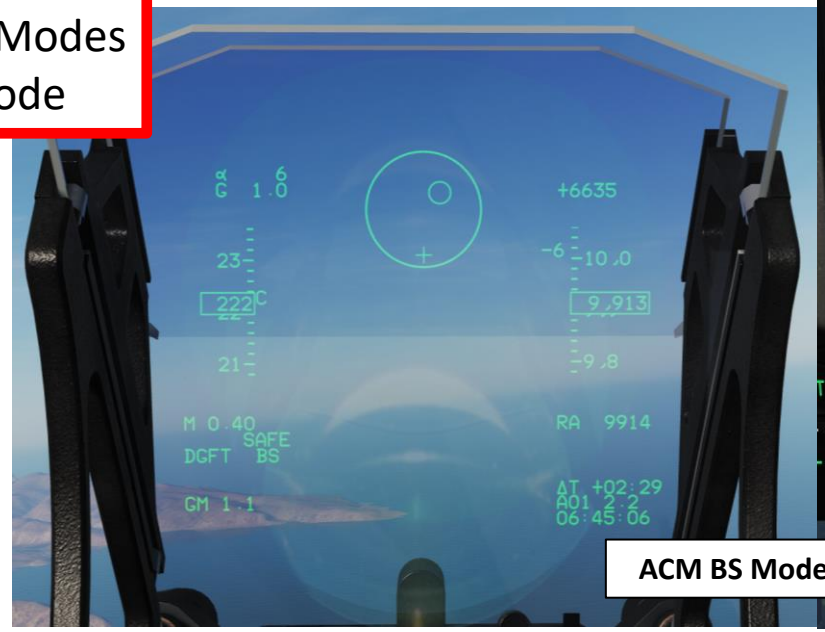


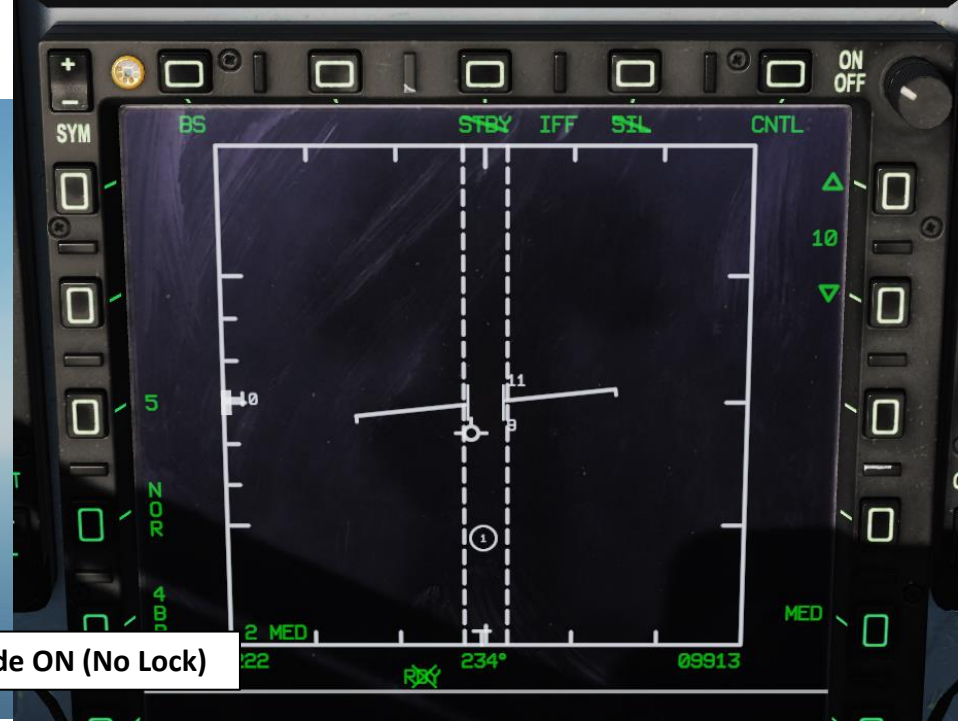
S1: SS (Sensor Selection) Switch



DOGFIGHT BS Mode

KJL-7 RADAR
2.1.7 – Air-to-Air Radar ACM Modes
2.1.7.2 – BS (Boresight) Mode





ACM BS Mode ON (No Lock)

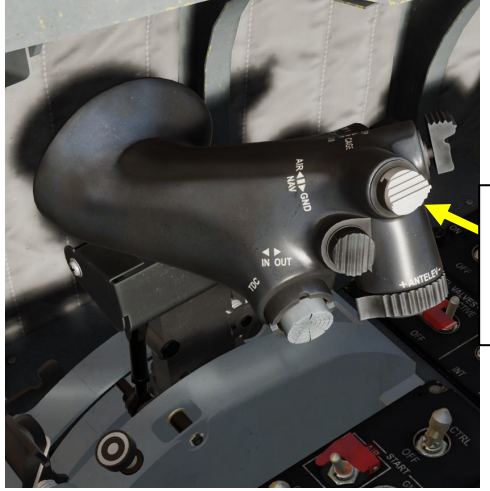
ACM BS Mode ON (With STT Lock)

KJL-7 RADAR
2.1.7 – Air-to-Air Radar ACM Modes
2.1.7.3 – HA (Heads-Up Display Area) Mode

HA (Heads-Up Display Area) Mode radar will scan whole HUD area.

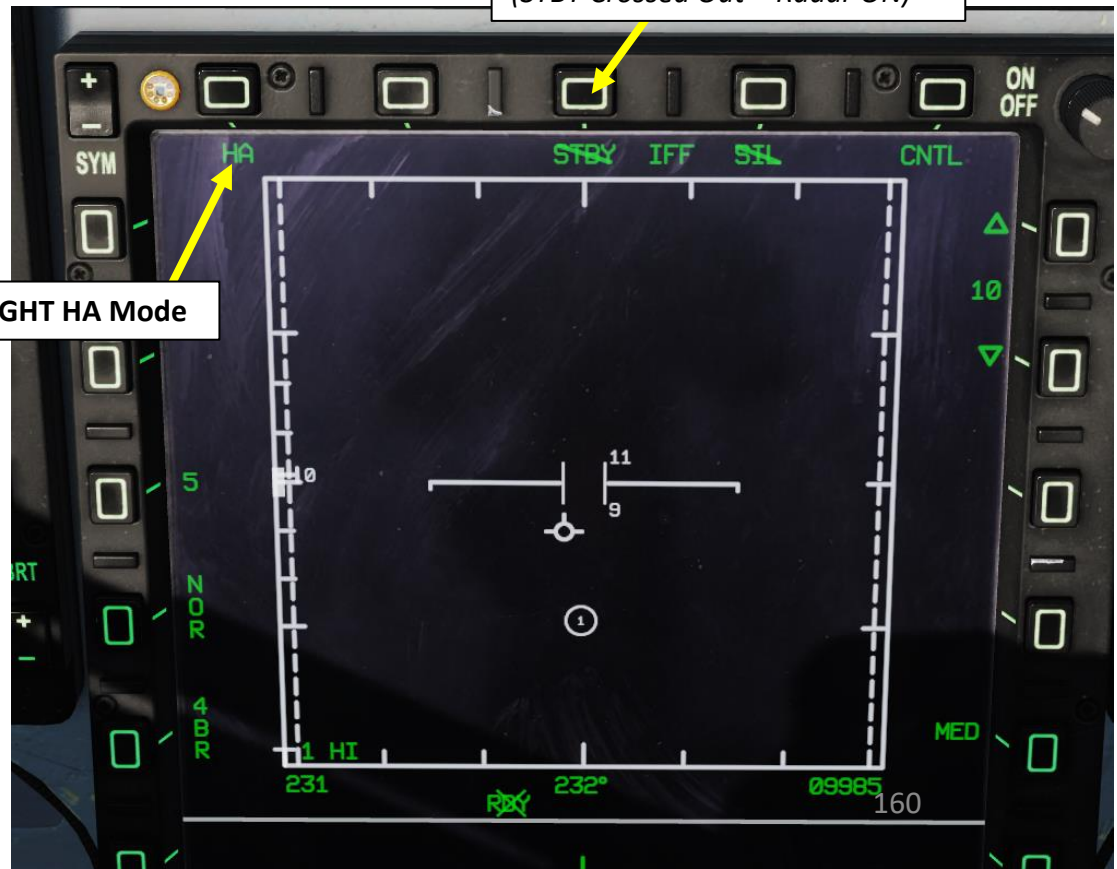
To enter ACM HA mode:

1. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
2. Select ACM Mode by pressing the S1 Sensor Selection Switch FWD.
3. Select ACM HA Sub-Mode by pressing the S2 Sensor Control Switch RIGHT.
4. In ACM sub modes, radar will automatically scan and lock target with a max lock target range of 10 nm. When a target is locked, radar will exit ACM mode automatically and go in STT (Radar Lock).
5. You can exit ACM mode by pressing the MMS (Master Mode Switch) UP to INTC (Intercept)



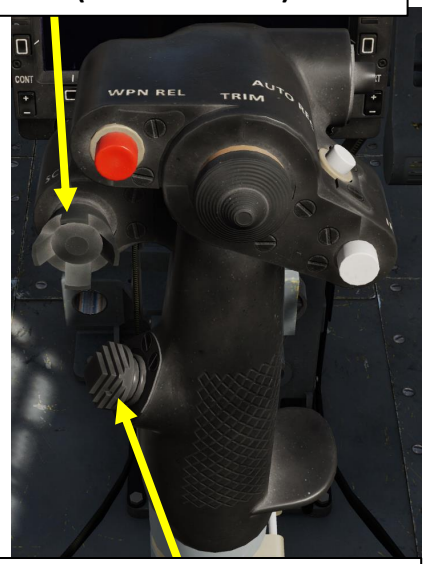
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

Radar Standby/ON Selector
(STBY Crossed Out = Radar ON)



DOGFIGHT HA Mode

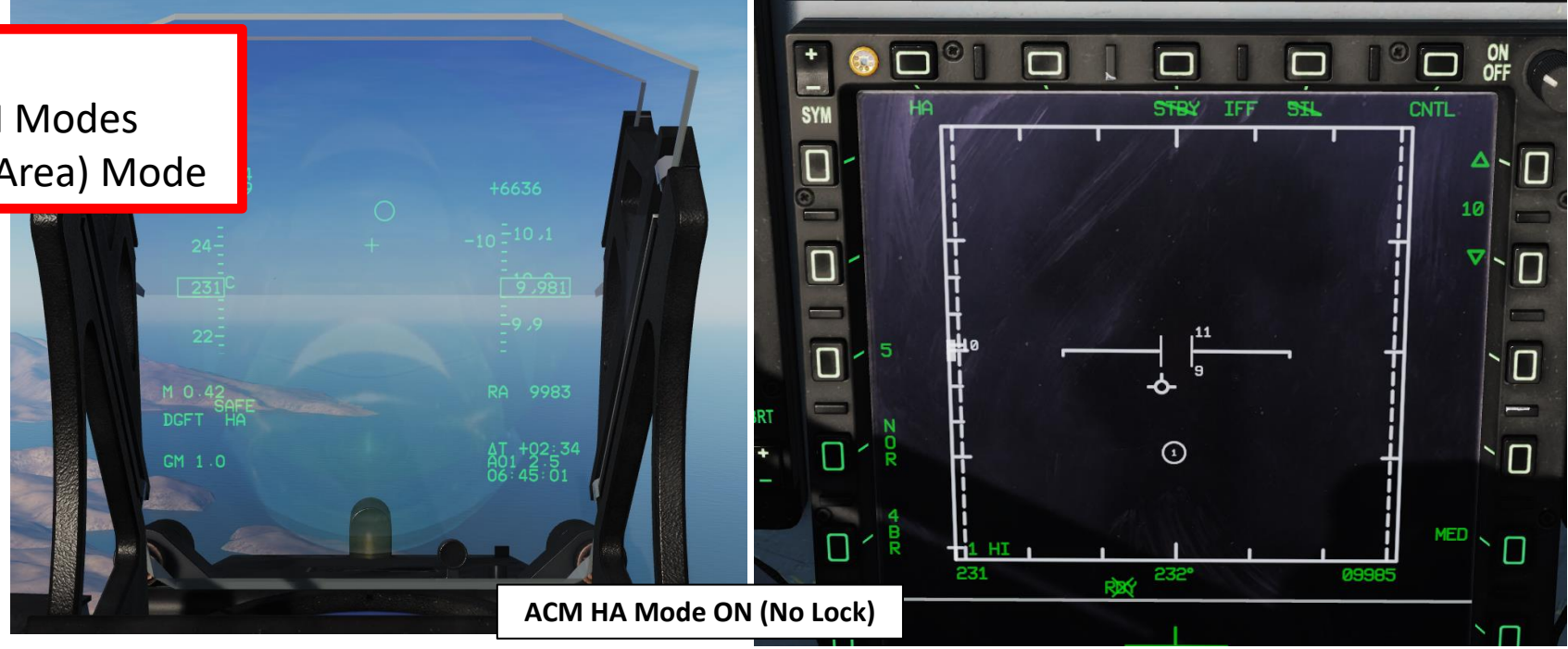
S2: SC (Sensor Control) Switch



S1: SS (Sensor Selection) Switch

DOGFIGHT HA Mode

KJL-7 RADAR
2.1.7 – Air-to-Air Radar ACM Modes
2.1.7.3 – HA (Heads-Up Display Area) Mode



ACM HA Mode ON (No Lock)

ACM HA Mode ON (With STT Lock)

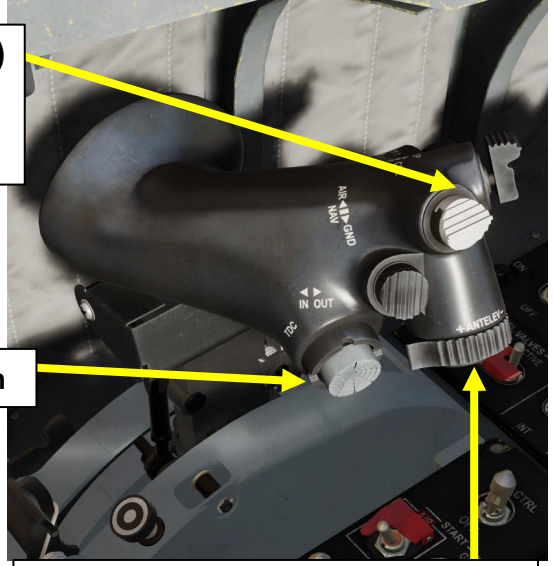
KJL-7 RADAR
2.1.8 – Air-to-Air Radar STT Mode (Radar Lock)

STT (Single Target Track) Mode is basically a radar lock mode.

To enter STT mode:

1. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
2. Enter either RWS, TWS, VS, SAM or ACM radar mode.
3. Acquire Radar Lock:
    1. **If TWS mode is selected:**
        a) Slew the **TDC (Target Designator Controller)** over a desired target and "bug" him by pressing the T5/TDC PRESS (ENTER). This is NOT a radar lock; you have merely set a target as the HPT (High Priority Target), which is represented as a circle. Other SPTs (Secondary Priority Targets) will be displayed as well without a circle.
        b) Press the TDC (ENTER) a second time to radar lock the desired target to STT (Single Target Track) mode.
        c) You can unlock target by using the S2 Sensor Control Switch DEPRESS.
    2. **If RWS or VS mode is selected:**
        a) Slew the **TDC (Target Designator Controller)** over a desired target and press the TDC (ENTER) to transfer from RWS to SAM mode. This is NOT a radar lock; you have merely set a target as the HPT (High Priority Target), which is represented as a circle. Other SPTs (Secondary Priority Targets) will be displayed as well without a circle.
        b) Press the TDC (ENTER) a second time to radar lock the desired target to STT (Single Target Track) mode.
        c) You can unlock target by using the S2 Sensor Control Switch DEPRESS.
    3. **If any ACM sub-modes is selected:**
        a) radar will automatically scan and lock target with a max lock target range of 10 nm. When a target is locked, radar will exit ACM mode automatically and go in STT (Radar Lock).
        b) You can exit ACM mode by pressing the MMS (Master Mode Switch) UP to INTC (Intercept)

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



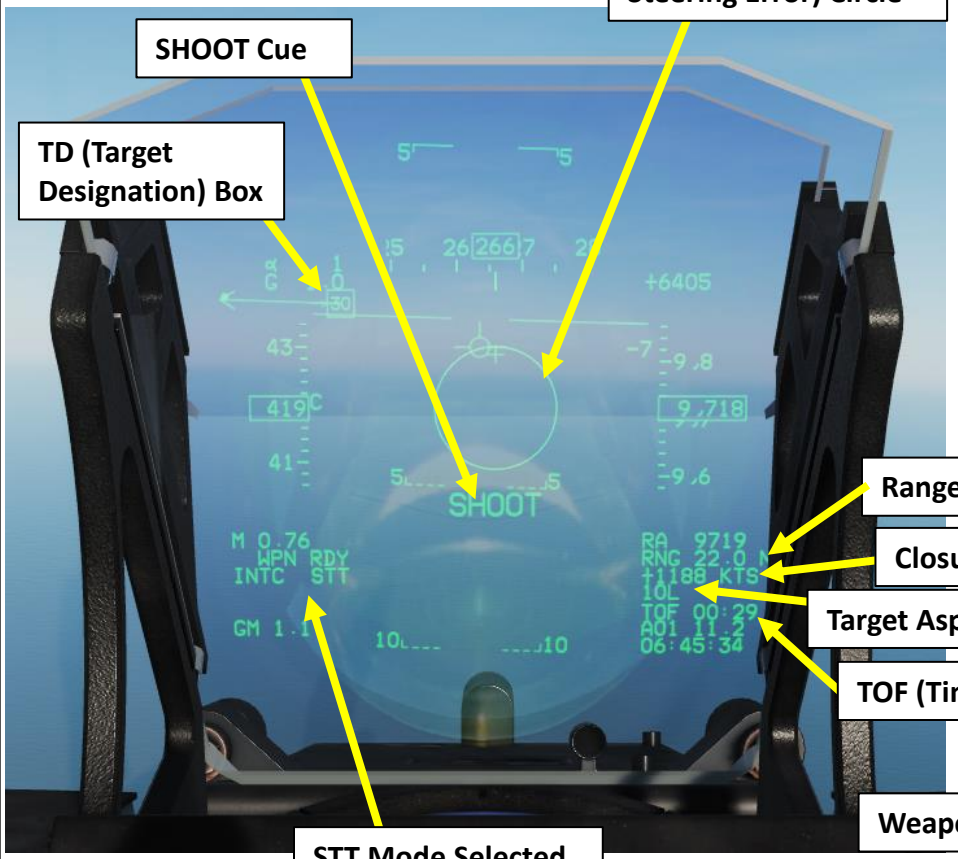
T5: TDC (Target Designator Controller) Switch

T6: Radar Antenna Elevation Switch

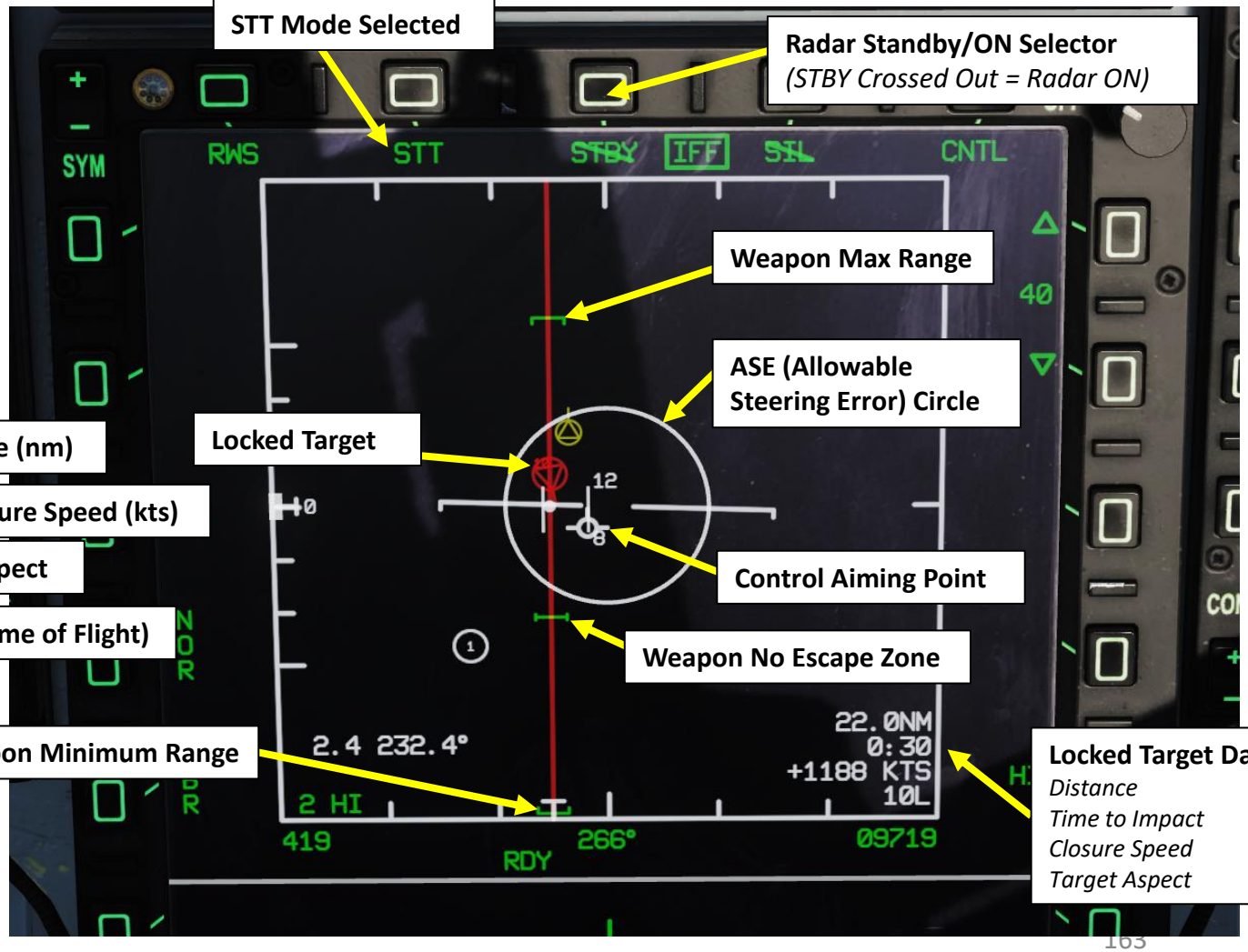
S2: SC (Sensor Control) Switch

S1: SS (Sensor Selection) Switch

KJL-7 RADAR
2.1.8 – Air-to-Air Radar STT Mode (Radar Lock)



TD (Target Designation) Box
- *Arrow > on the **left** of the box indicates target is within max range.*
- *Arrow ^ **below** the box indicates target is within no-escape zone.*
- *Arrow v **above** the box indicates target is beyond the no-escape zone.*
- *Arrow < on the **right** of the TD box indicates target is at minimum range.*

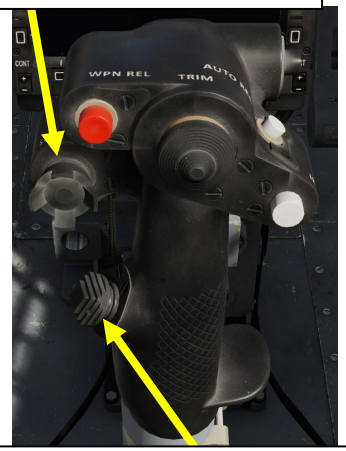


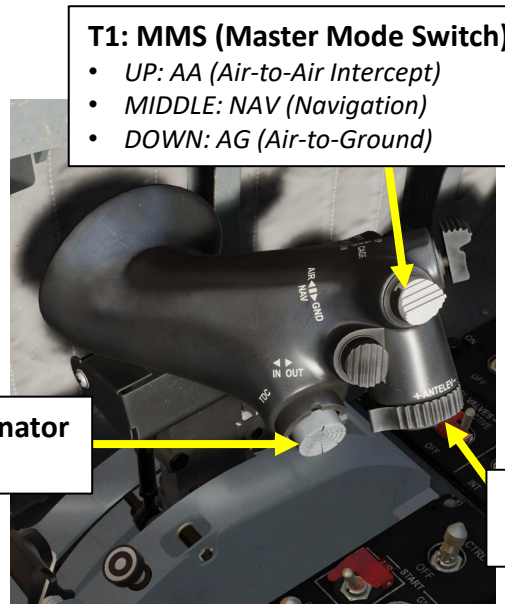
KJL-7 RADAR
2.1.9 – Air-to-Air Radar DTT Mode (Radar Lock)

DTT (Dual Target Track) Mode is basically a radar lock mode to lock one target (HPT) while tracking a second one (SPT).

To enter DTT mode:

1. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
2. Enter TWS radar mode.
3. Acquire Radar Lock:
   a) Slew the **TDC (Target Designator Controller)** over a desired target and "bug" him by pressing the T5/TDC PRESS (ENTER). This is NOT a radar lock; you have merely set a target as the HPT (High Priority Target), which is represented as a circle.
   b) Slew the TDC over another target and "bug" him as well by pressing the T5/TDC PRESS (ENTER). This contact will become a SPT (Secondary Priority Target) and it will be displayed as well, but without a circle.
   c) You will then enter DTT (Dual Target Track) mode.
   d) To switch between HPT and SPT, press the S2 Sensor Control switch LEFT.
4. Press the TDC (ENTER) a second time to radar lock the desired target to STT (Single Target Track) mode.
5. You can unlock target by using the S2 Sensor Control Switch DEPRESS.





KJL-7 RADAR
2.2.1 – Air-to-Ground Operating Modes

The Air-to-Ground Radar features several operating modes, each designed for specific tasks ranging from target detection and tracking to navigation and ranging. These modes will never be as precise as a targeting pod, but it has a much longer range and can see through cloud layers obscuring the view. Using these functionalities will be entirely up to you and the type of mission you're flying… and the type of ordnance you have available.

Here is an overview of the different modes available:

- **Ground Mapping (MAP)**
  - **Expanded Mapping Sub-Modes**
    - **EXP (Expanded Map)**
    - **DBS1 (Doppler-Beam-Sharpened Level 1)**
    - **DBS2 (Doppler-Beam-Sharpened Level 2)**
  - **FTT (Fixed Target Track)**
- **Ground Moving Target Indicator (GMTI)**
  - **GMTT (Ground Moving Target Track)**

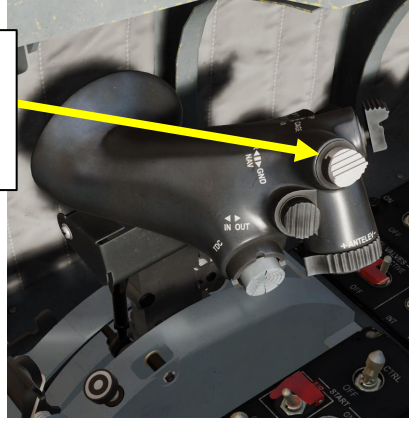
- **Weather Awareness (WA)**

- **Terrain Avoidance (TA)**

- **Sea Search (SEA) Modes**
  - **SEA1 Mode**
  - **SEA2 Mode**
  - **Sea Single Target Track (SSTT)**
  - **Sea Moving Target Track (SMTT)**

KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

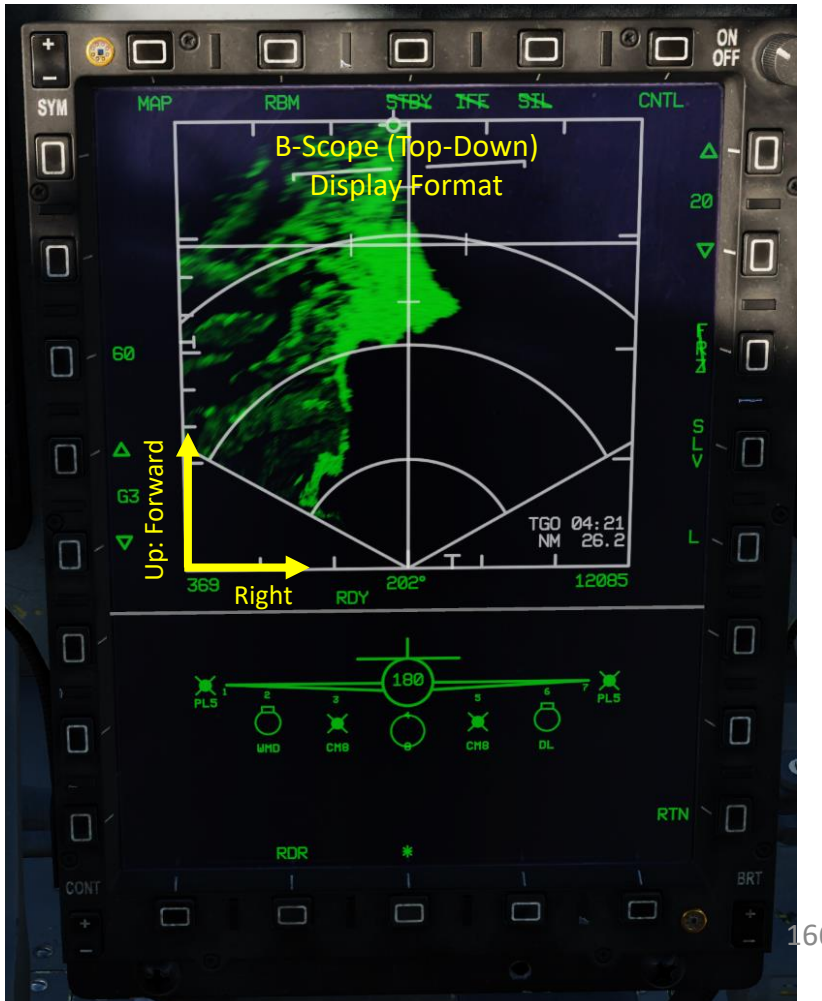
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



Display

The Ground Mapping mode is a B-scope raster scan of terrain ahead of the aircraft. Image intensity is a function of the strength of a radar return. Certain ground features will have higher intensity (e.g., buildings or vehicles) and others will have lower intensity (e.g., water). Terrain or tall structures will impede the radar beam from traveling further, creating distinctive shadows, giving the resulting image the appearance of an elevation relief map.

Keep in mind that in order to display the ground mapping overlay on the radar page, the A/G Master Mode should be selected with T1 (Master Mode Switch, MMS) set DOWN to AG (Air-to-Ground) and the "MAP" Mode should be selected from the RDR (Radar) page.



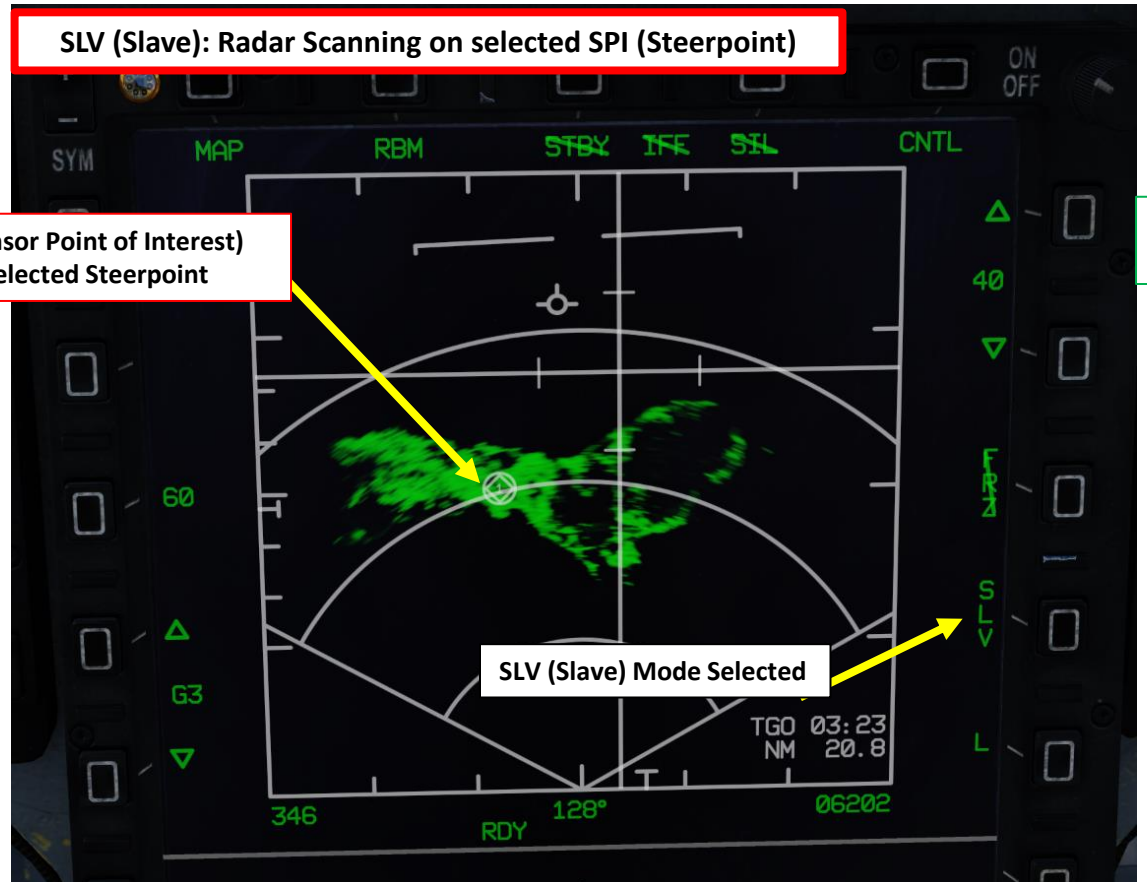
KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

Display

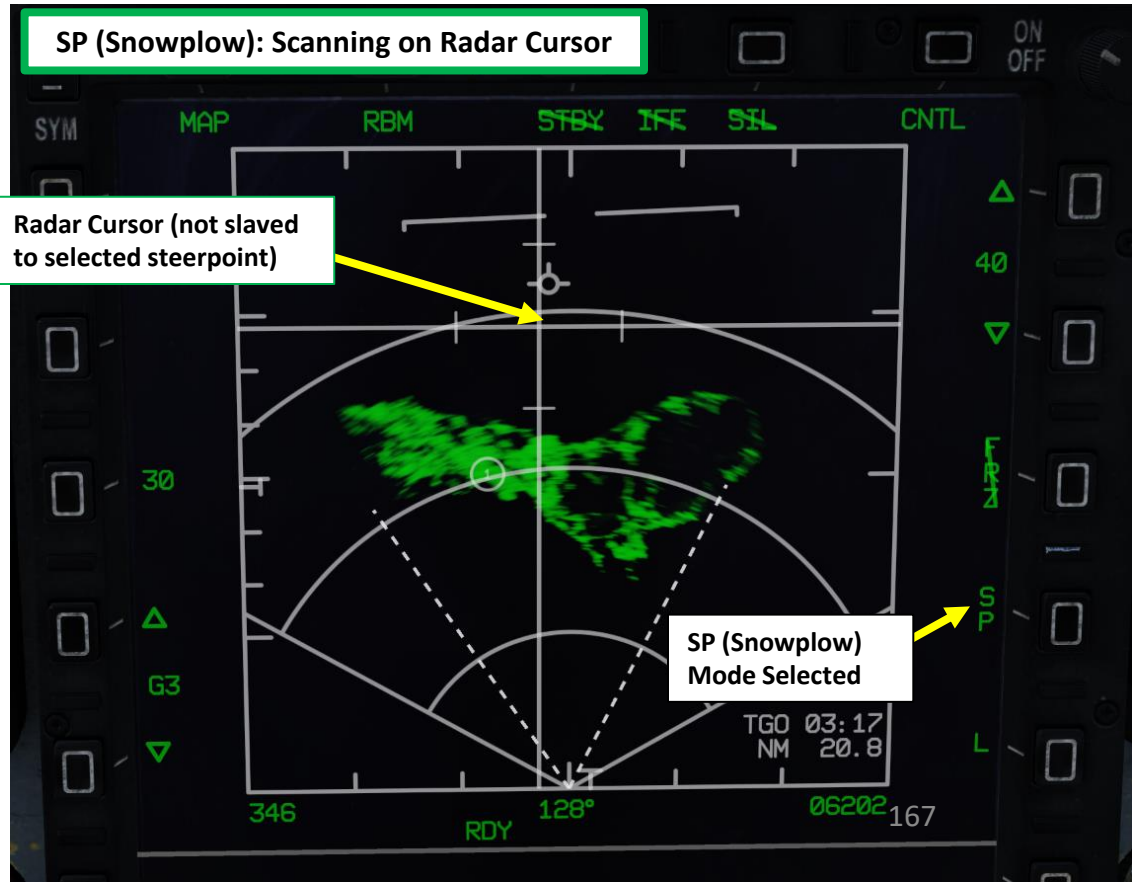
Normally, the radar operating in SLV (Slave) mode only **scans the area around the SPI** (Sensor Point of Interest, like a selected Steerpoint or a targeting pod area/point track), regardless of aircraft location or heading. If the SPI moves outside the radar field of view, the radar antenna is boresighted.

To scan directly on the radar cursor instead, use **Snowplow (SP) Mode**.

SLV (Slave): Radar Scanning on selected SPI (Steerpoint)



SP (Snowplow): Scanning on Radar Cursor

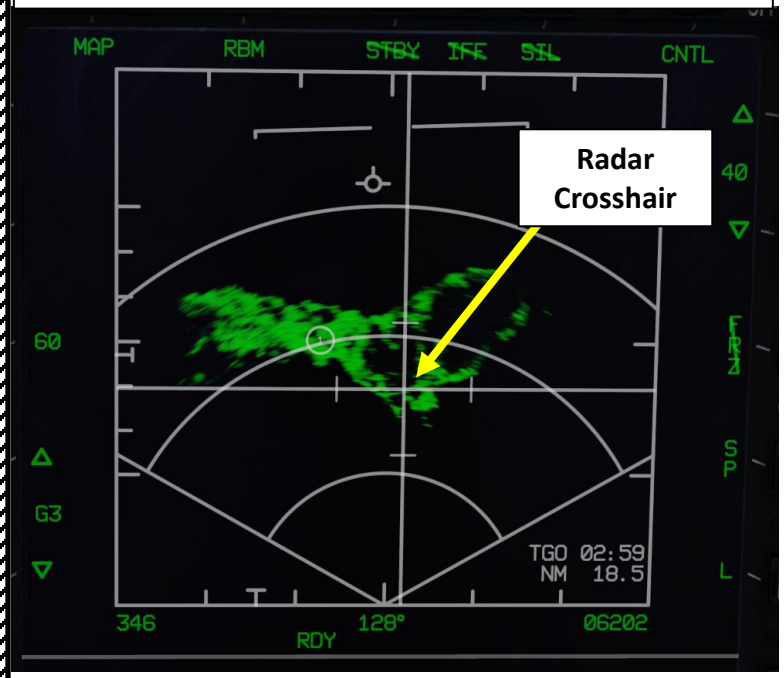


KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

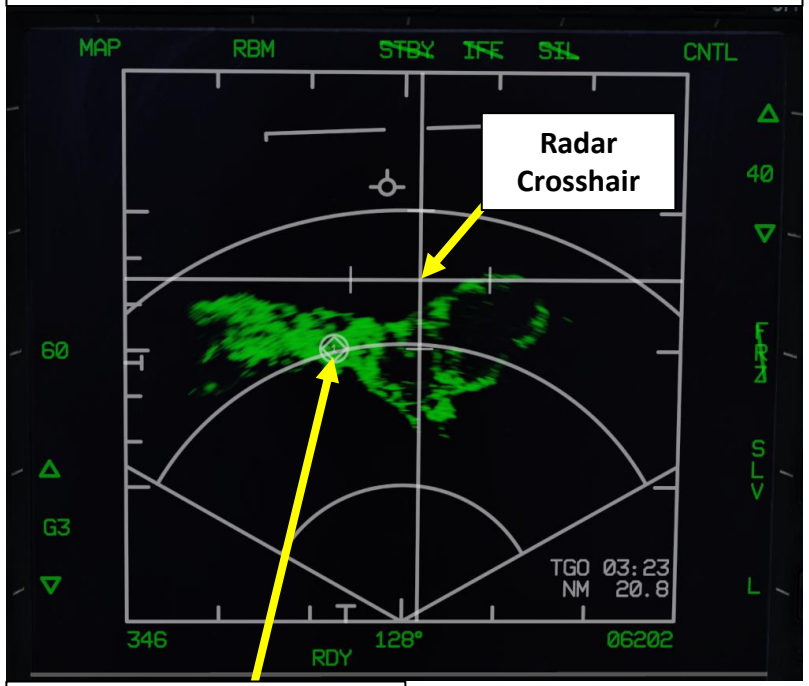
Display

The Radar Crosshair symbology indicates whether a Sensor Point of Interest (SPI) is designated from the radar page.

No Target Designated

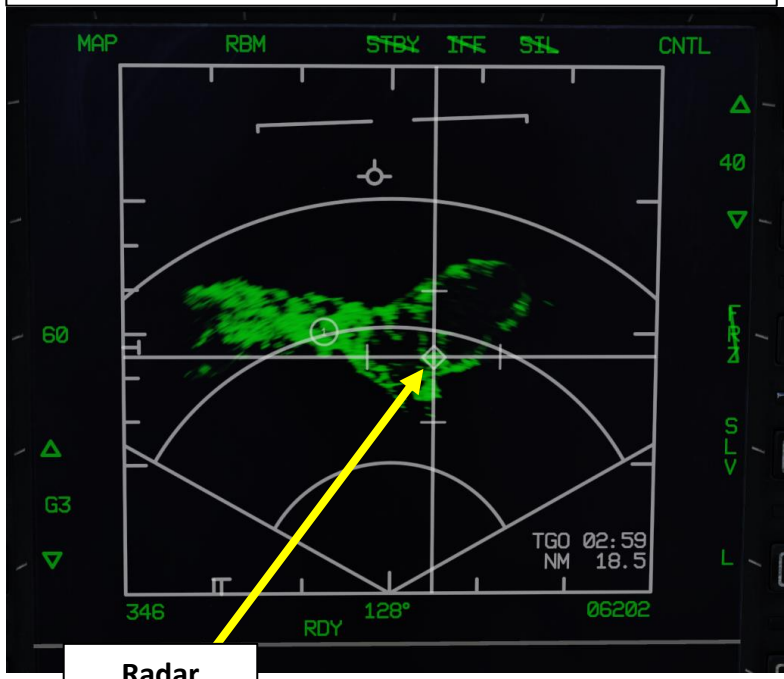


Steerpoint Designated as SPI



Steerpoint selected as SPI (Sensor Point of Interest)

Target Designated as SPI with Radar Crosshair



Radar Crosshair

KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

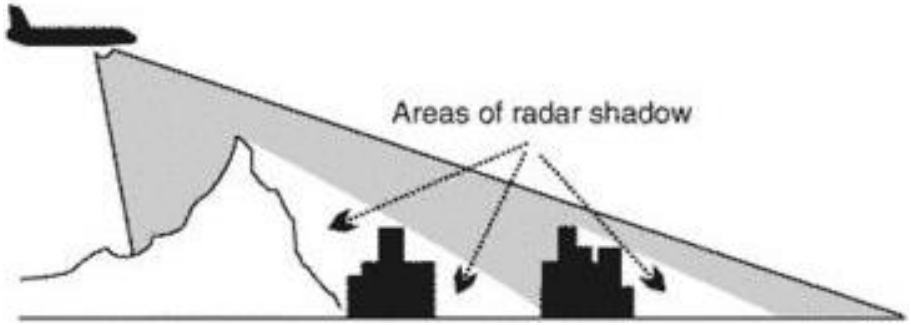
Display

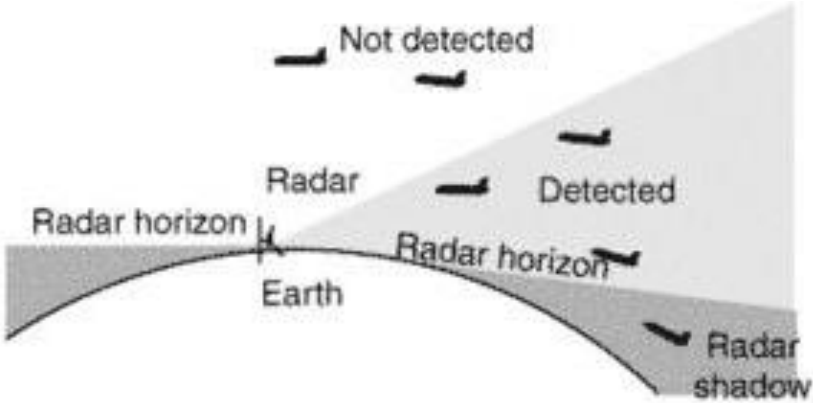
Regions that do not provide radar returns are black (such as water). The bright/green regions are generally man-made structures (buildings, power lines, roads, etc.) or mountains.

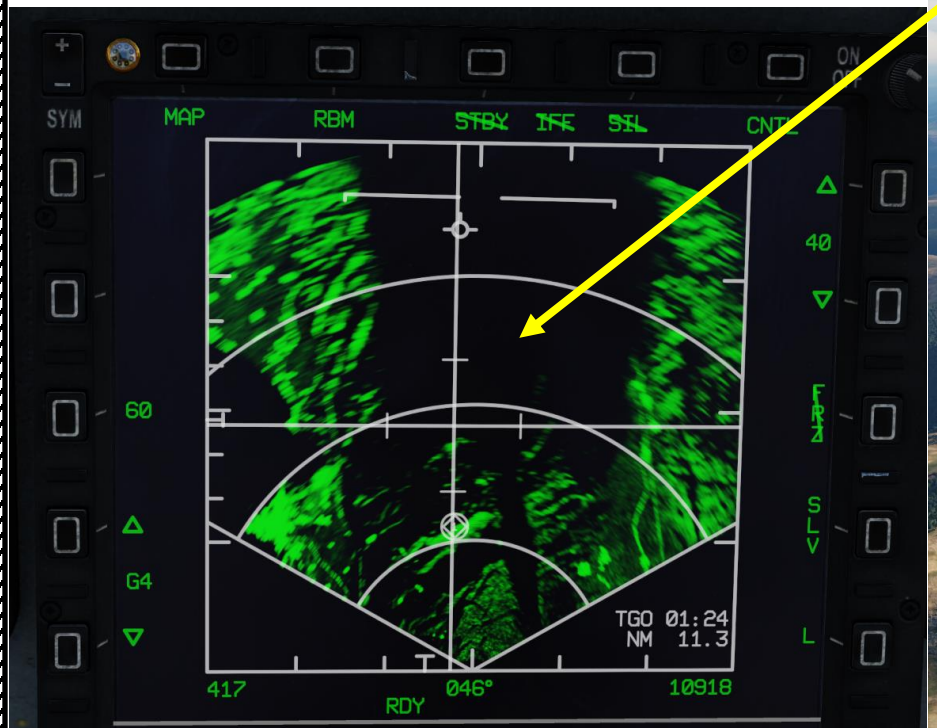
KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

Display

Some of the black areas on the MAP display are part of the radar shadow, which are regions behind hills or mountains that the radar cannot see behind.



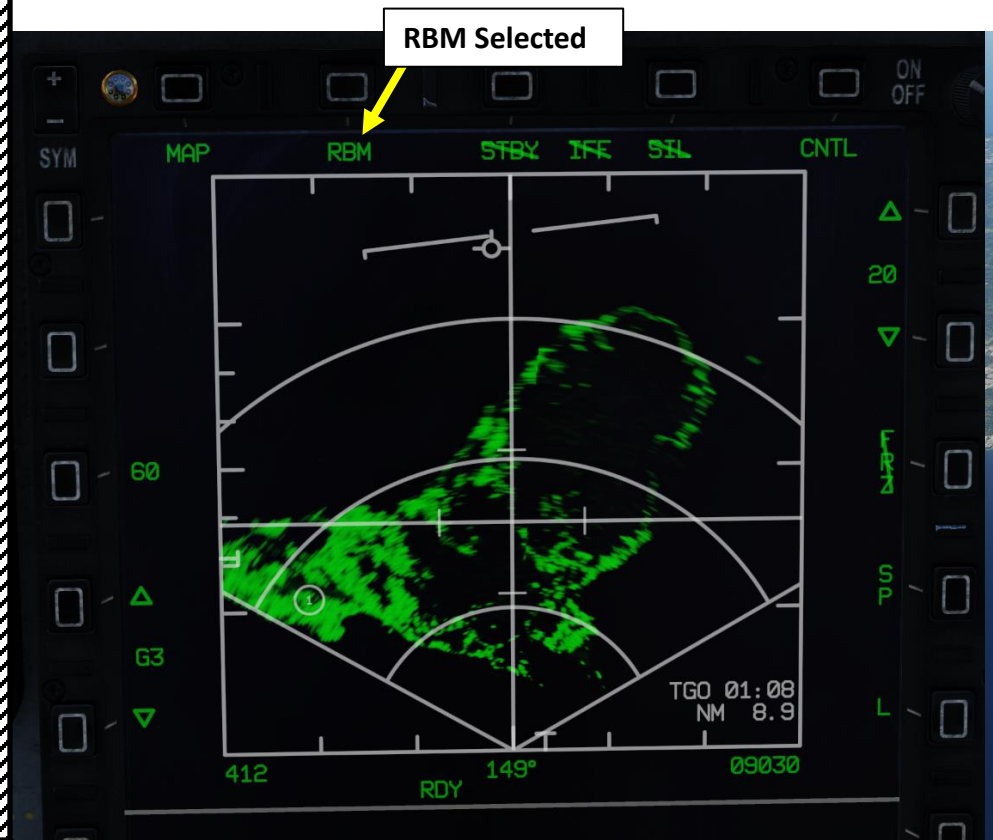




KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

RBM (Real Beam Mode) Image Processing

The Radar Sub-Mode OSB (Option Select Button) on the MAP radar page allows you to select between Real Beam Mode (RBM) and other expanded image processing modes (EXP, DBS1, DBS2), which will be explained later. The default ground mapping mode selected is **RBM (Real Beam Mode),** which uses raw radar data to quickly produce an image. The resolution is lesser than EXP, DBS1 or DBS2 sub-modes, but you get a faster image generation.



KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

Controls (MAP Page)

Here is an overview of the controls available from the Radar Ground Mapping (MAP) Page.

Air-to-Ground Radar Sub-Mode Selector
- *RBM (Real Beam Mode)*
- *EXP (Expanded)*
- *DBS1 (Doppler Beam Sharpening 1)*
- *DBS2 (Doppler Beam Sharpening 2)*

Display Symbology Brightness Control

Radar Silent Mode Selector

Radar MAP Control (CNTL) Page Selector

Air-to-Ground Radar Mode Selector
- *MAP (Ground Mapping)*
- *GMTI (Ground Moving Target Indicator)*
- *SEA1 (Sea Mode 1, Stationary + Moving Naval Targets)*
- *SEA2 (Sea Mode 2, Stationary Naval Targets)*
- *BCN (Beacon)*
- *WA (Weather Awareness)*
- *TA (Terrain Avoidance)*

Radar Distance Scale Setting (nm)

Frozen Radar Map Function Selector

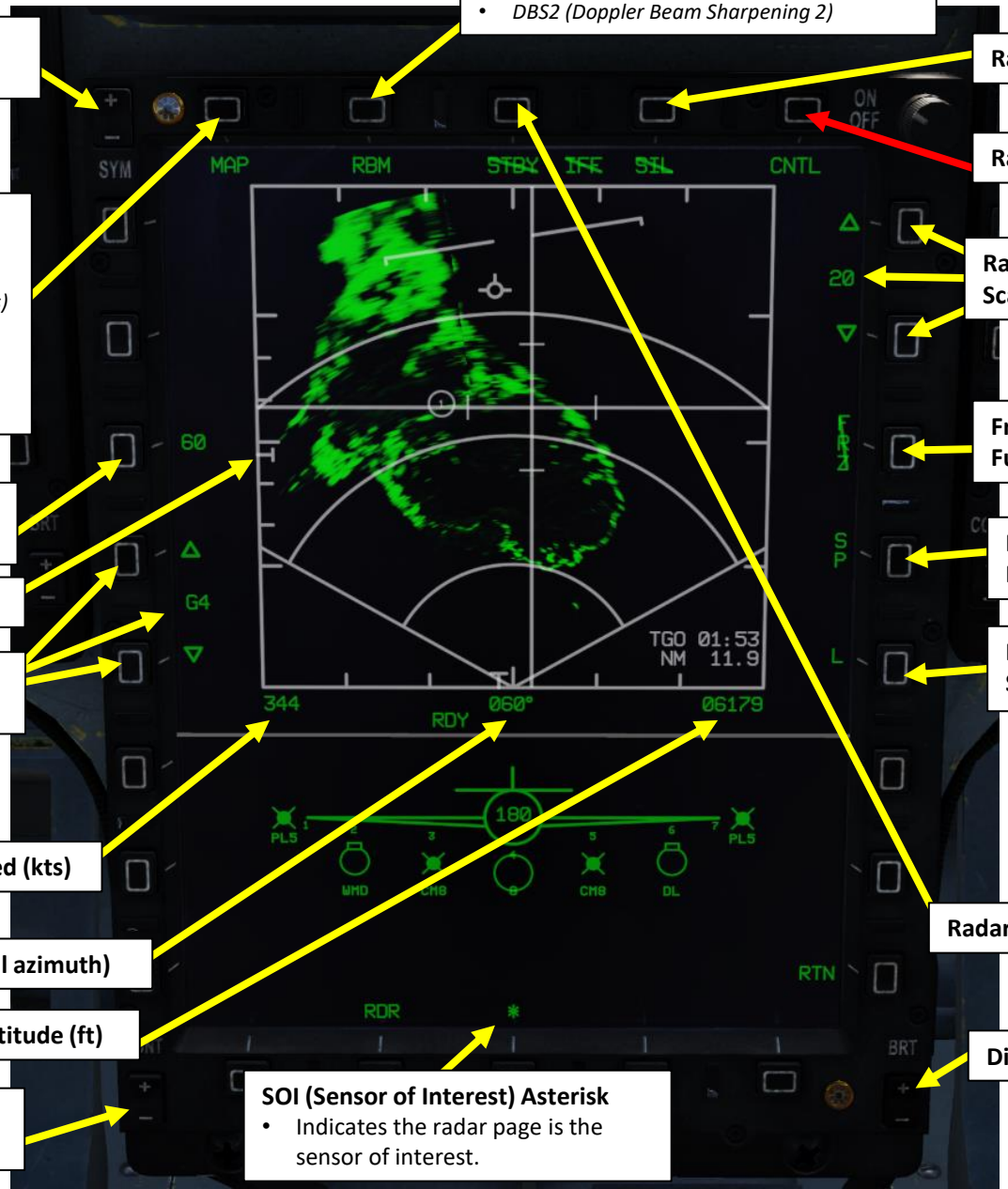
Radar Azimuth Selector (Coverage for half the total azimuth) *(can be set to 10/25/60 deg)*

Radar Snowplow/Slave Mode Selector

Radar Antenna Elevation Caret

Radar Speed Gate Setting *(LOW/HIGH)*

Radar Gain Level Indicator and Controls



Ownship Airspeed (kts)

Radar Standby Mode Selector

Radar Azimuth Indicator (Coverage for half the total azimuth)

Ownship Radar Altitude (ft)

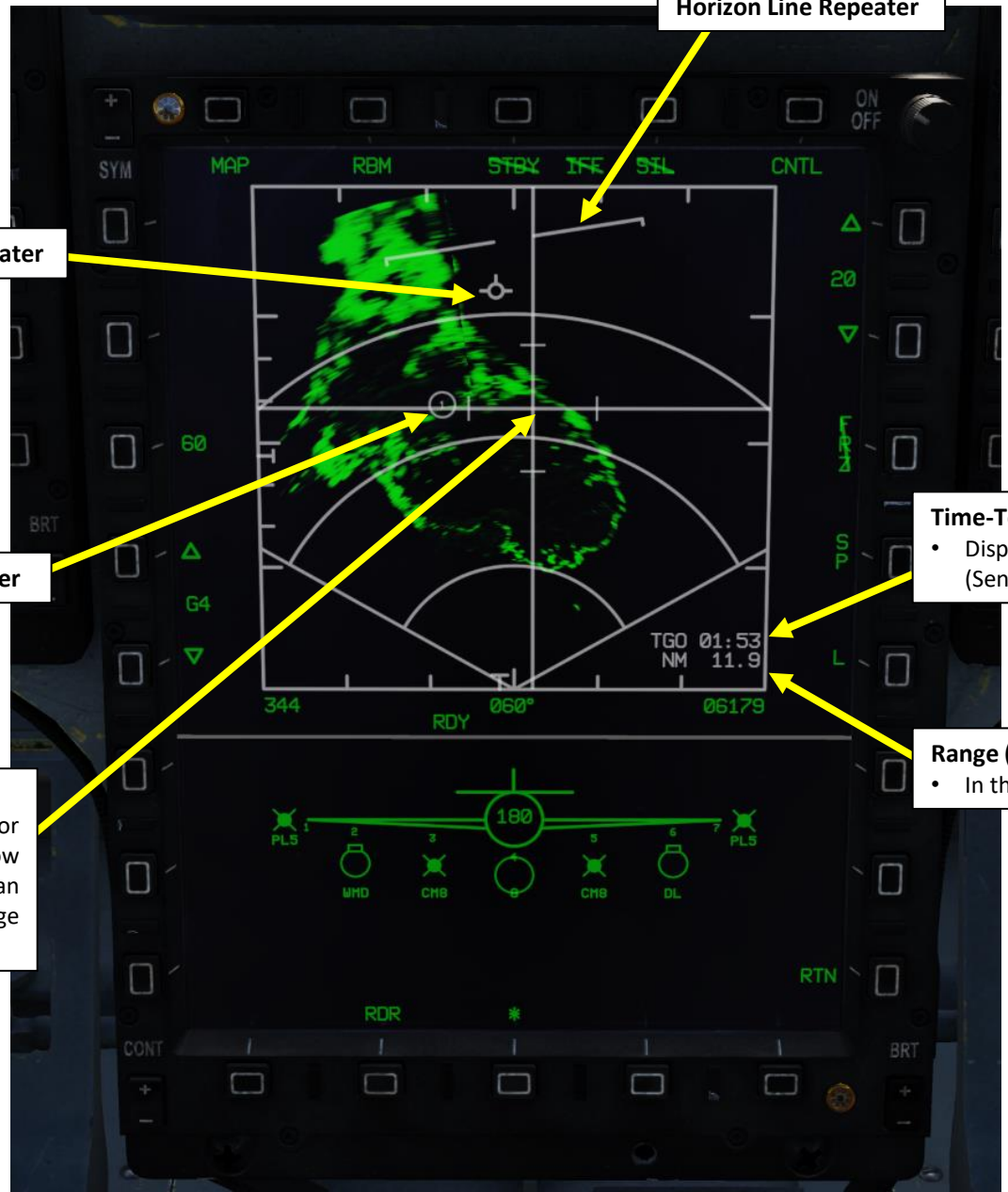
Display Brightness Control

Display Contrast Control

SOI (Sensor of Interest) Asterisk
- Indicates the radar page is the sensor of interest.

KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

Controls (MAP Page)



Horizon Line Repeater

Flight Path Marker (FPM) Repeater

Selected Waypoint Symbol and Number

Radar Crosshair/Cursor
- The crosshairs indicate the current sensor point of interest (SPI). When in snowplow mode, the TDC control on the throttle can be used to move the crosshairs and change the SPI.

Time-To-Go (TGO)
- Displays time until reaching the SPI (Sensor Point of Interest)

Range (nm) to SPI (Sensor Point of Interest)
- In that case, the SPI is on the Radar Crosshair.

KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

Controls (MAP - CNTL Sub-Page)

Here is an overview of the controls available from the Radar Ground Mapping (MAP) CNTL (Control) Sub-Page.

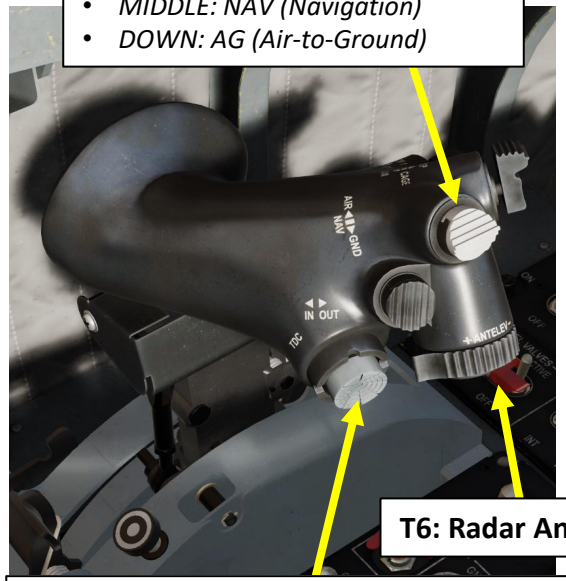
KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

Controls (HOTAS)

Here is an overview of the HOTAS controls available for the radar when in air-to-ground mode.

- T1 (Master Mode Switch): DOWN sets Master Mode to Air-to-Ground
- T6: UP/DOWN Controls Radar Antenna Elevation
- T5: TDC (Target Designator Controller) Switch controls Radar Crosshair/Cursor
- S2 (Sensor Control) Switch:
  - FWD: Increases Display Range
  - AFT: Decreases Display Range
  - RIGHT: Changes Azimuth Scan Range and/or cancels DBS/EXP Sub-Mode
  - LEFT: Cycles between EXP, DBS1 and DBS2 Sub-Modes.
  - PUSH: Discards Target Designation

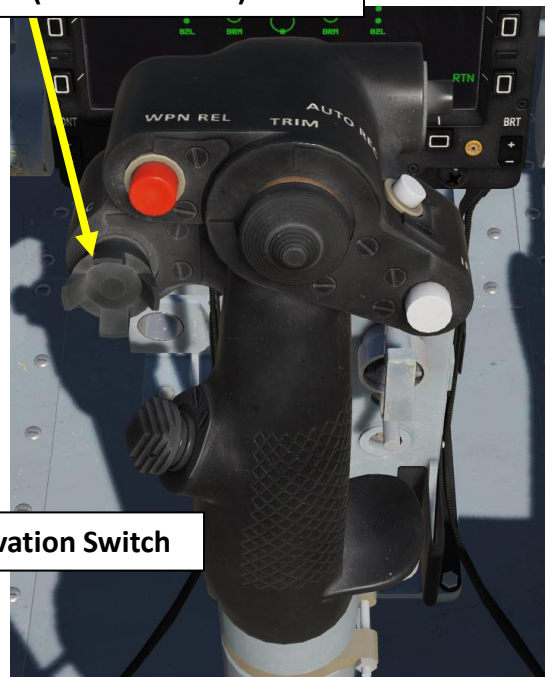
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

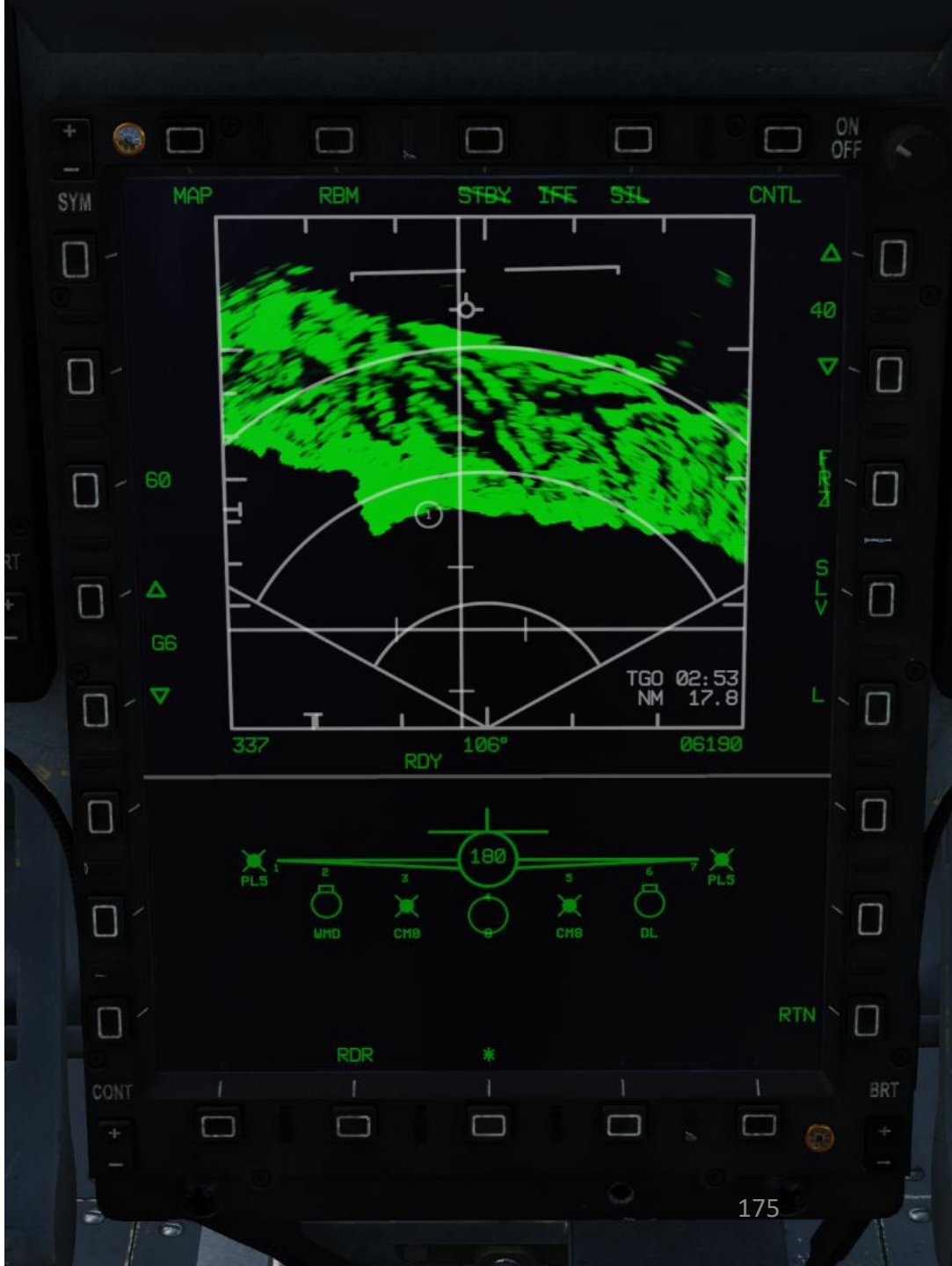


T5: TDC (Target Designator Controller) Switch

T6: Radar Antenna Elevation Switch

S2: SC (Sensor Control) Switch



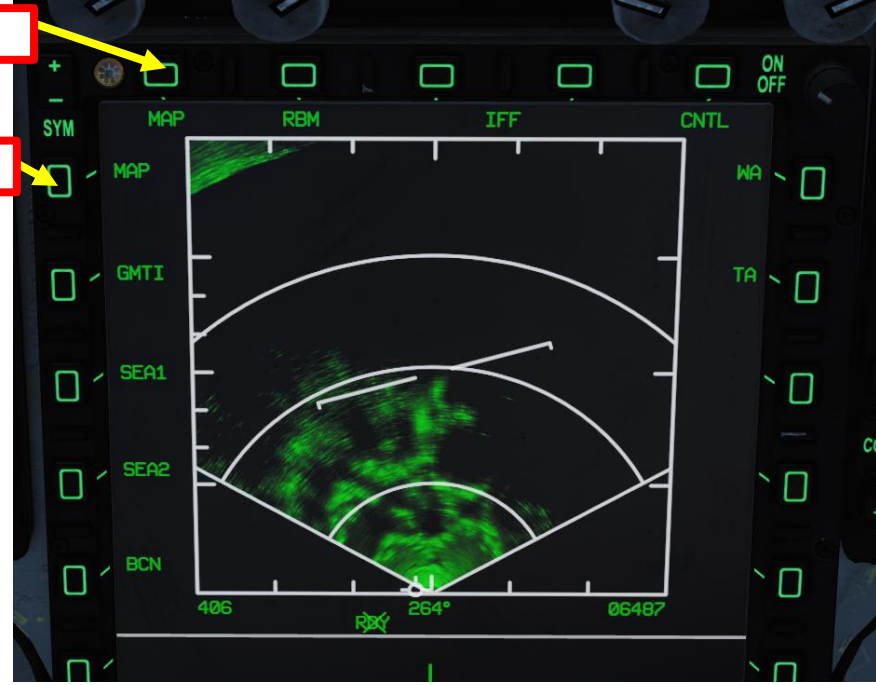


KJL-7 RADAR
2.2.2 – Air-to-Ground Radar MAP (Ground Mapping) Mode

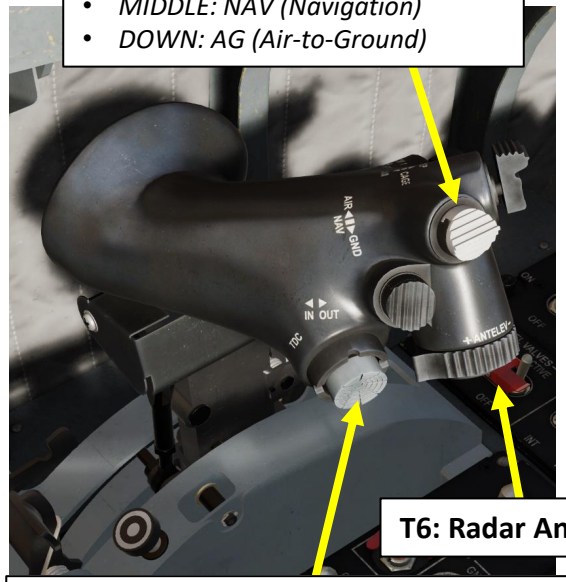
How to Select A/G Ground Mapping Mode

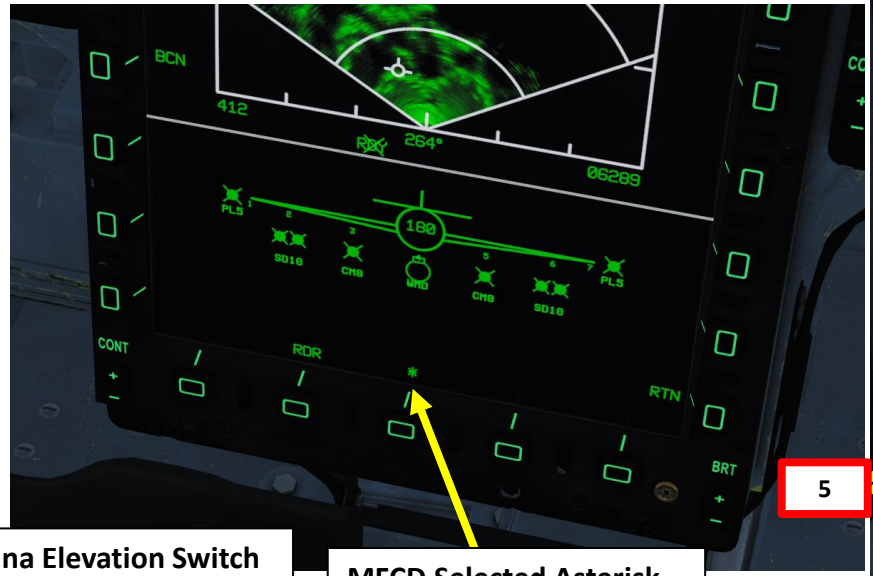
To display the ground mapping overlay on the Radar page:

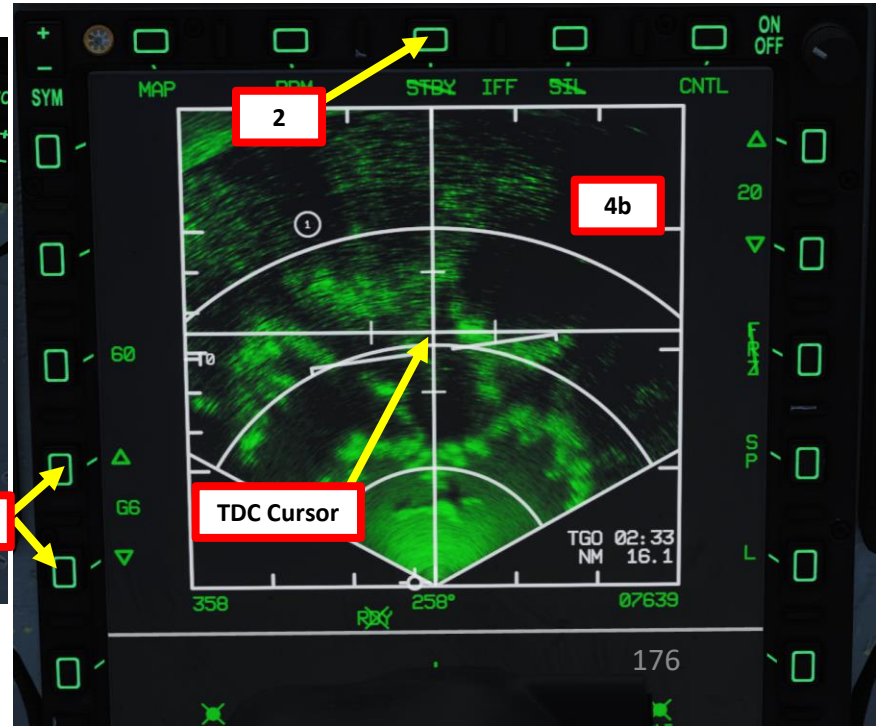
1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. If another Air-to-Ground Radar mode was selected, press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu.
4. Press on the OSB next to “MAP” to select Ground Mapping Mode.
5. Adjust Gain Control – As required.
6. You can control the radar antenna with the T6 Radar Antenna Elevation switch.



T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*







T6: Radar Antenna Elevation Switch

MFCD Selected Asterisk

T5: TDC (Target Designator Controller) Switch

KJL-7 RADAR
2.2.3 – Expanded Modes

Introduction to EXP Modes

When ground mapping (MAP) mode is selected, you can select « expanded » sub-modes, which can be seen as a « zoom » feature that can be used to designate target points for weapons delivery. These modes are called « Doppler-Beam-Sharpened » (DBS) modes since they are high resolution mapping modes used to identify and target detail down to individual structures or vehicles.

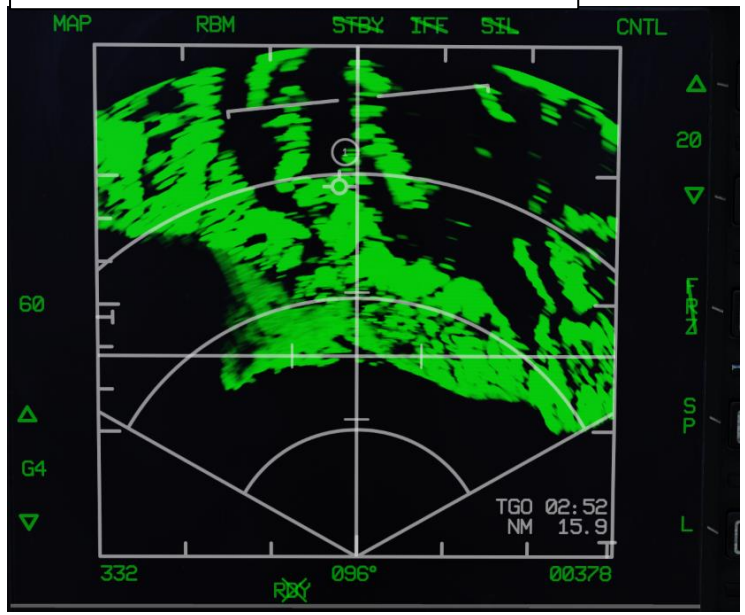
From the radar page or any expanded mode currently selected, you can access any of the three expanded sub-modes:

- **EXP Map**
  - EXP is the lowest resolution expanded mode, with a 4:1 expansion of the normal RBM scan area. The EXP format contains most of the same options and symbology described for the MAP mode.

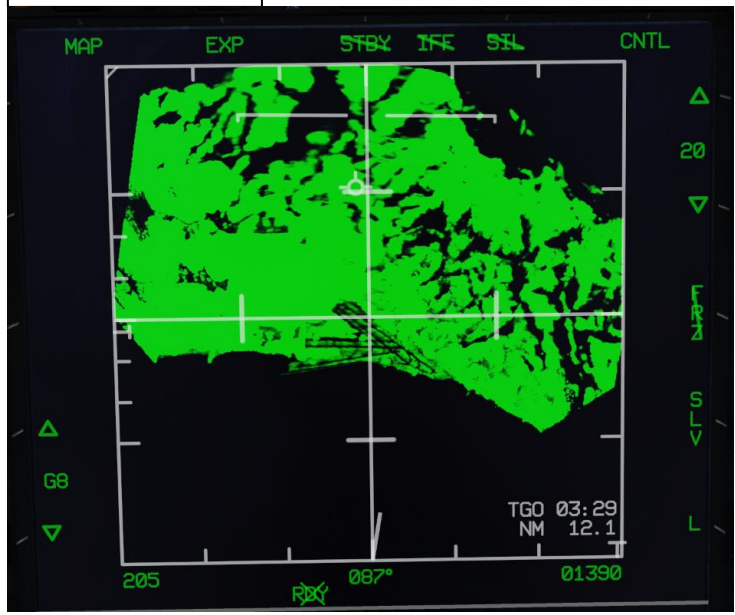
- **DBS1 Map**
  - DBS1 (Doppler Beam Sharpening mode level 1) is the next higher resolution mode up from EXP, but it has a smaller rendered area with a zoom-in scale of 8:1. The DBS mode can create a higher-resolution image than the enhanced ground mapping mode, though it takes longer to render the image. DBS level 1 produces a 8:1 sharpening. The rendered area is the same size as EXP mode.

- **DBS2 Map**
  - DBS2 (Doppler Beam Sharpening mode level 2) is the highest resolution expanded mode available. Level 2 creates an even sharper image, at 32:1, but raster takes longer than DBS1. The rendered area depends on range to target.

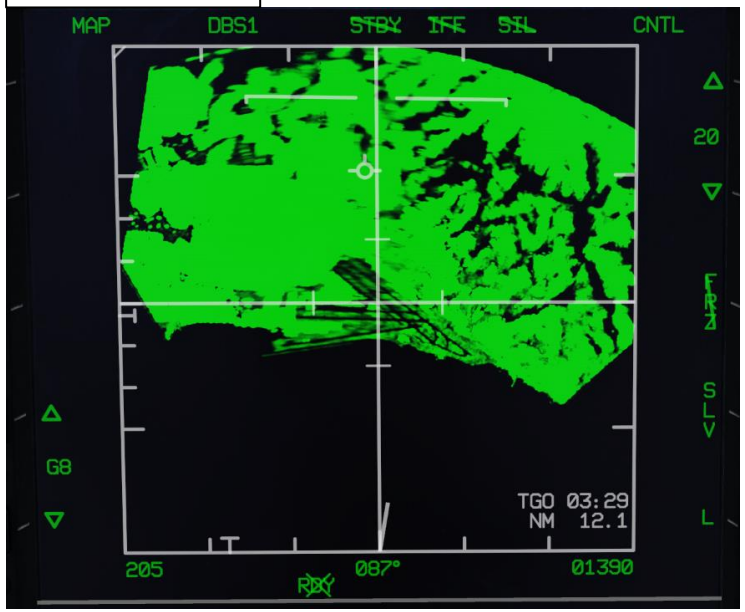
Ground Map Mode, RBM Normal Scan



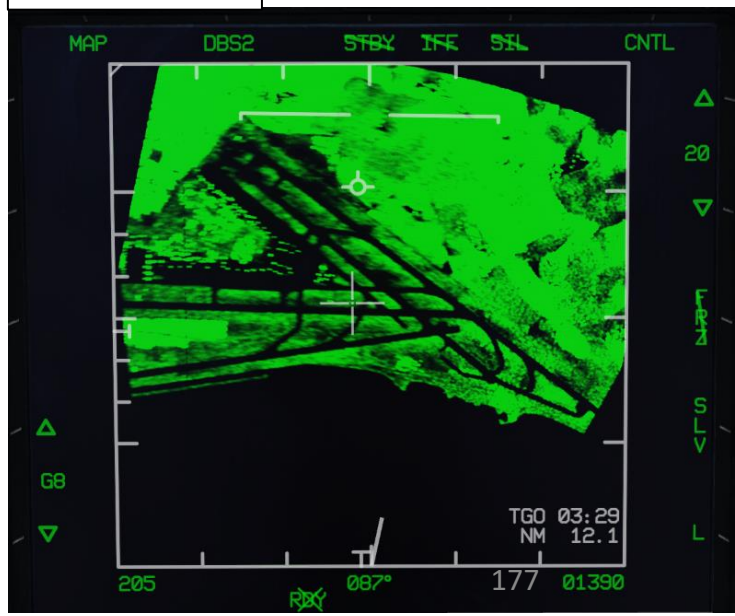
EXP Sub-Mode



DBS1 Sub-Mode



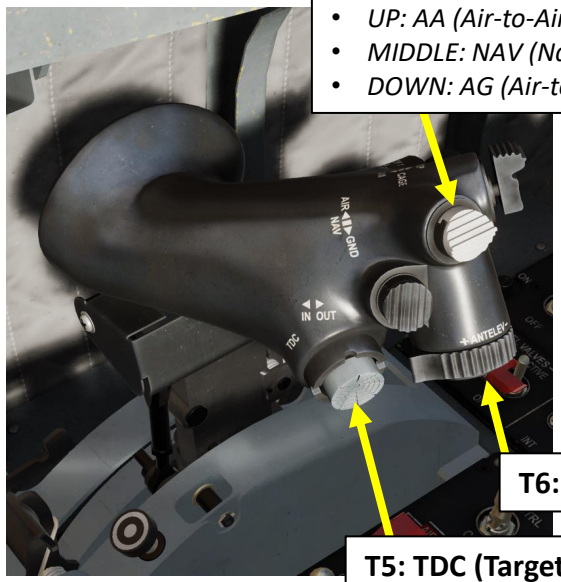
DBS2 Sub-Mode



KJL-7 RADAR
2.2.3 – Expanded Modes
2.2.3.1 – EXP Sub-Mode

How to Select EXP Sub-Mode

1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. If another Air-to-Ground Radar mode was selected, press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu and press on the OSB next to "MAP" to select Ground Mapping Mode.
4. Make sure Snowplow Mode is selected (OSB next to SP/SLV toggles Snowplow and Slave Modes).
5. Adjust Gain and Contrast– As required.
6. You can control the radar antenna with the T6 Radar Antenna Elevation switch.
7. Slew the TDC Cursor (Radar Crosshair) over the region you want to expand using the T5 TDC Switch.

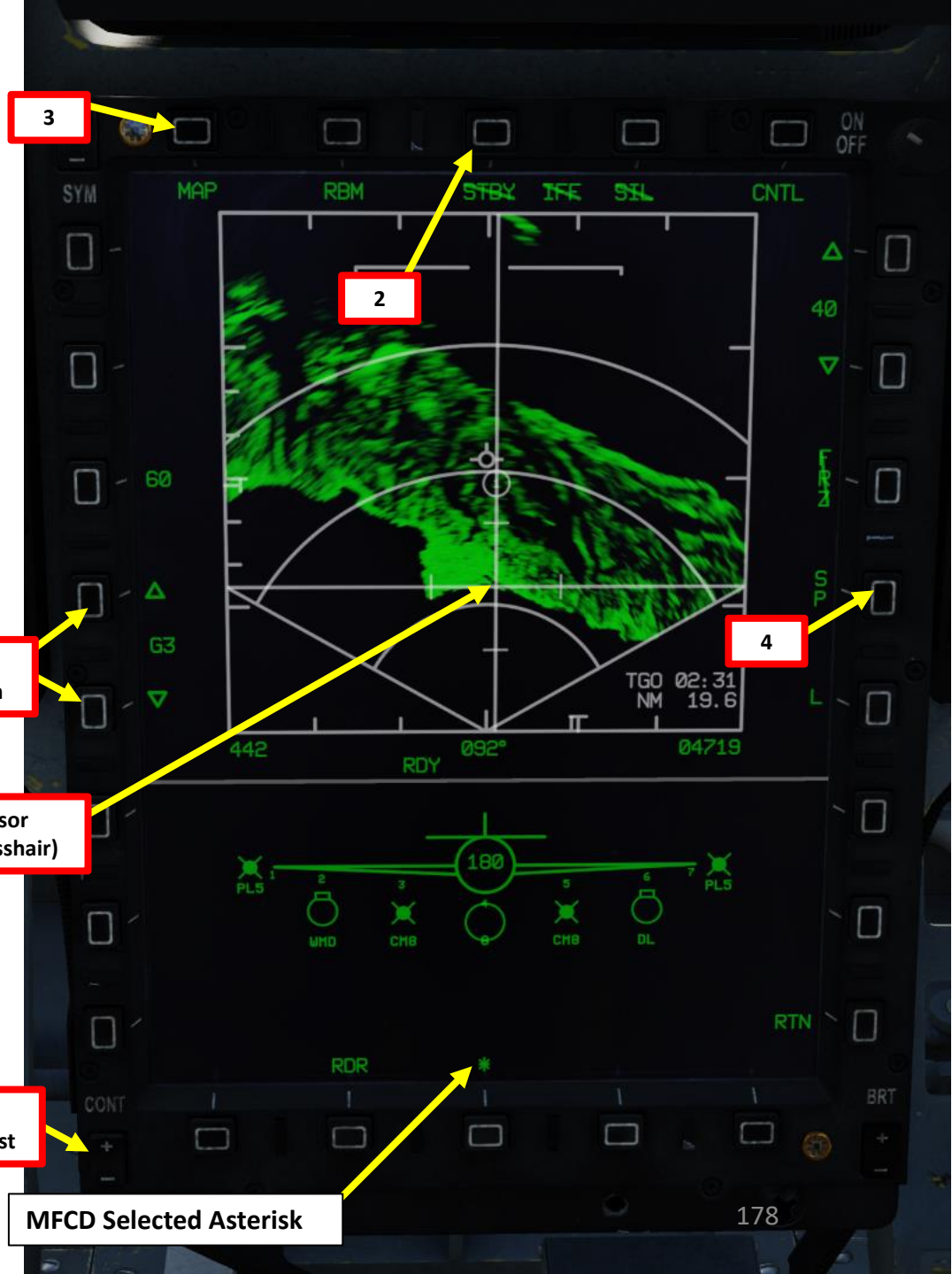


T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

1

T6: Radar Antenna Elevation Switch 6

T5: TDC (Target Designator Controller) Switch 7



3

2

5
Gain

4

7
TDC Cursor
(Radar Crosshair)

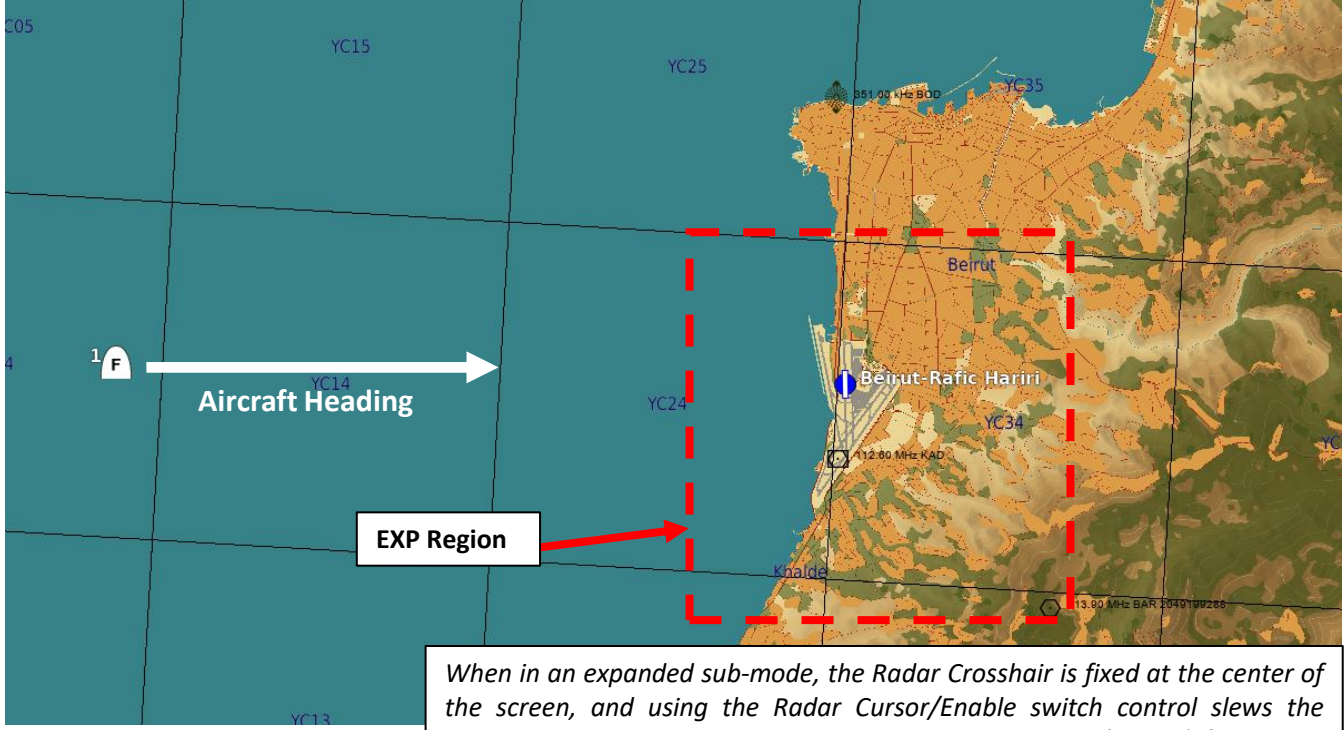
5
Contrast

MFCD Selected Asterisk

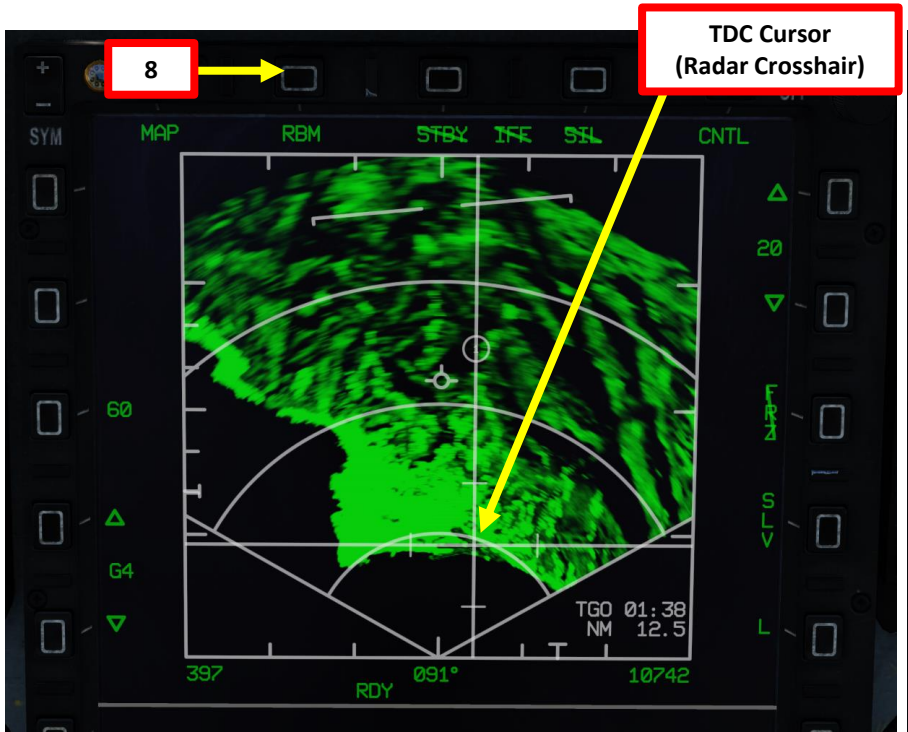
KJL-7 RADAR
2.2.3 – Expanded Modes
2.2.3.1 – EXP Sub-Mode

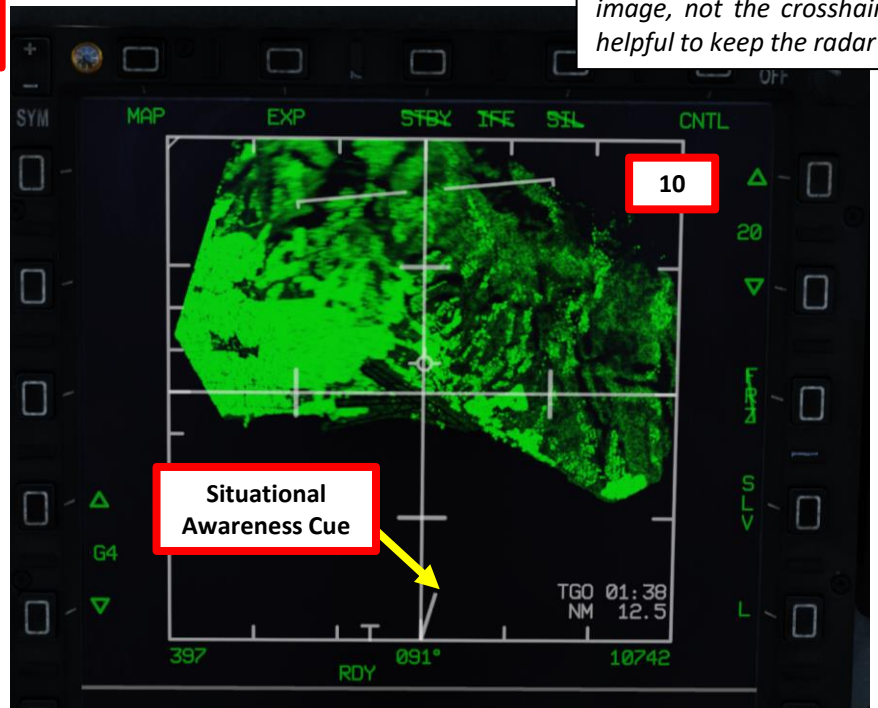
How to Select EXP Sub-Mode

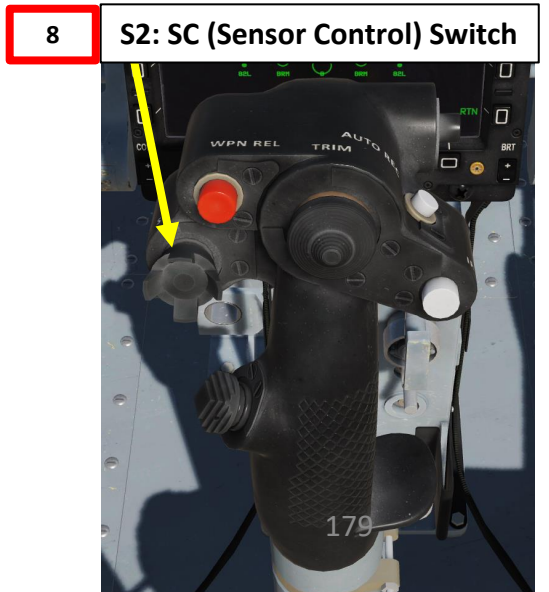
8. Once Radar Crosshair is over the region you want to expand, either press the S2/SC (Sensor Control) Switch LEFT or use the OSB next to the Radar Sub-Mode Selector to switch to from RBM (Real Beam Mode) to EXP (Expanded) Sub-Mode.
9. The air-to-ground radar will automatically adjust its range to give you a better view of the region you just expanded.
10. Once region is expanded with a 4:1 expansion of the normal scan area, a Situational Awareness Cue line appears on the display to show where the Radar Crosshair/Cursor is in relationship to the aircraft.
11. If you want to return to the normal RBM (Non-Expanded) mode, you can toggle between other Expanded Modes using the S2/SC (Sensor Control) Switch LEFT or use the OSB next to the Radar Sub-Mode Selector.



When in an expanded sub-mode, the Radar Crosshair is fixed at the center of the screen, and using the Radar Cursor/Enable switch control slews the image, not the crosshairs. Take note that using the FZ (Freeze) function is helpful to keep the radar image frozen while slewing.







KJL-7 RADAR
2.2.3 – Expanded Modes
2.2.3.2 – DBS1 Sub-Mode

How to Select DBS1 Sub-Mode

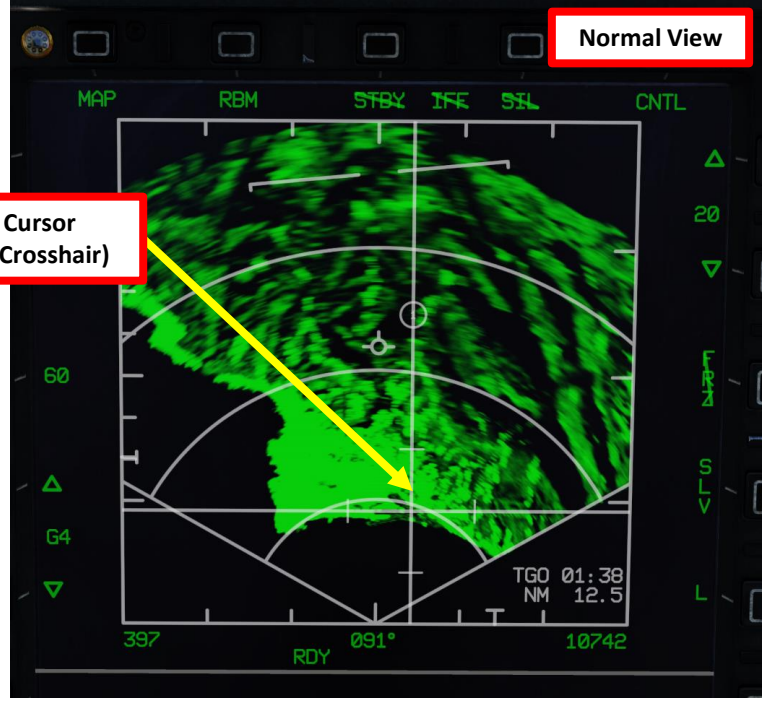
DBS1 (Doppler Beam Sharpening mode level 1) is the next higher resolution mode up from EXP. The DBS mode can create a higher-resolution image than the enhanced ground mapping mode, though it takes longer to render the image. DBS level 1 produces a 8:1 sharpening and zoom. The rendered area is the same size as EXP mode.

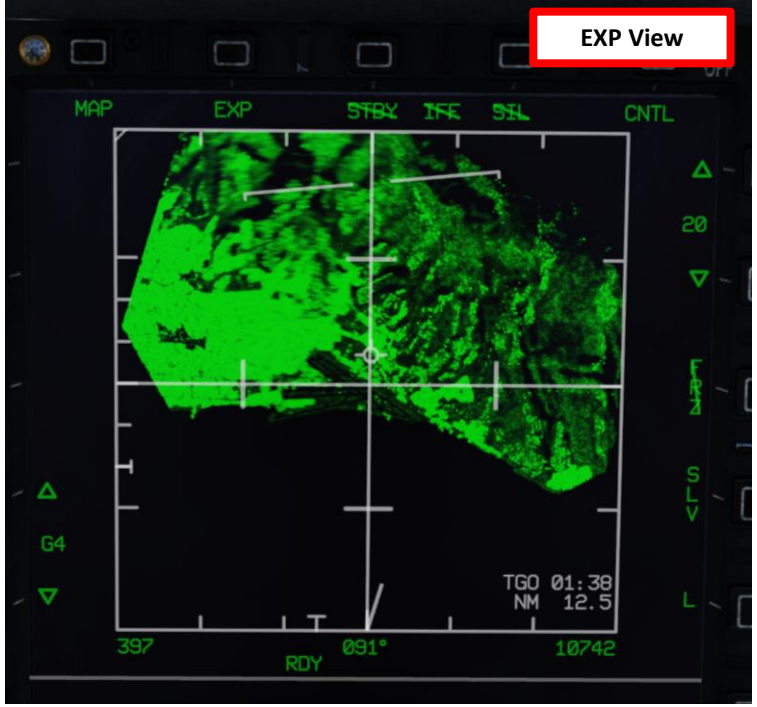
DBS1 Sub-Mode can be selected with the S2/SC (Sensor Control) Switch LEFT or the OSB next to the Radar Sub-Mode Selector once you have already expanded a region with EXP Sub-Mode.

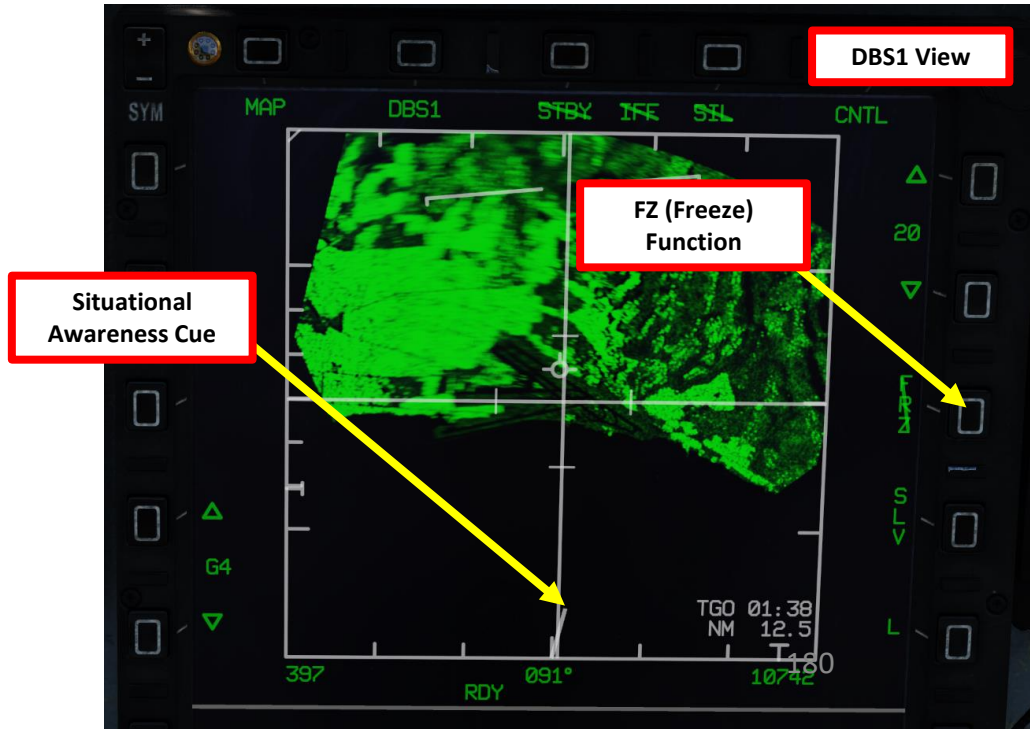
You can use the T5 TDC switch on the throttle to slew and radar crosshair and designate a SPI (Sensor Point of Interest) by pressing the T5 TDC PRESS switch (ENTER). The image will re-center around this designated SPI. You can also slew the TDC to the boundary of the radar frame to move the scanned area in the corresponding direction.

The Situational Awareness Cue line appears on the display to show where the Radar Crosshair/Cursor is in relationship to the aircraft. Take note that using the FZ (Freeze) function is helpful to keep the radar image frozen.

If you want to return to the normal RBM (Non-Expanded) mode, you can toggle between other Expanded Modes using the S2/SC (Sensor Control) Switch LEFT or use the OSB next to the Radar Sub-Mode Selector.







KJL-7 RADAR
2.2.3 – Expanded Modes
2.2.3.3 – DBS2 Sub-Mode

How to Select DBS2 Sub-Mode

DBS2 (Doppler Beam Sharpening mode level 2) is the highest resolution expanded mode available. Level 2 creates an even sharper image, at 32:1, but raster takes longer than DBS1. The rendered area depends on the range to target.

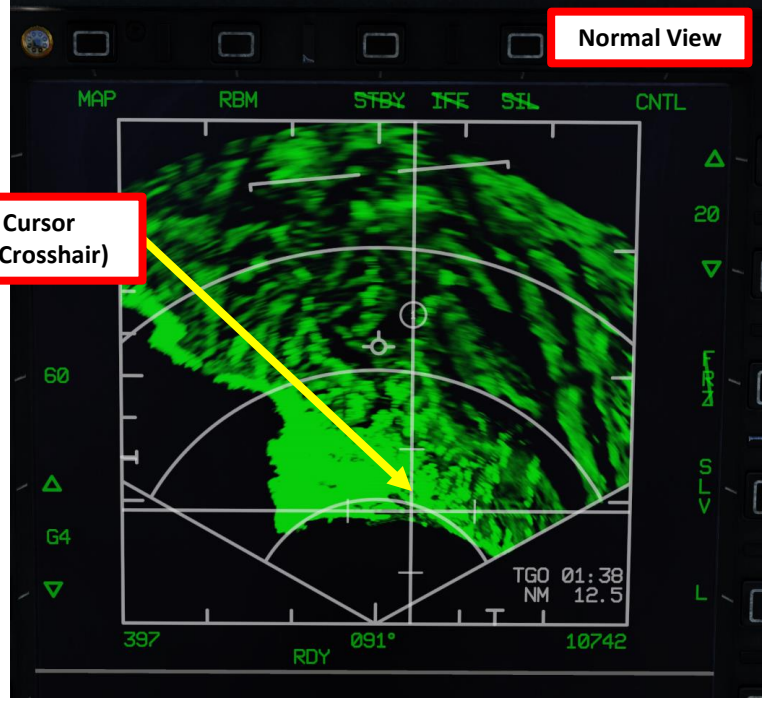
DBS2 Sub-Mode can be selected with the S2/SC (Sensor Control) Switch LEFT or the OSB next to the Radar Sub-Mode Selector once you have already expanded a region with EXP Sub-Mode, then expanded it again with DBS1 Sub-Mode.

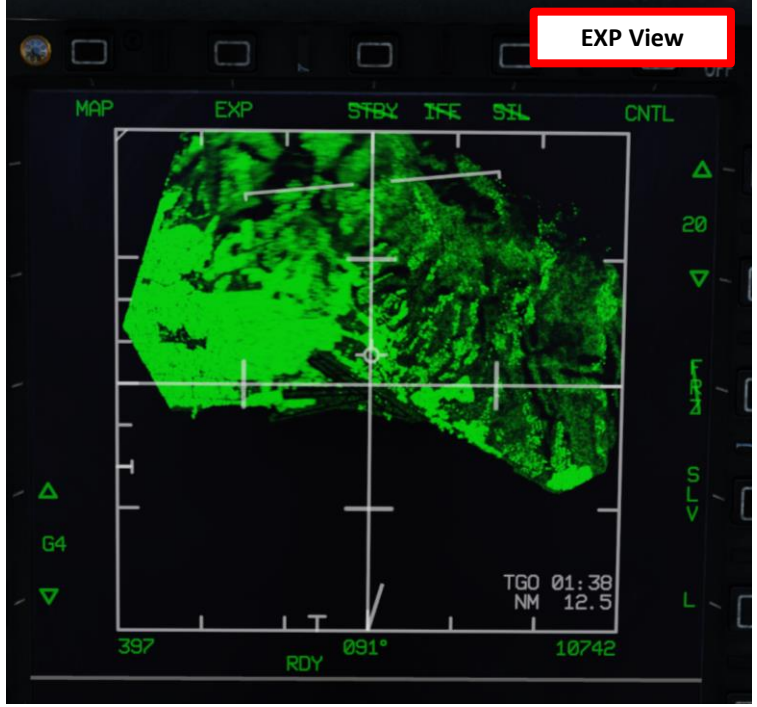
You can use the T5 TDC switch on the throttle to slew and radar crosshair and designate a SPI (Sensor Point of Interest) by pressing the T5 TDC PRESS switch (ENTER). The image will re-center around this designated SPI. You can also slew the TDC to the boundary of the radar frame to move the scanned area in the corresponding direction.

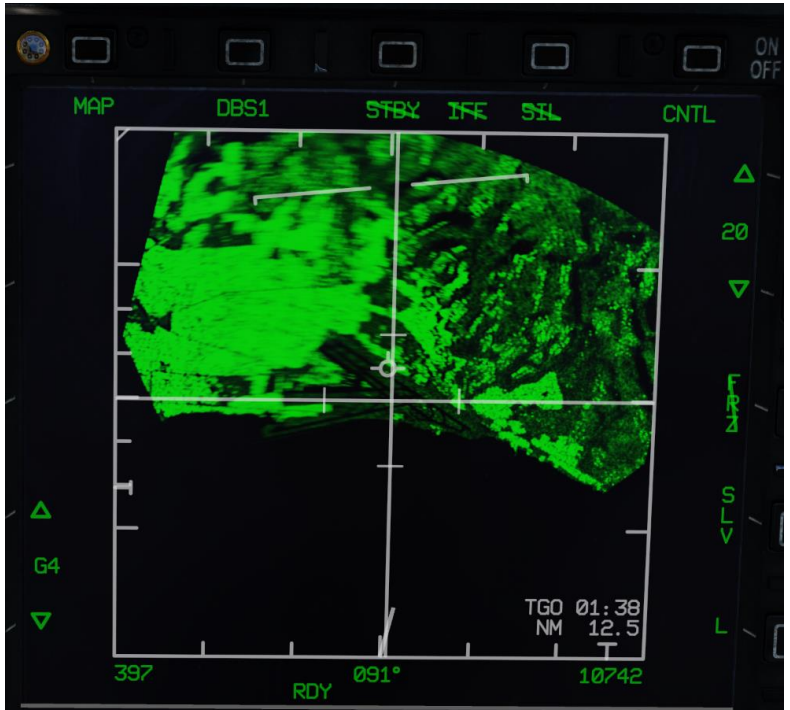
The Situational Awareness Cue line appears on the display to show where the Radar Crosshair/Cursor is in relationship to the aircraft. Take note that using the FZ (Freeze) function is helpful to keep the radar image frozen.

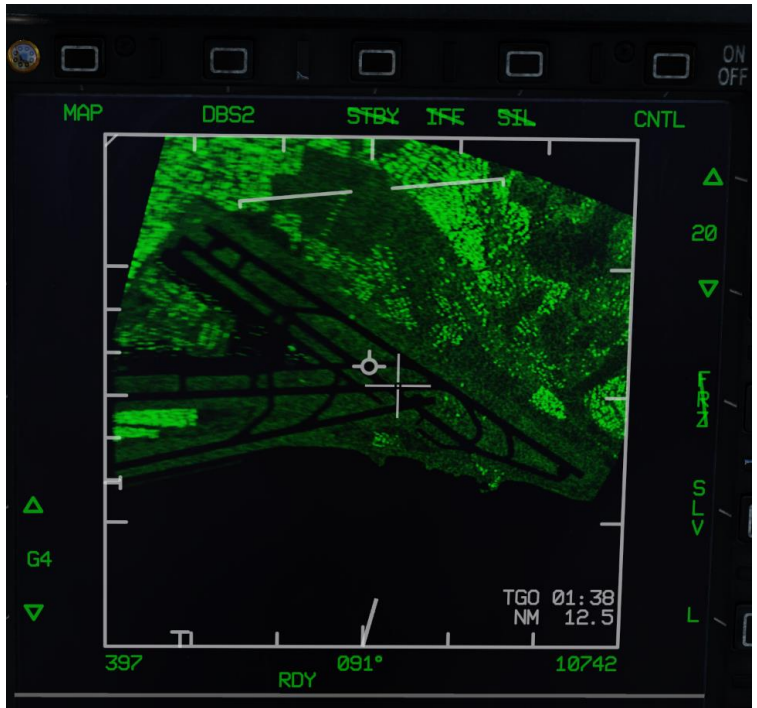
If you want to return to the normal RBM (Non-Expanded) mode, you can toggle between other Expanded Modes using the S2/SC (Sensor Control) Switch LEFT or use the OSB next to the Radar Sub-Mode Selector.

S2: SC (Sensor Control) Switch





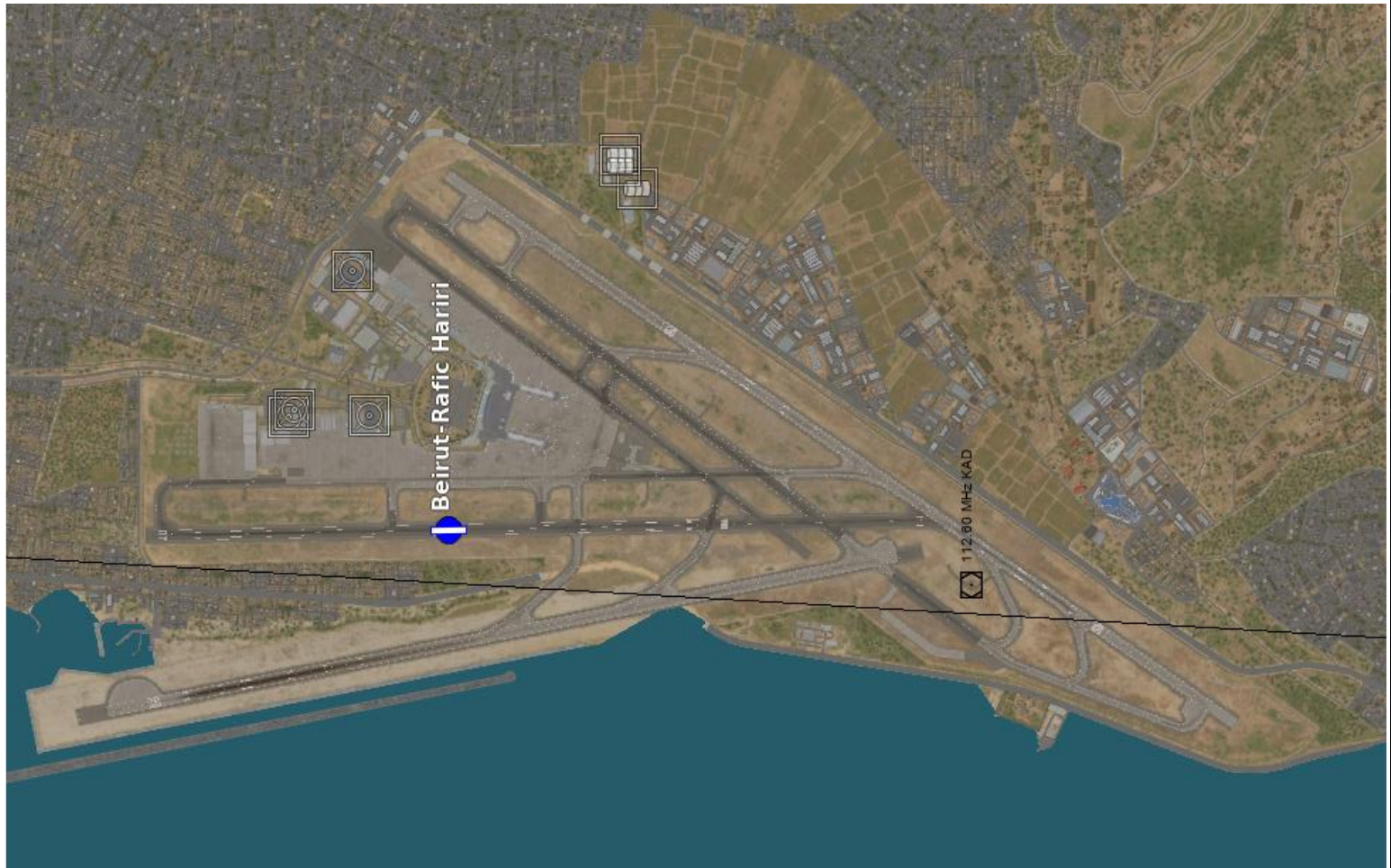




KJL-7 RADAR
2.2.3 – Expanded Modes
2.2.3.3 – DBS2 Sub-Mode

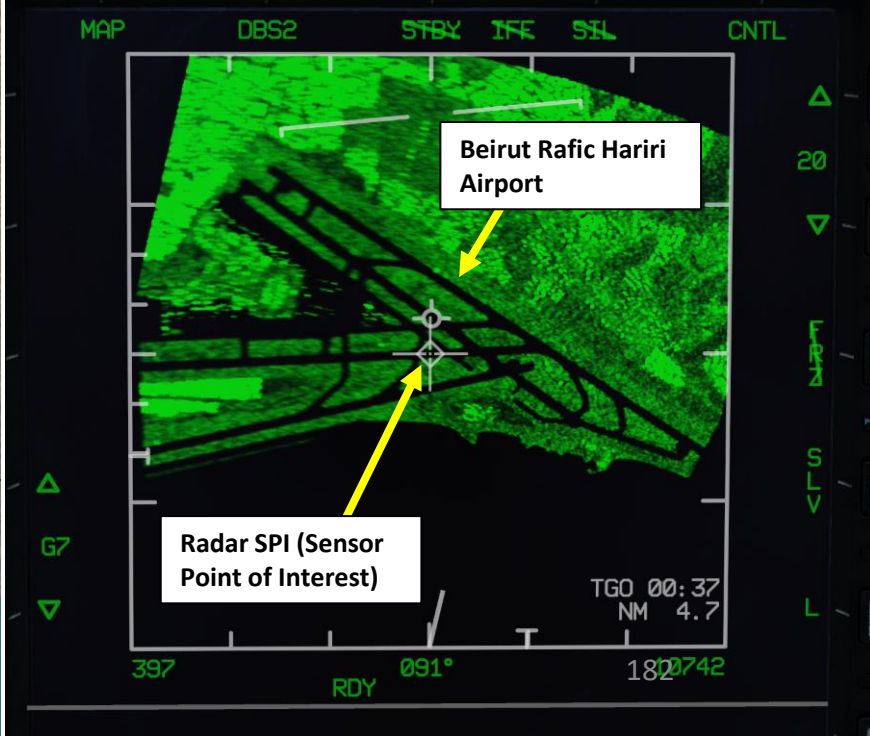
How to Select DBS2 Sub-Mode

As you can see, even with the best Expanded Mode setting, the resolution isn't amazing. Some terrain features are recognizable, but you will definitely need to use other sensors like the targeting pod to have a good visual of a target before dropping ordnance on it.



Targeting Pod SLAV (Slaved) to SPI designated from air-to-ground radar

Targeting Pod Feed



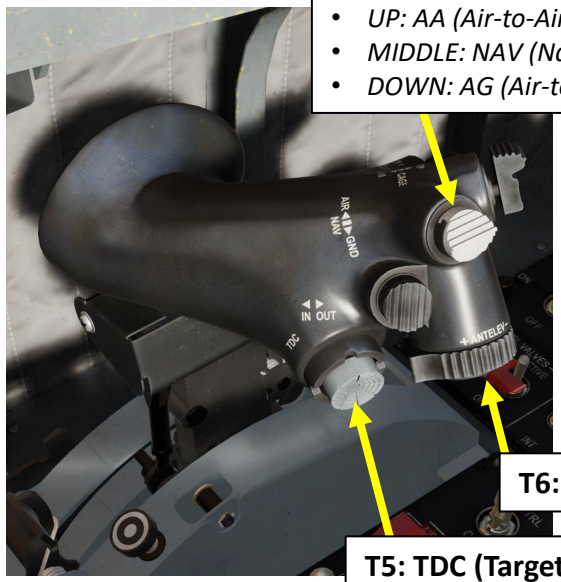
Beirut Rafic Hariri Airport

Radar SPI (Sensor Point of Interest)

KJL-7 RADAR
2.2.4 – Target Designation: Fixed Target Track (FTT)

How to Designate/Undesignate a Target

1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. If another Air-to-Ground Radar mode was selected, press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu and press on the OSB next to "MAP" to select Ground Mapping Mode.
4. Make sure Snowplow Mode is selected (OSB next to SP/SLV toggles Snowplow and Slave Modes).
5. Adjust Gain and Contrast– As required.
6. You can control the radar antenna with the T6 Radar Antenna Elevation switch.
7. Slew the TDC Cursor (Radar Crosshair) over the region you want to expand/designate using the T5 TDC Switch.

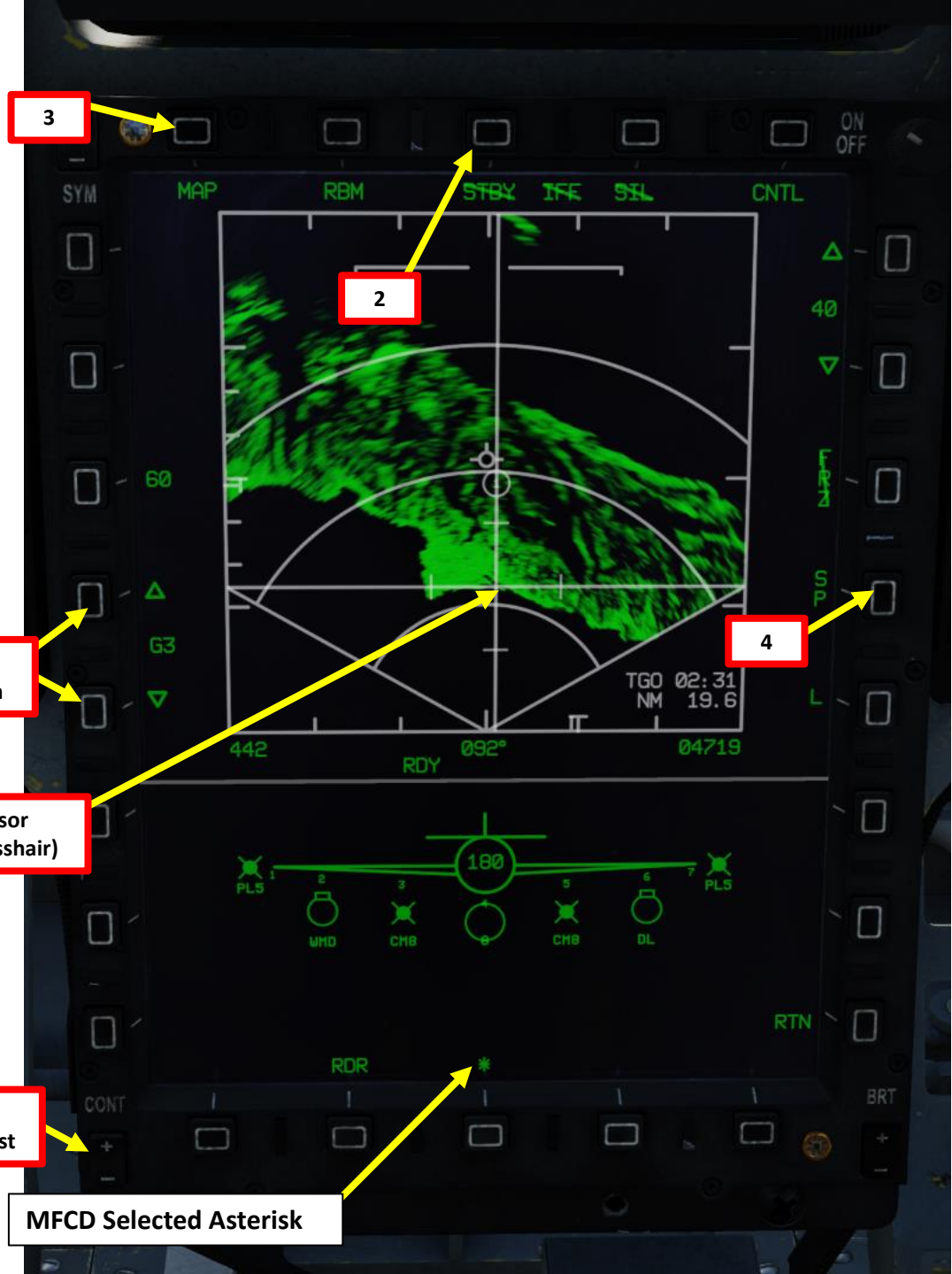


T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

1

T6: Radar Antenna Elevation Switch 6

T5: TDC (Target Designator Controller) Switch 7

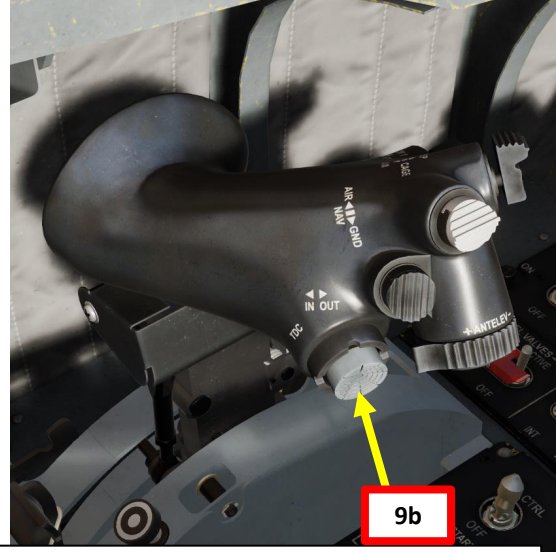


KJL-7 RADAR
2.2.4 – Target Designation: Fixed Target Track (FTT)

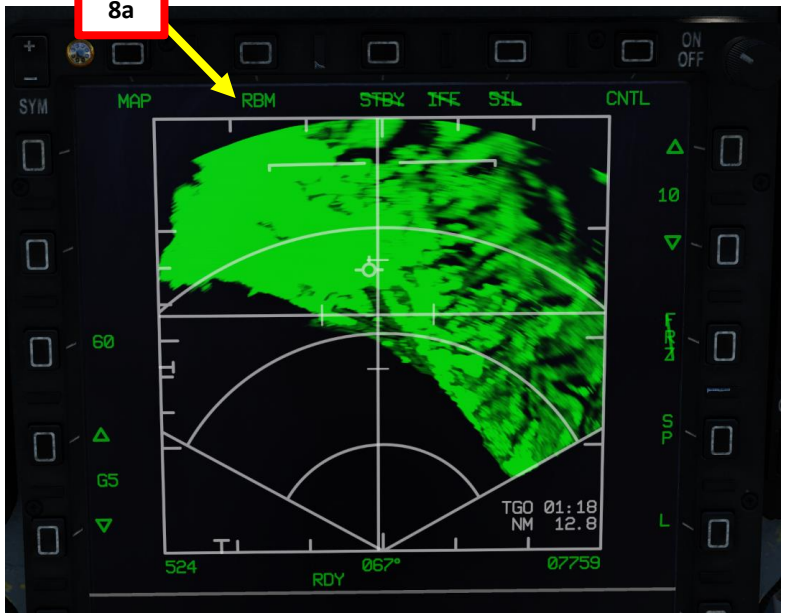
How to Designate/Undesignate a Target

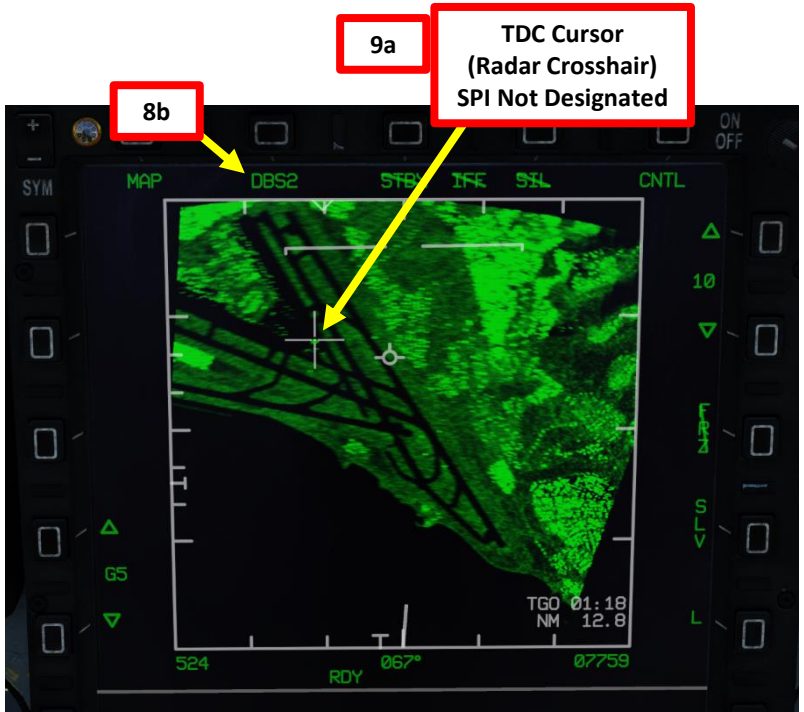
8. Target Designation via the ground radar, also called Fixed Target Track (FTT), can be performed from any air-to-ground radar Ground Mapping mode (RBM/Normal, EXP, DBS1, DBS2). If you want to use Expanded sub-modes, either press the S2/SC (Sensor Control) Switch LEFT or use the OSB next to the Radar Sub-Mode Selector to switch to desired Sub-Mode. The air-to-ground radar will automatically adjust its range to give you a better view of the region you just expanded. If you want to return to RBM/Normal (Non-Expanded), you can toggle between other Expanded Modes using S2/SC (Sensor Control) Switch LEFT.
9. To designate a target/SPI (Sensor Point of Interest) on the Radar Crosshair position, use the T5 TDC PRESS switch control (ENTER). This will set the SPI (Sensor Point of Interest) at this location and center the radar image around this SPI.

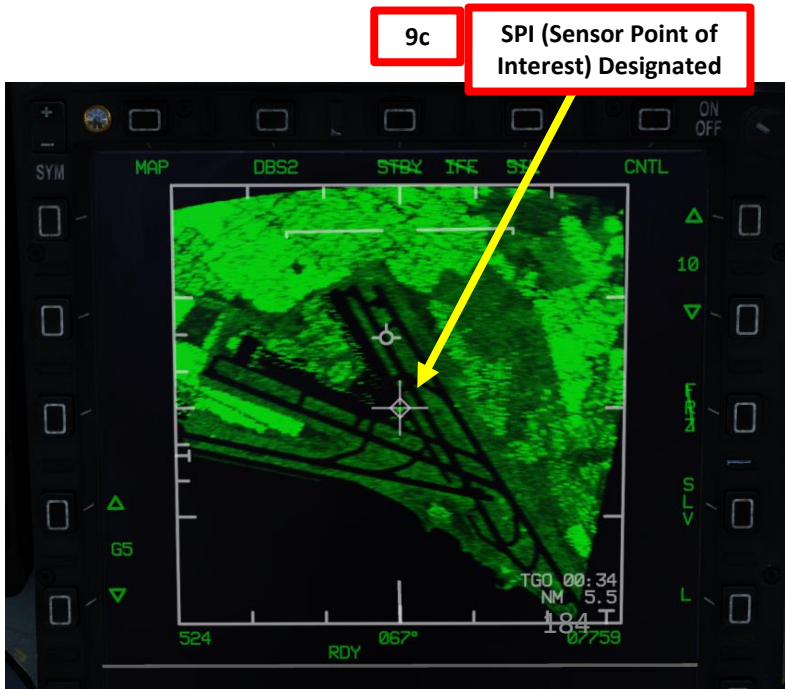
S2: SC (Sensor Control) Switch



T5: TDC (Target Designator Controller) Switch



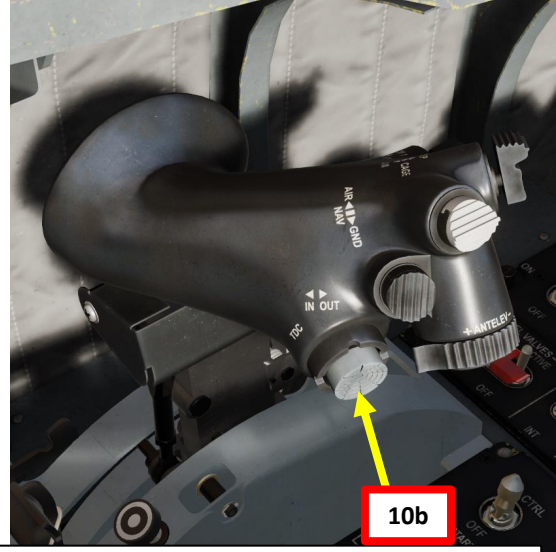




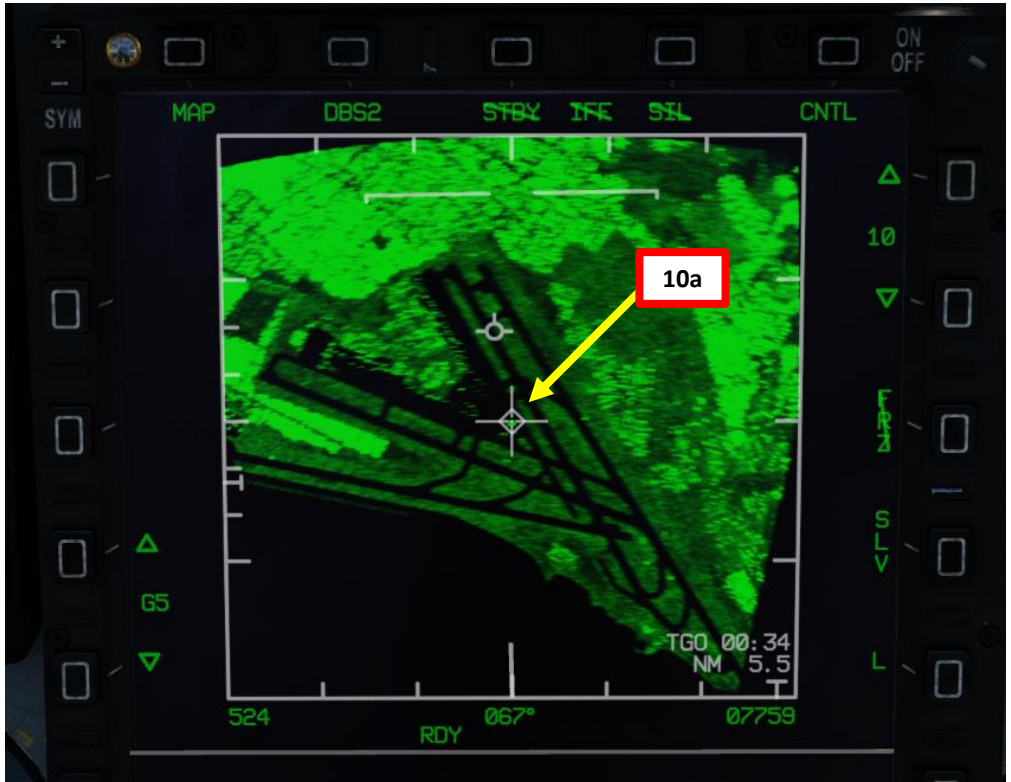
KJL-7 RADAR
2.2.4 – Target Designation: Fixed Target Track (FTT)

How to Designate/Undesignate a Target

10. Use the T5 TDC PRESS switch control (ENTER) a second time. This will perform a ground-stabilized Fixed Target Track (FTT). The radar will then focus all its energy on the landmark/feature you just designated.
11. To un-designate target and exit FTT, set the S2 Sensor Control Switch to PRESS (BACKSPACE).



T5: TDC (Target Designator Controller) Switch



KJL-7 RADAR
2.2.4 – Target Designation: Fixed Target Track (FTT)

How to Designate/Undesignate a Target

12. When in FTT, the designated location becomes the SPI (Sensor Point of Interest). The radar will continue to track the target location while line-of-sight (LOS) is maintained. If the designated location moves outside the radar field of view, the radar will slew to boresight until the target returns into the radar FOV, at which point the radar will attempt to reacquire the target.
13. If you want to slave other sensors like the Targeting Pod to the SPI (Sensor Point of Interest) designated via the radar, uncage the targeting pod and set the SP/SLAV (Snowplow/Slave) Function to SLAV. The targeting pod will then be slaved to the Fixed Target Track.

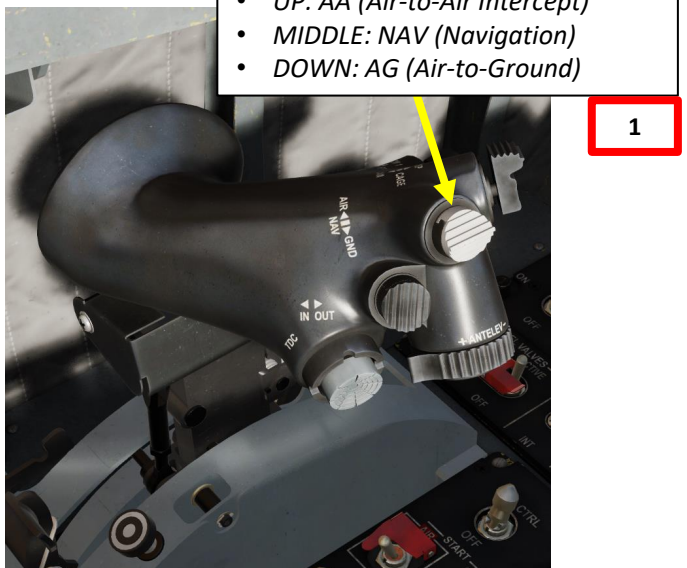
KJL-7 RADAR
2.2.5 – GMTI (Ground Moving Target Indicator) Mode

Display

The Ground Moving Target Indicator (GMTI) radar mode scans for and highlights moving targets, detected by their Doppler shift. Detected targets are displayed as white bricks. The shaded area of the display shows antenna azimuth coverage and the ground mapping (MAP) overlay, which is interleaved with the moving radar contacts.

In order to display the GMTI data on the radar page:

1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu.
4. Press on the OSB next to “GMTI” to select Ground Moving Target Indicator Mode.

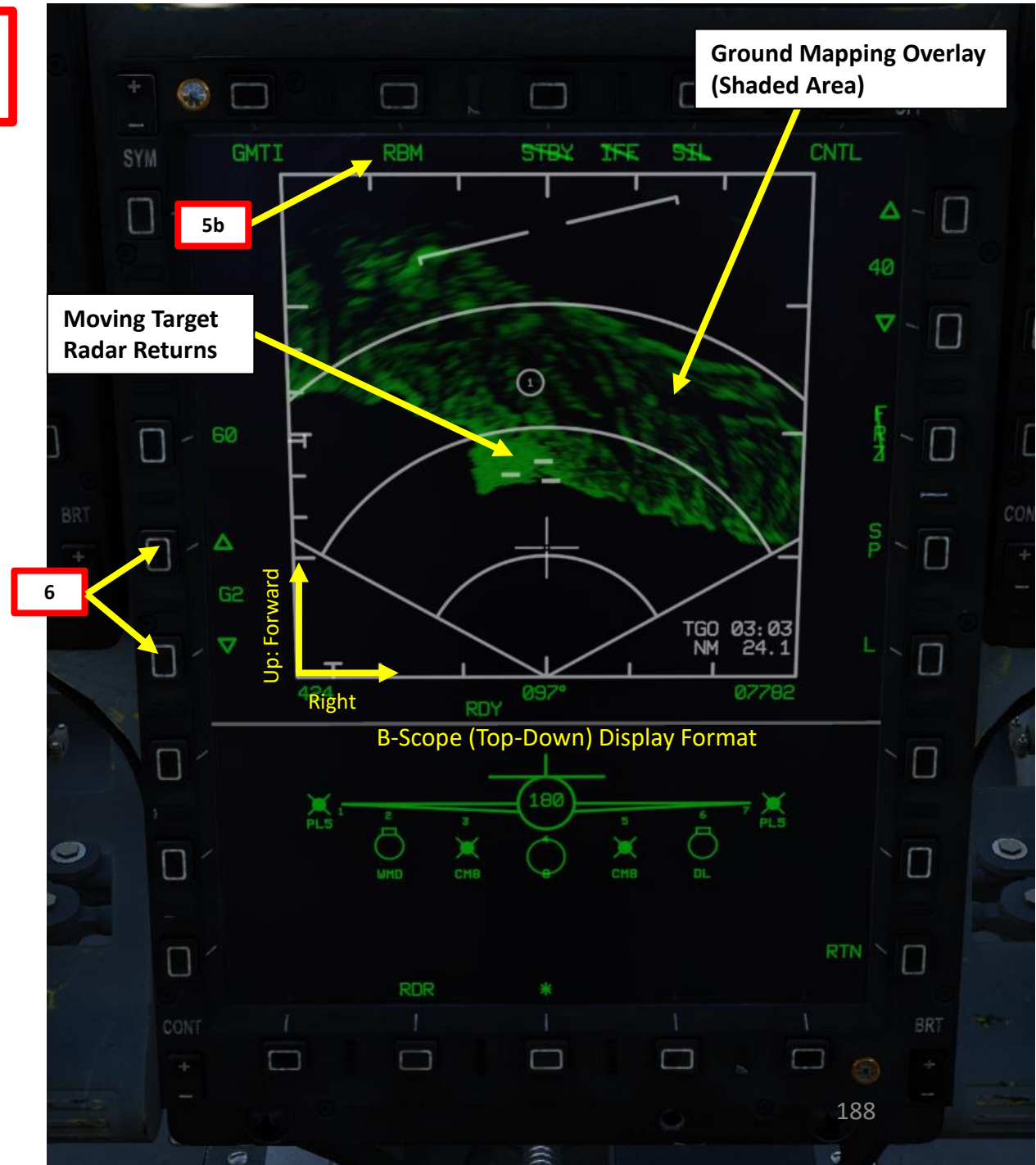


GMTI (Ground Moving Target Indicator) Radar Mode Selected

KJL-7 RADAR
2.2.5 – GMTI (Ground Moving Target Indicator) Mode

Display

5. To display ground mapping overlay, make sure “RBM” (Real Beam Mode) option is active.
6. Adjust Gain Control – As required.



KJL-7 RADAR
2.2.5 – GMTI (Ground Moving Target Indicator) Mode

Controls (GMTI Page)

Controls for the GMTI page are almost **identical to the controls of the MAP (Ground Mapping) page**. Display range and azimuth settings are modified in the same manner. However, there is one significant difference with MAP:

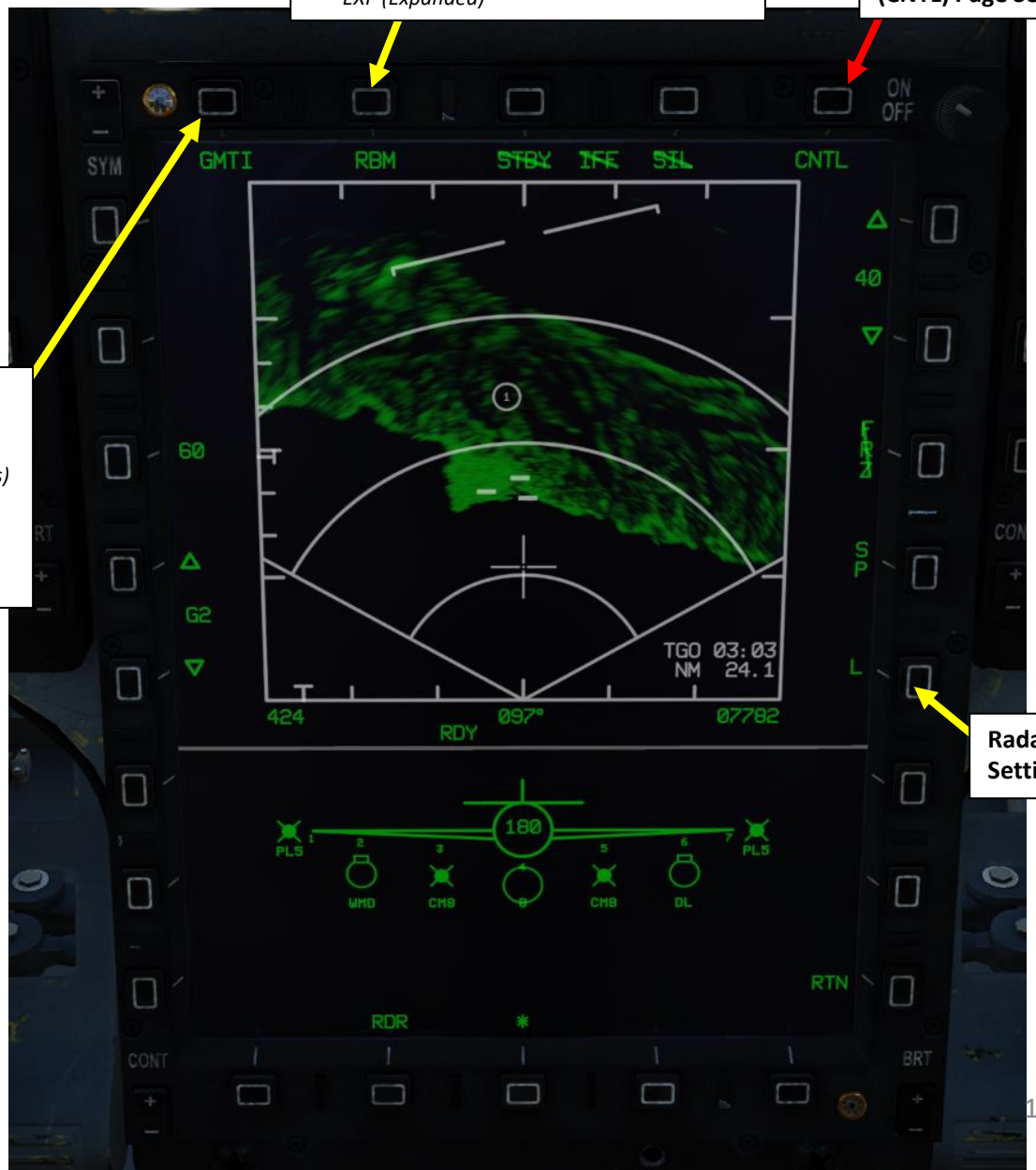
- In GMTI, the field-of-view sub-modes can only be RBM or EXP. DBS sub-mode are not available in GMTI. Switching between RBM and EXP can only be performed by using S2/SC (Sensor Control) Switch LEFT.

Air-to-Ground Radar Mode Selector
- *MAP (Ground Mapping)*
- *GMTI (Ground Moving Target Indicator)*
- *SEA1 (Sea Mode 1, Stationary + Moving Naval Targets)*
- *SEA2 (Sea Mode 2, Stationary Naval Targets)*
- *BCN (Beacon)*
- *WA (Weather Awareness)*
- *TA (Terrain Avoidance)*

S2: SC (Sensor Control) Switch

Air-to-Ground Radar Sub-Mode Selector
- *RBM (Real Beam Mode)*
- *EXP (Expanded)*

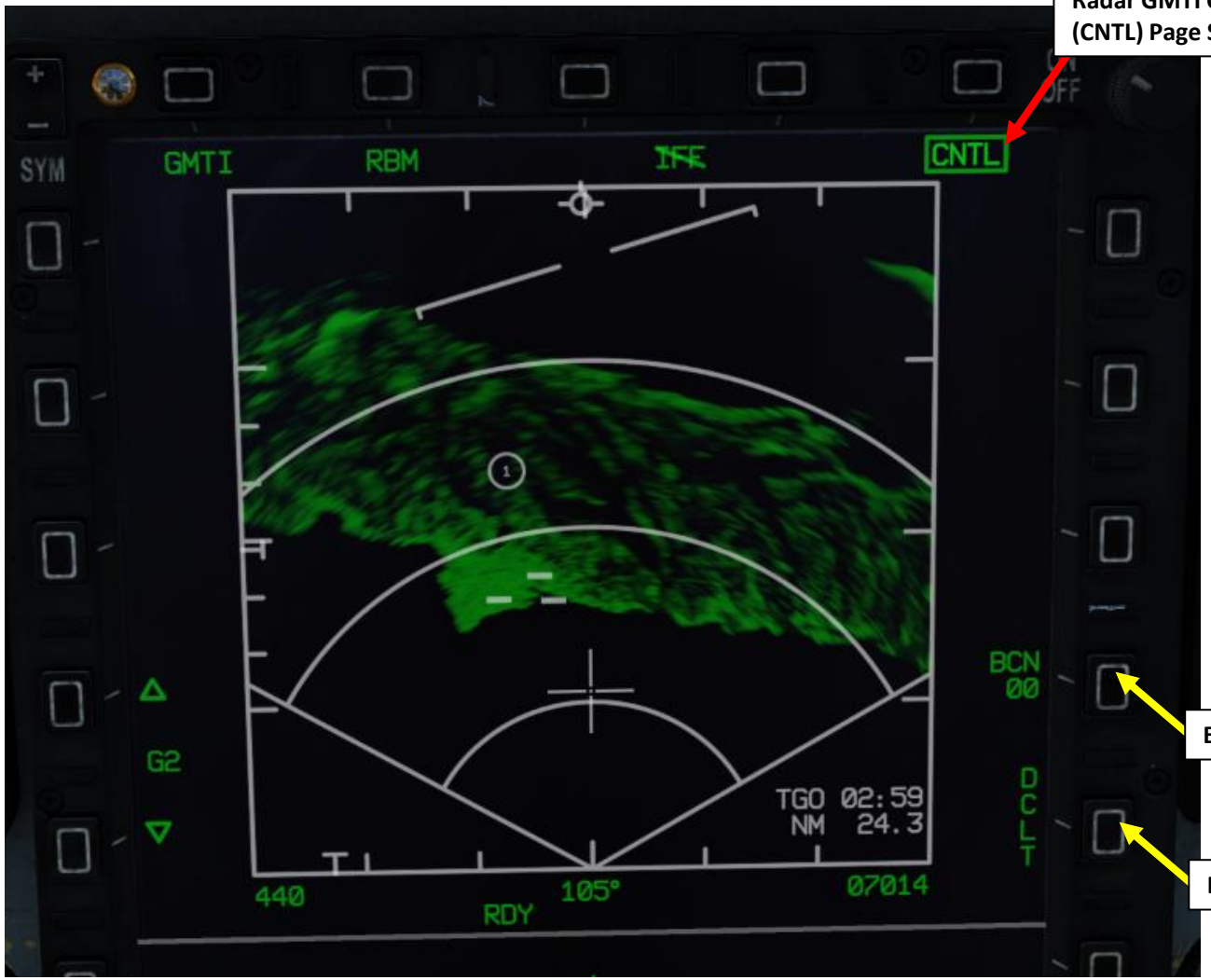
Radar GMTI Control (CNTL) Page Selector



Radar Speed Gate Setting *(LOW/HIGH)*

KJL-7 RADAR
2.2.5 – GMTI (Ground Moving Target Indicator) Mode

Controls (GMTI CNTL Page)



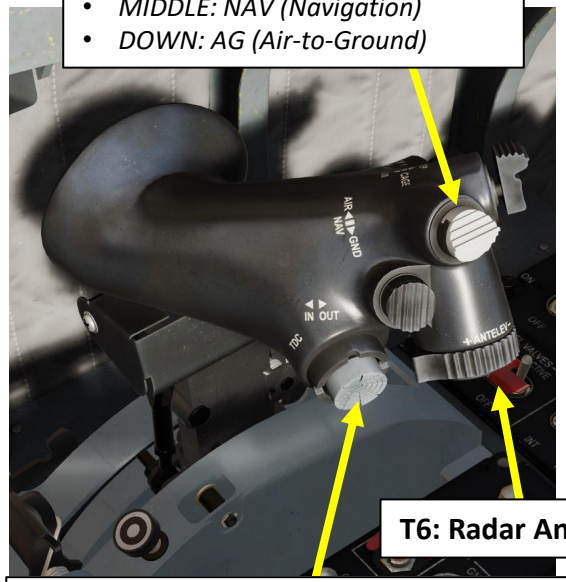
KJL-7 RADAR
2.2.5 – GMTI (Ground Moving Target Indicator) Mode

Controls (HOTAS)

Here is an overview of the HOTAS controls available for the radar when in air-to-ground mode.

- T1 (Master Mode Switch): DOWN sets Master Mode to Air-to-Ground
- T6: UP/DOWN Controls Radar Antenna Elevation
- T5: TDC (Target Designator Controller) Switch controls Radar Crosshair/Cursor
- S2 (Sensor Control) Switch:
  - FWD: Increases Display Range
  - AFT: Decreases Display Range
  - RIGHT: Changes Azimuth Scan Range and/or cancels EXP Sub-Mode
  - LEFT: Selects EXP Sub-Mode
  - PUSH: Discards Target Designation

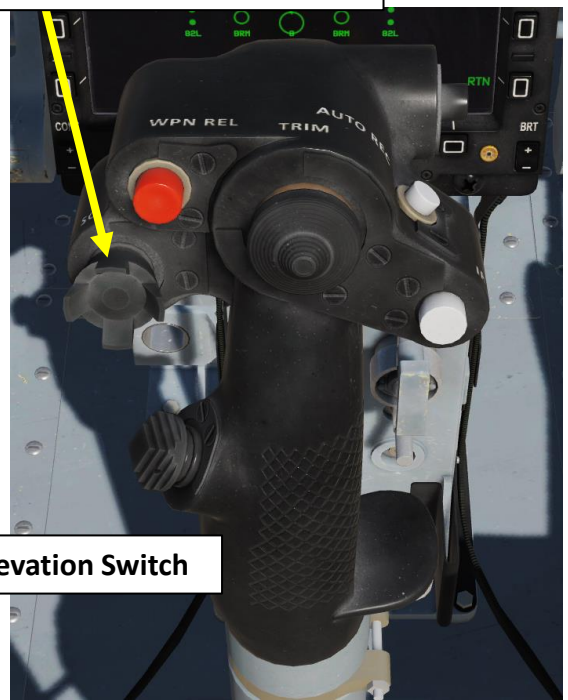
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

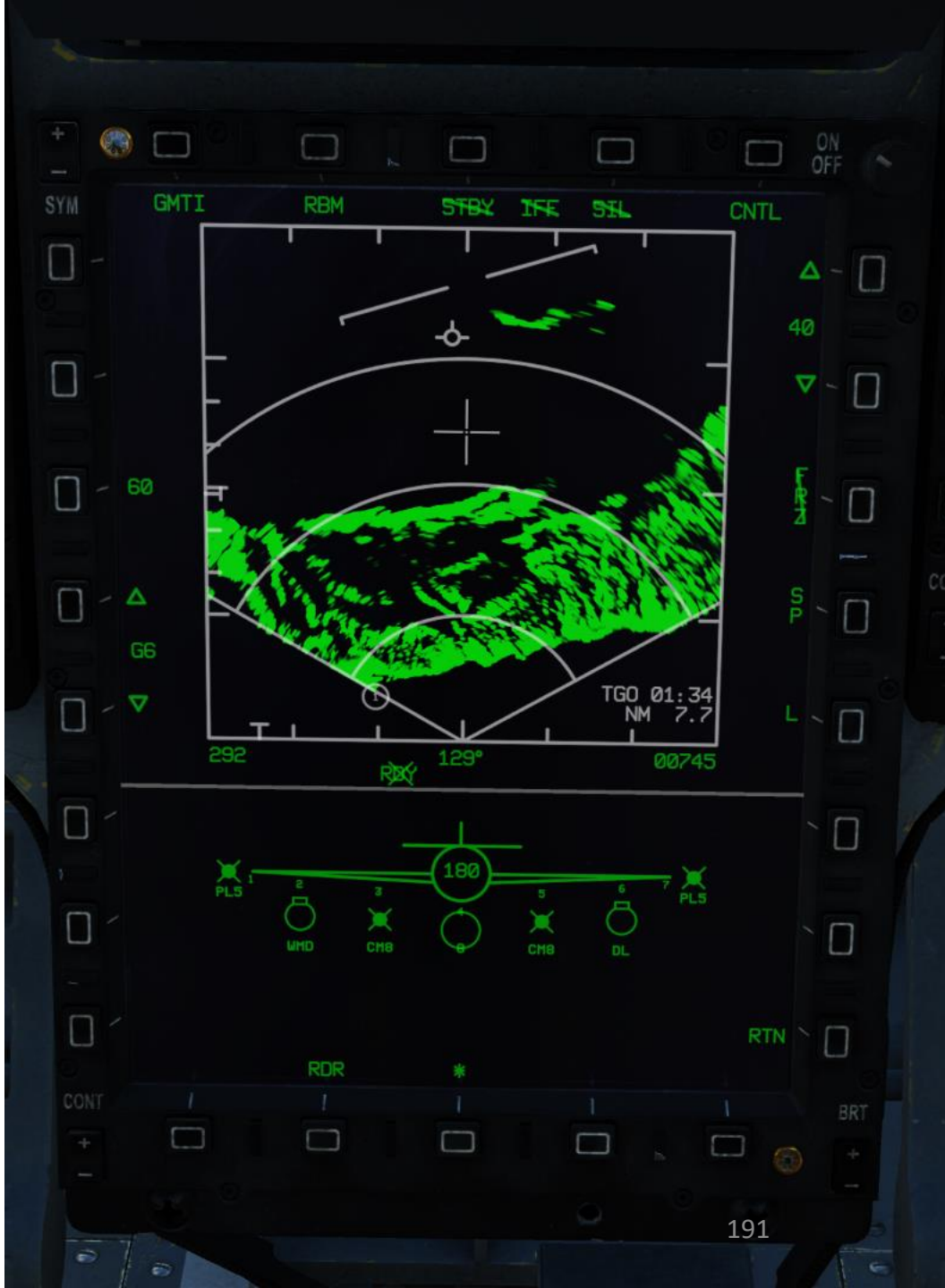


T6: Radar Antenna Elevation Switch

T5: TDC (Target Designator Controller) Switch

S2: SC (Sensor Control) Switch

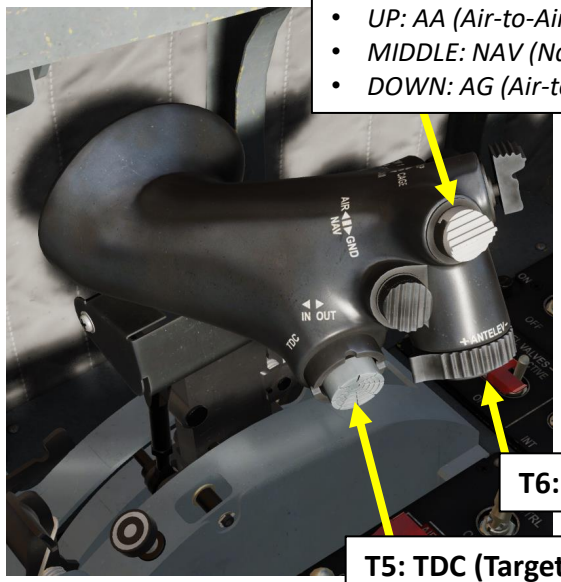




KJL-7 RADAR
2.2.5 – GMTI (Ground Moving Target Indicator) Mode

How to Track a Moving Target (GMTT, Ground Moving Target Track)

1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu. Press on the OSB next to "GMTI" to select Ground Moving Target Indicator Mode.
4. Make sure Snowplow Mode is selected (OSB next to SP/SLV toggles Snowplow and Slave Modes).
5. To display ground mapping overlay, make sure "RBM" (Real Beam Mode) option is active.
6. Adjust Gain and Contrast– As required.
7. You can control the radar antenna with the T6 Radar Antenna Elevation switch.
8. Slew the TDC Cursor (Radar Crosshair) over the region you want to expand/designate using the T5 TDC Switch.

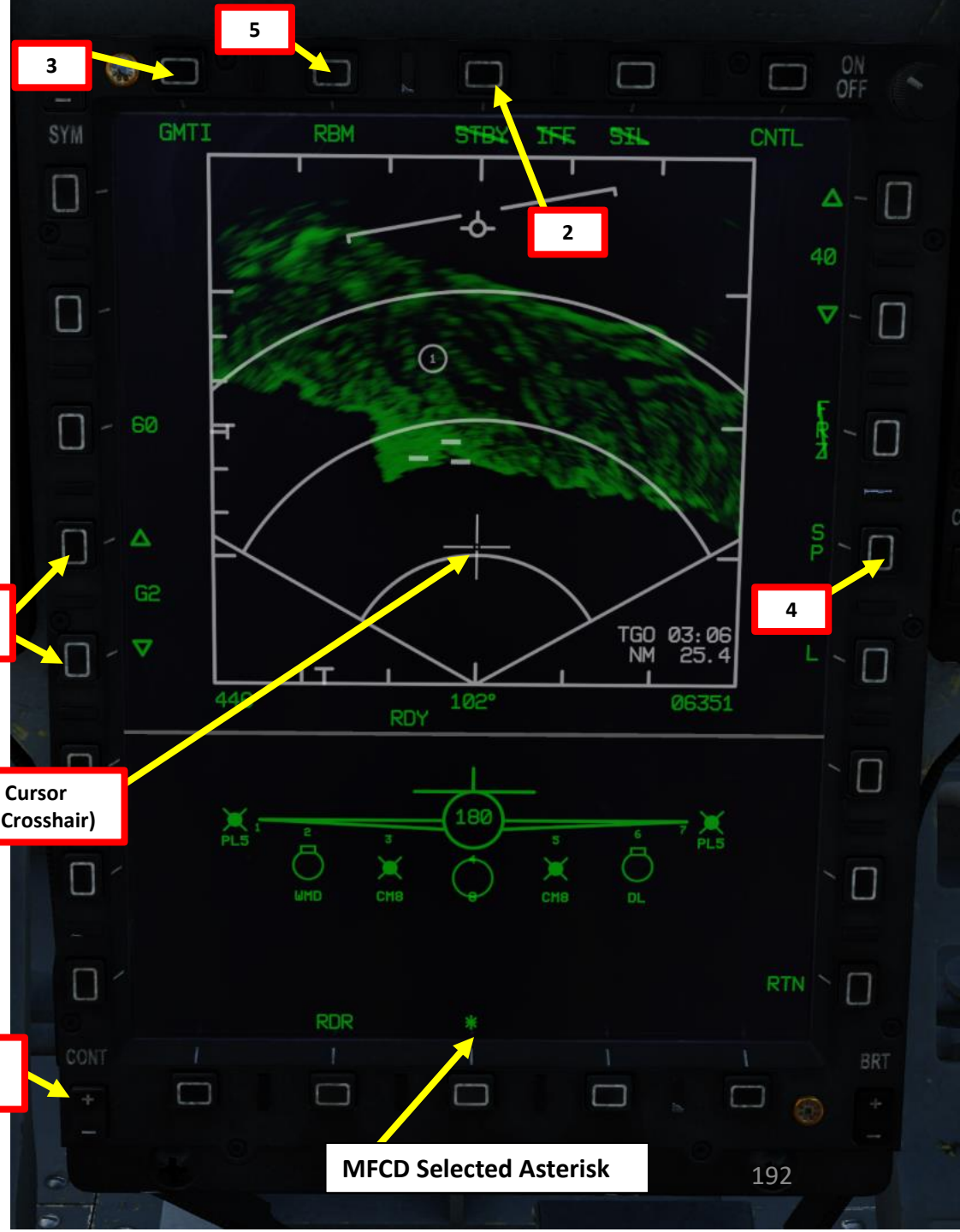


T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

1

T6: Radar Antenna Elevation Switch 7

T5: TDC (Target Designator Controller) Switch 8

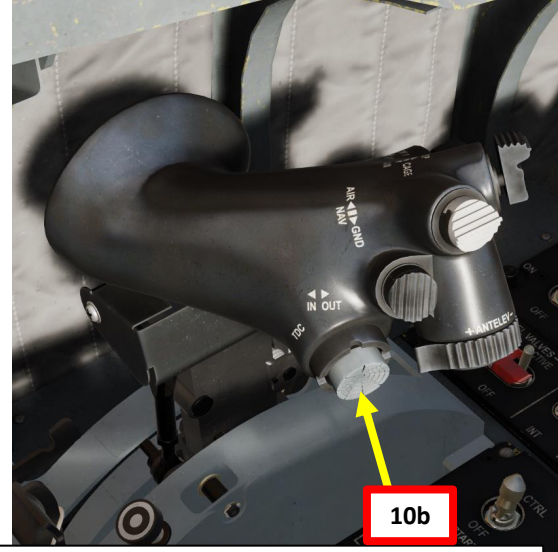


KJL-7 RADAR
2.2.5 – GMTI (Ground Moving Target Indicator) Mode

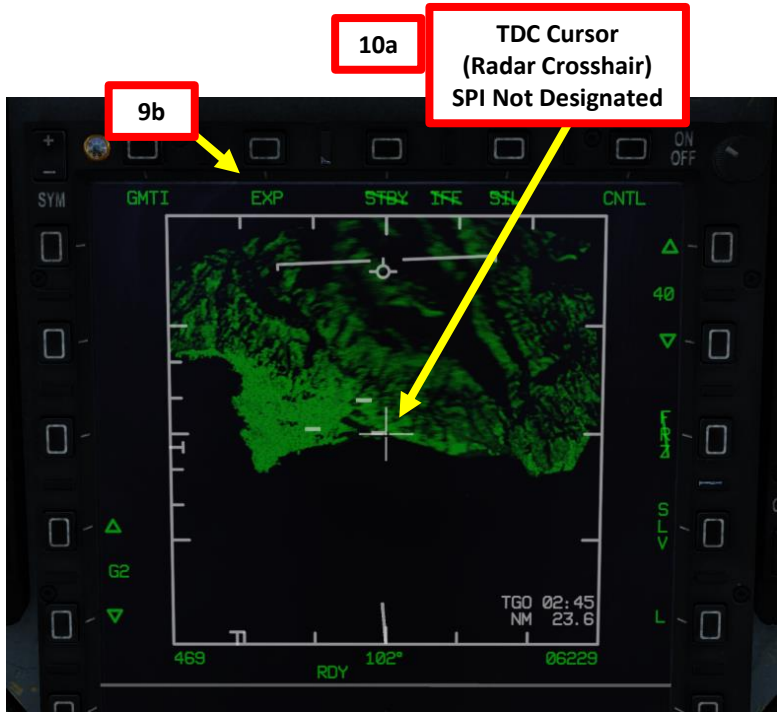
How to Track a Moving Target (GMTT, Ground Moving Target Track)

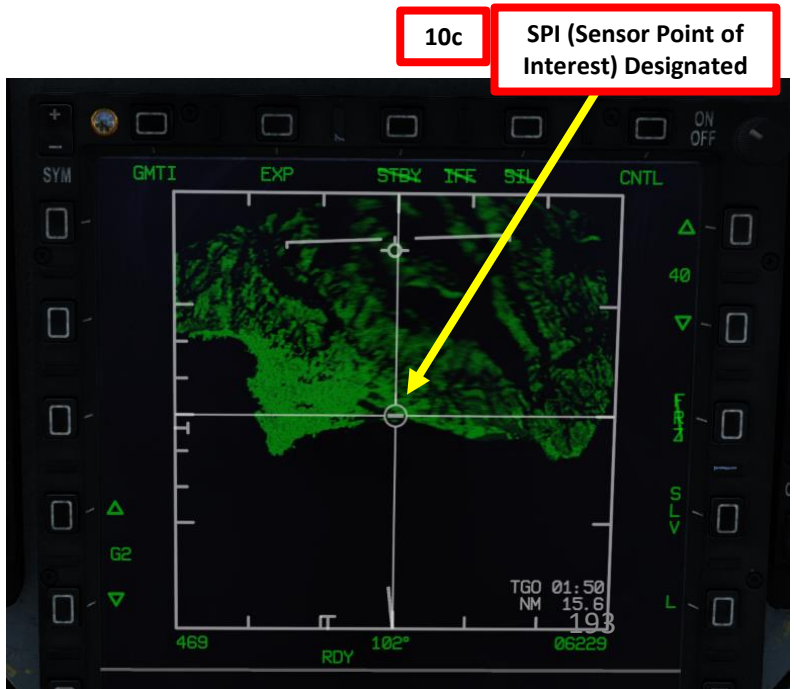
9. Moving Target Designation via the ground radar, also called Ground Moving Target Track (GMTT), can be performed from GMTI (Ground Moving Target Indicator) mode only. If you want to use EXP (Expanded) sub-mode, press the S2/SC (Sensor Control) Switch LEFT. The air-to-ground radar will automatically adjust its range to give you a better view of the region you just expanded. If you want to return to RBM/Normal (Non-Expanded), use S2/SC (Sensor Control) Switch LEFT.
10. To designate a target/SPI (Sensor Point of Interest) on the Radar Crosshair position, use the T5 TDC PRESS switch control (ENTER). This will set the SPI (Sensor Point of Interest) at this location and center the radar image around this SPI.

S2: SC (Sensor Control) Switch



T5: TDC (Target Designator Controller) Switch

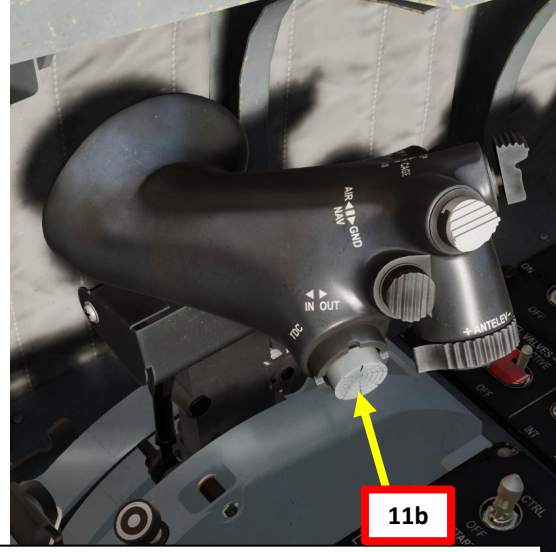




KJL-7 RADAR
2.2.5 – GMTI (Ground Moving Target Indicator) Mode

How to Track a Moving Target (GMTT, Ground Moving Target Track)

11. Use the T5 TDC PRESS switch control (ENTER) a second time. This will perform a ground-stabilized Moving Target Track (GMTT). The radar will then focus all its energy on the moving vehicle you just designated.
12. To un-designate target and exit GMTT, set the S2 Sensor Control Switch to PRESS (BACKSPACE).

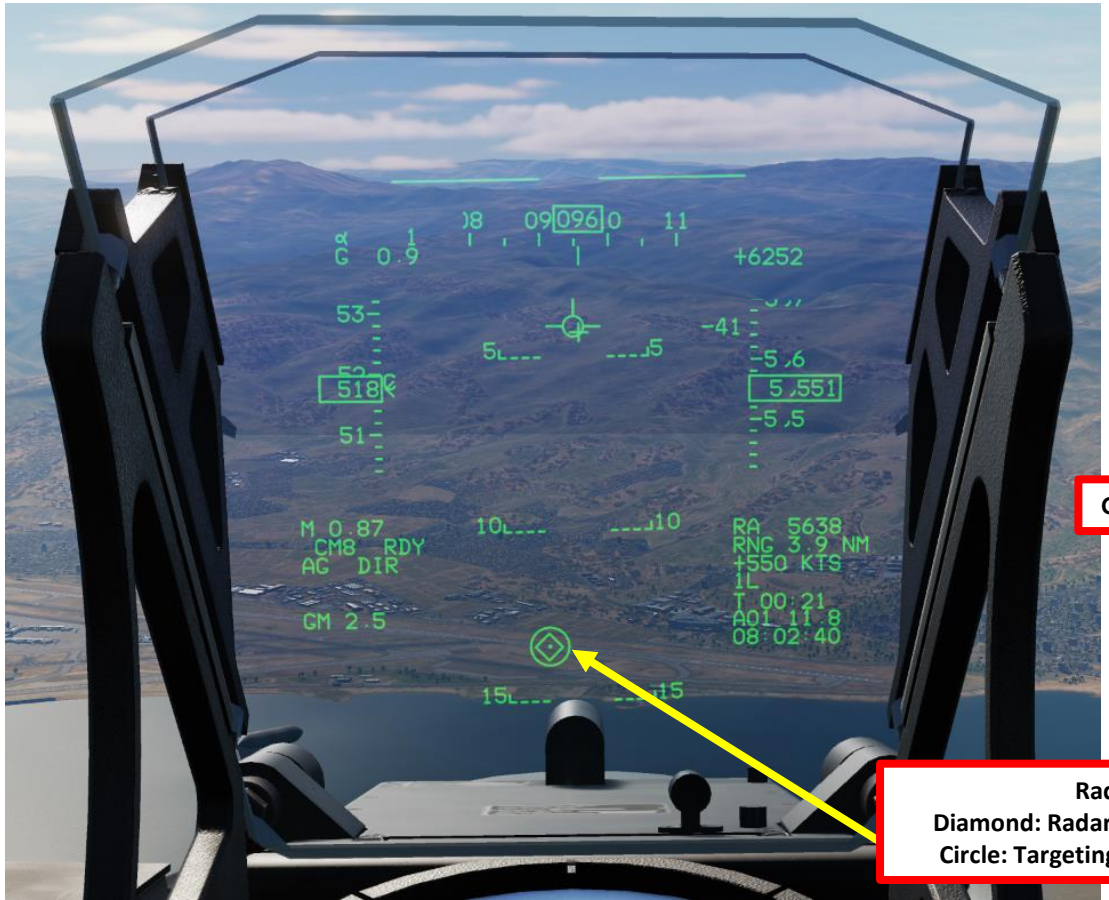


T5: TDC (Target Designator Controller) Switch

KJL-7 RADAR
2.2.5 – GMTI (Ground Moving Target Indicator) Mode

How to Track a Moving Target (GMTT, Ground Moving Target Track)

13. When in GMTT, the designated/tracked target becomes the SPI (Sensor Point of Interest). The radar will continue to track the target while line-of-sight (LOS) is maintained. If the designated location moves outside the radar field of view, the radar will slew to boresight until the target returns into the radar FOV, at which point the radar will attempt to reacquire the target.
14. If you want to slave other sensors like the Targeting Pod to the SPI (Sensor Point of Interest) designated via the radar, uncage the targeting pod and set the SP/SLAV (Snowplow/Slave) Function to SLAV. The targeting pod will then be slaved to the Ground Moving Target Track.



KJL-7 RADAR
2.2.6 – WA (Weather Awareness) Mode

Not yet implemented.

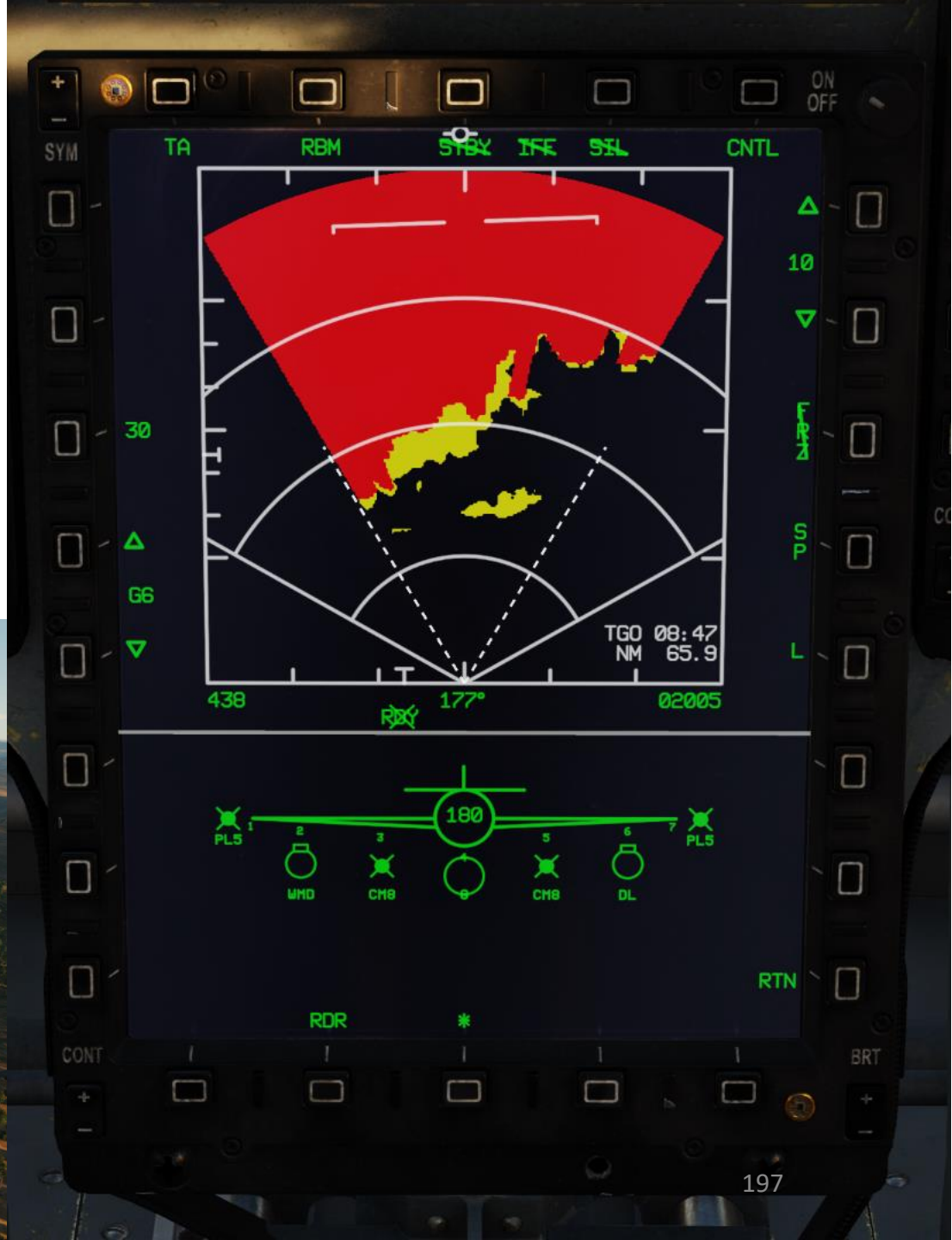
KJL-7 RADAR
2.2.7 – TA (Terrain Avoidance) Mode

The KJL-7 radar has a mode called TA (Terrain Avoidance). Terrain and obstacles that you risk colliding with are displayed in terms of color shades. A specific clearance height symbology is customizable through the TA CNTL sub-page.

In this mode, the radar range is locked to 10 nm and the azimuth aperture can be set to either 15 or 30 deg. The radar displays return from the ground in 2 colors depending on the terrain altitude relative to the clearance height (terrain avoidance margin) set by the pilot:

- Yellow when terrain is within the “clean zone” (200 ft zone below the clearance height / terrain avoidance margin set by the pilot)
- Red when terrain is within or above the clearance height / terrain avoidance margin set by the pilot. All the area behind the obstacle hidden from the radar’s line-of-sight will also be rendered in red.
- No color is visible when terrain is below the yellow “clean zone”

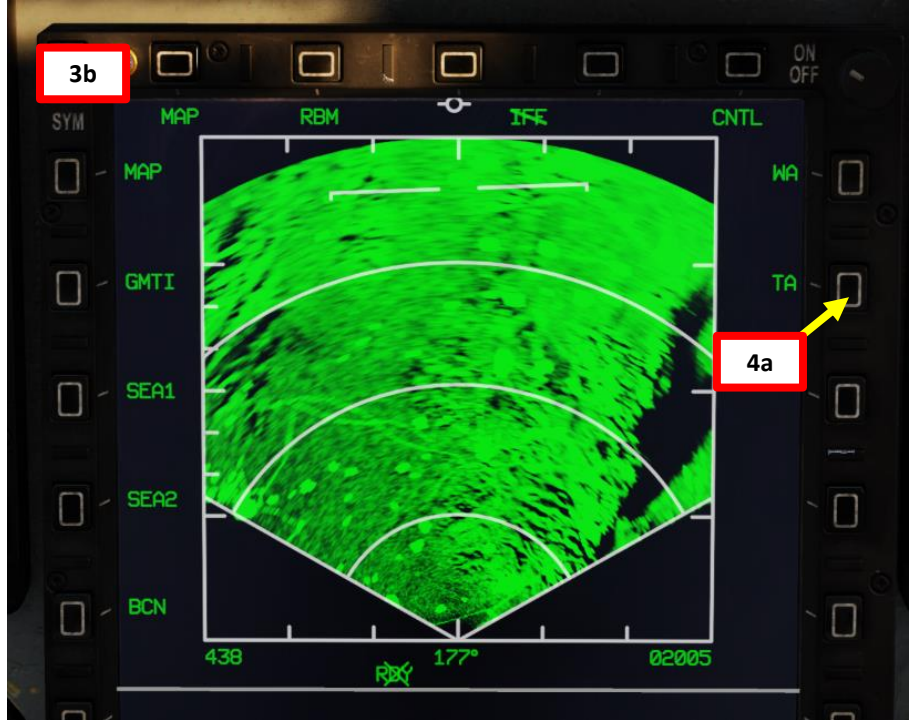
In this mode, the radar display is oriented to follow the aircraft bearing. This means that the display is not oriented to where the aircraft is pointed to but where it’s going.

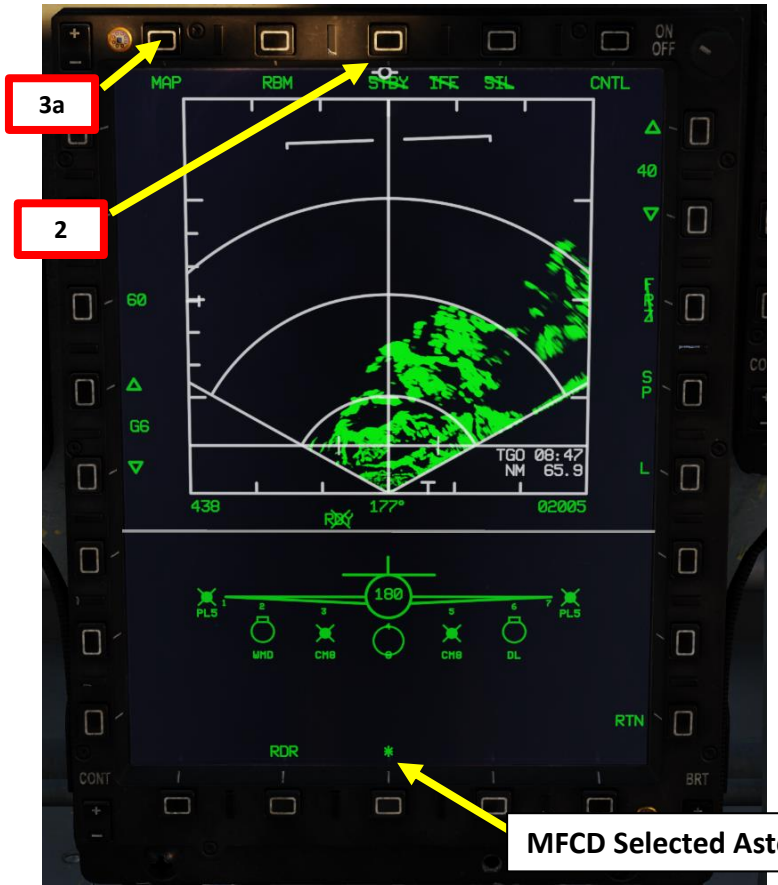


KJL-7 RADAR
2.2.7 – TA (Terrain Avoidance) Mode

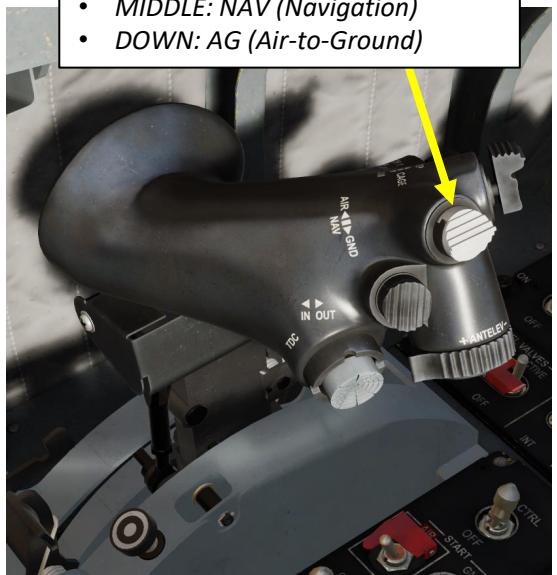
To display terrain avoidance data overlay on the Radar page:

1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. If another Air-to-Ground Radar mode was selected, press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu.
4. Press on the OSB next to "TA" to select Terrain Avoidance Mode.





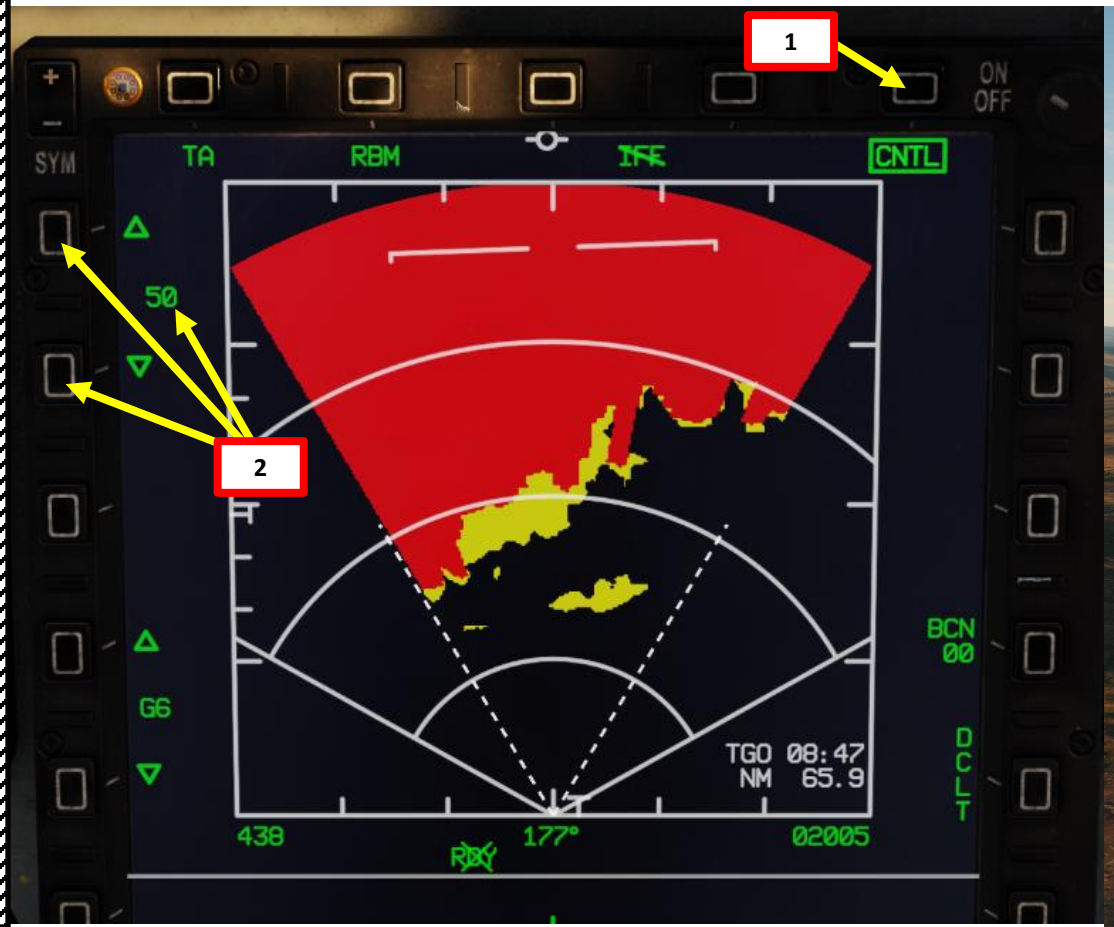
1 **T1: MMS (Master Mode Switch)**
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

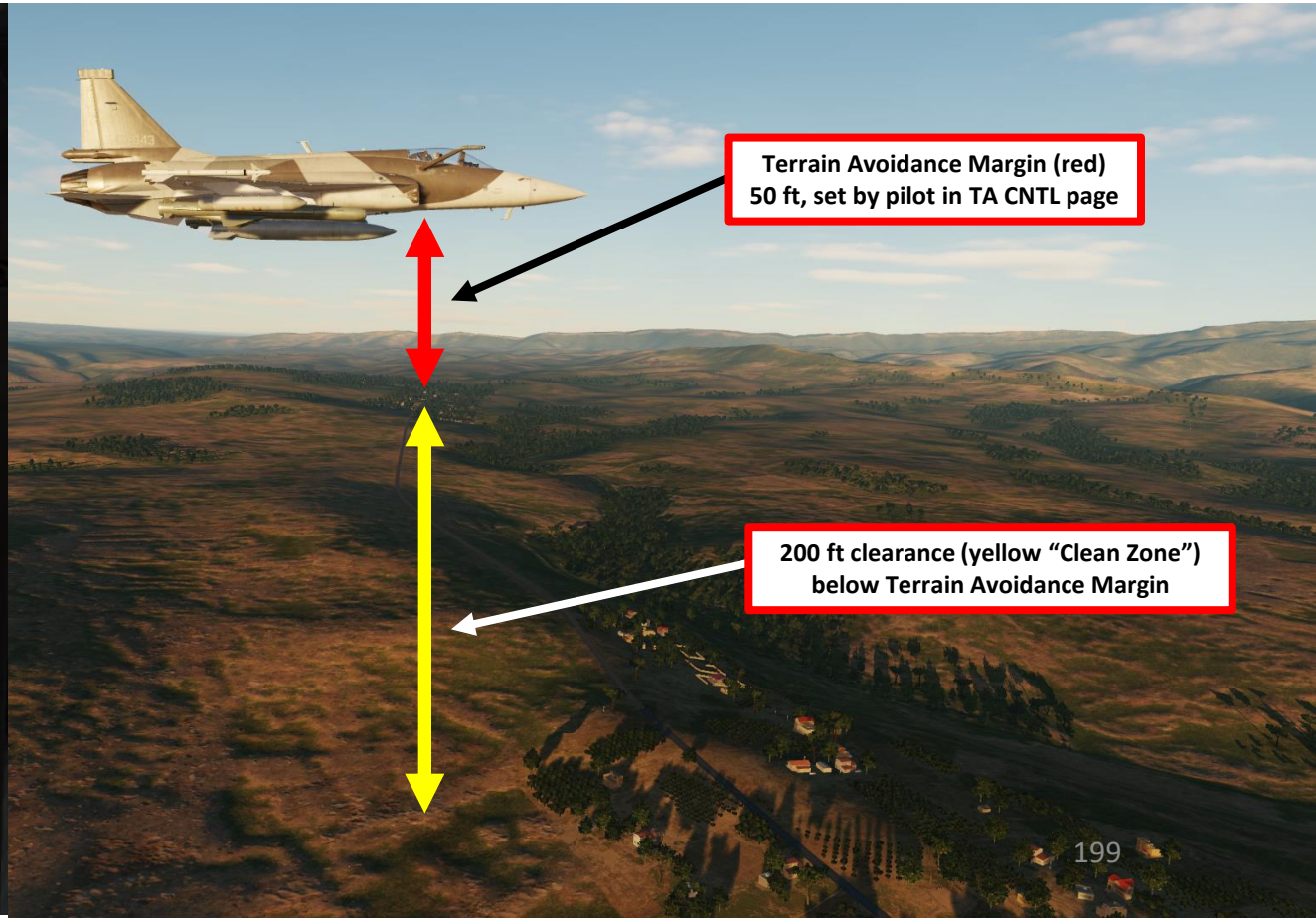


KJL-7 RADAR
2.2.7 – TA (Terrain Avoidance) Mode

To set the Terrain Avoidance Margin:

1. Select TA CNTL sub-page.
2. Press the OSBs next to the arrows surrounding the Terrain Avoidance Margin setting (in feet).
3. In this example, the Terrain Avoidance Margin is set to 50 ft. This means that the zones in red shows terrain from 50 ft below you to any terrain above you. Yellow shows terrain within the “clean zone”, which is a 200 ft zone below the Terrain Avoidance Margin in red, which in this example goes from 50 ft below you to 250 ft below you.





KJL-7 RADAR
2.2.8 – BCN (Beacon) Mode

The Beacon Search (BCN) radar mode is a passive radar mode that detects transmitting radar beacons typically placed by ground personnel. These beacons are programmed to emit certain codes that the radar can search for and track, giving you a bearing and distance to the emitter.

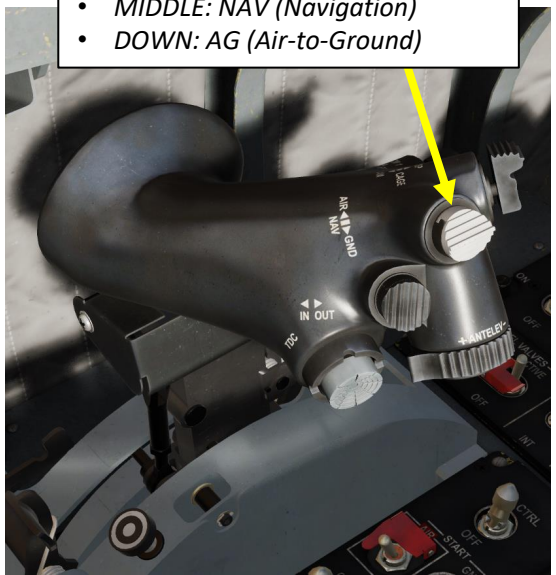
A practical application of BCN mode is that a beacon can be placed on the ground and used with an OAP (Offset Aimpoint), a reference point which can be used to designate a target (with distance and bearing from the beacon) and deliver ordnance without having to acquire the target via a sensor like the targeting pod.

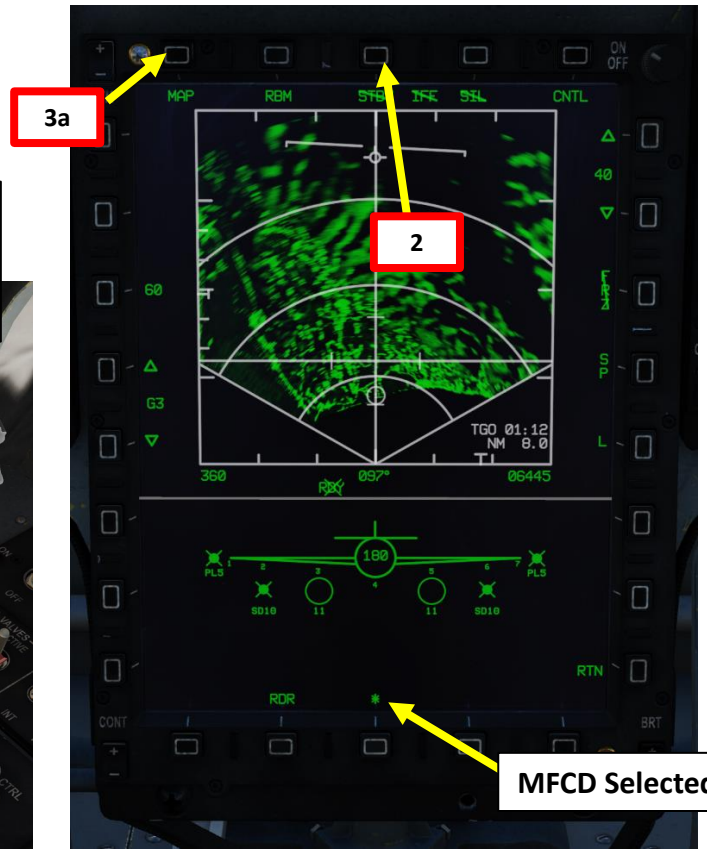
In DCS, the JF-17's BCN mode is simulated to track TACAN stations.

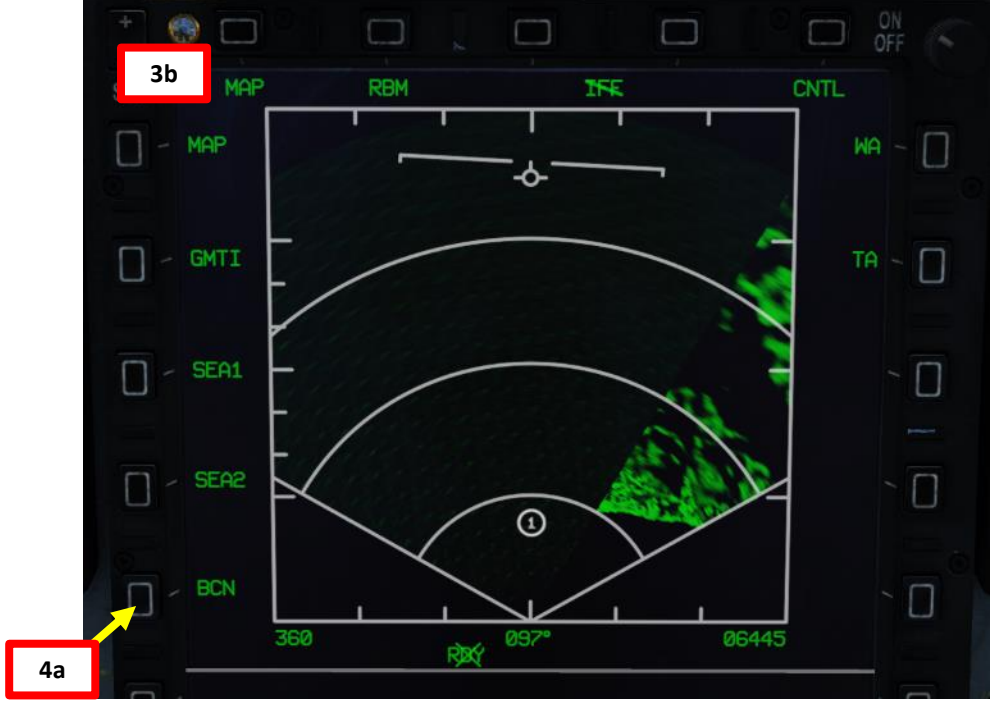
KJL-7 RADAR
2.2.8 – BCN (Beacon) Mode

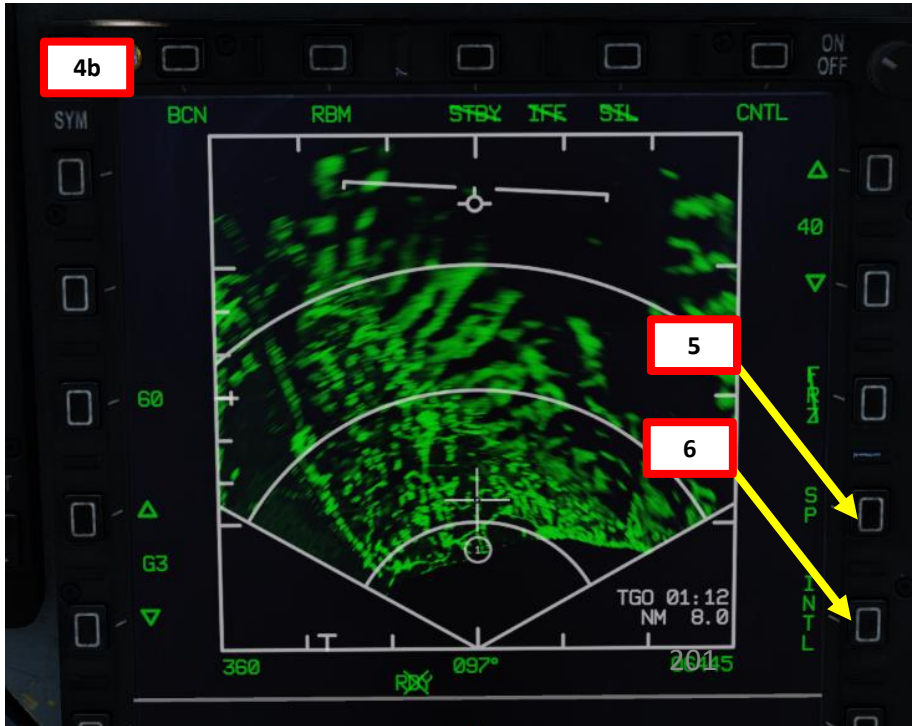
To employ BCN Mode:

1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. If another Air-to-Ground Radar mode was selected, press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu.
4. Press on the OSB next to "BCN" to select Beacon Search Mode.
5. Make sure Snowplow Mode is selected (OSB next to SP/SLV toggles Snowplow and Slave Modes).
6. If desired, select INTL (Interleaved) Mode, which will alternate between RBM (Real Beam Mode, Ground Mapping) overlay and Beacon Search Mode.



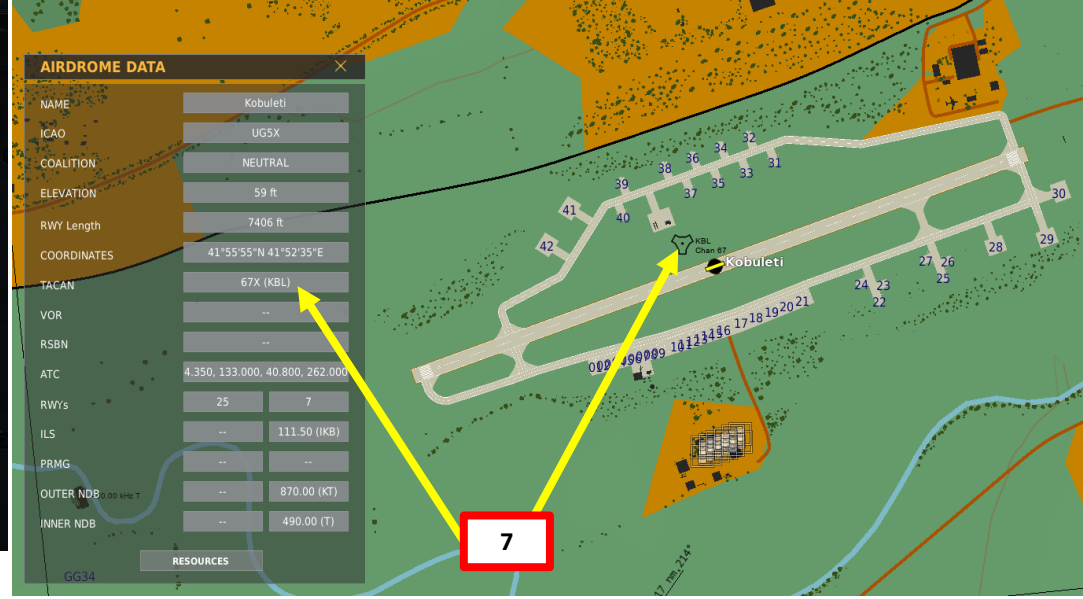






KJL-7 RADAR
2.2.8 – BCN (Beacon) Mode

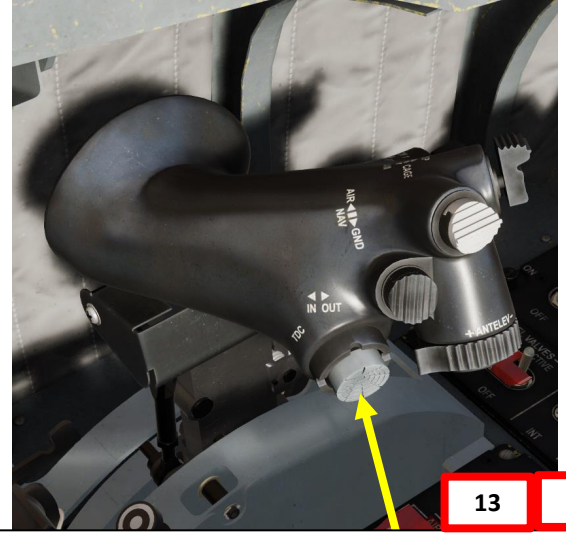
7. We want to use Kobuleti's TACAN (Channel 67X) as our beacon.
8. Press on the OSB next to CNTL to enter the Beacon Control sub-page.
9. Press on the OSB next to BCN 00 to enter the TACAN Channel.
10. Use OSBs to enter BCN Channel 67.
11. Press on the OSB next to CNTL to exit the Beacon Control sub-page.
12. When the TACAN beacon (67X) is detected, a "=" symbol will blink on the radar display.



= Symbol: Beacon detected by radar

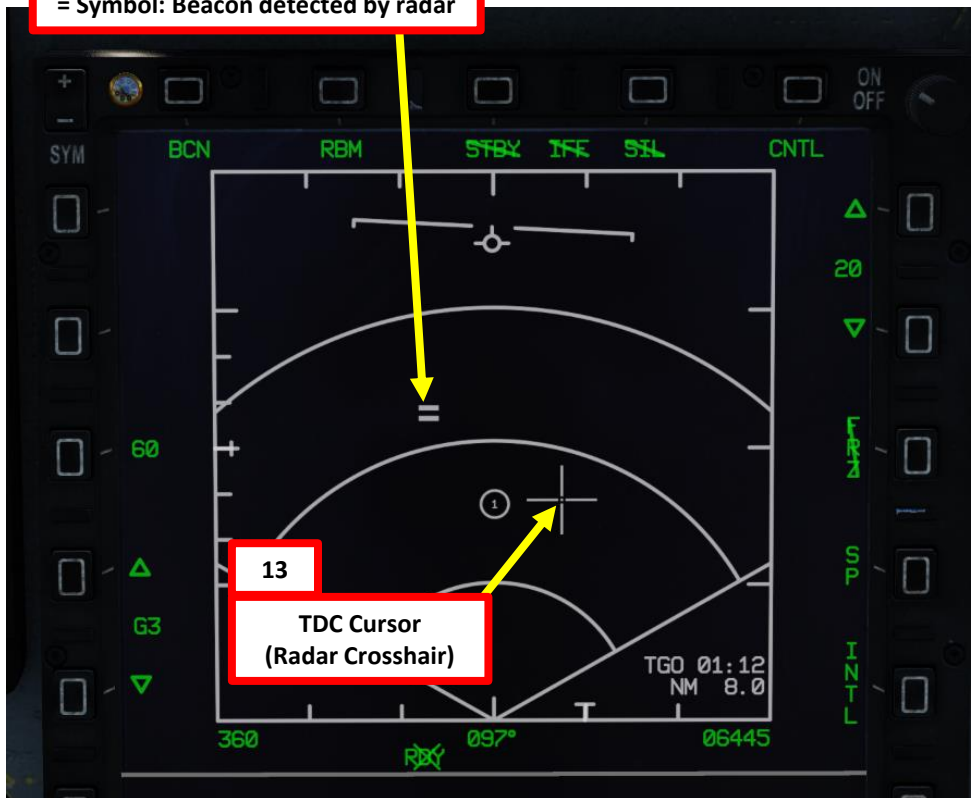
KJL-7 RADAR
2.2.8 – BCN (Beacon) Mode

13. Slew the TDC Cursor (Radar Crosshair) over the beacon symbol "=" you want to track using the T5 TDC Switch.
14. To designate the TACAN beacon as the SPI (Sensor Point of Interest), use the T5 TDC PRESS switch control (ENTER). The diamond indicates the beacon is being tracked by the radar.
15. Bearing, Time-to-Go and Range to Beacon information is displayed on the radar screen.
16. To un-designate beacon, set the S2 Sensor Control Switch to PRESS (BACKSPACE).



T5: TDC (Target Designator Controller) Switch

S2: SC (Sensor Control) Switch



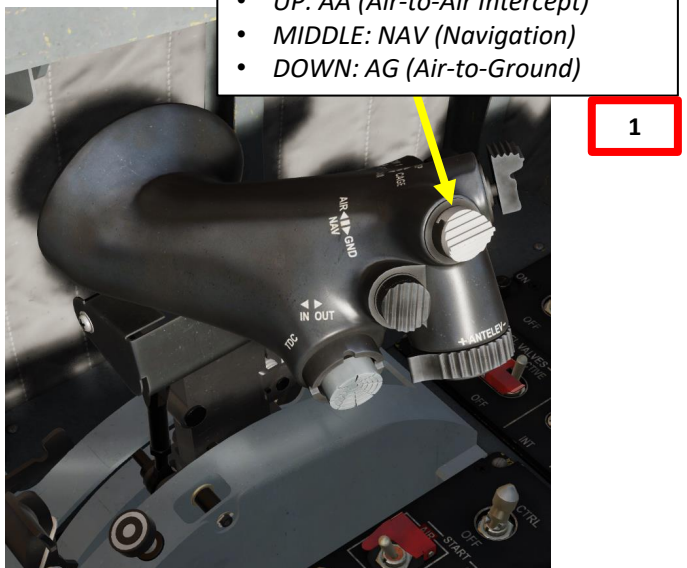
KJL-7 RADAR
2.3.1 – SEA1 Mode

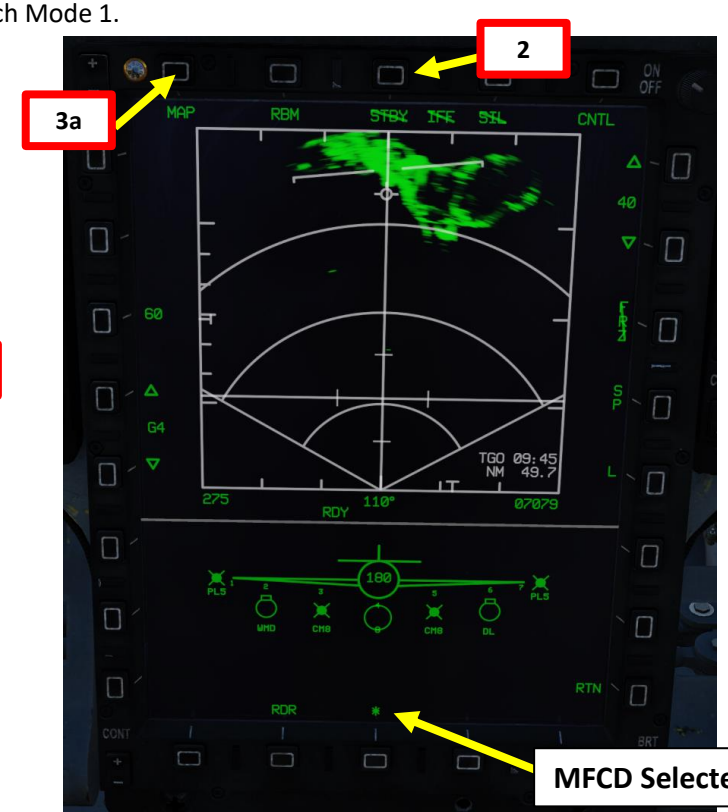
Display

The Sea Search radar mode 1 scans for and highlights **both moving and stationary naval targets**, detected by their Doppler shift. Detected targets are displayed as white bricks. The size of the bricks changes based on the RCS (radar cross-section) of the naval target. The shaded area of the display shows antenna azimuth coverage and the ground mapping (MAP) overlay.

In order to display the SEA1 data on the radar page:

1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu.
4. Press on the OSB next to “SEA1” to select Sea Search Mode 1.



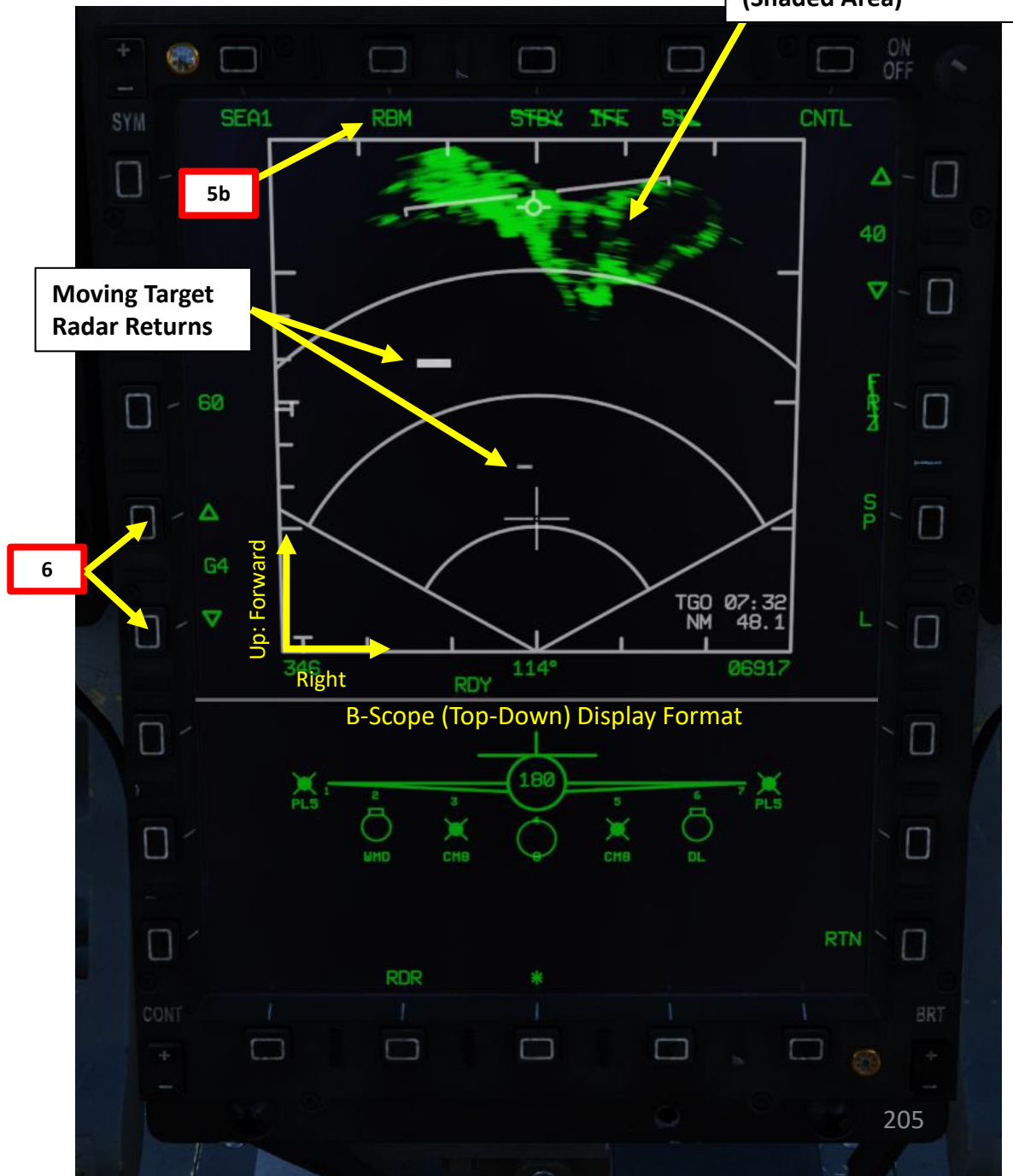


SEA1 Radar Mode Selected

KJL-7 RADAR
2.3.1 – SEA1 Mode

Display

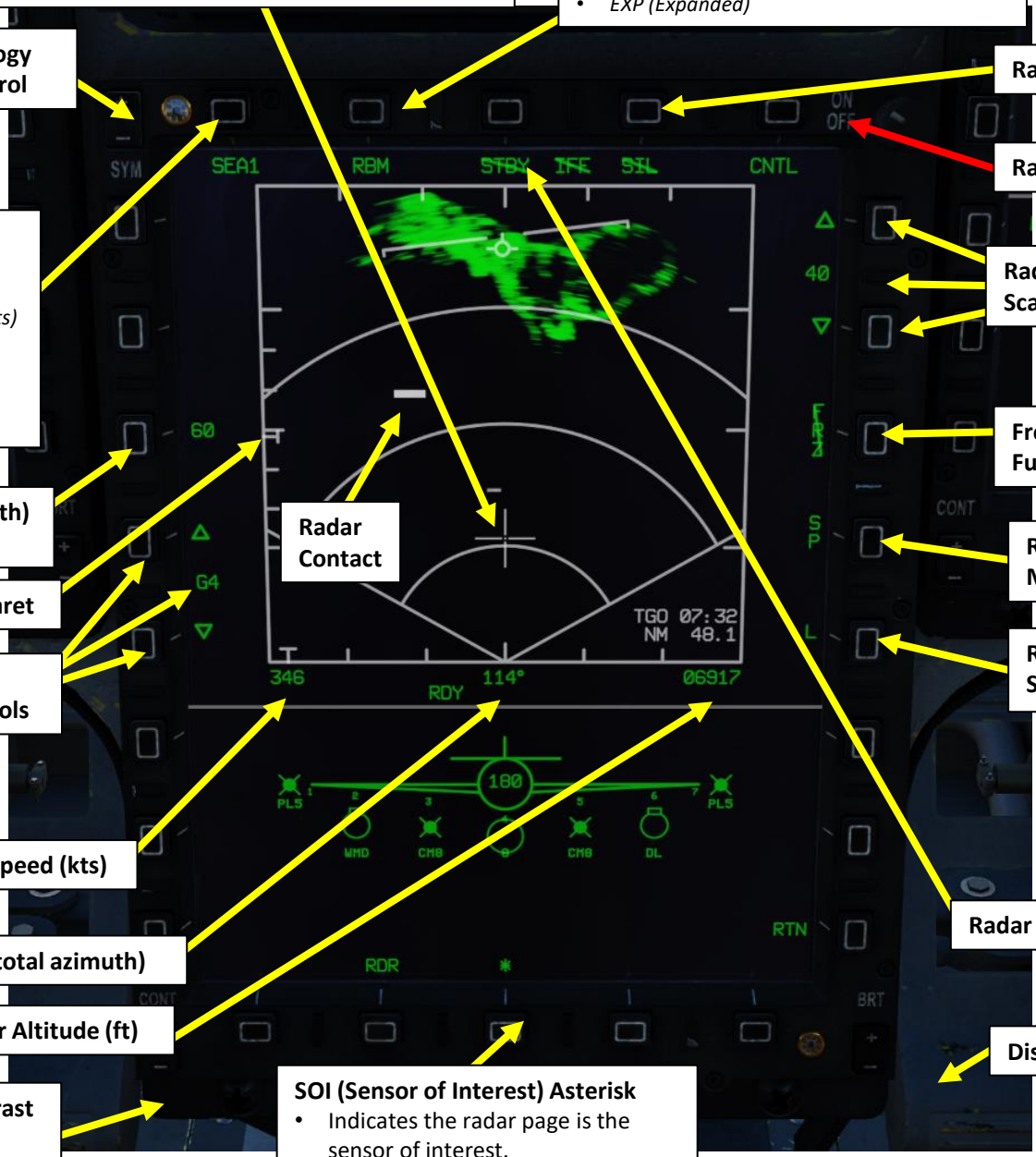
5. To display ground mapping overlay, make sure “RBM” (Real Beam Mode) option is active.
6. Adjust Gain Control – As required.



KJL-7 RADAR
2.3.1 – SEA1 Mode

Controls (SEA1 Page)

Here is an overview of the controls available from the Radar Sea Search (SEA1) Page.



Radar Crosshair/Cursor
- The crosshairs indicate the current sensor point of interest (SPI). When in snowplow mode, the TDC control on the throttle can be used to move the crosshairs and change the SPI.

Air-to-Ground Radar Sub-Mode Selector
- *RBM (Real Beam Mode)*
- *EXP (Expanded)*

Display Symbology Brightness Control

Radar Silent Mode Selector

Radar MAP Control (CNTL) Page Selector

Radar Mode Selector
- *MAP (Ground Mapping)*
- *GMTI (Ground Moving Target Indicator)*
- *SEA1 (Sea Mode 1, Stationary + Moving Naval Targets)*
- *SEA2 (Sea Mode 2, Stationary Naval Targets)*
- *BCN (Beacon)*
- *WA (Weather Awareness)*
- *TA (Terrain Avoidance)*

Radar Distance Scale Setting (nm)

Frozen Radar Map Function Selector

Radar Azimuth Selector (Coverage for half the total azimuth) *(can be set to 10/25/60 deg)*

Radar Contact

Radar Snowplow/Slave Mode Selector

Radar Antenna Elevation Caret

Radar Gain Level Indicator and Controls

Radar Speed Gate Setting *(LOW/HIGH)*

Ownship Airspeed (kts)

Radar Standby Mode Selector

Radar Azimuth Indicator (Coverage for half the total azimuth)

Ownship Radar Altitude (ft)

Display Brightness Control

Display Contrast Control

SOI (Sensor of Interest) Asterisk
- Indicates the radar page is the sensor of interest.

KJL-7 RADAR
2.3.1 – SEA1 Mode

Controls (SEA1 CNTL Page)

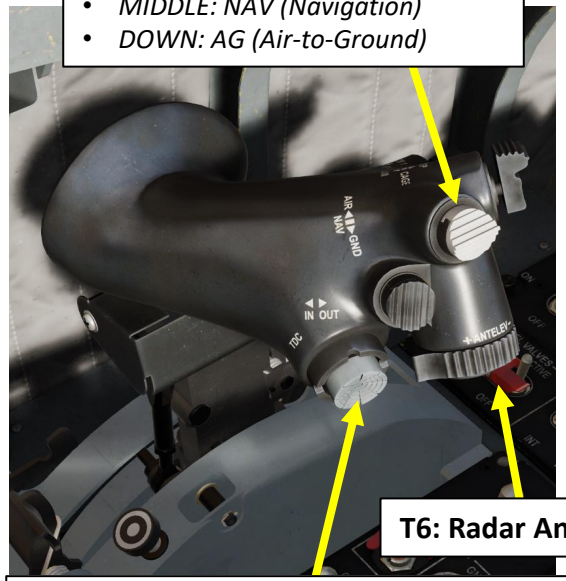
KJL-7 RADAR
2.3.1 – SEA1 Mode

Controls (HOTAS)

Here is an overview of the HOTAS controls available for the radar when in air-to-ground mode.

- T1 (Master Mode Switch): DOWN sets Master Mode to Air-to-Ground
- T6: UP/DOWN Controls Radar Antenna Elevation
- T5: TDC (Target Designator Controller) Switch controls Radar Crosshair/Cursor
- S2 (Sensor Control) Switch:
  - FWD: Increases Display Range
  - AFT: Decreases Display Range
  - RIGHT: Changes Azimuth Scan Range and/or cancels EXP Sub-Mode
  - LEFT: Selects EXP Sub-Mode
  - PUSH: Discards Target Designation

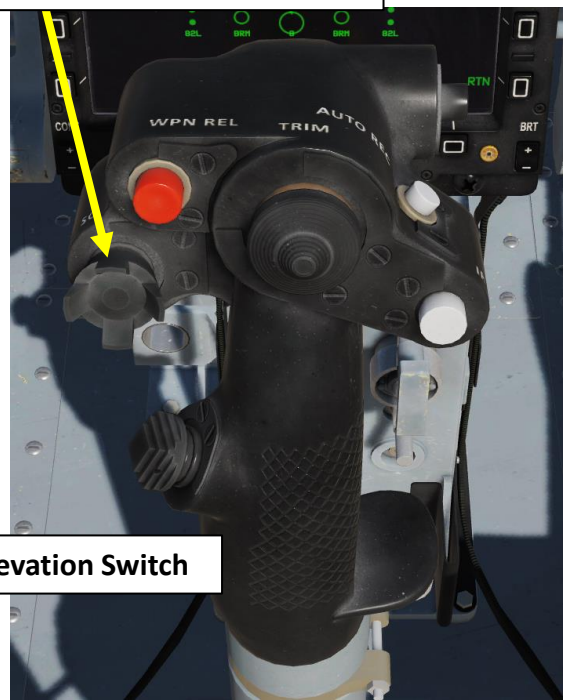
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

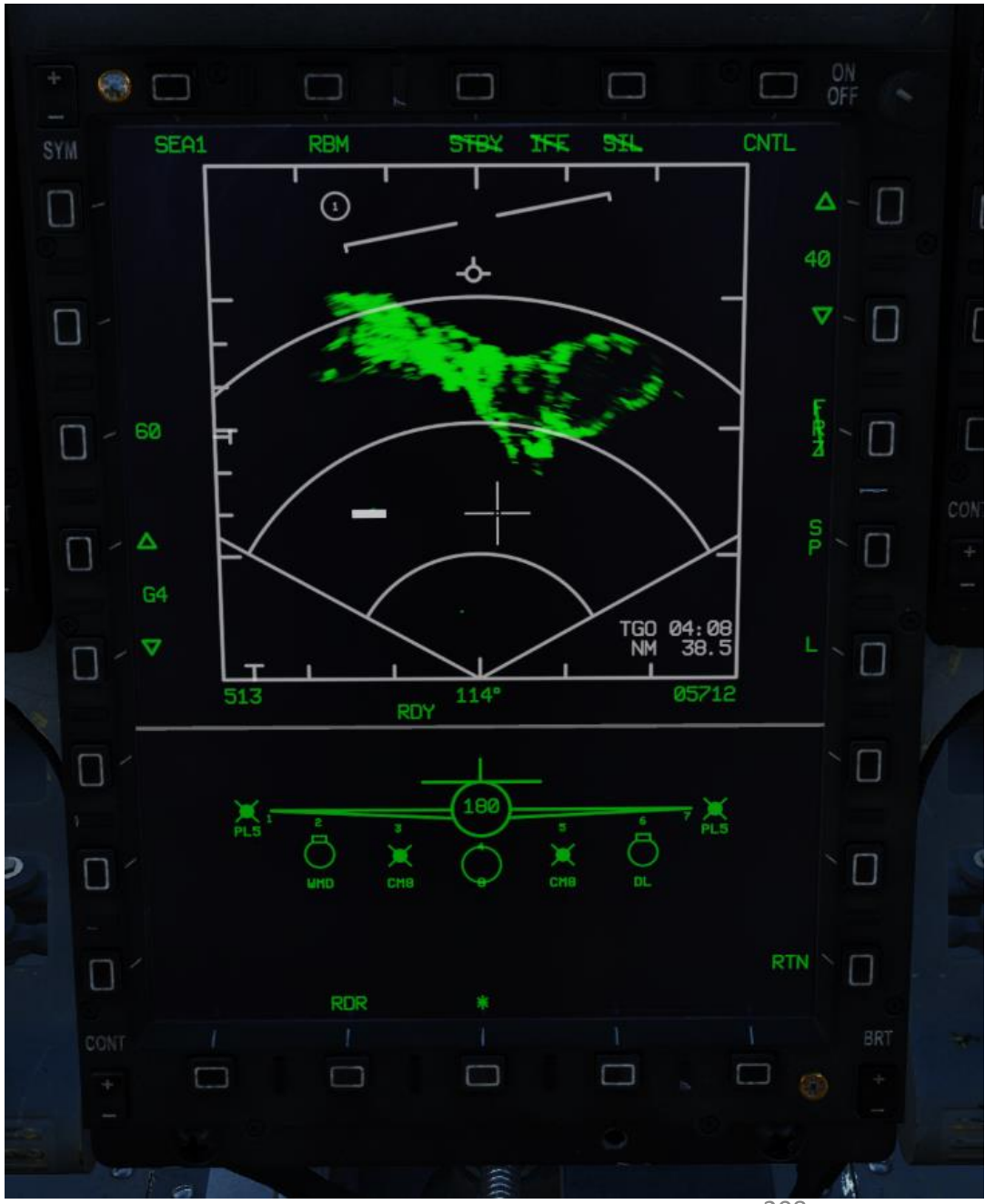


T6: Radar Antenna Elevation Switch

T5: TDC (Target Designator Controller) Switch

S2: SC (Sensor Control) Switch





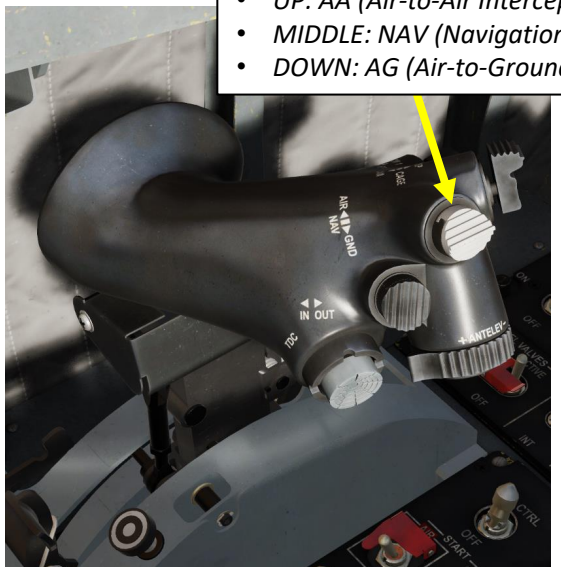
KJL-7 RADAR
2.3.2 – SEA2 Mode

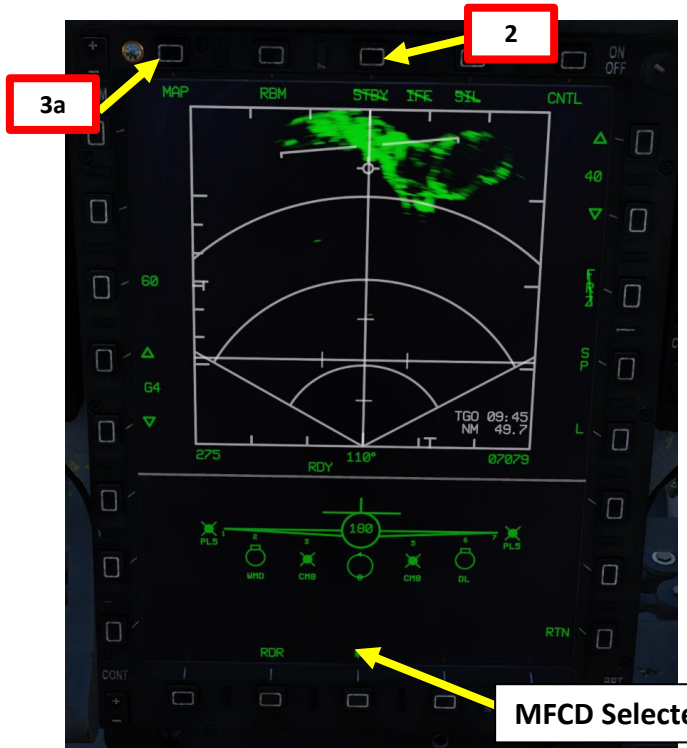
Display

The Sea Search radar mode 2 scans for and highlights **moving naval targets only**, detected by their Doppler shift. Detected targets are displayed as white bricks. The size of the bricks changes based on the RCS (radar cross-section) of the naval target. The display and controls of SEA2 mode are pretty much identical to SEA1, however ground mapping overlay (RBM) is unavailable for SEA2. Refer to section 2.3.1 for information about SEA1 controls.

In order to display the SEA2 data on the radar page:

1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu.
4. Press on the OSB next to “SEA2” to select Sea Search Mode 2.



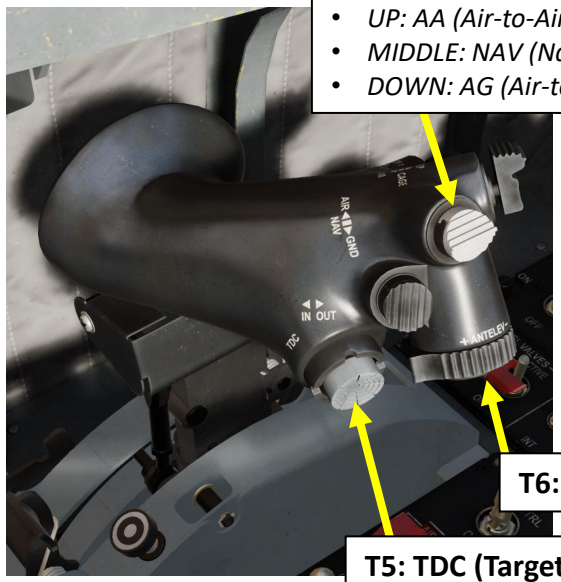


SEA2 Radar Mode Selected

KJL-7 RADAR
2.3.3 – SSTT/SMTT (Sea Single/Moving Target Track) Mode

How to Track a Naval Target (SSTT/SMTT, Sea Single/Moving Target Track)

1. Press the MMS (Master Mode Switch) DOWN to AG (Air-to-Ground). Center MFCD will automatically be set as the Sensor of Interest (SOI), as shown by the asterisk. By default, MAP mode should already be selected.
2. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
3. Press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu. Press on the OSB next to "SEA1" to select Sea Search Mode 1.
4. Make sure Snowplow Mode is selected (OSB next to SP/SLV toggles Snowplow and Slave Modes).
5. To display ground mapping overlay, make sure "RBM" (Real Beam Mode) option is active.
6. Adjust Gain and Contrast– As required.
7. You can control the radar antenna with the T6 Radar Antenna Elevation switch.
8. Slew the TDC Cursor (Radar Crosshair) over the region you want to expand/designate using the T5 TDC Switch.

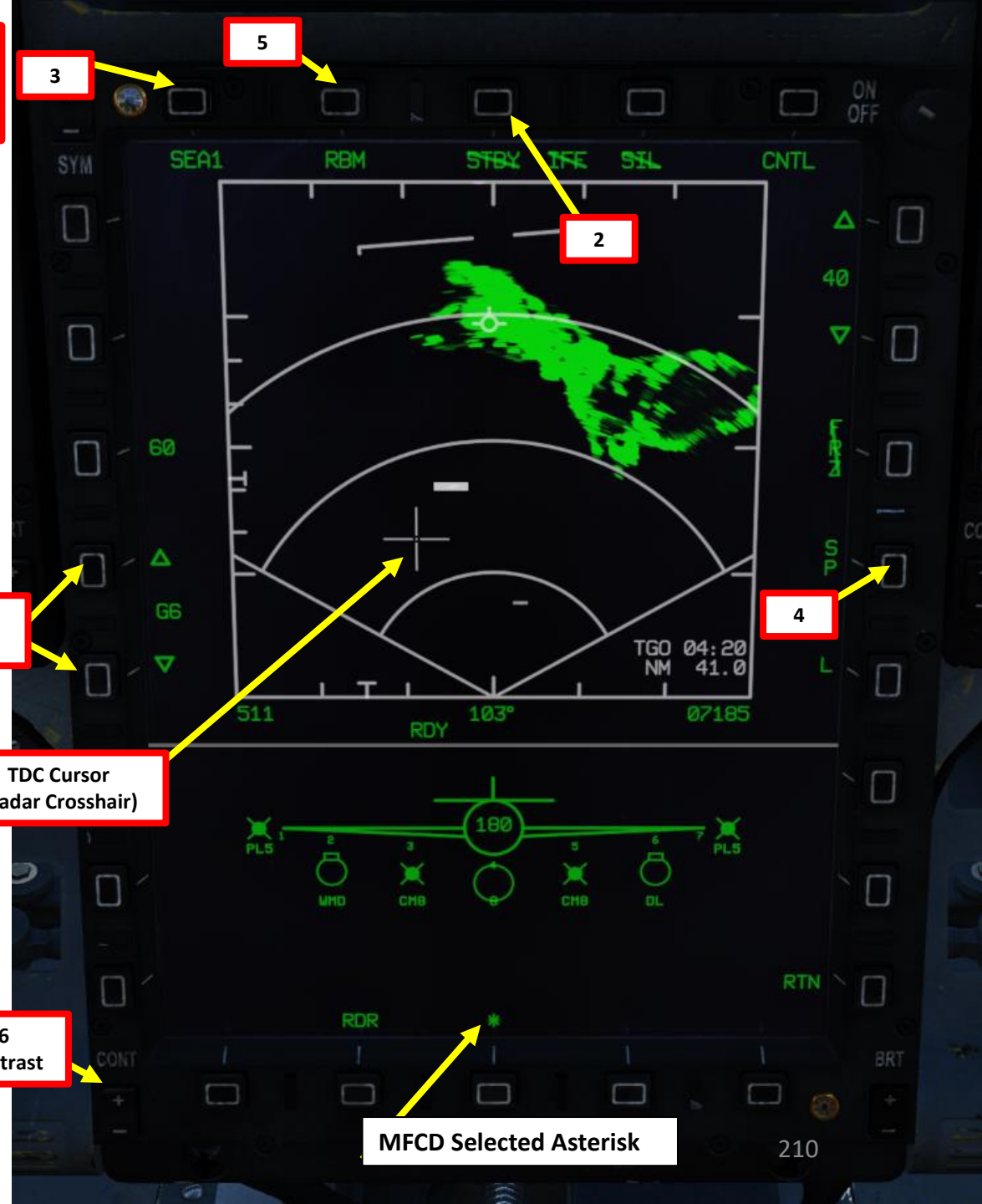


T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

1

T6: Radar Antenna Elevation Switch 7

T5: TDC (Target Designator Controller) Switch 8



3

5

2

6 Gain

4

8 TDC Cursor (Radar Crosshair)

6 Contrast

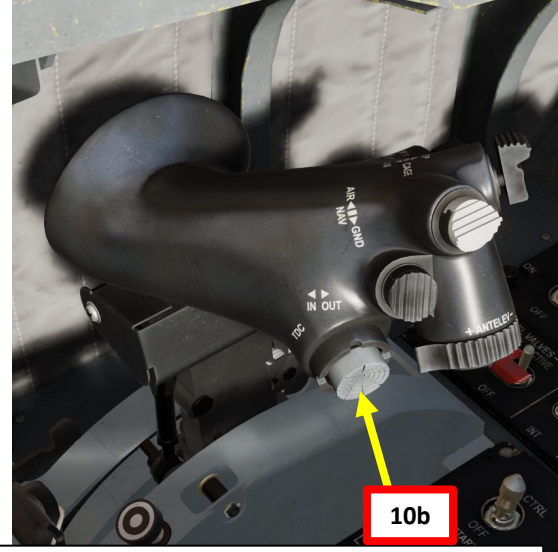
MFCD Selected Asterisk

KJL-7 RADAR
2.3.3 – SSTT/SMTT (Sea Single/Moving Target Track) Mode

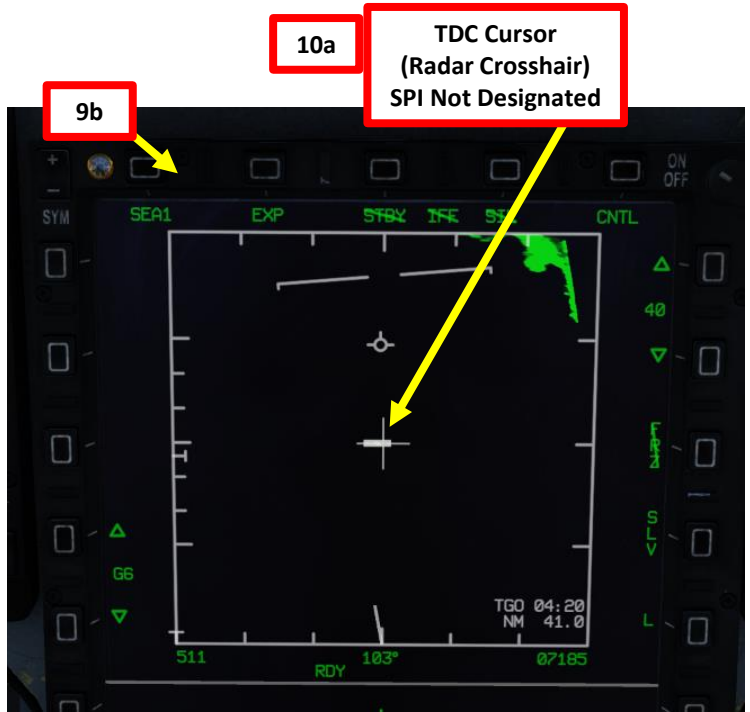
How to Track a Naval Target (SSTT/SMTT, Sea Single/Moving Target Track)

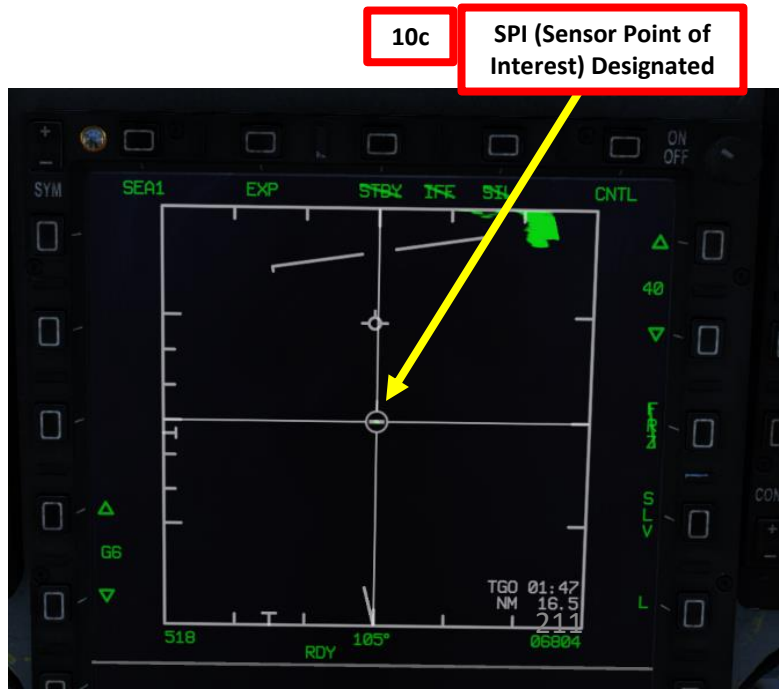
9. Naval Target Designation via the ground radar, also called Sea Single Target Track (SSTT), can be performed from SEA1 mode only. Moving Target Designation via the ground radar, also called Sea Moving Target Track (SMTT), can be performed from either SEA1 or SEA2 mode only. If you want to use EXP (Expanded) sub-mode, press the S2/SC (Sensor Control) Switch LEFT. The air-to-ground radar will automatically adjust its range to give you a better view of the region you just expanded. If you want to return to RBM/Normal (Non-Expanded), use S2/SC (Sensor Control) Switch LEFT.
10. To designate a target/SPI (Sensor Point of Interest) on the Radar Crosshair position, use the T5 TDC PRESS switch control (ENTER). This will set the SPI (Sensor Point of Interest) at this location and center the radar image around this SPI.

S2: SC (Sensor Control) Switch



T5: TDC (Target Designator Controller) Switch

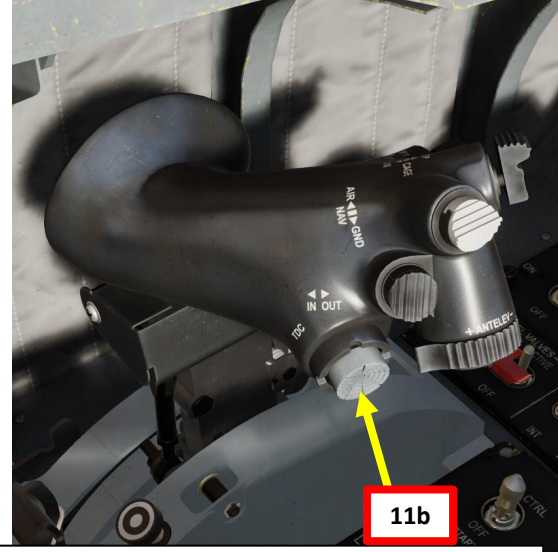




KJL-7 RADAR
2.3.3 – SSTT/SMTT (Sea Single/Moving Target Track) Mode

How to Track a Naval Target (SSTT/SMTT, Sea Single/Moving Target Track)

11. Use the T5 TDC PRESS switch control (ENTER) a second time. This will perform a ground-stabilized sea single target track (SSTT) if the target is stationary or a SMTT (sea moving target track) if the target is moving. The radar will then focus all its energy on the naval target you just designated.
12. To un-designate target and exit GMTT, set the S2 Sensor Control Switch to PRESS (BACKSPACE).



T5: TDC (Target Designator Controller) Switch

KJL-7 RADAR
2.3.3 – SSTT/SMTT (Sea Single/Moving Target Track) Mode

How to Track a Naval Target (SSTT/SMTT, Sea Single/Moving Target Track)

13. When in SSTT or SMTT, the designated/tracked target becomes the SPI (Sensor Point of Interest). The radar will continue to track the target while line-of-sight (LOS) is maintained. If the designated location moves outside the radar field of view, the radar will slew to boresight until the target returns into the radar FOV, at which point the radar will attempt to reacquire the target.
14. If you want to slave other sensors like the Targeting Pod to the SPI (Sensor Point of Interest) designated via the radar, uncage the targeting pod and set the SP/SLAV (Snowplow/Slave) Function to SLAV. The targeting pod will then be slaved to the Ground Moving Target Track.

14b
TGP Slaved to Radar SPI

Radar SPI
Diamond: Radar-Designated Target
Circle: Targeting Pod Slaved to SPI

SSTT (Sea Single Target Track)

KJL-7 RADAR
2.4 – Radar Lingo & Terminology

- BANDIT: Identified Enemy Aircraft
- BOGEY: Unidentified Aircraft
- SPIKE: Air-to-Air radar is locked on you
- BUDDY SPIKE: Friendly radar is locked on you
- NAILS: RWR contact, which emits radar waves but does not have a radar lock on you
- FOX 1: semi-active radar missile (27R/ER + AIM-7)
- FOX 2: heat-seeking infrared missile (27T/ET + AIM-9 + R-73/60 + PL-5EII)
- FOX 3: active radar missile, meaning the missile tracks to an aircraft's radar up to a certain distance, then its internal radar activates (pitbull) (AIM-120/R-77/SD-10)
- RIFLE: AGM-65 Air-to-Ground missile
- RAYGUN: When locking a target with your radar, it is good practice to say "RAYGUN" so your teammates are aware that you are locking someone. It is often used to identify a contact as friend or foe. If a person yells "BUDDY SPIKE!", it's very likely that you are locking a friendly contact.
- IFF: meaning "Is he friendly or bandit (enemy)?"
- PITBULL: Any FOX 3 (active radar) missile that starts using its onboard radar for tracking

WMD-7 TARGETING POD
3.1 – INTRODUCTION

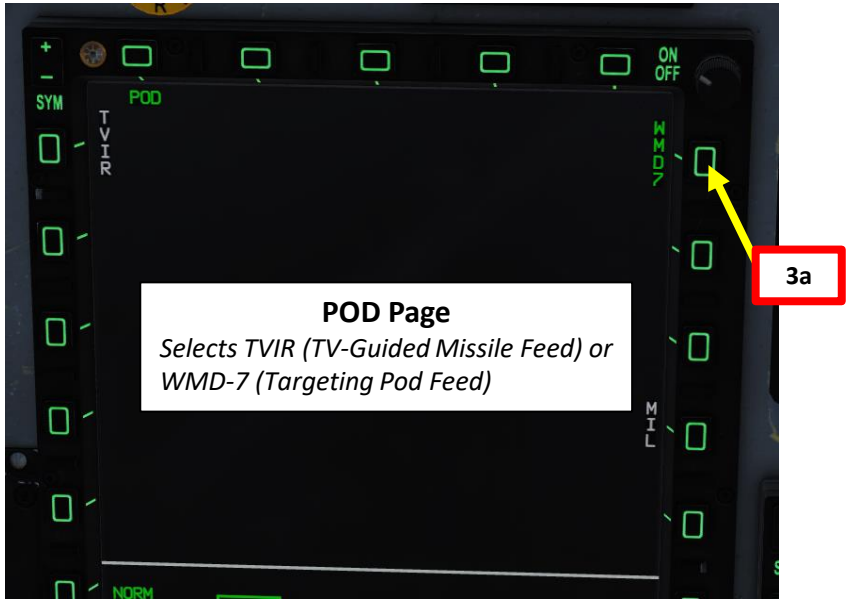
The WMD-7 Targeting Pod is a self-contained, multi-sensor targeting and surveillance system. The WMD-7 enables aircrews to detect, acquire, auto-track and identify targets at long ranges for weapon delivery or non-traditional intelligence, surveillance and reconnaissance missions. WMD-7's FLIR, charged-coupled device (CCD), laser imaging sensors, advanced image processing and digital video output provide useful imagery of targets on the ground, allowing aircrews to identify and engage targets under a wide range of battlefield conditions.

WMD-7 TARGETING POD
3.2 – DISPLAYS

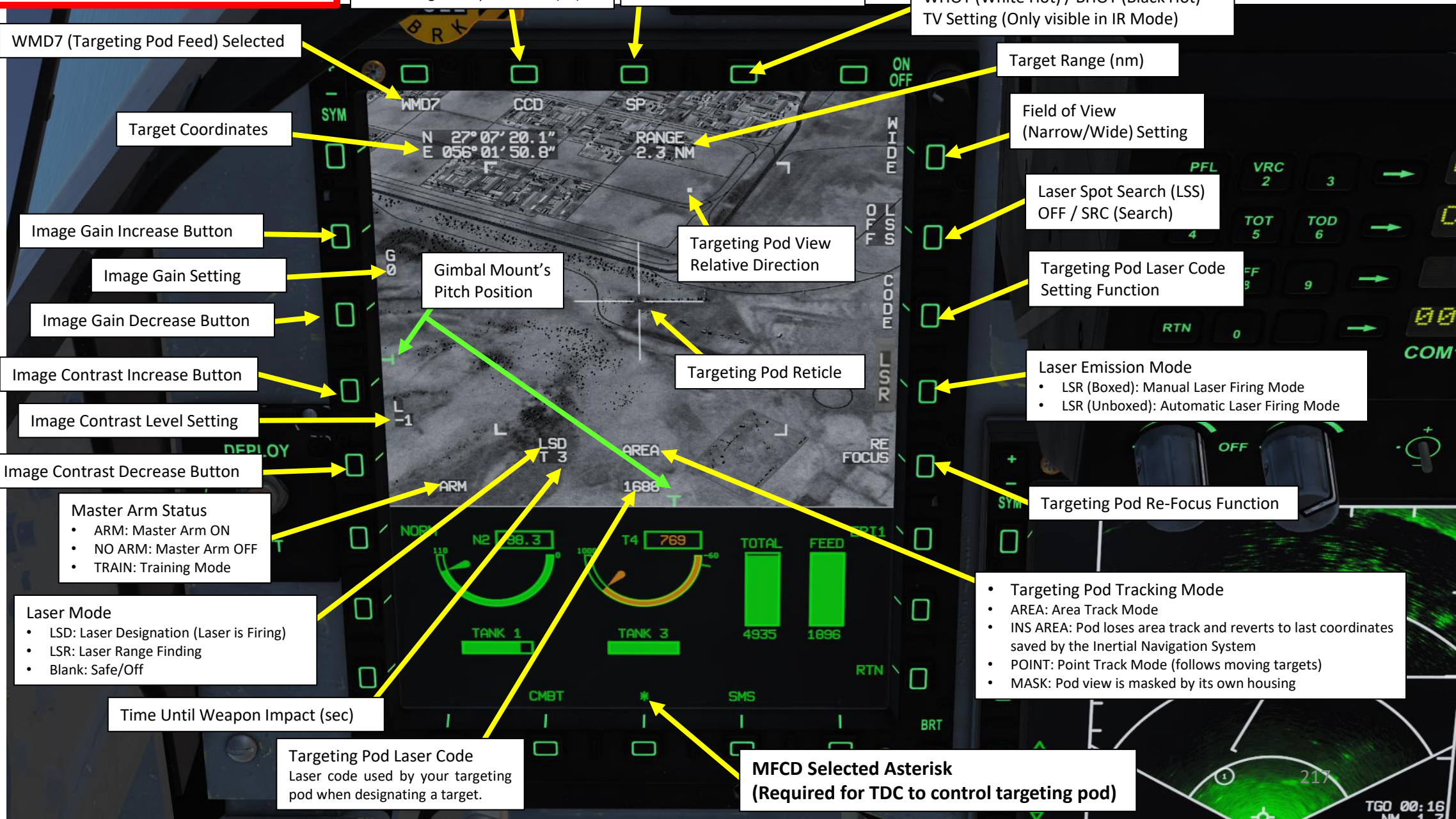
The targeting pod feed can be displayed on any MFCD (Multi-function Colored Display). Take note that the POD page on the MFCD is displayed in white and black.

To display targeting pod feed:

1. Select MAIN MENU page
2. Click on the OSB next to « POD ».
3. Click on the OSB next to « WMD7 » to select the targeting pod feed.



WMD-7 TARGETING POD
3.2 – DISPLAYS



IR/CCD Camera Mode Selector
IR: Infrared
CCD: Charged Coupled Device (TV)

SP (Snowplow) / SLAV (Slave) Mode Selector

WHOT (White Hot) / BHOT (Black Hot) TV Setting (Only visible in IR Mode)

WMD7 (Targeting Pod Feed) Selected

Target Range (nm)

Target Coordinates

Field of View (Narrow/Wide) Setting

Laser Spot Search (LSS) OFF / SRC (Search)

Image Gain Increase Button

Image Gain Setting

Image Gain Decrease Button

Gimbal Mount's Pitch Position

Targeting Pod View Relative Direction

Targeting Pod Laser Code Setting Function

Image Contrast Increase Button

Image Contrast Level Setting

Image Contrast Decrease Button

Targeting Pod Reticle

Laser Emission Mode
- LSR (Boxed): Manual Laser Firing Mode
- LSR (Unboxed): Automatic Laser Firing Mode

Master Arm Status
- ARM: Master Arm ON
- NO ARM: Master Arm OFF
- TRAIN: Training Mode

Targeting Pod Re-Focus Function

Laser Mode
- LSD: Laser Designation (Laser is Firing)
- LSR: Laser Range Finding
- Blank: Safe/Off

- Targeting Pod Tracking Mode
- AREA: Area Track Mode
- INS AREA: Pod loses area track and reverts to last coordinates saved by the Inertial Navigation System
- POINT: Point Track Mode (follows moving targets)
- MASK: Pod view is masked by its own housing

Time Until Weapon Impact (sec)

Targeting Pod Laser Code
Laser code used by your targeting pod when designating a target.

MFCD Selected Asterisk
(Required for TDC to control targeting pod)

WMD-7 TARGETING POD
3.2 – DISPLAYS

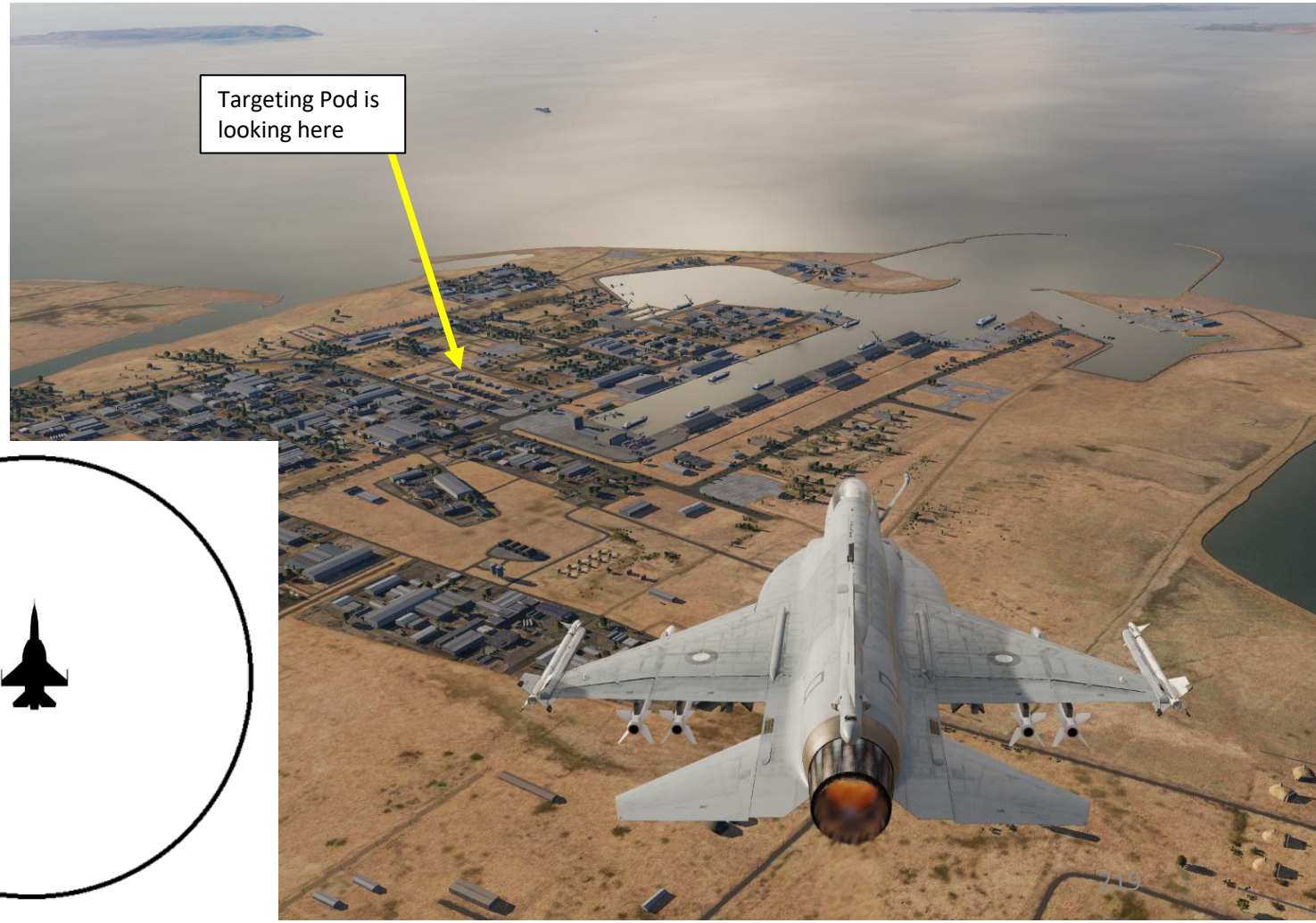
TV / CCD Mode

WHOT (White Hot) FLIR Mode

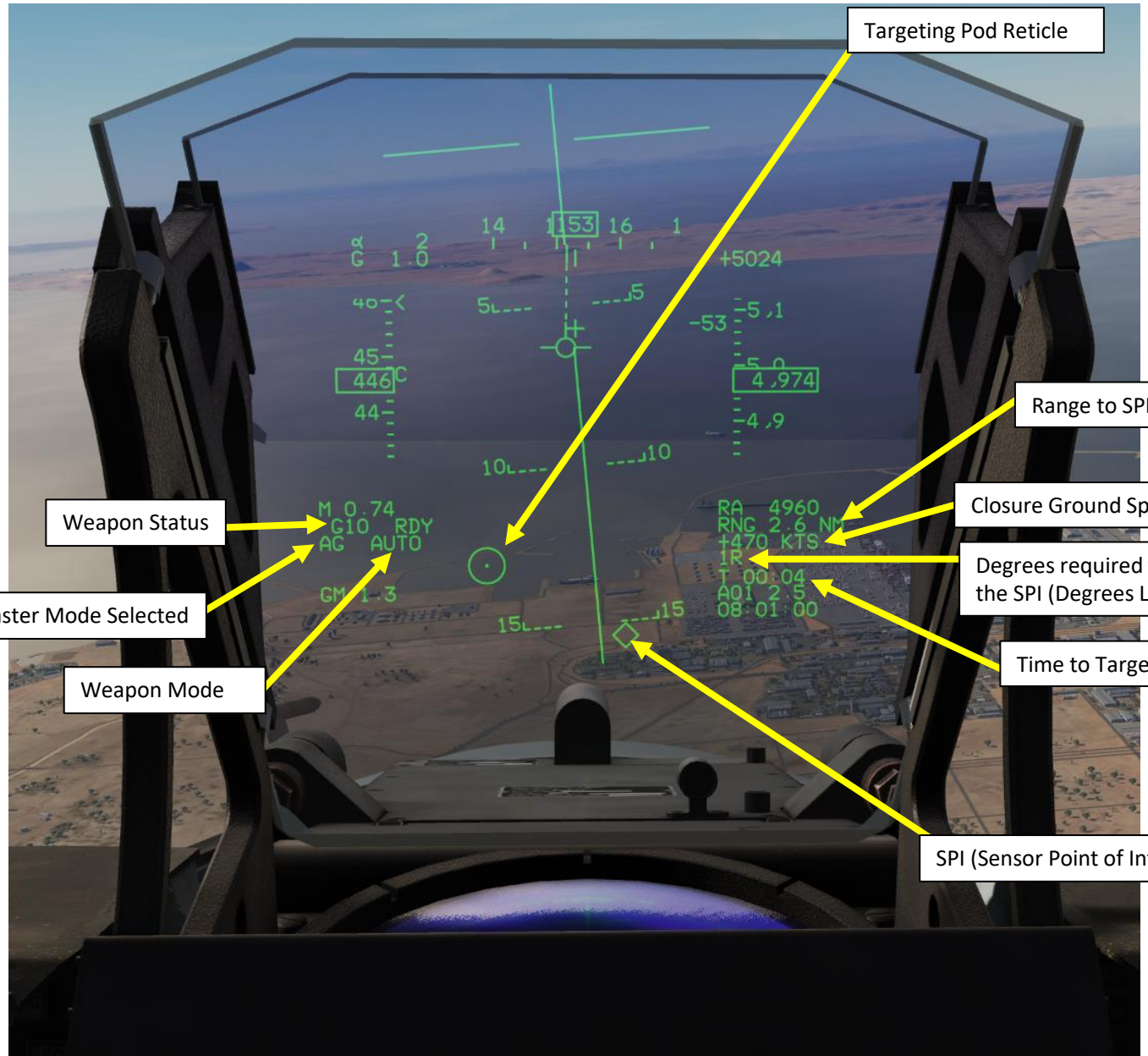
BHOT (Black Hot) FLIR Mode

WMD-7 TARGETING POD
3.2 – DISPLAYS

The Targeting Pod View Relative Direction symbol on the TGP display can give you a good idea of where the pod is pointing in relationship to your aircraft. This view direction is represented in a top-down view.



WMD-7 TARGETING POD
3.2 – DISPLAYS



WMD-7 TARGETING POD
3.3 – CONTROLS

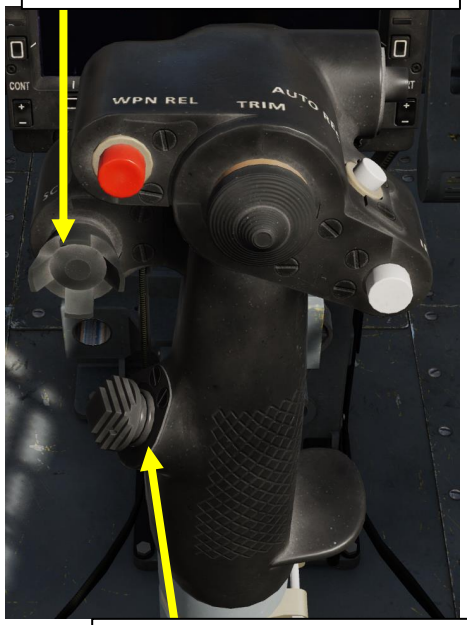
- **S1 Sensor Selection Switch** sets Targeting Pod MFCD as the SOI (Sensor of Interest).
  - **LEFT-RIGHT** selects left or right MFCD. Asterisk indicates MFCD is set as the Sensor of Interest (SOI).
  - **AFT** cycles between Left, Center and Right MFCD.

- **T5/TDC (Target Designator Controller) Switch**
  - **T5-TDC LEFT/RIGHT/UP/DOWN Slew Control** controls Targeting Pod SPI (Sensor Point of Interest)
  - **T5-TDC PRESS Control** will lock the ground to either AREA TRACK or POINT TRACK (if available) and designate SPI (Sensor Point of Interest).

- **S2 Sensor Control Switch**
  - **LEFT** toggles TV (CCD) or IR Mode
  - **RIGHT** toggles between BHOT (Black Hot) and WHOT (White Hot) in TV Mode
  - **FWD** sets Narrow Field of View
  - **AFT** sets Wide Field of View
  - **PRESS** sets the following:
    - When pressed once, unlocks/undesignates SPI (Sensor Point of Interest).
    - When pressed a second time, returns sensor to current focus mode.
    - If SNOWPLOW MODE is used, the S2 Sensor Control Switch PRESSED will return the pod to its resting position (stabilized on the horizon, following our aircraft heading).
    - If SLAVED MODE is used, it will return the pod to its default SPI such as a selected waypoint.

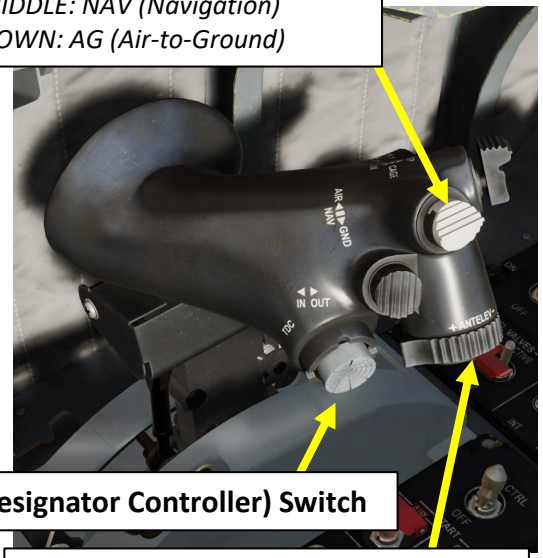
- **T6 Radar Antenna Elevation control**
  - Adjusts the pod zoom level.

S2: SC (Sensor Control) Switch



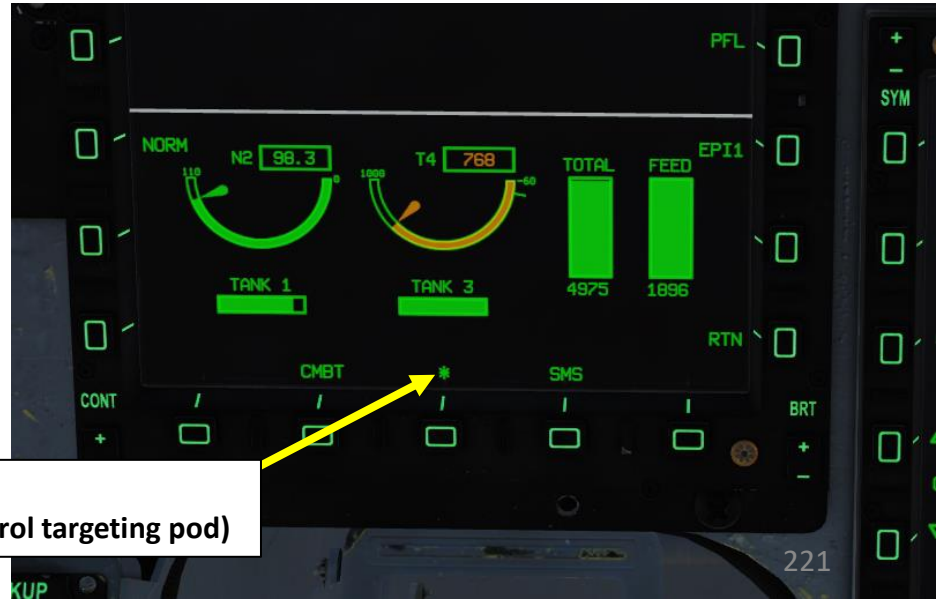
S1: SS (Sensor Selection) Switch

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



T5: TDC (Target Designator Controller) Switch

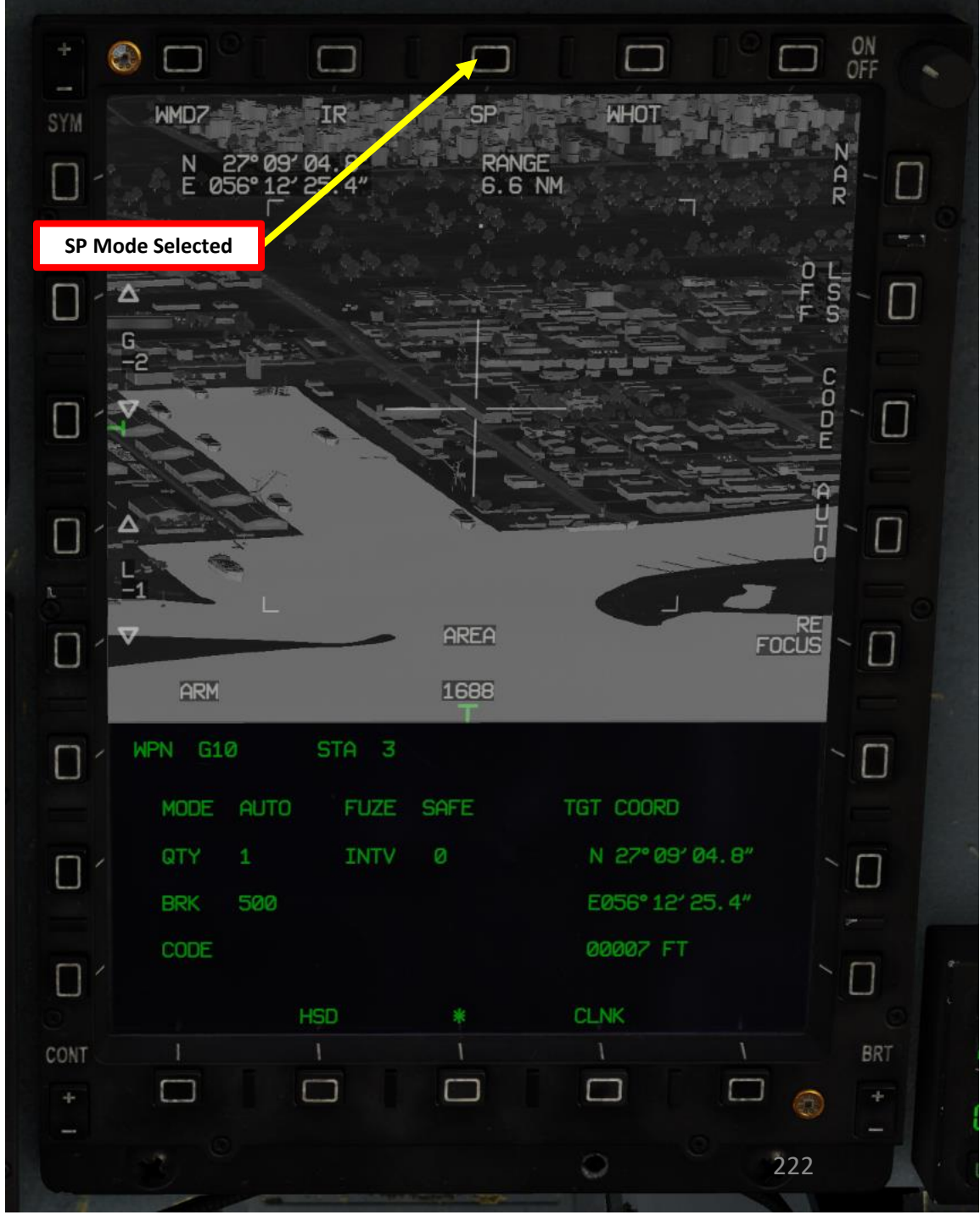
T6: Radar Antenna Elevation Switch



MFCD Selected Asterisk
(Required for TDC to control targeting pod)

WMD-7 TARGETING POD
3.4 – SNOWPLOW MODE

Snowplow (SP) mode is selected by using the OSB next to the SP/SLAV menu in the POD page. Snowplow mode is stabilized on the horizon, following our aircraft heading. It is a basic “look and designate” mode that is done through the targeting pod feed.



WMD-7 TARGETING POD 3.5 – SLAVE MODE

SLAVE mode is selected by using the OSB next to the SP/SLAV menu in the POD page. In this mode, you can slave the targeting pod reticle to a designated point (i.e. waypoint, markpoint, air-to-air radar lock or a ground radar lock) by locking the desired point, then selecting the SLAV mode.

As an example, we have set the Air-to-Ground Radar MFCD page as the SOI (Sensor of Interest) and locked a specific point in a town with the TDC PRESS button. This designated this point as the SPI (Sensor Point of Interest). Then, we selected SLAV mode, the targeting pod slew itself automatically to this designated point in the town.

SP/SLAV Function

Targeting Pod slaved to Ground Radar SPI (Sensor Point of Interest) Designation

Ground Radar SPI (Sensor Point of Interest) Designation

WMD-7 TARGETING POD
3.6 – START-UP & LASING PROCEDURE

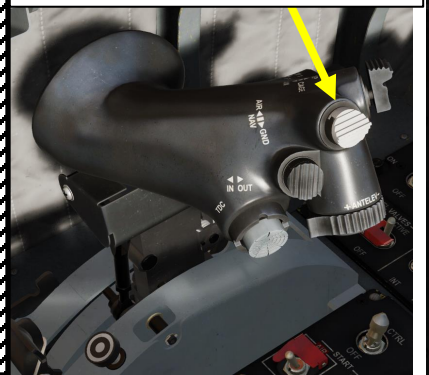
The laser code on the laser-guided bomb units / laser-guided rockets first needs to be set manually on the ground by the ground crew. We will see that in the Weapons section.

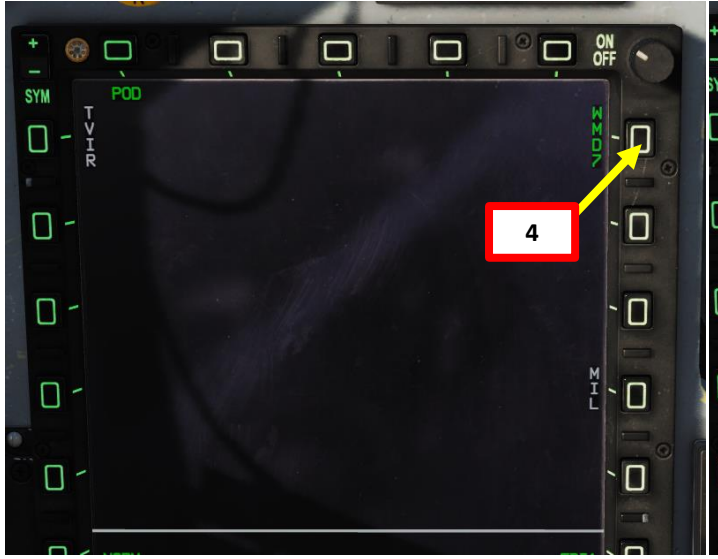
1. Press the CLDP (Convertible Laser Designator Pod) button to allow the targeting pod laser to be used.
2. Set Master Mode Switch to AG (Air-to-Ground).
3. Go in the MAIN MENU MFCD page and press the OSB (Option Select Button) next to POD.
4. Press the OSB next to WMD7 to enter the Targeting Pod feed page.
5. Press the OSB next to "OFF" to start warm-up process.
6. Targeting pod will enter a BIT (Built-In Test) mode that starts a warm-up process that will take about 60 seconds.
7. When targeting pod is ready to be used, the pod ALIGN status will disappear and be replaced by the pod feed in caged/stowed position.

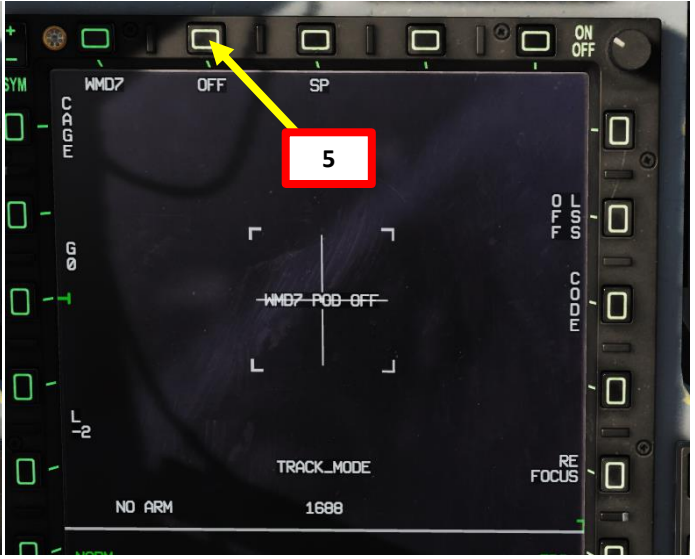
2

T1: MMS (Master Mode Switch)

- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*







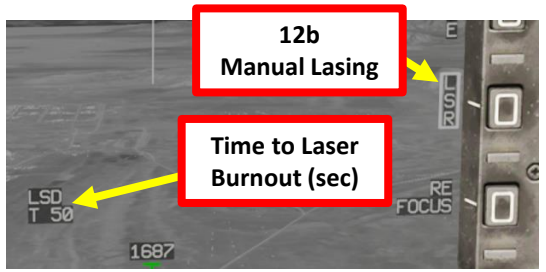
WMD-7 TARGETING POD
3.6 – START-UP & LASING PROCEDURE

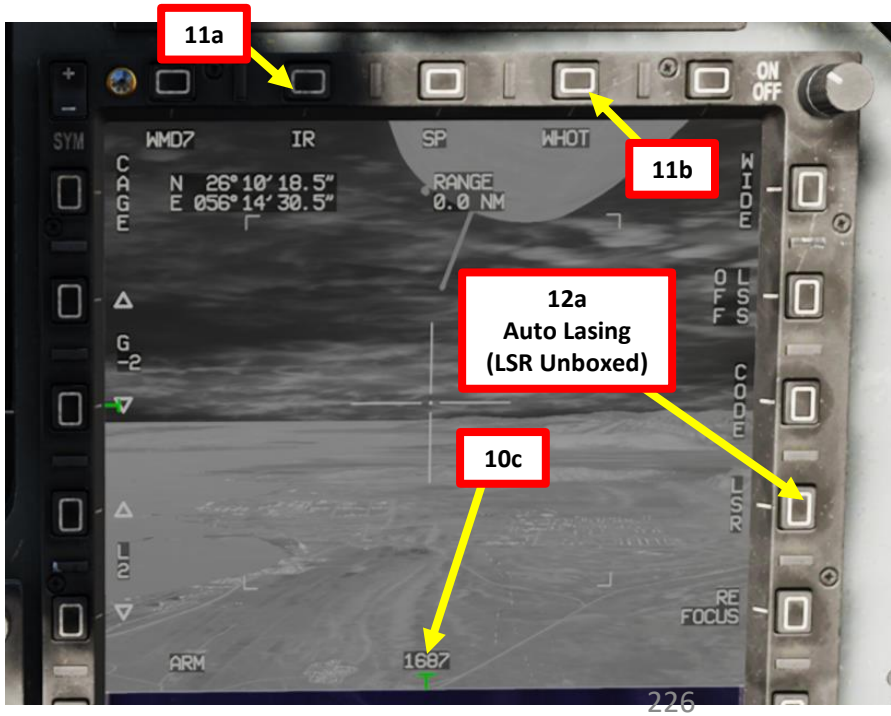
8. If pod is caged (UNCAGE indication is visible), press the OSB next to UNCAGE to uncage targeting pod.
9. Select desired mode (SP/SNOWPLOW or SLAV/SLAVED) by pressing the OSB next to SP/SLAV. In this case, we will use SNOWPLOW (SP) mode.

WMD-7 TARGETING POD
3.6 – START-UP & LASING PROCEDURE

10. Press the OSB next to CODE and set the desired laser code the targeting pod will designate with. The default code is 1688, so make sure it matches the code of the laser-guided bombs/rockets (set by ground crew) that will track this laser. In this example, we will use a laser code of 1687.
11. Select either CCD (Charged-Coupled Device/TV) or IR as required. If IR is selected, select either WHOT (White Hot) or BHOT (Black Hot) infrared imagery setting.
12. Select Laser Designation Mode as desired.
    a) AUTO mode (LSR unboxed) will automatically fire the laser and latch it after you launch a laser-guided weapon. This is much more efficient since it reduces your workload and avoids overheating the laser designator.
    b) MANUAL mode (LSR boxed) will fire the laser and latch it, displaying a flashing LSD indication. This is useful when "buddy lasing" a target for a friendly aircraft, but there is a time limit before the laser designator burns out and becomes inoperable.

Note: MANUAL mode is required if you are lasing a target for someone else.

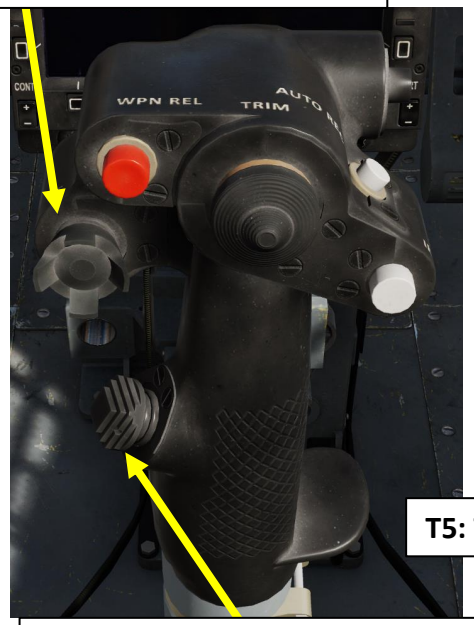




WMD-7 TARGETING POD
3.6 – START-UP & LASING PROCEDURE

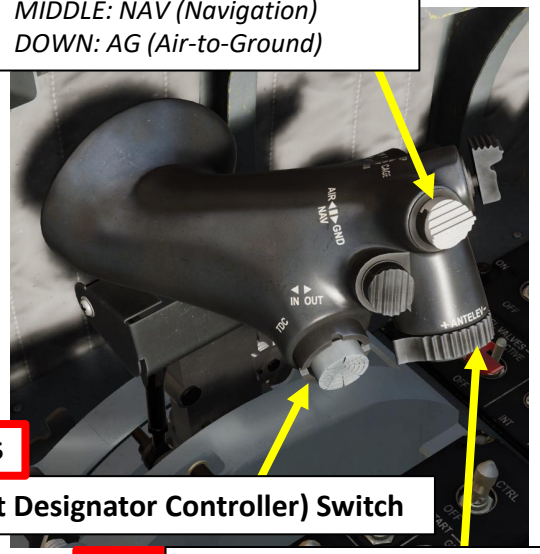
13. Set Targeting Pod page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (Right if POD page is on the RIGHT MFCD). An asterisk will indicate the SOI status.
14. Slew the Targeting Pod reticle on a target using the T5 TDC (Target Designator Controller) slew controls. Use Radar Antenna Elevation Switch to zoom in or out. Use OSB next to NAR/WIDE to select narrow or wide field-of-view.
15. When targeting pod reticle is over the target, use the T5 TDC PRESS button (ENTER) to designate the target as a SPI (Sensor Point of Interest).
16. Once a target is designated, the pod will attempt to enter POINT TRACK (tracks moving target). If POINT TRACK is not possible, the pod will enter AREA TRACK mode by default if the target is within 21 nm.

S2: SC (Sensor Control) Switch



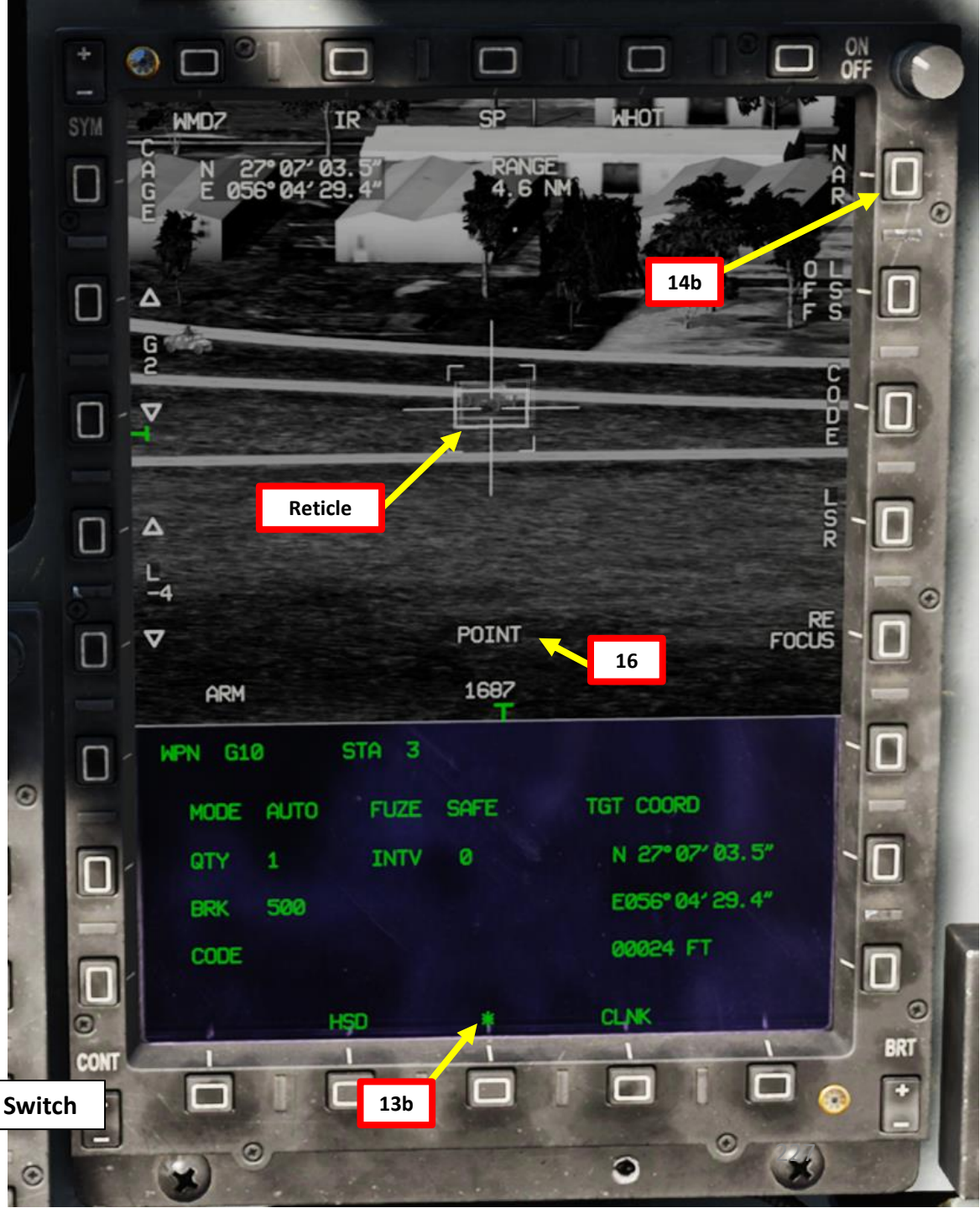
S1: SS (Sensor Selection) Switch **13a**

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



14/15 **T5: TDC (Target Designator Controller) Switch**

14a **T6: Radar Antenna Elevation Switch**

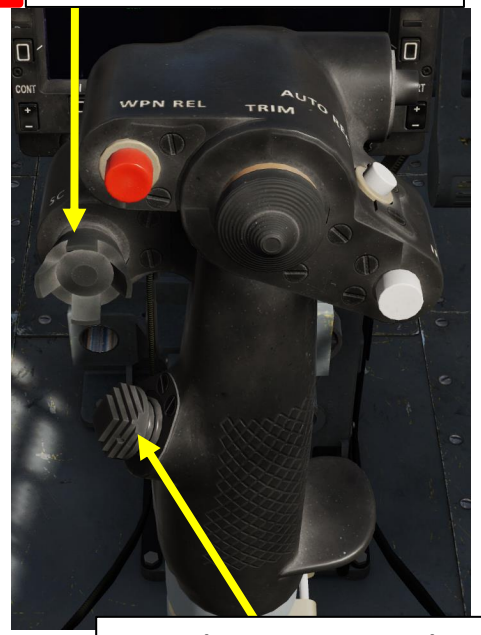


WMD-7 TARGETING POD
3.6 – START-UP & LASING PROCEDURE

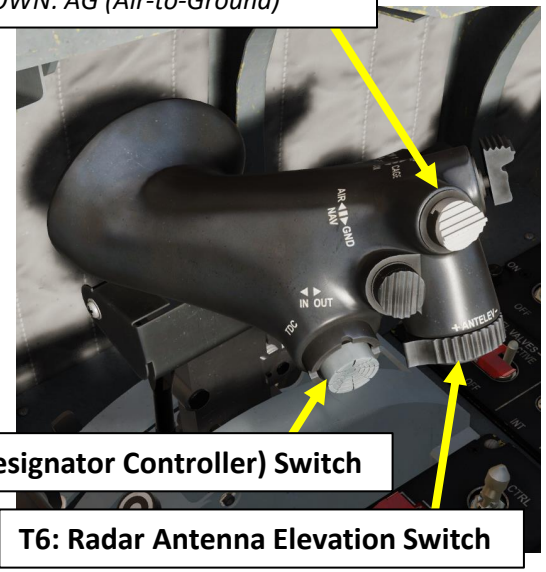
17. If Laser Designation Mode is set to AUTO, laser will remain in LSR (Laser Ranging) mode and fire only when a weapon is launched. If Laser Designation Mode is set to MANUAL, pressing the « LSR » button (boxed when selected) will manually fire the laser on the target in LSD (Laser Designate) mode.
18. Laser Designation Mode indication and Laser Code will both flash once laser is firing.
19. To undesignate a target, set the S2 Sensor Control Switch to PRESS (BACKSPACE).

19

S2: SC (Sensor Control) Switch



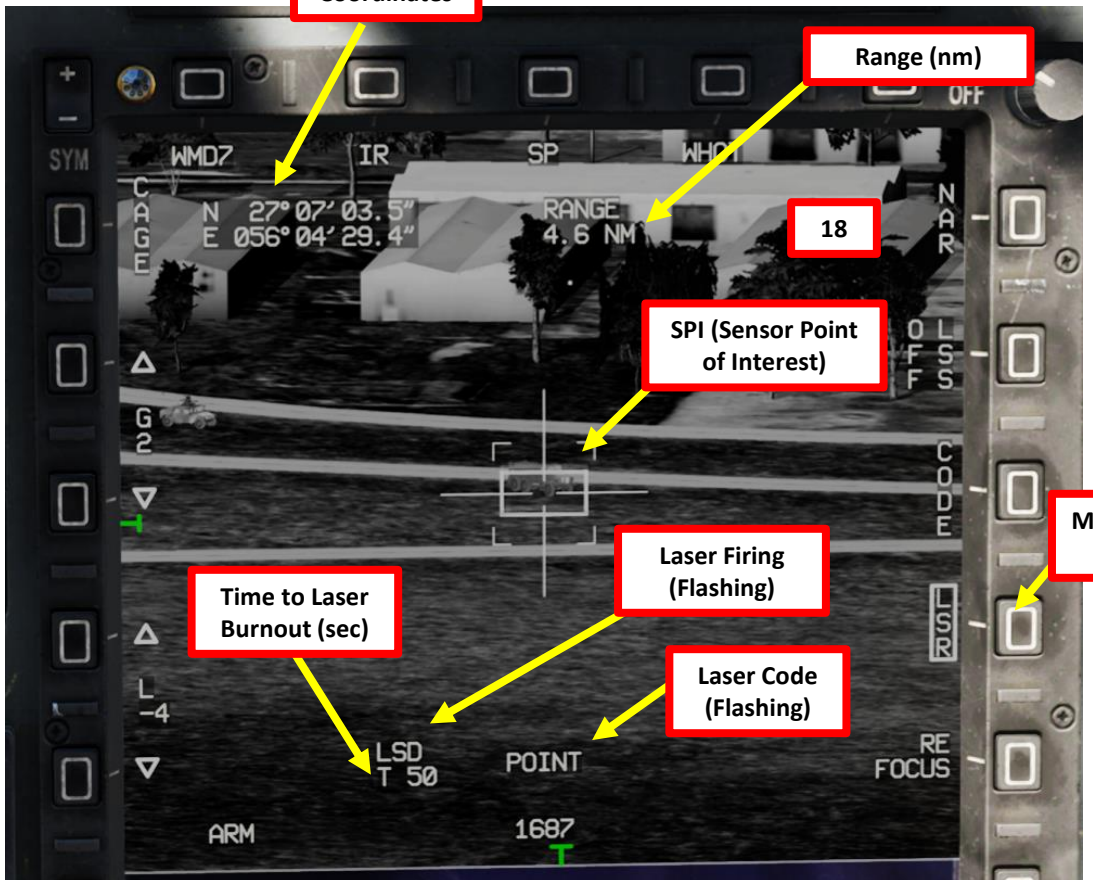
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



T5: TDC (Target Designator Controller) Switch

T6: Radar Antenna Elevation Switch

S1: SS (Sensor Selection) Switch



Coordinates

Range (nm)

18

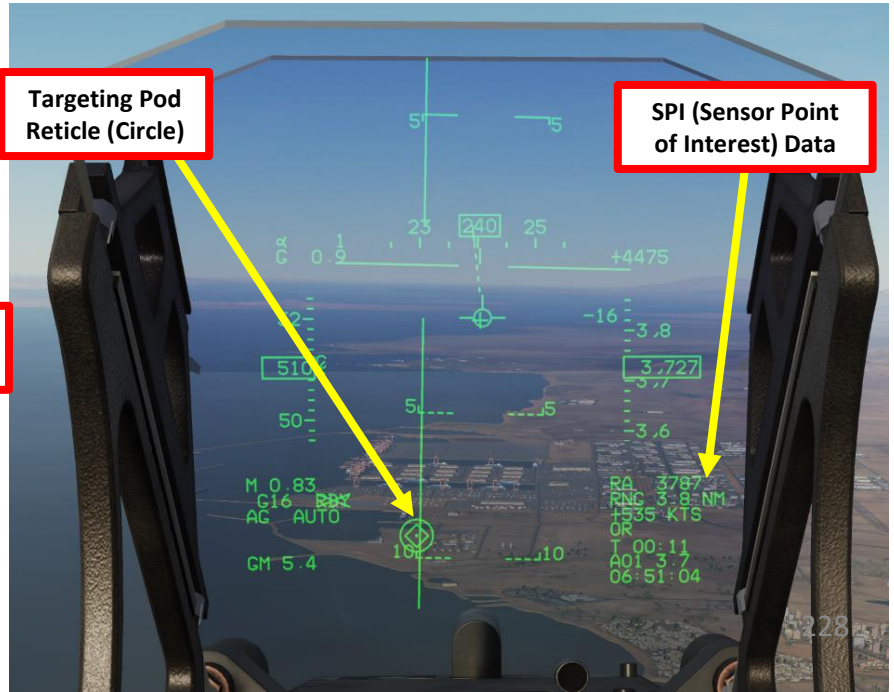
SPI (Sensor Point of Interest)

Laser Firing (Flashing)

Time to Laser Burnout (sec)

Laser Code (Flashing)

Manual Lasing Selected (LSR Boxed)



Targeting Pod Reticle (Circle)

SPI (Sensor Point of Interest) Data

WMD-7 TARGETING POD
3.7 – LASER SPOT SEARCH MODE

The targeting pod can also spot and track a laser from someone else (a friendly JF-17 lasing his own target, or a JTAC, Joint Tactical Air Controller, calling an air strike). To track another laser:

1. Find out what the laser code used by the friendly is (in our case, the friendly JTAC uses code 1688). Make sure the friendly asset is lasing the target before attempting to track it.
2. Power up the Targeting Pod and set A/G Master Mode as per the previous Power-Up Procedure.
3. Press the OSB next to CODE and set the desired laser code the targeting pod will search for. The default code is 1688, so make sure it matches the code of the laser designator on the ground.
4. Press the OSB next to LSS OFF (Laser Spot Search) to allow the targeting pod to search for a laser designator with the code entered previously.

JTAC (Axeman11): line is as follows
1, 2, 3 N/A
[4. Elevation:]23 feet MSL
[5. Target:]bunker
[6. Coordinates:]DQ083998
[7.]Marked by laser, 1688
[8. Friendlies:]southwest 70 meters, troops in contact
[9.]Egress west

WMD-7 TARGETING POD
3.7 – LASER SPOT SEARCH MODE

5. While Targeting Pod is searching, it will be in SRC LSS (Search) mode.
6. LSS DET (Detection) indicates that a laser with the correct code has been detected.
7. After a few seconds, the Targeting Pod will automatically enter LSS TRK (Track) mode.
8. If you want to slew your TDC and set the SPI (Sensor Point of Interest) somewhere else, press OSB next to LSS TRK to go in OFF LSS mode. You may now slew the TDC and lock it with the T5 TDC PRESS switch (ENTER).

WMD-7 TARGETING POD
3.8 – WAYPOINT/MARKPOINT SLAVING

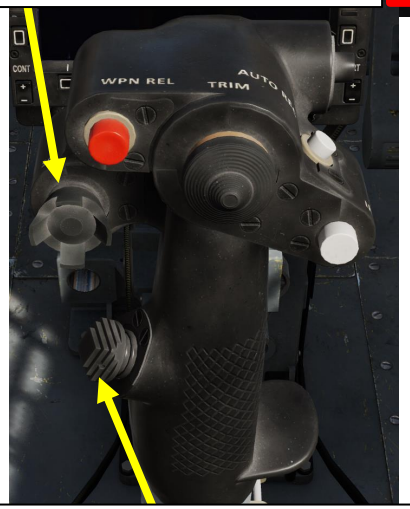
The targeting pod can be slaved to a waypoint or a markpoint. Here is an example where the target is on Waypoint No. 2:

1. Set NAV Master Mode
2. On the UFCP, press “RTN” to select Main UFCP Menu.
3. Press the arrow next to the WAYPOINT data field, enter “02” to select Waypoint 2, then press the arrow again.
4. Set A/G Master Mode
5. Power up the Targeting Pod as per the previous Power-Up Procedure.
6. Set Targeting Pod page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (Left if POD page is on the LEFT MFCD). An asterisk will indicate the SOI status.
7. Use the S2 Sensor Control PRESS control twice to make sure no SPI (Sensor Point of Interest) is selected. Alternatively, you can cycle between SP and SLAV mode again.

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

1 4

S2: SC (Sensor Control) Switch 7



6 **S1: SS (Sensor Selection) Switch**

WMD-7 TARGETING POD
3.8 – WAYPOINT/MARKPOINT SLAVING

8. Select SLAVE mode by pressing the OSB next to SP/SLAV.
9. Targeting pod will automatically slave itself to Waypoint 2, which will become the new SPI (Sensor Point of Interest).

WMD-7 TARGETING POD
3.9 – Air-to-Air Operation
3.9.1 - Operation Modes

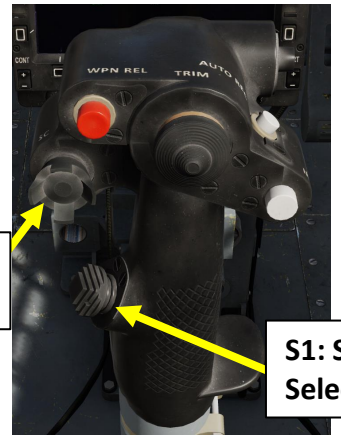
The targeting pod can also be used in air-to-air modes in conjunction with the radar. This is quite useful to perform visual identifications of air targets. To use Air-to-Air mode, the WMD-7 TGP (Targeting Pod) requires the AA (Air-to-Air Intercept) Master Mode to be active. The TGP is automatically commanded to the radar line-of-sight when AA master mode is selected, the radar is tracking a target and the SLAV targeting pod mode is selected. Alternatively, you can select the targeting pod's SP (Snowplow) mode, slew the reticle of the pod and acquire a point track from the pod directly. Here are the main A-A operation modes of the pod:

- **Radar Slaved:** The TGP is slaved to radar's locked target.
- **Point Track (POINT):** The TGP itself is tracking a target. Point Track is accessed by "bumping" the T5 TDC Switch PRESS control while the TGP page is the SOI (Sensor of Interest), and will attempt to acquire a recognized target within the reticle.

WMD-7 TARGETING POD
3.9 – Air-to-Air Operation
3.9.2 – Point Track (Slaved from Radar)

In order to **track a target with the targeting pod**:

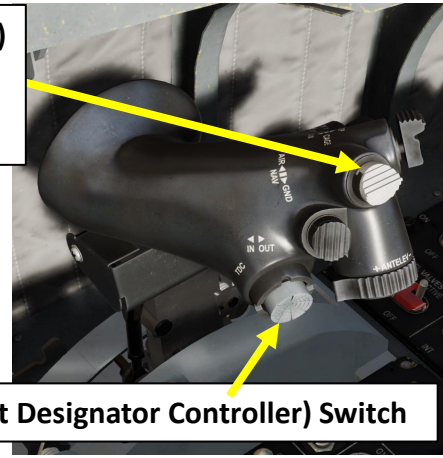
1. Power up the Targeting Pod as per the previous Power-Up Procedure.
2. Press the MMS (Master Mode Switch) UP to INTC (Intercept)
3. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
4. Enter either RWS, TWS, VS, SAM or ACM radar mode. In this example, we will use RWS mode.
5. Acquire Radar Lock: slew the **TDC (Target Designator Controller)** over a desired target and press the TDC (ENTER) to transfer from RWS to SAM mode. Then, press the TDC (ENTER) a second time to radar lock the desired target to STT (Single Target Track) mode.
6. From the targeting pod page, select SLAVE mode by pressing the OSB next to SP/SLAV.
7. The targeting pod will slew its reticle on the radar locked target. However, Point Track is not yet active.



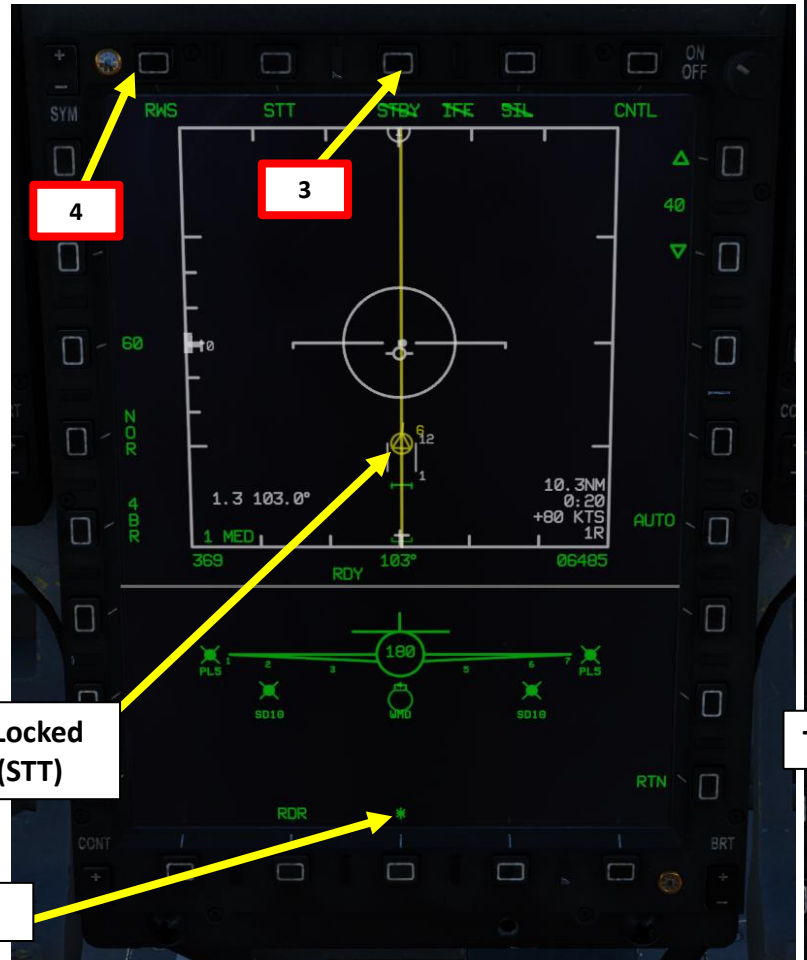
S2: SC (Sensor Control) Switch

S1: SS (Sensor Selection) Switch

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



T5: TDC (Target Designator Controller) Switch



4

3

5 **Radar Locked Target (STT)**

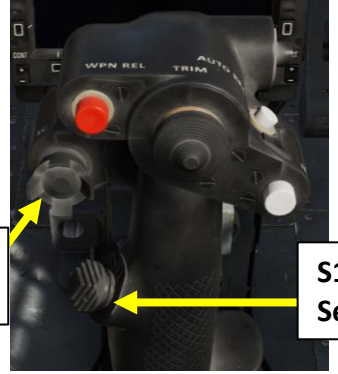
Sensor of Interest (SOI) Asterisk

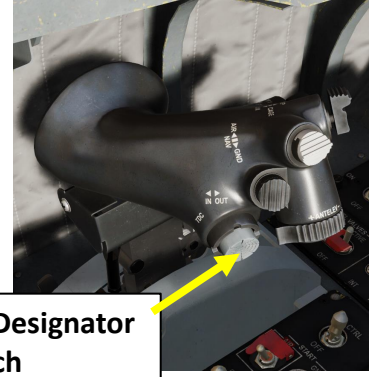
6

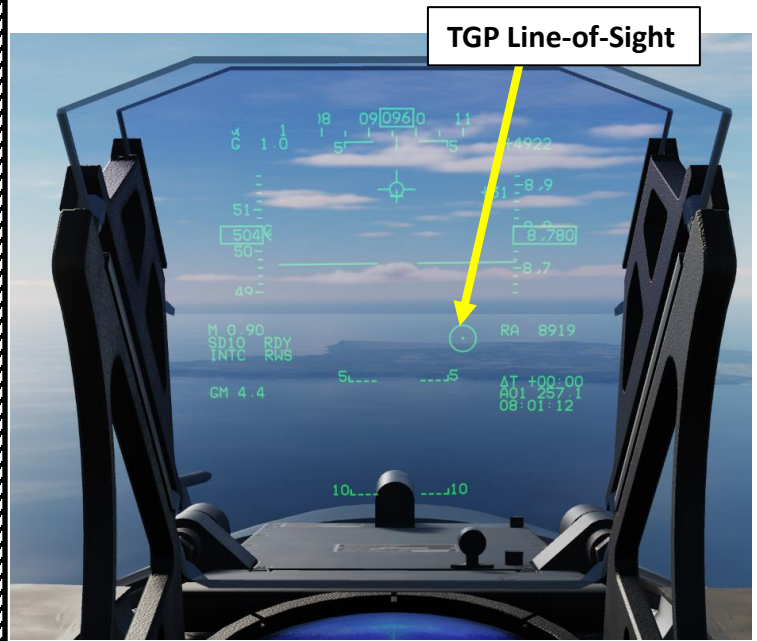
TGP Slaved to Radar **7**

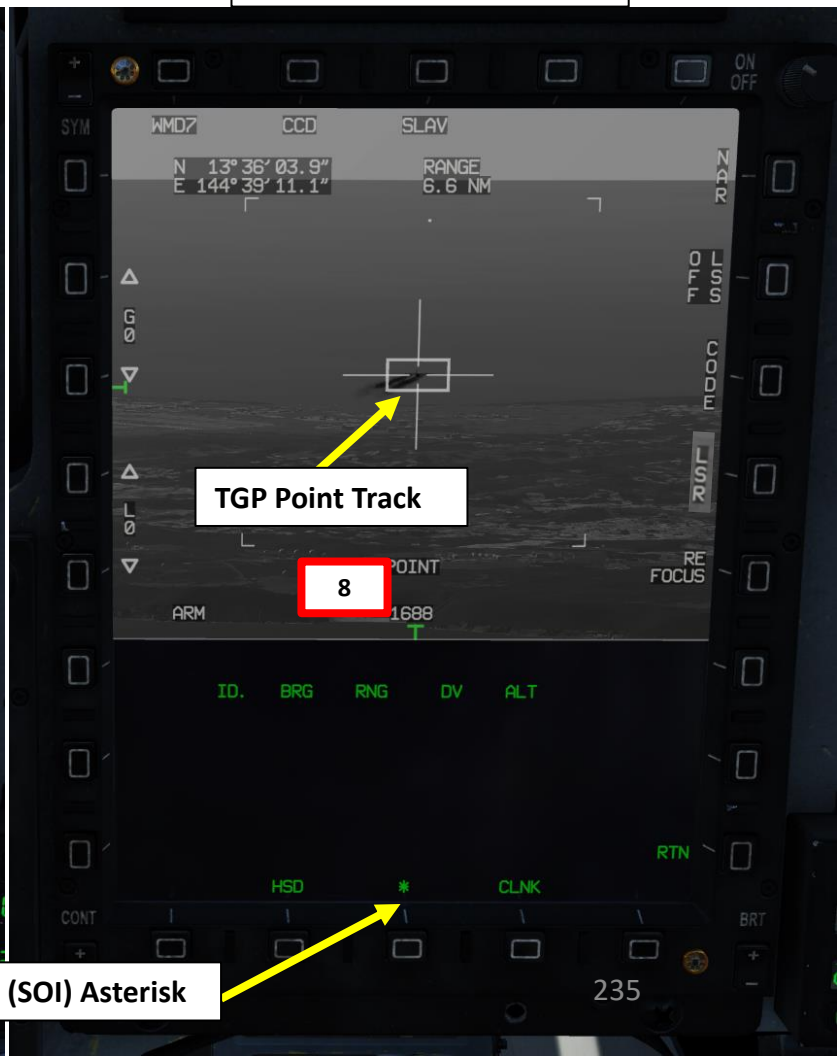
WMD-7 TARGETING POD
3.9 – Air-to-Air Operation
3.9.2 – Point Track (Slaved from Radar)

8. Unlock target and exit radar STT lock by setting the S2 Sensor Control Switch to PRESS (BACKSPACE).
9. Set Targeting Pod page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (Right if POD page is on the RIGHT MFCD). An asterisk will indicate the SOI status.
10. Use T5 TDC Switch to slew the targeting pod reticle on the target, then use T5 TDC Switch PRESS control to attempt a Point Track.
11. To "dump" (undesignated) a target, set the S2 Sensor Control Switch to PRESS (BACKSPACE).









CM-802AKG TV-GUIDED MISSILE
4.1 – DISPLAYS

The CM-802 AKG missile is a derivative of C-802AK, with over 150 km of low-profile range and Man-in-the-loop (MITL) control. It is far more flexible than the C-701 since it can follow advanced programmable flight profiles.

Basically, the missile can be launched, follow a pre-planned trajectory and require the missile to be manually remote-controlled by the pilot once it is close enough to the target.

The CM-802AKG missile requires a datalink pod to be installed to ensure communication between the pilot and the missile.

CM-802AKG TV-GUIDED MISSILE
4.2 – CONTROLS

The controls will be further detailed in the Weapons section.

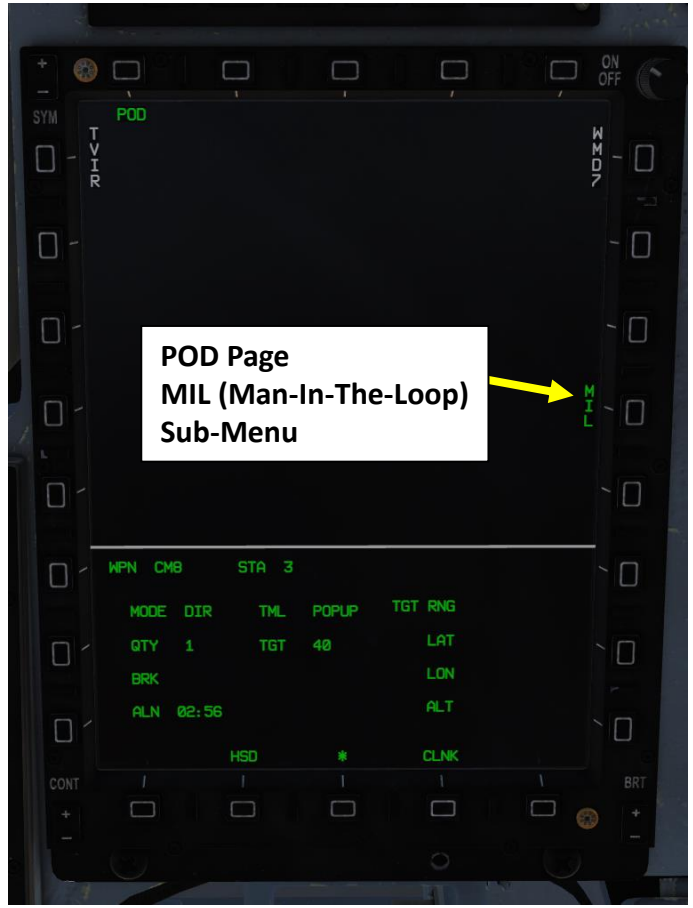
In short, the S1 Sensor Selection allows you to select the POD MIL (Man-In-The-Loop) Page as the Sensor of Interest (SOI).

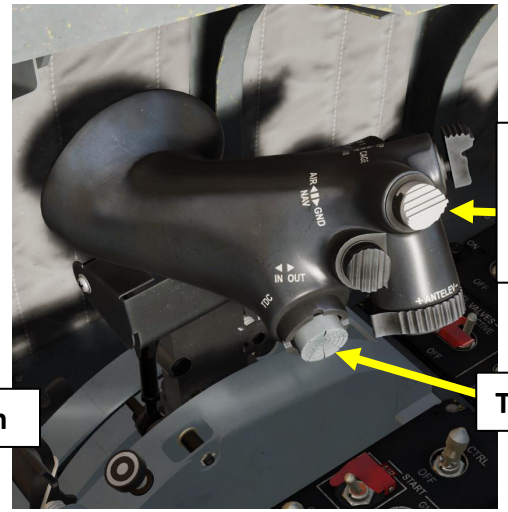
The Master Mode Switch must be set to AG (Air-to-Ground).

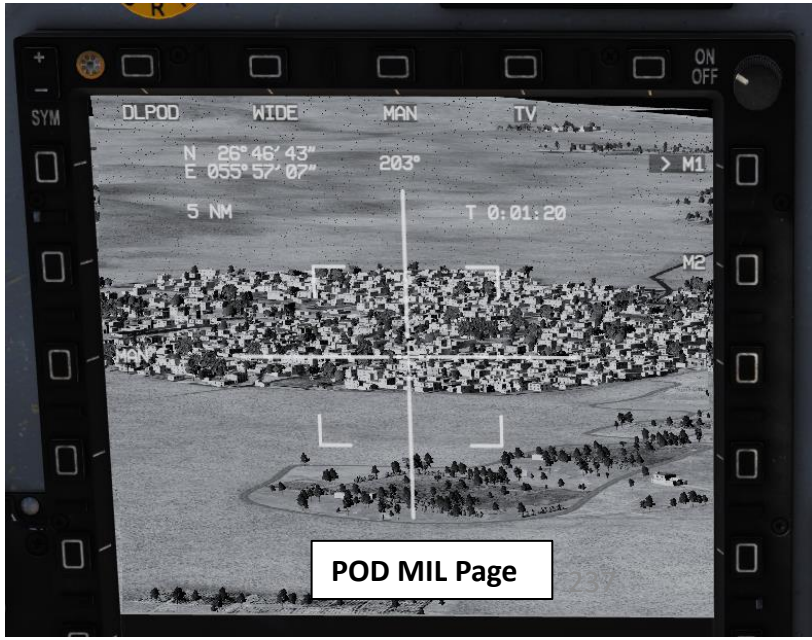
The POD MIL page allows you to set sensor TV options and watch missile seeker feed.

The SMS (Stores Management System) page allows you to set missile parameters and power up the missile.

The T5 TDC (Target Designator Controller) allows you to control the missile remotely once it is in range.





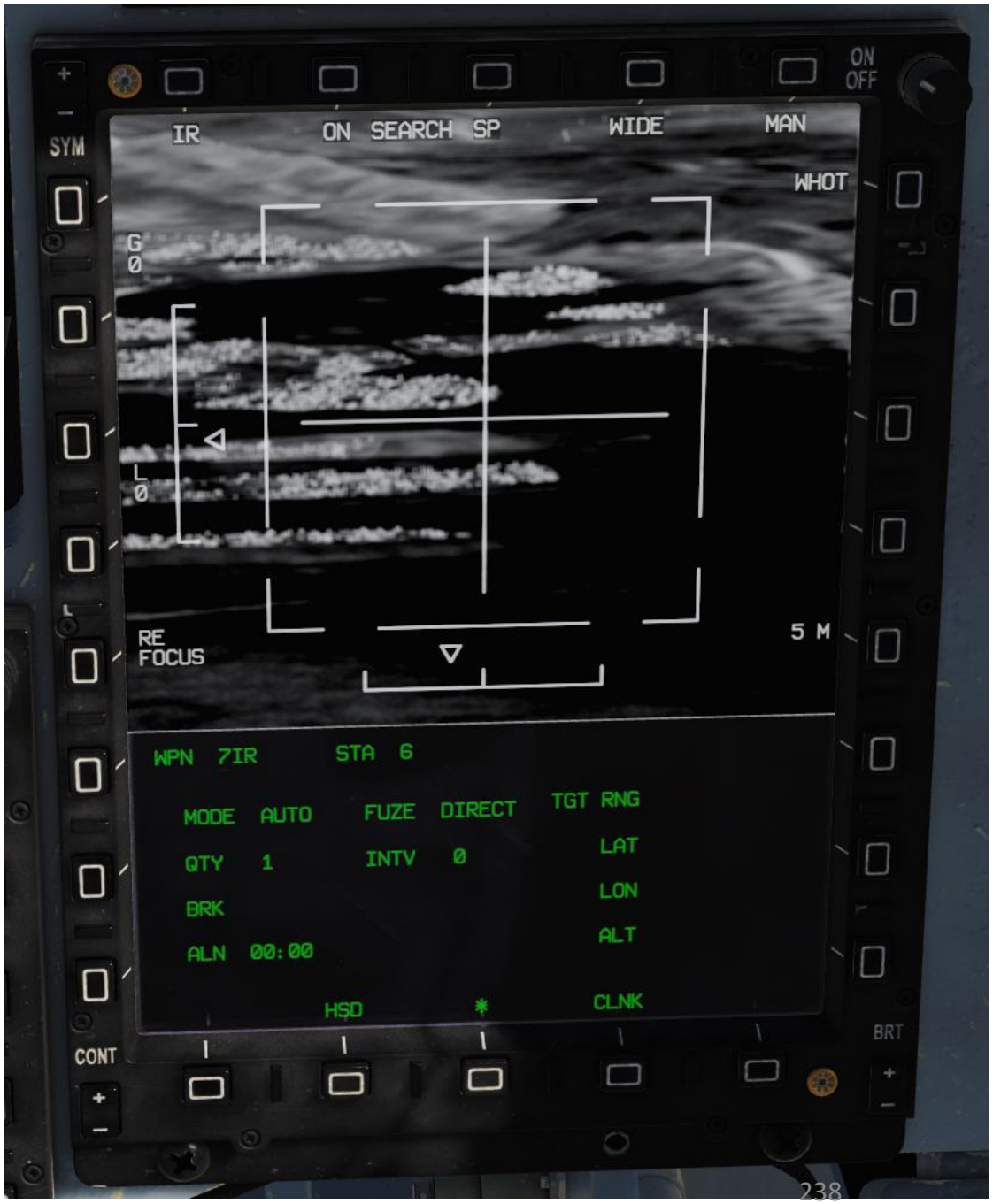


C-701 TV-GUIDED MISSILE
5.1 – DISPLAYS

The C-701 is an Infrared TV-Guided missile similar to the AGM-65 Maverick.

You can slave its seeker to other sensors or use SNOWPLOW mode to search a target. C-701 doesn't have ranging capability, but when you can lock on target using its seeker (about 10 nm), you will most likely be in range.

C-701 is type of launch and forget missile.



C-701 TV-GUIDED MISSILE
5.2 – CONTROLS

The controls will be further detailed in the Weapons section.

In short, the S1 Sensor Selection allows you to select the POD TVIR Page as the Sensor of Interest (SOI).

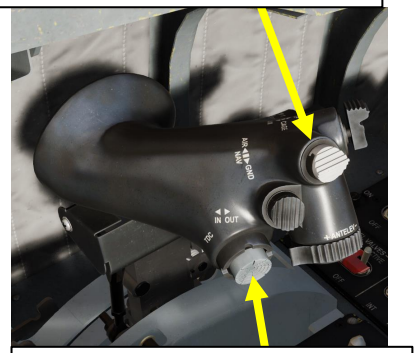
The Master Mode Switch must be set to AG (Air-to-Ground).

The POD TVIR page allows you to set sensor TV options and watch missile seeker feed.

The SMS (Stores Management System) page allows you to set missile parameters and power up the missile.

The T5 TDC (Target Designator Controller) allows you to control sensors and lock a target. Once a SPI (Sensor Point of Interest) is designated, the missile is slaved to this SPI and ready to be launched.

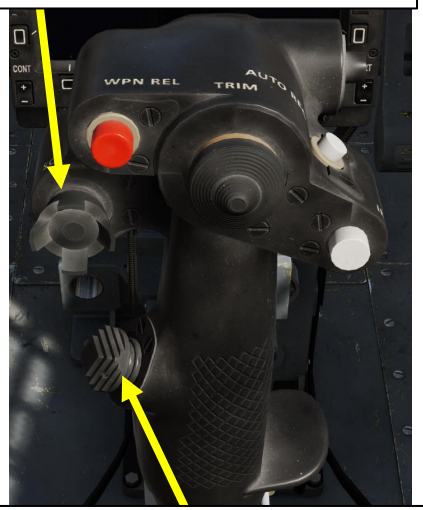
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



T5: TDC (Target Designator Controller) Switch

POD TVIR Page

S2: SC (Sensor Control) Switch



S1: SS (Sensor Selection) Switch

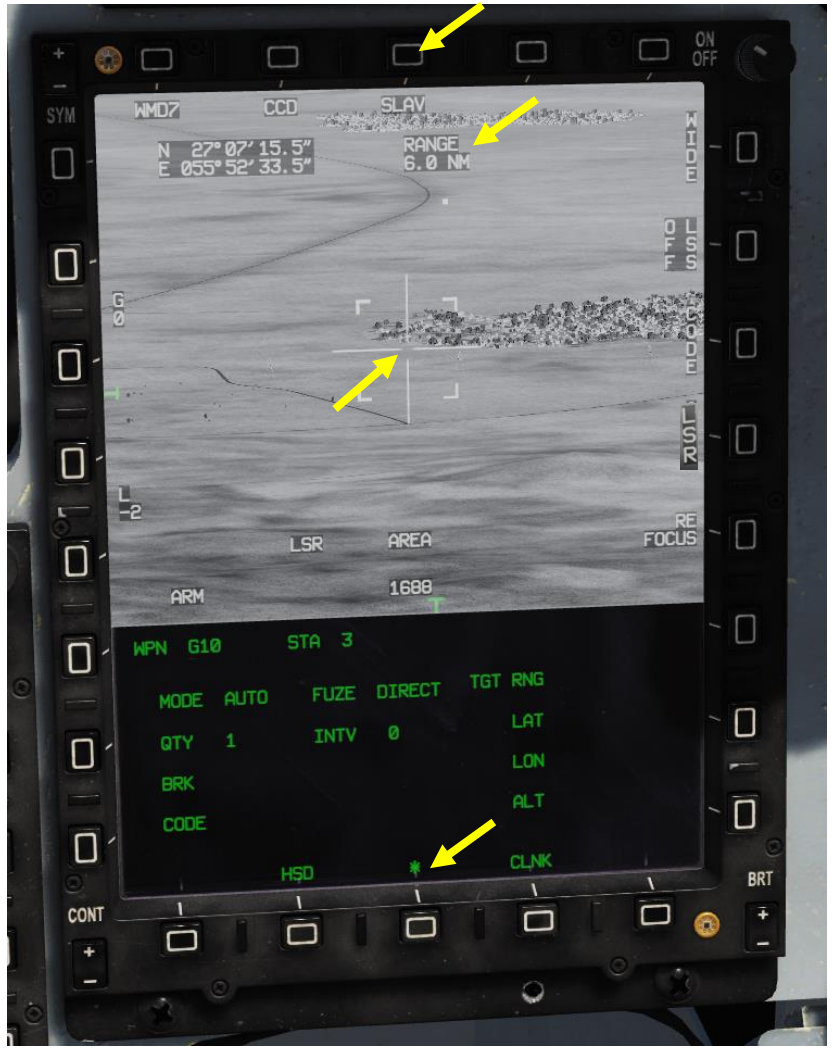
POD Page TVIR Sub-Menu

SMS Page

6 - INTEGRATED SENSORS OPERATION

Here is an example of how sensors can interact with each other; using the air-to-ground radar and the targeting pod.

1. Using the air-to-ground radar, you can set the radar page as a SOI (Sensor of Interest) with the S1 Sensor Selection switch. Then, you can slew the TDC cursor on an area and use the T5 TDC PRESS (ENTER) button to set a point as a SPI (Sensor Point of Interest).
2. Setting the targeting pod as the SOI with the S1 Sensor Selection switch, you can then slave the targeting pod on the SPI designated by the air-to-ground radar by pressing the OSB next to SLAV/SP.
3. Pressing the T5 TDC PRESS (ENTER) button will then set the targeting pod reticle as the SPI. The targeting pod will then showcase ranging information.
4. The HUD will then overlap the Targeting Pod Reticle Circle and the SPI diamond.



6 - INTEGRATED SENSORS OPERATION

Here is another example of how sensors can interact with each other; using the air-to-air radar and the targeting pod this time.

1. Using the air-to-air radar, you can set the radar page as a SOI (Sensor of Interest) with the S1 Sensor Selection switch. Then, you can slew the TDC cursor on a target and use the T5 TDC PRESS (ENTER) button twice to lock the target in STT (Single Target Track) mode.
2. Setting the targeting pod as the SOI with the S1 Sensor Selection switch, you can then slave the targeting pod on the SPI designated by the air-to-air radar by pressing the OSB next to SLAV/SP.
3. Pressing the T5 TDC PRESS (ENTER) button will then set the targeting pod reticle as the SPI. The targeting pod will then display ranging information and allow you to visually identify the radar contact.
4. The HUD will then overlap the Targeting Pod Reticle Circle and the radar lock square.

JF-17 THUNDER
DEKA IRONWORK SIMULATIONS

SECTION STRUCTURE

- **1 - Introduction**
  - 1.1 – Introduction to Weapons
  - 1.2 – Armament Overview
  - 1.3 – Weapons Control Setup
  - 1.4 – DTC (Data Transfer Cartridge) & Re-Arming
  - 1.5 – SMS (Stores Management System) Page
  - 1.6 – Weapon Restrictions
  - 1.7 – Bomb Delivery Modes

- **2 – Air-to-Ground Weapons**
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    - 2.1.1 – MK-82 Bomb (CCIP)
    - 2.1.2 – MK-82 Bomb (CCRP/AUTO)
    - 2.1.3 – Type 200A Anti-Runway Bombs (AG Radar + CCRP/AUTO)
  - 2.2 – Unguided Rockets (CCIP)
  - 2.3 – GSh-23-2 Cannon (Air-to-Ground)
  - 2.4 – BRM-1 Laser-Guided Rockets (Targeting Pod)
  - 2.5 – GBU-12 Laser Guided Bombs (Targeting Pod)
  - 2.6 – Precision-Guided Munitions
    - 2.6.1 – LS-6 PGM Glide Bomb (TOO)
    - 2.6.2 – GB-6 PGM Glide Bomb (PP)
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    - 2.7.1 – C-701T TV-Guided Missile
      - 2.7.1.1 – C-701T – SNOWPLOW
      - 2.7.1.2 – C-701T – SLAVED, Targeting Pod
      - 2.7.1.3 – C-701T – SLAVED, AG Radar
    - 2.7.2 – CM-802AKG TV-Guided Missile
      - 2.7.2.1 – Initial Setup
      - 2.7.2.2 – CM-802AKG – DIR (Direct) Release
      - 2.7.2.3 – CM-802AKG – COO (Coordinates) Release
      - 2.7.2.4 – CM-802AKG – MAN (Manual) Release
      - 2.7.2.5 – Man-In-The-Loop (MITL) Guidance

- **2 – Air-to-Ground Weapons**
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    - 2.8.1 – LD-10 Anti-Radiation Missile (ACT)
    - 2.8.2 – LD-10 Anti-Radiation Missile (PAS)
    - 2.8.3 – LD-10 Anti-Radiation Missile (SP)
  - 2.9 – C-802AK Anti-Ship Missile
    - 2.9.1 – C-802AK Anti-Ship Missile (DIR)
    - 2.9.2 – C-802AK Anti-Ship Missile (COO)
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- **3 – Air-to-Air Weapons**
  - 3.1 – PL-5EII Infrared Homing Missile
  - 3.2 – SD-10 Active Radar Homing Missile
    - 3.2.1 – SD-10 (Radar Lock)
    - 3.2.2 – SD-10 (Mad Dog Mode)
    - 3.2.3 – SD-10 (HOJ Mode)
  - 3.3 – GSh-23-2 Cannon (Air-to-Air)
    - 3.3.1 – Cannon (SS Mode)
    - 3.3.2 – Cannon (LCOS Mode)
    - 3.3.3 – Cannon (SSLC Mode)

- **4 – Selective Ordnance Jettison**

1.1 – INTRODUCTION TO WEAPONS

The JF-17 carries a variety of weapons. Unguided weapons like dumb bombs and rockets have limited value in this aircraft since the Thunder is optimized to use its sensors to guide weapons like the C-802AK anti-ship missile, GB-6 Precision-Guided Munition, CM-802AKG remote-controlled missile and BRM-1 laser-guided rockets. An impressive arsenal of ordnance is available to use, and the way sensors are used to designate SPIs (Sensor Point of Interest) on targets is only limited by the creativity of the pilot. Take note that while a cannon is installed on the JF-17, it is not very precise and best used if everything else failed and your virtual life is on the line.

1.2 – ARMAMENT OVERVIEW

BOMBS

WEAPON	TYPE	WEAPON	TYPE
MK-82	500 lbs low-drag unguided bomb ***Fuze Needed: NOSE***	MK-20 Rockeye	Unguided cluster bomb ***Fuze Needed: NOSE***
MK-82SE (Snake Eye)	500 lbs unguided low-drag retarded bomb ***Fuze Needed: NOSE***	LS-6 JDAM	Global Positioning System (GPS)-guided glide bomb (lighter than GB-6) PGM (Precision Guided Munition) / Joint Direct Attack Munition (JDAM)
MK-83	1000 lbs low-drag unguided bomb ***Fuze Needed: NOSE***	GB-6 JSOW	Global Positioning System (GPS)-guided glide bomb (heavier than LS-6) PGM (Precision Guided Munition) / Joint Standoff Weapon (JSOW)
MK-84	2000 lbs low-drag unguided bomb ***Fuze Needed: NOSE***	GBU-10/12/16 PAVEWAY II	2000/500/1000 lbs laser-guided bomb
Type 200A	*450 lbs (200 kg) very-high-drag anti-runway bomb* ***Fuze Needed: NOSE + TAIL***		

GUN POD

WEAPON	TYPE
GSh-23-2 Cannon	Twin-barreled 23 mm autocannon (180 rounds)

AIR-TO-AIR MISSILES

WEAPON	TYPE
PL-5EII	Infrared guided air-to-air missile, similar to AIM-9 Sidewinder
SD-10	Active radar homing air-to-air missile, similar to AIM-120B AMRAAM

ROCKETS

WEAPON	TYPE
BRM-1 (16 per pod)	90 mm (3.5 inches) laser-guided rockets. Cannot be equipped on inner pylons in order to avoid rocket smoke ingestion through the engine intake.
2.75 in (7 per pod)	2.75 inches rocket, used for general purpose

1.2 – ARMAMENT OVERVIEW

AIR-TO-GROUND MISSILES	
WEAPON	TYPE
C-701– IR Seeker (TV-Guided)	Air-to-Ground missile guided by imaging infrared system and used at night and during bad weather. Similar to the AGM-65 Maverick.
CM-802AKG (TV-Guided)	Air-to-Ground missile derivative of C-802AK, with over 150 km of low-profile range and man in the loop (MITL) control, which is similar to the C-701 but far more flexible. It is basically a cruise missile that can be remote-controlled from the aircraft with a datalink pod.
LD-10 ARM (Anti-Radiation Missile)	Air-to-Surface Anti-Radiation Missile (ARM). Anti-radiation guidance homes in on radiowave emissions from a radar, allowing it to attack surface-to-air missile (SAM) sites.
C-802AK ASM (Anti-Ship Missile)	All-weather, over-the-horizon, Anti-Ship cruise missile system.

1.3 – WEAPONS CONTROL SETUP
MY SETUP

S5 – Change Weapon Station/NWS (Grey button on RHS)

S3: Weapon Launch

S4: Fire Main Gun

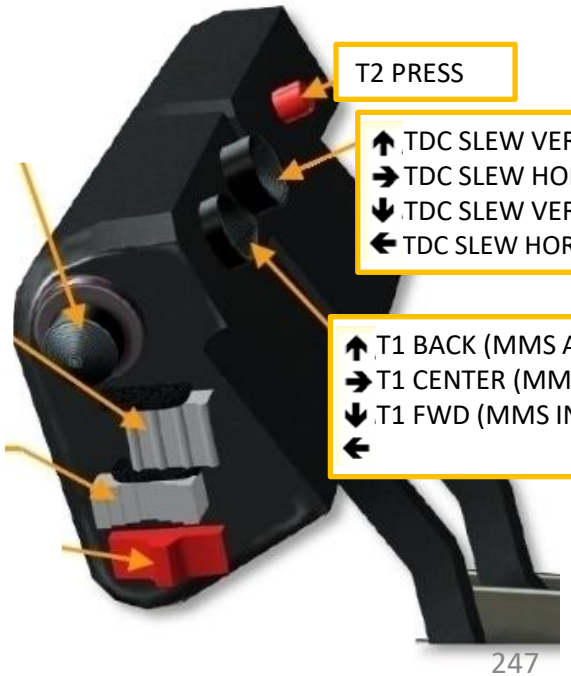
↑ S1 (Sensor Selection) Sw. FWD
→ S1 (Sensor Selection) Sw. RIGHT
↓ S1 (Sensor Selection) Sw. AFT
← S1 (Sensor Selection) Sw. LEFT
P

S8 – Change Weapons

↑ S2 (Sensor Control) UP
→ S2 (Sensor Control) RIGHT
↓ S2 (Sensor Control) DOWN
← S2 (Sensor Control) LEFT

↑
→ T5 (TDC) Press (ENTER)
↓
← S2 (Sensor Control) PRESS

T6 Axis: Antenna Elevation



T2 PRESS

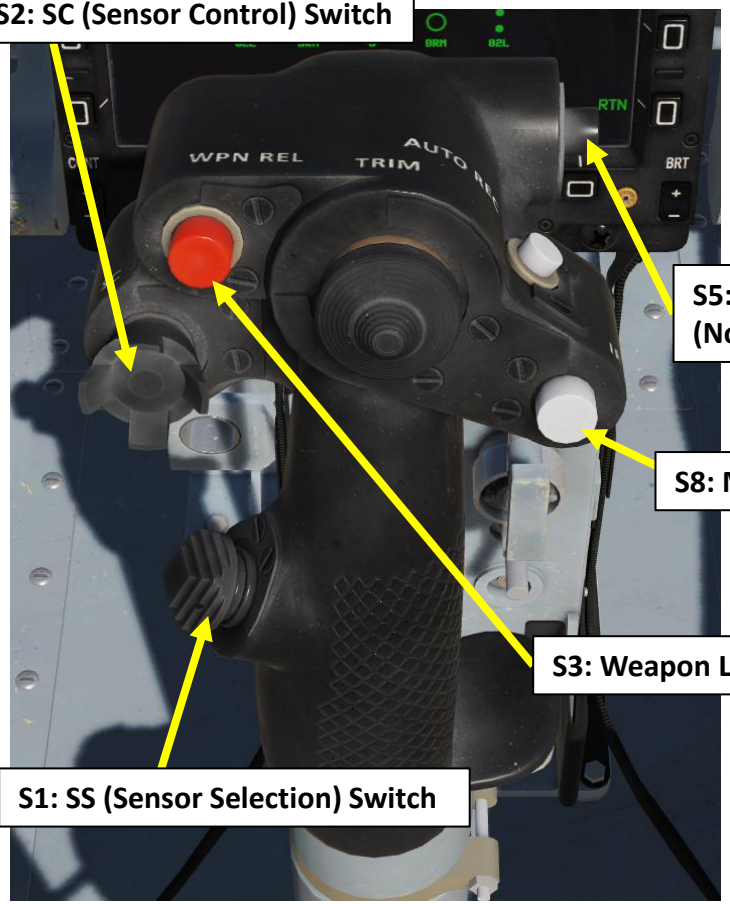
↑ TDC SLEW VERTICAL
→ TDC SLEW HORIZONTAL
↓ TDC SLEW VERTICAL
← TDC SLEW HORIZONTAL

↑ T1 BACK (MMS AG)
→ T1 CENTER (MMS NAV)
↓ T1 FWD (MMS INTC)
←

1.3 – WEAPONS CONTROL SETUP
REAL SETUP

S4: Gun Trigger

S2: SC (Sensor Control) Switch



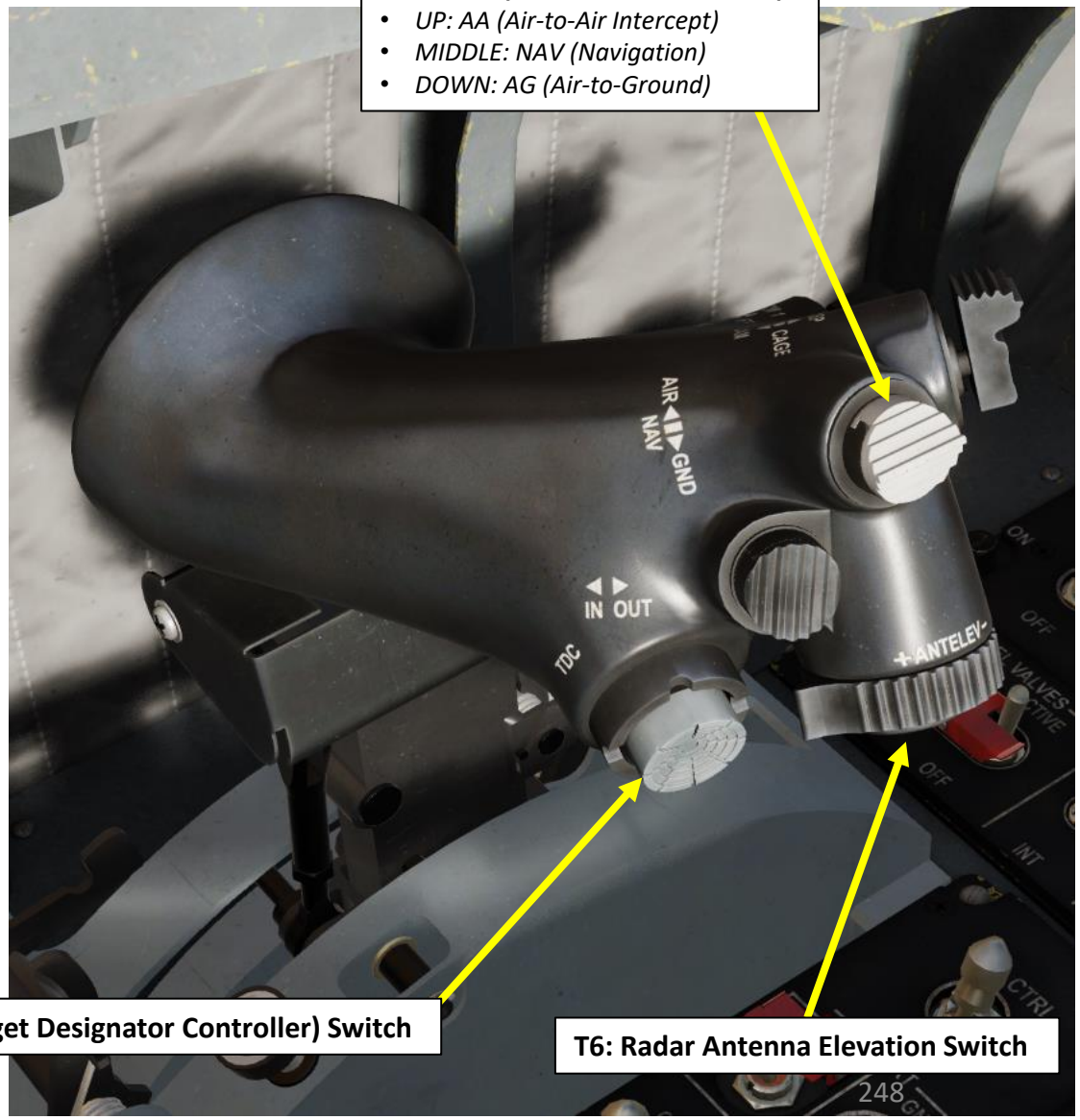
S5: Missile Step Button/NWS (Nosewheel Steering) Control Button

S8: Missile Type Selection Button

S3: Weapon Launch/Release Button

S1: SS (Sensor Selection) Switch

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



T5: TDC (Target Designator Controller) Switch

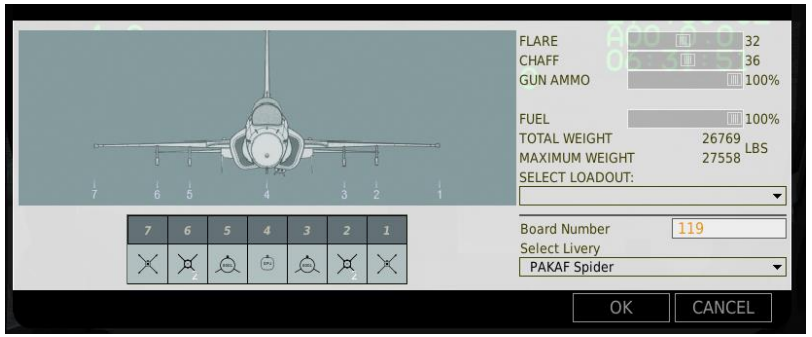
T6: Radar Antenna Elevation Switch

1.4 – DTC & RE-ARMING

If you ever want to re-arm or change your weapon loadout on the ground, the procedure to contact the ground crew is as follows:

- Contact ground crew and select your desired loadout by pressing « \ », then pressing F8 (Ground Crew), and F1 (Rearm & Refuel).

However, the Stores Management System (SMS) page may appear empty or incorrect once the re-arming process is complete. Why? Because the **DTC (Data Transfer Cartridge)** needs to be updated by the ground crew, then inserted in the aircraft, then loaded into the SMS page itself.



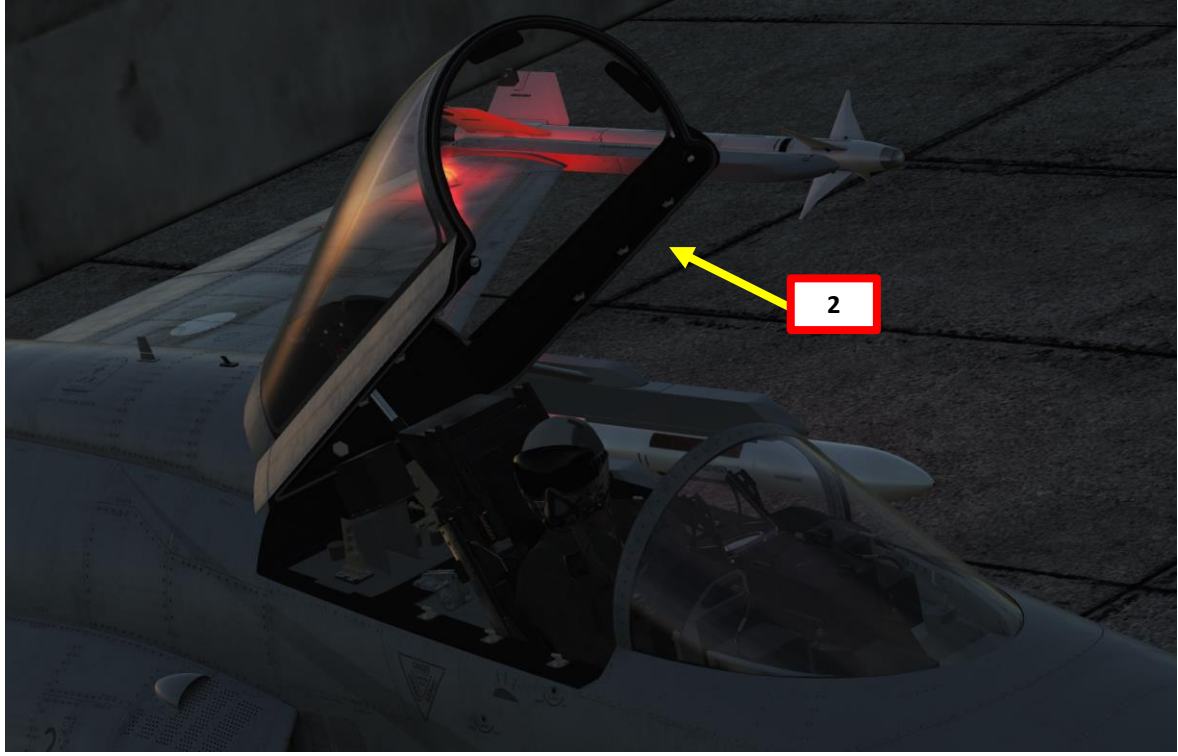
SMS Page in incorrect state (DTC needs to be updated, then loaded into the aircraft)

SMS Page in correct state (DTC has been updated, then loaded into the aircraft)

1.4 – DTC & RE-ARMING

To update the Stores Management System page after a re-arming:

1. Make sure DC Power is available (engine is started and DC GEN switch is ON) and DTC card is unmounted.
2. Open canopy, then contact ground crew and request a DTC Data Update by pressing:
   a) « \ »
   b) F8 (Ground Crew)
   c) F6 (Update DTC Data)
   d) F1 (Update Data).
3. Once DTC is updated, click twice on the DTC slot to insert the cartridge.



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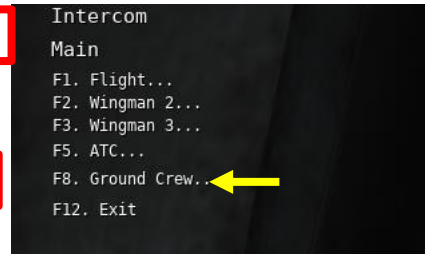
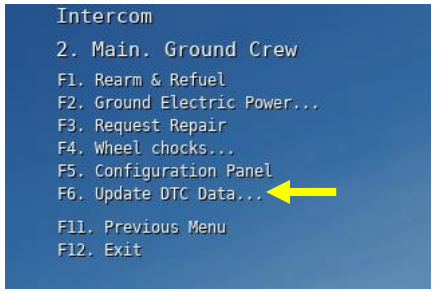
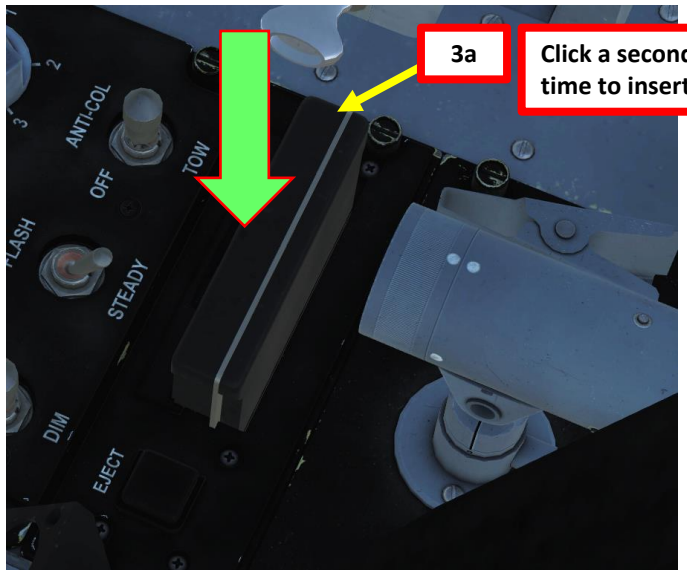
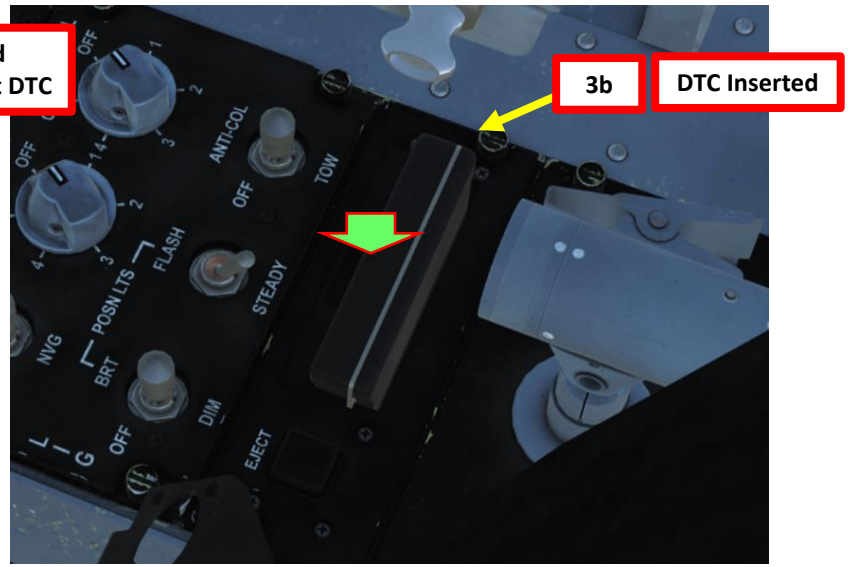
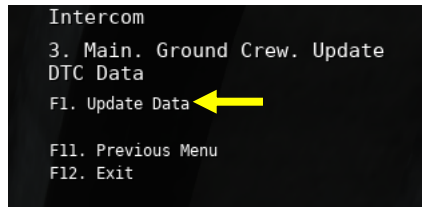
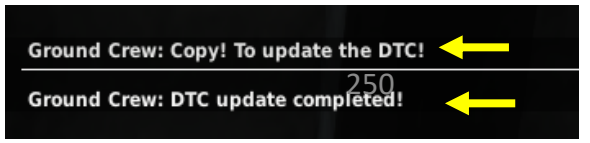






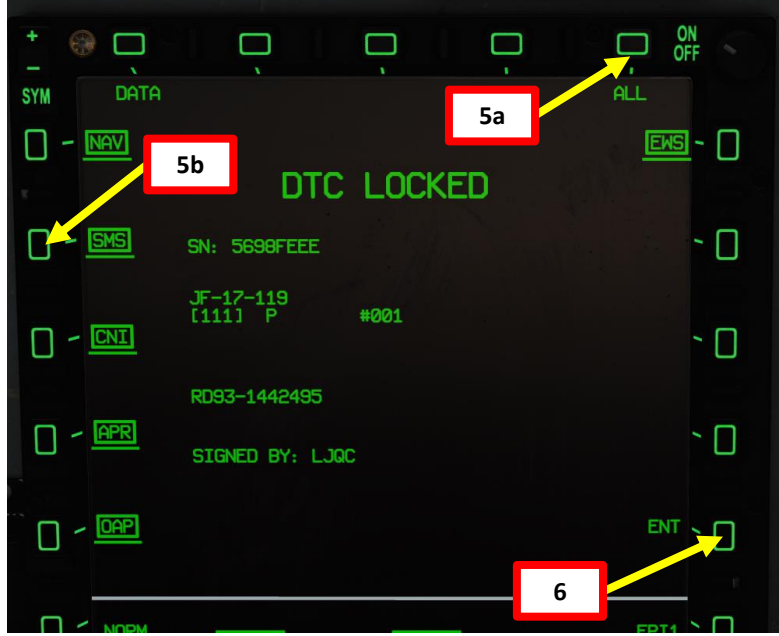






1.4 – DTC & RE-ARMING

4. Once DTC is inserted, left MFCD will automatically display to the DATA – DTC Sub-page with the « DTC LOCKED » message.
5. Select menus to be updated with the new DTC:
   a) If you have changed your navigation program, countermeasure program or other elements applicable to the DTC menus, you should probably not take any chances and press OSB (Option Select Button) next to « ALL » to select all data fields to be updated (boxed when selected).
   b) If you have just updated your weapons and nothing else, you can select the SMS menu only to avoid wasting time to reload every other data field.
6. Press OSB (Option Select Button) next to « ENT » (Enter) to transfer data.
7. « DTC TRANS » message will indicate information transfer is in progress.
8. « DTC LOCKED » message and unboxed data fields will indicate that the information transfer is complete.

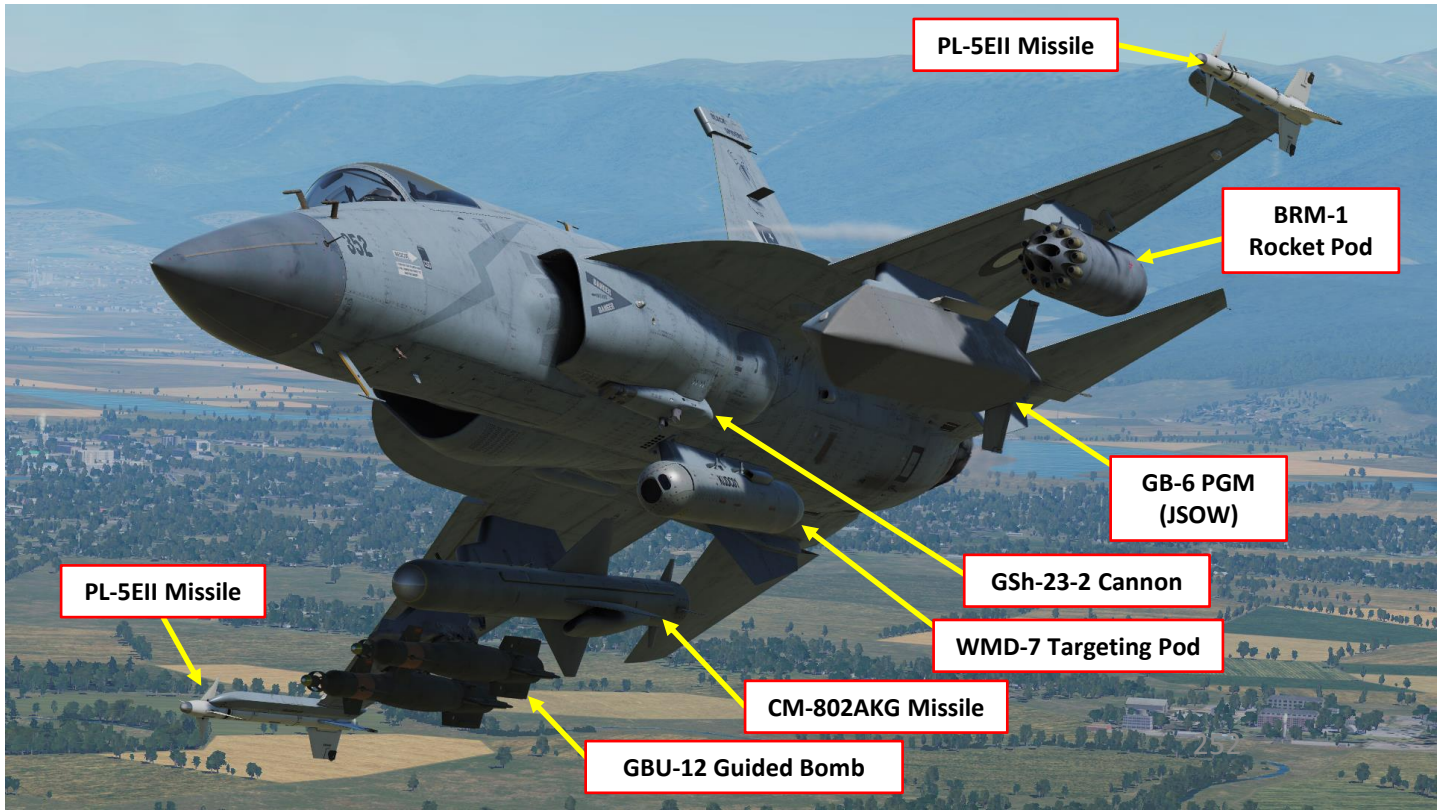


1.5 – SMS (STORES MANAGEMENT SYSTEM) PAGE

The SMS (Stores Management System) page can be accessed by clicking on the Main MENU OSB , then selecting the SMS sub-menu.

This page acts like the A-10C's DSMS (Data & Stores Management Systems) page and allows you to select armament and program useful options like gun firing speed, bomb delivery mode or advanced air-to-ground missile modes. The content of the SMS page needs to be loaded from the DTC (Data Transfer Cartridge), which is programmed by the ground crew once your ordnance is loaded on the aircraft. See the previous section for more details.

The wingform display provides the number, type, and status of all stores loaded on the aircraft's weapon stations. A square on the weapon symbol indicates that a station is selected. Various indications can be displayed below the number of weapons numeric to indicate weapon status such as ARM, RDY, FAL (Failure), OFF, or STBY. The gun rounds remaining is indicated at the top of the wingform (180 being a full load and 0 when empty).

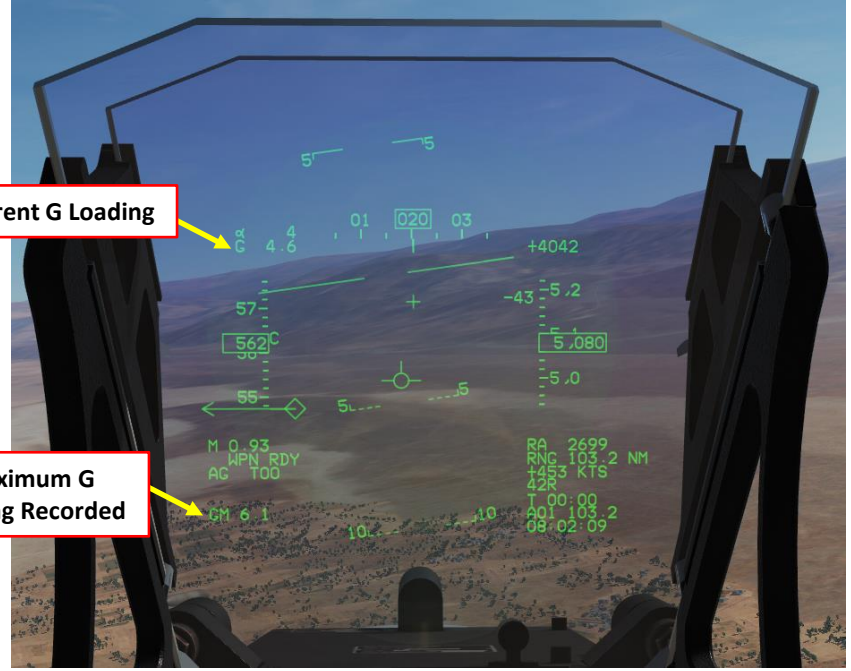


1.6 – WEAPON RESTRICTIONS

When flying the JF-17 is heavy load configurations, you must be careful not to exceed the structural limits of the ordnance you are carrying.

Air-to-Air missiles and pods do not have structural G restrictions, but heavy Air-to-Ground weapon pylons like the GB-6 or C-802AK can be jammed or damaged during high G manoeuvers. When the pylon is damaged, launching or jettisoning the payload may not be possible. The C-701 missile itself can also be damaged by high Gs.

Try to avoid pulling more than 4-5 Gs when flying with heavy payloads.



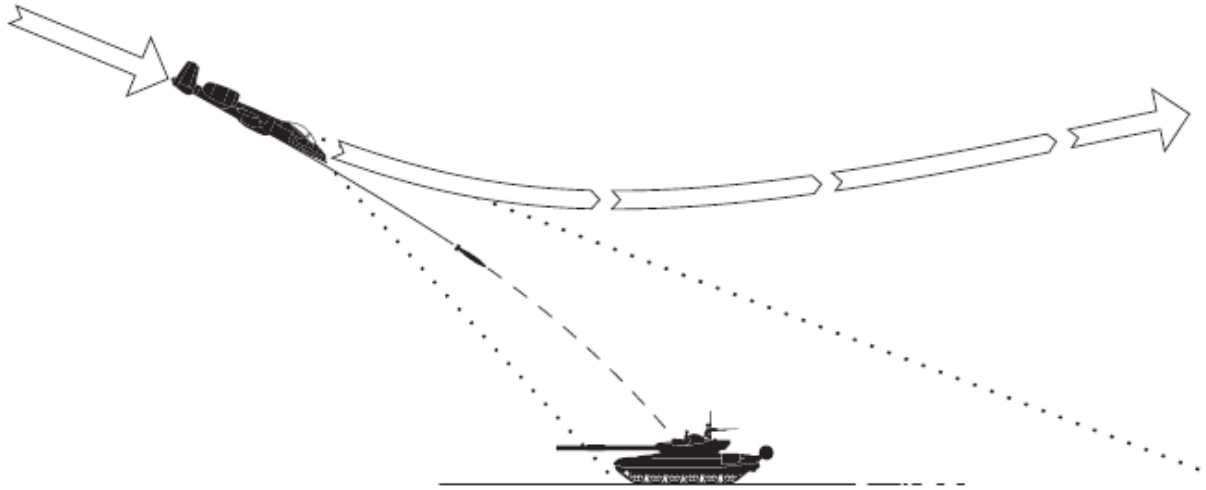
1.7 – BOMB DELIVERY MODES CCIP & CCRP

There are 2 ways to deliver a bomb: CCRP or CCIP modes.

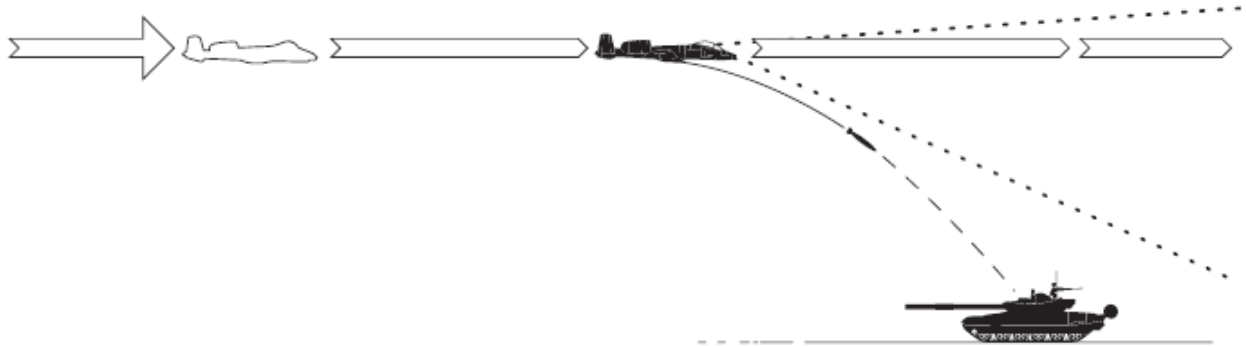
CCIP mode is the traditional dive bombing approach: you dive on target and the reticle will tell you where the bomb will impact.

However, dive bombing is a risky business, especially if anti-air defences are surrounding your target. The lower you go, the more vulnerable you are. This is why CCRP release mode was invented.

CCRP mode allows you to fly straight and level without having to dive down. The HUD will tell you when to release your bomb for the target you have designated with your radar. It is a much safer way to release a bomb, but as you may have guessed already, it is less precise. CCRP mode is also referred to the AUTO mode.



CCIP: Continuously Computed Impact Point



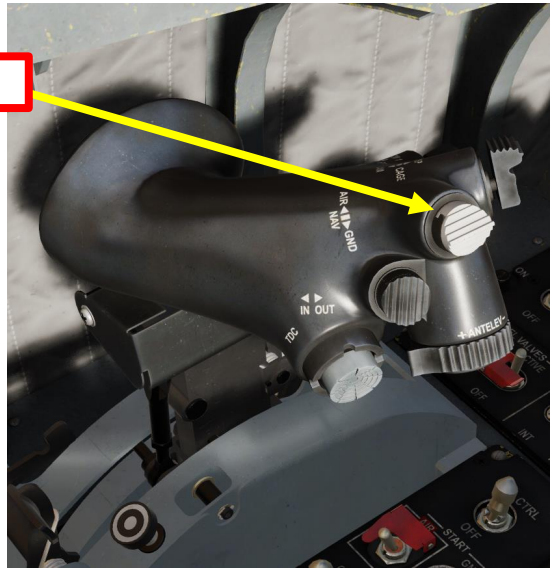
CCRP: Continuously Computed Release Point

2.1.1 – UNGUIDED BOMB – MK-82 (CCIP)

1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. Go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.

T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

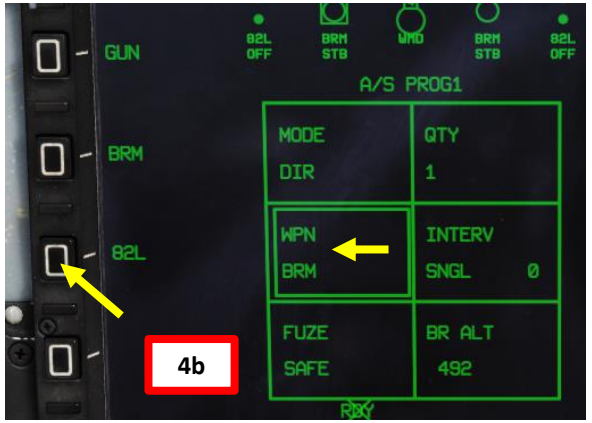
2

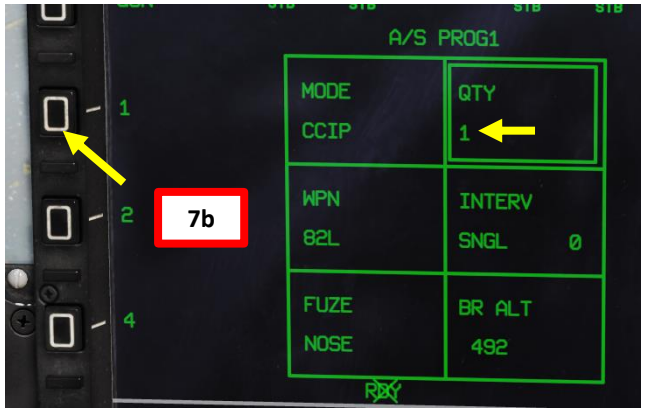


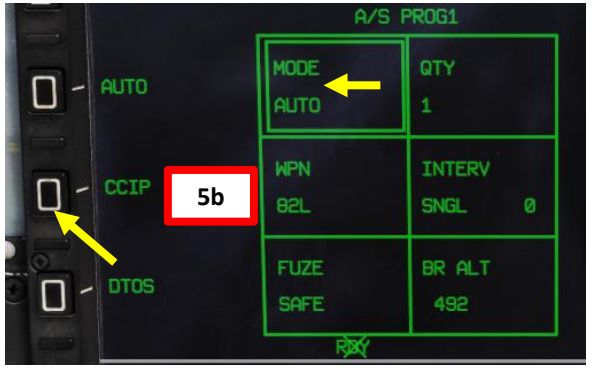
3

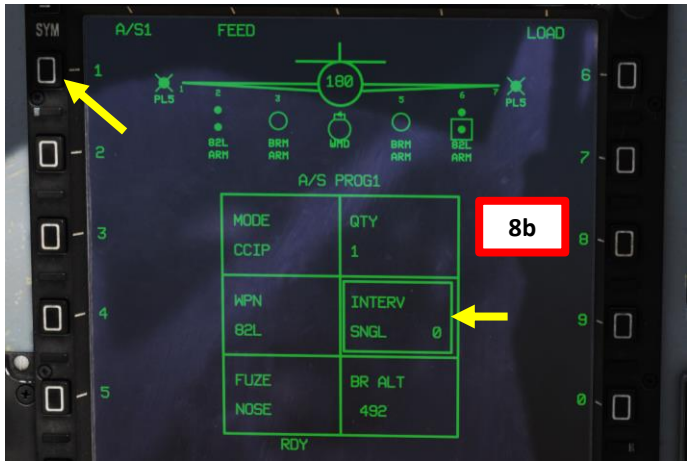
2.1.1 – UNGUIDED BOMB – MK-82 (CCIP)

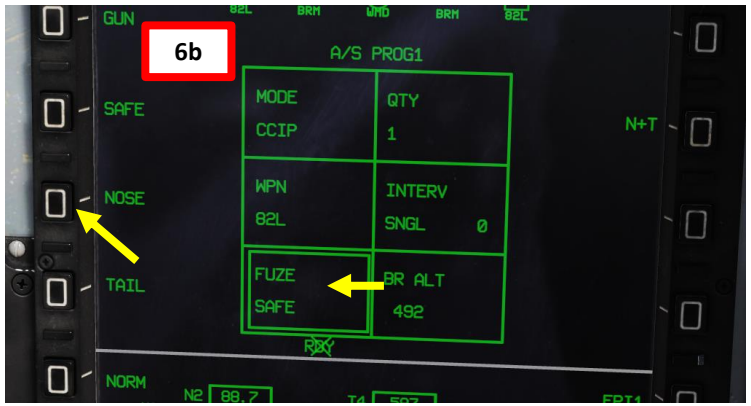
4. Select MK-82 bombs by pressing the OSB next to WPN, then select 82L.
5. Select CCIP weapon release mode by pressing the OSB next to MODE, then select CCIP.
6. Select fuzing by pressing the OSB next to FUZE, then select NOSE.
7. Select quantity by pressing the OSB next to QTY, then select desired quantity (i.e. 1).
8. If applicable, select bomb release interval by pressing the OSB next to INTERVAL, then enter distance between bomb in ft (no interval since single bomb is selected).
9. Select BR ALT (Break Off Altitude) by pressing the OSB next to BR ALT, then enter desired altitude in ft (i.e. 0500 = 500 ft). This will set the altitude setting of the Pull-Up Cue X on the HUD.





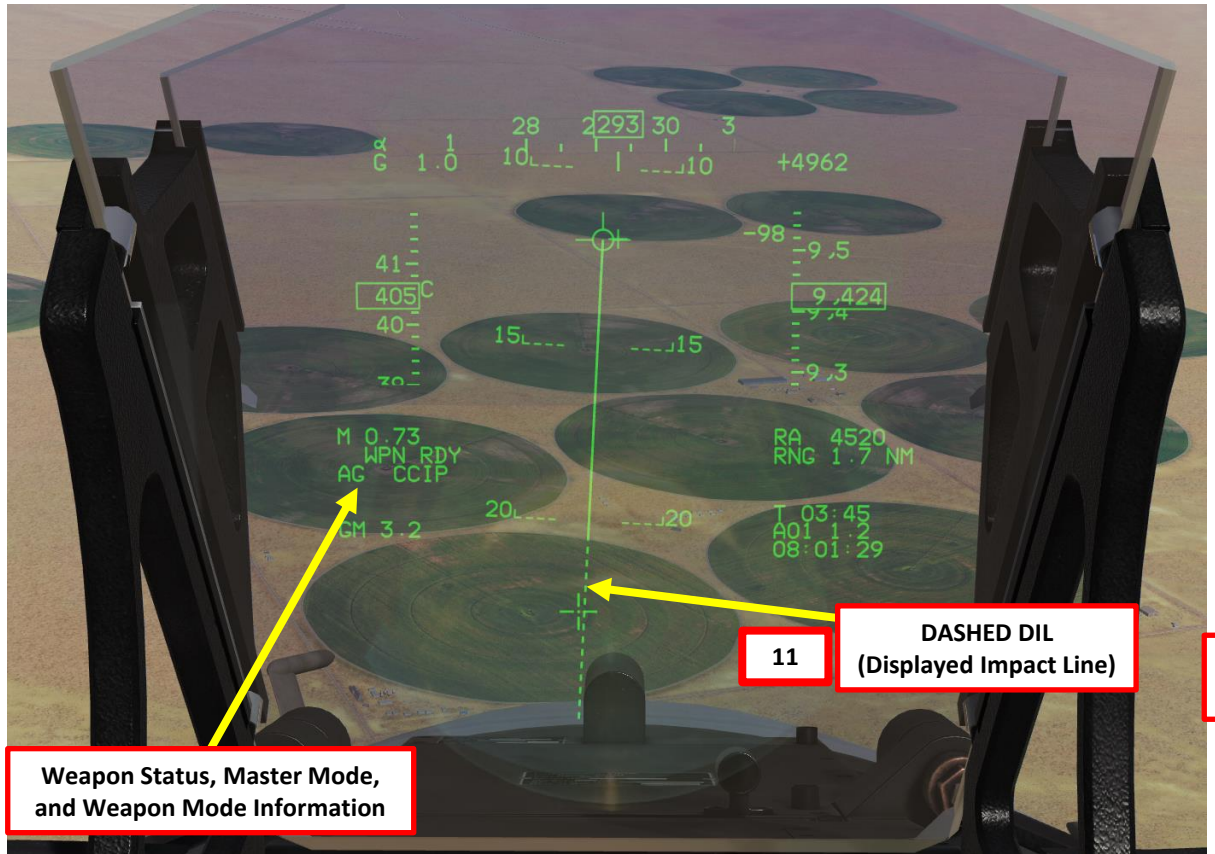


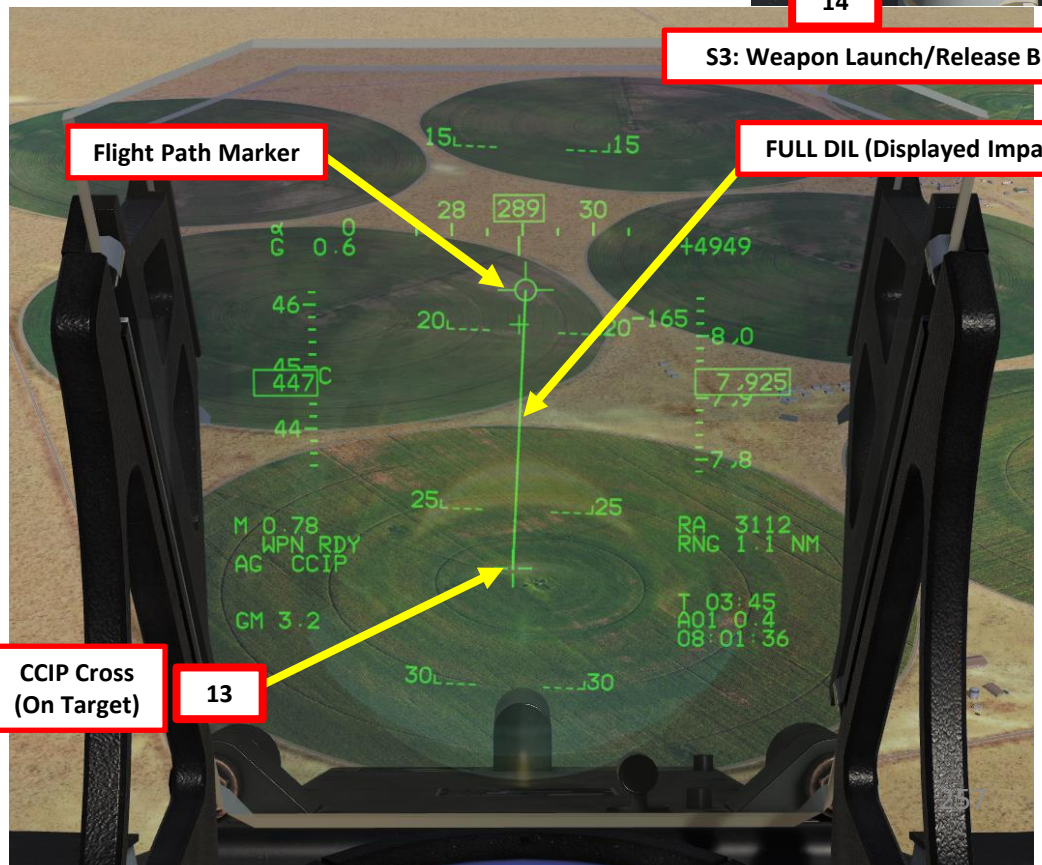




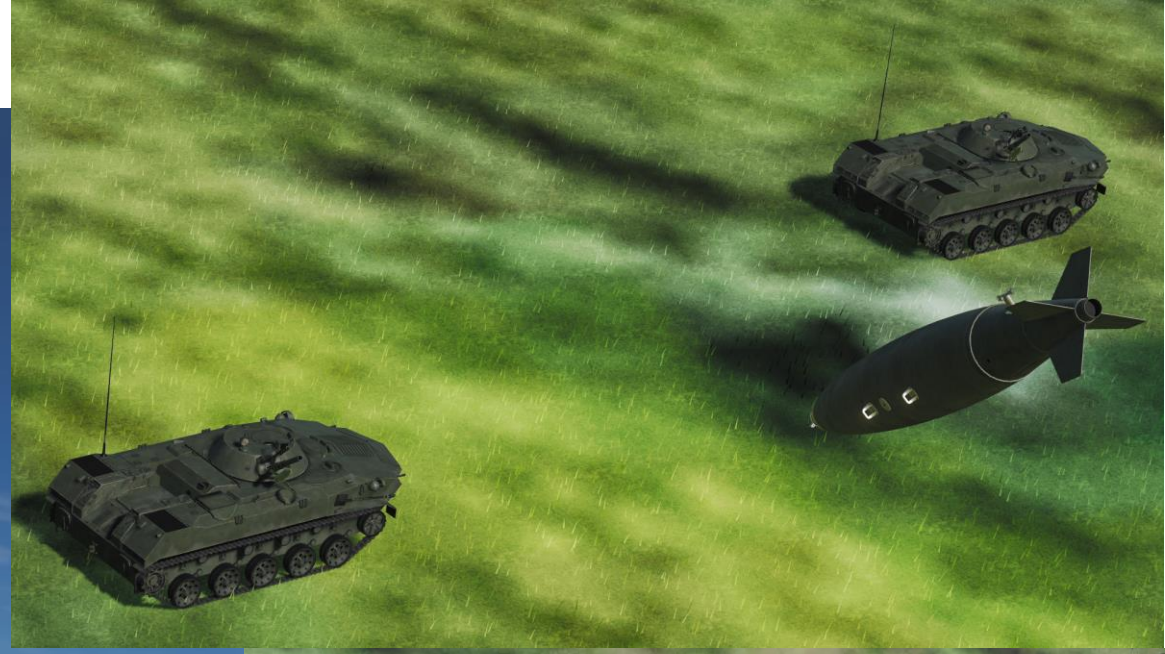
2.1.1 – UNGUIDED BOMB – MK-82 (CCIP)

10. Start a 30-45 degree dive on your target
11. Align target vertically with DIL (Displayed Impact Line), also known as Bomb Fall Line. The DIL will be dashed when no bombing solution is computed yet.
12. The CCIP cross will appear once a bombing solution is computed; the DIL will become full.
13. Steer aircraft to keep the DIL vertical and the CCIP cross on the target.
14. Press and hold the Weapon Release button (« RALT+SPACE ») once CCIP cross is on target. Hold button until all programmed bombs are released.





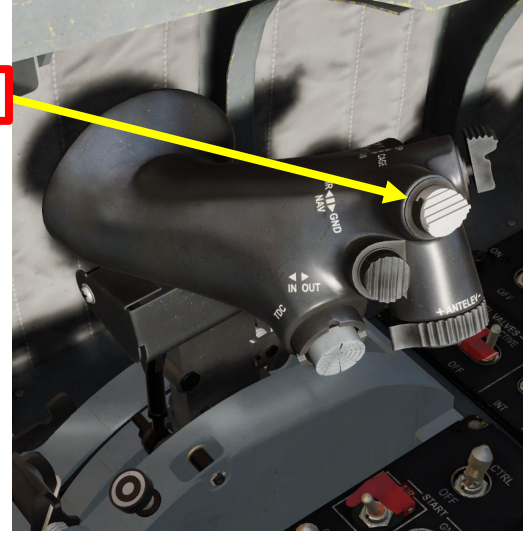
2.1.1 – UNGUIDED BOMB – MK-82 (CCIP)



2.1.2 – UNGUIDED BOMB – MK-82 (CCRP/AUTO)

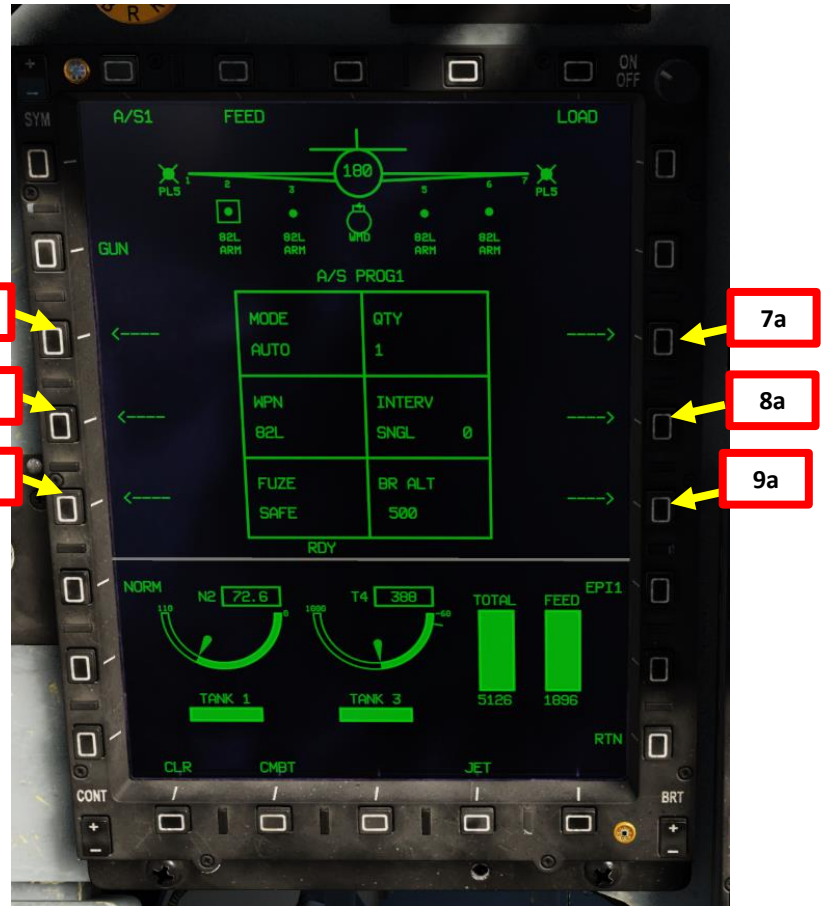
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. Go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.

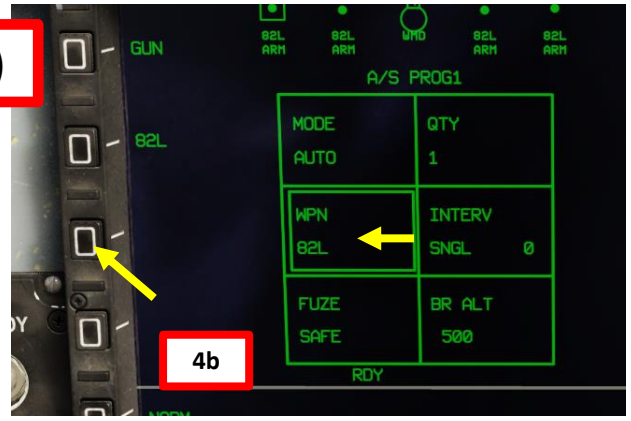
T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

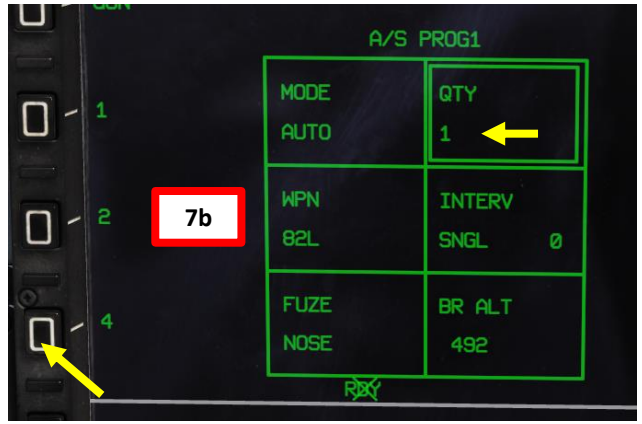


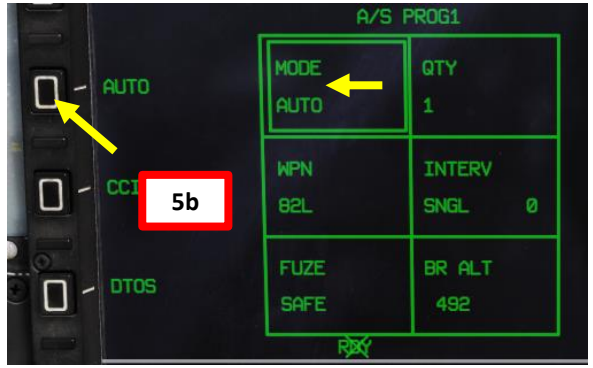
2.1.2 – UNGUIDED BOMB – MK-82 (CCRP/AUTO)

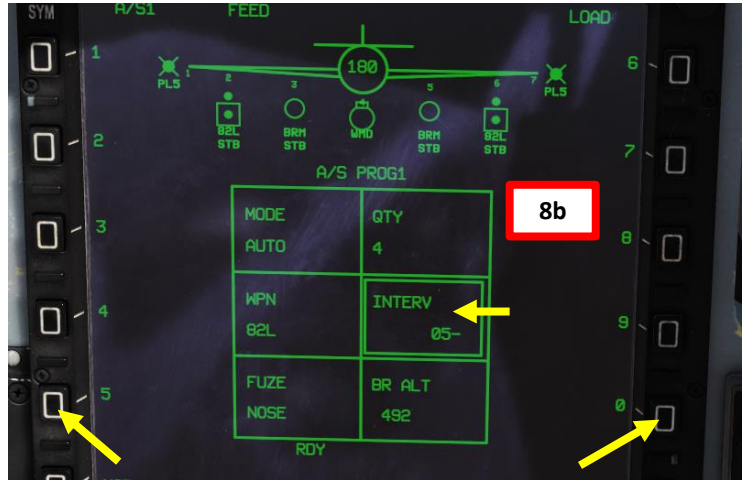
4. Select MK-82 bombs by pressing the OSB next to WPN, then select 82L.
5. Select CCRP/AUTO weapon release mode by pressing the OSB next to MODE, then select AUTO.
6. Select fuzing by pressing the OSB next to FUZE, then select NOSE.
7. Select quantity by pressing the OSB next to QTY, then select desired quantity (i.e. 4).
8. If applicable, select bomb release interval by pressing the OSB next to INTERVAL, then enter distance between bomb in ft (050 = 50 ft).
9. Select BR ALT (Break Off Altitude) by pressing the OSB next to BR ALT, then enter desired altitude in ft (i.e. 0500 = 500 ft). This will set the altitude setting of the Pull-Up Cue X on the HUD.

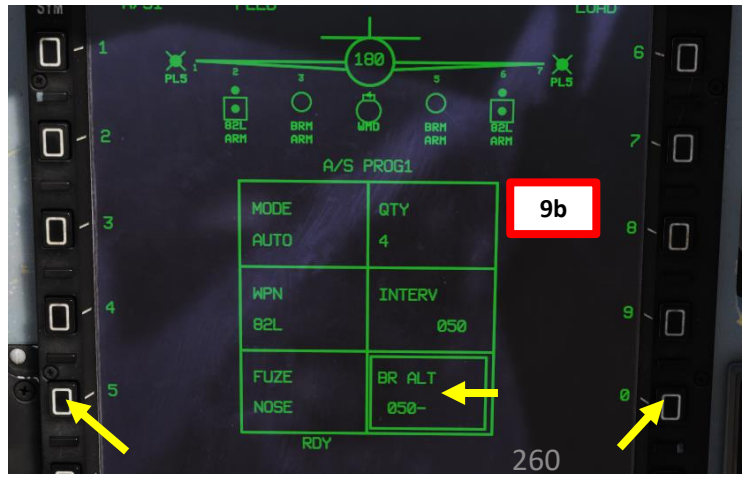






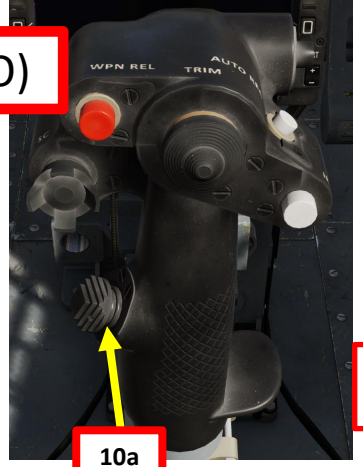


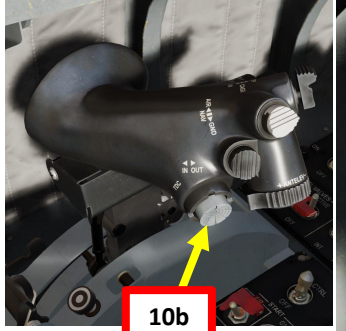


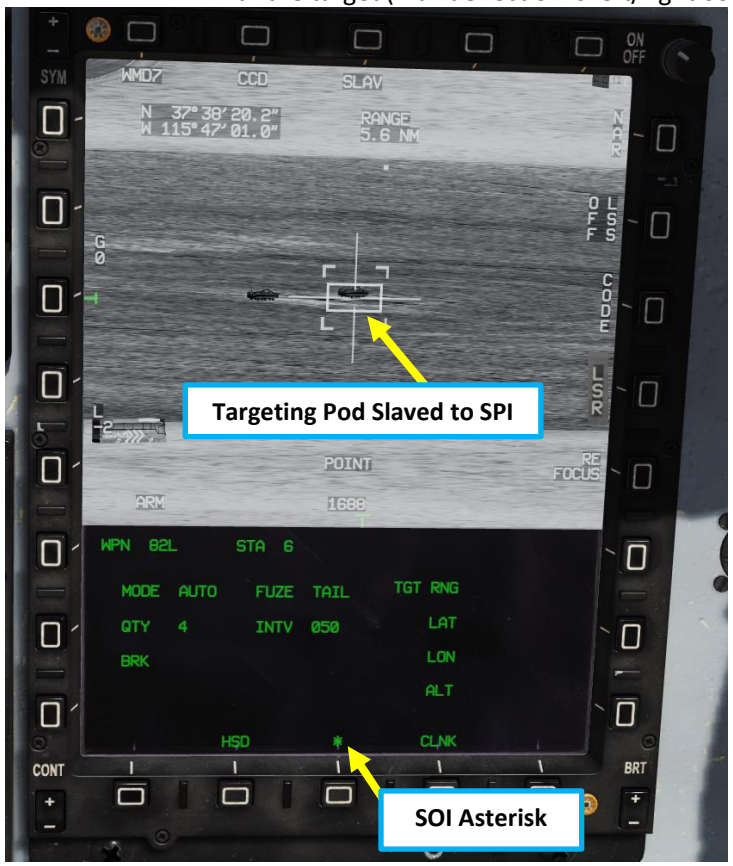


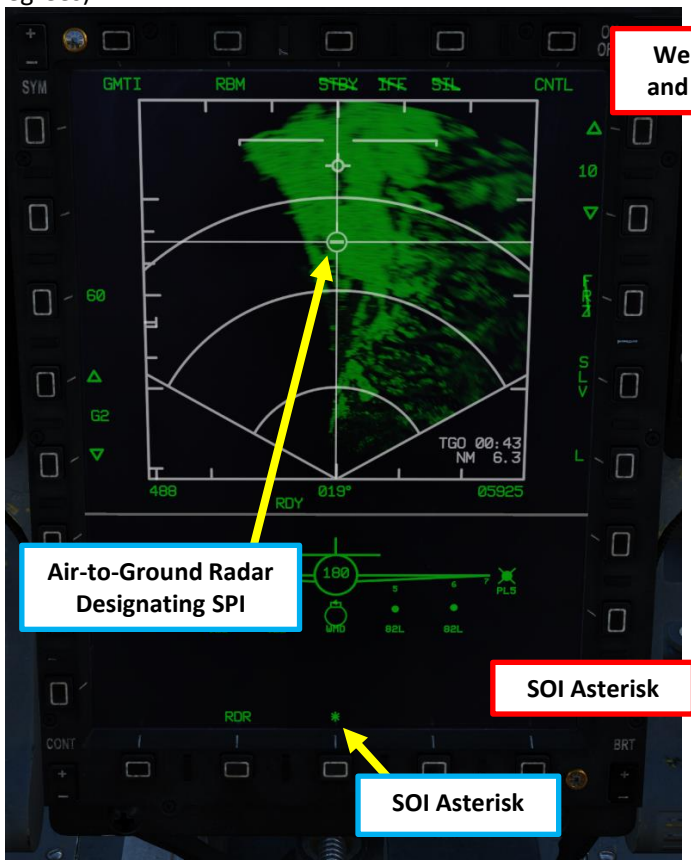
2.1.2 – UNGUIDED BOMB – MK-82 (CCRP/AUTO)

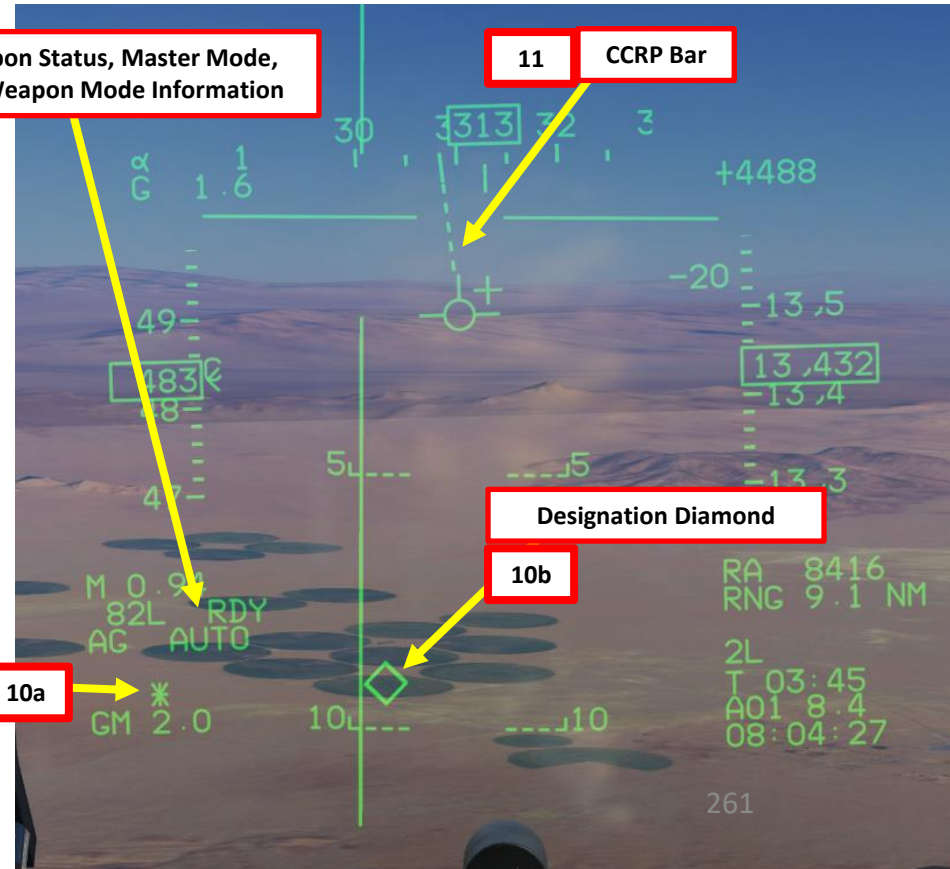
10. Visually identify your target, and set it as the SPI (Sensor Point of Interest) with your desired sensor.
    a) To designate a target with the HUD, toggle the S1 Sensor Selection Switch AFT to toggle the HUD as the SOI (Sensor of Interest), which will be marked by an asterisk.
    b) Steer the aircraft to place the designation diamond over the target, then designate target as the SPI by using the T5-TDC PRESS button (ENTER).
    - Alternatively, you could also designate the SPI using the targeting pod or with the air-to-ground radar.
11. The CCRP bar attached to Flight Path Marker indicates CCRP solution.
    - The deflection of bar means commanded bank to help aircraft align with the target (max deflection is left/right 60 degrees)





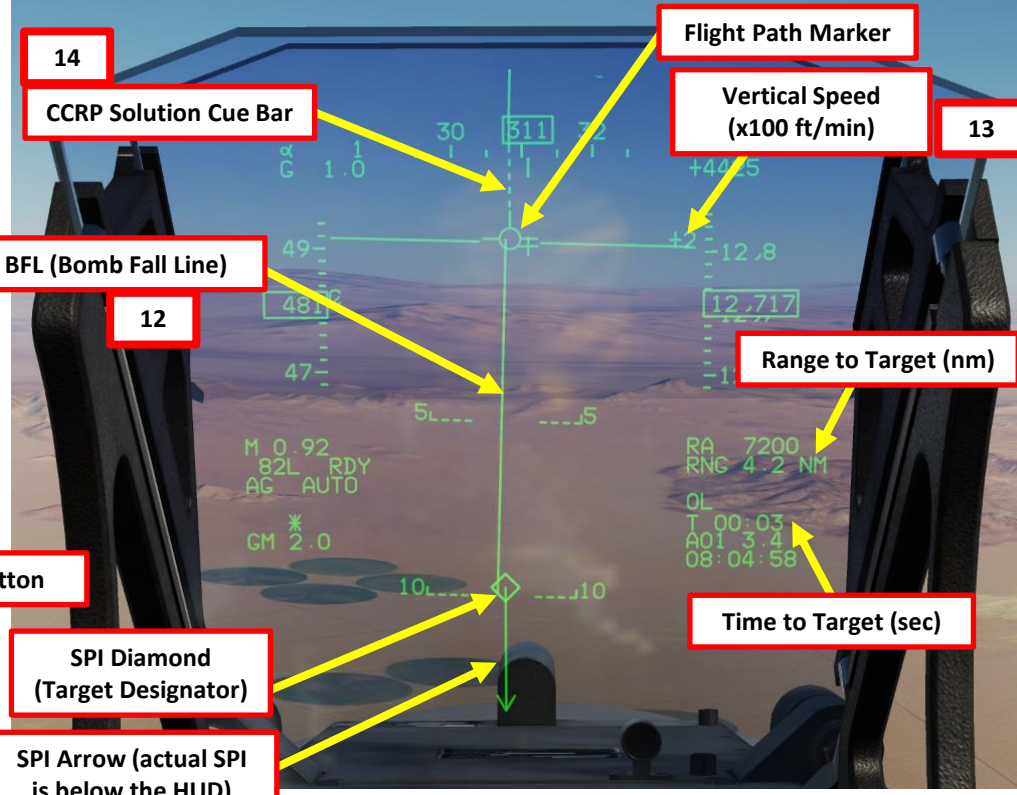


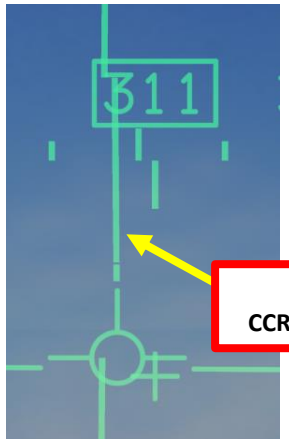




2.1.2 – UNGUIDED BOMB – MK-82 (CCRP/AUTO)

12. Fly level and keep your flight path marker aligned with the BFL (Bomb Fall Line).
13. Pay special attention to the vertical speed: the aircraft should NOT be descending (bomb release will be inhibited to avoid flying into your own bombs) and should NOT be ascending (this will throw off your aim). Fly level (vertical speed = 0).
14. The CCRP Solution Cue Bar is used as a release cue
    - If there is no CCRP solution, the bar is a completely dashed line
    - If there is a CCRP solution but greater than 15 sec, only 1/4 from the top is solid but the remaining part of the bar remains dashed
15. When CCRP solution cue is reducing from 4 sec to 0 sec, the bar starts to change to solid line on the 3/4 part.
16. When Time to Target is about 3 sec, hold the S3 Weapon Release Button (« RALT+SPACE »). An aural cue is audible 3 seconds away from the bomb release point
17. When CCRP bar is full, bombs will release automatically as long as you hold the Weapon Release button.

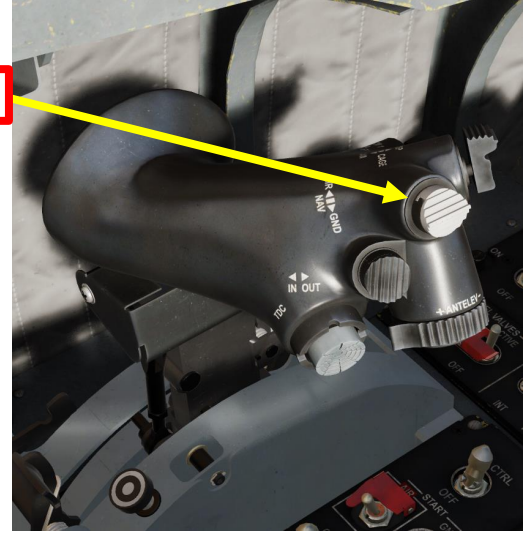




2.1.3 – ANTI-RUNWAY BOMBS – TYPE 200A (AG Radar + CCRP/AUTO)

T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

2

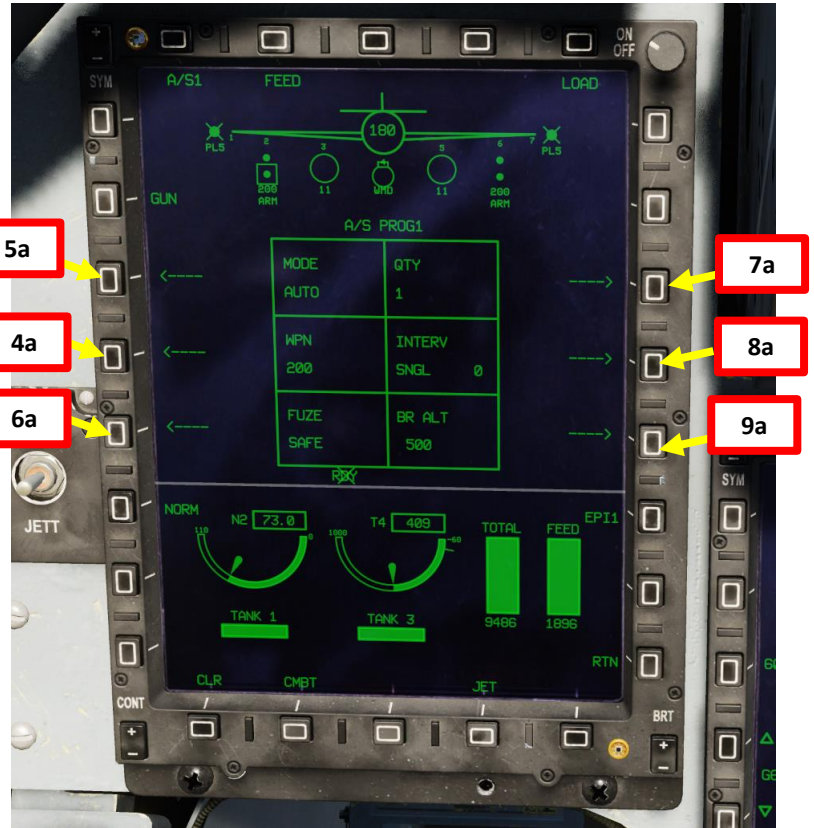


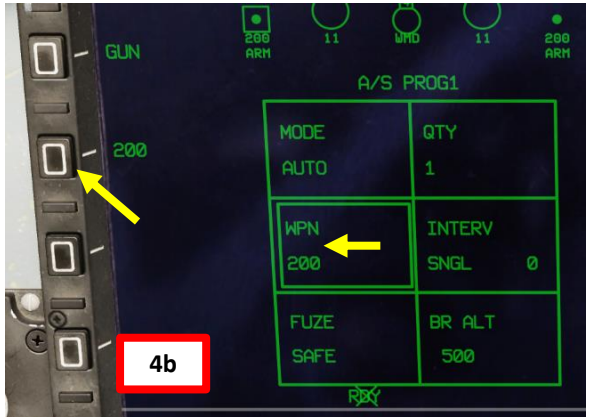
Basically, the Type 200As are unguided, high-drag, rocket assisted anti-runway bombs. They are delivered just like Snake Eyes and can use either CCIP or CCRP (Auto) release mode. The Type 200As are used against hard/reinforced targets like runways. The forward half of the bomb holds the explosives, the penetrator and the fuse. The aft half contains the booster, the stabilizing fins and the deployable chute.

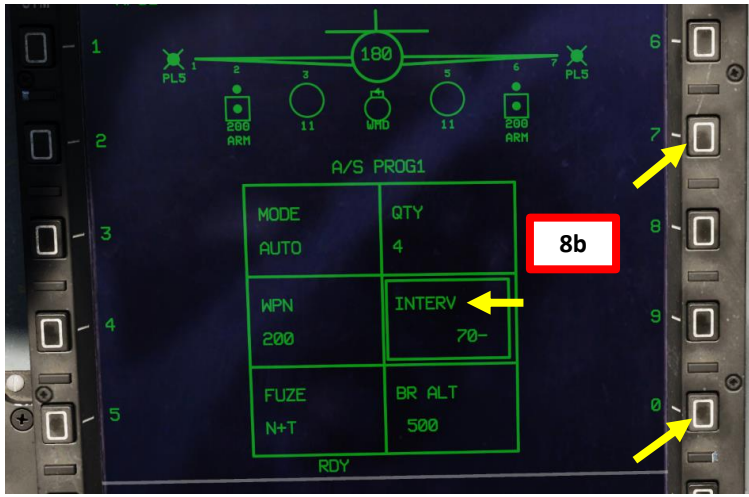
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. Go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.

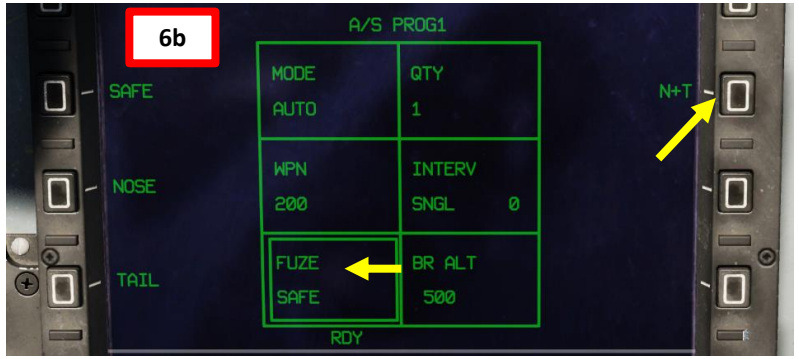
2.1.3 – ANTI-RUNWAY BOMBS – TYPE 200A (AG Radar + CCRP/AUTO)

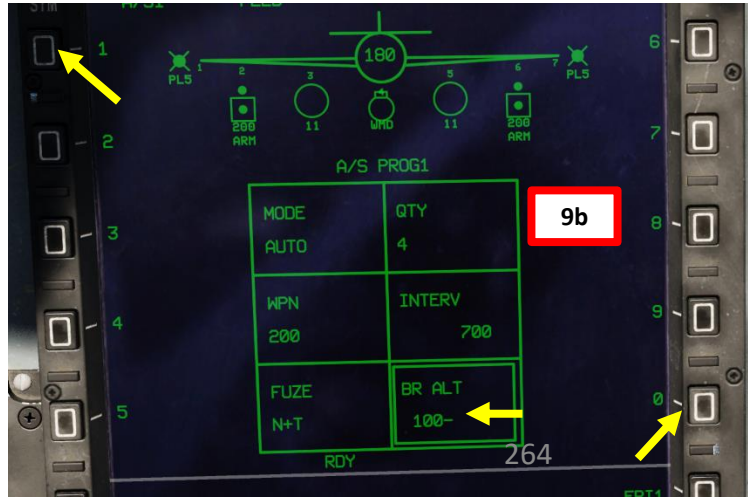
4. Select Type 200A Anti-Runway bombs by pressing the OSB next to WPN, then select « 200 ».
5. Select CCRP/AUTO weapon release mode by pressing the OSB next to MODE, then select AUTO.
6. Select fuzing by pressing the OSB next to FUZE, then select N+T (Nose + Tail).
7. Select quantity by pressing the OSB next to QTY, then select desired quantity (i.e. 4).
8. If applicable, select bomb release interval by pressing the OSB next to INTERVAL, then enter distance between bomb in ft (700 = 700 ft).
9. Select BR ALT (Break Off Altitude) by pressing the OSB next to BR ALT, then enter desired altitude in ft (i.e. 1000 = 1000 ft). This will set the altitude setting of the Pull-Up Cue X on the HUD.





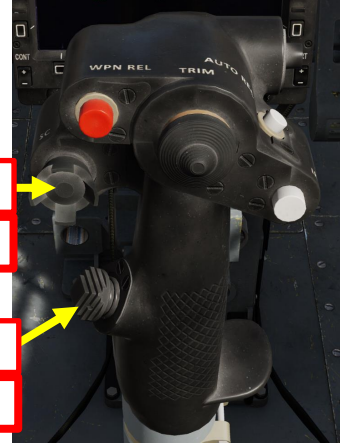


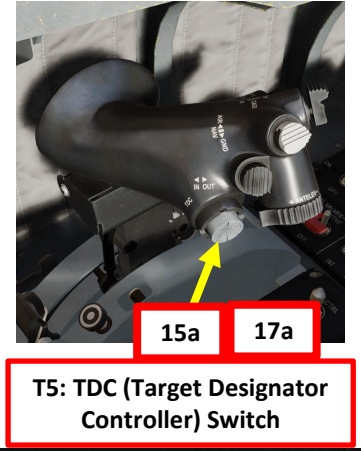


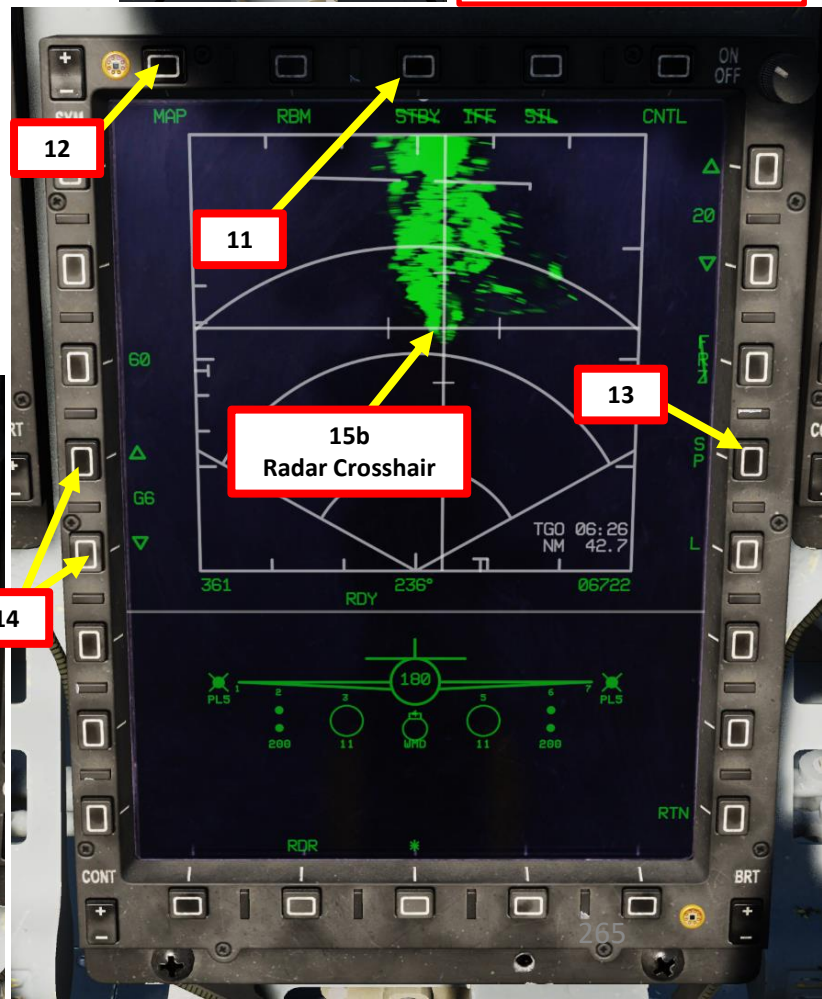


2.1.3 – ANTI-RUNWAY BOMBS – TYPE 200A (AG Radar + CCRP/AUTO)

10. By default, radar MAP mode should already be selected.
11. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
12. If another Air-to-Ground Radar mode was selected, press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu and press on the OSB next to "MAP" to select Ground Mapping Mode.
13. Make sure Snowplow Mode is selected (OSB next to SP/SLV toggles Snowplow and Slave Modes).
14. Adjust Gain and Contrast– As required.
15. Slew the TDC Cursor (Radar Crosshair) over the region you want to expand/designate using the T5 TDC Switch.
16. If you want to use Expanded sub-modes, either press the S2/SC (Sensor Control) Switch LEFT or use the OSB next to the Radar Sub-Mode Selector to switch to desired Sub-Mode.
17. To designate a target/SPI (Sensor Point of Interest) on the Radar Crosshair position, use the T5 TDC PRESS switch control (ENTER). This will set the SPI (Sensor Point of Interest) at this location and center the radar image around this SPI. We will designate the right runway as seen on the radar ground mapping display expanded in DBS2 sub-mode.



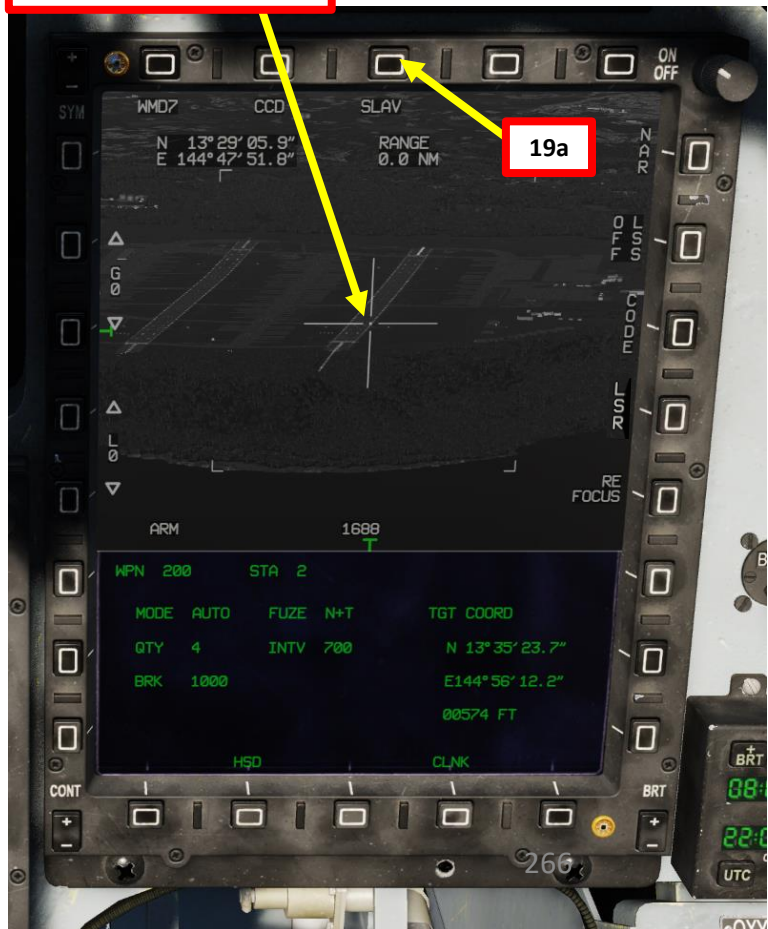




2.1.3 – ANTI-RUNWAY BOMBS – TYPE 200A (AG Radar + CCRP/AUTO)

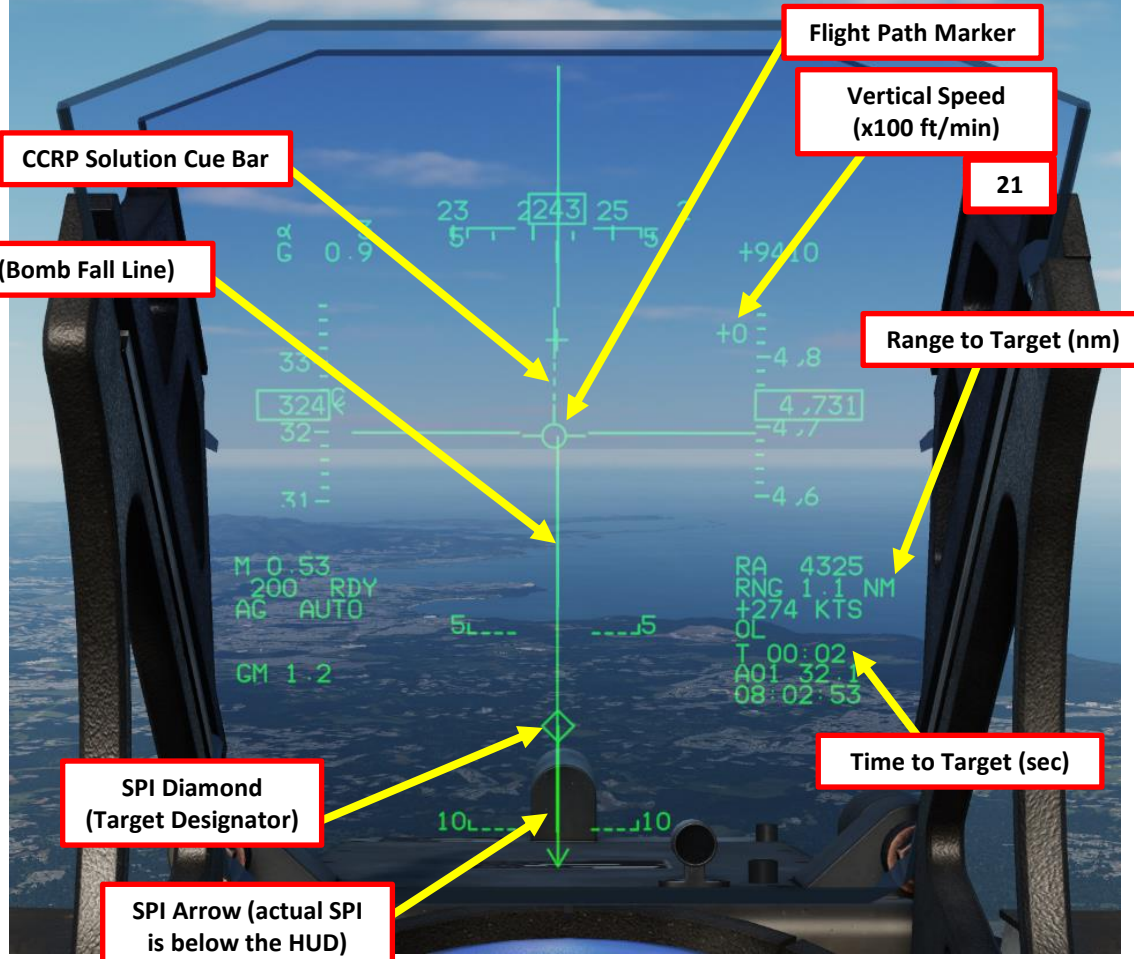
19. If desired, you can slave other sensors like the Targeting Pod to the SPI (Sensor Point of Interest) designated via the radar. To do so, uncage the targeting pod and set the SP/SLAV (Snowplow/Slave) Function to SLAV. The targeting pod will then be slaved to the designated SPI and give you a better view of the point designated by the radar.

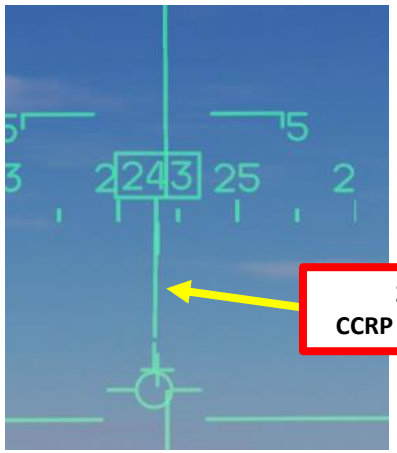
19b
TGP Slaved to Radar SPI



2.1.3 – ANTI-RUNWAY BOMBS – TYPE 200A (AG Radar + CCRP/AUTO)

20. Fly level at least 1000 ft above the target and keep your flight path marker aligned with the BFL (Bomb Fall Line).
21. Pay special attention to the vertical speed: the aircraft should NOT be descending (bomb release will be inhibited to avoid flying into your own bombs) and should NOT be ascending (this will throw off your aim). Fly level (vertical speed = 0).
22. The CCRP Solution Cue Bar is used as a release cue
    - If there is no CCRP solution, the bar is a completely dashed line
    - If there is a CCRP solution but greater than 15 sec, only 1/4 from the top is solid but the remaining part of the bar remains dashed
23. When CCRP solution cue is reducing from 4 sec to 0 sec, the bar starts to change to solid line on the 3/4 part.
24. When Time to Target is about 3 sec, hold the S3 Weapon Release Button (« RALT+SPACE »). An aural cue is audible 3 seconds away from the bomb release point
25. When CCRP bar is full, bombs will release automatically as long as you hold the Weapon Release button.





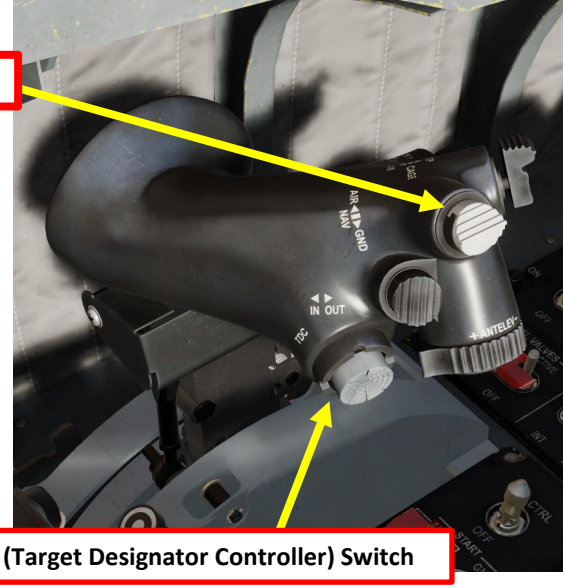
2.1.3 – ANTI-RUNWAY BOMBS – TYPE 200A (AG Radar + CCRP/AUTO)

26. Just after the bombs are released, the parachute is deployed, separating the bomb from the aircraft and slowing it down. After a few seconds seconds and when the bomb is less than 40° from the vertical, the parachute is jettisoned and the booster is fired, accelerating the bomb into the ground. After penetration is achieved, the bomb explodes… creating a crater.
27. Pull up to avoid smacking yourself into the ground and watch the fireworks.

2.2 – UNGUIDED ROCKETS (CCIP)

1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. Go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.

T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

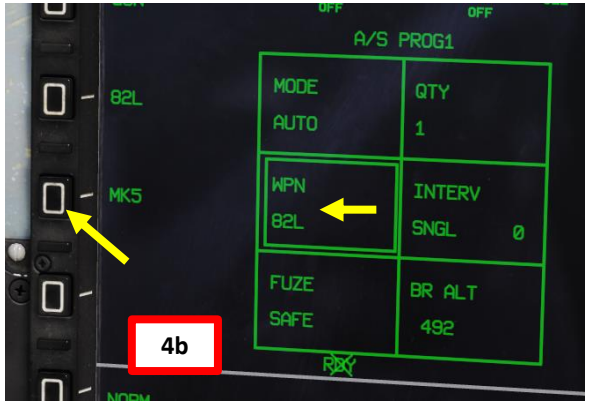


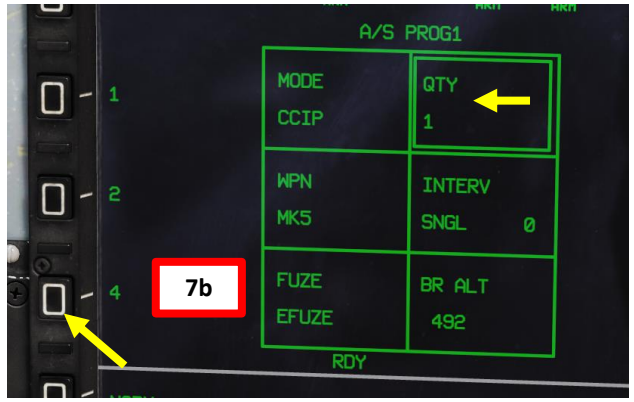
T5: TDC (Target Designator Controller) Switch

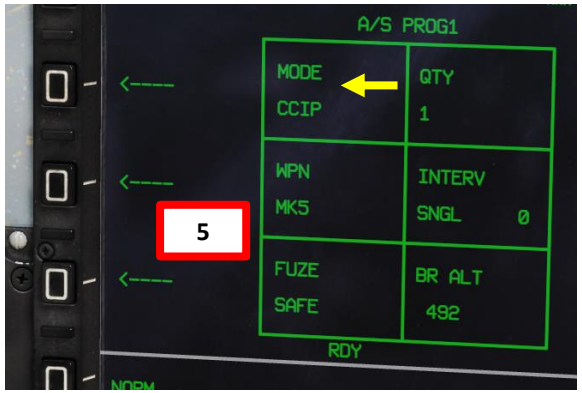
S1: SS (Sensor Selection) Switch

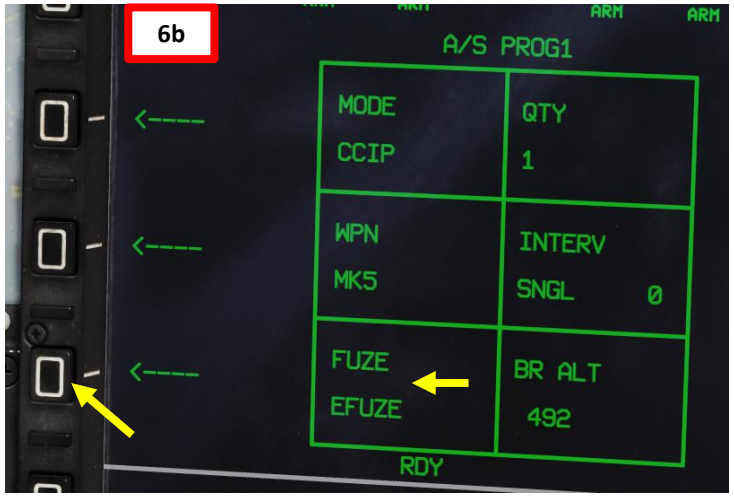
2.2 – UNGUIDED ROCKETS (CCIP)

4. Select MK-82 bombs by pressing the OSB next to WPN, then select 82L.
5. CCIP weapon release mode is selected by default and cannot be changed.
6. Select fuzing by pressing the OSB next to FUZE, then select EFUZE (Electronic Fuze).
7. Select quantity by pressing the OSB next to QTY, then select desired quantity (i.e. 4).
8. If applicable, select bomb release interval by pressing the OSB next to INTERVAL, then enter time between rockets in ms (500 = 0.5 s).
9. Select BR ALT (Break Off Altitude) by pressing the OSB next to BR ALT, then enter desired altitude in ft (i.e. 0500 = 500 ft). This will set the altitude setting of the Pull-Up Cue X on the HUD.





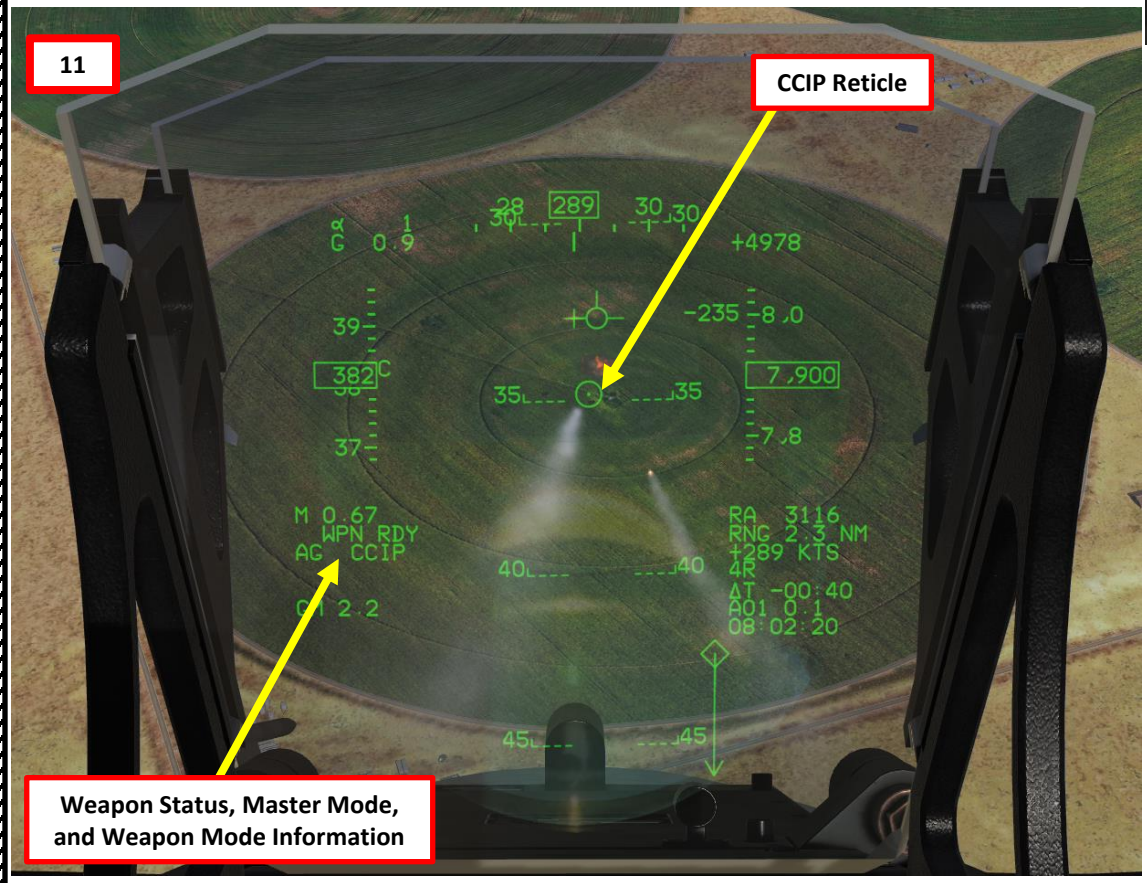




2.2 – UNGUIDED ROCKETS (CCIP)

10. Start a 30-45 degree dive on your target
11. Align CCIP circle/reticle on the target
12. Press and hold the Weapon Release button (« RALT+SPACE ») once CCIP circle is on target. Hold button until all programmed rockets are released.

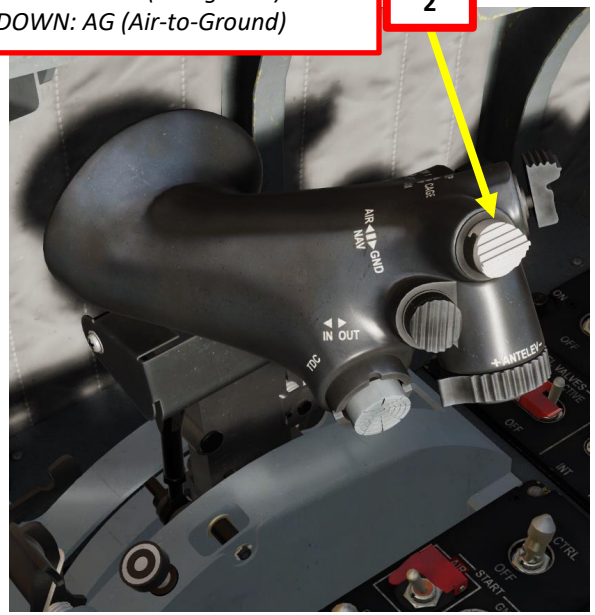
S3: Weapon Launch/Release Button



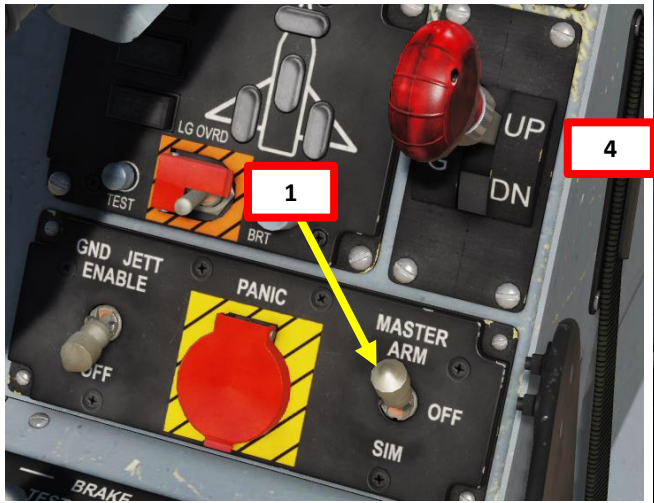
2.3 – GSH-23-2 CANNON (AIR-TO-GROUND)

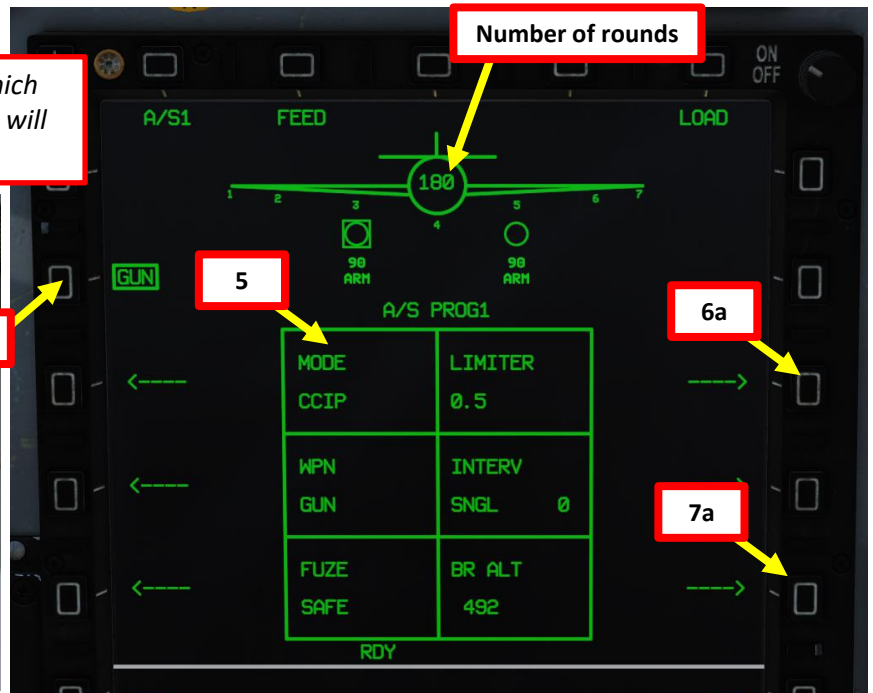
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. Go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select GSh-23 Gun by pressing the OSB next to GUN. The weapon profile will automatically switch to the Air-to-Ground Gun Profile.
5. CCIP weapon release mode is selected by default and cannot be changed.
6. Select Gun Burst Time Limiter by pressing the OSB next to LIMITER, then select desired burst duration (i.e. 0.5 sec).
7. Select BR ALT (Break Off Altitude) by pressing the OSB next to BR ALT, then enter desired altitude in ft (i.e. 0500 = 500 ft). This will set the altitude setting of the Pull-Up Cue X on the HUD.
8. Click on the FEED OSB to reload the gun. A box indication on FEED will blink for a few seconds, then disappear once the gun is loaded and ready to be fired. The FEED function can be used if the gun jams, but it can only be used up to three times. After a third attempt, the system won't respond and FEED will keep blinking.

T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)



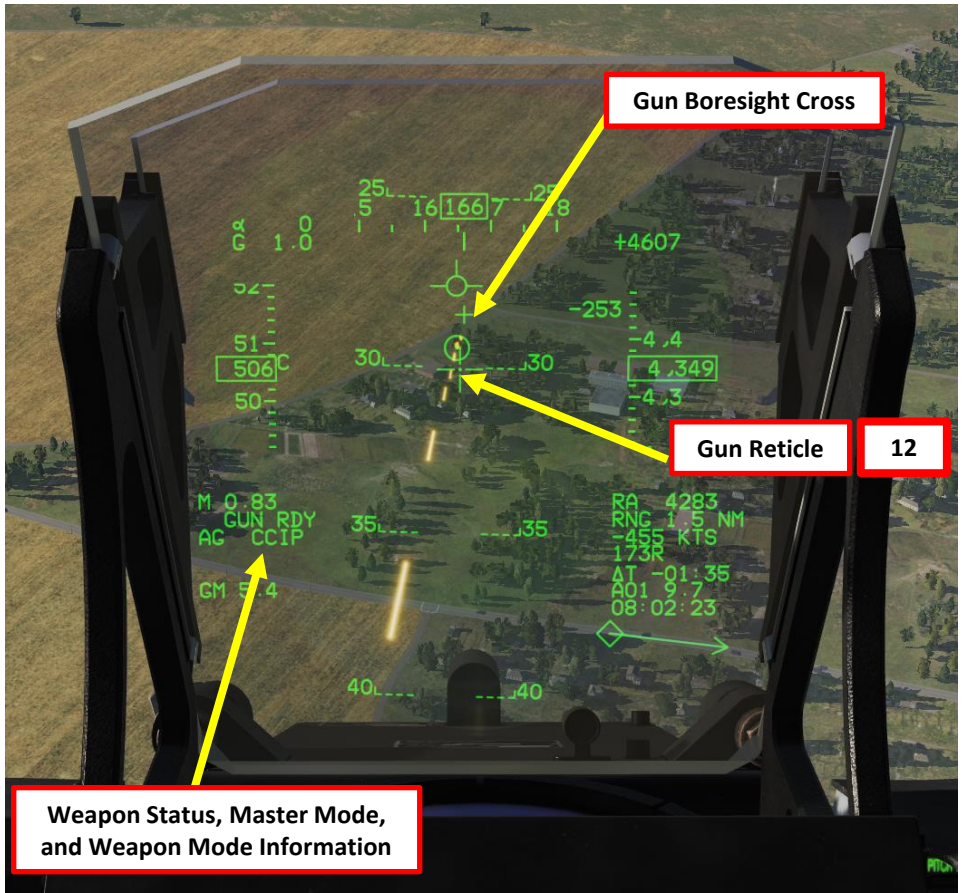
The cannon uses a "pyrotechnical" reload system, which means that a cassette equipped with a pyrocartridge will detonate a charge to "reload" the gun.





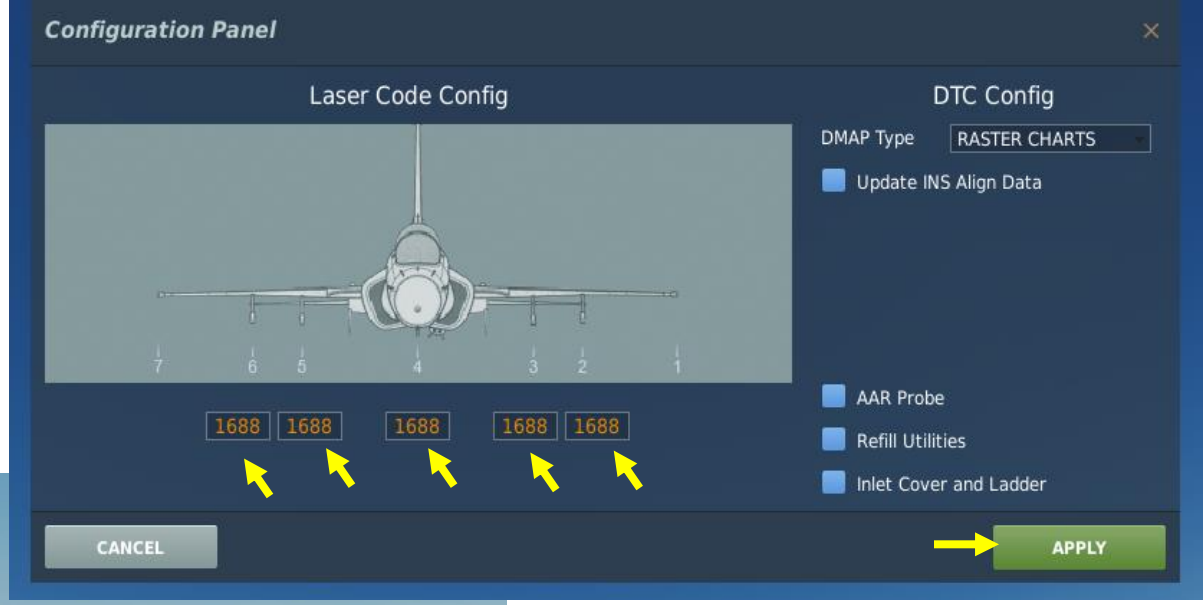
2.3 – GSH-23-2 CANNON (AIR-TO-GROUND)

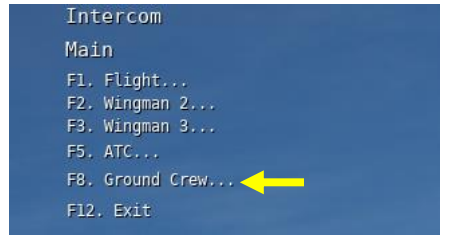
10. Start a 30-45 degree dive on your target
11. Align gun reticle on the target
12. Press and hold the S4 Gun Trigger (« SPACE ») once gun reticle is on target.

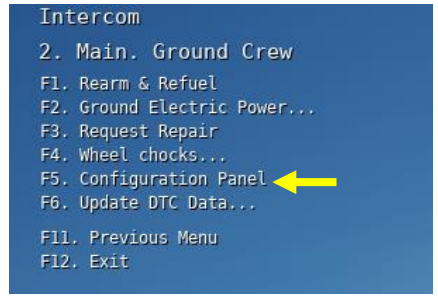


2.4 – BRM-1 LASER-GUIDED ROCKETS (TARGETING POD)

- The laser code on the laser-guided rockets needs to be set manually on the ground by the ground crew.
  a) Contact ground crew and select your desired loadout by pressing « \ »
  b) Select **Ground Crew** menu
  c) Select **Configuration Panel**.
  d) From the Configuration panel, modify laser codes as needed.
  e) Click APPLY to request the ground crew to change the laser code.





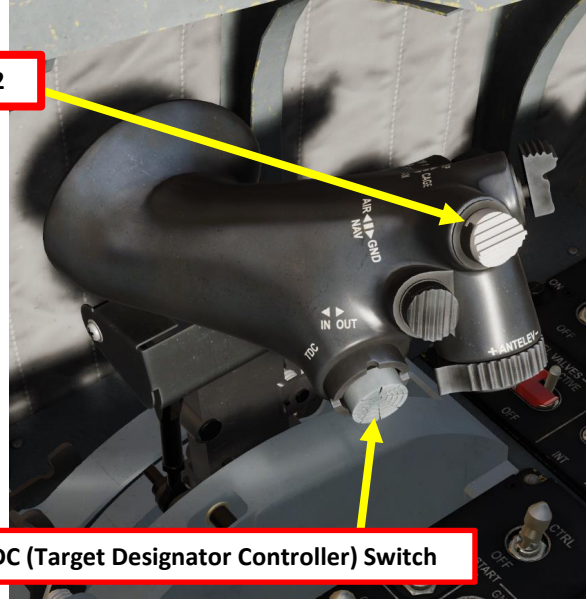


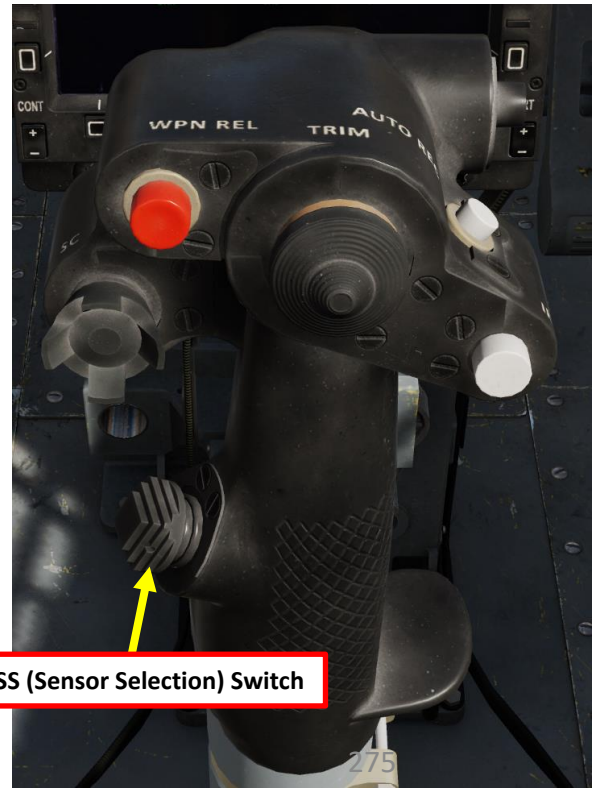
2.4 – BRM-1 LASER-GUIDED ROCKETS (TARGETING POD)

Note: Make sure the the CLDP (Convertible Laser Designator Pod) button is pressed to allow the targeting pod laser to be used.

1. Master Arm switch – ARM (UP).
2. Set Master Mode Switch – A/G (DOWN)
3. Go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.

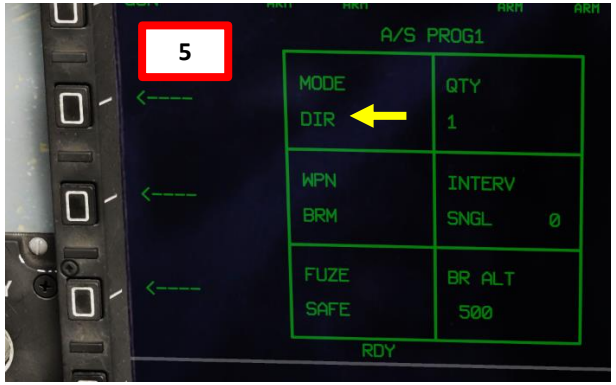
T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)





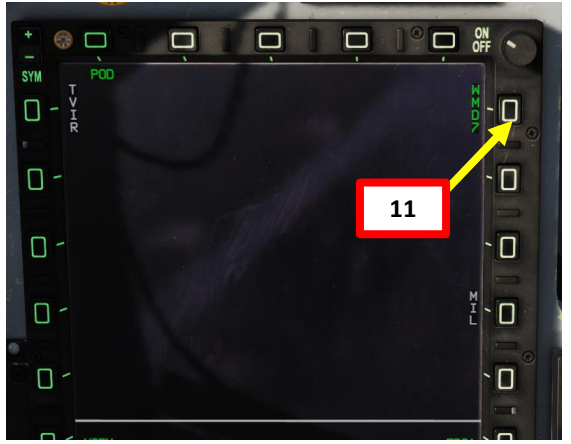
2.4 – BRM-1 LASER-GUIDED ROCKETS (TARGETING POD)

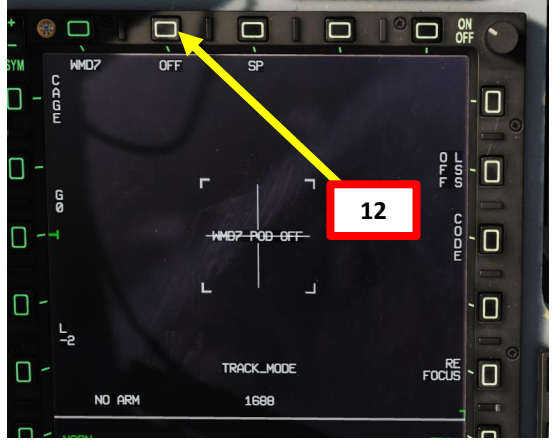
4. Select BRM-1 rockets by pressing the OSB next to WPN, then select BRM.
5. DIR (Direct) weapon release mode is already set by default.
6. Select fuzing by pressing the OSB next to FUZE, then select EFUZE (Electronic Fuze).
7. Select quantity by pressing the OSB next to QTY (i.e. 2).
8. The rocket release interval will automatically set by the QTY setting (SALVO for QTY 2, SINGLE for QTY 1).
9. Select BR ALT (Break Off Altitude) by pressing the OSB next to BR ALT, then enter desired altitude in ft (i.e. 0500 = 500 ft). This will set the altitude setting of the Pull-Up Cue X on the HUD.

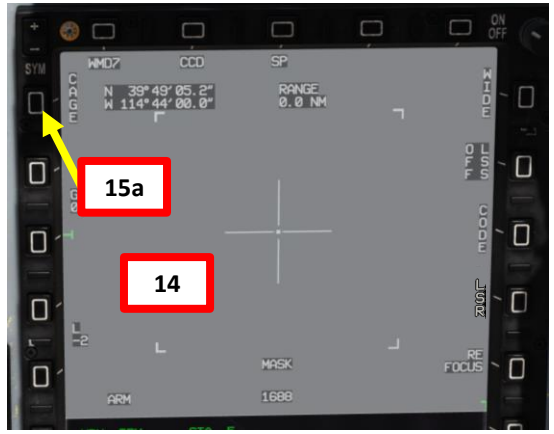


2.4 – BRM-1 LASER-GUIDED ROCKETS (TARGETING POD)

10. Go in the MAIN MENU MFCD page and press the OSB (Option Select Button) next to POD.
11. Press the OSB next to WMD7 to enter the Targeting Pod feed page.
12. Press the OSB next to “OFF” to start warm-up process.
13. Targeting pod will enter a BIT (Built-In Test) mode that starts a warm-up process that will take about 60 seconds.
14. When targeting pod is ready to be used, the pod ALIGN status will disappear and be replaced by the pod feed in caged/stowed position.
15. If pod is caged (UNCAGE indication is visible), press the OSB next to UNCAGE to uncage targeting pod.
16. Select desired mode (SP/SNOWPLOW or SLAV/SLAVED) by pressing the OSB next to SP/SLAV. In this case, we will use SNOWPLOW (SP) mode.
17. Press the OSB next to CODE and set the desired laser code the targeting pod will designate with. The default code is 1688, so make sure it matches the code of the laser-guided ordnance (set by ground crew) that will track this laser. In this example, we will use a laser code of 1688.
18. Select either CCD (Charged-Coupled Device/TV) or IR as required.





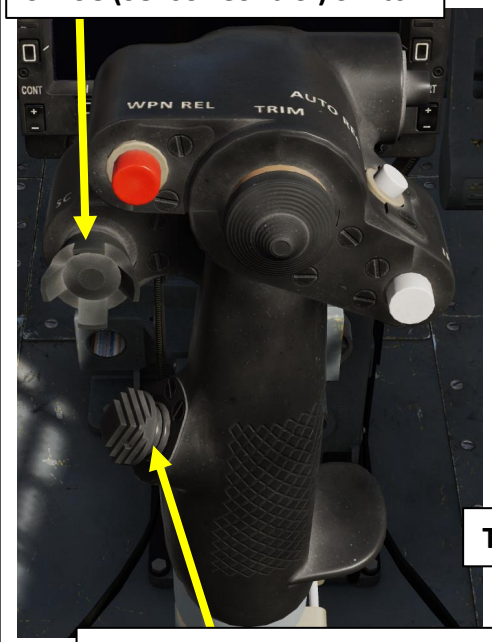


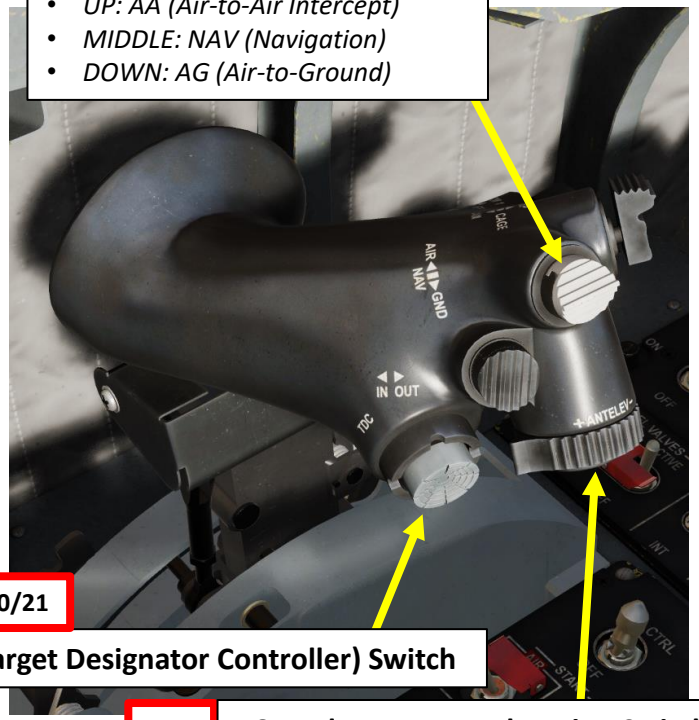
2.4 – BRM-1 LASER-GUIDED ROCKETS (TARGETING POD)

19. Set Targeting Pod page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (RIGHT if POD page is on the Right MFCD). An asterisk will indicate the SOI status.
20. Slew the Targeting Pod reticle on a target using the T5 TDC (Target Designator Controller) slew controls. Use Radar Antenna Elevation Switch to zoom in or out.
21. When targeting pod reticle is over the target, use the T5 TDC PRESS button (ENTER) to designate the target as a SPI (Sensor Point of Interest).
22. Once a target is designated, the pod will attempt to enter POINT TRACK (tracks moving target). If POINT TRACK is not possible, the pod will enter AREA TRACK mode by default if the target is within 21 nm.

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

S2: SC (Sensor Control) Switch





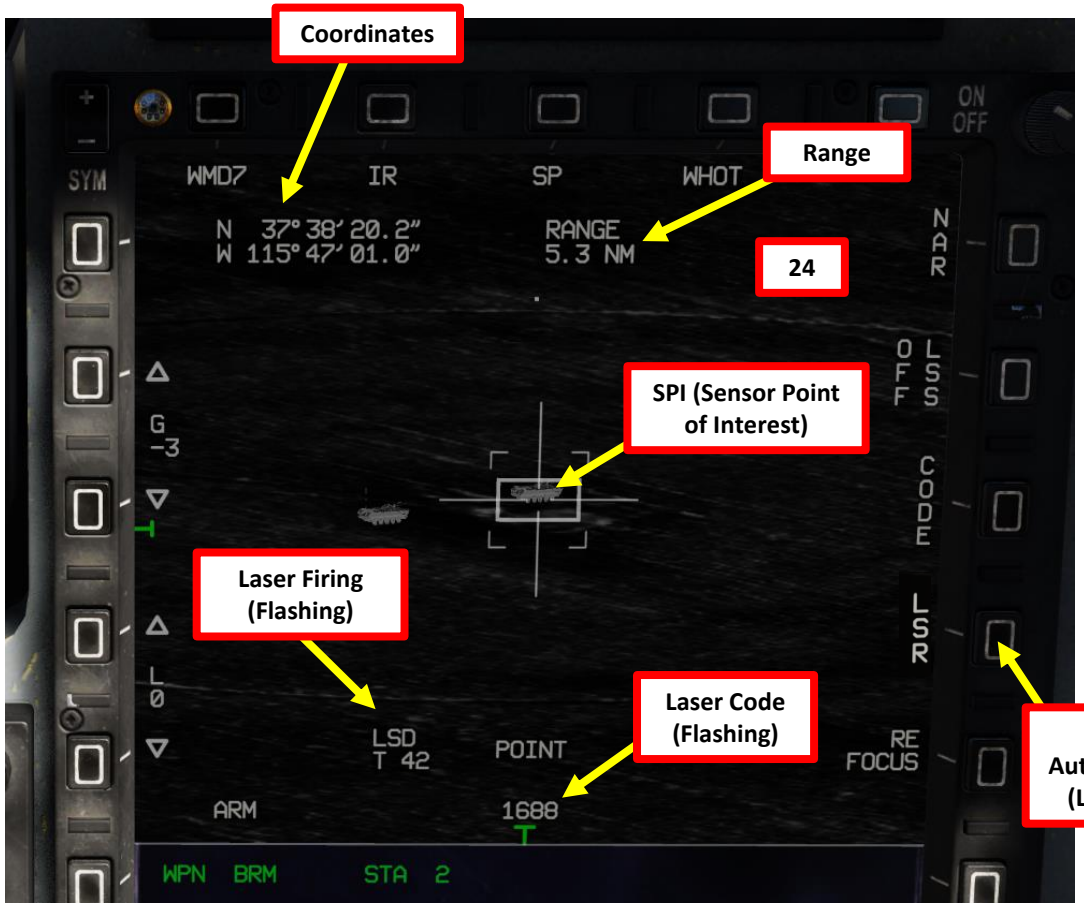
S1: SS (Sensor Selection) Switch **19a**

20/21 **T5: TDC (Target Designator Controller) Switch**

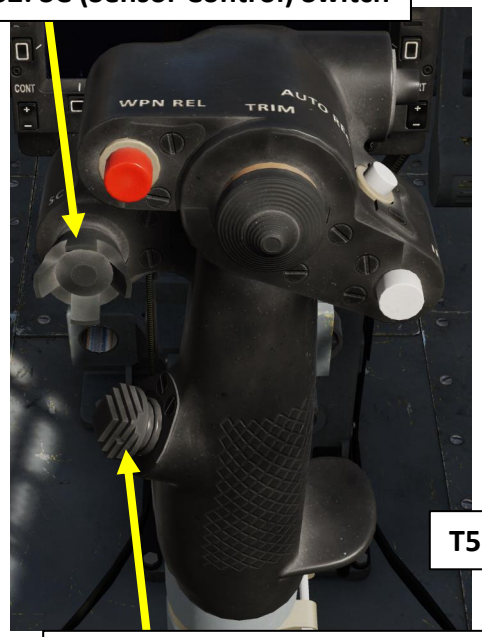
20 **T6: Radar Antenna Elevation Switch**

2.4 – BRM-1 LASER-GUIDED ROCKETS (TARGETING POD)

23. Select Laser Designation Mode as desired.
    - MANUAL mode (LSR boxed) will fire the laser and latch it, displaying a flashing LSD indication. This is useful when "buddy lasing" a target for a friendly aircraft, but there is a time limit before the laser designator burns out and becomes inoperable.
    - AUTO mode (LSR unboxed) will automatically fire the laser and latch it after you fire a laser-guided rocket. This is much more efficient since it reduces your workload and avoids overheating the laser designator.
24. Laser Designation Mode indication and Laser Code will both flash once laser is firing.
    - Note: If you want to undesignate a target, set the S2 Sensor Control Switch to PRESS (BACKSPACE).

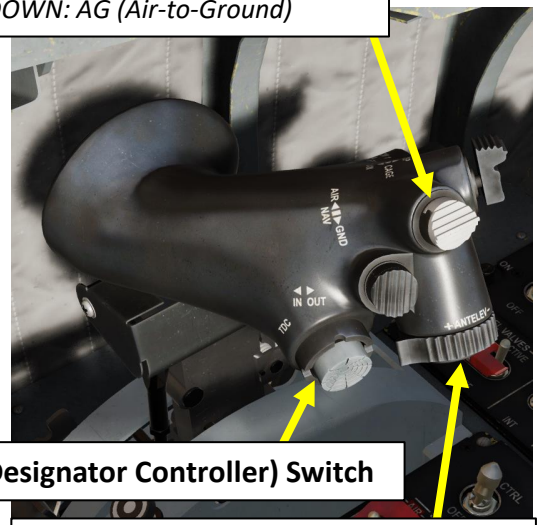


17 **S2: SC (Sensor Control) Switch**



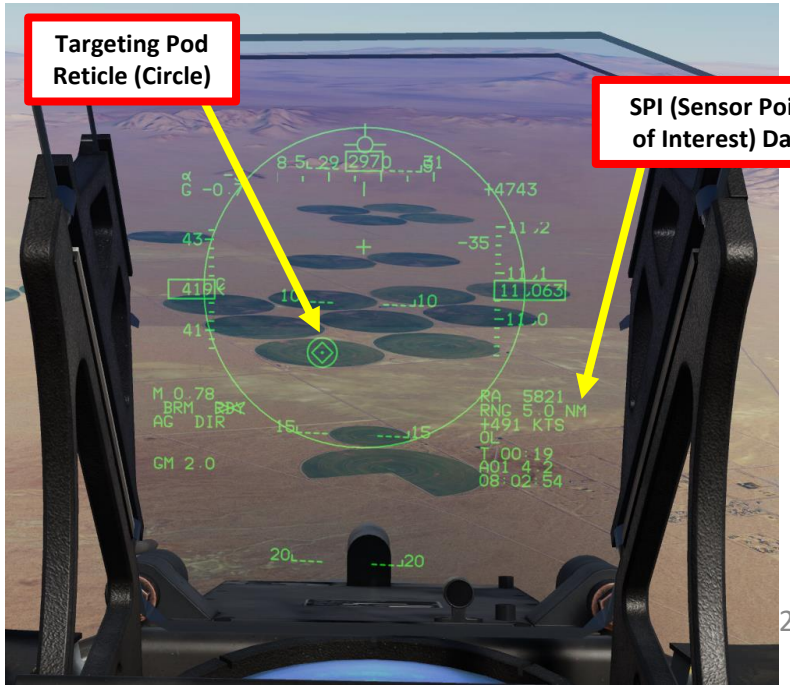
S1: SS (Sensor Selection) Switch

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



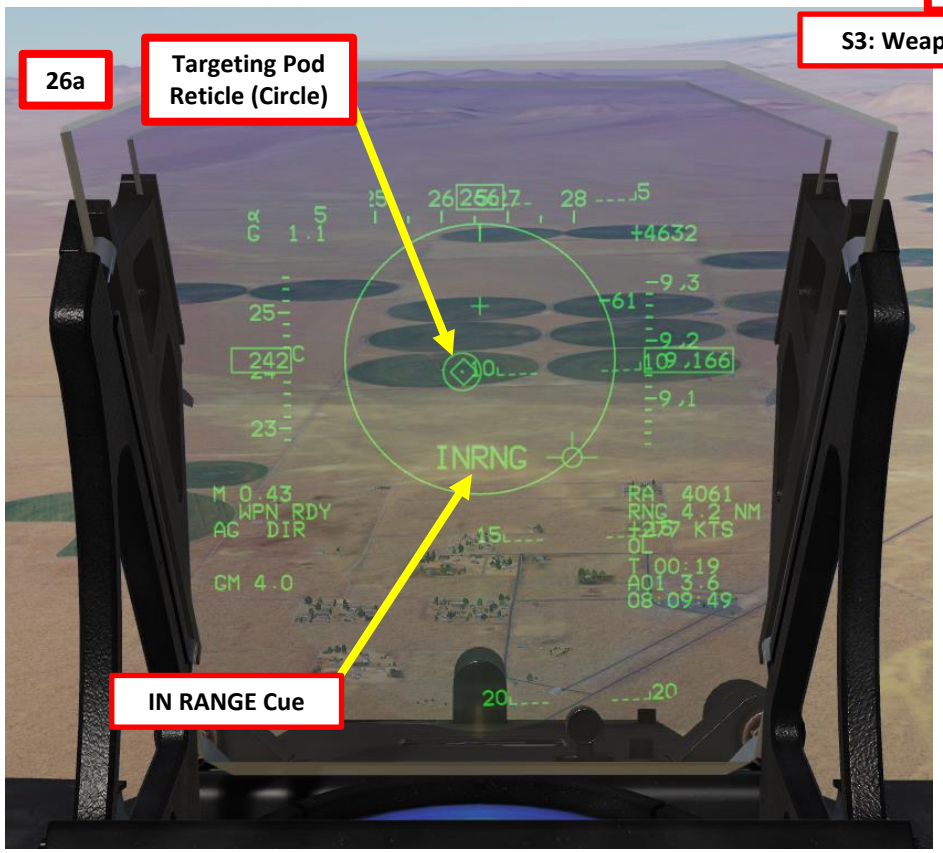
T5: TDC (Target Designator Controller) Switch

T6: Radar Antenna Elevation Switch



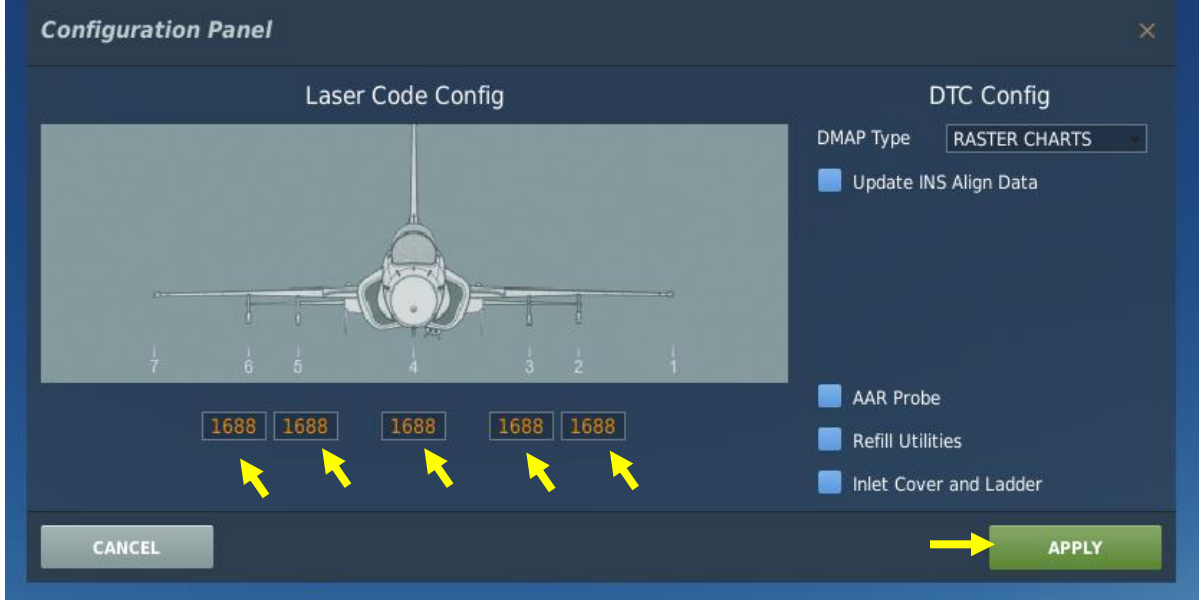
2.4 – BRM-1 LASER-GUIDED ROCKETS (TARGETING POD)

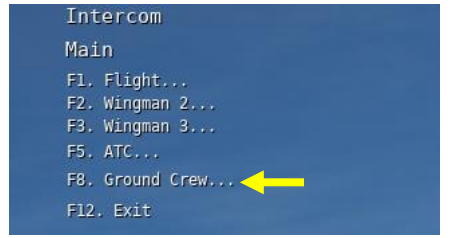
25. Steer the aircraft to roughly align the rocket aiming zone with the targeting pod's reticle.
26. When the IN RANGE cue is visible, press the S3 Weapon Release Button (« RALT+SPACE ») to fire your rockets.
27. If Laser Designation Mode is set to MANUAL, pressing the « LSR » button (boxed when selected) will manually fire the laser on the target in LSD (Laser Designate) mode. If using AUTO lasing mode, the laser will automatically fire once you have fired the rockets. The rockets will track the laser and home on the designated target.

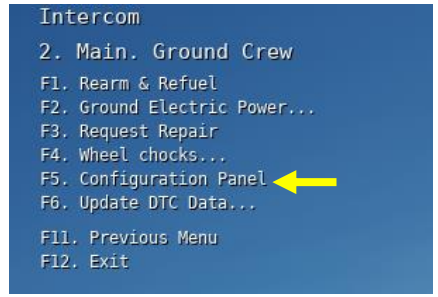


2.5 – GBU-12 LASER-GUIDED BOMBS (TARGETING POD)

- The laser code on the laser-guided bomb units needs to be set manually on the ground by the ground crew.
  a) Contact ground crew and select your desired loadout by pressing « \ »
  b) Select **Ground Crew** menu
  c) Select **Configuration Panel**.
  d) From the Configuration panel, modify laser codes as needed.
  e) Click APPLY to request the ground crew to change the laser code.





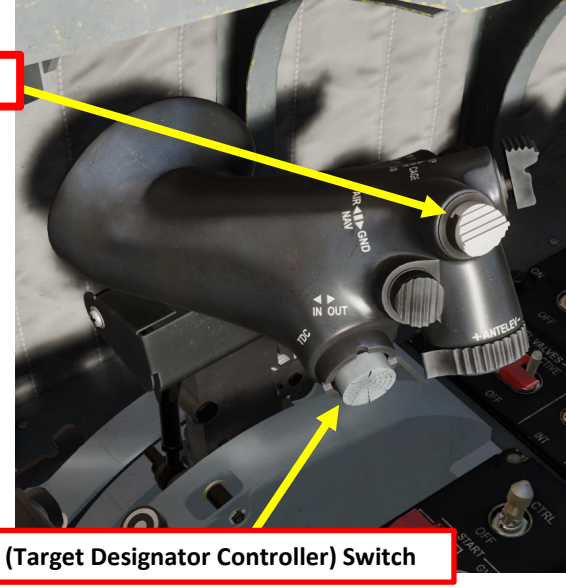


2.5 – GBU-12 LASER-GUIDED BOMBS (TARGETING POD)

Note: Make sure the the CLDP (Convertible Laser Designator Pod) button is pressed to allow the targeting pod laser to be used.

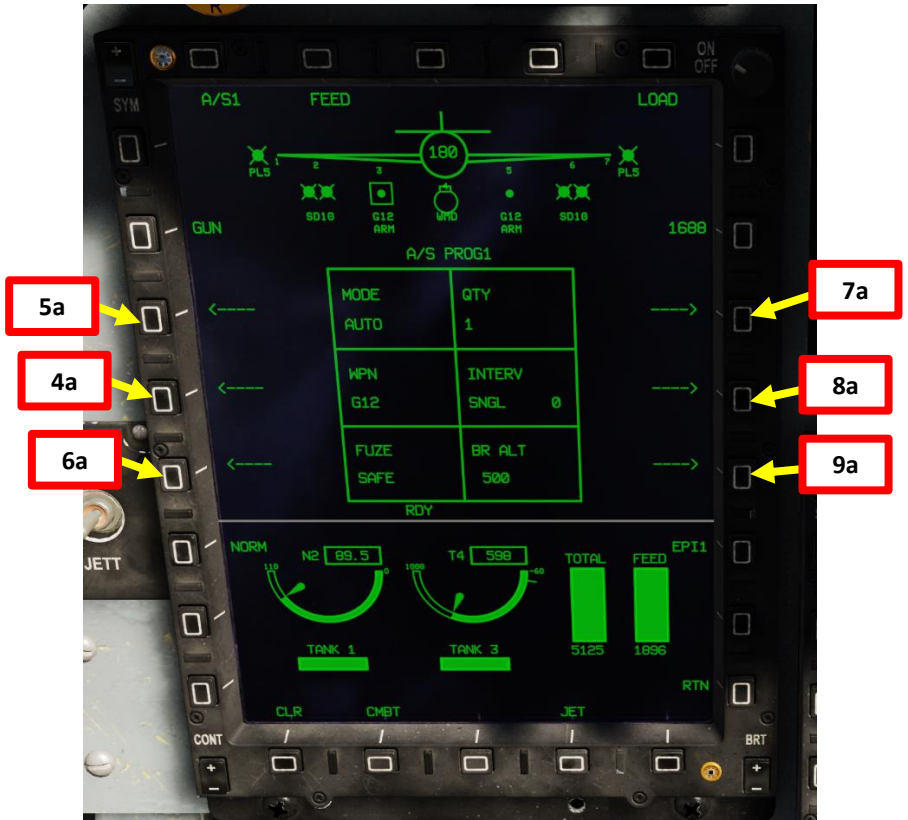
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. Go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.

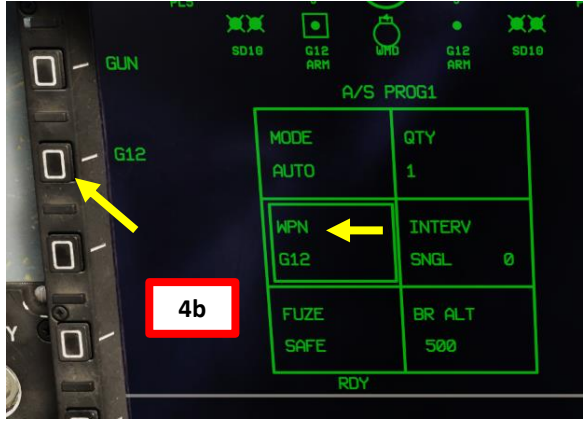
T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

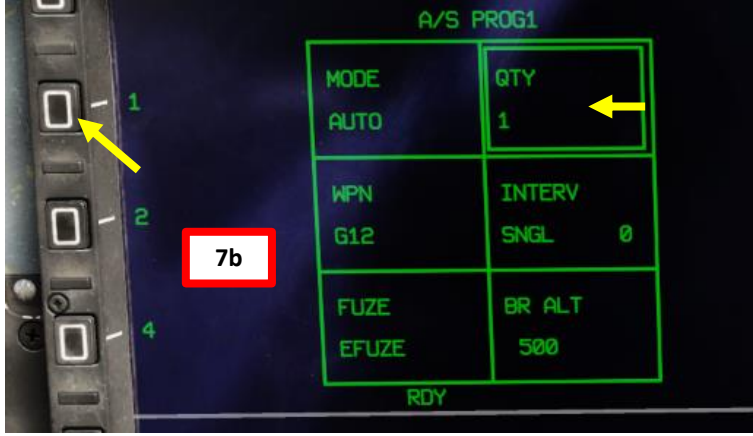


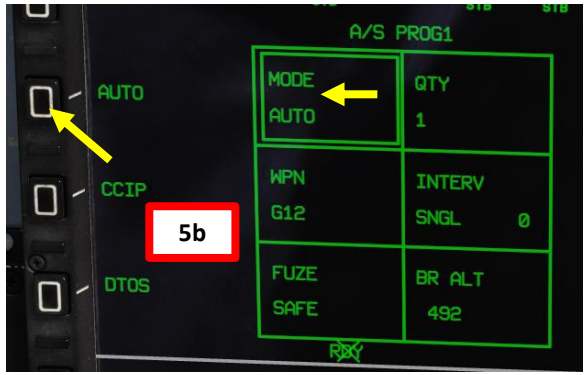
2.5 – GBU-12 LASER-GUIDED BOMBS (TARGETING POD)

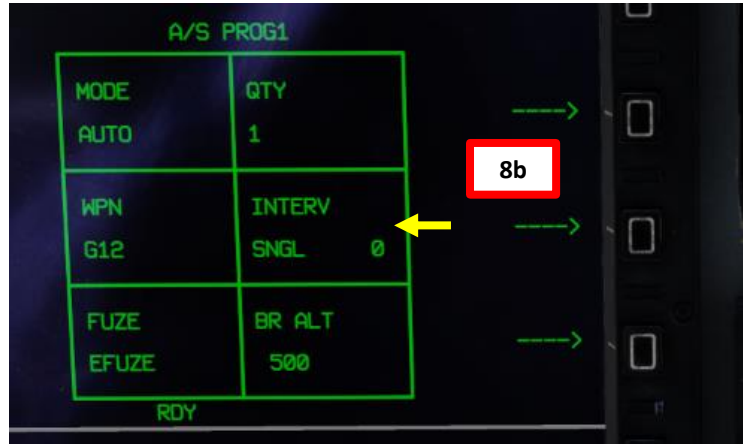
4. Select GBU-12 bombs by pressing the OSB next to WPN, then select G12.
5. Select CCRP/AUTO weapon release mode by pressing the OSB next to MODE, then select AUTO.
6. Select fuzing by pressing the OSB next to FUZE, then select EFUZE (Electronic Fuze).
7. Select quantity by pressing the OSB next to QTY, then select desired quantity (i.e. 1).
8. If applicable, select bomb release interval by pressing the OSB next to INTERVAL, then enter distance between bomb in ft. For single bombs, we'll leave this to 0.
9. Select BR ALT (Break Off Altitude) by pressing the OSB next to BR ALT, then enter desired altitude in ft (i.e. 0500 = 500 ft). This will set the altitude setting of the Pull-Up Cue X on the HUD.





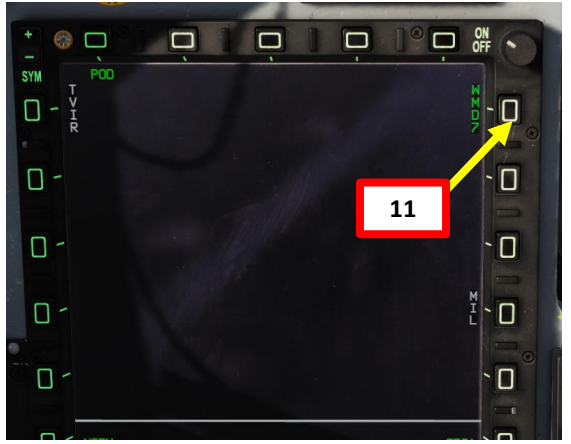


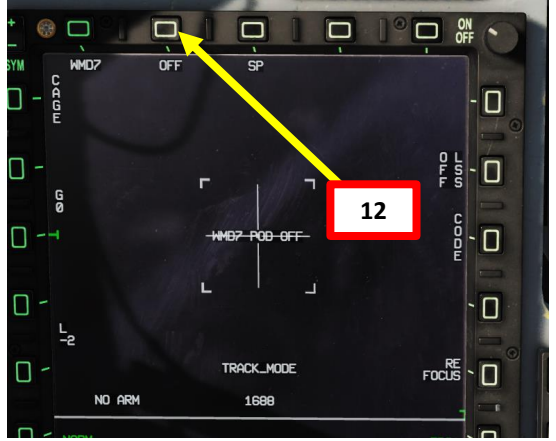


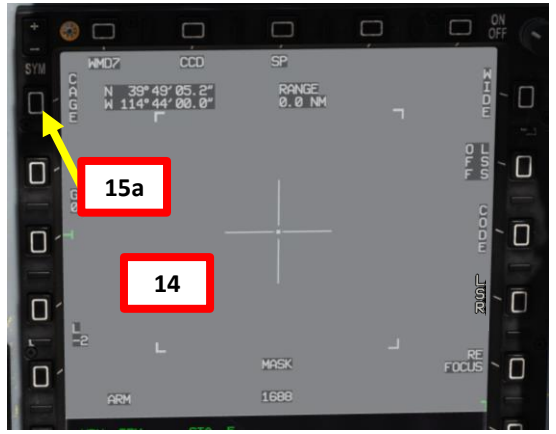


2.5 – GBU-12 LASER-GUIDED BOMBS (TARGETING POD)

10. Go in the MAIN MENU MFCD page and press the OSB (Option Select Button) next to POD.
11. Press the OSB next to WMD7 to enter the Targeting Pod feed page.
12. Press the OSB next to “OFF” to start warm-up process.
13. Targeting pod will enter a BIT (Built-In Test) mode that starts a warm-up process that will take about 60 seconds.
14. When targeting pod is ready to be used, the pod ALIGN status will disappear and be replaced by the pod feed in caged/stowed position.
15. If pod is caged (UNCAGE indication is visible), press the OSB next to UNCAGE to uncage targeting pod.
16. Select desired mode (SP/SNOWPLOW or SLAV/SLAVED) by pressing the OSB next to SP/SLAV. In this case, we will use SNOWPLOW (SP) mode.
17. Press the OSB next to CODE and set the desired laser code the targeting pod will designate with. The default code is 1688, so make sure it matches the code of the laser-guided ordnance (set by ground crew) that will track this laser. In this example, we will use a laser code of 1688.
18. Select either CCD (Charged-Coupled Device/TV) or IR as required.





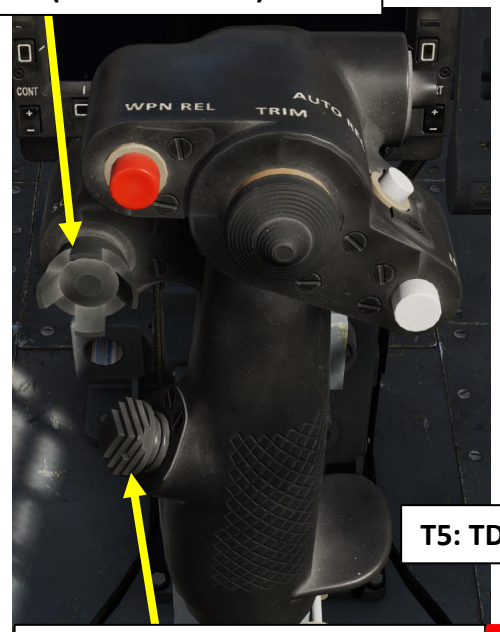


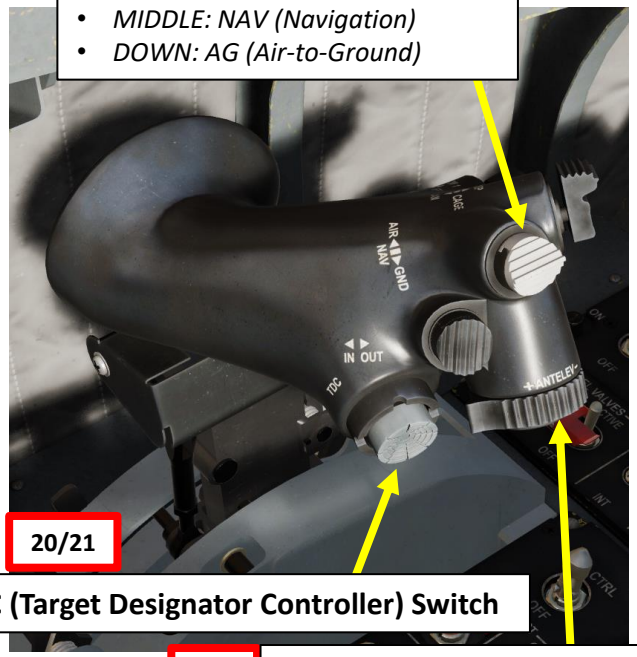
2.5 – GBU-12 LASER-GUIDED BOMBS (TARGETING POD)

19. Set Targeting Pod page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (RIGHT if POD page is on the Right MFCD). An asterisk will indicate the SOI status.
20. Slew the Targeting Pod reticle on a target using the T5 TDC (Target Designator Controller) slew controls. Use Radar Antenna Elevation Switch to zoom in or out.
21. When targeting pod reticle is over the target, use the T5 TDC PRESS button (ENTER) to designate the target as a SPI (Sensor Point of Interest).
22. Once a target is designated, the pod will attempt to enter POINT TRACK (tracks moving target). If POINT TRACK is not possible, the pod will enter AREA TRACK mode by default if the target is within 21 nm.

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

S2: SC (Sensor Control) Switch



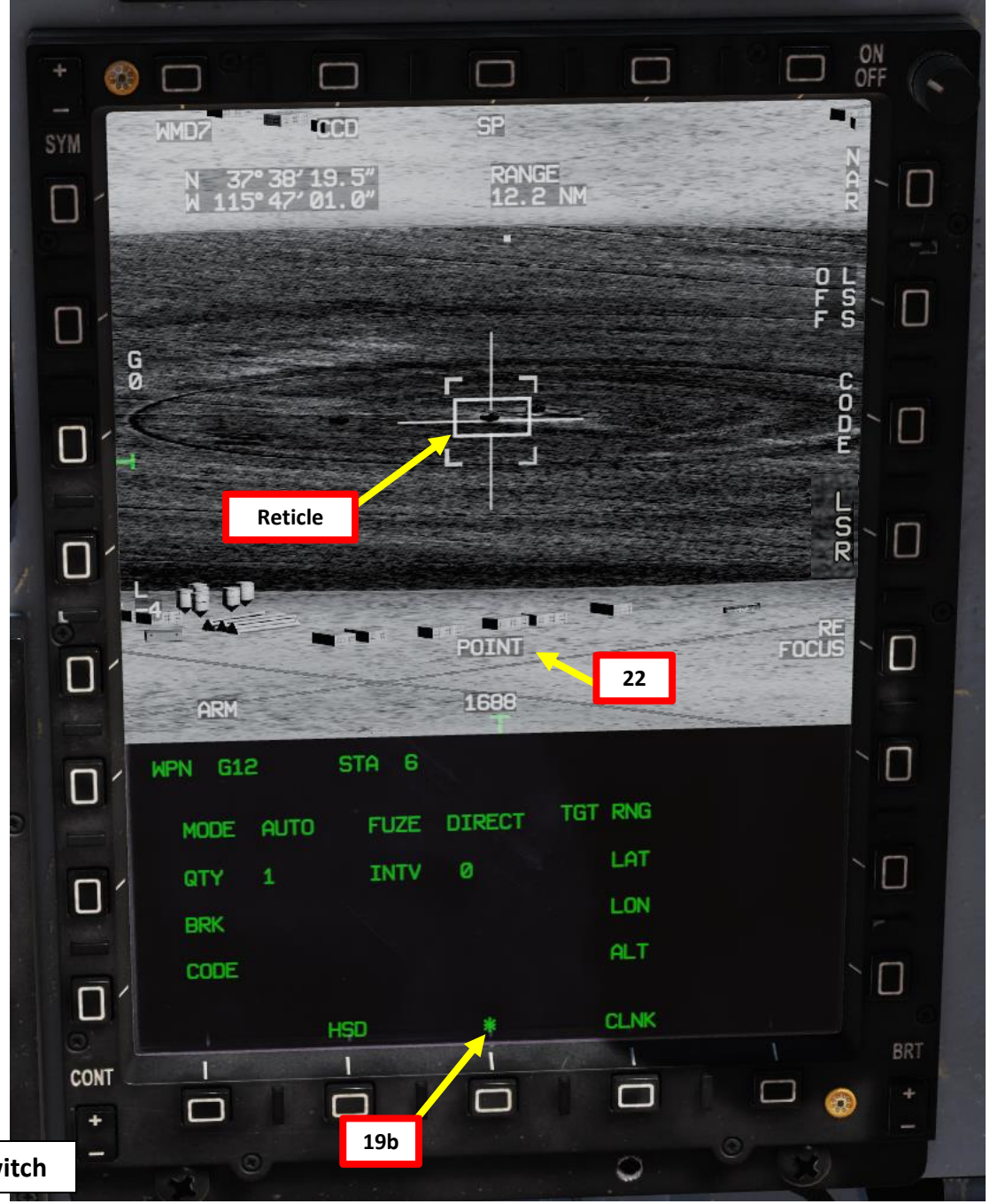


20/21

T5: TDC (Target Designator Controller) Switch

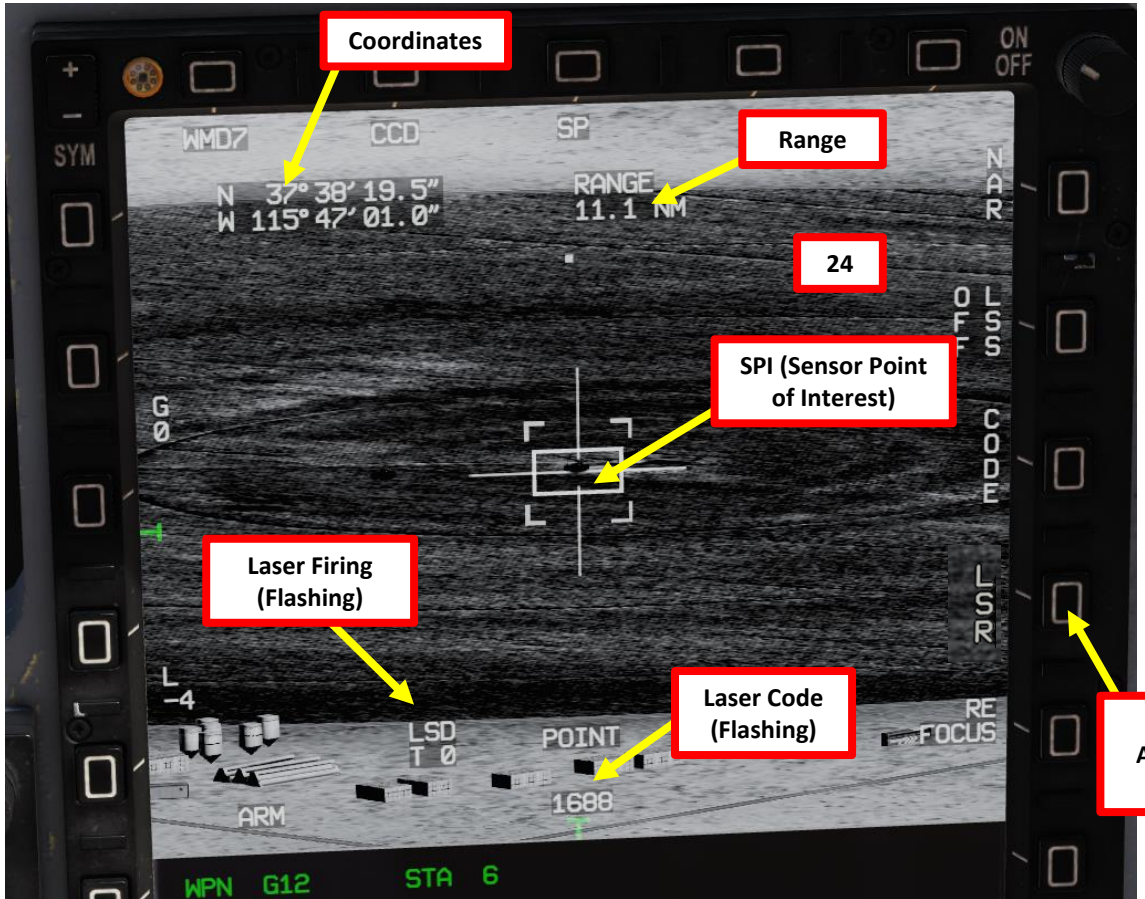
20 **T6: Radar Antenna Elevation Switch**

S1: SS (Sensor Selection) Switch 19a

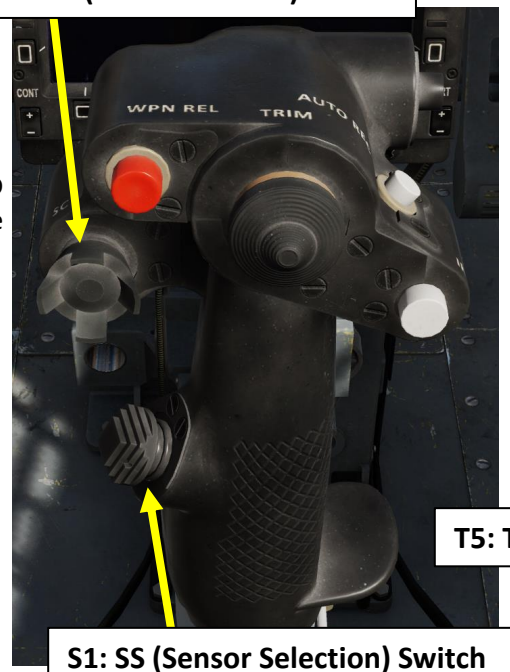


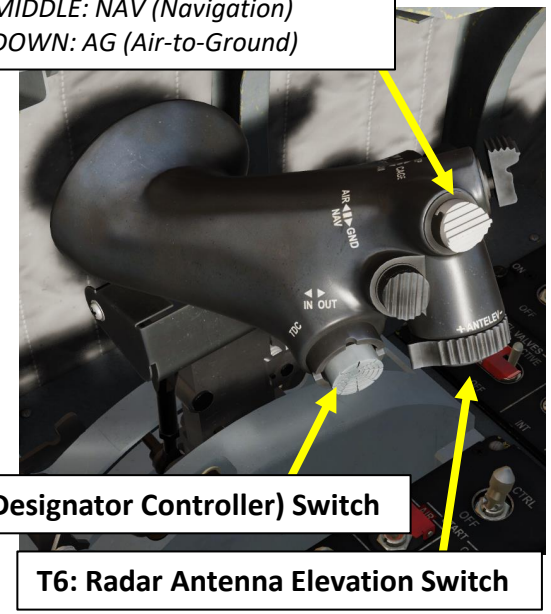
2.5 – GBU-12 LASER-GUIDED BOMBS (TARGETING POD)

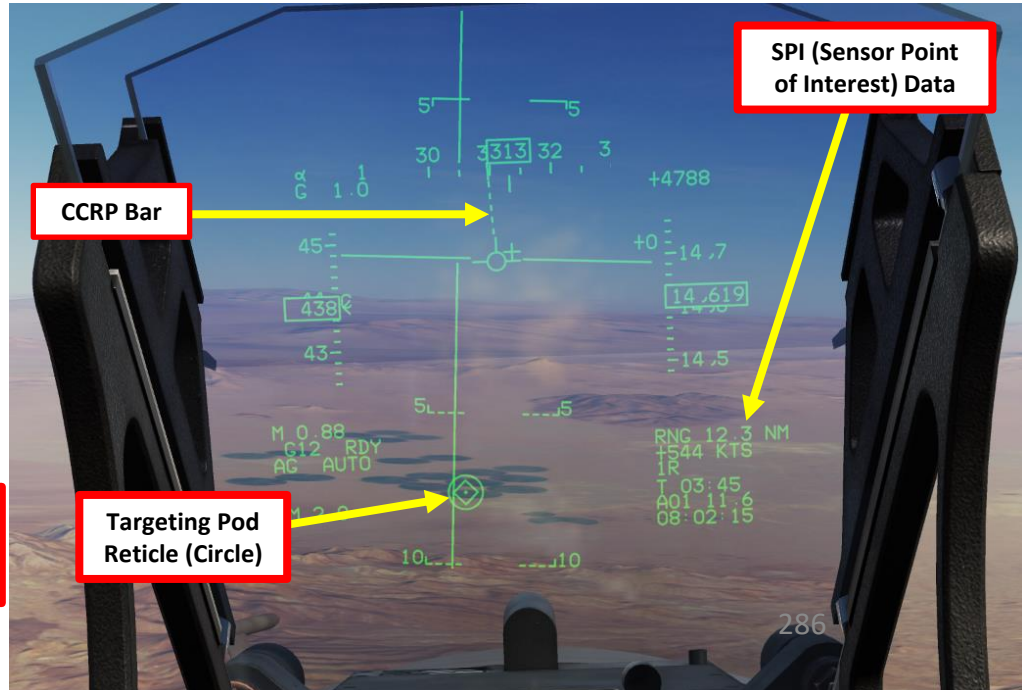
23. Select Laser Designation Mode as desired.
    - MANUAL mode (LSR boxed) will fire the laser and latch it, displaying a flashing LSD indication. This is useful when "buddy lasing" a target for a friendly aircraft, but there is a time limit before the laser designator burns out and becomes inoperable.
    - AUTO mode (LSR unboxed) will automatically fire the laser and latch it after you launch a laser-guided bomb. This is much more efficient since it reduces your workload and avoids overheating the laser designator.
24. Laser Designation Mode indication and Laser Code will both flash once laser is firing.
    - Note: If you want to undesignate a target, set the S2 Sensor Control Switch to PRESS (BACKSPACE).



17

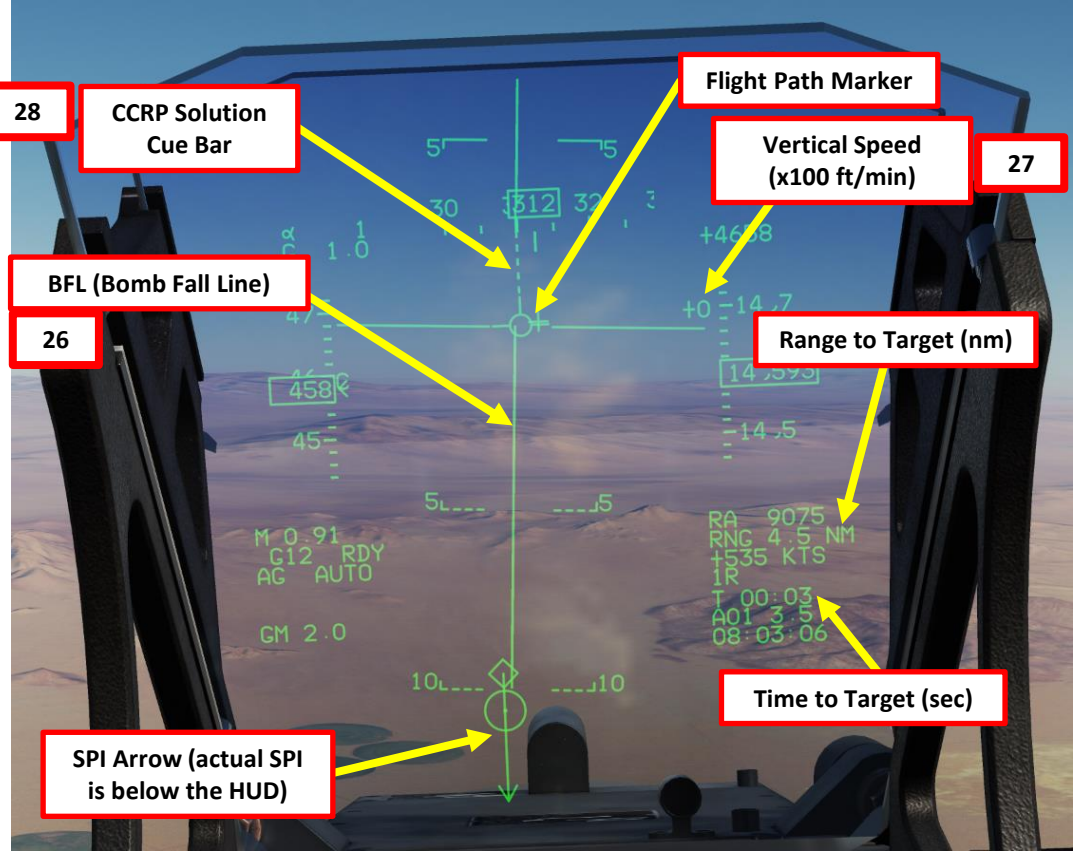


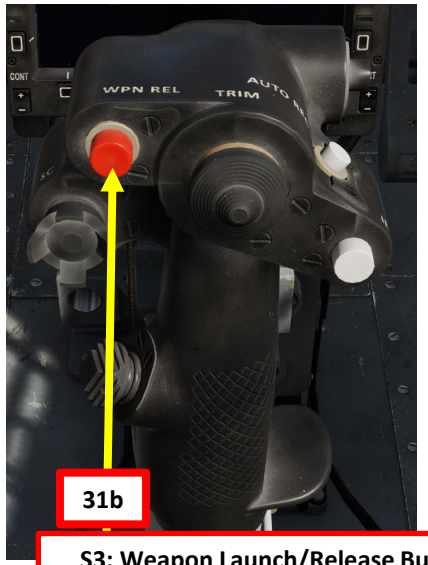


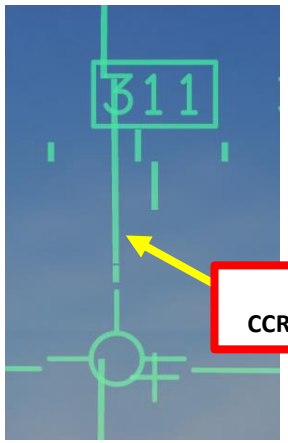


2.5 – GBU-12 LASER-GUIDED BOMBS (TARGETING POD)

25. The CCRP bar attached to Flight Path Marker indicates CCRP solution.
    - The deflection of bar means commanded bank to help aircraft align with the target (max deflection is left/right 60 degrees)
26. Fly level and keep your flight path marker aligned with the BFL (Bomb Fall Line).
27. Pay special attention to the vertical speed: the aircraft should NOT be descending (bomb release will be inhibited to avoid flying into your own bombs) and should NOT be ascending (this will throw off your aim). Fly level (vertical speed = 0).
28. The CCRP Solution Cue Bar is used as a release cue
    - If there is no CCRP solution, the bar is a completely dashed line
    - If there is a CCRP solution but greater than 15 sec, only 1/4 from the top is solid but the remaining part of the bar remains dashed
29. When CCRP solution cue is reducing from 4 sec to 0 sec, the bar starts to change to solid line on the 3/4 part.
30. When Time to Target is about 3 sec, an aural cue is audible 3 seconds away from the bomb release point
31. When CCRP bar is full and Time to Target is at 0 sec, hold the S3 Weapon Release Button (« RALT+SPACE »).







2.5 – GBU-12 LASER-GUIDED BOMBS (TARGETING POD)

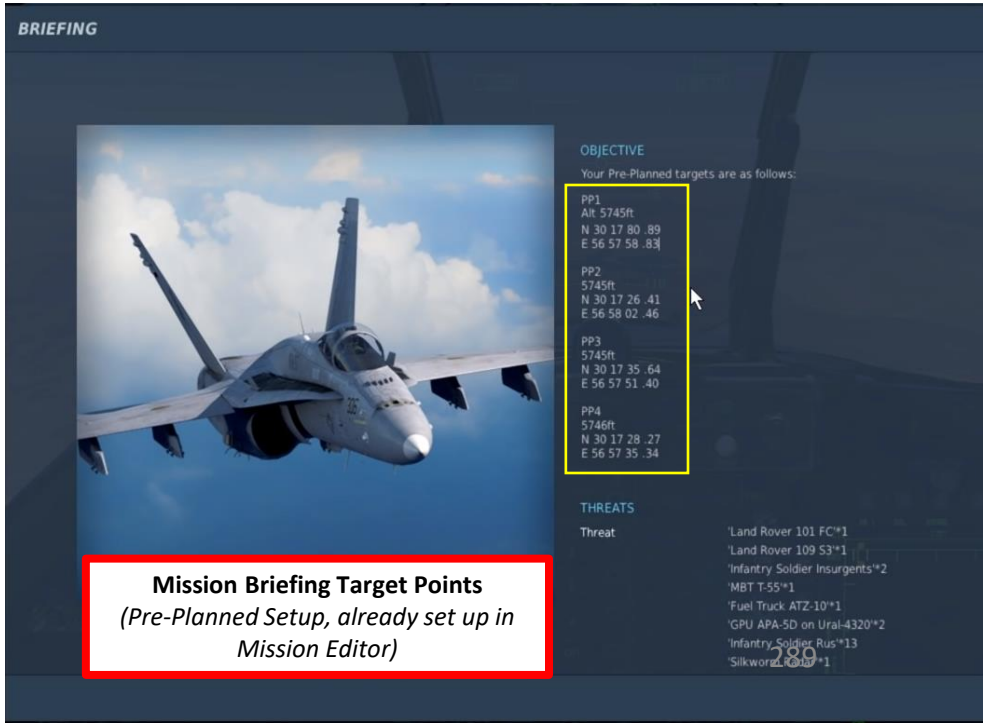
32. If Laser Designation Mode is set to MANUAL, pressing the « LSR » button (boxed when selected) will manually fire the laser on the target in LSD (Laser Designate) mode. If using AUTO lasing mode, the laser will automatically fire once you have dropped the bomb. The guided bomb unit will track the laser and home on the designated target.

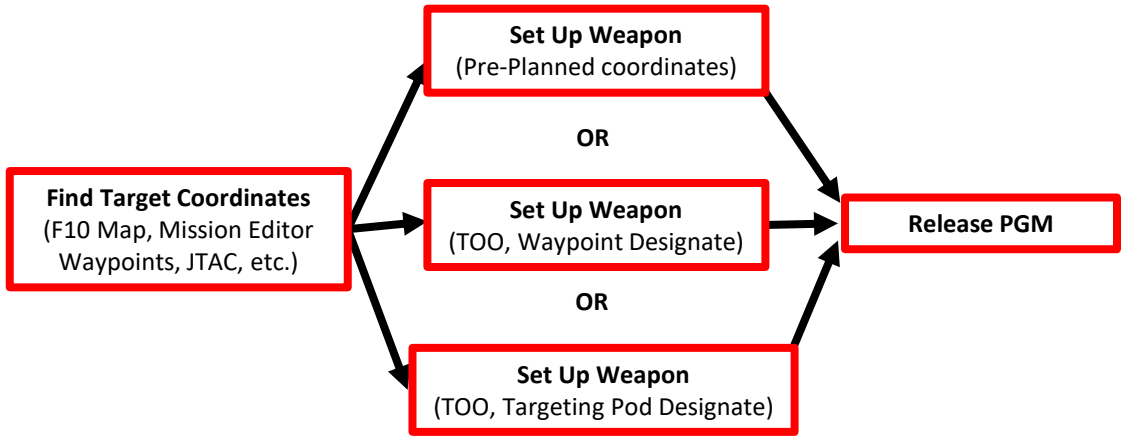
2.6 – PRECISION-GUIDED MUNITIONS (PGM)

The JF-17 is able to employ the Global Positioning System (GPS)-guided LS-6 and GB-6 precision-guided munitions (PGM). The LS-6 is very similar to the F-16's Joint Direct Attack Munition (JDAM) bombs and the GB-6 is also very similar to the Joint Standoff Weapon (JSOW) glide bombs. JDAMs are modified general purpose bombs, equipped with a GPS and inertial navigation system (INS) for guidance as well as flight controls. The JSOW has the same guidance and is a bomb with wings to provide lift and maneuvering flight controls. As such, it has a significantly longer range than JDAMs.

Basically, the way to employ JDAMs is to first get your target coordinates from either the mission briefing or using the F10 map, input them to the weapons in either Pre-Planned Mode (coordinates need to be entered manually) or in TOO Mode (Target of Opportunity, weapons use the existing designated SPI (Sensor Point of Interest) from the targeting pod, ground radar or waypoint designation.

For the LS-6 JDAM tutorial, we will use the TOO Mode while for the GB-6 JSOW tutorial we will use Pre-Planned (PP) Mode. Once the setup is done and the weapon alignment has been performed, we will then be able to release them in Manual Mode.

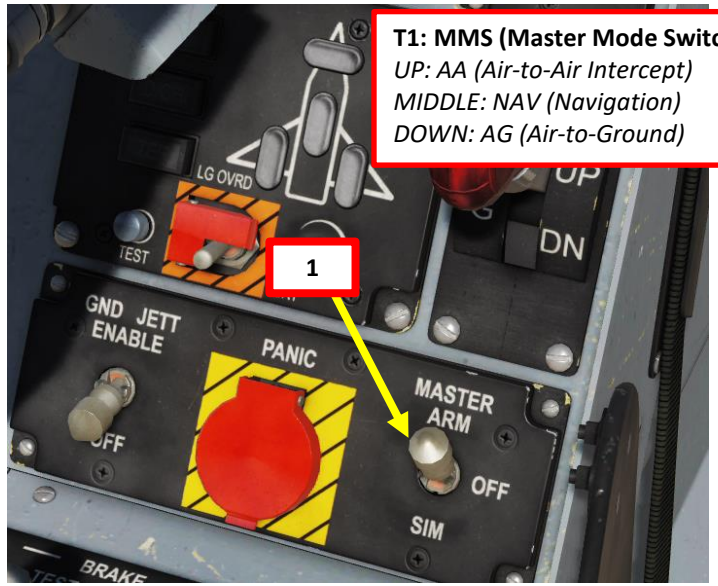




2.6.1 – LS-6 PGM GLIDE BOMB (TOO, Target-of-Opportunity)

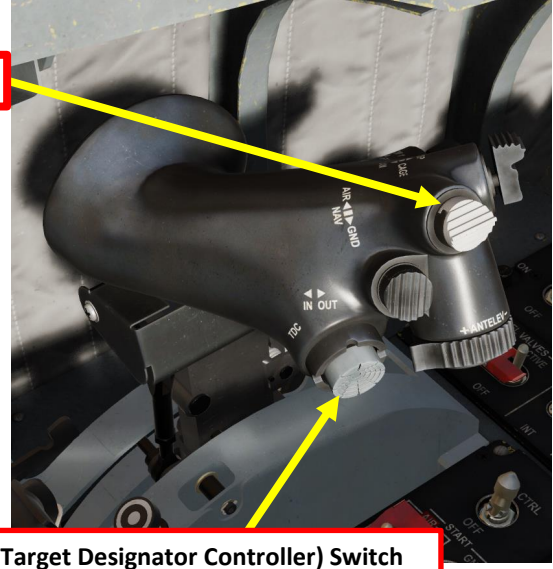
Set Up Weapons

1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select LS-6 glide bombs by pressing the OSB next to WPN, then select LS6.
5. Set Fuze (Direct/Delay), Quantity and Interval (ft) as required.
6. Once selected, the LS-6 needs about 3 minutes for alignment. When alignment is complete, the ALN Timing indicator will go to 00:00. This timer is visible on the right display



T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

2

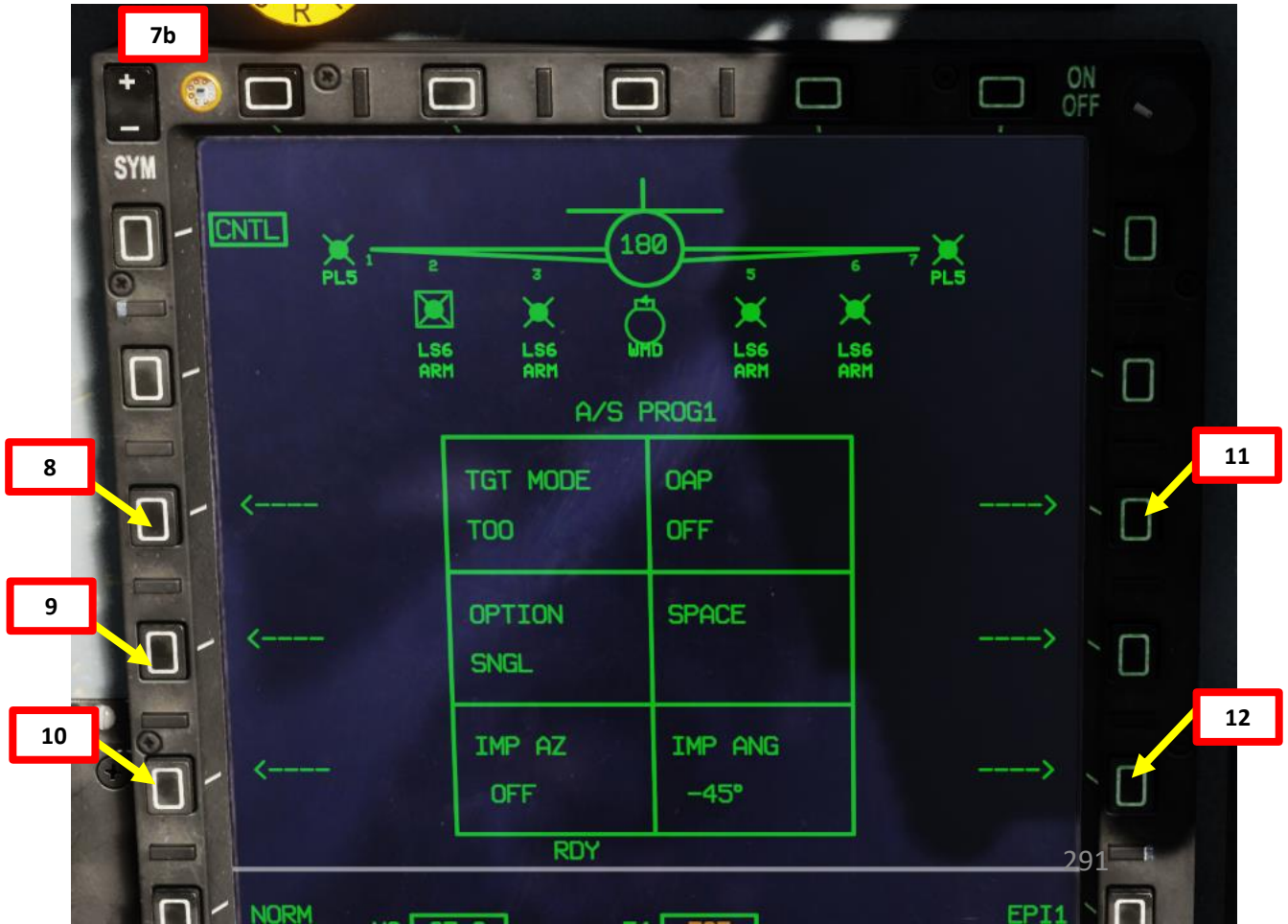


T5: TDC (Target Designator Controller) Switch

2.6.1 – LS-6 PGM GLIDE BOMB (TOO, Target-of-Opportunity)

Set Up Weapons

7. Select the CNTL (Control) menu.
8. Select TOO weapon release mode by pressing the OSB next to MODE, then select TOO.
9. Set Option as desired. We will leave this field to SNGL (Single).
10. If desired, set Impact Azimuth (Direction the LS-6 will take to attack the target) as required. We will leave it to OFF, meaning that the LS-6 will head straight for the target after launch.
11. If using an Offset Aiming Point, set OAP option to ON. We will leave this to OFF.
12. Set Impact Angle as desired. -45 deg is a good angle, so we will leave it as is.



2.6.1 – LS-6 PGM GLIDE BOMB (TOO, Target-of-Opportunity)

Set Up Targeting Pod

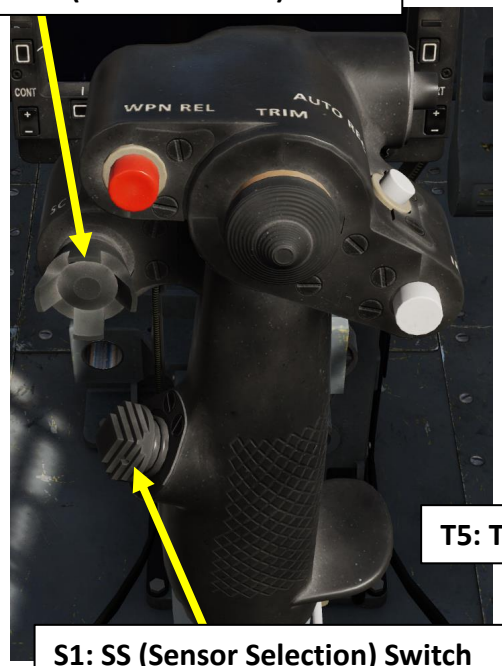
13. Go in the MAIN MENU MFCD page and press the OSB (Option Select Button) next to POD.
14. Press the OSB next to WMD7 to enter the Targeting Pod feed page.
15. Press the OSB next to "OFF" to start warm-up process.
16. Targeting pod will enter a BIT (Built-In Test) mode that starts a warm-up process that will take about 60 seconds.
17. When targeting pod is ready to be used, the pod ALIGN status will disappear and be replaced by the pod feed in caged/stowed position.
18. If pod is caged (UNCAGE indication is visible), press the OSB next to UNCAGE to uncage targeting pod.
19. Select desired mode (SP/SNOWPLOW or SLAV/SLAVED) by pressing the OSB next to SP/SLAV. In this case, we will use SNOWPLOW (SP) mode.
20. Select either CCD (Charged-Coupled Device/TV) or IR as required.

2.6.1 – LS-6 PGM GLIDE BOMB (TOO, Target-of-Opportunity)

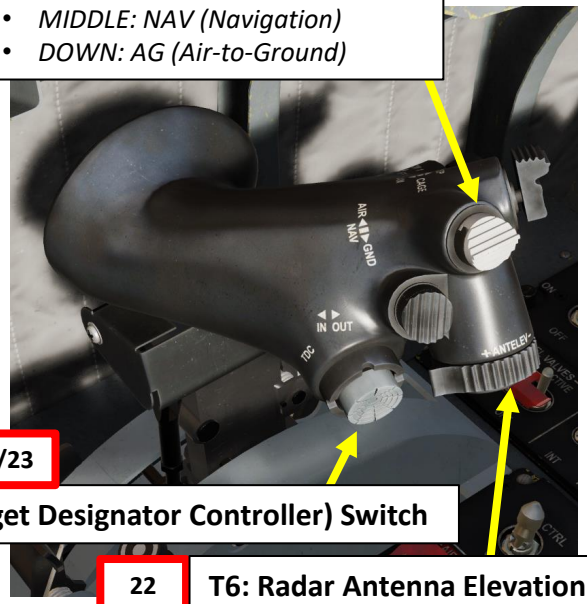
Set Up Targeting Pod

21. Set Targeting Pod page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (RIGHT if POD page is on the Right MFCD). An asterisk will indicate the SOI status.
22. Slew the Targeting Pod reticle on a target using the T5 TDC (Target Designator Controller) slew controls. Use Radar Antenna Elevation Switch to zoom in or out.
23. When targeting pod reticle is over the target, use the T5 TDC PRESS button (ENTER) to designate the target as a SPI (Sensor Point of Interest).
24. Once a target is designated, the pod will attempt to enter POINT TRACK (tracks moving target). If POINT TRACK is not possible, the pod will enter AREA TRACK mode by default if the target is within 21 nm.

S2: SC (Sensor Control) Switch



T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



22/23 **T5: TDC (Target Designator Controller) Switch**

22 **T6: Radar Antenna Elevation Switch**

S1: SS (Sensor Selection) Switch **21a**

2.6.1 – LS-6 PGM GLIDE BOMB (TOO, Target-of-Opportunity)

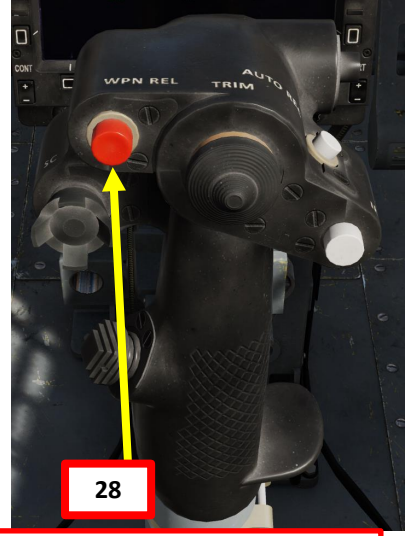
Set Up Targeting Pod

25. Confirm that SPI (Sensor Point of Interest) coordinates set by the targeting pod match the coordinates on the WPN LS6 page.

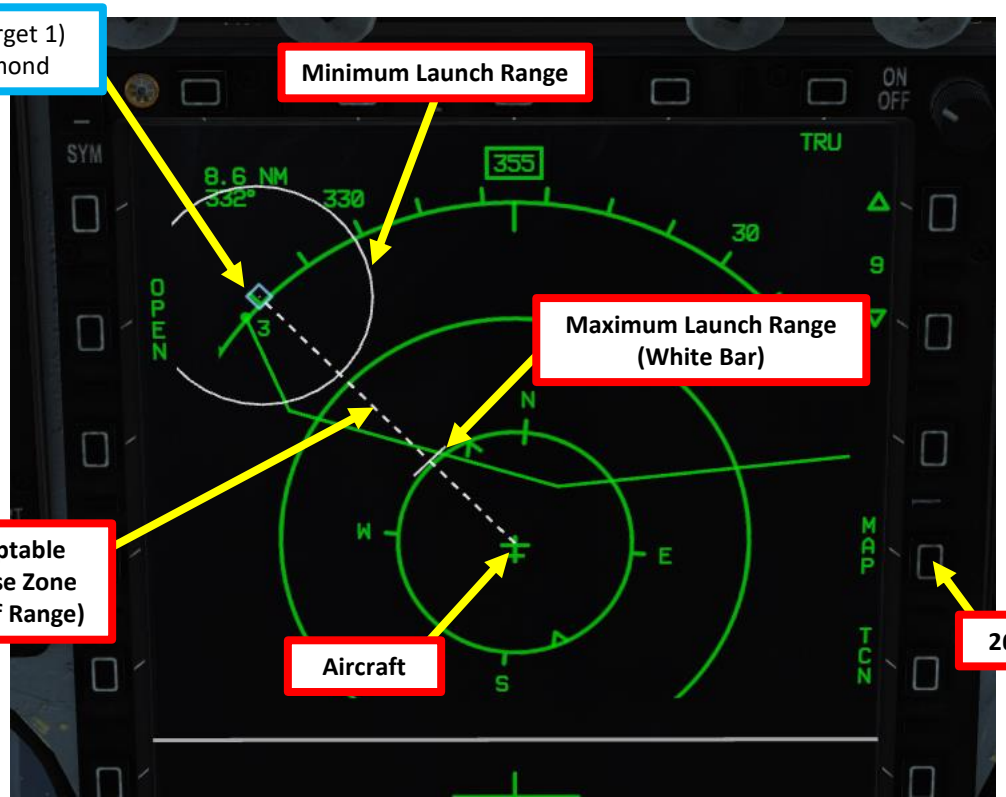
2.6.1 – LS-6 PGM GLIDE BOMB (TOO, Target-of-Opportunity)

Launch Weapon

26. I suggest you remove the moving map from the HSD (Horizontal Situation Display) if possible since this page is what we will use to determine our range to the target.
27. Fly the aircraft into the Maximum Acceptable Release Zone. The zone line is dashed when the aircraft is out of range, and full when the aircraft is within range.
28. When within the acceptable launch zone, press the S3 Weapon Release Button (« RALT+SPACE »). The GB-6 will glide by itself automatically to the Pre-Planned Point PP1.



S3: Weapon Launch/Release Button



TGT1 (Target 1)
SPI Diamond

Minimum Launch Range

Maximum Launch Range (White Bar)

Acceptable Release Zone (Out of Range)

Aircraft

Acceptable Release Zone (In Range)

Aircraft


LS-6/500C


ON
OFF
SYM
WMD7
CCD
SP
N 42° 14' 27.1"
E 042° 03' 06.1"
RANGE
4.0 NM
NAR
LSS
OFF
G
0
CODE
AUTO
L
-2
INS AREA
RE
FOCUS
ARM
1688

2.6.2 – GB-6 PGM GLIDE BOMB (PP, Pre-Planned)

Find Coordinates

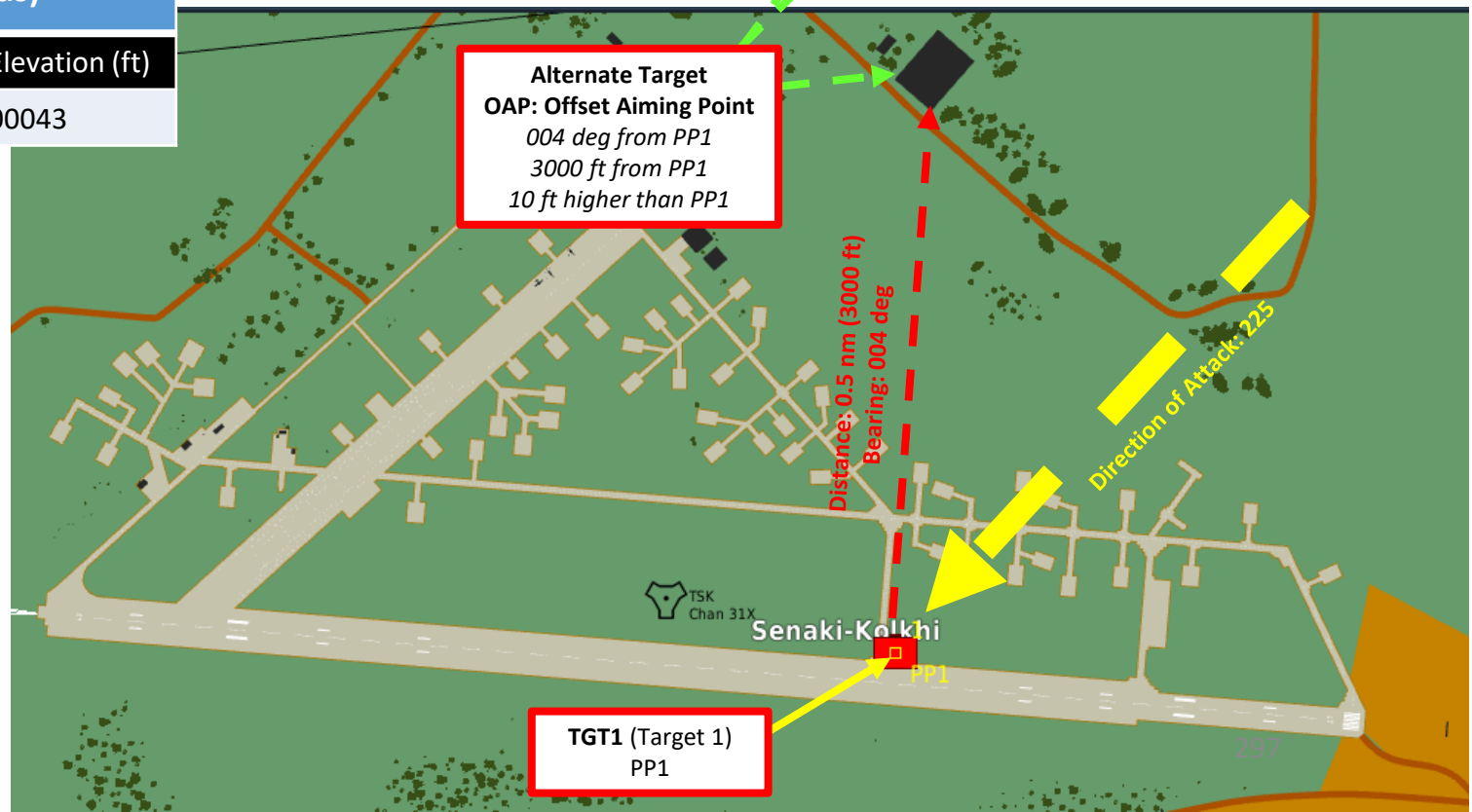
1. Find coordinates of target in Degrees Minutes Seconds:Decimal-Seconds. Do not forget target elevation. You can use the F10 map or a targeting pod.

- Each Pre-Planned point will need to have its coordinates stored in one of the four available DEST waypoints (Waypoints 36 to 39 are reserved for that purpose).

- You can use coordinates directly from the PP, or can also use an OAP (Offset Aiming Point), which takes the coordinates of a PP and offsets it by a bearing, range (ft) and altitude (ft). In our case, we will just use the Pre-Planned Point PP1.

Pre-Planned Point (Deg Min Sec.Decimal-Seconds)				
Target Point	DEST Point	Latitude	Longitude	Elevation (ft)
TGT1/ PP1	36	42 14 27.3 N	042 03 06.2 E	00043

DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)
36 to 39 (PP1 to PP4)	**Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)**
40	SPI (Sensor Point of Interest) Coordinates
41 to 49	Reserved for Markpoints
50 to 58	Reserved waypoints for airfields closest to last navigation waypoint (non-editable)
59	Reserved waypoint for airfield (editable)



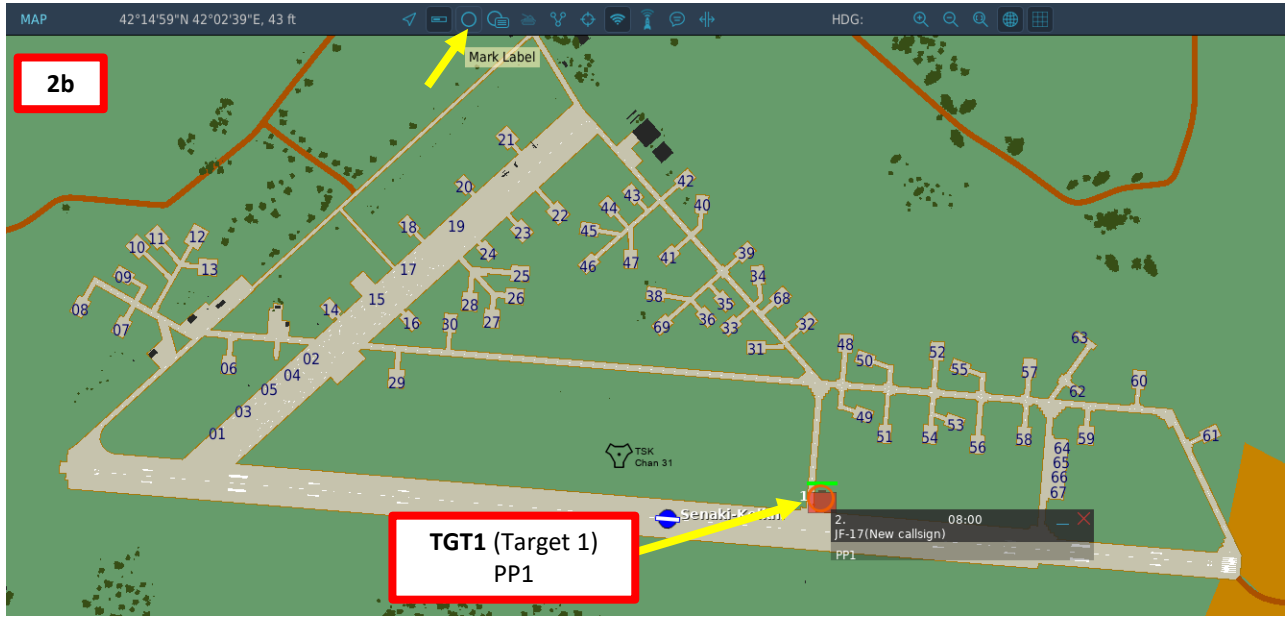
2.6.2 – GB-6 PGM GLIDE BOMB (PP, Pre-Planned)

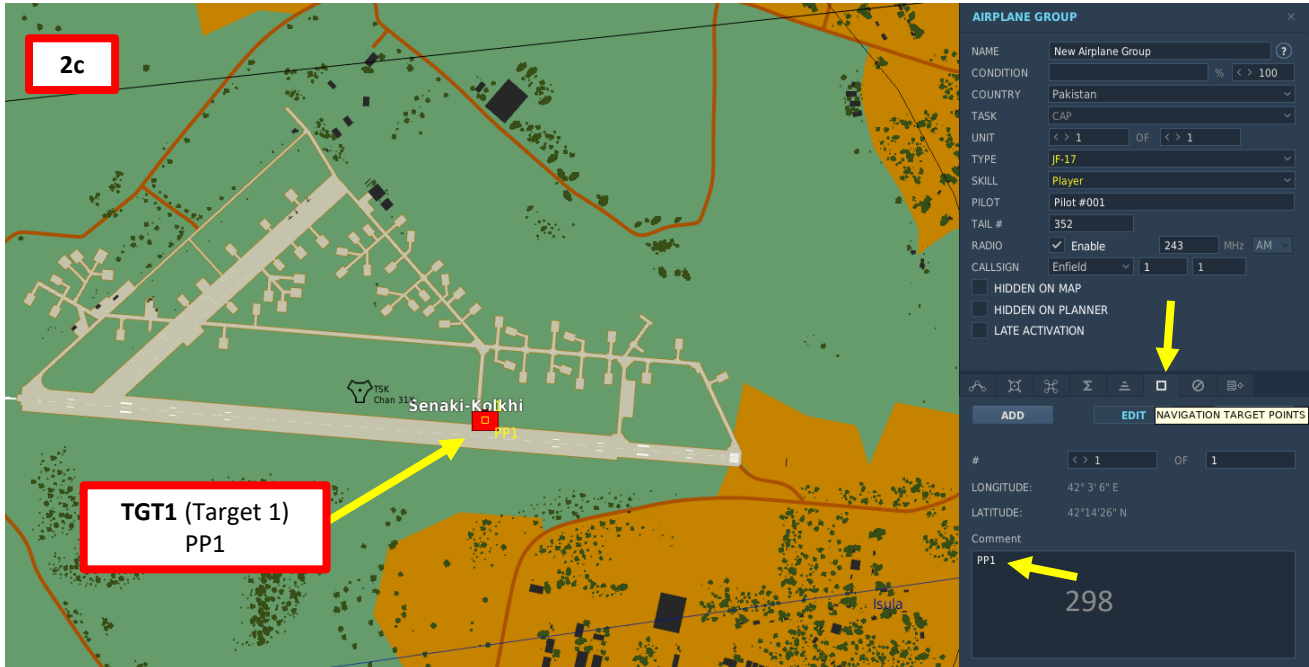
Enter Coordinates

2. We then need to enter coordinates on DST Waypoint 36 for PP1. There are many ways to do it. You can either:
   a) Press DST button on the UFCP, select Waypoint 36, enter manually the Latitude, Longitude and Elevation coordinates on the UFCP as shown in the Navigation section.
   b) Or… Add a Marker on the target via the F10 map and name it “PP1”. Then, ask the ground crew to update the DTC (Data Transfer Cartridge), then load the DTC into the aircraft as seen during the start-up procedure. This will automatically create Waypoint 36 (PP1) for you without having to enter coordinates manually.
   c) Or… Just load the DTC into the aircraft if the Mission Creator was kind enough to create a NAVIGATION TARGET POINT called “PP1” on the target.

Pre-Planned Point (Deg Min Sec.Decimal-Seconds)

Target Point	DEST Point	Latitude	Longitude	Elevation (ft)
TGT1/ PP1	36	42 14 27.3 N	042 03 06.2 E	00043

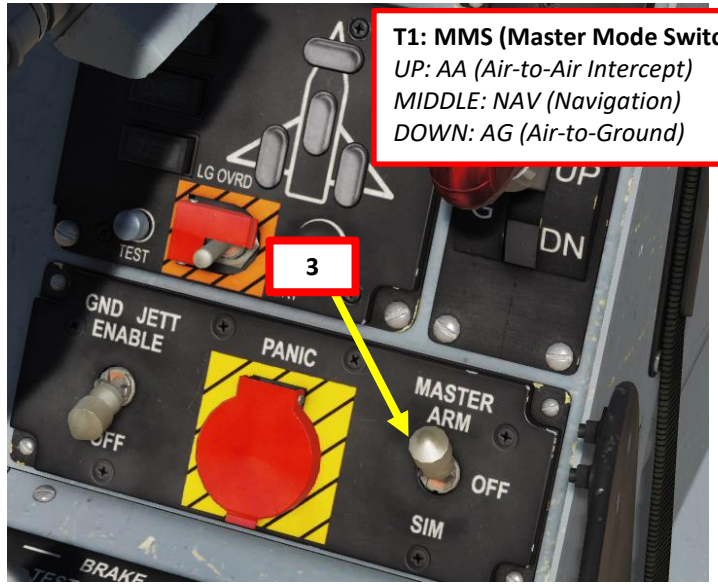




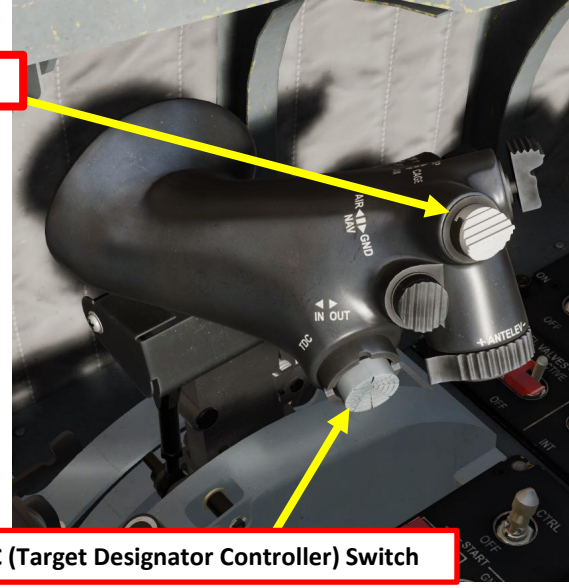
2.6.2 – GB-6 PGM GLIDE BOMB (PP, Pre-Planned)

Set Up Weapons

3. Master Arm switch – ARM (UP)
4. Set Master Mode Switch – A/G (DOWN)
5. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
6. Select GB-6 glide bombs by pressing the OSB next to WPN, then select GB6.
7. Once selected, the GB-6 needs about 3 minutes for alignment. When alignment is complete, the ALN Timing indicator will go to 00:00 on the right display.



T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)



2.6.2 – GB-6 PGM GLIDE BOMB (PP, Pre-Planned)

Set Up Weapons

8. Select the CNTL (Control) menu.
9. Select PP weapon release mode by pressing the OSB next to MODE, then select PP.
10. Select DEST Waypoint (Channel 36 for PP1) as desired.
11. Set Impact Azimuth (Direction the GB-6 will take to attack the target) as required (we will use 225).
12. If using an Offset Aiming Point, set OAP option to ON. We will leave this to OFF.
13. Set Height of Burst in the OPEN option (050 is 50 ft).
14. Press the OSB next to CNTL to return to the Weapons Program page.

2.6.2 – GB-6 PGM GLIDE BOMB (PP, Pre-Planned)

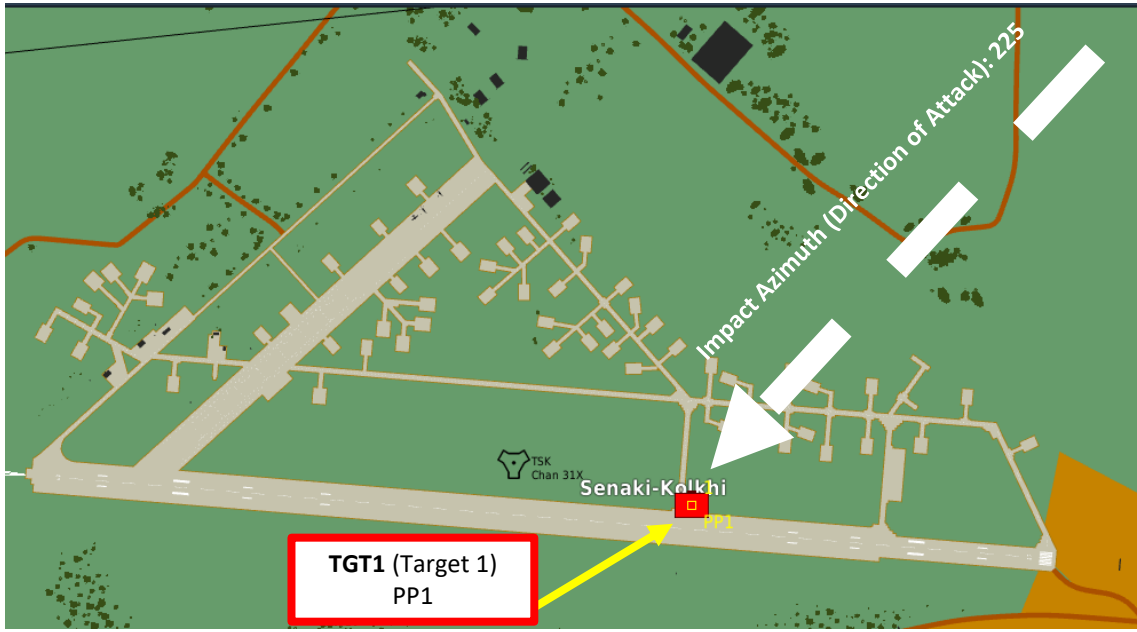
Set Up Weapons

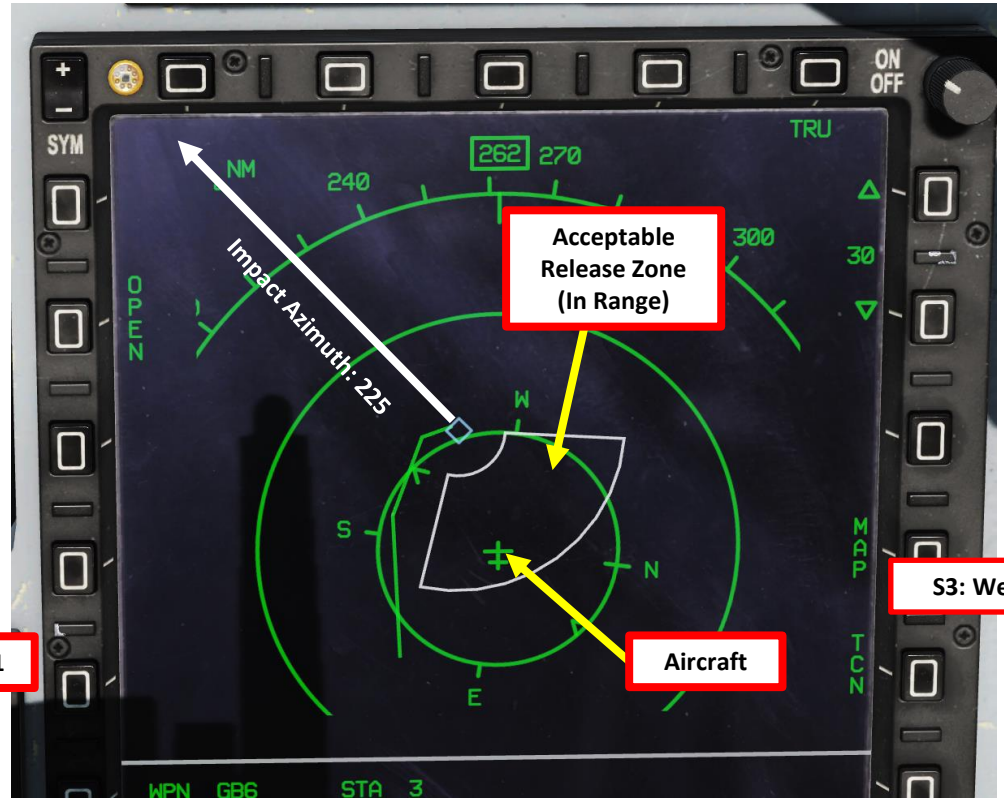
15. Select fuzing by pressing the OSB next to FUZE, then select DIRECT or DELAY as desired.
16. Select quantity by pressing the OSB next to QTY, then select desired quantity (i.e. 1).
17. If applicable, select bomb release interval by pressing the OSB next to INTERVAL, then enter distance between bomb in ft. For single bombs, we'll leave this to 0.
18. Since we will launch our ordnance from a high altitude, there is no real need to set the BR ALT (Break Off Altitude).
19. On the HUD, verify that Weapon Status (WPN RDY), Master Mode (AG) and Weapon Mode (PP) are selected properly.
20. Confirm that SPI (Sensor Point of Interest) coordinates on the WPN GB6 page match the coordinates for the target set previously for Waypoint 36.

2.6.2 – GB-6 PGM GLIDE BOMB (PP, Pre-Planned)

Launch Weapons

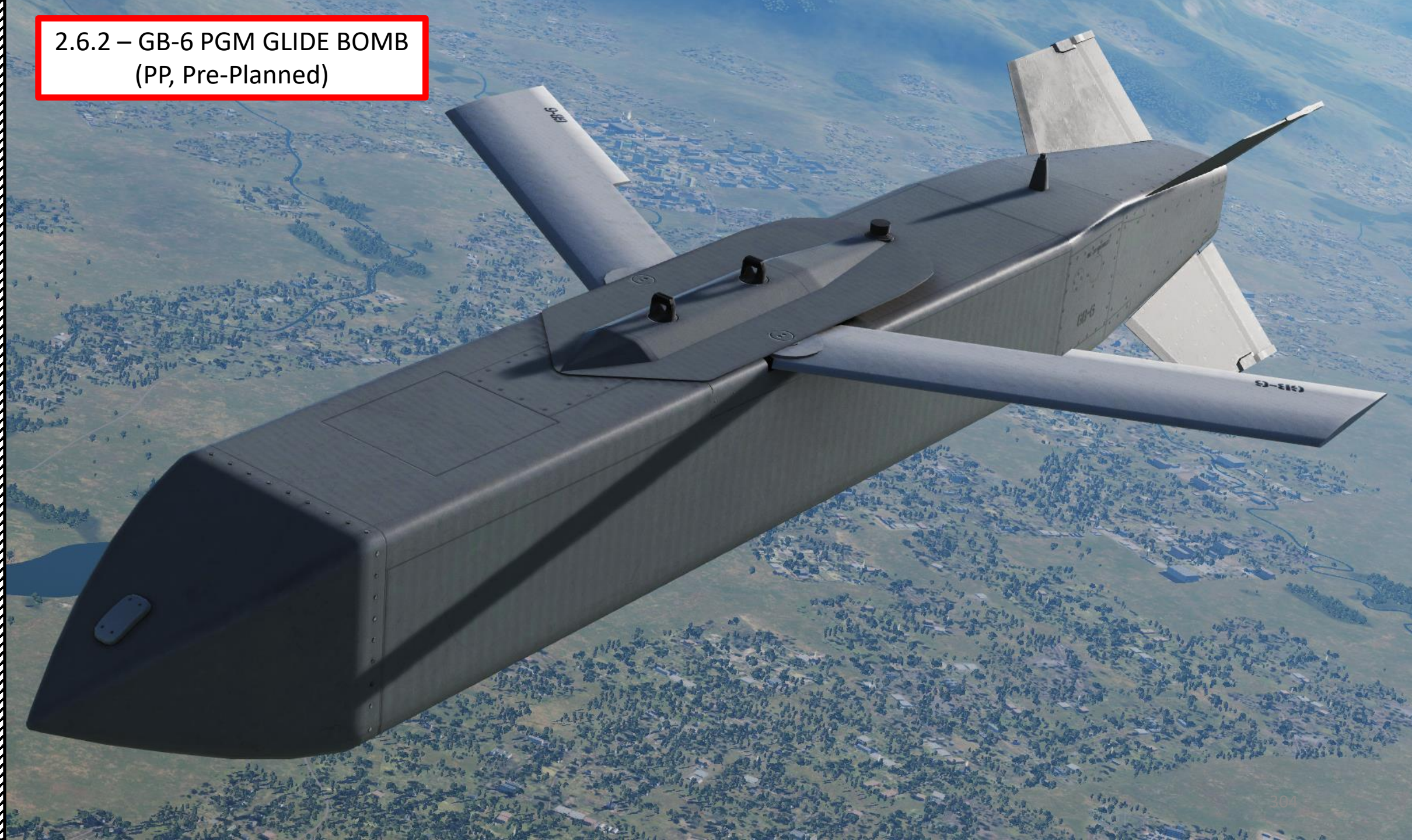
21. I suggest you remove the moving map from the HSD (Horizontal Situation Display) if possible since this page is what we will use to determine our range to the target.
22. Fly the aircraft into the Maximum Acceptable Release Zone. The zone is dashed when the aircraft is out of range, and full when the aircraft is within range.
23. When within the acceptable launch zone, press the S3 Weapon Release Button (« RALT+SPACE »). The GB-6 will glide by itself automatically to the Pre-Planned Point PP1.





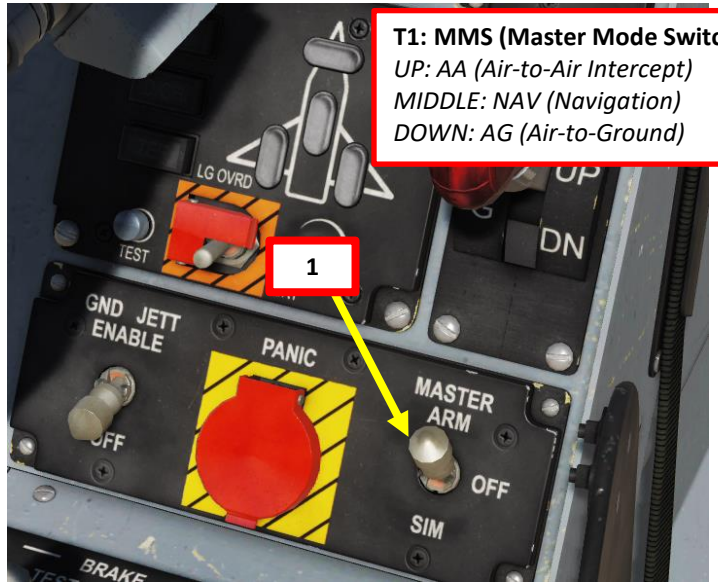
2.6.2 – GB-6 PGM GLIDE BOMB (PP, Pre-Planned)

2.6.2 – GB-6 PGM GLIDE BOMB (PP, Pre-Planned)

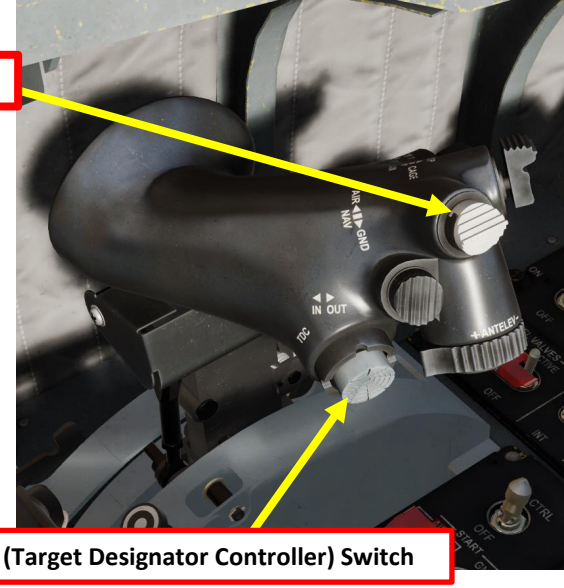


2.7.1 – C-701T TV-GUIDED MISSILE
2.7.1.1 - SNOWPLOW MODE

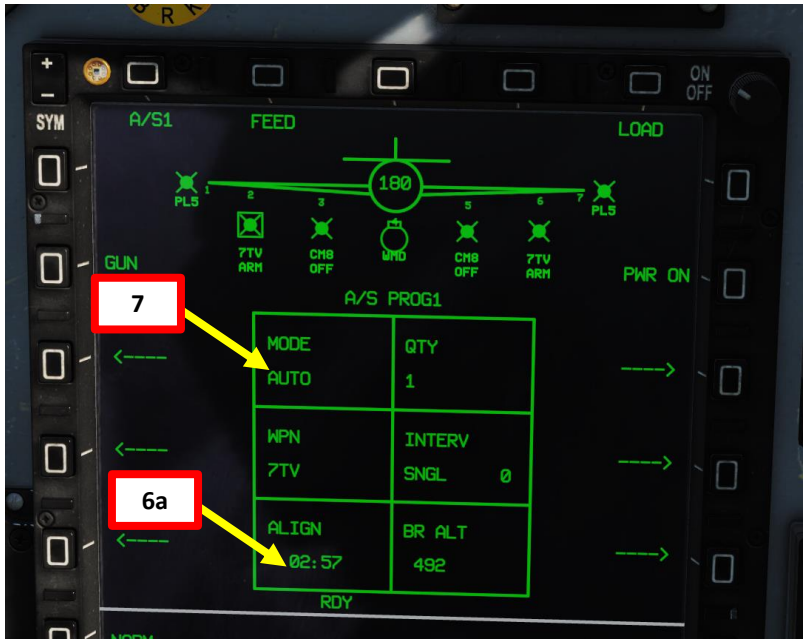
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select C-701T TV Missile by pressing the OSB next to WPN, then select 7TV.
5. Select the OSB next to PWR OFF to start the alignment sequence.
6. Once selected, the C-701 needs about 3 minutes for alignment. It will go from 10 UNSTABLE, to 06 MARGINAL and finally 01 GOOD. When alignment is complete, the ALN TIMING indicator will go to 00:00.
7. Missile Mode is set to AUTO by default
8. Set desired Quantity.

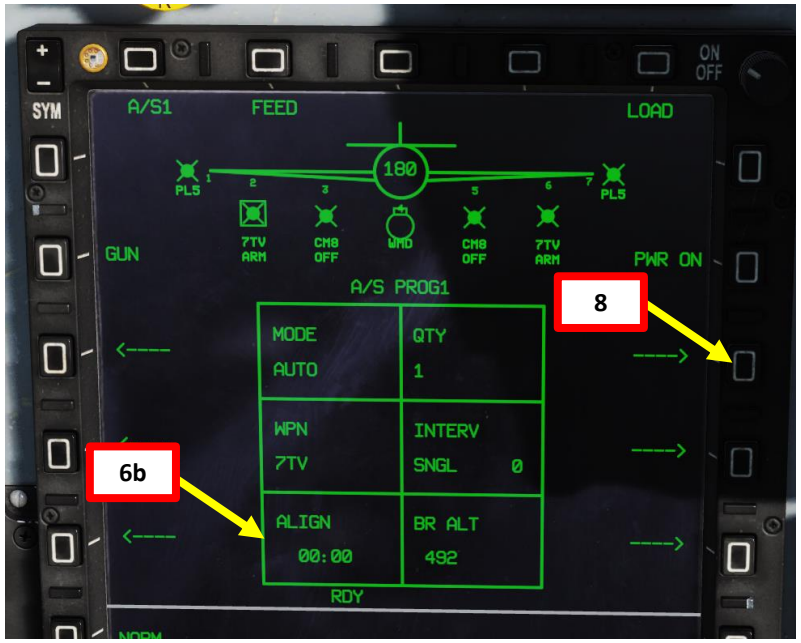


T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)



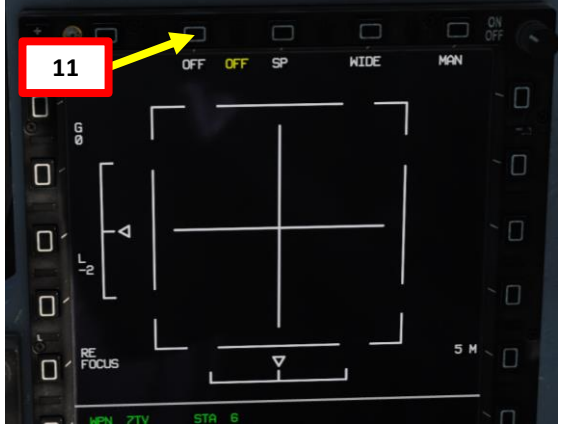
T5: TDC (Target Designator Controller) Switch

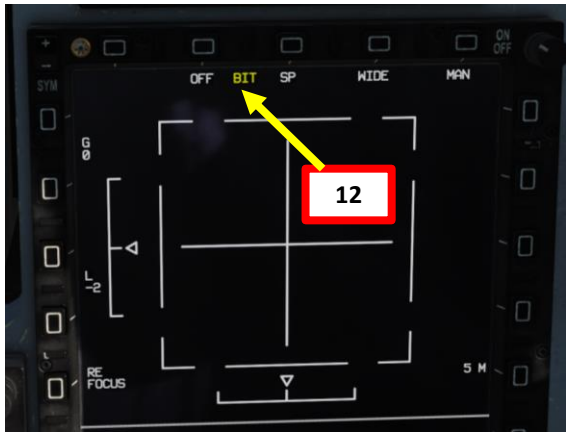


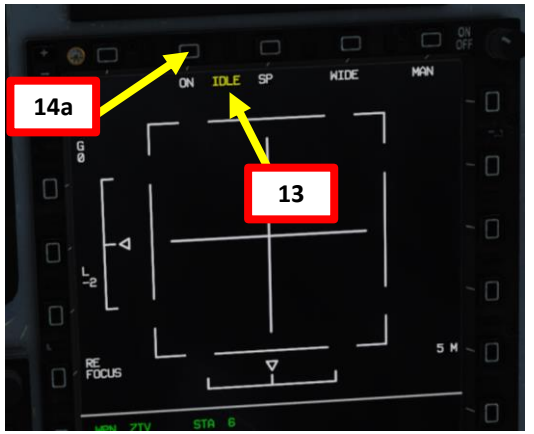


2.7.1 – C-701T TV-GUIDED MISSILE
2.7.1.1 - SNOWPLOW MODE

9. Go in the MAIN MENU MFCD page and press the OSB (Option Select Button) next to POD.
10. Press the OSB next to TVIR to enter the C-701 TV feed page.
11. Press the OSB next to “OFF” to start warm-up process.
12. Missile camera will enter a BIT (Built-In Test) mode that starts a warm-up process that will take about 30 seconds.
13. When missile is ready to be used, the BIT status will disappear and be replaced by the IDLE status; the missile seeker is caged.
14. Once missile status reaches IDLE and 3-minute alignment is complete, press on the OSB next to ON to turn ON the missile.
15. Select desired mode (SP/SNOWPLOW or SLAV/SLAVED) by pressing the OSB next to SP/SLAV. In this case, we will use SNOWPLOW (SP) mode.
16. Select AUTO lock mode.
17. Set target size (5 m)

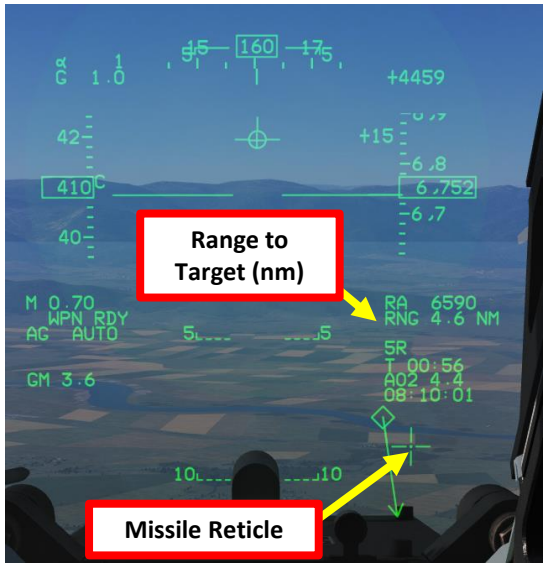




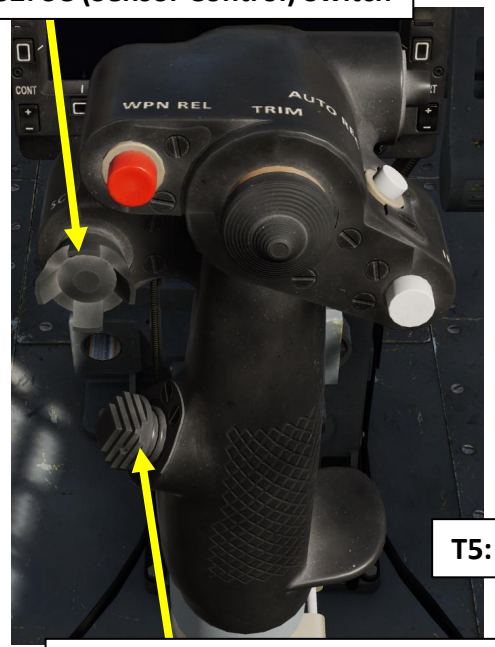


2.7.1 – C-701T TV-GUIDED MISSILE
2.7.1.1 - SNOWPLOW MODE

18. Set TV Missile page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (RIGHT if TV page is on the Right MFCD). An asterisk will indicate the SOI status.
19. Slew the TV Missile reticle on a target using the T5 TDC (Target Designator Controller) slew controls. Use the WIDE/NARROW OSB to adjust field of view.
20. When missile reticle is over the target, use the T5 TDC PRESS button (ENTER) to designate the target as a SPI (Sensor Point of Interest).
21. Once a target is designated and missile is less than 10 nm away from the target, the missile will attempt to lock the target you just designated (assuming you chose AUTO mode). You can also lock it in MANUAL mode.
22. A red diamond will indicate a good missile lock.

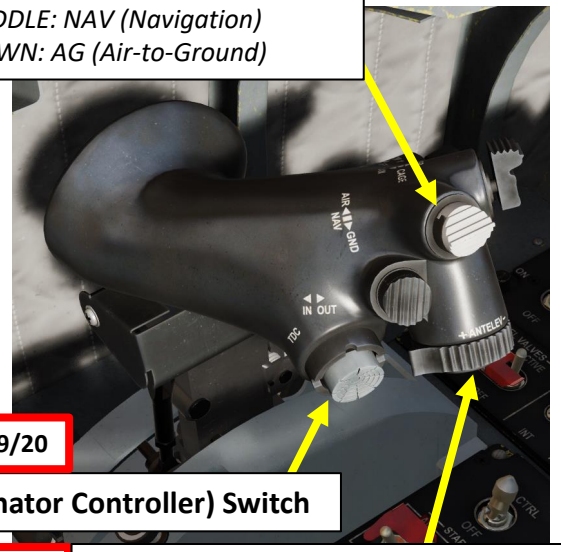


S2: SC (Sensor Control) Switch



S1: SS (Sensor Selection) Switch 18a

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



19/20

T5: TDC (Target Designator Controller) Switch

22 **T6: Radar Antenna Elevation Switch**

2.7.1 – C-701T TV-GUIDED MISSILE
2.7.1.1 - SNOWPLOW MODE

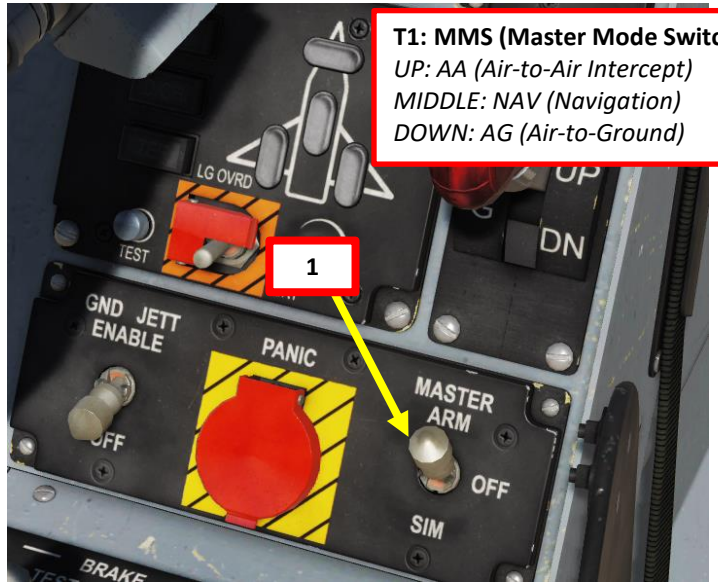
23. When within 10 nm of the target, press the S3 Weapon Release Button (« RALT+SPACE ») to launch the missile.
24. Missile will track its target by itself.

23

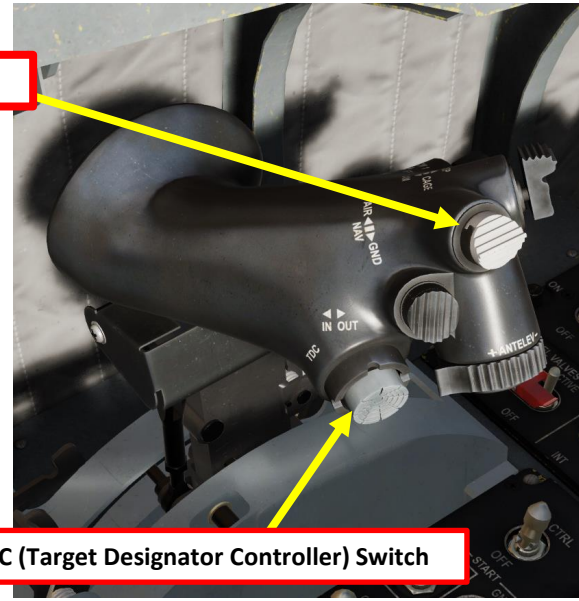
S3: Weapon Launch/Release Button

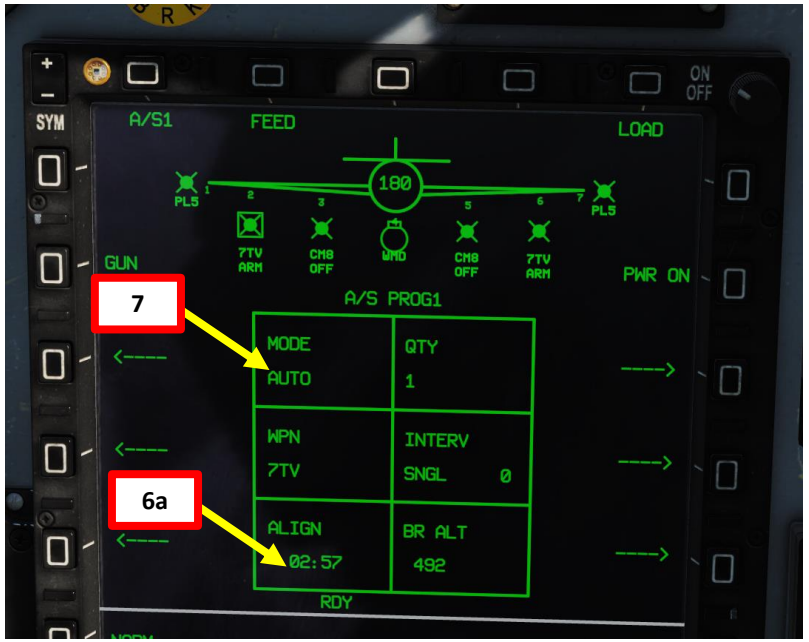
2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.2 – SLAVED – TARGETING POD

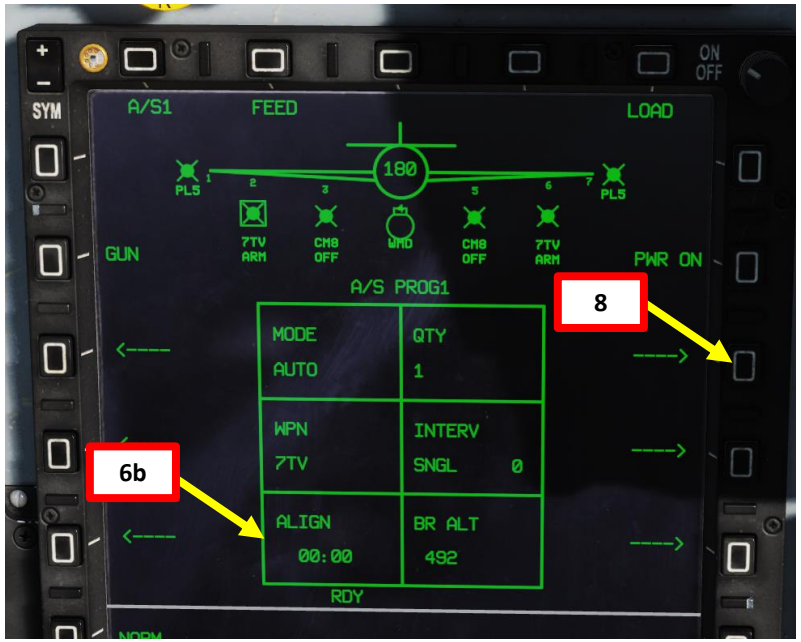
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select C-701T TV Missile by pressing the OSB next to WPN, then select 7TV.
5. Select the OSB next to PWR OFF to start the alignment sequence.
6. Once selected, the C-701 needs about 3 minutes for alignment. It will go from 10 UNSTABLE, to 06 MARGINAL and finally 01 GOOD. When alignment is complete, the ALN TIMING indicator will go to 00:00.
7. Missile Mode is set to AUTO by default
8. Set desired Quantity.



T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

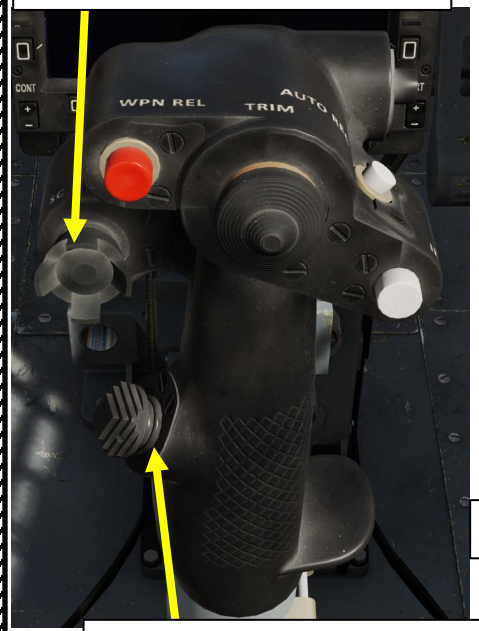


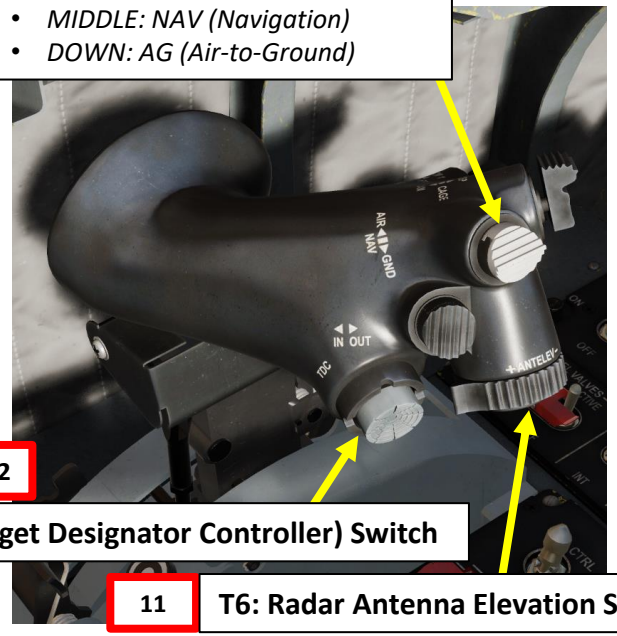




2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.2 – SLAVED – TARGETING POD

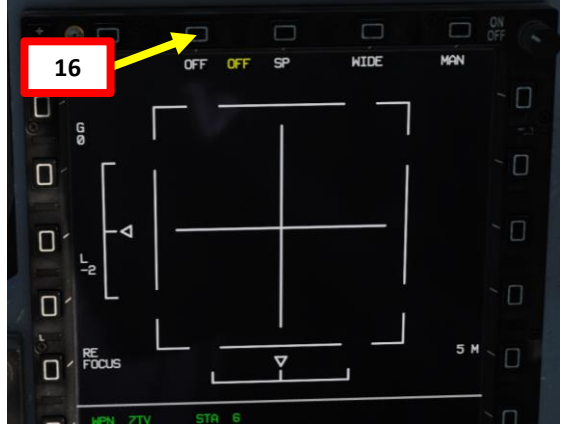
9. Start the Targeting Pod and uncage it as seen previously.
10. Set Targeting Pod page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (LEFT if POD page is on the Left MFCD). An asterisk will indicate the SOI status.
11. Slew the Targeting Pod reticle on a target using the T5 TDC (Target Designator Controller) slew controls. Use Radar Antenna Elevation Switch to zoom in or out.
12. When targeting pod reticle is over the target, use the T5 TDC PRESS button (ENTER) to designate the target as a SPI (Sensor Point of Interest).
13. Once a target is designated, the pod will attempt to enter POINT TRACK (tracks moving target). If POINT TRACK is not possible, the pod will enter AREA TRACK mode by default if the target is within 21 nm.

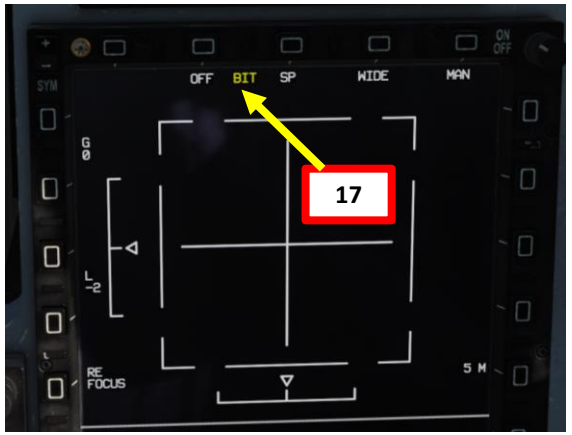


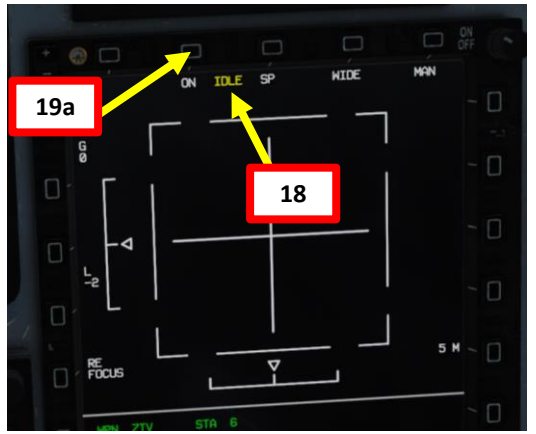


2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.2 – SLAVED – TARGETING POD

14. Go in the MAIN MENU MFCD page and press the OSB (Option Select Button) next to POD.
15. Press the OSB next to TVIR to enter the C-701 TV feed page.
16. Press the OSB next to “OFF” to start warm-up process.
17. Missile camera will enter a BIT (Built-In Test) mode that starts a warm-up process that will take about 30 seconds.
18. When missile is ready to be used, the BIT status will disappear and be replaced by the IDLE status; the missile seeker is caged.
19. Once missile status reaches IDLE and 3-minute alignment is complete, press on the OSB next to ON to turn ON the missile.
20. Select AUTO lock mode.
21. Set target size (5 m)
22. Select desired mode (SP/SNOWPLOW or SLAV/SLAVED) by pressing the OSB next to SP/SLAV. In this case, we will use SLAVED mode.

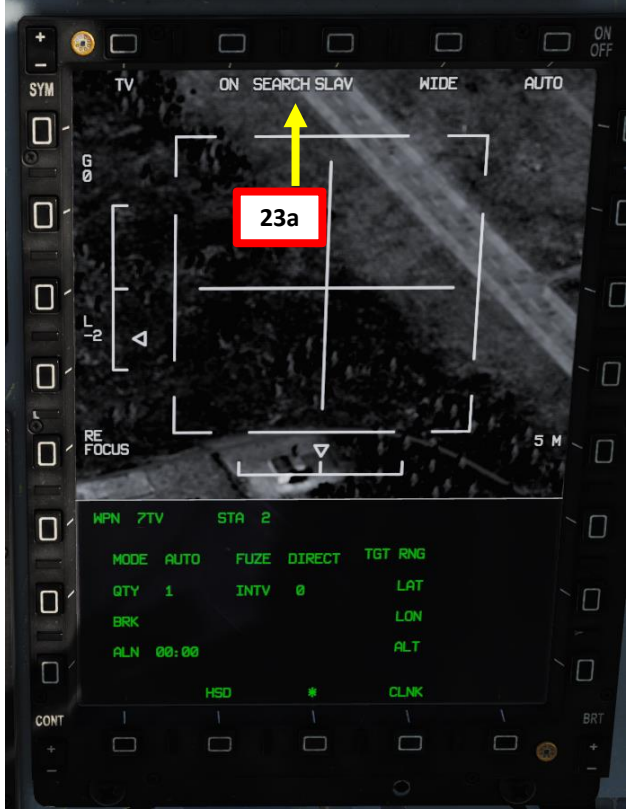


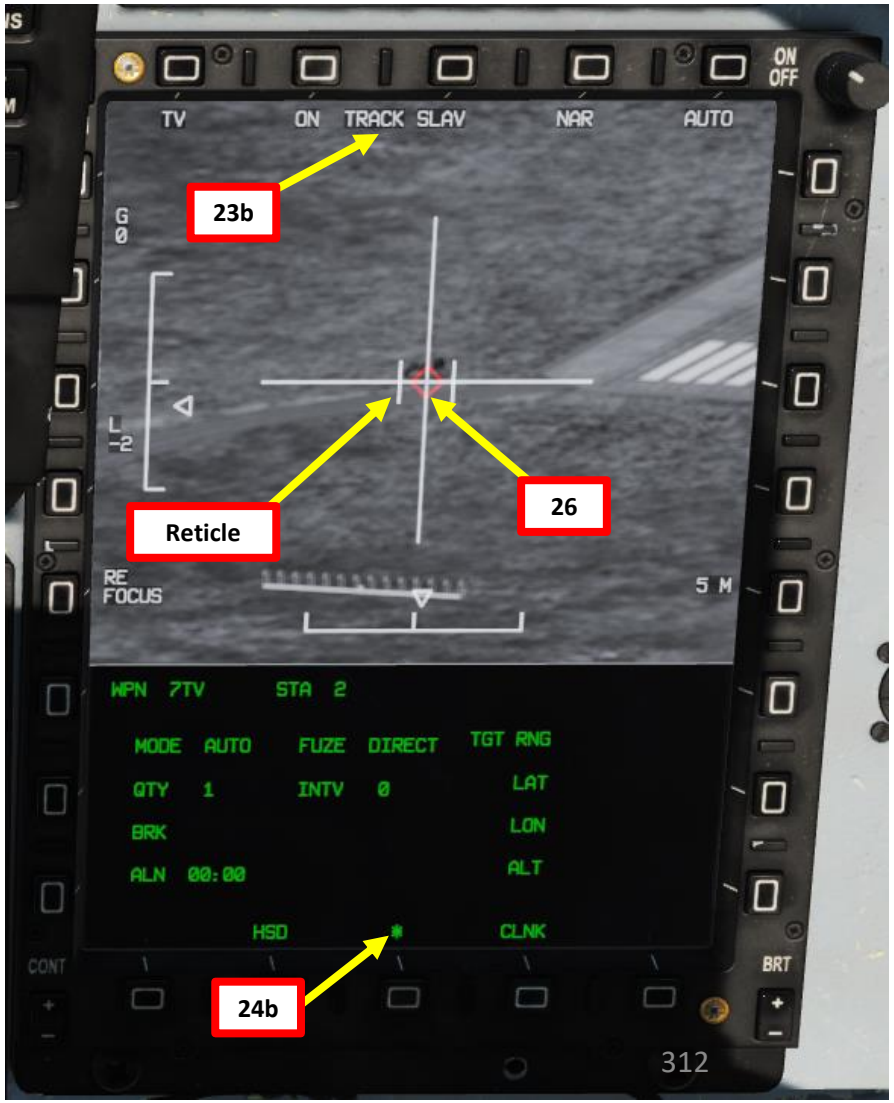




2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.2 – SLAVED – TARGETING POD

23. Once Missile mode is set to SLAVE, it will automatically search and attempt to track the SPI defined by the targeting pod.
24. Set TV Missile page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (RIGHT if TV page is on the Right MFCD). An asterisk will indicate the SOI status.
25. Once a target is designated and missile is less than 10 nm away from the target, the missile will attempt to lock the target you just designated (assuming you chose AUTO mode). You can also lock it in MANUAL mode using the T5 TDC PRESS.
26. A red diamond will indicate a good missile lock.





S2: SC (Sensor Control) Switch

S1: SS (Sensor Selection) Switch **24a**

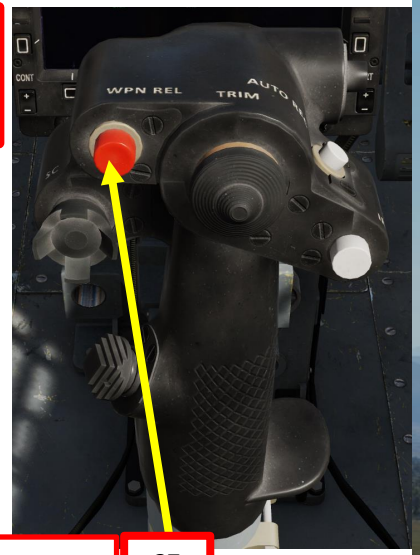
T5: TDC (Target Designator Controller) Switch

2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.2 – SLAVED – TARGETING POD

LSR

2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.2 – SLAVED – TARGETING POD

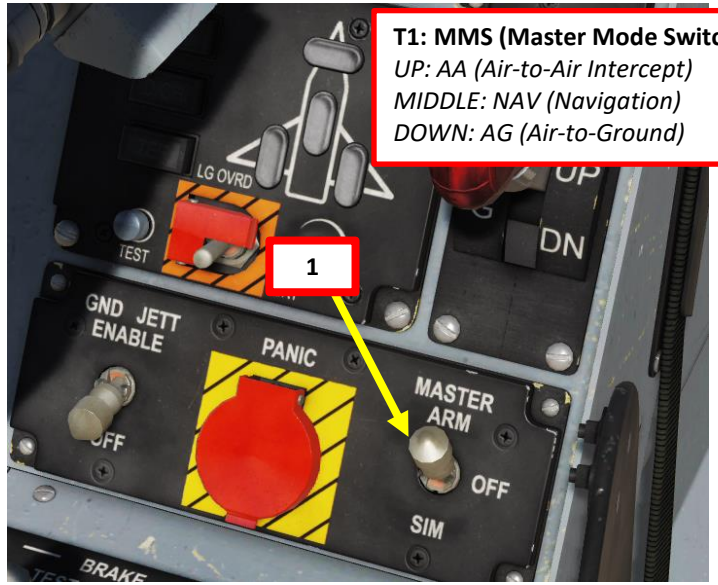
27. When within 10 nm of the target, press the S3 Weapon Release Button (« RALT+SPACE ») to launch the missile.
28. Missile will track its target by itself.



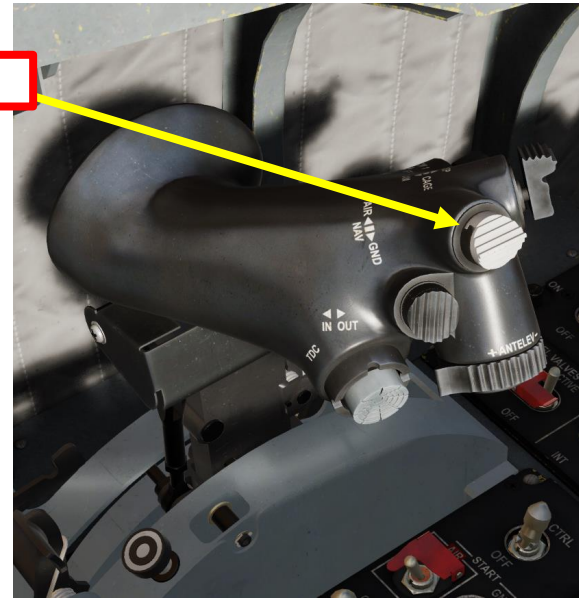
S3: Weapon Launch/Release Button	27

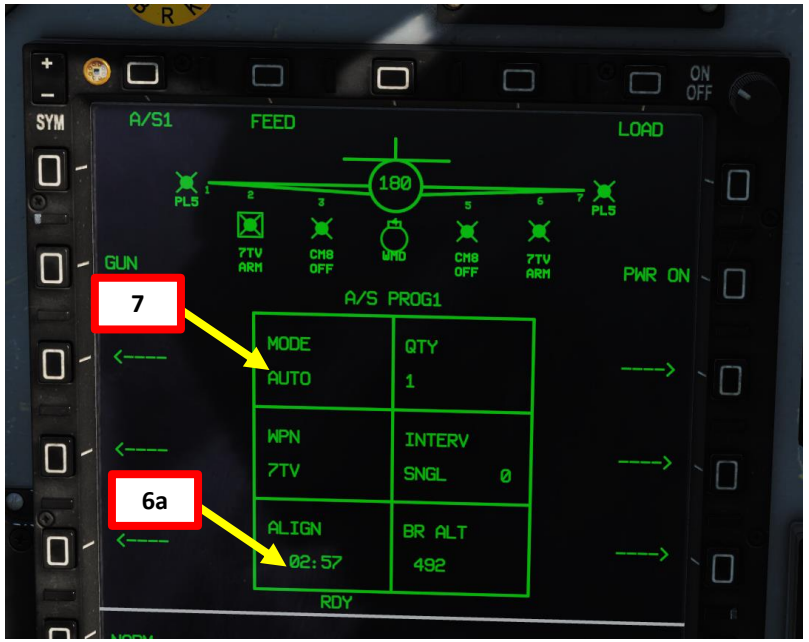
2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.3 – SLAVED – AG Radar

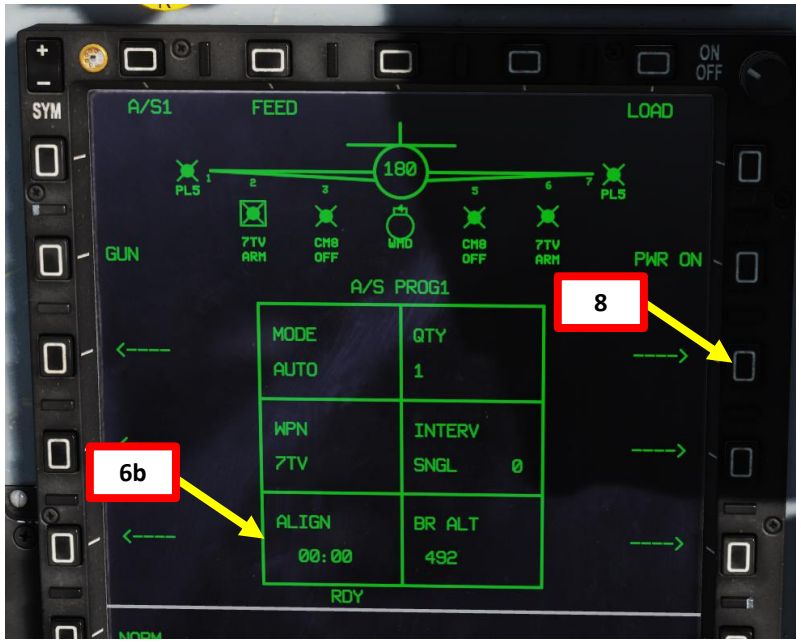
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select C-701T TV Missile by pressing the OSB next to WPN, then select 7TV.
5. Select the OSB next to PWR OFF to start the alignment sequence.
6. Once selected, the C-701 needs about 3 minutes for alignment. It will go from 10 UNSTABLE, to 06 MARGINAL and finally 01 GOOD. When alignment is complete, the ALN TIMING indicator will go to 00:00.
7. Missile Mode is set to AUTO by default
8. Set desired Quantity.



T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

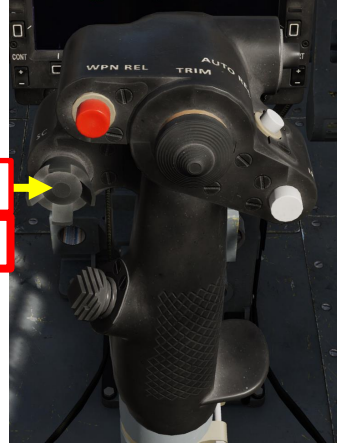


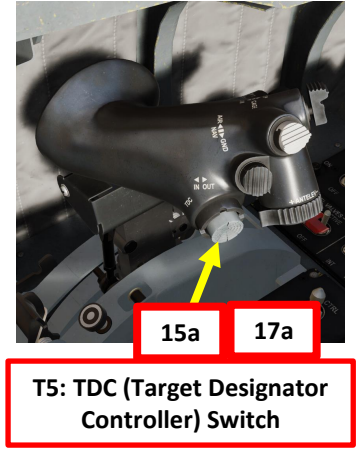


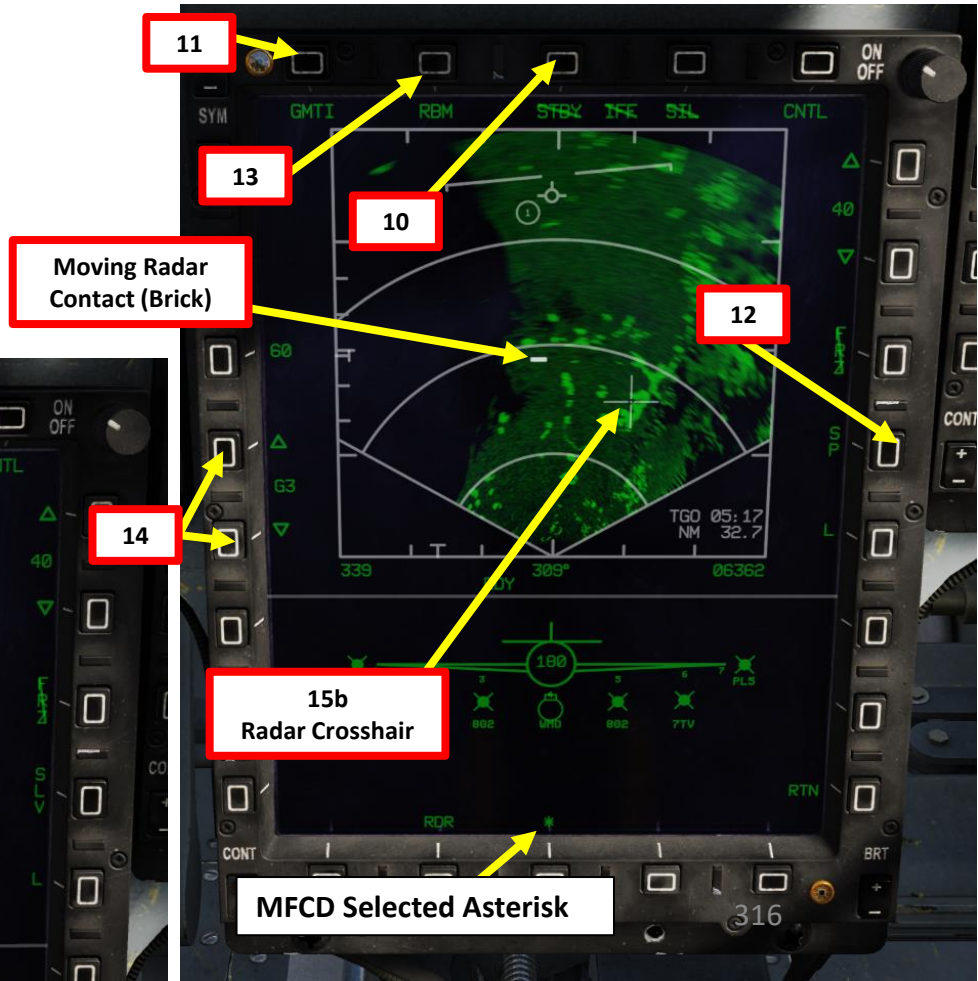


2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.3 – SLAVED – AG Radar

9. By default, radar MAP mode should already be selected.
10. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
11. Press the Radar Mode Selector OSB (Option Select Button) to enter the Air-to-Ground Radar Mode selection menu and press on the OSB next to “GMTI” to select Ground Moving Target Indicator Mode.
12. Make sure Snowplow Mode is selected (OSB next to SP/SLV toggles Snowplow and Slave Modes).
13. To display ground mapping overlay, make sure “RBM” (Real Beam Mode) option is active.
14. Adjust Gain and Contrast– As required.
15. Slew the TDC Cursor (Radar Crosshair) over the region you want to expand/designate using the T5 TDC Switch.
16. If you want to use Expanded sub-mode, press the S2/SC (Sensor Control) Switch LEFT.
17. To designate a target/SPI (Sensor Point of Interest) on the Radar Crosshair position, use the T5 TDC PRESS switch control (ENTER). This will set the SPI (Sensor Point of Interest) at this location and center the radar image around this SPI.



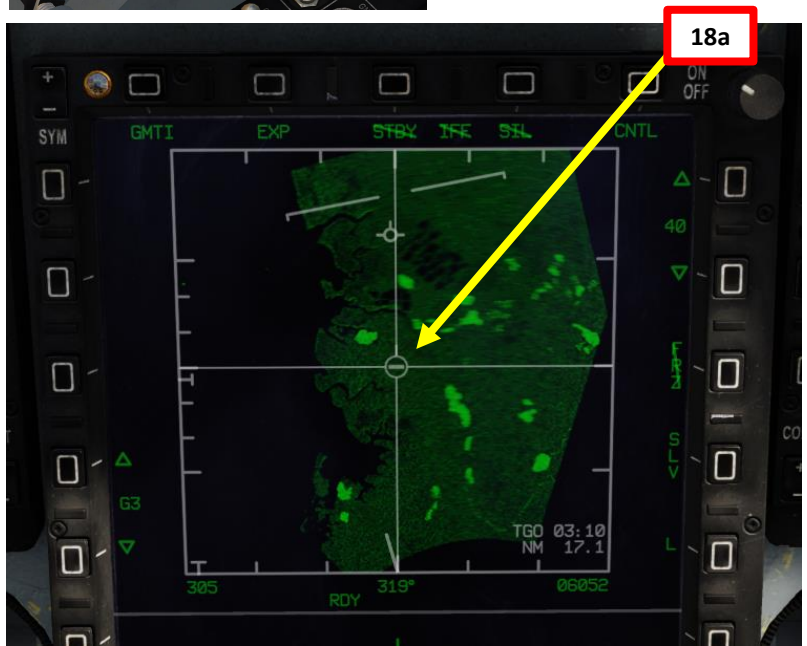




2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.3 – SLAVED – AG Radar

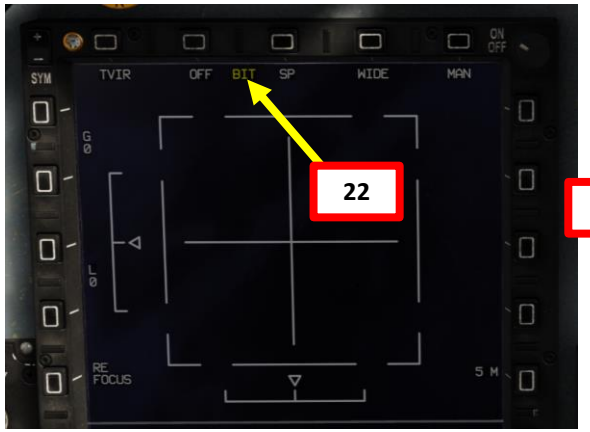
18. Use the T5 TDC PRESS switch control (ENTER) a second time. This will perform a ground-stabilized Moving Target Track (GMTT). The radar will then focus all its energy on the moving vehicle you just designated.

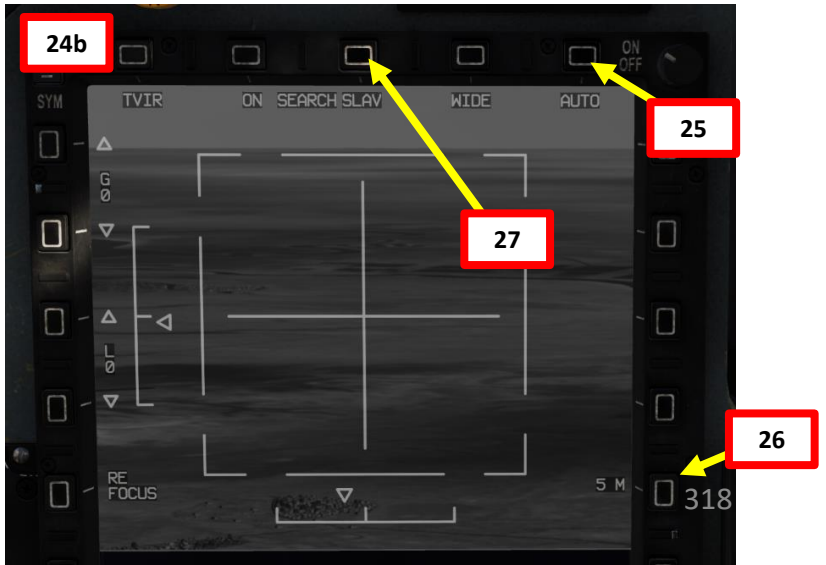
18b — T5: TDC (Target Designator Controller) Switch



2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.3 – SLAVED – AG Radar

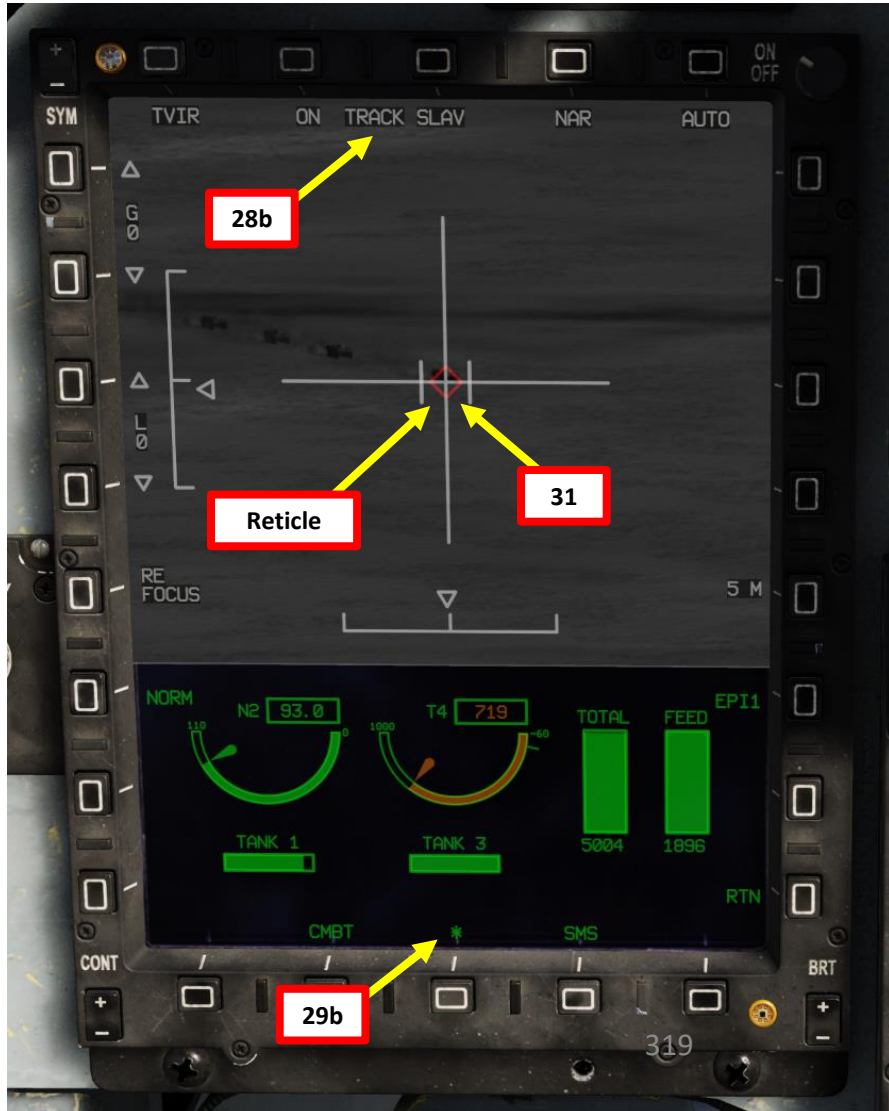
19. Go in the MAIN MENU MFCD page and press the OSB (Option Select Button) next to POD.
20. Press the OSB next to TVIR to enter the C-701 TV feed page.
21. Press the OSB next to “OFF” to start warm-up process.
22. Missile camera will enter a BIT (Built-In Test) mode that starts a warm-up process that will take about 30 seconds.
23. When missile is ready to be used, the BIT status will disappear and be replaced by the IDLE status; the missile seeker is caged.
24. Once missile status reaches IDLE and 3-minute alignment is complete, press on the OSB next to ON to turn ON the missile.
25. Select AUTO lock mode.
26. Set target size (5 m)
27. Select desired mode (SP/SNOWPLOW or SLAV/SLAVED) by pressing the OSB next to SP/SLAV. In this case, we will use SLAVED mode.





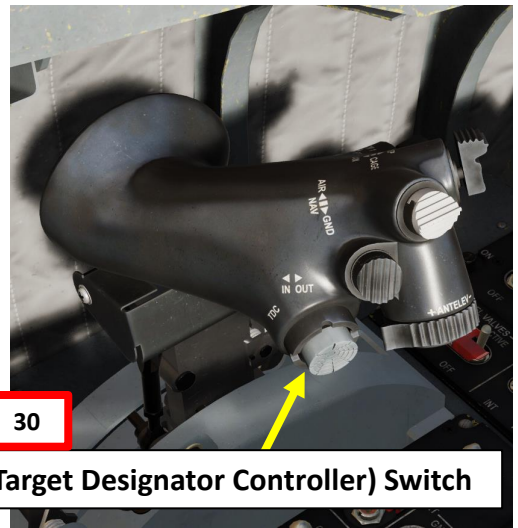
2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.3 – SLAVED – AG Radar

28. Once Missile mode is set to SLAVE, it will automatically search and attempt to track the SPI defined by the targeting pod.
29. Set TV Missile page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (RIGHT if TV page is on the Right MFCD). An asterisk will indicate the SOI status.
30. Once a target is designated and missile is less than 10 nm away from the target, the missile will attempt to lock the target you just designated (assuming you chose AUTO mode). You can also lock it in MANUAL mode using the T5 TDC PRESS.
31. A red diamond will indicate a good missile lock.



S2: SC (Sensor Control) Switch

S1: SS (Sensor Selection) Switch **29a**



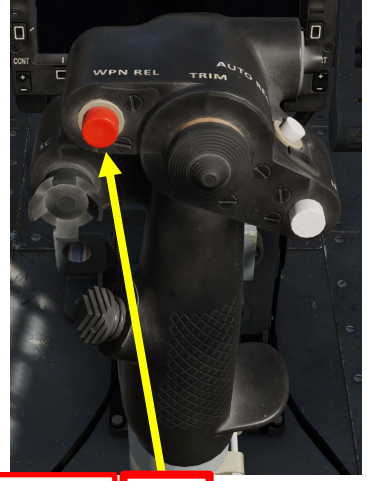
T5: TDC (Target Designator Controller) Switch

2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.3 – SLAVED – AG Radar

32. Approach the target while monitoring TV Missile Feed, the radar display and the SPI (Sensor Point of Interest) diamond on the Heads-Up Display.

2.7.1 – C-701 TV-GUIDED MISSILE
2.7.1.3 – SLAVED – AG Radar

33. When within 10 nm of the target, press the S3 Weapon Release Button (« RALT+SPACE ») to launch the missile.
34. Missile will track its target by itself.



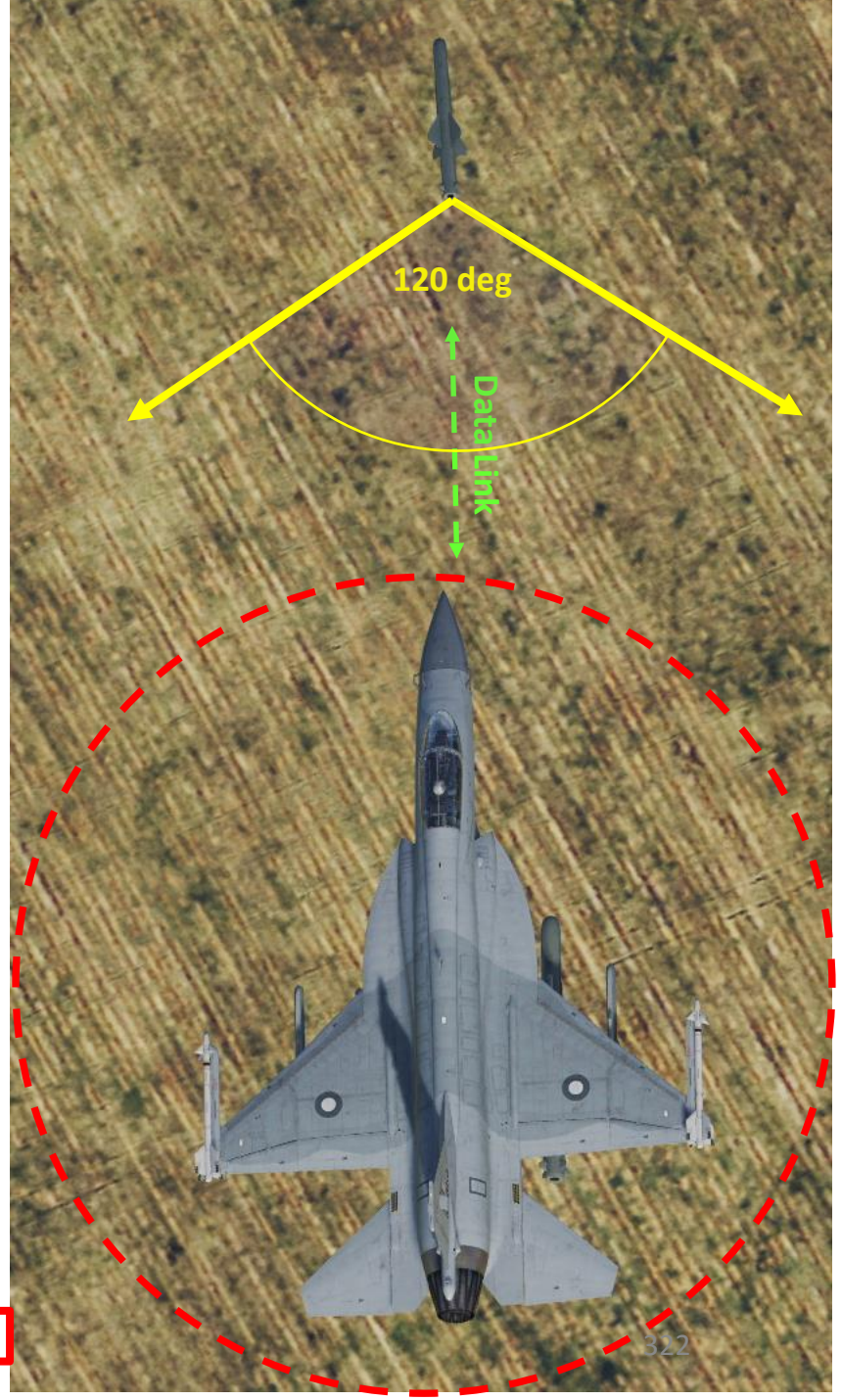
S3: Weapon Launch/Release Button	33

2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.1 – Introduction

The CM-802AKG is a cruise missile that can be remotely guided to the target, which is what we call the "Man-In-The-Loop" concept. To use MITL (Man-In-The-Loop) mode to control the missile remotely, the JF-17 **needs to carry a datalink pod**. The Datalink pod can provide two-way data link between the missile and the aircraft. The pod can transmit and receive signal in 360° azimuth, but only below the aircraft wings.

The CM-802AKG missile, on the other hand, can transmit and receive signal **from its tail in a cone of 120°**. If the missile steers in a direction from which it cannot send you data (i.e. you fall into its blind spot), you will lose connection until you are within its 120° tail cone again. In the cruise stage (CRS), CM-802AKG has a terrain following capability – you don't need to worry about keeping data link connected in that specific stage since the missile will fly on its own.

However, when planning the missile and the aircraft's flight path, **make sure you are within the 120° tail cone of the missile in order to control it when it reaches the MITL stage**.



2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.2 – DIR (Direct) Release

DIRECT mode requires a **SPI** (Sensor Point of Interest) to be designated with an sensor (targeting pod, waypoint, air-to-ground radar, etc.). When launched, the missile will then fly towards this SPI.

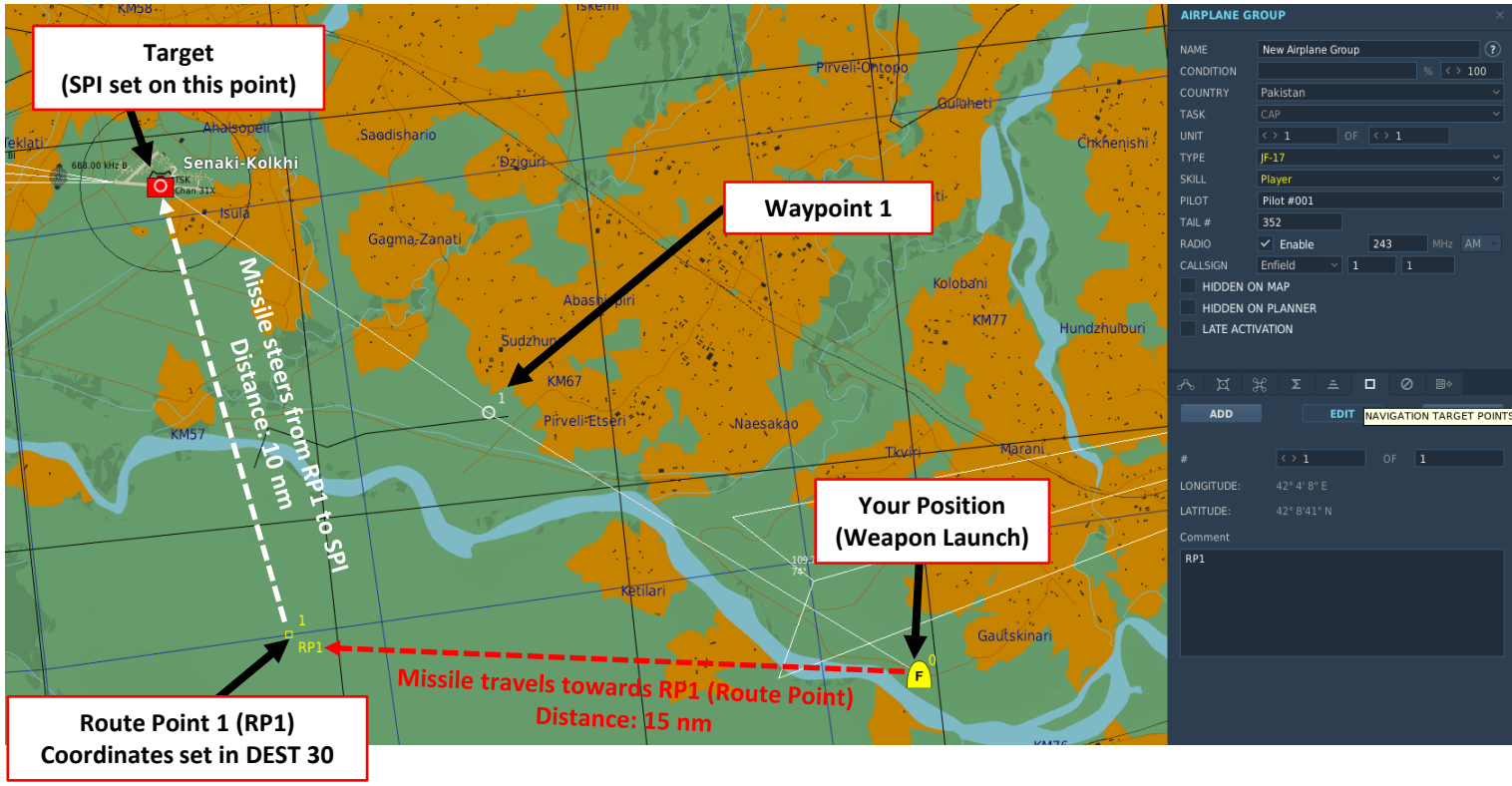
If a **Route Point** (TP) is programmed in the missile, the missile will turn towards this point before looking for the target in the SPI area. Route Point coordinates need to be entered in any of the DEST waypoints 30 to 35).

Route Points are by no means mandatory for this mode but can help to bypass defenses. In this tutorial, we will use one.

When the missile is 20 km away from the SPI, the missile will enter "MITL" mode, which will allow you to take control of the missile remotely.

DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	**Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)**
36 to 39 (PP1 to PP4)	Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)
40	SPI (Sensor Point of Interest) Coordinates
41 to 49	Reserved for Markpoints
50 to 58	Reserved waypoints for airfields closest to last navigation waypoint (non-editable)
59	Reserved waypoint for airfield (editable)

CM-802AKG Missile Restrictions	
Allowable Launch Altitude	1600 ft to 24600 ft
Allowable Launch Speed	Less than Mach 0.9



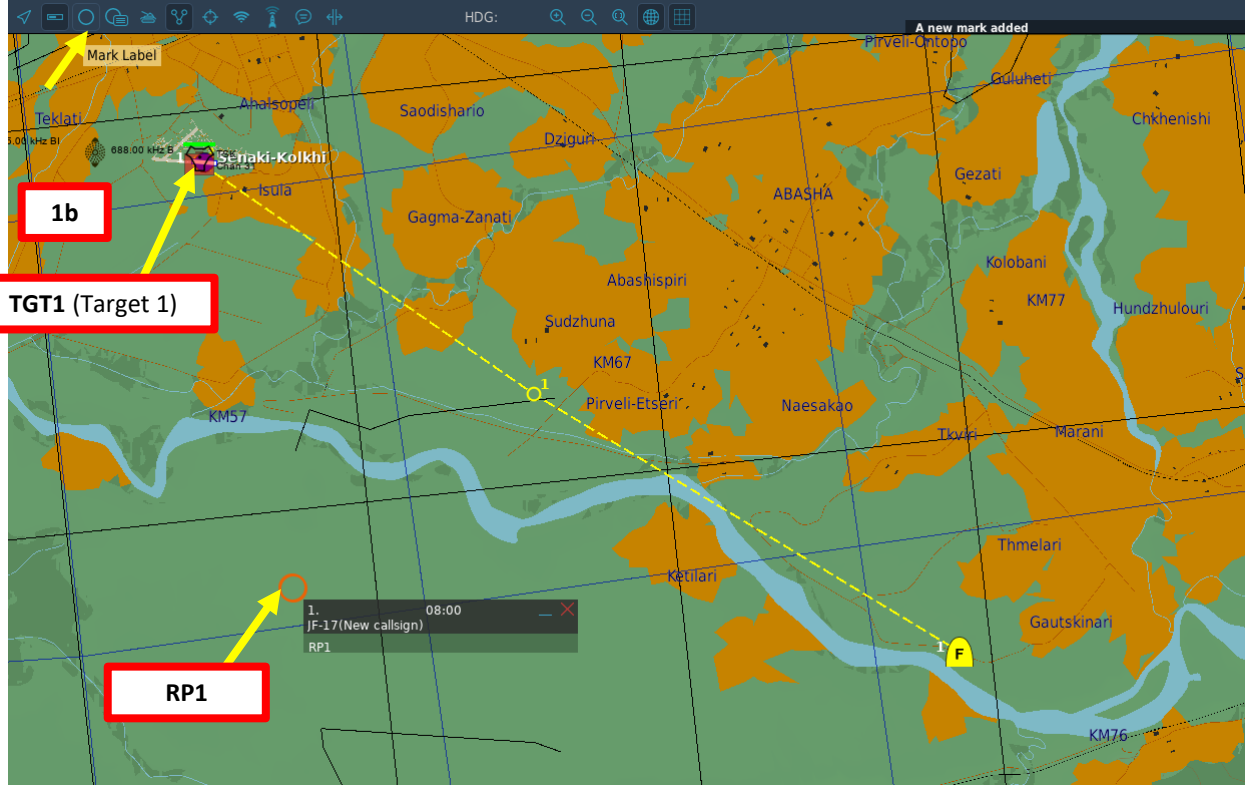
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.2 – DIR (Direct) Release

Set Route Point 1 (if desired)

1. If we want to use one Route Point (or more), we need to enter coordinates on DST Waypoint 30 for RP1 (Route Point). There are many ways to do it. You can either:
   a) Press DST button on the UFCP, select Waypoint 30, enter manually the Latitude, Longitude and Elevation coordinates on the UFCP as shown in the Navigation section.
   b) Or… Add a Marker on the target via the F10 map and name it “RP1”. Then, ask the ground crew to update the DTC (Data Transfer Cartridge), then load the DTC into the aircraft as seen during the start-up procedure. This will automatically create Waypoint 30 (RP1) for you without having to enter coordinates manually.
   c) Or… Just load the DTC into the aircraft if the Mission Creator was kind enough to create a NAVIGATION TARGET POINT called “RP1” on the target.

Route Point (Deg Min Sec.Decimal-Seconds)

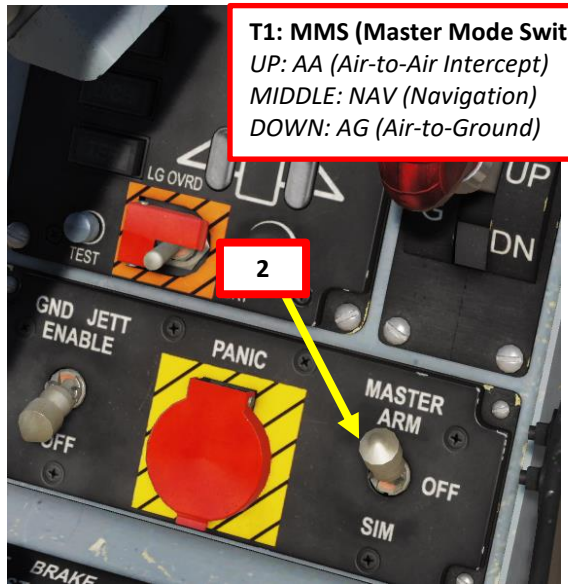
Route Point	DEST Point	Latitude	Longitude	Elevation (ft)
RP1	30	42 08 42.1 N	042 04 09.1 E	00031



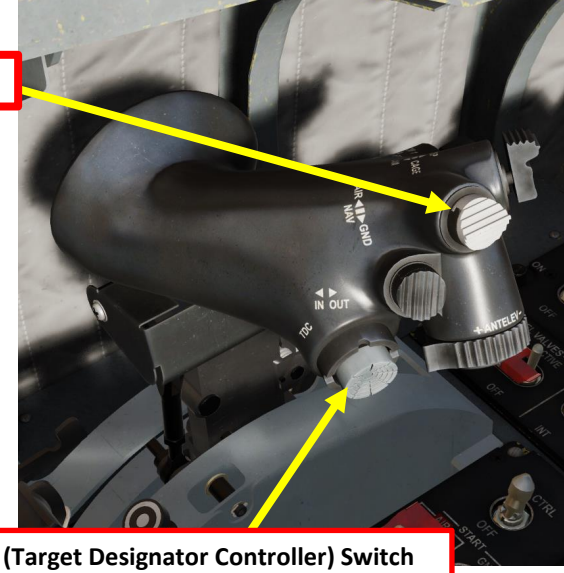
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.2 – DIR (Direct) Release

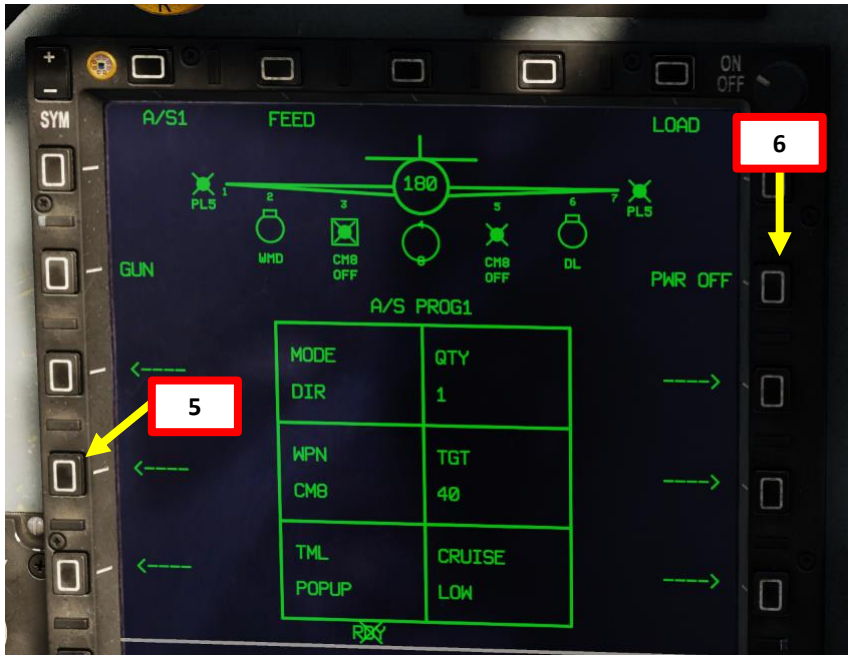
Set Up Weapon

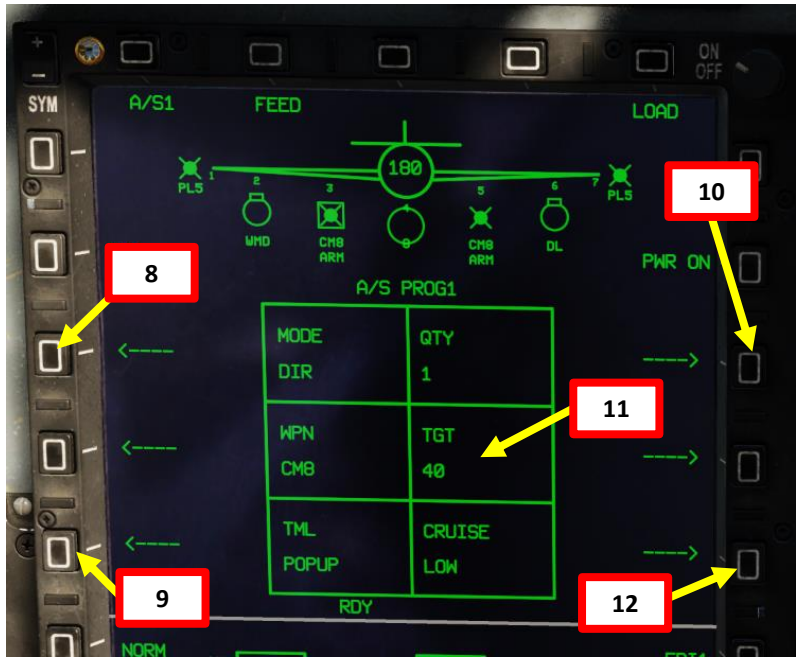
2. Master Arm switch – ARM (UP)
3. Set Master Mode Switch – A/G (DOWN)
4. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
5. Select CM-802AKG missile by pressing the OSB next to WPN, then select CM8.
6. Select the OSB next to PWR OFF to power up the missile and start its alignment.
7. The missile needs about 3 minutes for alignment (see below HSD). When alignment is complete, the ALN TIMING indicator will go to 00:00.
8. Set Mode to DIR (Direct)
9. Select Final Attack Mode (POPUP or SKIM). We will choose POPUP.
10. Set Quantity as required.
11. The TGT (Target) point is set to DEST Waypoint 40, which is a waypoint reserved for the SPI (Sensor Point of Interest). When we designate the SPI, the coordinates will automatically update.
12. Select desired Missile Cruise Altitude (HIGH = 3500 m, MEDIUM = 1500 m, LOW = 50 m).



T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)





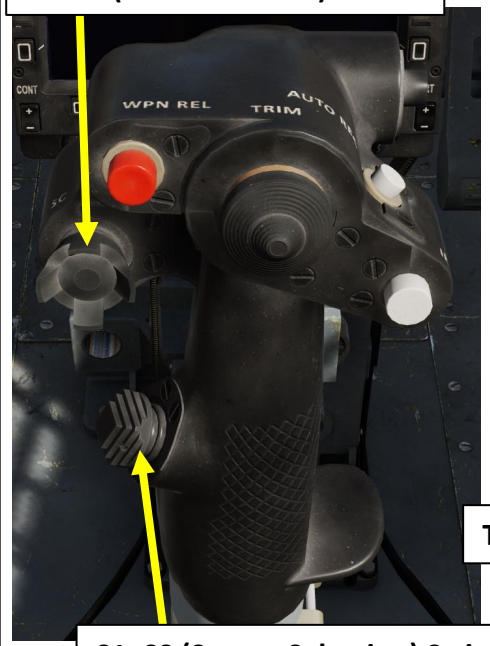


2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.2 – DIR (Direct) Release

Designate SPI (Sensor Point of Interest)

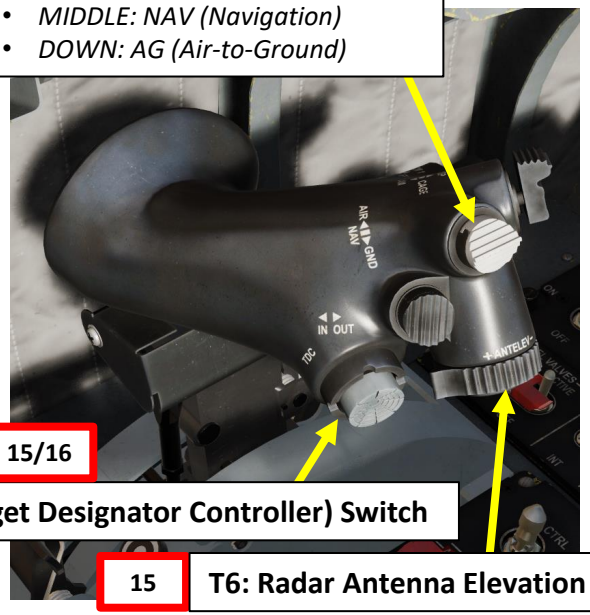
13. Start the Targeting Pod and uncage it as seen previously.
14. Set Targeting Pod page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (LEFT if POD page is on the Left MFCD). An asterisk will indicate the SOI status.
15. Slew the Targeting Pod reticle on a target using the T5 TDC (Target Designator Controller) slew controls. Use Radar Antenna Elevation Switch to zoom in or out.
16. When targeting pod reticle is over the target, use the T5 TDC PRESS button (ENTER) to designate the target as a SPI (Sensor Point of Interest).
17. Once a target is designated, the pod will attempt to enter POINT TRACK (tracks moving target). If POINT TRACK is not possible, the pod will enter AREA TRACK mode by default if the target is within 21 nm.

S2: SC (Sensor Control) Switch



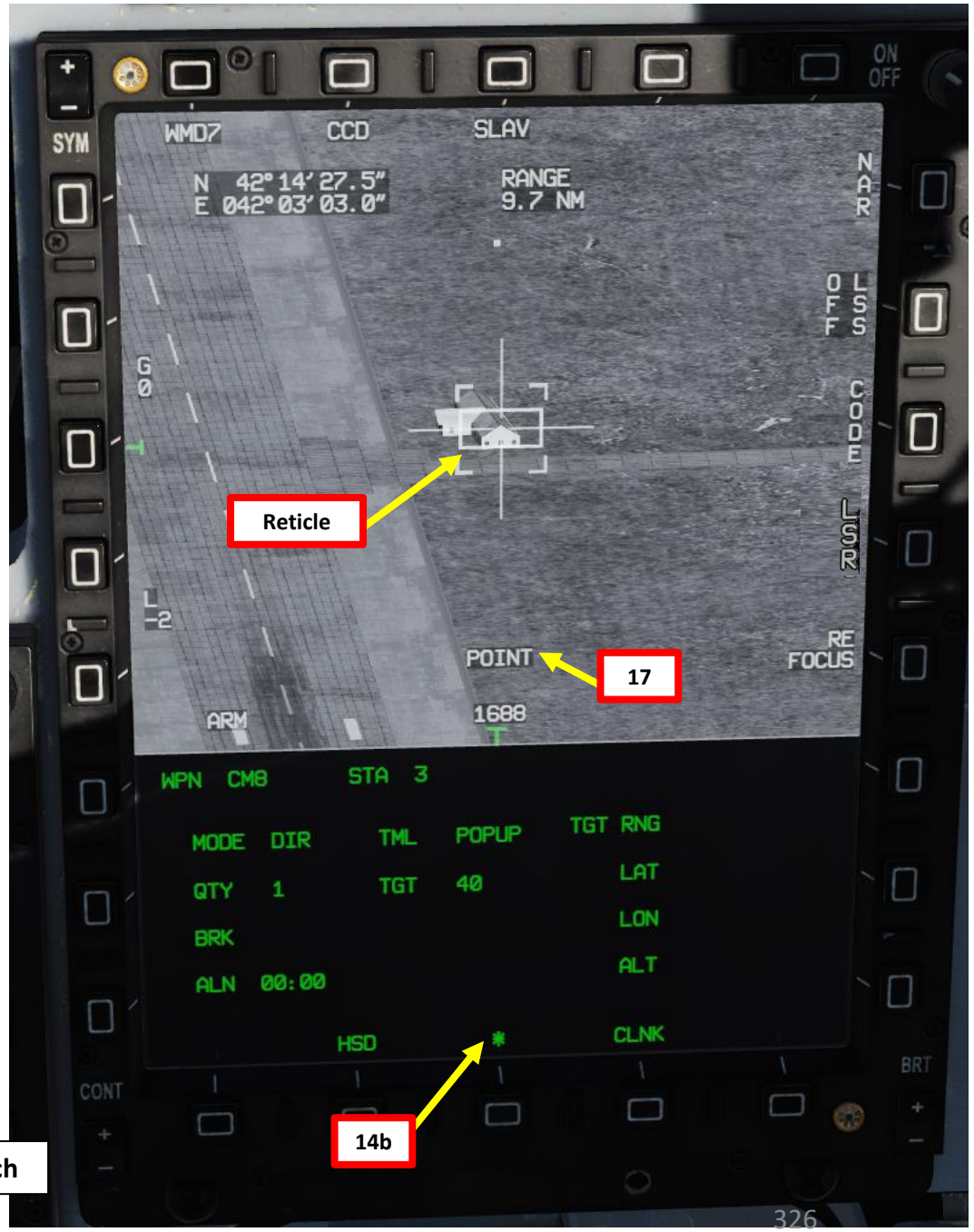
S1: SS (Sensor Selection) Switch **14a**

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



15/16 **T5: TDC (Target Designator Controller) Switch**

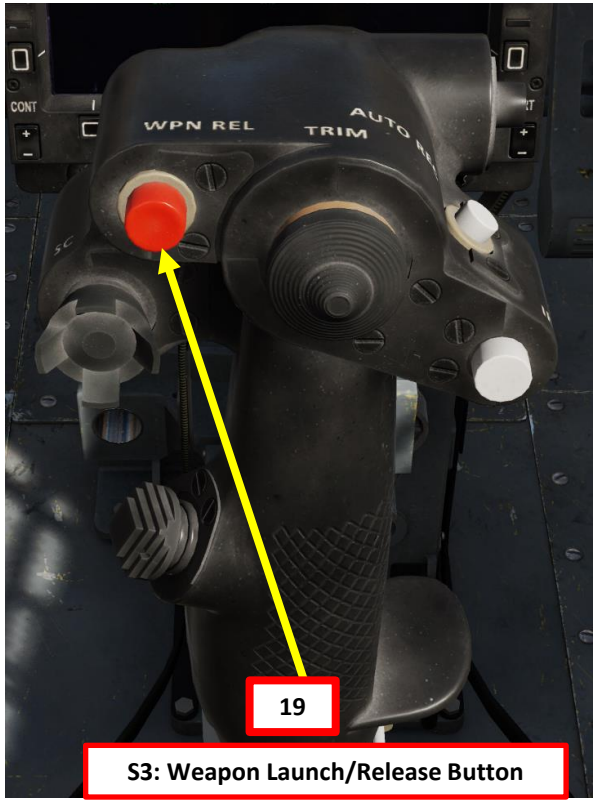
15 **T6: Radar Antenna Elevation Switch**



2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.2 – DIR (Direct) Release

Launch Weapons

18. In this mode, the missile seeker will power on 20 km before the designated target point.
19. To launch the CM-802AKG, press the S3 Weapon Release Button (« RALT+SPACE »). The missile will fly to the Route Point RP1 first, then steer to the designated SPI.
20. When the missile is 20 km away from the SPI, the missile will enter “MITL” mode, which will allow you to take control of the missile remotely. See section 2.7.2.5 for information about MITL guidance.



2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.2 – DIR (Direct) Release

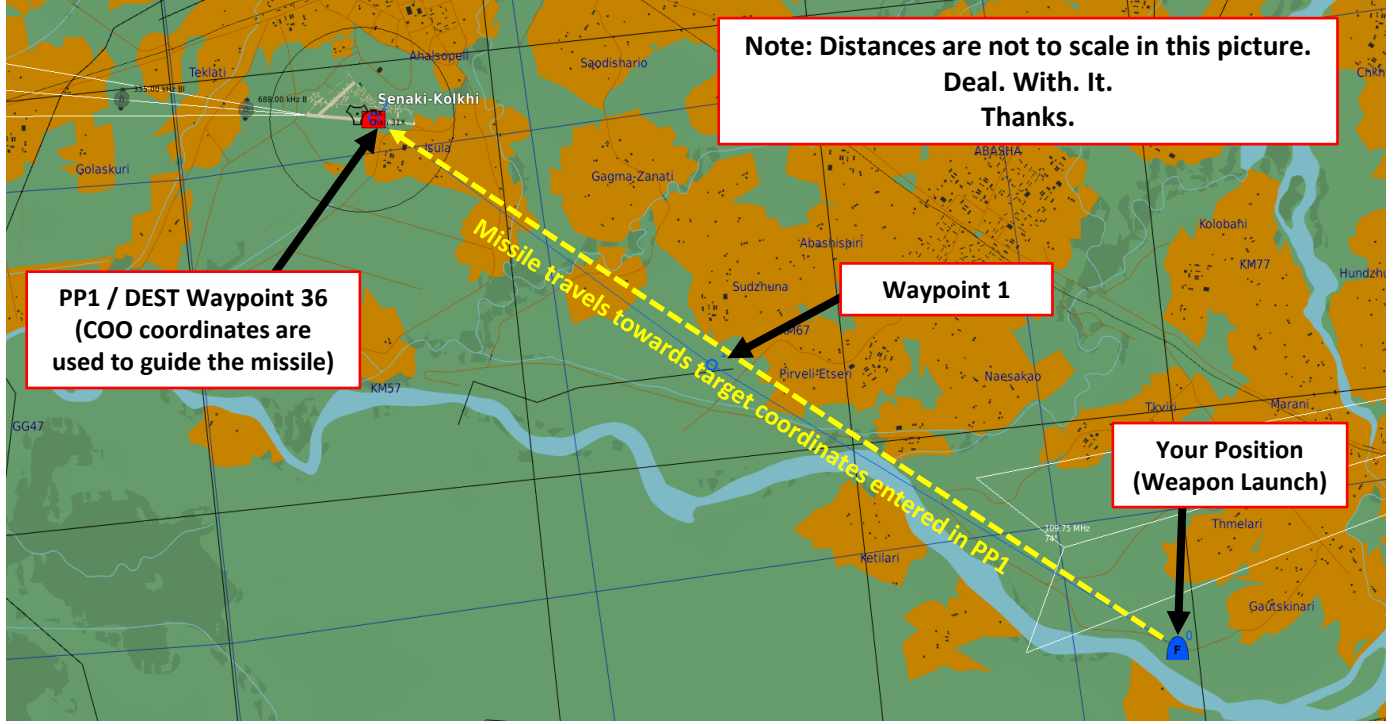
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.3 – COO (Coordinates) Release

COO mode requires a **coordinates** to be set in a **PP (Pre-Planned Point)**. Pre-Planned Point coordinates need to be entered in any of the DEST waypoints 36 to 39. When launched, the missile will then fly towards this Pre-Planned Point.

If a **Route Point** (RP) is programmed in the missile, the missile will turn towards this point before looking for the target in the SPI area. Route Point coordinates need to be entered in any of the DEST waypoints 30 to 35).

Route Points are by no means mandatory for this mode but can help to bypass defenses. In this tutorial, we will not use any RP.

When the missile is 20 km away from the Pre-Planned Point, the missile will enter "MITL" mode, which will allow you to take control of the missile remotely.



DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)
36 to 39 (PP1 to PP4)	**Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)**
40	SPI (Sensor Point of Interest) Coordinates
41 to 49	Reserved for Markpoints
50 to 58	Reserved waypoints for airfields closest to last navigation waypoint (non-editable)
59	Reserved waypoint for airfield (editable)

Pre-Planned Point (Deg Min Sec.Decimal-Seconds)

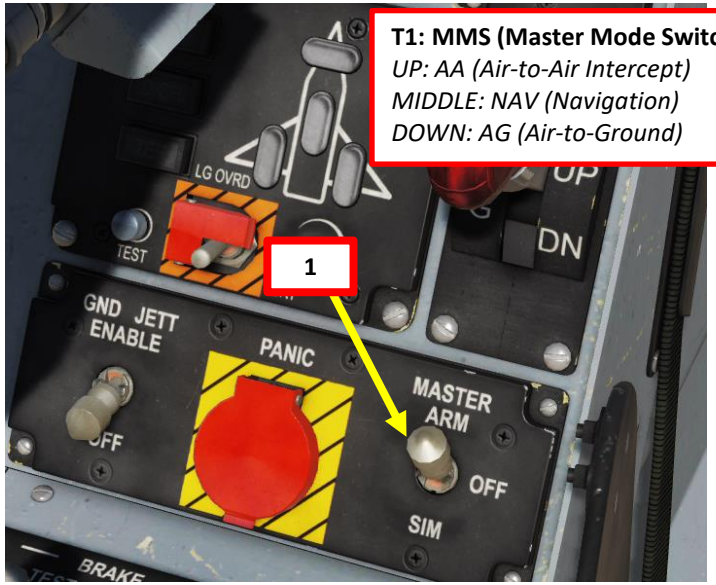
Target Point	DEST Point	Latitude	Longitude	Elevation (ft)
TGT1/ PP1	36	42 14 27.3 N	042 03 04.1 E	00072

CM-802AKG Missile Restrictions	
Allowable Launch Altitude	1600 ft to 24600 ft
Allowable Launch Speed	Less than Mach 0.9

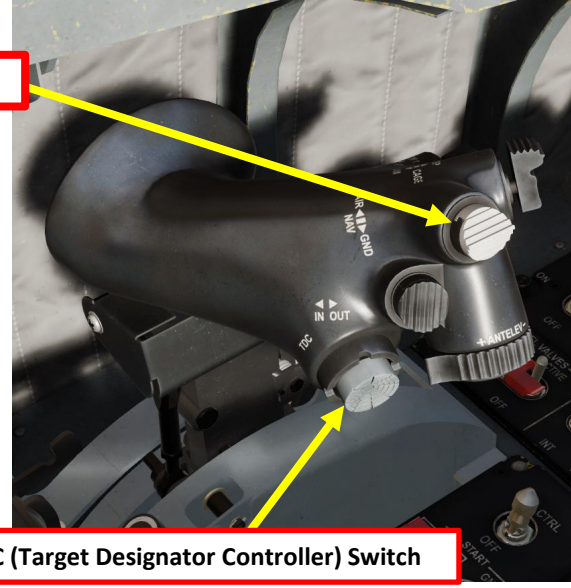
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.3 – COO (Coordinates) Release

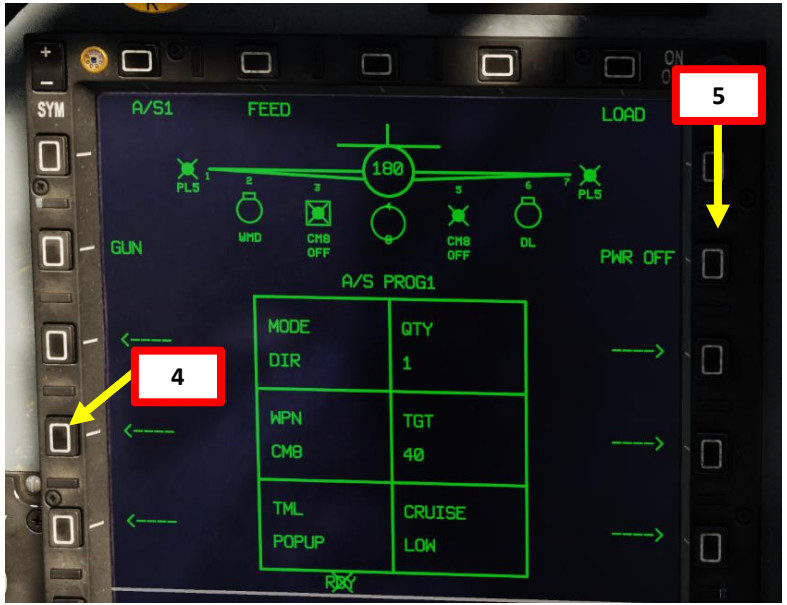
Set Up Weapon

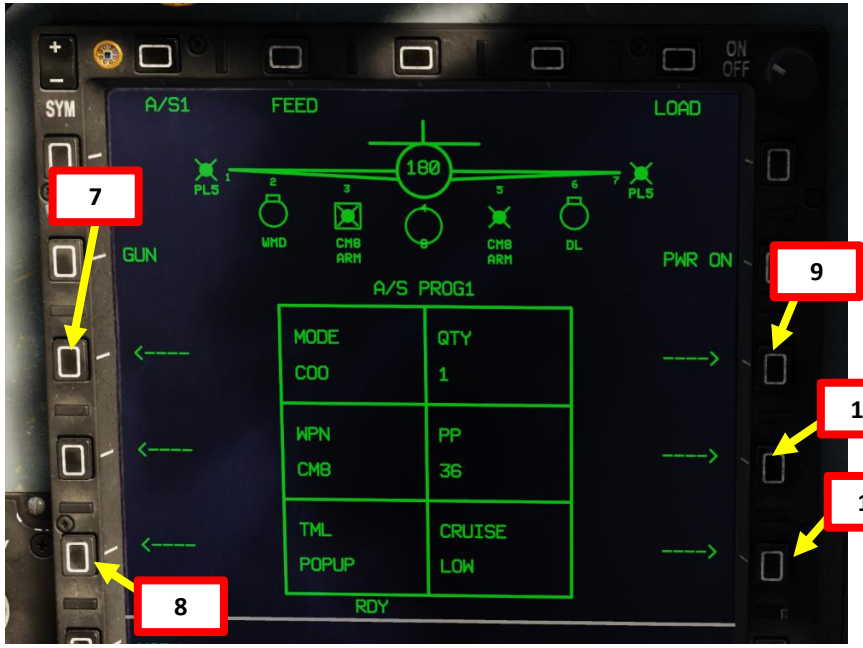
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select CM-802AKG missile by pressing the OSB next to WPN, then select CM8.
5. Select the OSB next to PWR OFF to power up the missile and start its alignment.
6. The missile needs about 3 minutes for alignment (see below HSD). When alignment is complete, the ALN TIMING indicator will go to 00:00.
7. Set Mode to COO (Coordinates)
8. Select Final Attack Mode (POPUP or SKIM). We will choose POPUP.
9. Set Quantity as required.
10. Set the PP (Pre-Planned Point) to DEST Waypoint 36 for PP1. This is what the missile will use as a target reference.
11. Select desired Missile Cruise Altitude (HIGH = 3500 m, MEDIUM = 1500 m, LOW = 50 m).

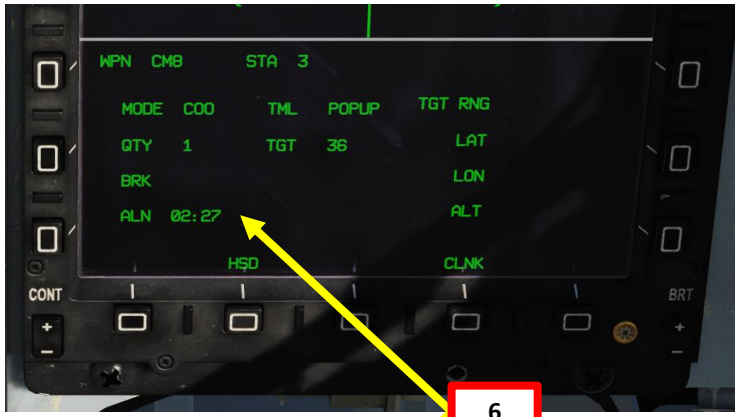


T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)





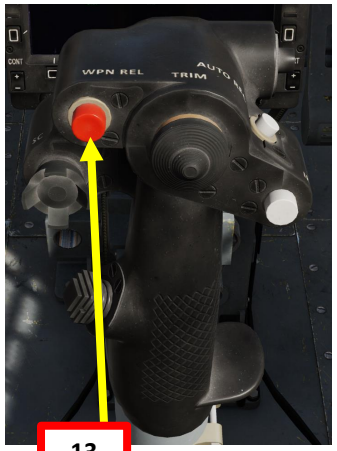




2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.3 – COO (Coordinates) Release

Launch Weapons

12. In this mode, the missile seeker will power on 20 km before the designated target point.
13. To launch the CM-802AKG, press the S3 Weapon Release Button (« RALT+SPACE »). The missile will fly to the PP1 coordinates directly since we have not entered any Route Points.
14. When the missile is 20 km away from the Pre-Planned Point, the missile will enter “MITL” mode, which will allow you to take control of the missile remotely. See section 2.7.2.5 for information about MITL guidance.



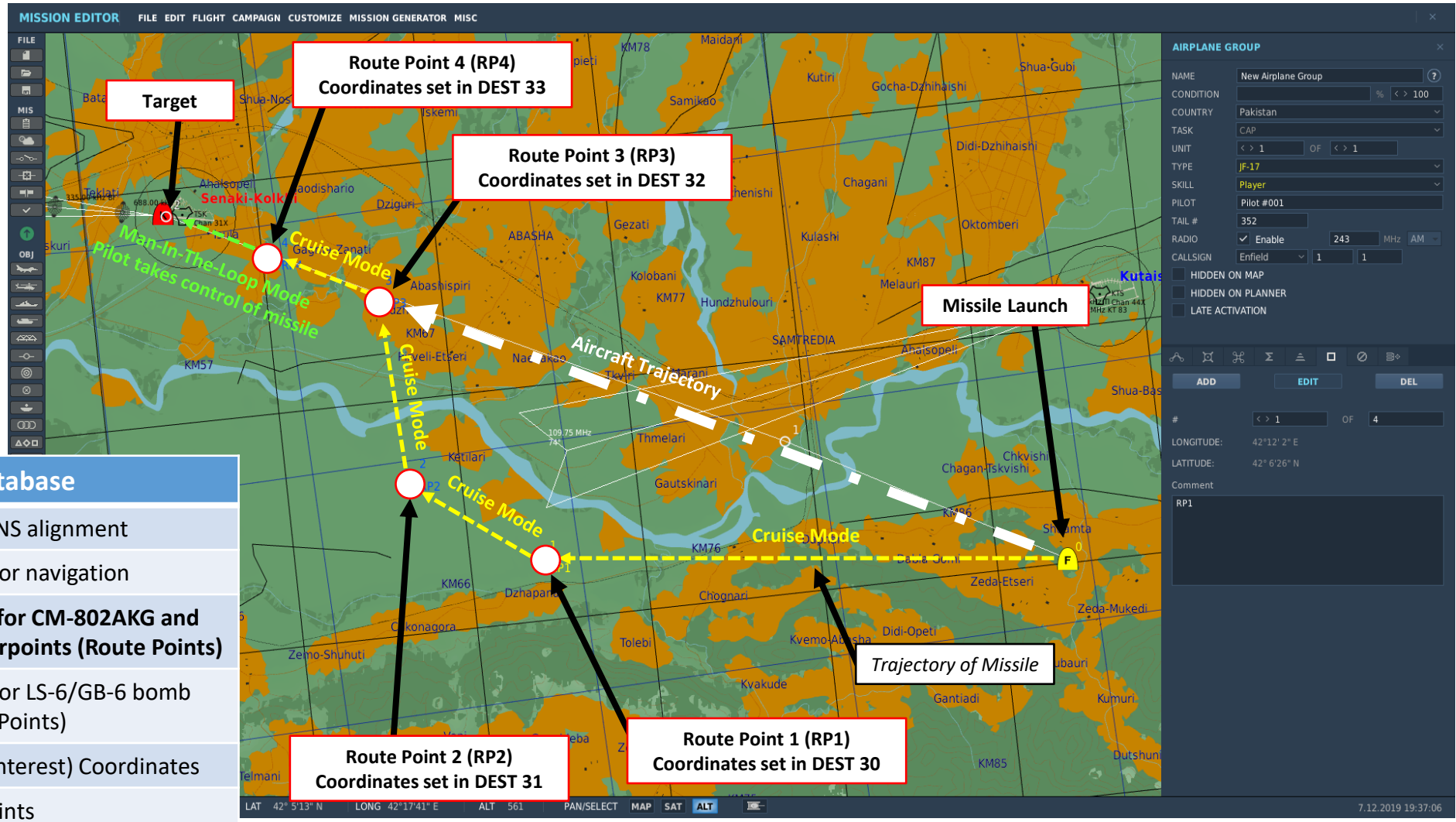
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.4 – MAN (Manual) Release

MANUAL mode requires a minimum of one RP (Route Point). Up to six RPs can be set to define the trajectory of the missile. The missile will automatically follow all RPs available in your database in numerical order (RP1 (DEST 30) first, then RP2 (DEST 31)… until the last RP).

Route Point coordinates need to be entered in any of the DEST waypoints 30 to 35).

When the last Route Point is reached, the missile will enter "MITL" mode, which will allow you to take control of the missile remotely.

CM-802AKG Missile Restrictions	
Allowable Launch Altitude	1600 ft to 24600 ft
Allowable Launch Speed	Less than Mach 0.9



DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	**Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)**
36 to 39 (PP1 to PP4)	Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)
40	SPI (Sensor Point of Interest) Coordinates
41 to 49	Reserved for Markpoints
50 to 58	Reserved waypoints for airfields closest to last navigation waypoint (non-editable)
59	Reserved waypoint for airfield (editable)

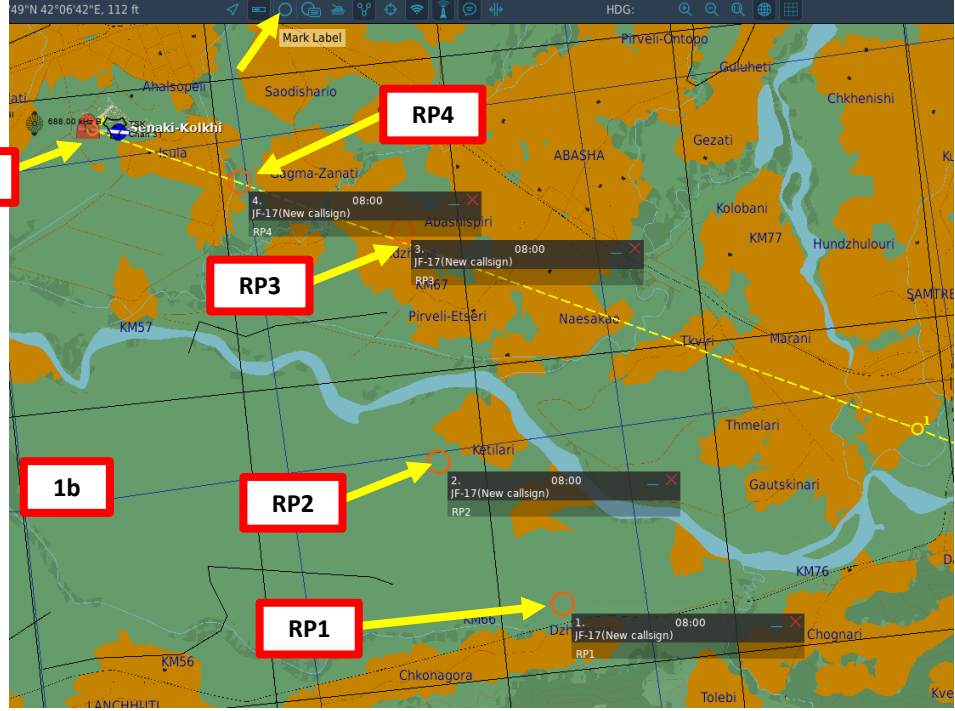
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.4 – MAN (Manual) Release

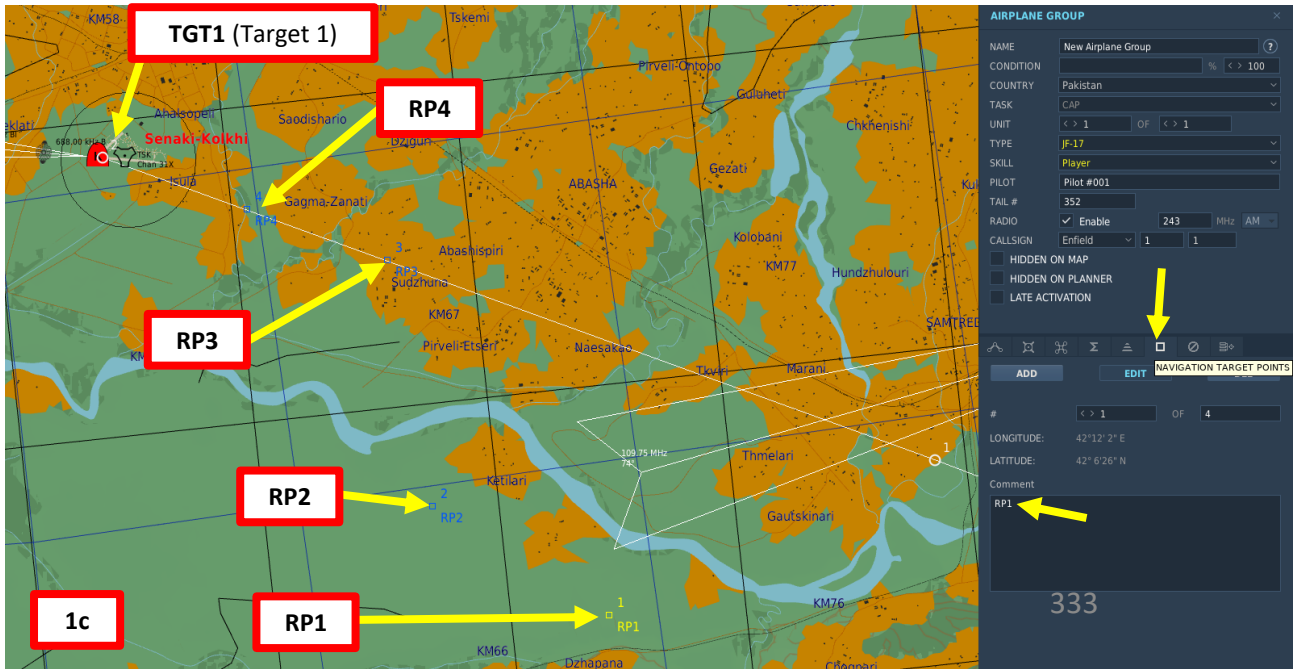
Enter Route Point Coordinates

1. In order to use Route Points, we need to enter coordinates on DST Waypoint 30 for RP1 (Route Point). There are many ways to do it. As an example for RP1, you can either:
   a) Press DST button on the UFCP, select Waypoint 30, enter manually the Latitude, Longitude and Elevation coordinates on the UFCP as shown in the Navigation section.
   b) Or… Add a Marker on the target via the F10 map and name it "RP1". Then, ask the ground crew to update the DTC (Data Transfer Cartridge), then load the DTC into the aircraft as seen during the start-up procedure. This will automatically create Waypoint 30 (RP1) for you without having to enter coordinates manually.
   c) Or… Just load the DTC into the aircraft if the Mission Creator was kind enough to create a NAVIGATION TARGET POINT called "RP1" on the target.

Route Point (Deg Min Sec.Decimal-Seconds)

Route Point	DEST Point	Latitude	Longitude	Elevation (ft)
RP1	30	42 06 27.1 N	042 12 02.2 E	00040
RP2	31	42 08 28.1 N	042 08 33.1 E	00043
RP3	32	42 12 26.1 N	042 08 09.1 E	00049
RP4	33	42 13 28.1 N	042 05 17.1 E	00057





2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.4 – MAN (Manual) Release

You can verify your coordinates by selecting the DEST (Destination) page.

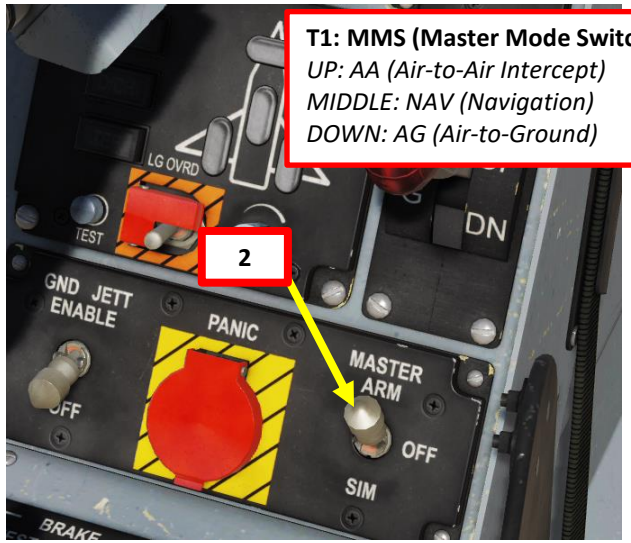
Route Point (Deg Min Sec.Decimal-Seconds)

Route Point	DEST Point	Latitude	Longitude	Elevation (ft)
RP1	30	42 06 27.1 N	042 12 02.2 E	00040
RP2	31	42 08 28.1 N	042 08 33.1 E	00043
RP3	32	42 12 26.1 N	042 08 09.1 E	00049
RP4	33	42 13 28.1 N	042 05 17.1 E	00057

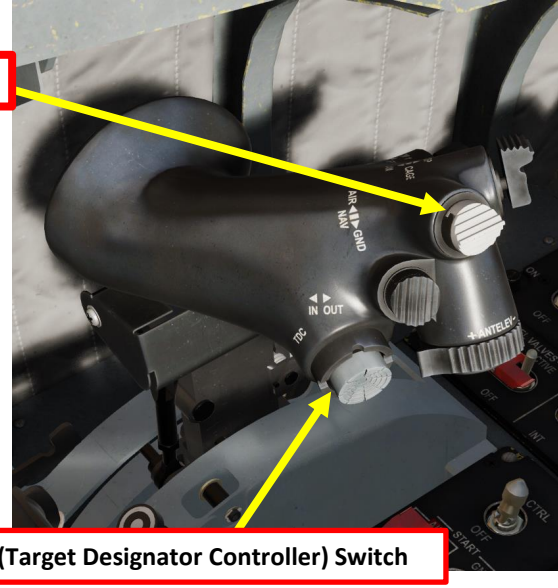
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.4 – MAN (Manual) Release

Set Up Weapon

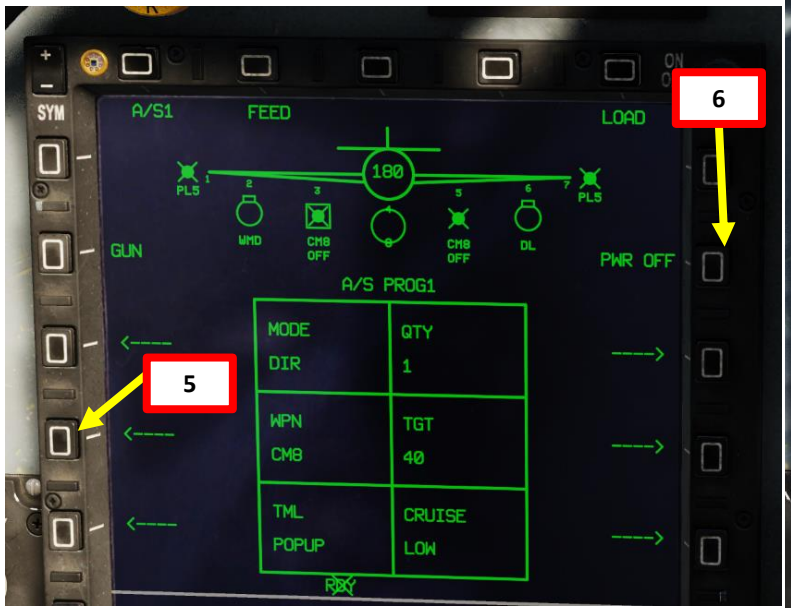
2. Master Arm switch – ARM (UP)
3. Set Master Mode Switch – A/G (DOWN)
4. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
5. Select CM-802AKG missile by pressing the OSB next to WPN, then select CM8.
6. Select the OSB next to PWR OFF to power up the missile and start its alignment.
7. The missile needs about 3 minutes for alignment (see below HSD). When alignment is complete, the ALN TIMING indicator will go to 00:00.
8. Set Mode to MAN (Manual)
9. Final Attack is irrelevant for this mode since Man-In-The-Loop requires manual control.
10. Set Quantity as required.
11. The FP field displays the Route Points (RPs) selected for the missile trajectory. DEST Waypoints 30, 31, 32 and 33 are used for RP1, RP2, RP3 and RP4.
12. Select desired Missile Cruise Altitude (HIGH = 3500 m, MEDIUM = 1500 m, LOW = 50 m).

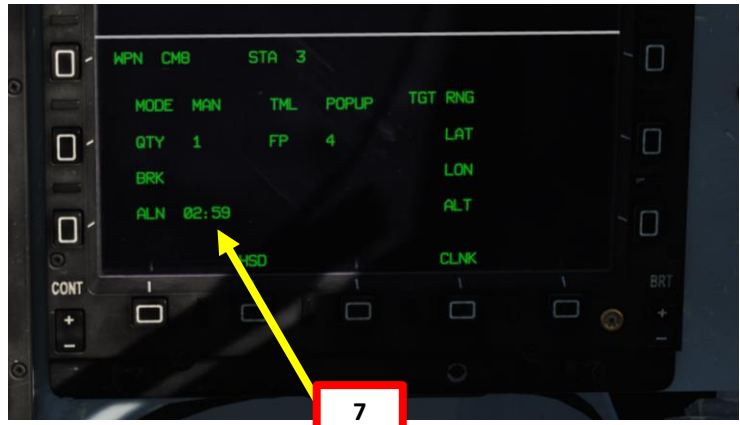


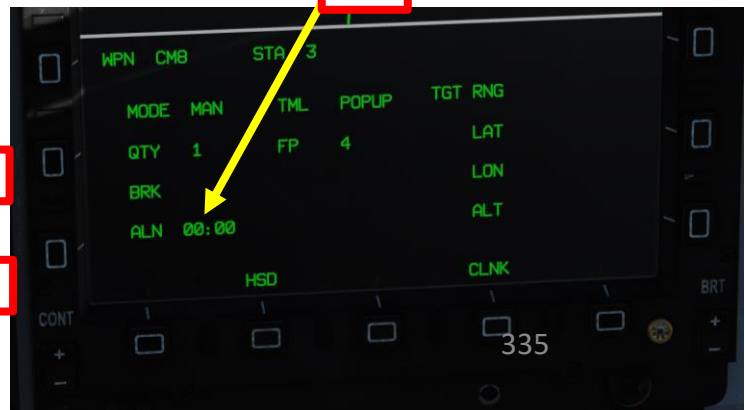
T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)



T5: TDC (Target Designator Controller) Switch



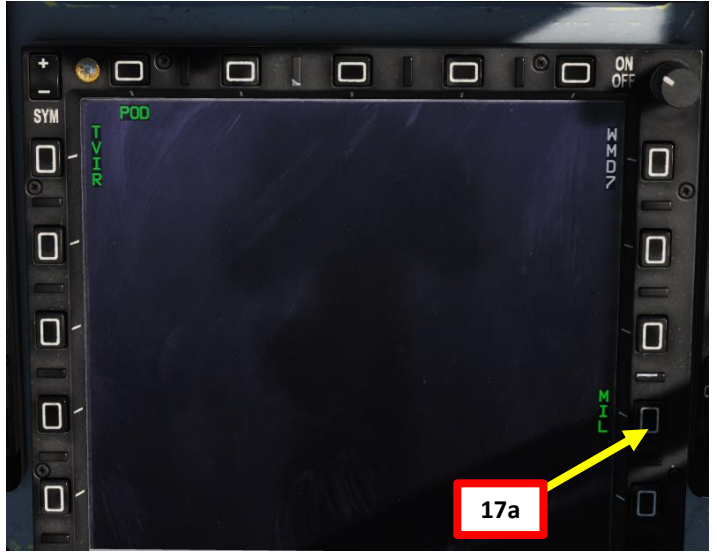


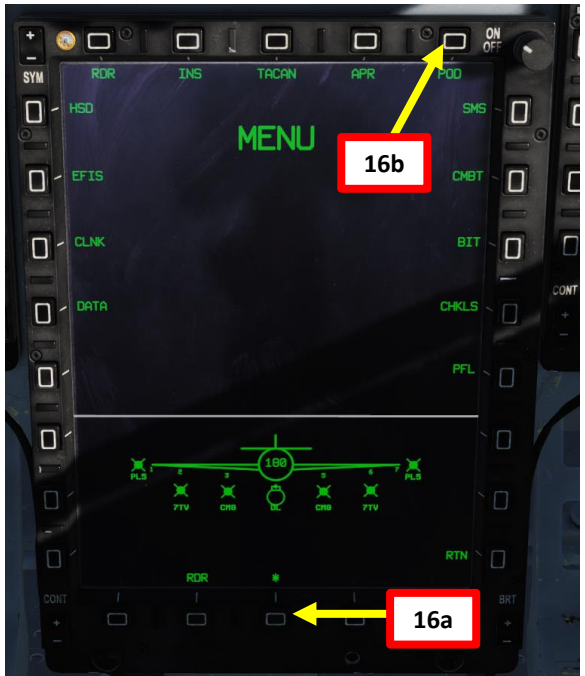


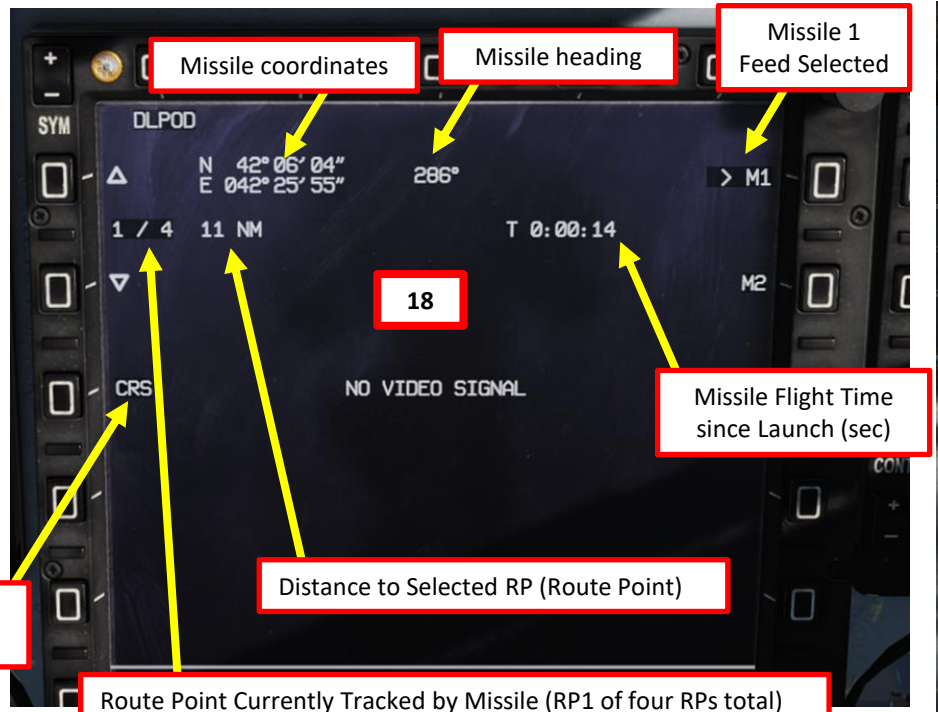
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.4 – MAN (Manual) Release

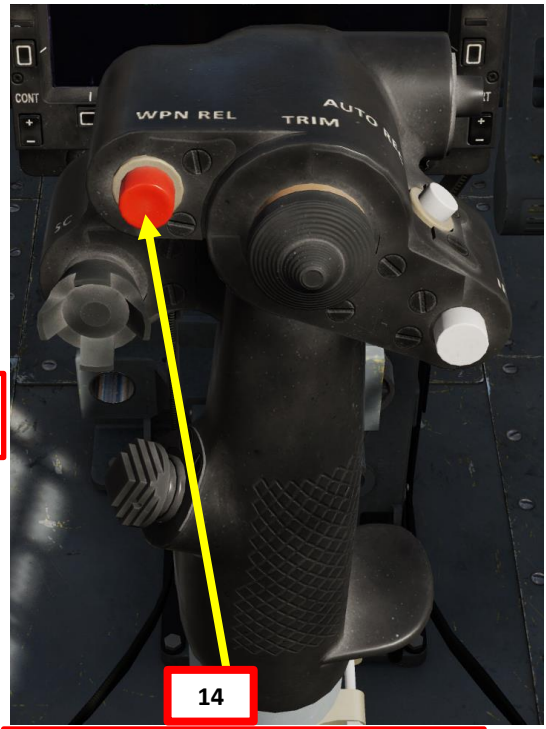
Launch Weapons

13. In MANUAL mode, the missile seeker will power on 2 km before the last RP (Route Point), which would be RP4 in our case. Once seeker is powered on, the missile will enter MITL (Man-In-The-Loop) mode, which allows you to remotely control the missile with the TDC.
14. To launch the CM-802AKG, press the S3 Weapon Release Button (« RALT+SPACE »).
15. The missile will fly to the RP1 coordinates, then follow RP2, RP3 and RP4.
16. Go in the MAIN MENU MFCD page and press the OSB (Option Select Button) next to POD.
17. Press the OSB next to MIL (Man-In-Loop) to enter the DLPOD (Datalink Pod) feed page.
18. After a few seconds, the DLPOD feed will start receiving datalink signal, which will give you missile coordinates, distance to current RP and time since launch.

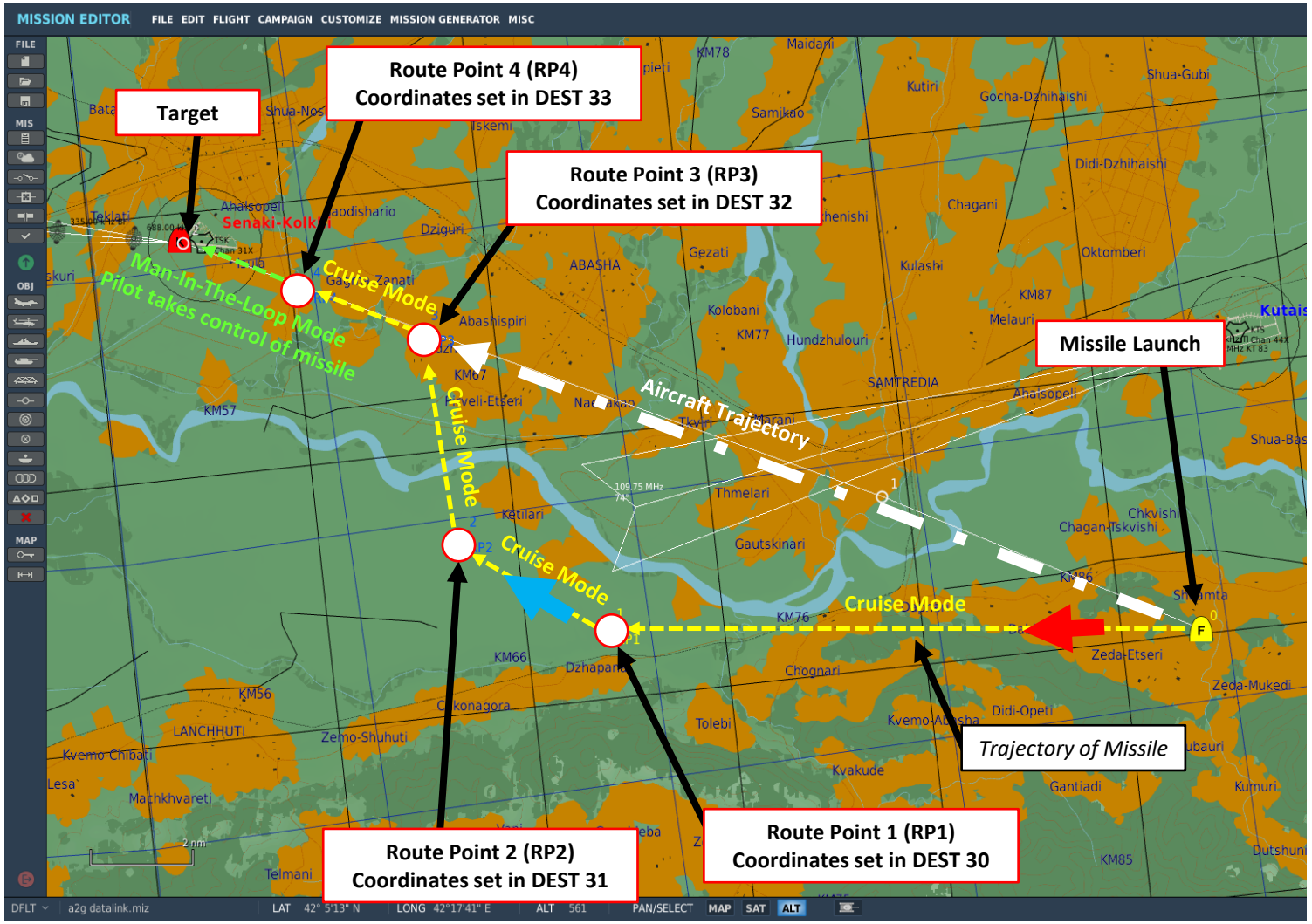






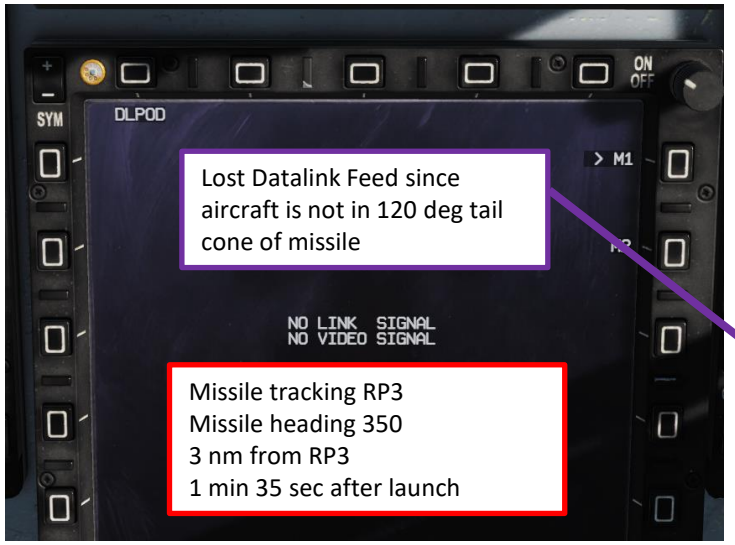


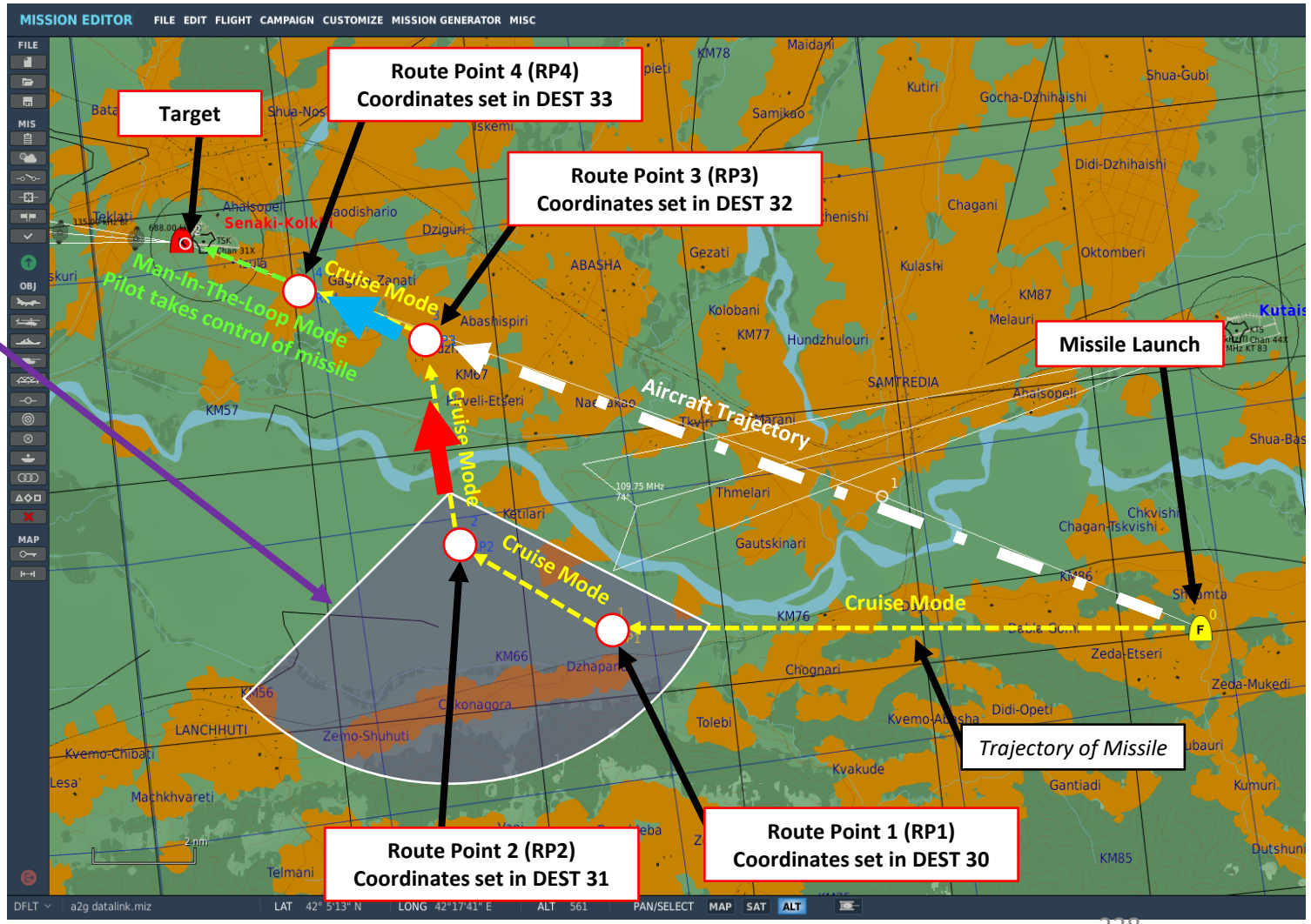
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.4 – MAN (Manual) Release



2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.4 – MAN (Manual) Release

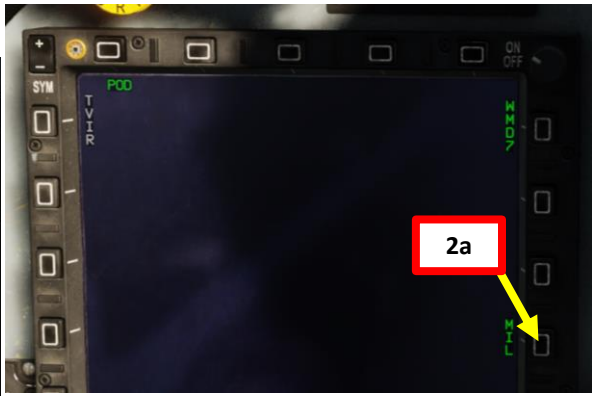
19. When the missile is near enough the last Route Point, the TKJ countdown timer will appear to indicate the time remaining until the missile seeker powers on automatically.
20. The missile seeker automatically powers on 2 km before the last RP (Route Point), which is RP4 in our case. Once seeker is powered on, the missile enters MITL (Man-In-The-Loop) mode, which allows you to remotely control the missile with the TDC. Video signal will go live. See section 2.7.2.5 for information about MITL guidance.

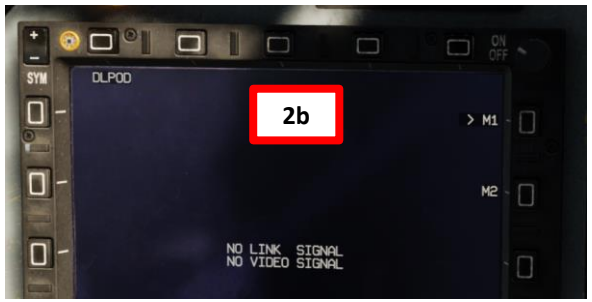


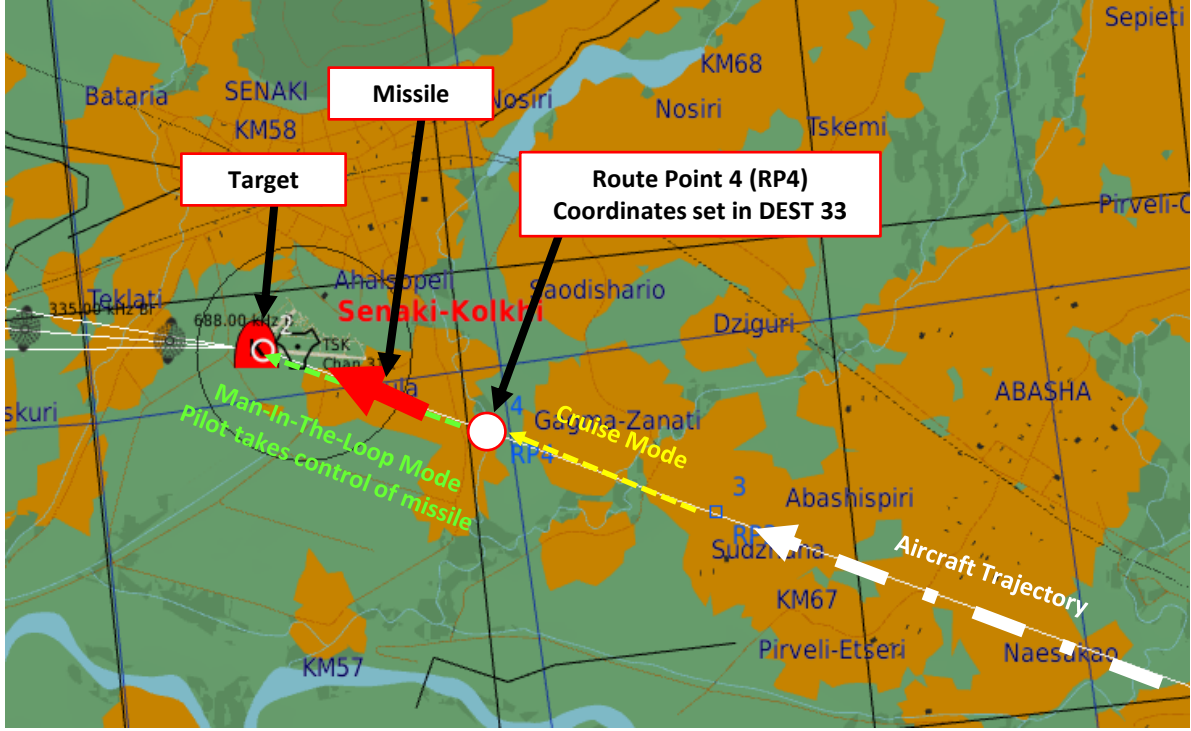


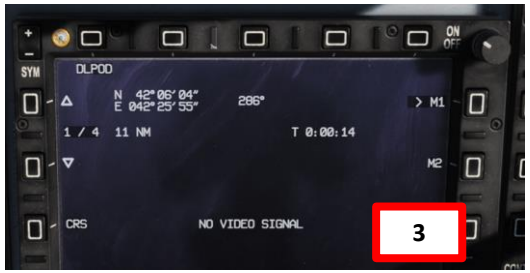
2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.5 – MITL (Man-In-The-Loop) Guidance

1. Once missile is fired, go in the MAIN MENU MFCD page and press the OSB (Option Select Button) next to POD.
2. Press the OSB next to MIL (Man-In-Loop) to enter the DLPOD (Datalink Pod) feed page.
3. After a few seconds, the DLPOD feed will start receiving datalink signal, which will give you missile coordinates, distance to current RP (if applicable) and time since launch.
4. The missile seeker automatically powers on :
   - In DIR mode: 20 km away from the SPI (Sensor Point of Interest)
   - In COO mode: 20 km away from the Pre-Planned Point
   - In MAN mode: 2 km before the last RP (Route Point), which is RP4 in our case.
5. If you want to manually power on the seeker, select CRS (Missile Cruise Mode). However, this is purely optional.
6. Once seeker is powered on, the missile enters MITL (Man-In-The-Loop) mode, which allows you to remotely control the missile with the TDC. Video signal will go live.



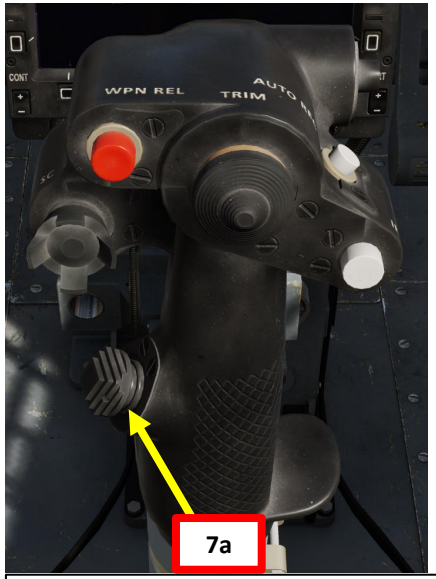




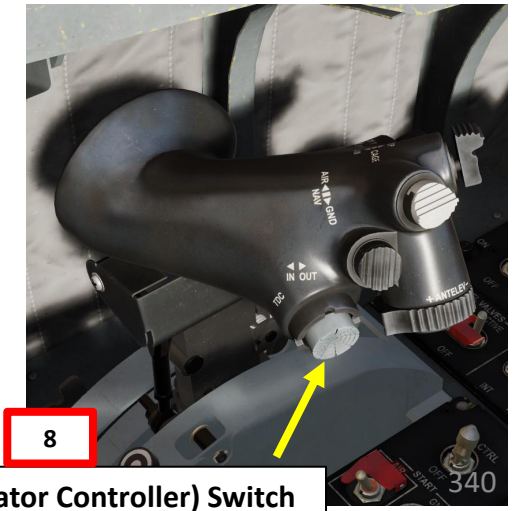


2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.5 – MITL (Man-In-The-Loop) Guidance

7. Set Datalink Pod page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (DOWN if POD page is on the Center MFCD). An asterisk will indicate the SOI status. This will allow you to control the missile with the TDC.
8. Use T5 TDC controls UP/DOWN/LEFT/RIGHT to steer the missile on the target until impact.
    - Note: Control the missile gently since abrupt attitude changes will cause image noise and skew the aiming process. Keep your aircraft within the 120 deg tail cone of the missile to maintain datalink contact.



S1: SS (Sensor Selection) Switch



T5: TDC (Target Designator Controller) Switch

2.7.2 – CM-802AKG TV-GUIDED MISSILE
2.7.2.5 – MITL (Man-In-The-Loop) Guidance

2.8 – LD-10 ANTI-RADIATION MISSILE INTRODUCTION

Suppression of Enemy Air Defenses (SEAD, also known in the United States as "Wild Weasel" and (initially) "Iron Hand" operations) are military actions to suppress enemy surface-based air defenses, including not only surface-to-air missiles (SAMs) and anti-aircraft artillery (AAA) but also interrelated systems such as early-warning radar and command, control and communication (C3) functions, while also marking other targets to be destroyed by an air strike. Suppression can be accomplished both by physically destroying the systems or by disrupting and deceiving them through electronic warfare.

The **LD-10 ARM** (Anti-radiation Missile) is a tactical, air-to-surface anti-radiation missile designed to home in on electronic transmissions coming from surface-to-air radar systems. The LD-10 can detect, attack and destroy a radar antenna or transmitter with minimal aircrew input. The proportional guidance system that homes in on enemy radar emissions has a fixed antenna and seeker head in the missile's nose.

TLDR version? The LD-10 mainly homes on radar emitters. The best way to use the ARM is to use the HSD page with the RWR (Radar Warning Receiver) and MAWS (Missile Approach Warning System) together to detect which radar emitters are actively tracking, which ones are locking you, what level of threat each emitter poses, and which one to target.

LD-10

SA6 SAM Site

2.8 – LD-10 ANTI-RADIATION MISSILE INTRODUCTION

The LD-10 is an ARM (Anti-Radiation Missile) that is intended to search and destroy radar emitters. It has three main operation modes:

ACT (Active) Mode
The active mode of the LD-10 requires you to designate a point as a Sensor Point of Interest (SPI) with any of your sensors like your radar, targeting pod, HUD or a waypoint. The missile will use this SPI as a reference point to search for radar emitters in this specific area. This mode is similar to the HaS (HARM-as-Sensor) mode of the HARM missile of a F-16.

PAS (Passive) Mode
If we launch a missile when multiple radar emitters are in the area, the LD-10 will choose by itself which emitter to track. This method is more or less "fire and forget" as means to clear areas from SAM threats. This mode is similar to the MAD DOG mode of the SD-10 active radar homing missile.

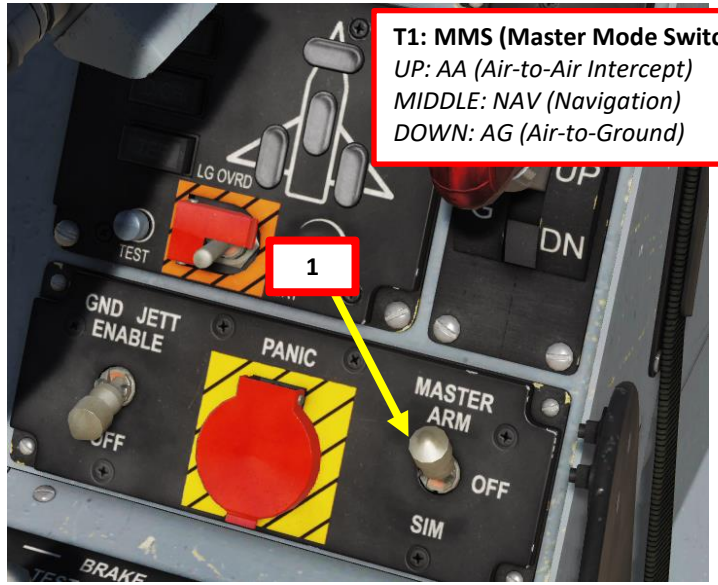
SP (Self-Protection Mode) Mode
If we launch a missile when we are locked by a radar emitter or the MAWS has detected a missile launch heading our way, the ARM will track this emitter.

The maximum range of this missile is about 40 nm. A higher launch altitude and airspeed means a better missile range.

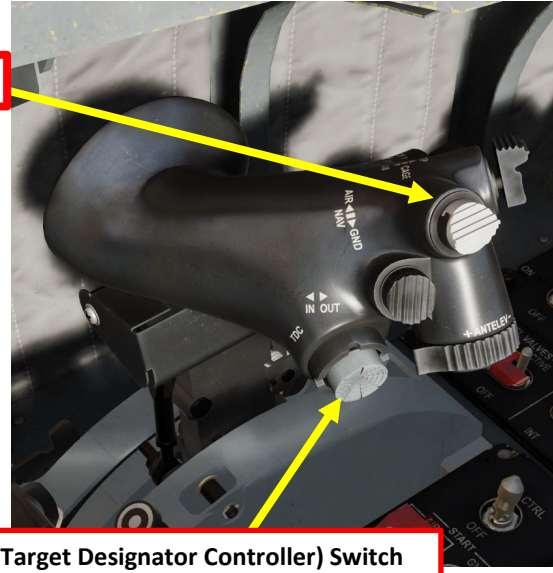
Flying at high altitudes greatly enhances the LD-10's range. However, the higher you are, the easier you are to find by enemy radars. Keep in mind that doing SEAD operations means that you will be locked by multiple radar stations and SAM sites can fire missiles on you or on your own ARM missiles. This means that your countermeasures programs must be ready at all times and you must often break away from the target once you have fired your weapon. A great way to do SEAD is to use terrain to mask your approach and fire your weapons at the last second before breaking off back your egress route.

2.8.1 – LD-10 ANTI-RADIATION MISSILE (ACT, Active)

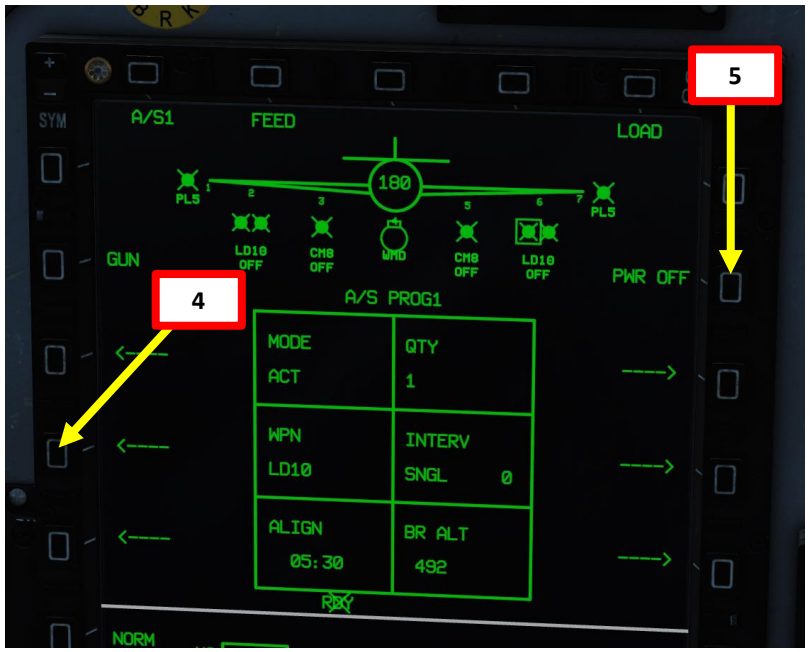
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select LD-10 Anti-Radiation Missile by pressing the OSB next to WPN, then select LD10.
5. Select the OSB next to PWR OFF to start the alignment sequence.
6. Once selected, the LD-10 needs about 3 minutes for alignment. It will go from 10 UNSTABLE, to 06 MARGINAL and finally 01 GOOD. When alignment is complete, the ALN TIMING indicator will go to 00:00.
7. Set Missile Mode to ACT (Active)
8. Set desired Quantity.



T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

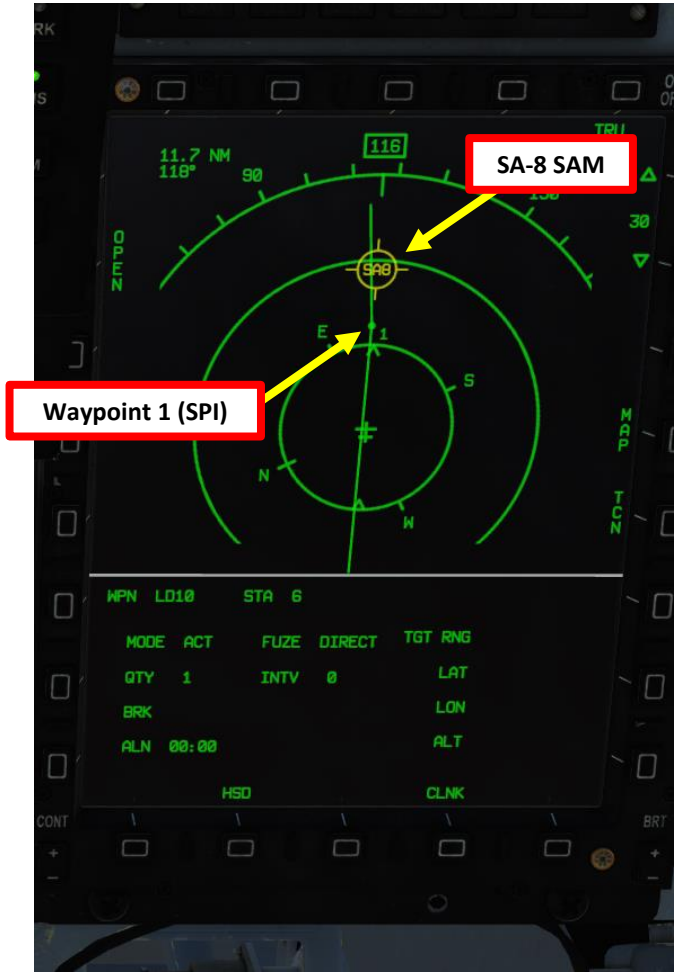


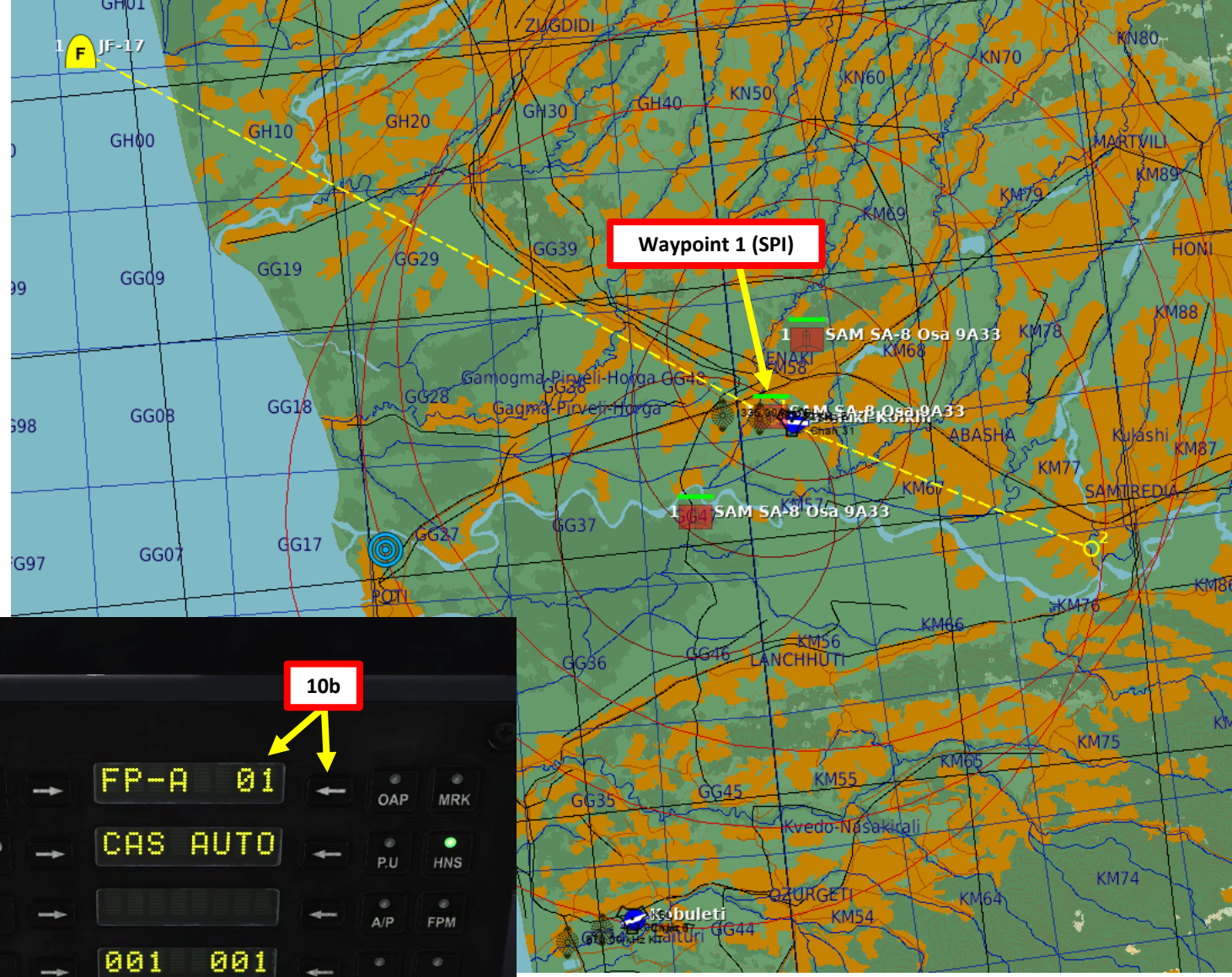
T5: TDC (Target Designator Controller) Switch



2.8.1 – LD-10 ANTI-RADIATION MISSILE (ACT, Active)

9. Set a SPI (Sensor Point of Interest) near the suspected area of a radar emitter. It can be a designation point from the HUD, from the Targeting Pod, from the Air-to-Ground radar, or from a waypoint. In our case we will use a waypoint.
10. Press RTN on the UFCP (returns to Main Menu), then select DEST Waypoint 01, which is located near the target. This will slave the missile sensor to the designated SPI on Waypoint 1.

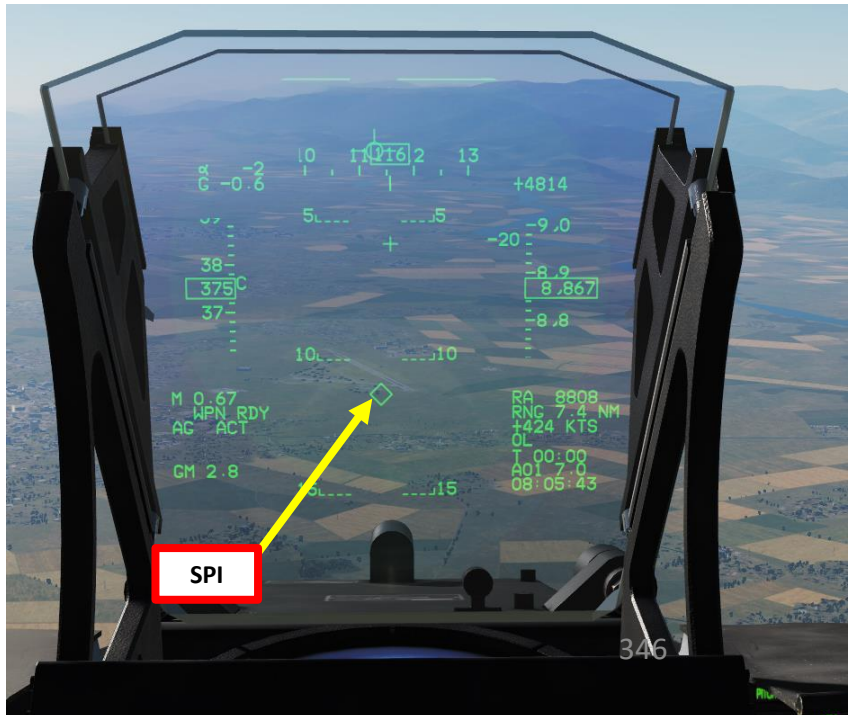




2.8.1 – LD-10 ANTI-RADIATION MISSILE (ACT, Active)

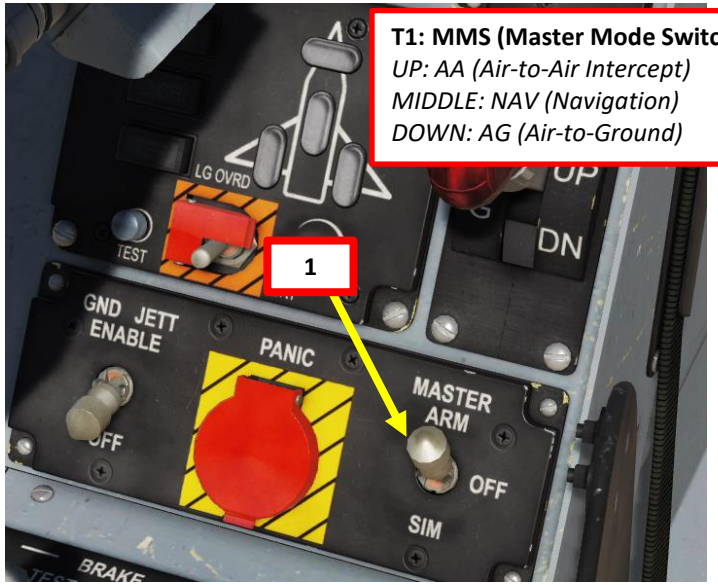
11. Fly the towards the designated SPI (Waypoint 1).
12. When within 20-40 nm, press the S3 Weapon Release Button (« RALT+SPACE ») and break away from SAM site.
13. The missile will use the SPI as a reference point to search for radar emitters in this specific area.

Note: you cannot select what emitter to fire on.

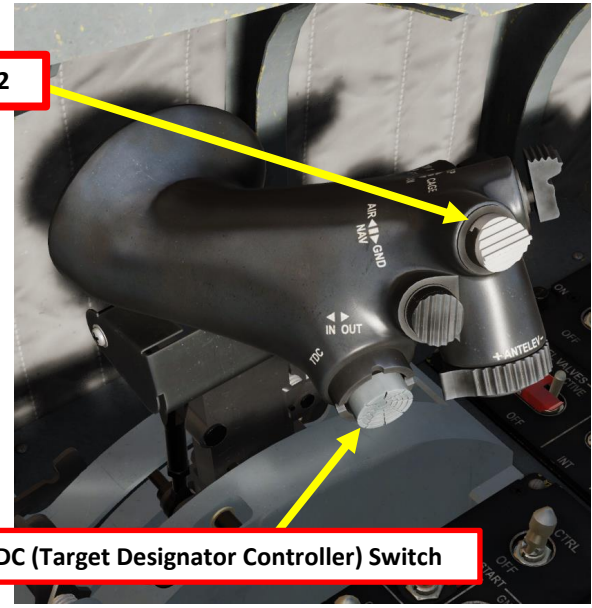


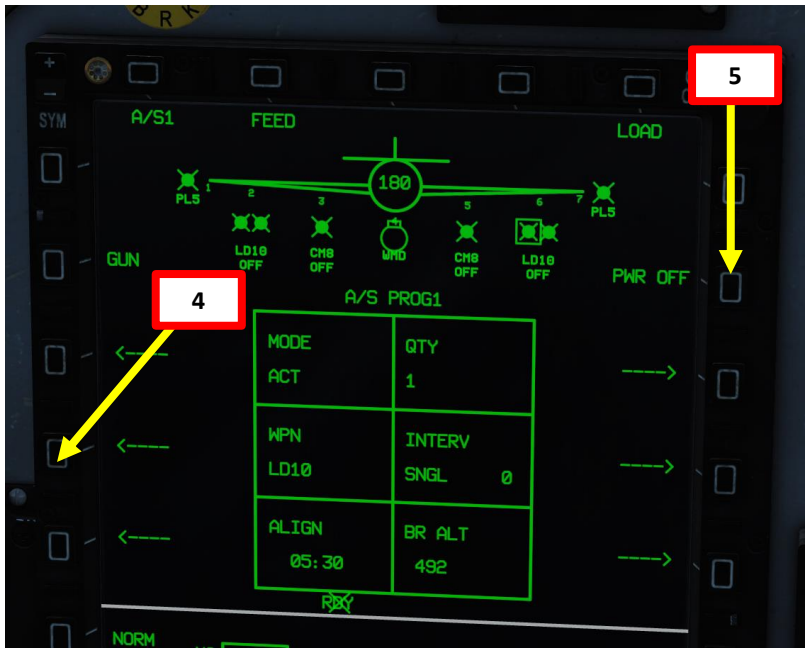
2.8.2 – LD-10 ANTI-RADIATION MISSILE (PAS, Passive)

1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select LD-10 Anti-Radiation Missile by pressing the OSB next to WPN, then select LD10.
5. Select the OSB next to PWR OFF to start the alignment sequence.
6. Once selected, the LD-10 needs about 3 minutes for alignment. It will go from 10 UNSTABLE, to 06 MARGINAL and finally 01 GOOD. When alignment is complete, the ALN TIMING indicator will go to 00:00.
7. Set Missile Mode to PAS (Passive)
8. Set desired Quantity.



T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)





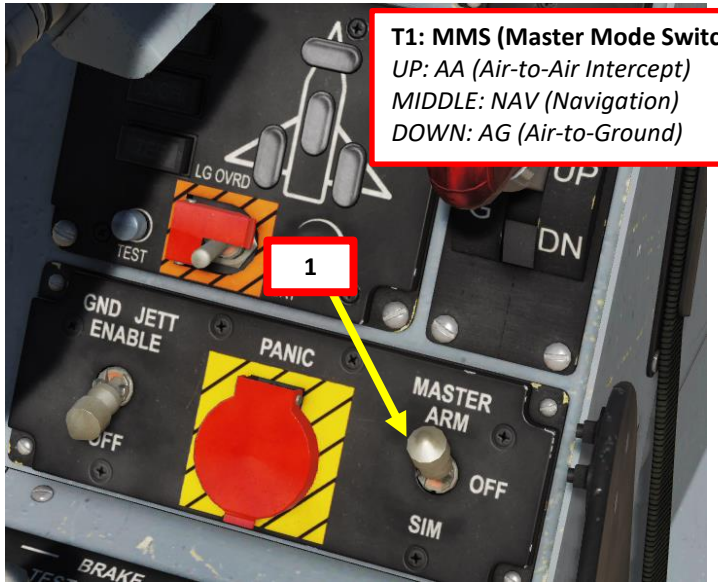
2.8.2 – LD-10 ANTI-RADIATION MISSILE (PAS, Passive)

9. Fly towards radar emitters spotted on the HSD (Horizontal Situation Indicator).
10. When within 20-40 nm, press the S3 Weapon Release Button (« RALT+SPACE ») and break away from SAM site.
11. LD-10 will choose by itself which emitter to track.

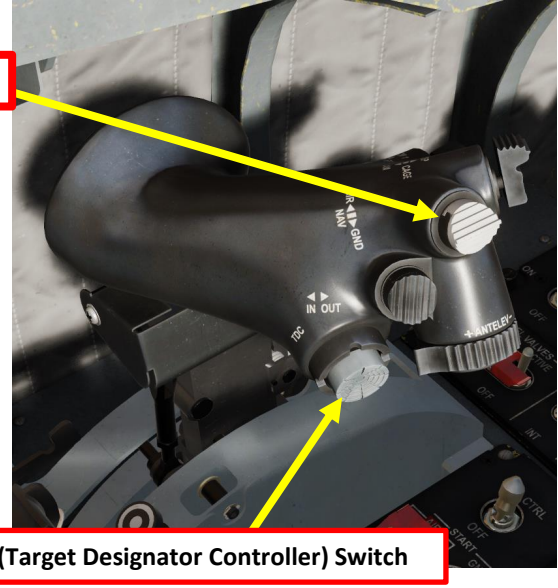
Note: you cannot select what emitter to fire on.

2.8.3 – LD-10 ANTI-RADIATION MISSILE (SP, Self-Protect)

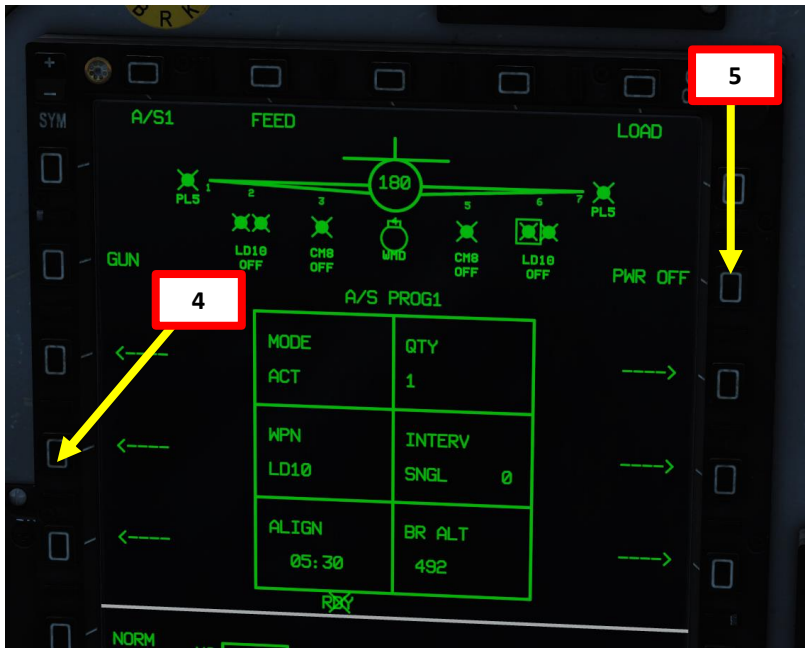
1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select LD-10 Anti-Radiation Missile by pressing the OSB next to WPN, then select LD10.
5. Select the OSB next to PWR OFF to start the alignment sequence.
6. Once selected, the LD-10 needs about 3 minutes for alignment. It will go from 10 UNSTABLE, to 06 MARGINAL and finally 01 GOOD. When alignment is complete, the ALN TIMING indicator will go to 00:00.
7. Set Missile Mode to SP (Self-Protect)
8. Set desired Quantity.

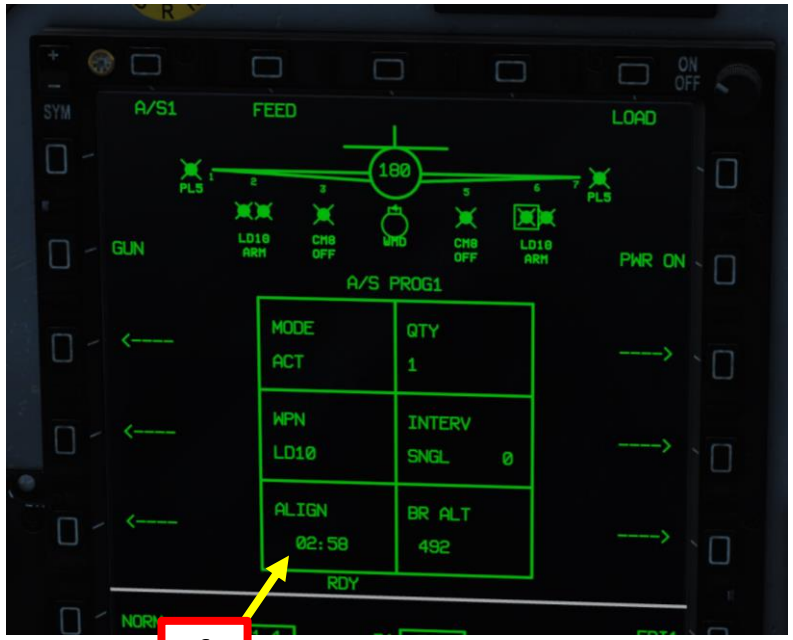


T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)



T5: TDC (Target Designator Controller) Switch





2.8.3 – LD-10 ANTI-RADIATION MISSILE (SP, Self-Protect)

9. Fly towards radar emitters spotted on the HSD (Horizontal Situation Indicator).
10. When you are locked by a radar or missile, press the S3 Weapon Release Button (« RALT+SPACE ») and break away from SAM site.
11. When the missile is launched, the ARM will track the radar emitter that is locking you.

Note: you cannot select what emitter to fire on.

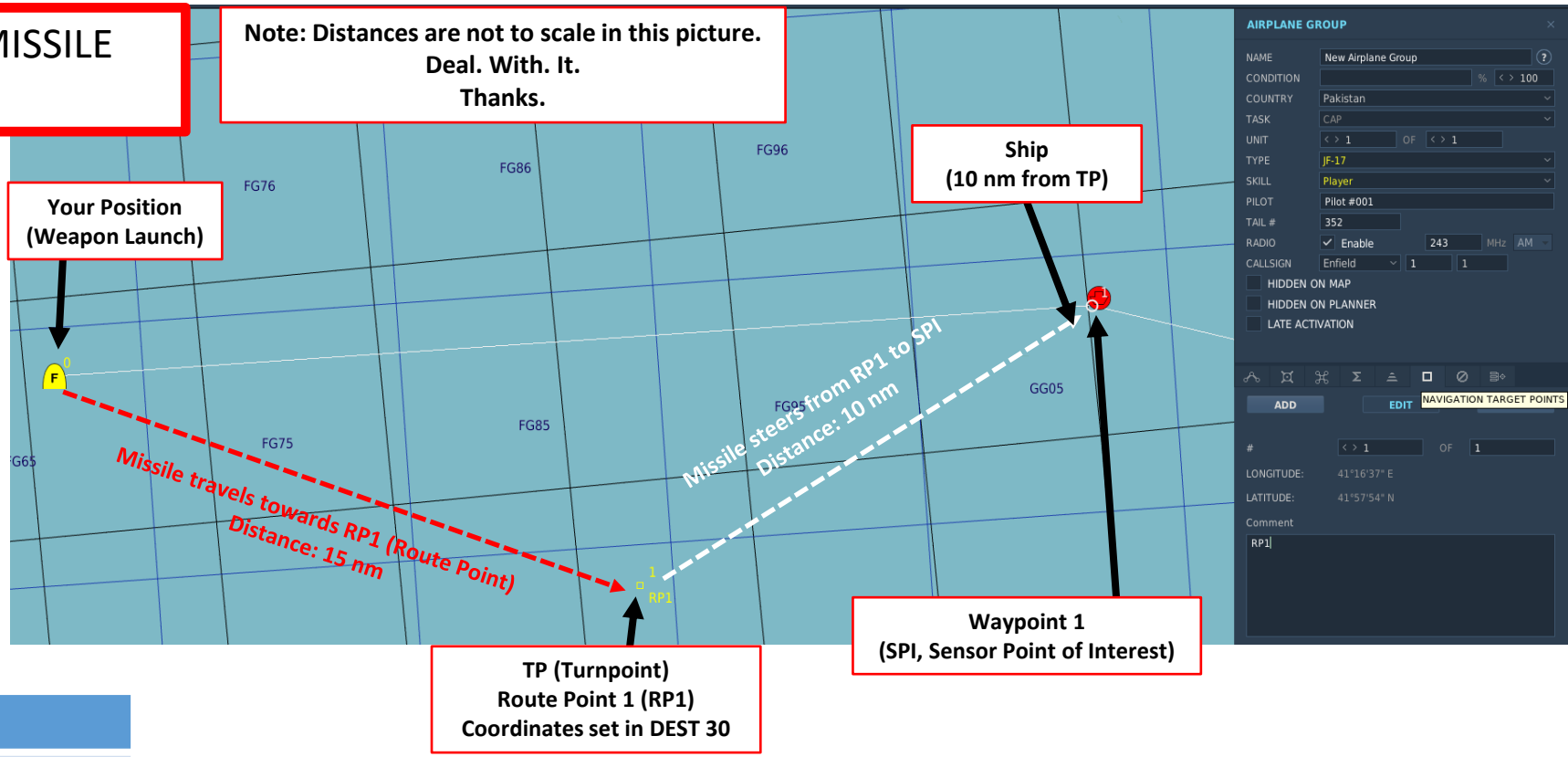
2.8.3 – LD-10 ANTI-RADIATION MISSILE (SP, Self-Protect)

2.9.1 – C-802AK ANTI-SHIP MISSILE (DIR, Direct)

DIRECT mode requires a **SPI** (Sensor Point of Interest) to be designated with the Air-to-Sea radar (or any other sensor). When launched, the missile will then fly towards this SPI.

If a **Turnpoint** (TP) is programmed in the missile, the missile will turn towards this point before looking for a ship in the SPI area. Turnpoint coordinates need to be entered in any of the DEST waypoints 30 to 35, also known as Route Points).

Turnpoints are by no means mandatory but do help in improving the odds of severely damaging a ship. For this tutorial, we will use one.



DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	**Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)**
36 to 39 (PP1 to PP4)	Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)
40	SPI (Sensor Point of Interest) Coordinates
41 to 49	Reserved for Markpoints
50 to 58	Reserved waypoints for airfields closest to last navigation waypoint (non-editable)
59	Reserved waypoint for airfield (editable)

C-802AK Missile Restrictions	
Allowable Launch Altitude	1600 ft to 24600 ft
Allowable Launch Speed	Less than Mach 0.9

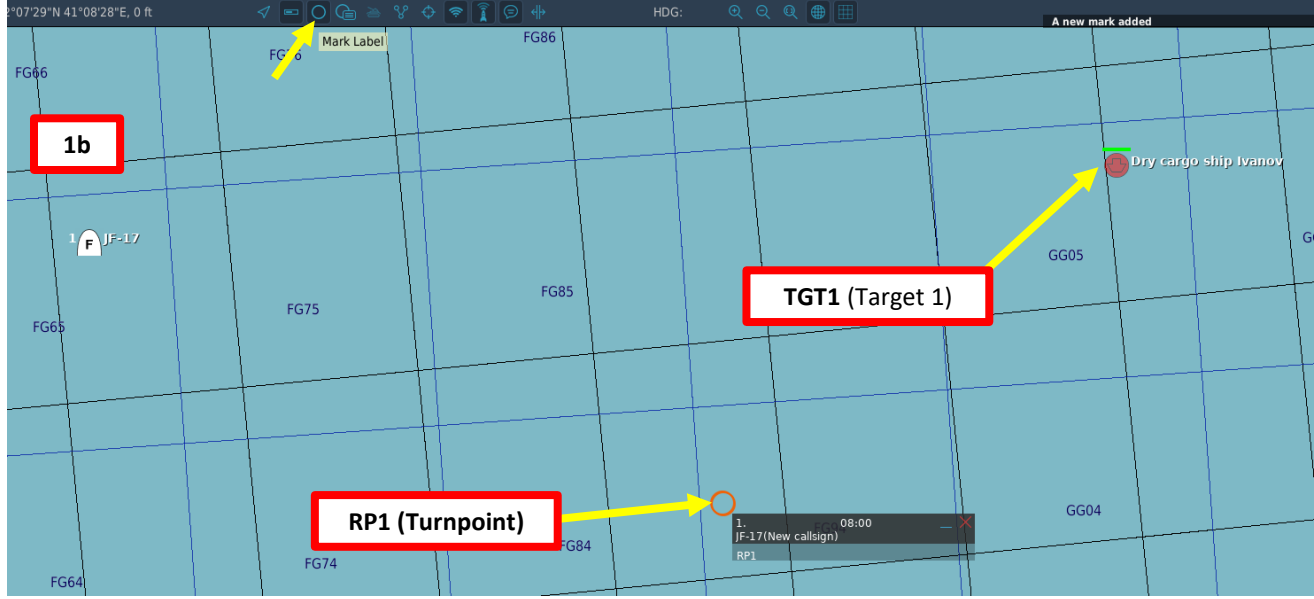
2.9.1 – C-802AK ANTI-SHIP MISSILE (DIR, Direct)

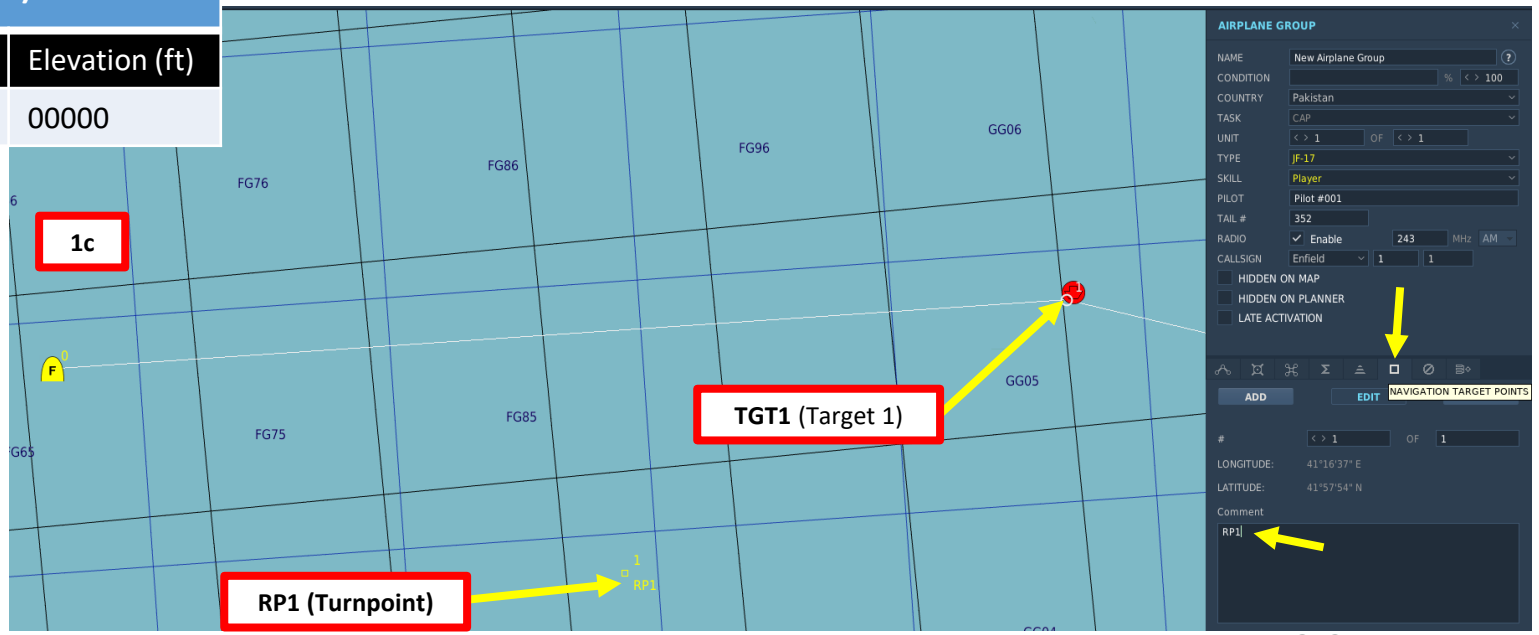
Set Turnpoint – Route Point 1 (if desired)

1. If we want to use a Turnpoint, we need to enter coordinates on DST Waypoint 30 for RP1 (Route Point). There are many ways to do it. You can either:
   a) Press DST button on the UFCP, select Waypoint 30, enter manually the Latitude, Longitude and Elevation coordinates on the UFCP as shown in the Navigation section.
   b) Or… Add a Marker on the target via the F10 map and name it "RP1". Then, ask the ground crew to update the DTC (Data Transfer Cartridge), then load the DTC into the aircraft as seen during the start-up procedure. This will automatically create Waypoint 30 (RP1) for you without having to enter coordinates manually.
   c) Or… Just load the DTC into the aircraft if the Mission Creator was kind enough to create a NAVIGATION TARGET POINT called "RP1" on the target.

Route Point (Deg Min Sec.Decimal-Seconds)

Route Point	DEST Point	Latitude	Longitude	Elevation (ft)
RP1	30	41 57 55.1 N	041 16 38.1 E	00000

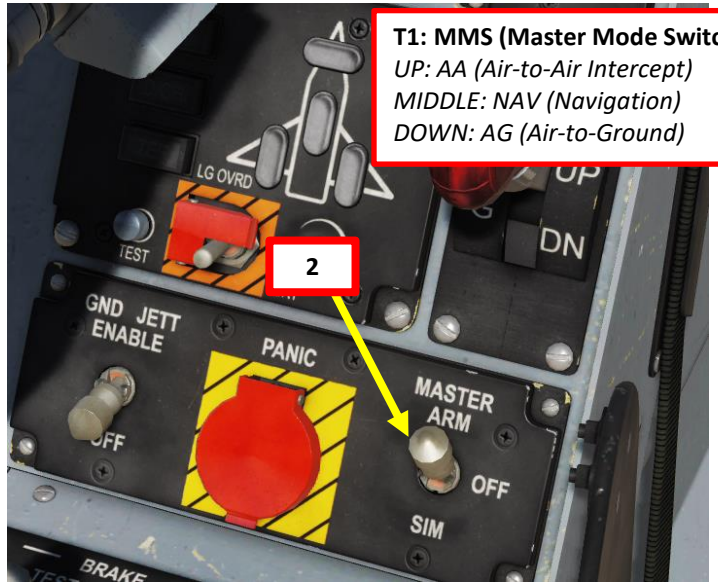




2.9.1 – C-802AK ANTI-SHIP MISSILE (DIR, Direct)

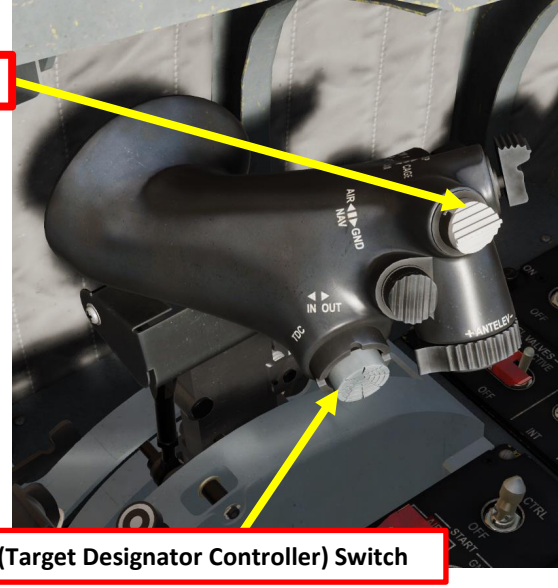
Set Up Weapon

2. Master Arm switch – ARM (UP)
3. Set Master Mode Switch – A/G (DOWN)
4. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
5. Select C-802AK missile by pressing the OSB next to WPN, then select 802.
6. Select the OSB next to PWR OFF to start the alignment sequence.
7. Set Mode to DIR (Direct)
8. Set Fuze (Direct/Delay), Quantity and Target Size as required.
9. Sea Condition (Skimming Altitude) is inoperative.
10. Once selected, the missile needs about 3 minutes for alignment. It will go from 10 UNSTABLE, to 06 MARGINAL and finally 01 GOOD. When alignment is complete, the ALN indicator will go to 00:00.

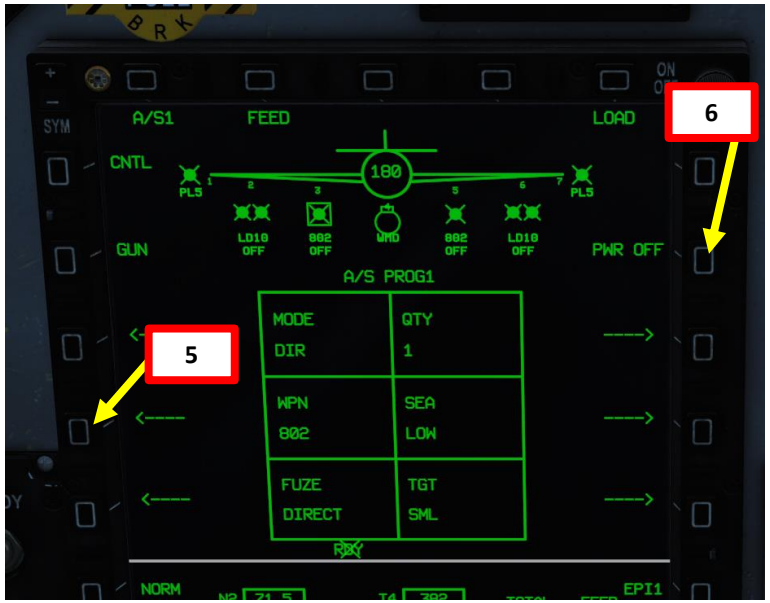


T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

3



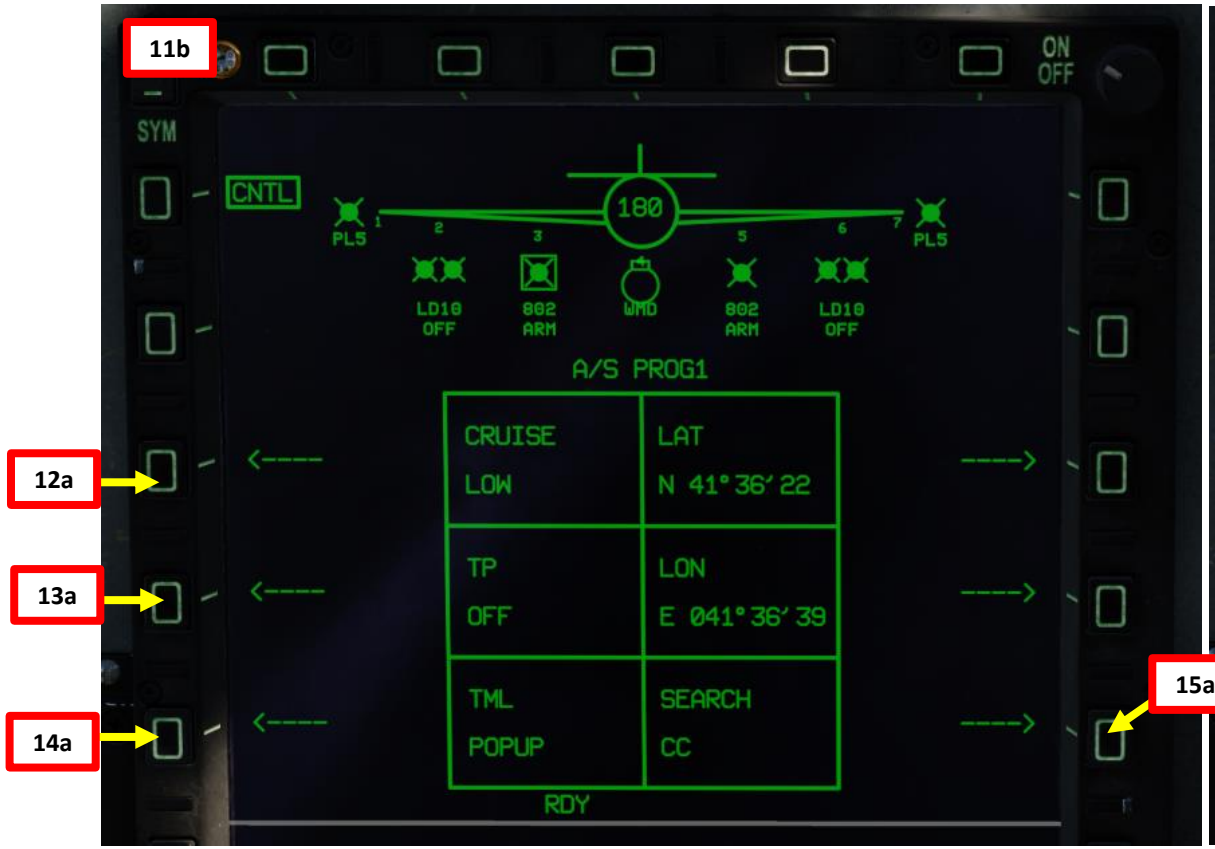
T5: TDC (Target Designator Controller) Switch

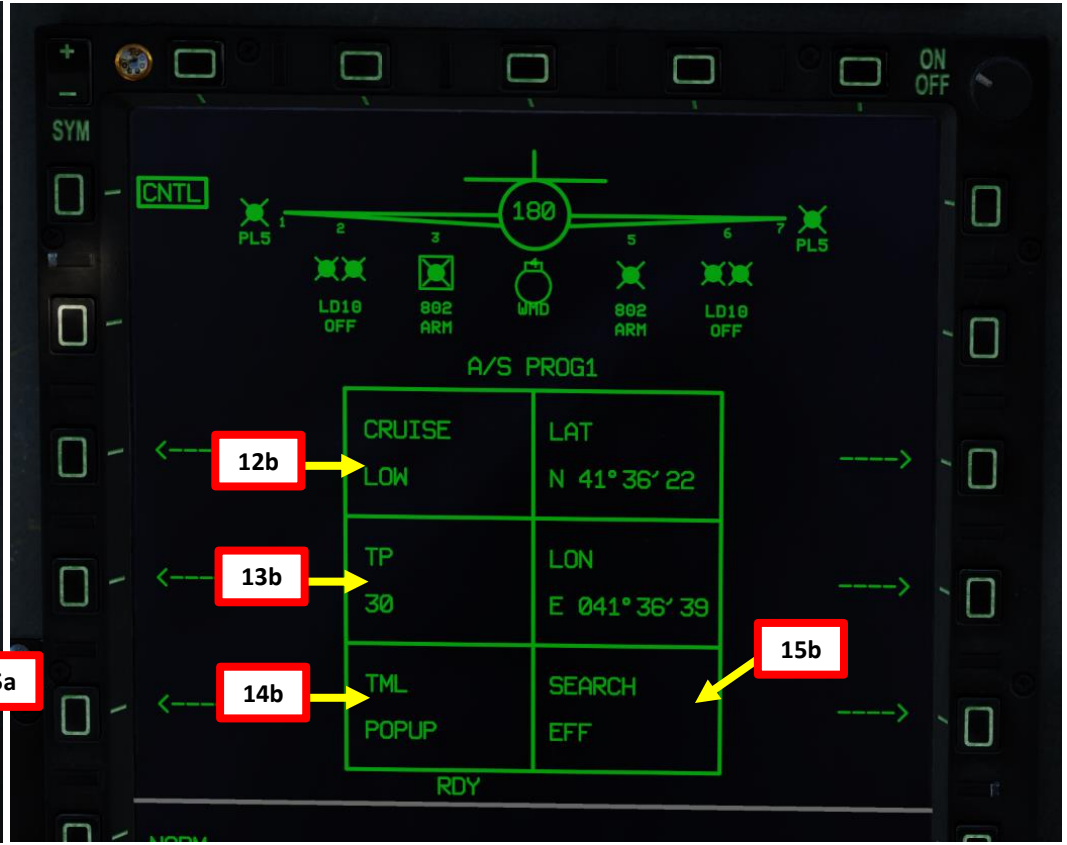


2.9.1 – C-802AK ANTI-SHIP MISSILE (DIR, Direct)

Set Up Weapon

11. Select the CNTL (Control) menu.
12. Select desired Missile Cruise Altitude (HIGH = 3500 m, MEDIUM = 1500 m, LOW = 50 m).
13. Press OSB next to TP (Turnpoint) to select which DEST waypoint is to be used as the Turnpoint. In our case, DEST waypoint 30 (Route Point RP1) will be used.
14. Select Final Attack Mode (POPUP or SKIM). We will choose POPUP.
15. Select desired Search Mode (EFF mode powers up the missile's radar seeker 10 seconds after launch, while CC mode powers up the missile's radar seeker when missile is 25 km away from the target).

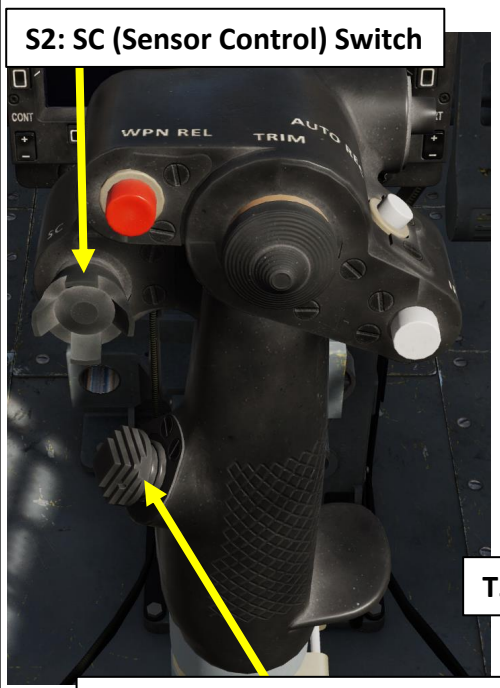


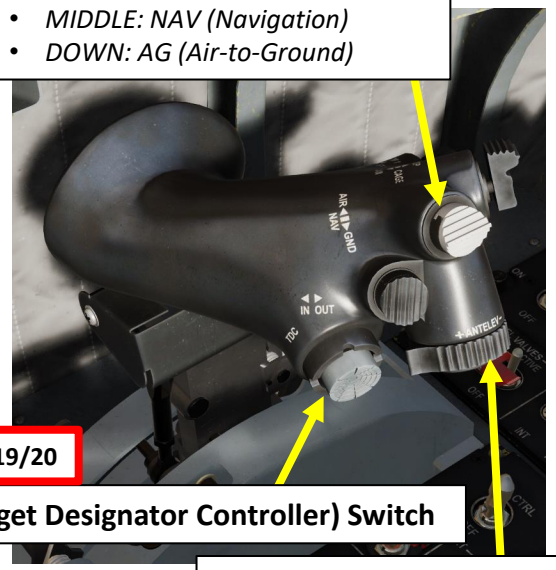


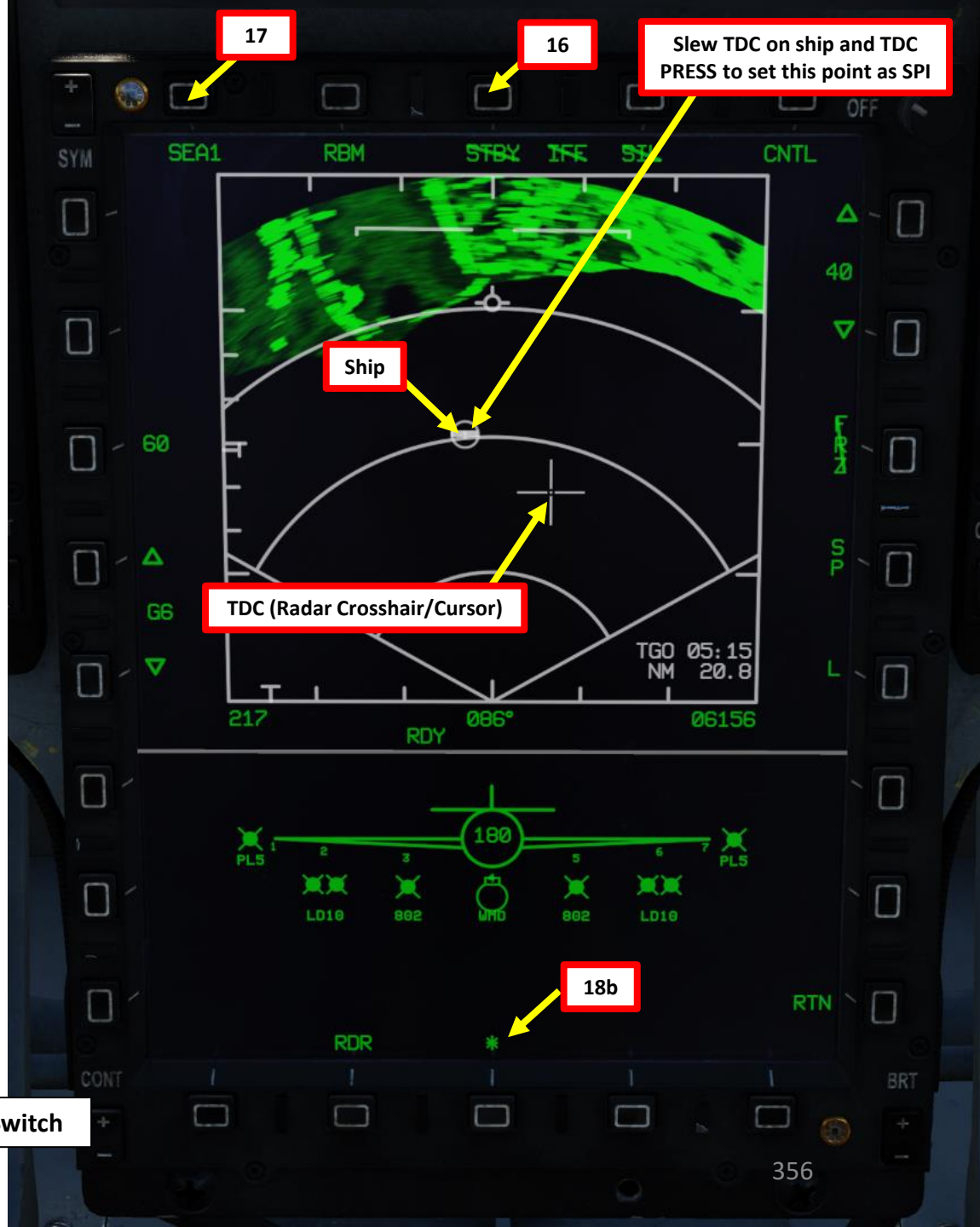
2.9.1 – C-802AK ANTI-SHIP MISSILE (DIR, Direct)

Designate SPI (Sensor Point of Interest)

16. Turn on radar by pressing the Radar STBY/ON button.
17. Select SEA1 mode.
18. Set radar page as a SOI (Sensor of Interest) by setting the S1 Sensor Selection Switch in the direction of the MFCD (AFT if RADAR page is on the center MFCD). An asterisk will indicate the SOI status.
19. Slew the TDC reticle on a target using the T5 TDC (Target Designator Controller) slew controls.
20. When TDC reticle is over a naval radar contact, use the T5 TDC PRESS button (ENTER) to designate the target as a SPI (Sensor Point of Interest).





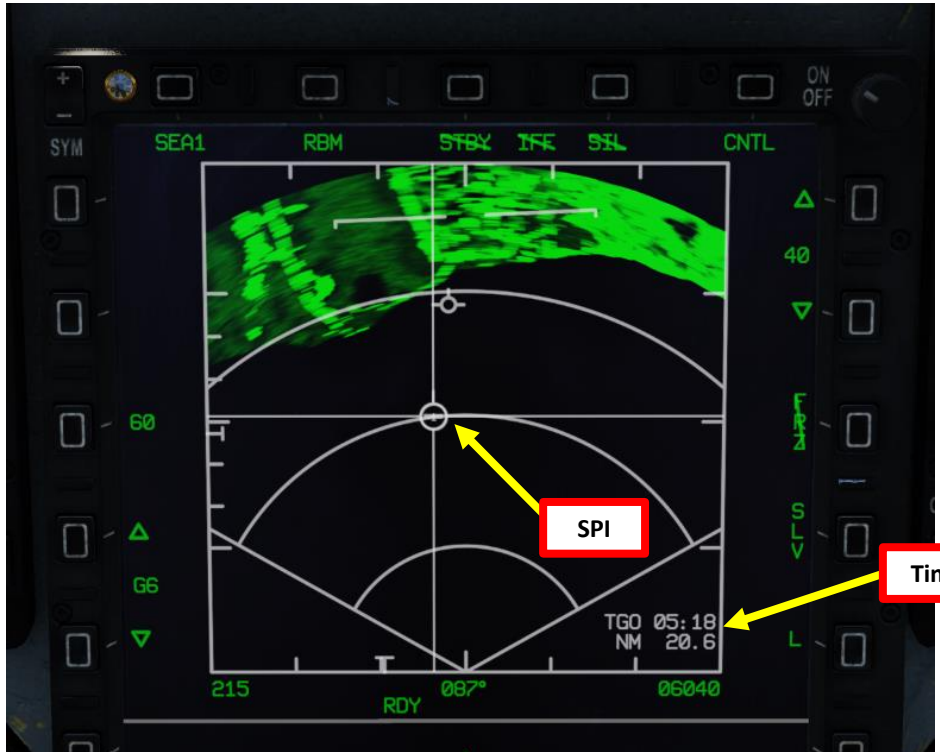


2.9.1 – C-802AK ANTI-SHIP MISSILE (DIR, Direct)

Launch Weapons

21. When lined up with the SPI (Sensor Point of Interest), press the S3 Weapon Release Button (« RALT+SPACE »). The missile will fly to the turnpoint (Route Point 1) first, then steer to the designated SPI, then track any ship in its path.

21 S3: Weapon Launch/Release Button



2.9.1 – C-802AK ANTI-SHIP MISSILE (DIR, Direct)

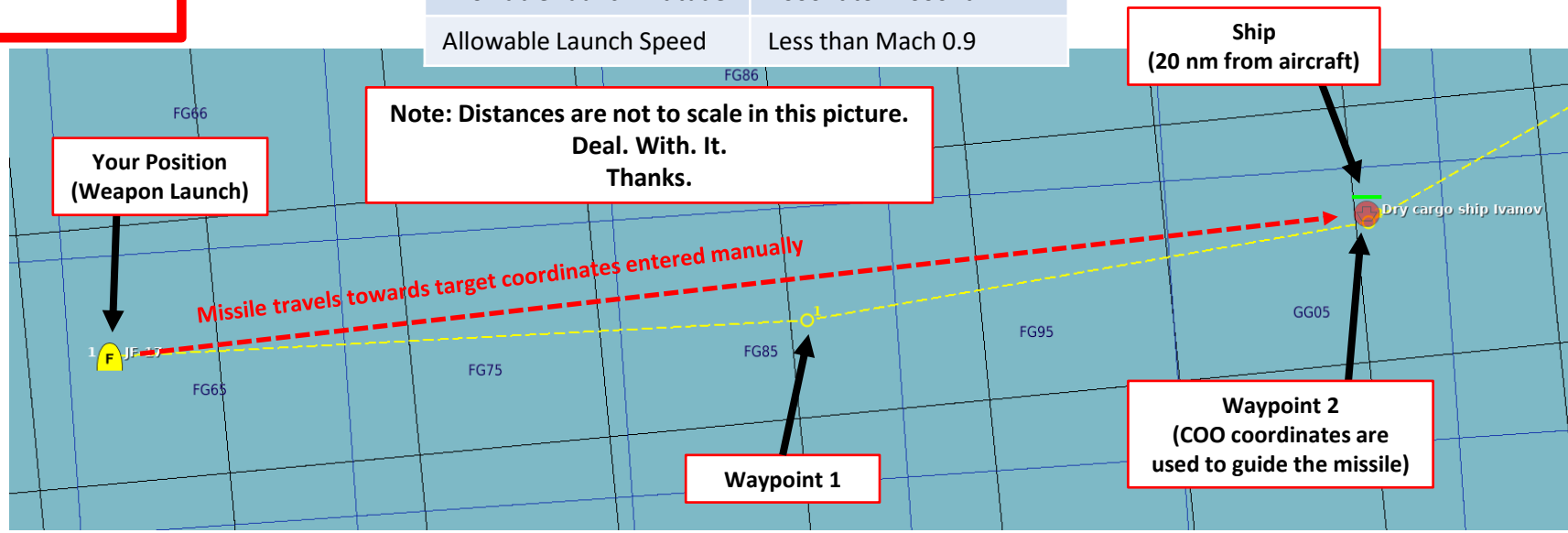
2.9.2 – C-802AK ANTI-SHIP MISSILE (COO, Coordinates)

C-802AK Missile Restrictions	
Allowable Launch Altitude	1600 ft to 24600 ft
Allowable Launch Speed	Less than Mach 0.9

COO mode requires a **coordinates** to be manually entered. When launched, the missile will then fly towards these coordinates.

If a **Turnpoint** (TP) is programmed in the missile, the missile will turn towards this point before looking for a ship in the SPI area. Turnpoint coordinates need to be entered in any of the DEST waypoints 30 to 35, also known as Route Points).

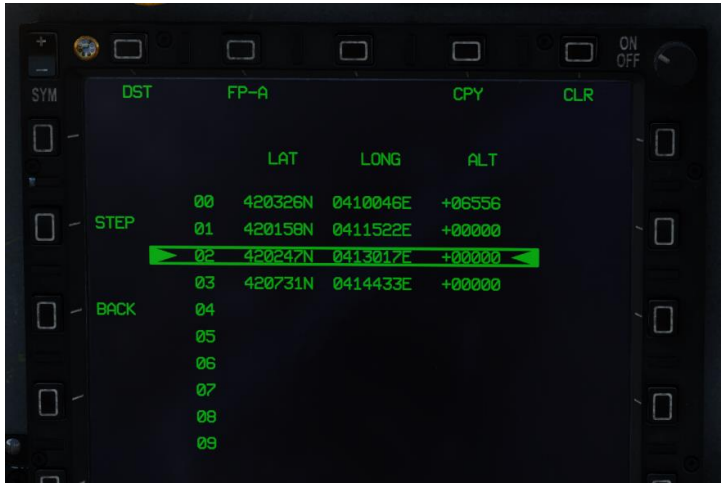
Turnpoints are by no means mandatory but do help in improving the odds of severely damaging a ship. For this tutorial, we will not use a turnpoint.



DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)
36 to 39 (PP1 to PP4)	Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)
40	SPI (Sensor Point of Interest) Coordinates
41 to 49	Reserved for Markpoints
50 to 58	Reserved waypoints for airfields closest to last navigation waypoint (non-editable)
59	Reserved waypoint for airfield (editable)

Route Point (Deg Min Sec.Decimal-Seconds)

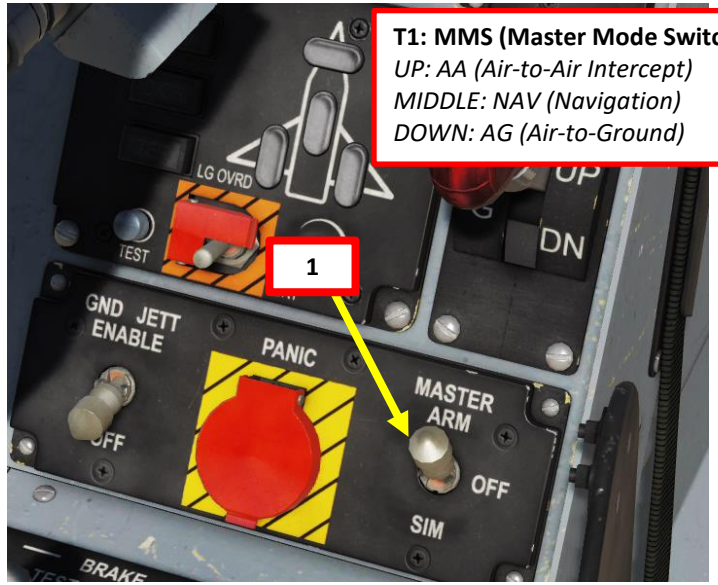
Target Point	DEST Point	Latitude	Longitude	Elevation (ft)
TGT1/ WP2	02	42 02 47.1 N	041 30 18.1 E	00000



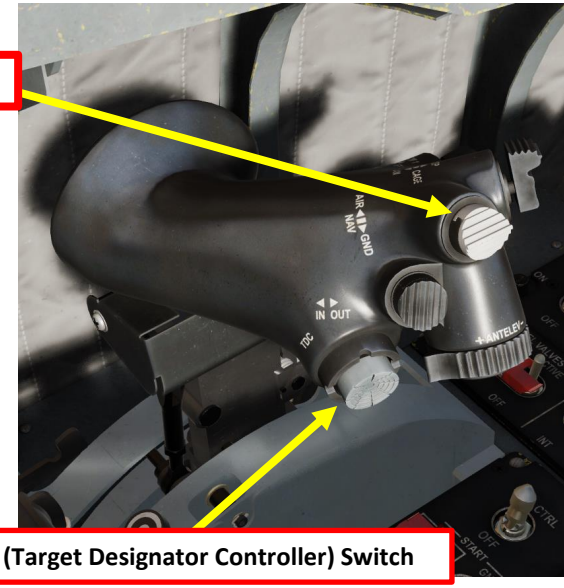
2.9.2 – C-802AK ANTI-SHIP MISSILE (COO, Coordinates)

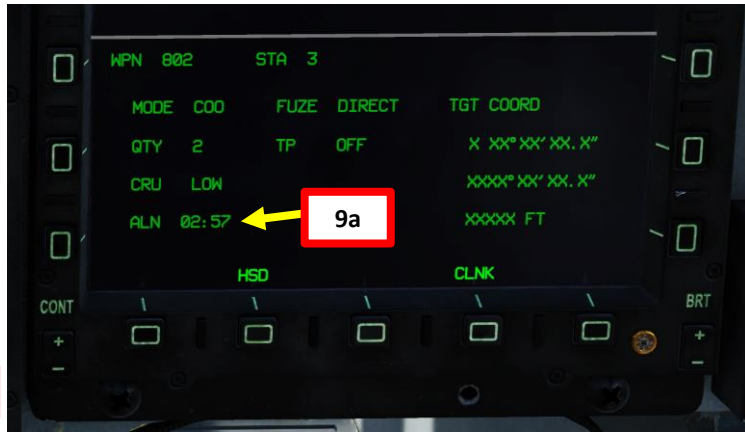
Set Up Weapon

1. Master Arm switch – ARM (UP)
2. Set Master Mode Switch – A/G (DOWN)
3. While in the air, go in SMS (Stores Management System) page. A/S1 represents the Air-to-Ground Weapon Profile No. 1, which we will modify.
4. Select C-802AK missile by pressing the OSB next to WPN, then select 802.
5. Select the OSB next to PWR OFF to start the alignment sequence.
6. Set Mode to COO (Coordinates)
7. Set Fuze (Direct/Delay), Quantity and Target Size as required.
8. Sea Condition (Skimming Altitude) is inoperative.
9. Once selected, the missile needs about 3 minutes for alignment. It will go from 10 UNSTABLE, to 06 MARGINAL and finally 01 GOOD. When alignment is complete, the ALN indicator will go to 00:00.



T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

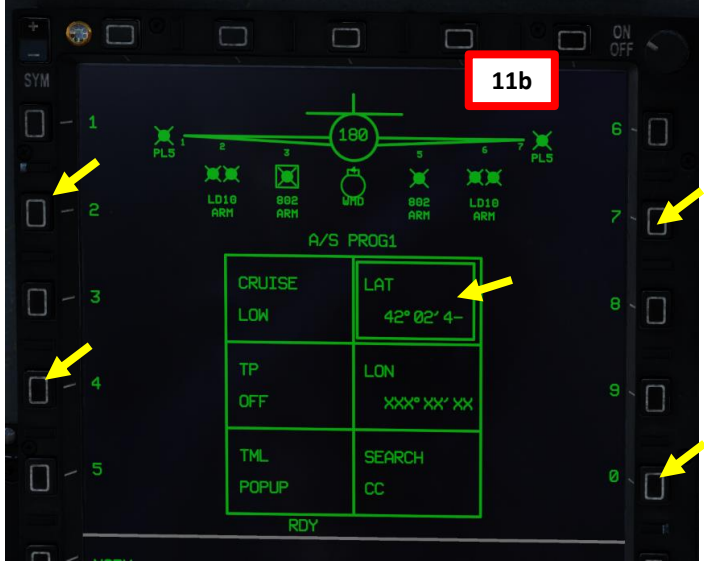




2.9.2 – C-802AK ANTI-SHIP MISSILE (COO, Coordinates)

Enter Target Coordinates & Set Up Weapon

10. Select the CNTL (Control) menu.
11. Select the LAT field and enter Latitude coordinates (420247).
12. Select the LON field and enter Longitude coordinates (0413018).
12. Select desired Missile Cruise Altitude (HIGH = 3500 m, MEDIUM = 1500 m, LOW = 50 m).
13. If desired, press OSB next to TP (Turnpoint) to select which DEST waypoint is to be used as the Turnpoint. In our case, we will leave it to OFF.
14. Select Final Attack Mode (POPUP or SKIM). We will choose SKIM.
15. Select desired Search Mode (EFF mode powers up the missile's radar seeker 10 seconds after launch, while CC mode powers up the missile's radar seeker when missile is 25 km away from the target).



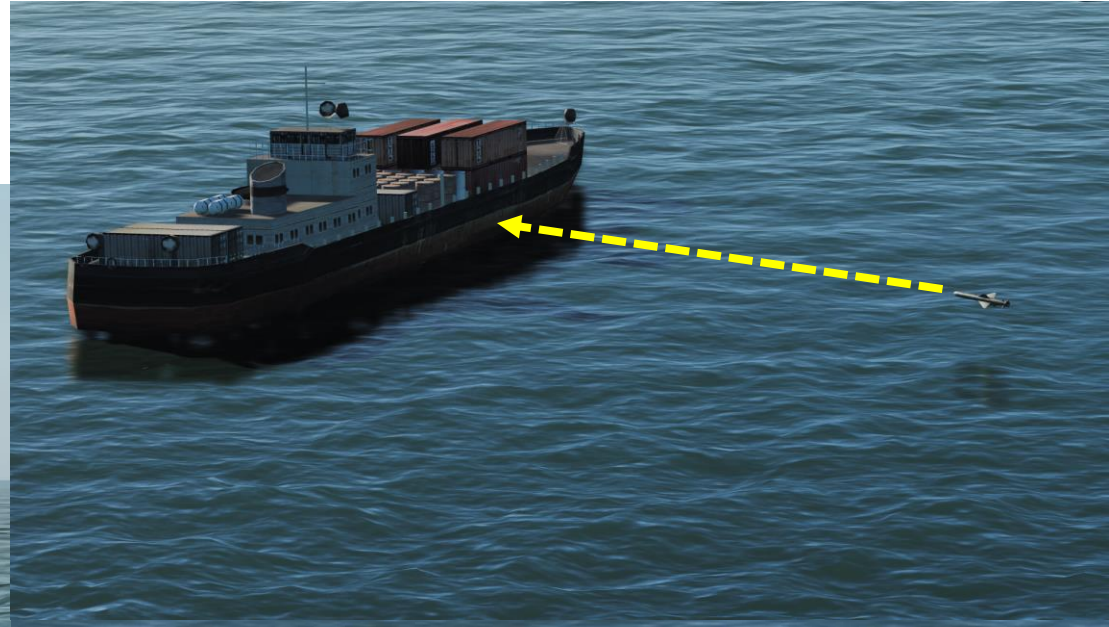
Route Point (Deg Min Sec.Decimal-Seconds)				
Target Point	DEST Point	Latitude	Longitude	Elevation (ft)
TGT1/ WP2	02	42 02 47.1 N	041 30 18.1 E	00000

2.9.2 – C-802AK ANTI-SHIP MISSILE (COO, Coordinates)

Launch Weapons

16. When lined up with the ship, press the S3 Weapon Release Button (« RALT+SPACE »). The missile will fly to the designated coordinates, then steer towards any ship in its path.

2.9.2 – C-802AK ANTI-SHIP MISSILE (COO, Coordinates)

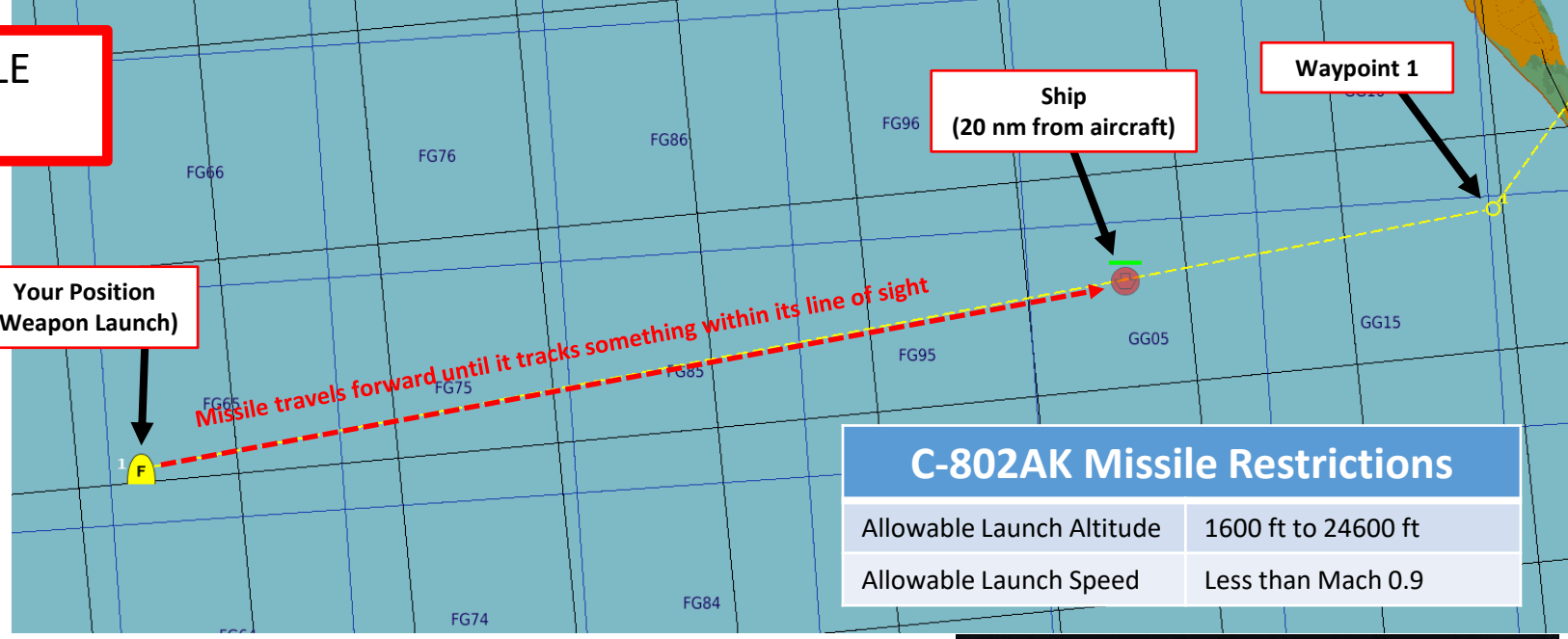


2.9.3 – C-802AK ANTI-SHIP MISSILE (LOS, Line-of-Sight)

LOS (Line of Sight) mode is the simplest but less reliable way to employ anti-ship missiles; when launched, the missile will keep going forward until it detects a ship within its line of sight, then track it.

Its employment is pretty much “fire and forget”. Spot a target with the air-to-sea radar, line up the aircraft with the ship, launch, then hope for the best.

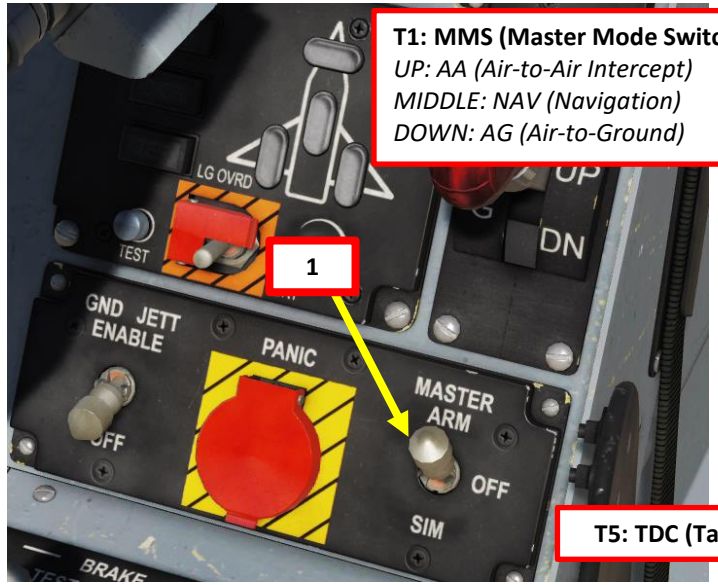
This mode is used almost exactly like the other modes, but it has less options to work with and cannot use Turnpoints.

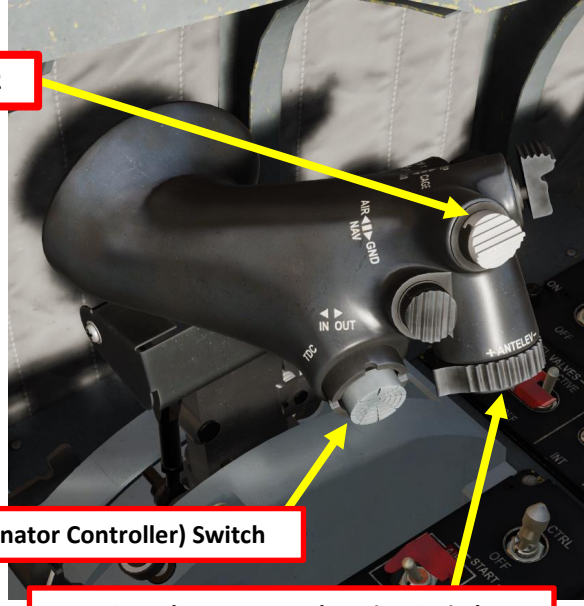


C-802AK Missile Restrictions	
Allowable Launch Altitude	1600 ft to 24600 ft
Allowable Launch Speed	Less than Mach 0.9

3.1 – PL-5EII INFRARED HOMING MISSILE

1. Set Master Arm Switch – ON (UP)
2. Set MMS (Master Mode Switch) to AA INTC. TWS is selected by default.
3. Press S8 Missile Type Selection switch until the PL-5EII missiles are selected. The missile will need a few seconds for warm-up (PL5 ON indication will blink during that warm-up period).
4. You can toggle between PL5 missiles by using the S5 Missile Step button.

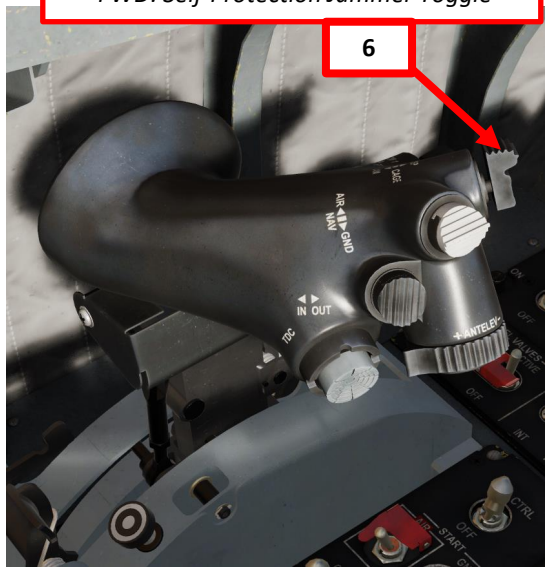




3.1 – PL-5EII INFRARED HOMING MISSILE

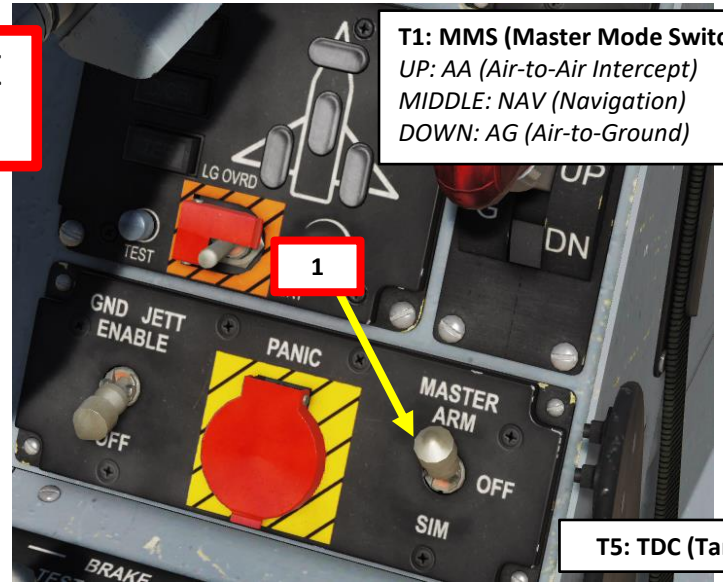
5. Missile should be actively looking for a lock on the closest heat signature.
6. Uncage the PL-5E missile with the T2 Countermeasure PRESS Switch. The binding is called « T2 Press ».
7. Fly to place the target inside the PL5 seeker circle until a high-pitched audio sound confirms that the missile's seeker has acquired a solid lock. The seeker circle will move over the target and keep it locked.
8. Press the S3 Weapon Release Button (« RALT+SPACE ») to launch missile.

T2: Countermeasure Switch
- *AFT: Chaff/Flare Dispense*
- *PRESS: Cage-Uncage Missile Seeker*
- *FWD: Self-Protection Jammer Toggle*

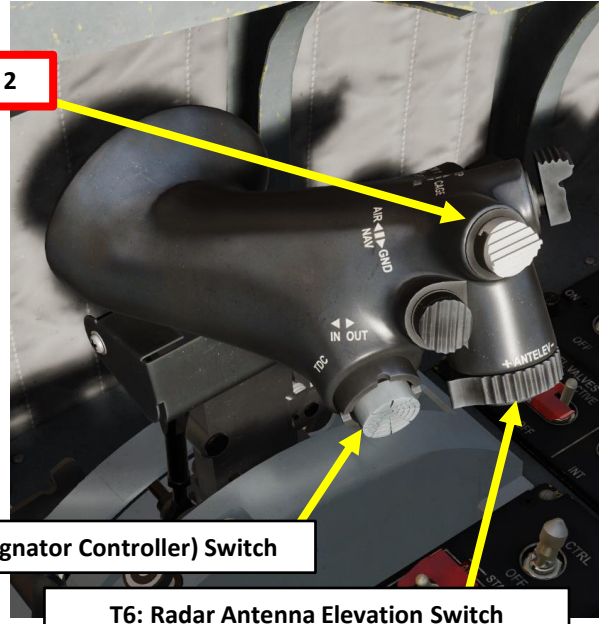


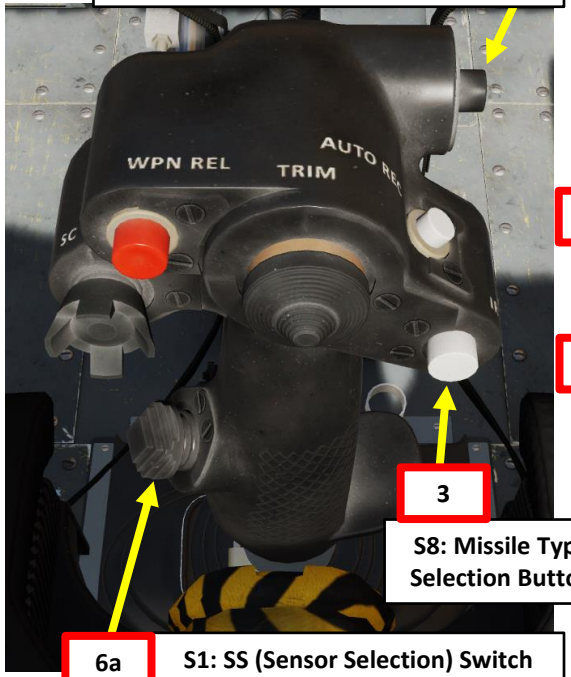
3.2.1 – SD-10 ACTIVE RADAR HOMING MISSILE (RADAR LOCK)

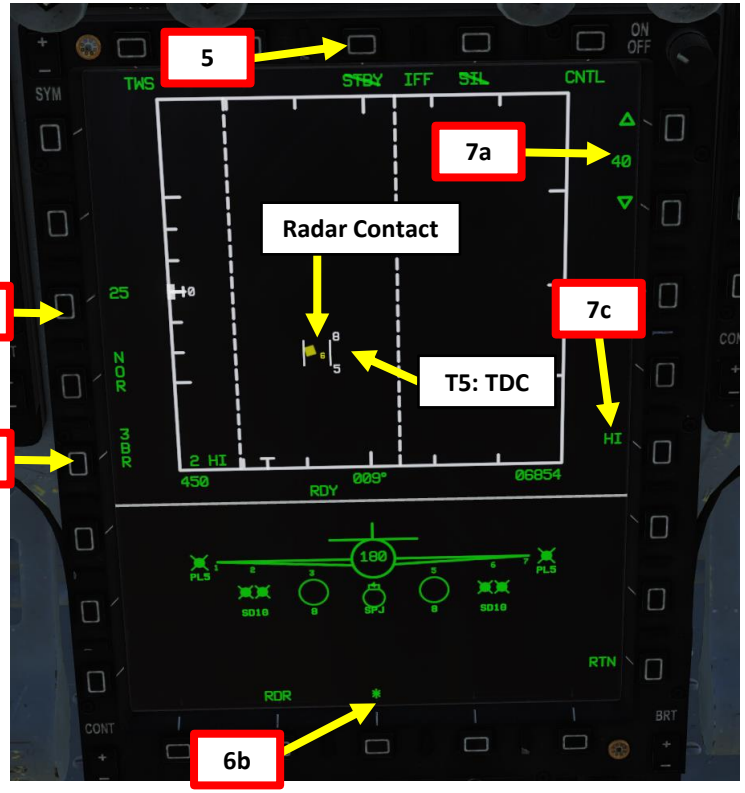
1. Set Master Arm Switch – ON (UP)
2. Set MMS (Master Mode Switch) to AA INTC. TWS is selected by default.
3. Press S8 Missile Type Selection switch until the SD10 missiles are selected. The missile will need a few seconds for warm-up (SD10 ON indication will blink during that warm-up period).
4. You can toggle between SD10 missiles by using the S5 Missile Step button.
5. Set radar mode from STANDBY to ON by pressing the Radar Standby/ON Selector.
6. Verify that Center MFCD is set as the Sensor of Interest (SOI). An asterisk will indicate the radar screen is the SOI. If another sensor/display is set as the SOI, press Sensor Select Switch AFT.
7. Set desired radar range scale (a, 40 nm), radar azimuth range (b, 25 deg) and radar Repetition Frequency (c, HI) and bar mode (d, 2 bars)



T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)





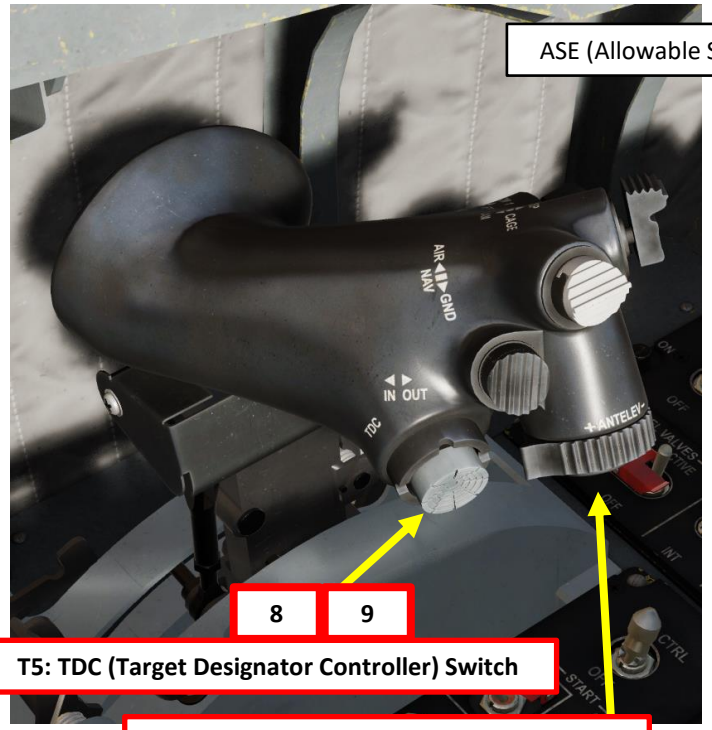


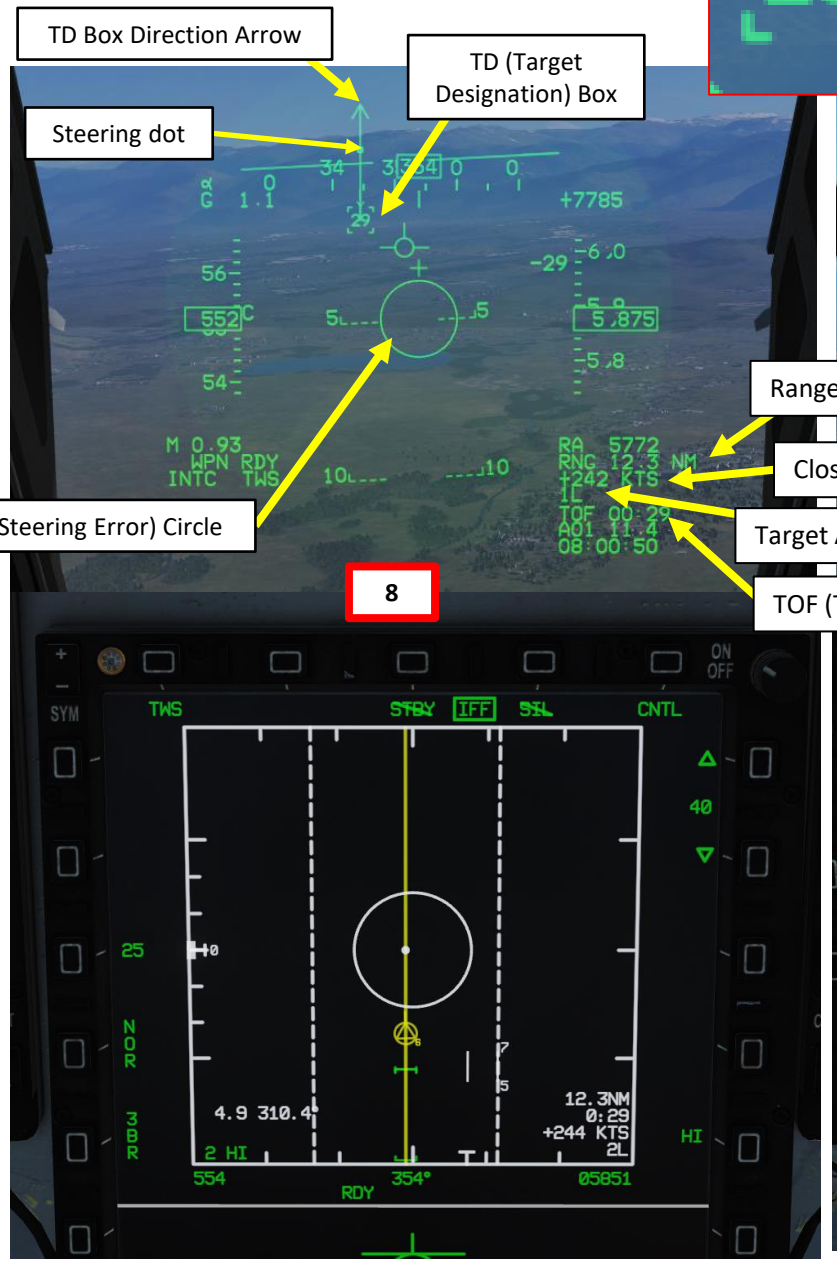
3.2.1 – SD-10 ACTIVE RADAR HOMING MISSILE (RADAR LOCK)

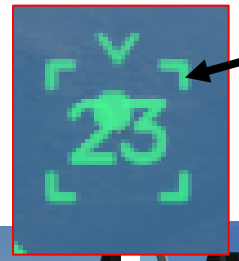
Take note that if the aircraft is connected to a datalink network, the radar scan cone and SD-10 missile range will be visible on the HSD (Horizontal Situation Display). We will talk about this further in the Datalink section.

3.2.1 – SD-10 ACTIVE RADAR HOMING MISSILE (RADAR LOCK)

8. Slew the **TDC (Target Designator Controller)** over a desired target and "bug" him by pressing the T5/TDC PRESS (ENTER). This is NOT a radar lock; you have merely set a target as the HPT (High Priority Target), which is represented as a circle. Other SPTs (Secondary Priority Targets) will be displayed as well without a circle.
9. If you press the TDC (ENTER) a second time, you will radar lock the desired target to STT (Single Target Track) mode.

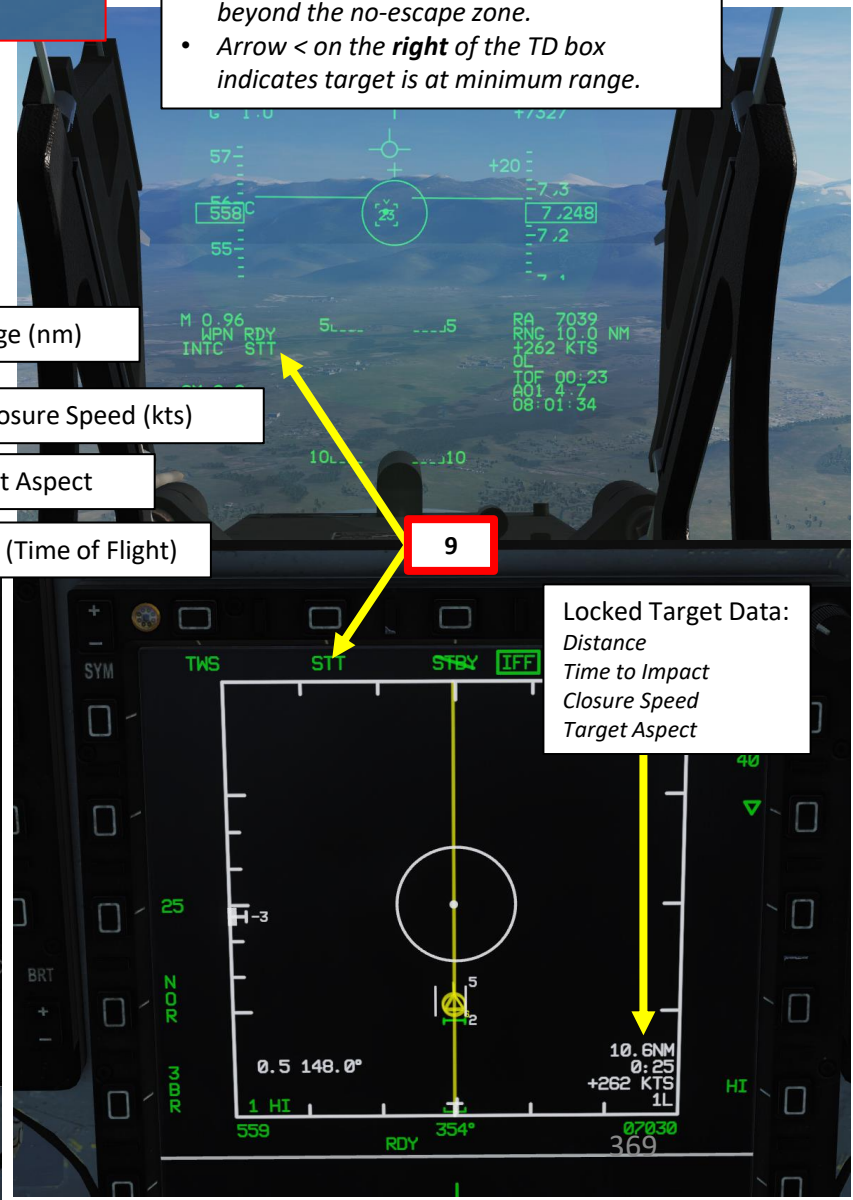






TD (Target Designation) Box

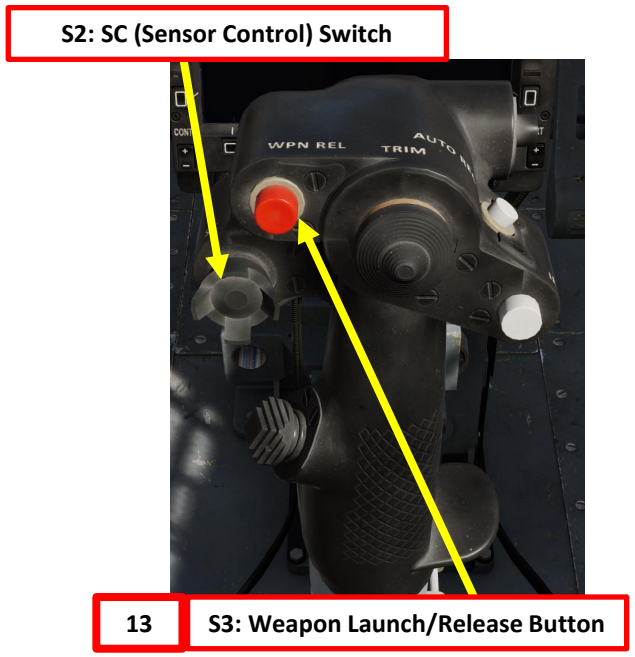
- *Arrow > on the **left** of the box indicates target is within max range.*
- *Arrow ^ **below** the box indicates target is within no-escape zone.*
- *Arrow v **above** the box indicates target is beyond the no-escape zone.*
- *Arrow < on the **right** of the TD box indicates target is at minimum range.*

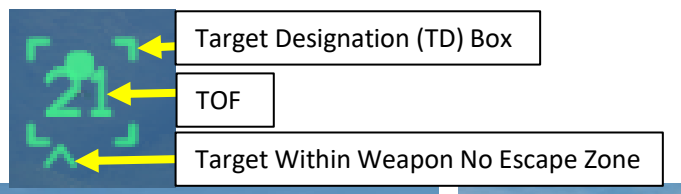


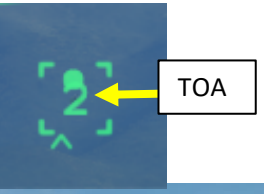
3.2.1 – SD-10 ACTIVE RADAR HOMING MISSILE (RADAR LOCK)

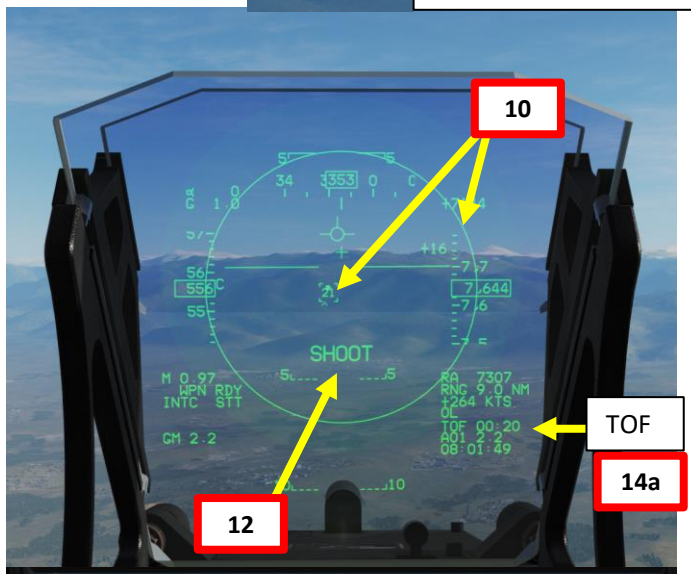
10. Fly to place target in ASE (Allowable Steering Error) circle on the HUD.
11. Fly to place the Steering Dot inside the ASE circle
12. When SHOOT cue appears on the HUD, the target will be within the No Escape Zone: you are in range to fire the missile.
13. Press the S3 Weapon Release Button (« RALT+SPACE ») to launch missile.
14. When missile is launched, the TOF (Time of Flight) indication indicating the total missile flight time to the target will then switch to TOA (Time of Activation), which represents the time remaining until the missile goes ACTIVE and starts using its own radar seeker.
15. When TOA reaches 0, missile will start using its own seeker to track the target. The missile will go active, or « pitbull », and attempt to track the target until impact.

Note: You can unlock target by using the S2 Sensor Control Switch DEPRESS.



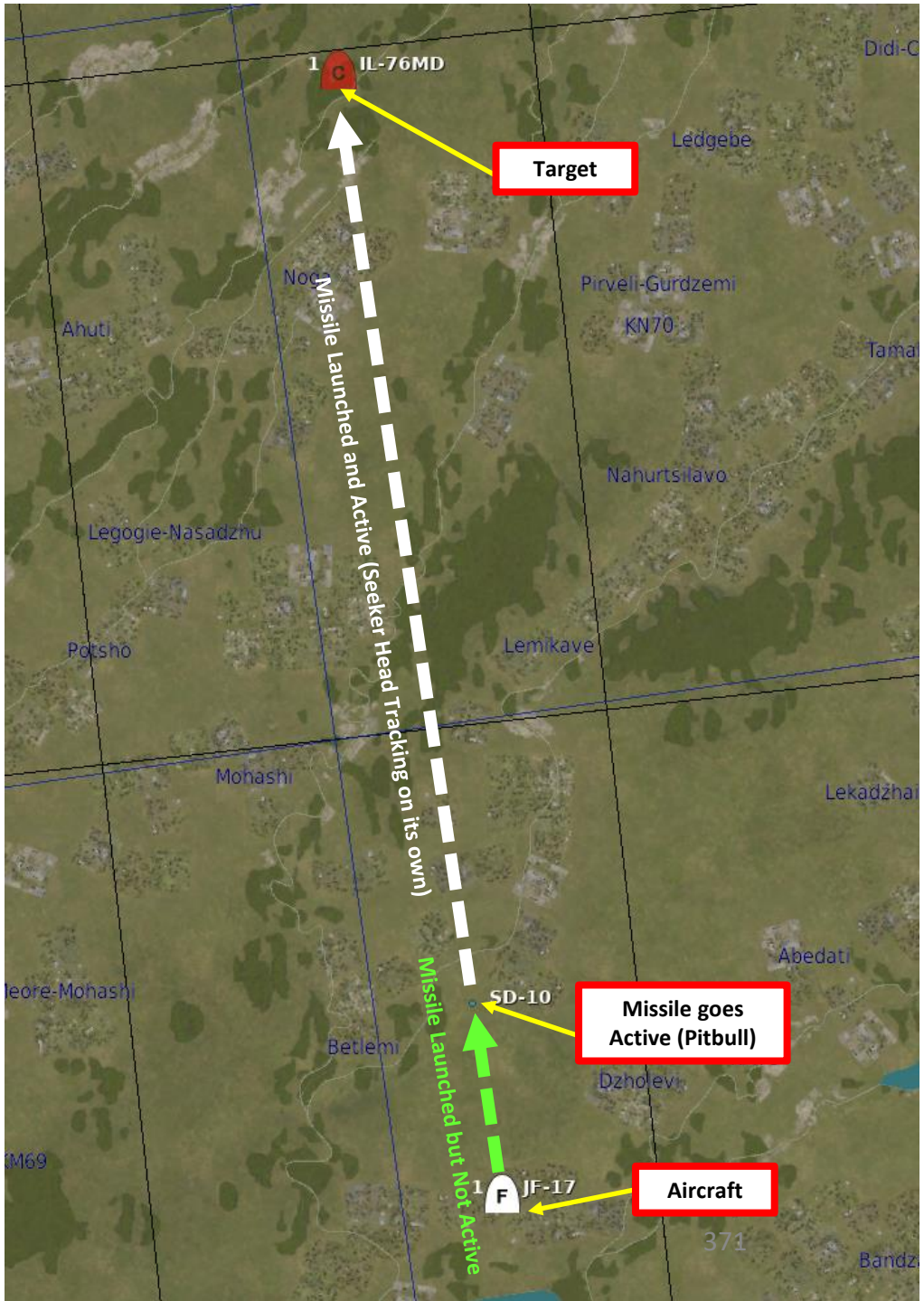






3.2.1 – SD-10 ACTIVE RADAR HOMING MISSILE (RADAR LOCK)

When you first fire a SD-10 missile, the missile is initially guided by your own radar. However, an « active radar homing missile » also has his own radar inside the seeker head. The moment the missile goes « active » (meaning it will start self-homing/tracking targets on his own instead of using your aircraft's radar) is called « Pitbull ». When the missile goes « Pitbull », the missile truly becomes fire-and-forget. NATO brevity word "Pitbull" would be called out on the radio to inform other pilots, just as "Fox Three" would be called out upon launch.



3.2.2 – SD-10 ACTIVE RADAR HOMING MISSILE (MAD DOG MODE)

When the SD-10 is selected and there is no radar lock yet, a large dashed circle will appear on the HUD if you bug a target using TWS. This circle is the seeker field of view if the missile is launched with no radar lock, which is termed a ***Mad Dog Launch***. A Mad Dog Launch will lock on to intercept the first target the missile seeker detects within the dashed circle area out to 10 miles.

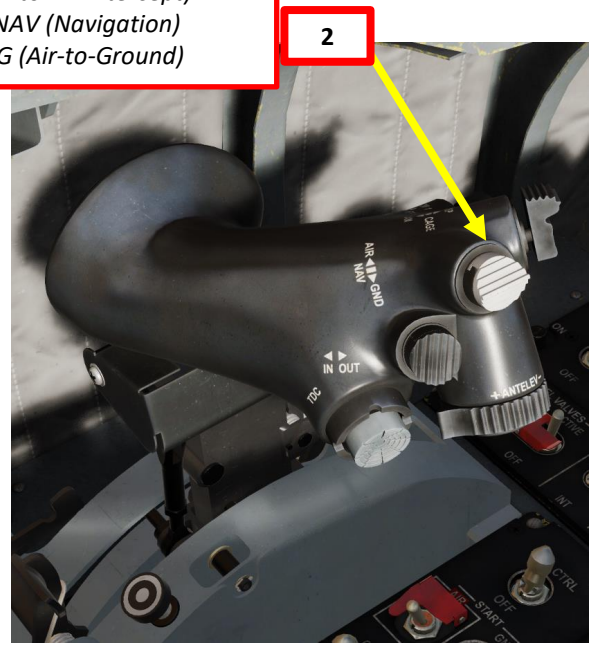
As an example, when using TWS mode, you have slewed the **TDC (Target Designator Controller)** over a desired target and "bugged" it by pressing the T5/TDC PRESS (ENTER). This is NOT a radar lock; you have merely set a target as the HPT (High Priority Target), which is represented as a circle. The Mad Dog Launch Field-of-View circle appears

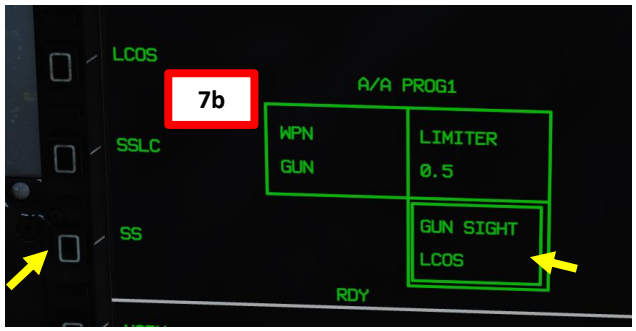
3.2.3 – SD-10 ACTIVE RADAR HOMING MISSILE (HOJ, HOME-ON-JAM MODE)

3.3.1 – GSH-23-2 CANNON (AIR-TO-AIR) (SS, SNAPSHOT SIGHT MODE)

1. Master Arm switch – ARM (UP)
2. Set MMS (Master Mode Switch) to AA INTC. TWS is selected by default.
3. Go in SMS (Stores Management System) page.
4. Select GSh-23 Gun by pressing the OSB next to GUN. The weapon profile will automatically switch to the Air-to-Air Gun Profile.
5. Select ACM Mode by pressing the S1 Sensor Selection Switch FWD.
6. Select Gun Burst Time Limiter by pressing the OSB next to LIMITER, then select desired burst duration (i.e. 0.5 sec).
7. Select Gunsight Type (SS) by pressing the OSB next to GUN SIGHT, then select SS mode.
8. Click on the FEED OSB to reload the gun. A box indication on FEED will blink for a few seconds, then disappear once the gun is loaded and ready to be fired. The FEED function can be used if the gun jams, but it can only be used up to three times. After a third attempt, the system won't respond and FEED will keep blinking.

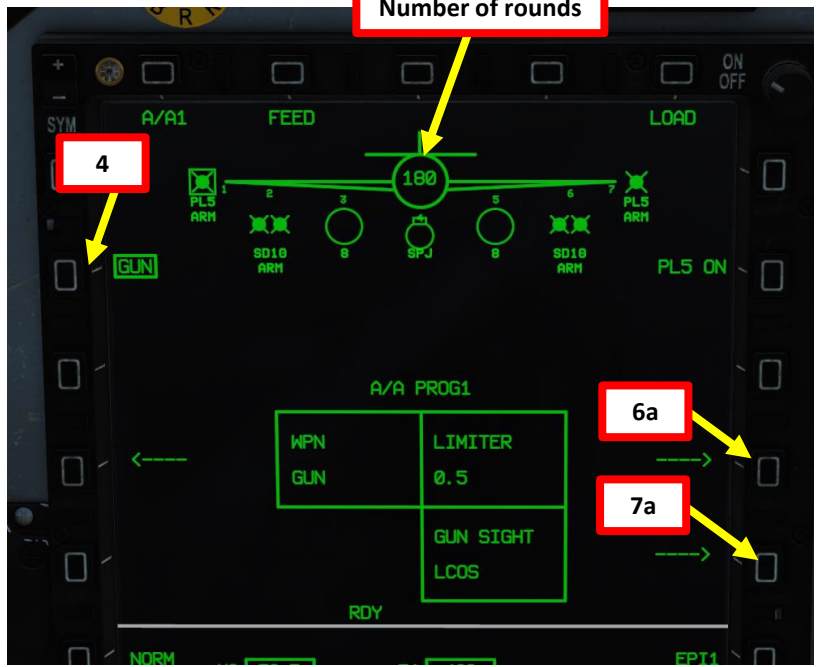
T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)





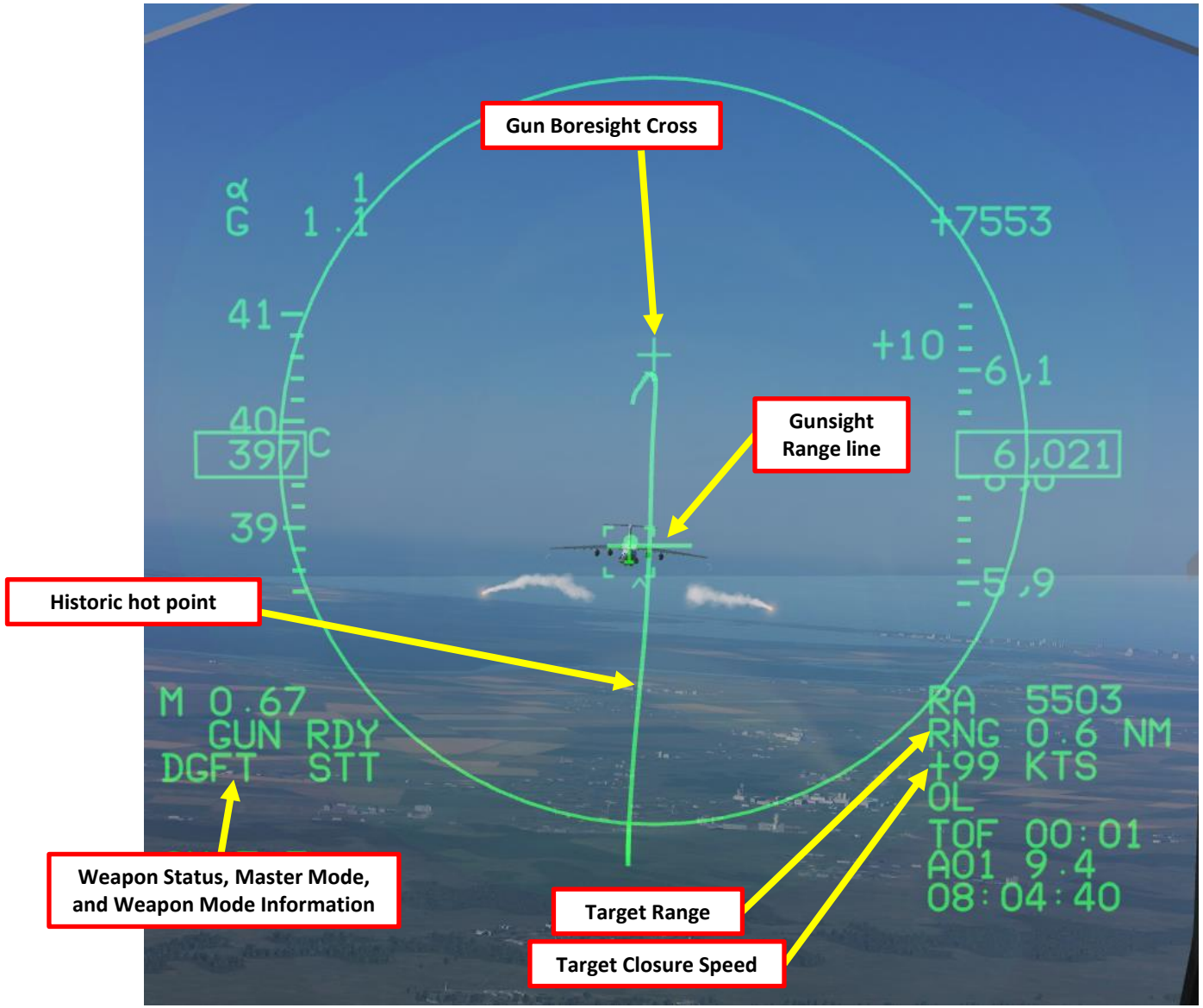
The cannon uses a "pyrotechnical" reload system, which means that a cassette equipped with a pyrocartridge will detonate a charge to "reload" the gun.

S1: SS (Sensor Selection) Switch



3.3.1 – GSH-23-2 CANNON (AIR-TO-AIR) (SS, SNAPSHOT SIGHT MODE)

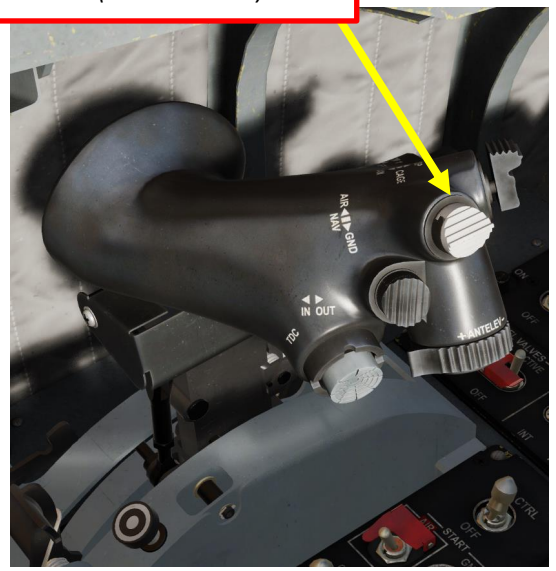
9. Acquire a radar lock on the target with ACM Mode.
10. Align gunsight range line on target.
11. Press and hold the S4 Gun Trigger (« SPACE ») to fire the gun

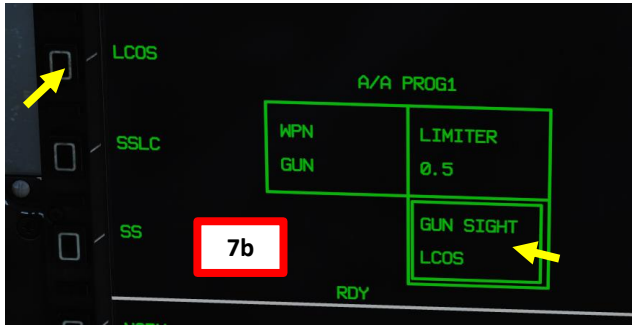


3.3.2 – GSH-23-2 CANNON (AIR-TO-AIR) (LCOS, LEAD COMPUTING OPTICAL SIGHT MODE)

1. Master Arm switch – ARM (UP)
2. Set MMS (Master Mode Switch) to AA INTC. TWS is selected by default.
3. Go in SMS (Stores Management System) page.
4. Select GSh-23 Gun by pressing the OSB next to GUN. The weapon profile will automatically switch to the Air-to-Air Gun Profile.
5. Select ACM Mode by pressing the S1 Sensor Selection Switch FWD.
6. Select Gun Burst Time Limiter by pressing the OSB next to LIMITER, then select desired burst duration (i.e. 0.5 sec).
7. Select Gunsight Type (LCOS) by pressing the OSB next to GUN SIGHT, then select LCOS mode.
8. Click on the FEED OSB to reload the gun. A box indication on FEED will blink for a few seconds, then disappear once the gun is loaded and ready to be fired. The FEED function can be used if the gun jams, but it can only be used up to three times. After a third attempt, the system won't respond and FEED will keep blinking.

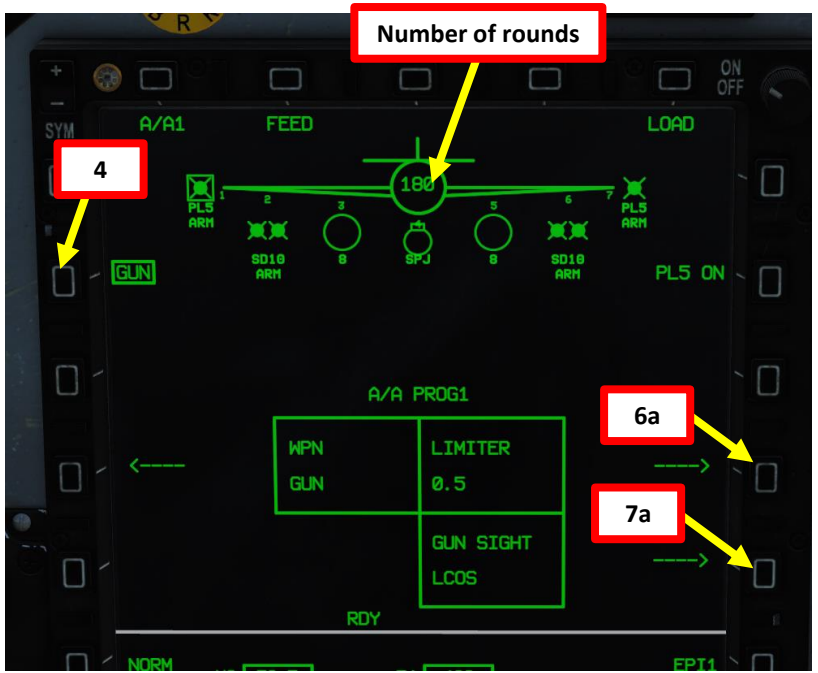
T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

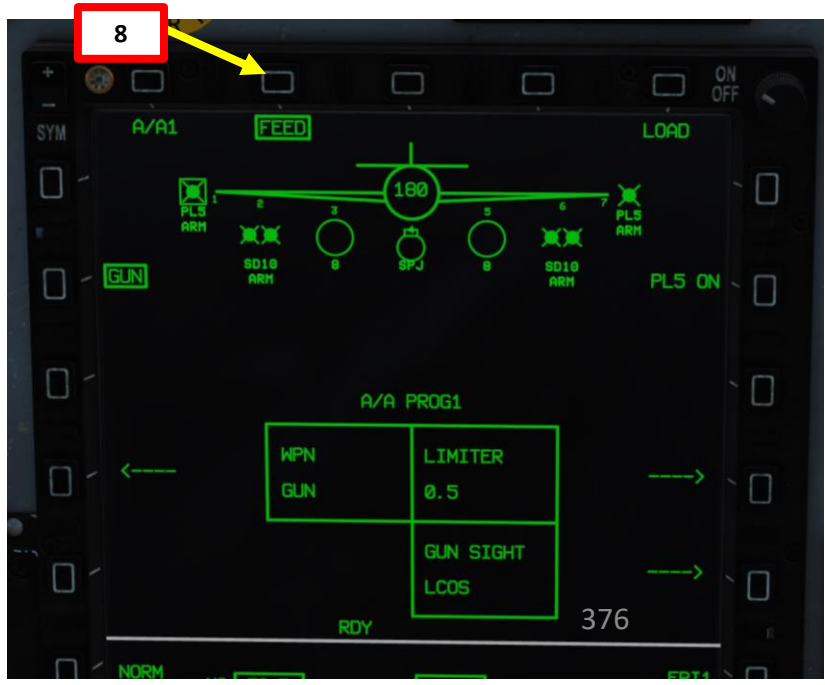




The cannon uses a "pyrotechnical" reload system, which means that a cassette equipped with a pyrocartridge will detonate a charge to "reload" the gun.

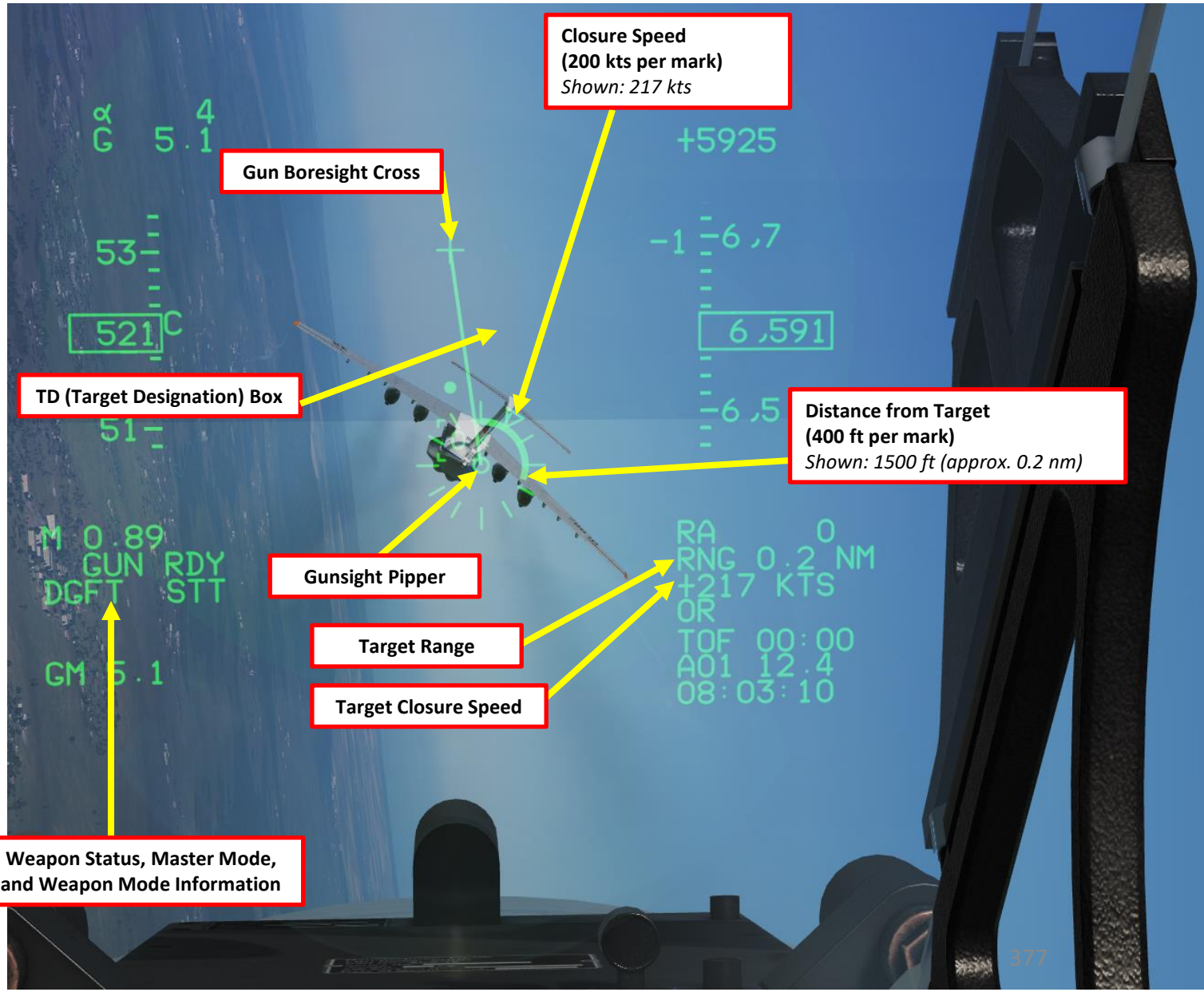
S1: SS (Sensor Selection) Switch





3.3.2 – GSH-23-2 CANNON (AIR-TO-AIR) (LCOS, LEAD COMPUTING OPTICAL SIGHT MODE)

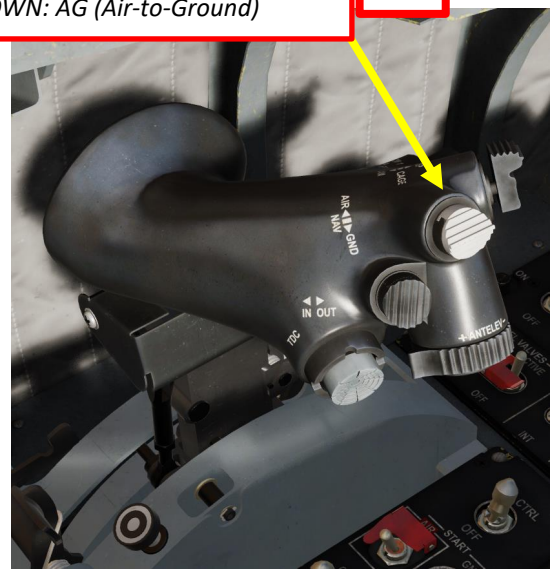
9. Acquire a radar lock on the target with ACM Mode. Select ACM Mode by pressing the S1 Sensor Selection Switch FWD.
10. Align gunsight pipper on the target and wait for the pipper to unwind
11. When gunsight pipper starts unwinding, press and hold the S4 Gun Trigger (« SPACE »)

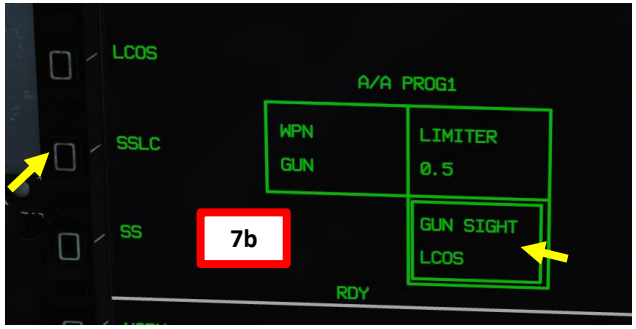


3.3.3 – GSH-23-2 CANNON (AIR-TO-AIR) (SSLC, SNAPSHOT SIGHT LEAD COMPUTING MODE)

1. Master Arm switch – ARM (UP)
2. Set MMS (Master Mode Switch) to AA INTC. TWS is selected by default.
3. Go in SMS (Stores Management System) page.
4. Select GSh-23 Gun by pressing the OSB next to GUN. The weapon profile will automatically switch to the Air-to-Air Gun Profile.
5. Select ACM Mode by pressing the S1 Sensor Selection Switch FWD.
6. Select Gun Burst Time Limiter by pressing the OSB next to LIMITER, then select desired burst duration (i.e. 0.5 sec).
7. Select Gunsight Type (SSLC) by pressing the OSB next to GUN SIGHT, then select SSLC mode.
8. Click on the FEED OSB to reload the gun. A box indication on FEED will blink for a few seconds, then disappear once the gun is loaded and ready to be fired. The FEED function can be used if the gun jams, but it can only be used up to three times. After a third attempt, the system won't respond and FEED will keep blinking.

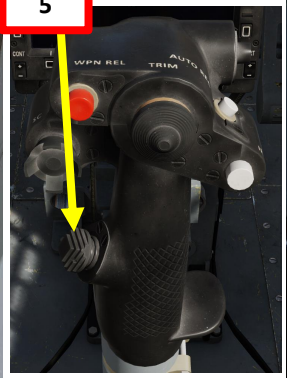
T1: MMS (Master Mode Switch)
UP: AA (Air-to-Air Intercept)
MIDDLE: NAV (Navigation)
DOWN: AG (Air-to-Ground)

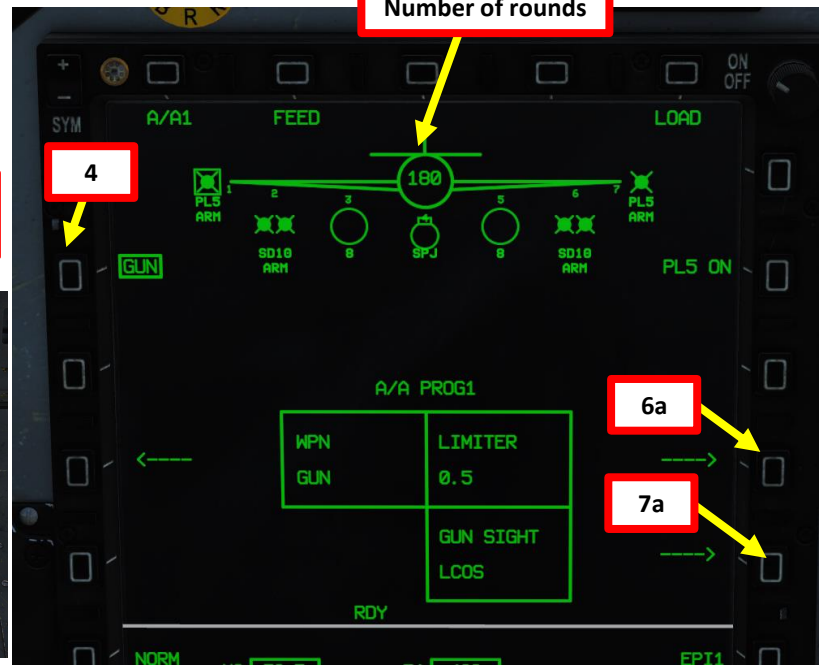


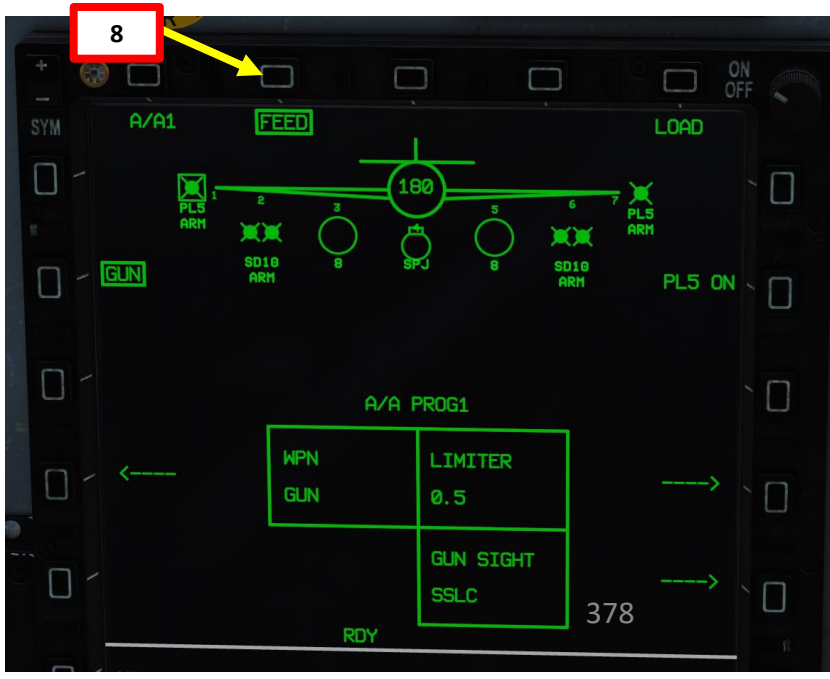


The cannon uses a "pyrotechnical" reload system, which means that a cassette equipped with a pyrocartridge will detonate a charge to "reload" the gun.

S1: SS (Sensor Selection) Switch

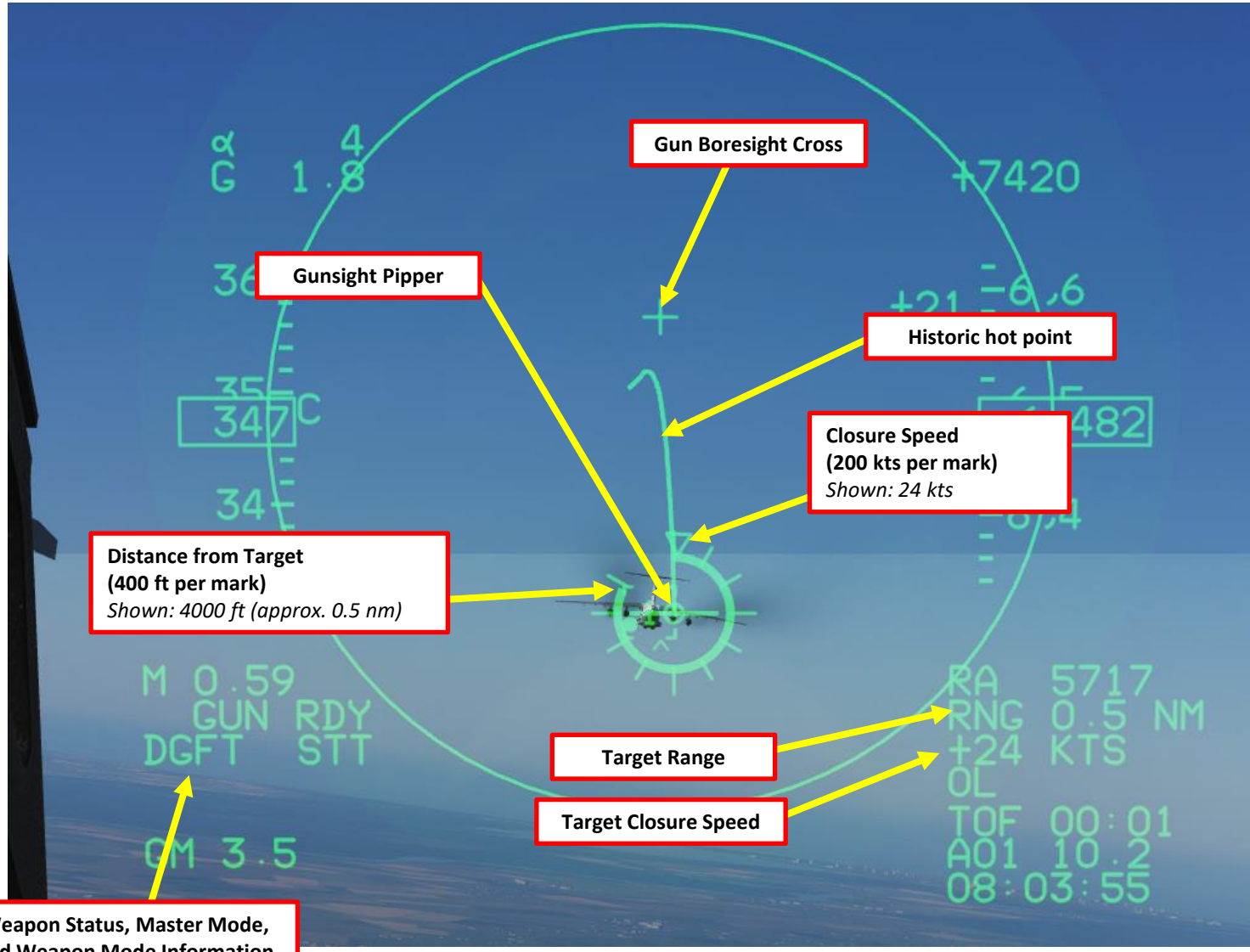






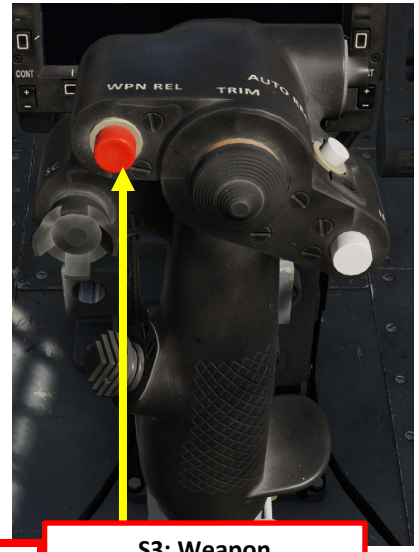
3.3.3 – GSH-23-2 CANNON (AIR-TO-AIR) (SSLC, SNAPSHOT SIGHT LEAD COMPUTING MODE)

9. Acquire a radar lock on the target with ACM Mode. Select ACM Mode by pressing the S1 Sensor Selection Switch FWD.
10. Align gunsight pipper on the target and wait for the pipper to unwind. This mode combines SS and LCOS modes.
11. When gunsight pipper starts unwinding, press and hold the S4 Gun Trigger (« SPACE »)



4 – SELECTIVE ORDNANCE JETTISON

1. Master Arm switch – ARM (UP)
2. Go in SMS (Stores Management System) page
3. Select JET sub-menu
4. Select the ordnance you want to drop by pressing their respective OSBs. When selected, stations are boxed.
5. To jettison selected stations, press the S3 Weapon Release Button (« RALT+SPACE »)



INTRODUCTION

Countermeasures are very simple to use. You have three countermeasure types at your disposal: flares, chaff and an ECM (Electronic Countermeasure) jammer. We will explore together what is used against what, and how.

Missiles can generally track you using 2 things: radar signature (radar waves are sent on you and you reflect them, which is called a “radar signature”) and heat signature (like the exhaust of your engines). Countermeasures will only be effective against the kind of weapon it was meant to counter; a heat-seeking missile will not care if you deploy electronic countermeasures against it since it tracks heat, not radar signatures. This is why it is important to know what is attacking you in order to counter it properly. This is what the **RWR** (Radar Warning Receiver) is for: to help you know what is firing at you so you can take the adequate action to counter it.

Flares are used against missiles that track heat (infrared or IR) signatures. Instead of going for the heat signature generated by your engines, a missile will go for a hotter heat source like flares.

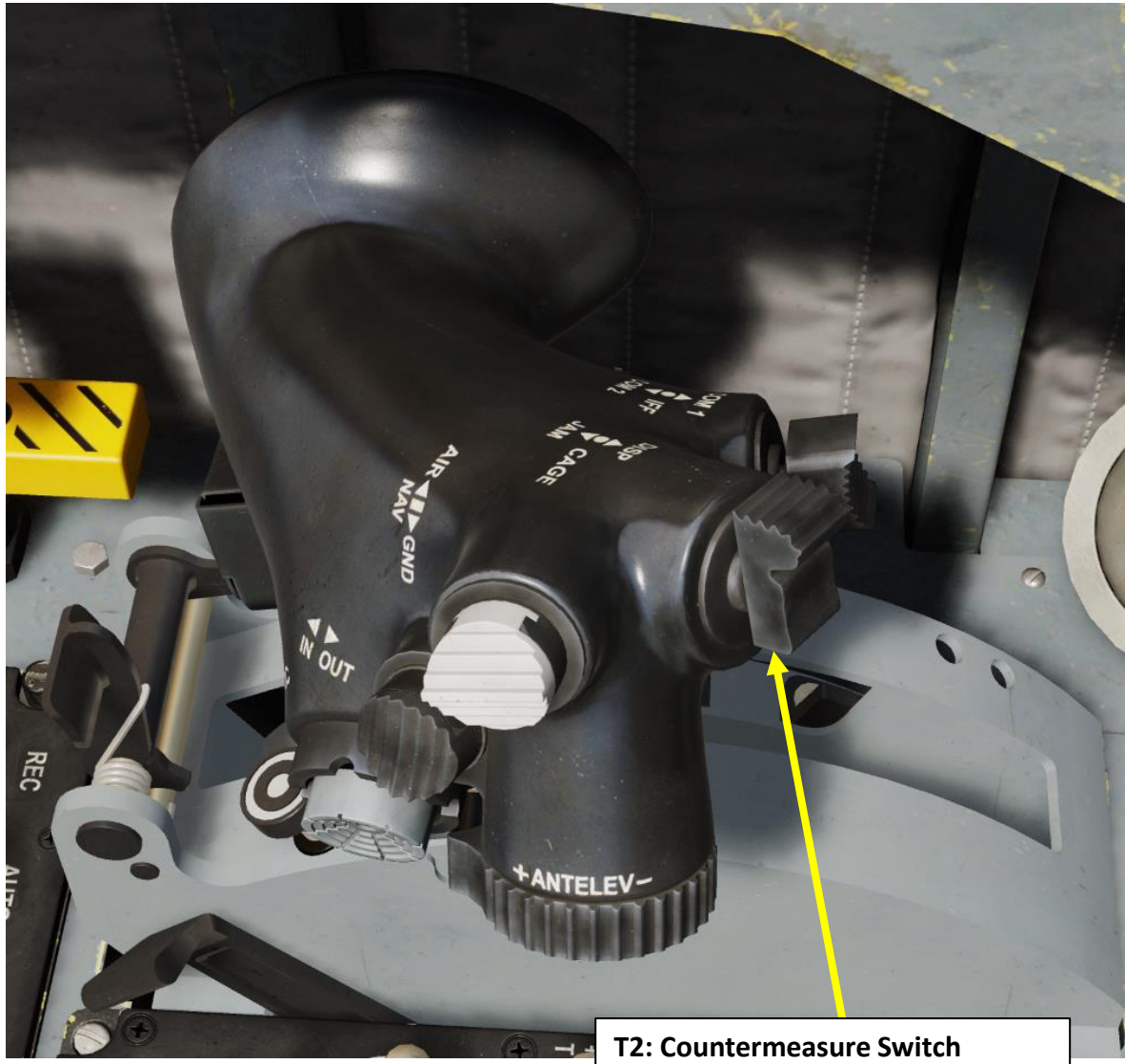
Chaff is a form of “passive” jamming. Passive (reflected) jamming is when a deceptive object or device reflects radar waves. Chaff is simply a bundle of small pieces of metal foil with reflective coating, which creates clusters of radar signatures that prevent a radar to get a solid lock on the aircraft itself.

The **KG-600 Self Protection Jammer (SPJ)** is the onboard Electronic Countermeasure (**ECM**) system. It is a form of “continuous” jamming, also called “active” or “transmitted” jamming. This device transmits its own synchronized radar waves back at your enemy’s radar receiver to simulate erroneous radar wave returns. Simply put, active jamming will try to drown a radar in white noise.

In order to use these three forms of countermeasures, you can use “countermeasure programs”, routines that will deploy a number of flares/chaff for a number of cycles at a given interval. Both Flare and Chaff are released with the **OESP (Optical/Electronic Self Protection)** dispenser system. Preset Countermeasure Release programs can be set in the DTC (Data Transfer Cartridge) in the “Special Options”.

COUNTERMEASURES CONTROL SETUP

T2 AFT – Countermeasures Dispense
T2 FWD – SPJ Standby/Jam



T2: Countermeasure Switch

- *AFT: Chaff/Flare Dispense*
- *PRESS: Cage-Uncage Missile Seeker*
- *FWD: Self-Protection Jammer Toggle*

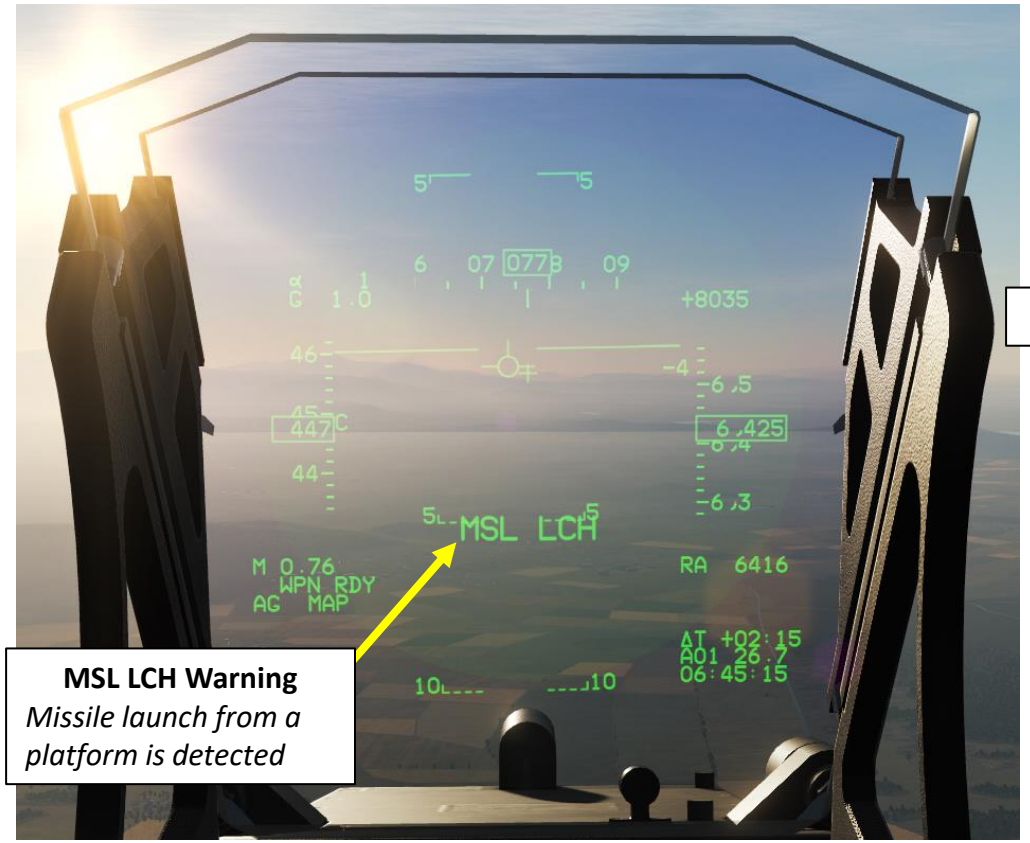
RWR (RADAR WARNING RECEIVER)

RWR Threat Number Setting
Sets the number of RWR contacts displayed on the HSD
- *OPEN (All) / PRTY (Priority)*

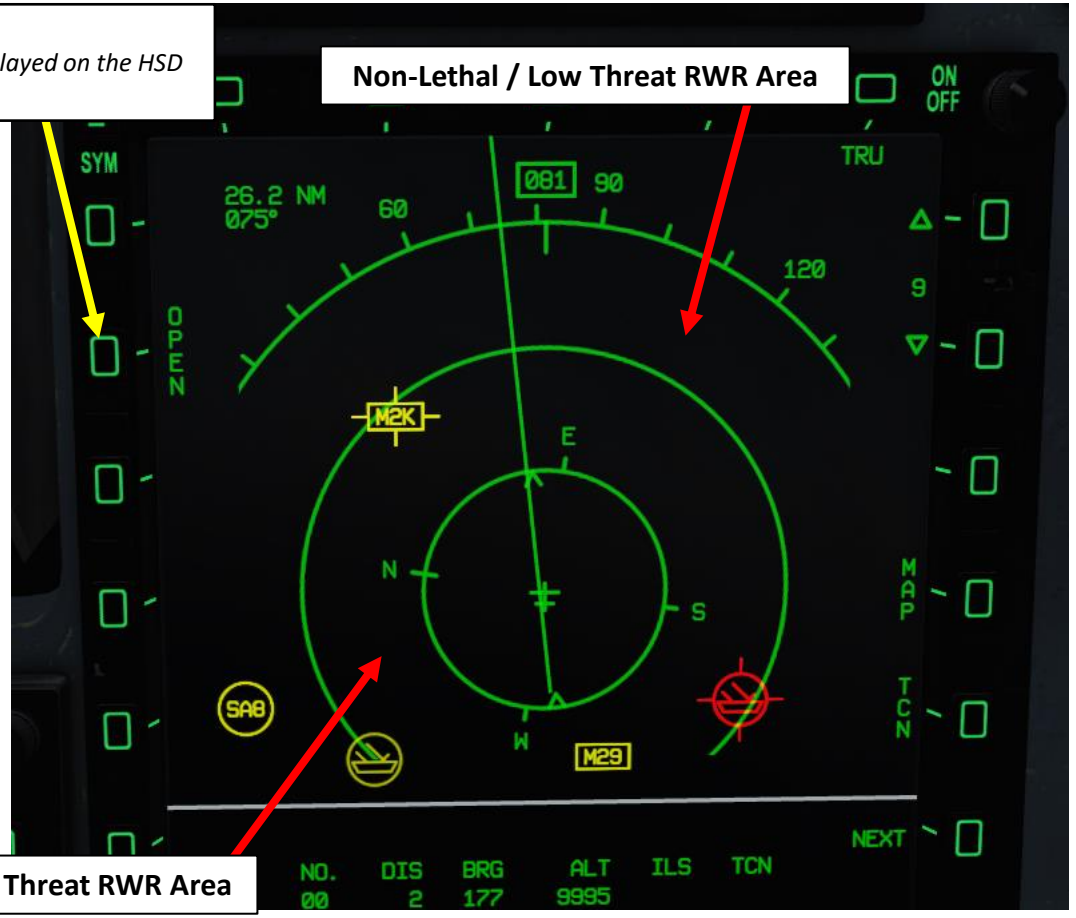
The RWR (Radar Warning Receiver) will tell if you are being searched or locked by radar. The RWR is overlayed on the HSD (Horizontal Situation Indicator) page; you will have a top-down view of your aircraft. The RWR is powered ON using the RWR Power button on the Avionics Activation Panel.

The HSD RWR page will locate the radar emitters' heading but not their range. Instead, their spacing from the center of the RWR circle refers to the lethality of the threat. The inner band (lethal) is for radars actively tracking you. The outer band is classified as non-lethal since these are radars searching for you, not actively tracking you.

The HUD (Heads-Up Display) will also inform you if a missile launch is detected (MSL LCH).



MSL LCH Warning
Missile launch from a platform is detected



Non-Lethal / Low Threat RWR Area

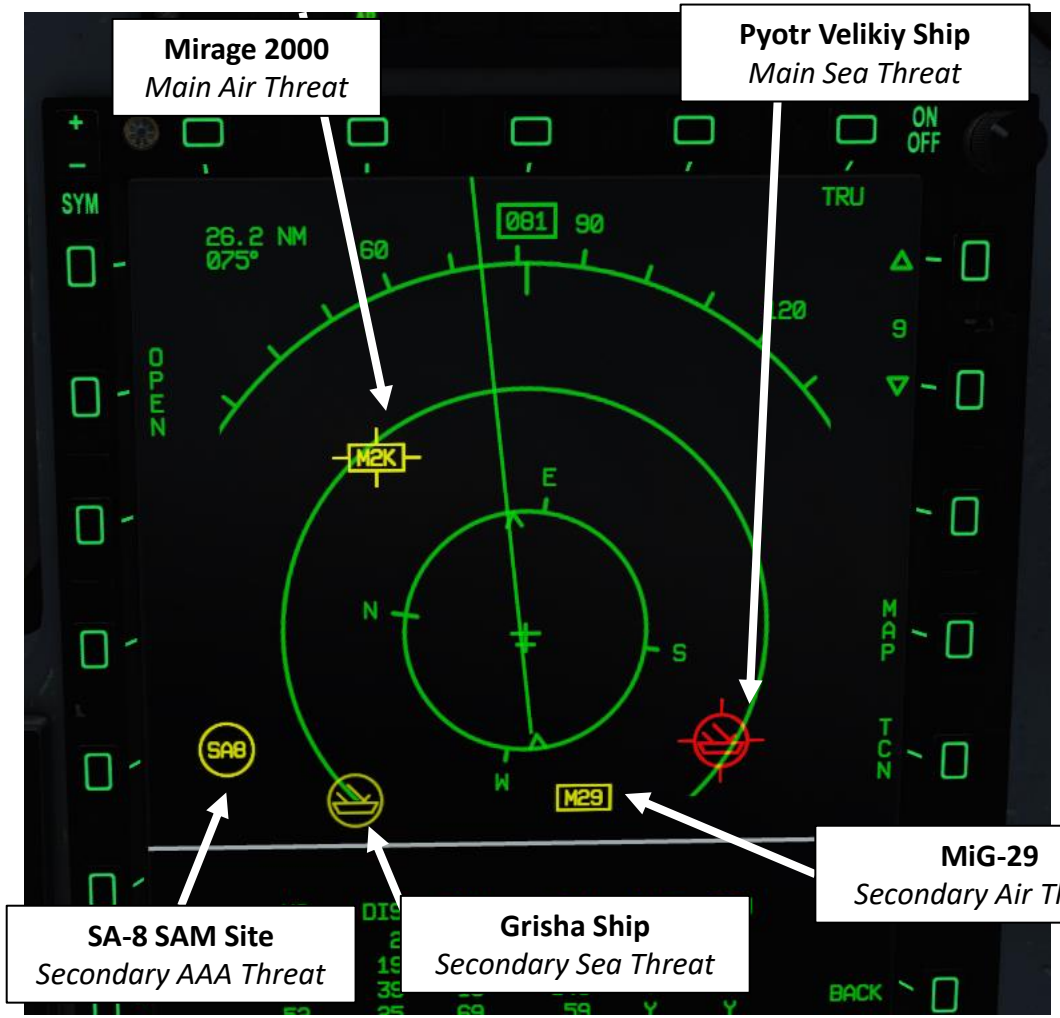
Lethal Threat RWR Area

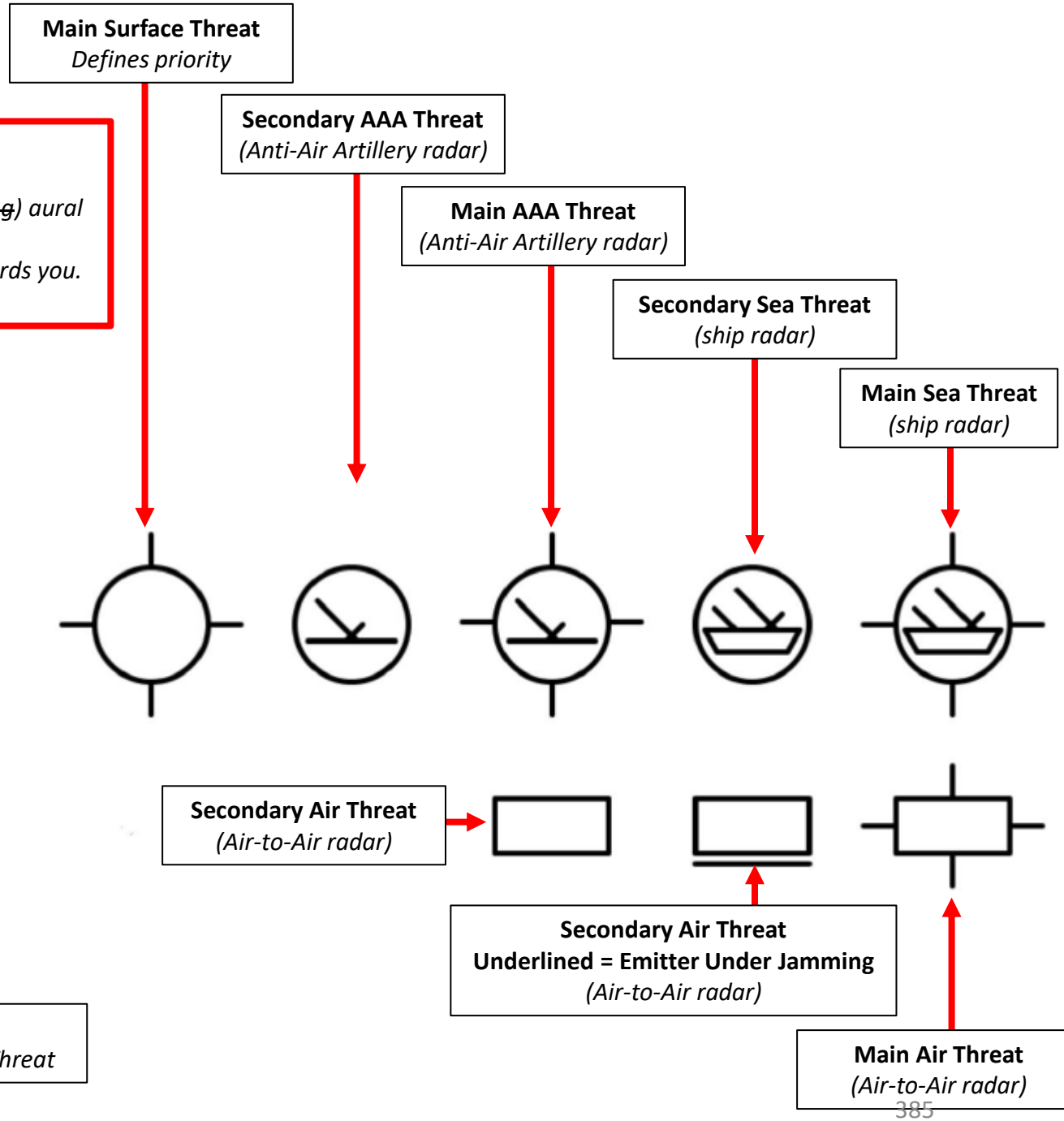
RWR Power Button

RWR (RADAR WARNING RECEIVER)

RWR Symbol States

- ***Yellow***: *Radar is scanning you but has no lock on you yet*
- ***Red***: *Radar is locking and tracking you. Accompanied by the (~~very annoying~~) aural warning "Tracking! Tracking! Tracking!"*
- ***Flashing***: *Missile has been launched by radar emitter and is heading towards you. Accompanied by a high-pitch beeping sound.*





RWR (RADAR WARNING RECEIVER)

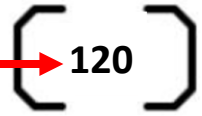
Symbol	Emitter
FA	Unknown
Aircraft	
J17	JF-17
J11	J-11A
KJ	KJ-2000
7ST	HQ-7 STR
7T	HQ-7 LN
F16	F-16A/C
F18	F/A-18A/C
F5	F-5E/F-5E-3
M2K	M-2000
AV8	AV8B
M19	MiG-19
37	AJS37
F14	F-14A/B
M21	MiG-21Bis
M23	MiG-23
M29	MiG-29
S17	Su-27
S24	Su-24
S27	Su-27
S33	Su-33
F4	F-4
F15	F-15C/E
M25	MiG-25
M31	MiG-31
M27	MiG-27
S30	Su-30
111	F-111
GR4	Tornado GR4
IDS	Tornado IDS
A50	A-50
E3A	E-3A
E2C	E-2C
S3	S-3
EA6	EA-6B
SAM	
10S	S-300 SR
10T	S-300 TR
11S	SA-11 SR
11T	SA-11 LN
SA6	SA-6 SR
SA8	SA-8 SR
15	SA-15
19	SA-19
RLS	Roland SR
RLT	Roland TR
PST	Patriot
HS	Hawk SR
HT	Hawk TR
HCW	Hawk CWAR
2S	S-125 SR
2T	S-125 TR
23	Zu-23
Missile	
12	PL-12
10	SD-10
54A	AIM-54A47/60
54C	AIM-54C47
120	AIM-120
R77	R-77
R27	R-27
MCA	MICA

MAWS
(MISSILE APPROACH WARNING SYSTEM)

The MAWS is the Missile Approach Warning System. MAWS detectors are installed on the sides of the vertical stabilizer to prioritize the protection of the aircraft's rear hemisphere. However, the MAWS detects missile launches from all directions.

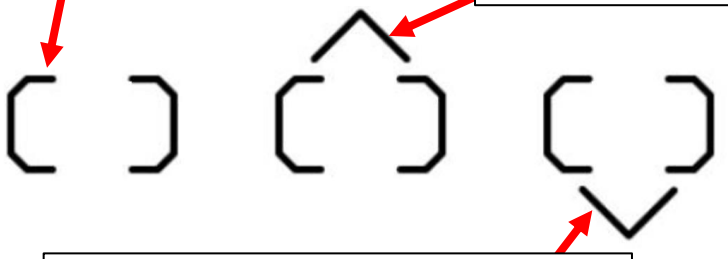
MAWS displays missile symbols on the HSD RWR display. It shows missile bearing but has no range information. Take note that the MAWS have higher chances for successful detection when the missile range is within 5 km.

Missile Type Symbol
- *A number displays a type of active radar homing missile.*
- *"M" displays any other type of missile (i.e. semi-active).*



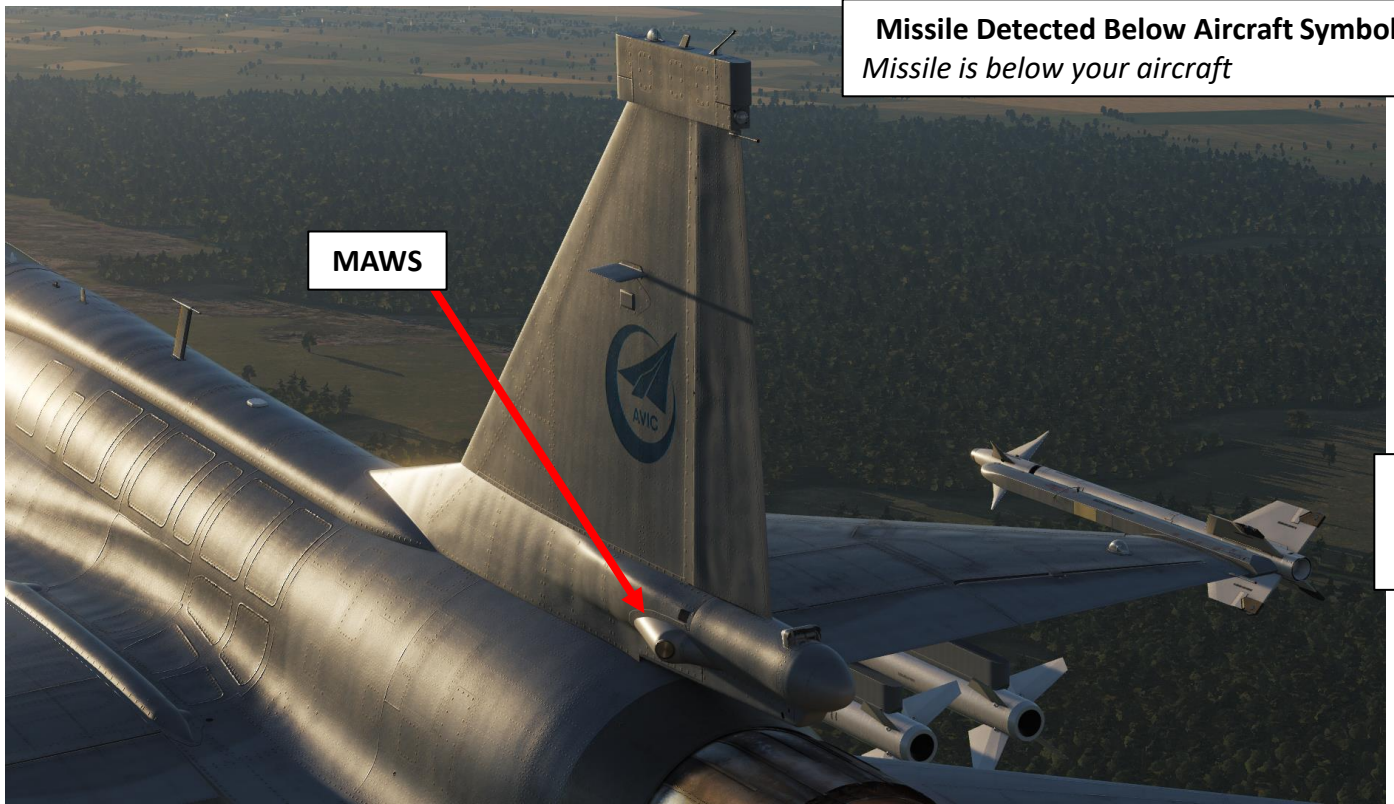
Missile Detected Symbol
Missile is at the same altitude as your aircraft +/- 100 meters

Missile Detected Above Aircraft Symbol
Missile is above your aircraft



Missile Detected Below Aircraft Symbol
Missile is below your aircraft

MISSILE Warning
Active missile seeker radiation is detected



Super S530D Semi-Active Radar Homing Missile
(above aircraft)

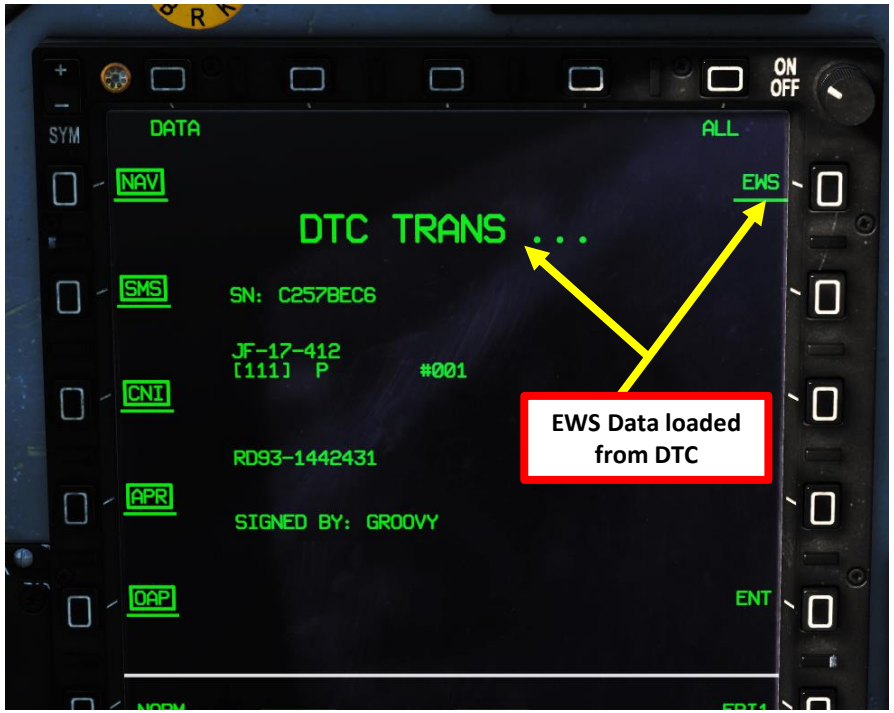
AIM-120 Active Radar Homing Missile
(same altitude as aircraft)

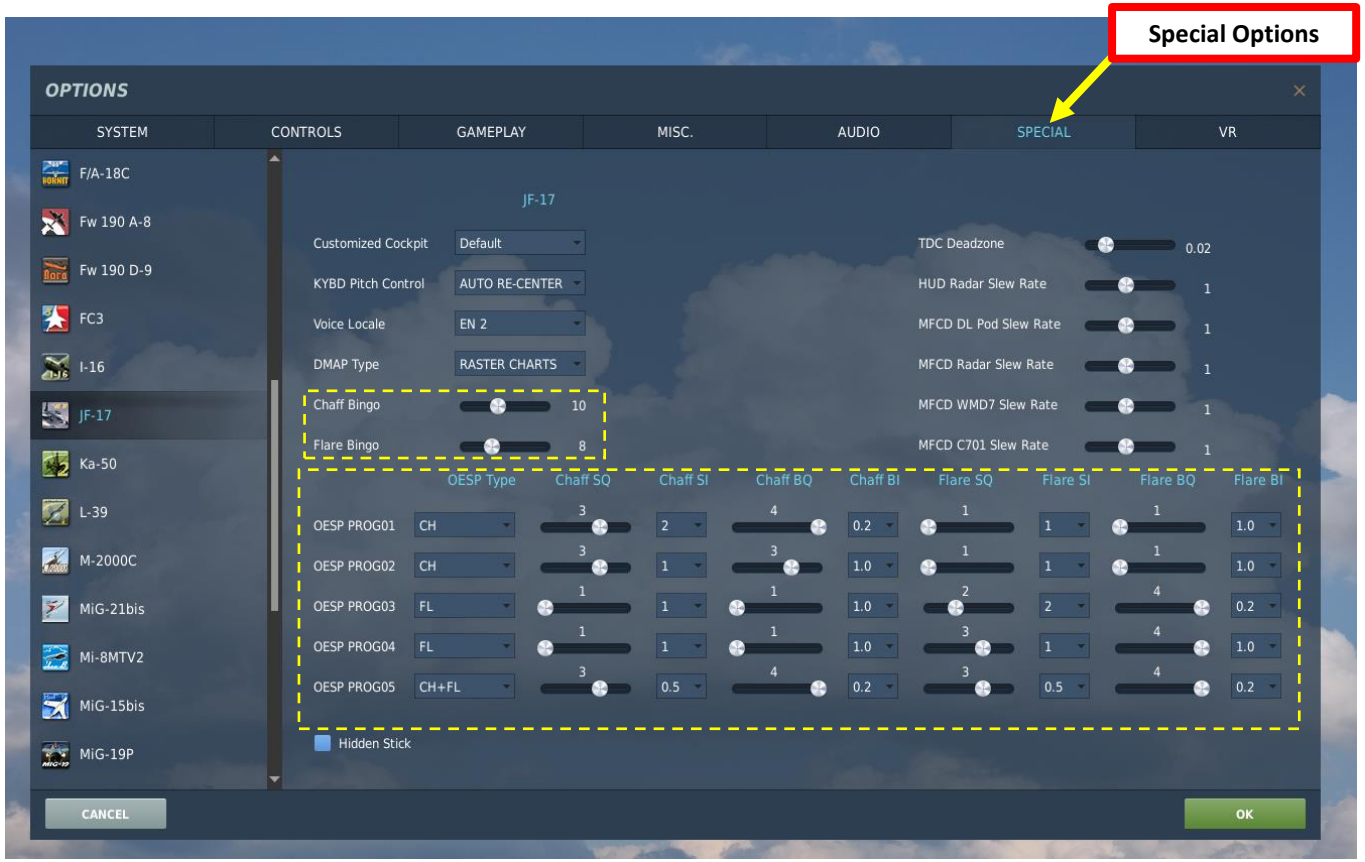
COUNTERMEASURES - CHAFF & FLARES
OESP RELEASE PROGRAM CREATION & DATA TRANSFER CARTRIDGE

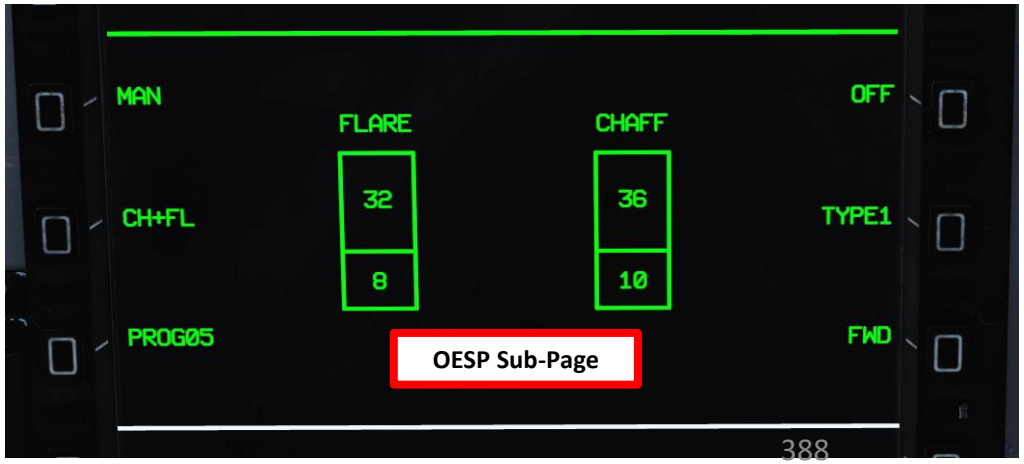
Countermeasure release programs are stored in the DTC (Data Transfer Cartridge). In order to create your own programs, you need to go in the “Special Options” menu.

Countermeasure programs are loaded in the aircraft when the cartridge is inserted in the DTC slot, then loaded via the DTC page. Countermeasure information is stocked in the EWS (Electronic Warfare System) DTC data set.

You can choose what program to use via the OESP sub-menu of the CMBT (Combat) page.





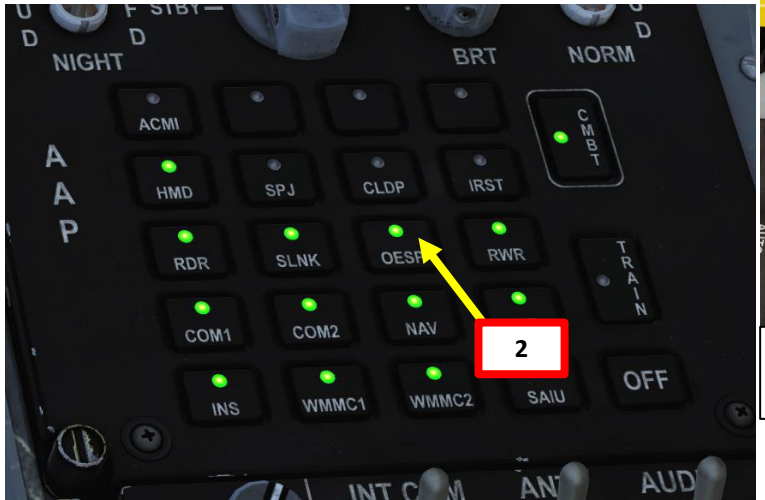


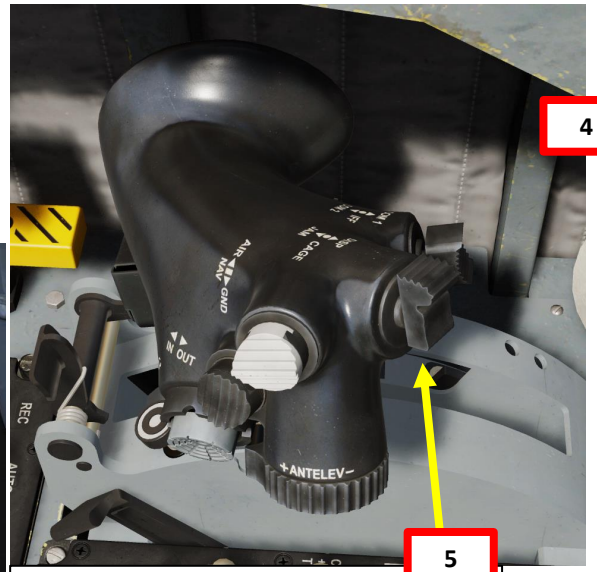
COUNTERMEASURES - CHAFF & FLARES
OESP (OPTICAL/ELECTRONIC SELF PROTECTION) DISPENSER SYSTEM

COUNTERMEASURE USAGE TUTORIAL

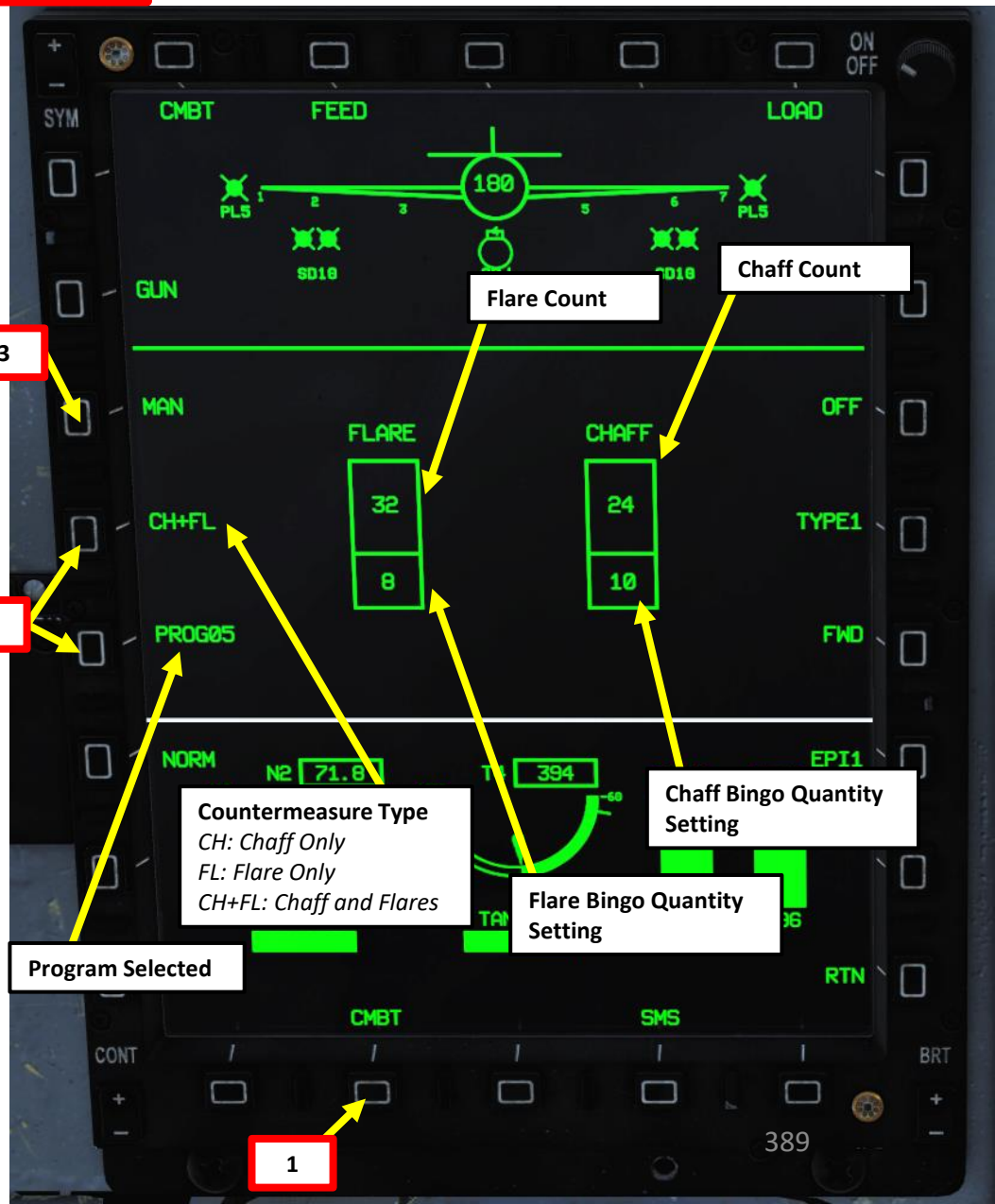
Note: The JF-17 can carry up to 36 chaffs and 32 flares. 5 different preset release programs are available.

1. Select CMBT (Combat) Menu
2. If not powered ON already, press the OESP (Optical/Electronic Self-Protection Dispenser) Power Button.
3. Select dispenser release mode: AUTO (countermeasures will automatically deploy for you) or MAN (Manual, selected release program will dispense countermeasures when you set the T2 Countermeasure switch AFT)
4. Select Release Program by either toggling the PROG OSB (Option Select Button) or by toggling the Current Countermeasure Type OSB.
5. Press the T2 Countermeasure Switch AFT (COUNTERMEASURE DISPENSER) to start jamming (Q binding).





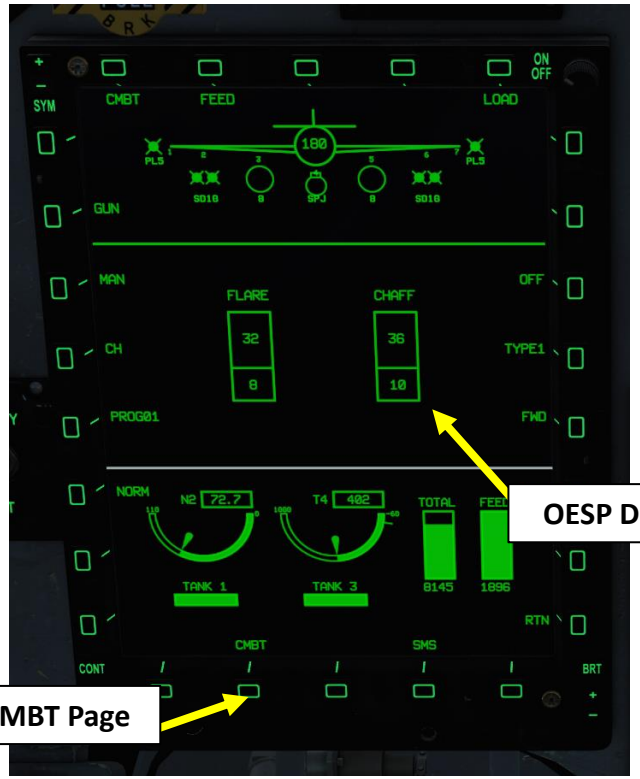
T2: Countermeasure Switch
- *AFT: Countermeasures Dispense*



KG-600 SPJ (SELF PROTECTION JAMMER)

The KG-600 Self Protection Jammer (SPJ) is the onboard Electronic Countermeasure (ECM) system. The KG-600 detects and deceives threat pulse fire control and guidance RADARs and has three operating modes: standby, jamming (transmit), and built in test. This ECM system detects, processes, and transmits a simulated target echo for deception when a radar signal is received. The simulated echoes are recognized by the enemy radar as true target returns. Tracking radar then tracks a false target and breaks lock from the true target. Threat radar indications are indicated on the Radar Warning Receiver.

The jammer modes can be accessed in the CMBT page in the OESP (Optical/Electronic Self Protection) sub-menu.



Jammer Modes

- *OFF*
- *BIT: Built-In Test In Progress*
- *STBY: Standby*
- *JAM (Blinking): Jammer Pod is warming up*
- *JAMING : Jamming is active*

Jamming Types

- *TYPE 1: Jamming when aircraft is radar locked by emitter*
- *TYPE 2: Jamming when spotted by radar emitter*

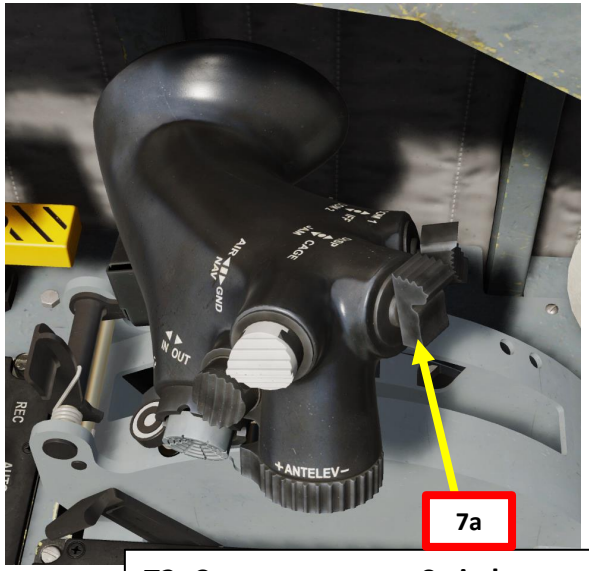
Jamming Direction

- *FWD: Forward*
- *BWD: Backward*
- *F+B: Forward and Backward*

KG-600 SPJ (SELF PROTECTION JAMMER)

To use jammer:

1. Select CMBT (Combat) Menu
2. Press the SPJ (Self-Protection Jammer) Power Button.
3. A BIT (Built-In Test) will be performed during approx. 15 sec
4. When BIT is complete, jammer mode will be in STBY (Standby)
5. Select Jamming Type
6. Select Jamming Direction
7. Press the T2 Countermeasure Switch FWD (SPJ ON) to start jamming (E binding). The blinking JAM indication means that SPJ is warming up, and the steady JAMING indication means the SPJ is actively jamming. Press again when stop jamming.



T2: Countermeasure Switch

- *FWD: Self-Protection Jammer Toggle*

KG-600 SPJ (SELF PROTECTION JAMMER)

When the SPJ pod is powered on, it can determine an approximative slant range of radar emitters (do keep in mind that altitude differential has an impact on slant range).

As an example, the RWR display at the top has the SPJ turned OFF. Radar emitters are placed in function of criticality (i.e. lethal vs non-lethal).

For the same situation, the RWR display at the bottom has the SPJ turned ON. Radar emitters are placed in function of both criticality but also slant range. As we can see, this shows a clearer picture of where radar emitters are physically in relationship to you.

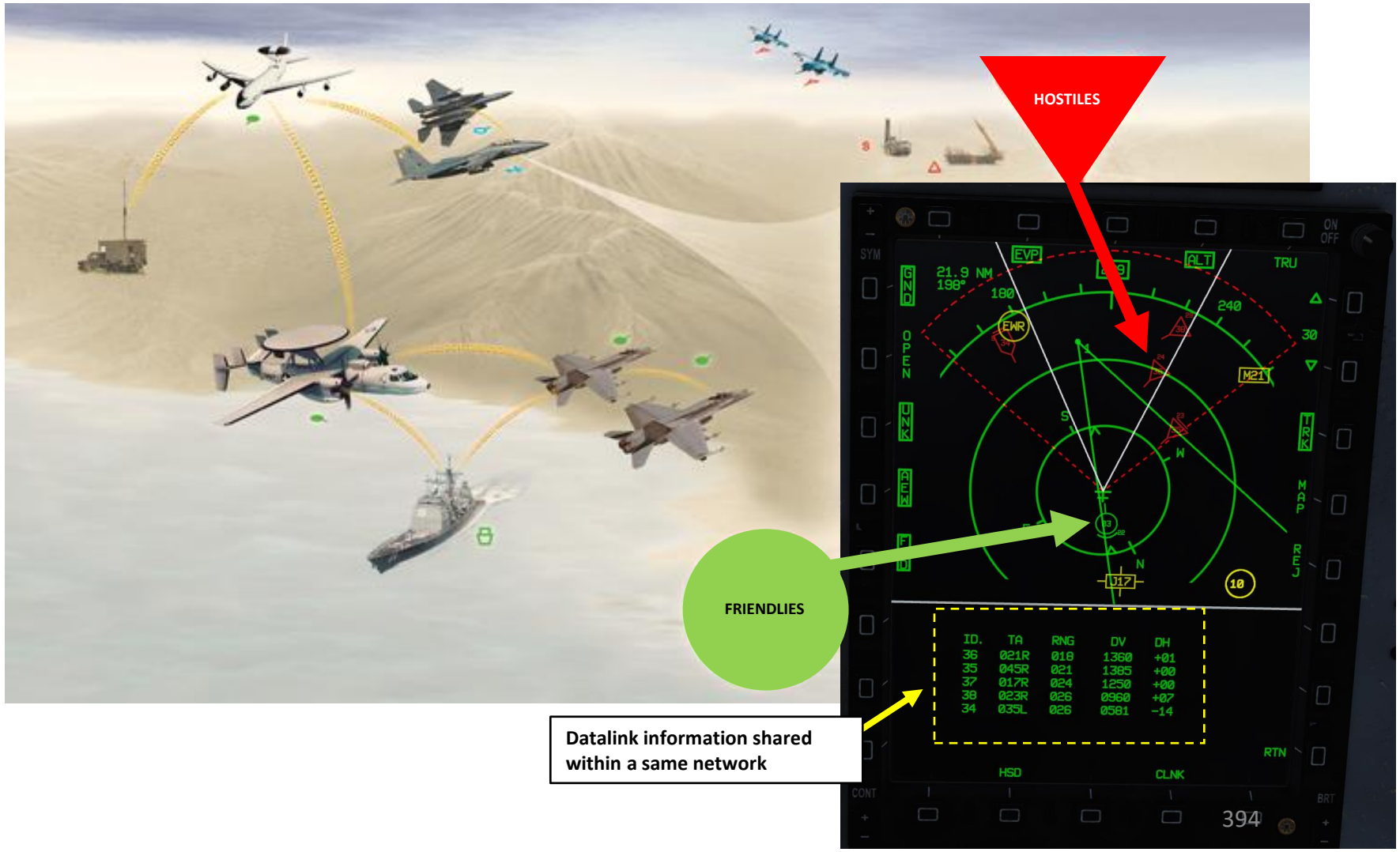
KG-600 SPJ (SELF PROTECTION JAMMER)

RWR (Radar Warning Receiver) symbols with an underline represent radar emitters being actively jammed by the SPJ (Self Protection Jammer).

DATALINK & IFF INTRODUCTION

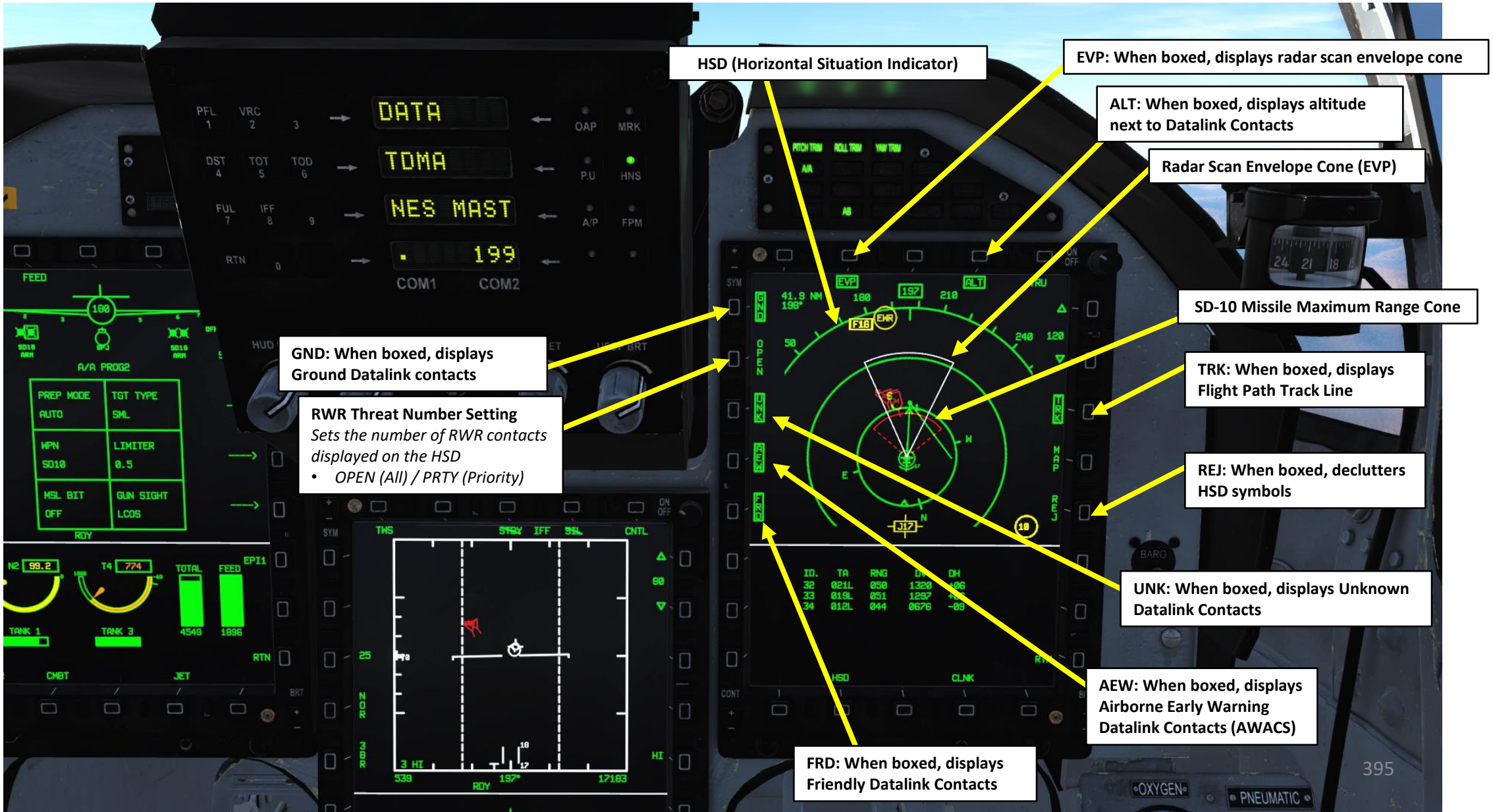
One of the biggest challenges of integrated modern warfare is the identification of contacts. As various information donors like friendly fighters, ground radar stations, AWACS (Airborne Warning and Control System, like an E-3 Sentry or an E-2 Hawkeye), and ships interrogate unknown contacts with IFF (Identify-Friend-or-Foe) systems, this information needs to be relayed to everyone within a given Network. This is where Datalink comes in; with Link 17 Datalink (Pakistan's own indigenous datalink system, similar to the NATO Link 16), military aircraft as well as ground forces may exchange their tactical picture in near-real time.

Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) is a term commonly used to describe the idea of using a network to communicate and pass data between connected assets. Link 17 incorporates high-capacity, jam-resistant, digital communication links for exchange of near real-time tactical information, including both data and voice, among air and ground elements. Such information can consist of target aspect, target angle off, range, closure rate and height deviation.



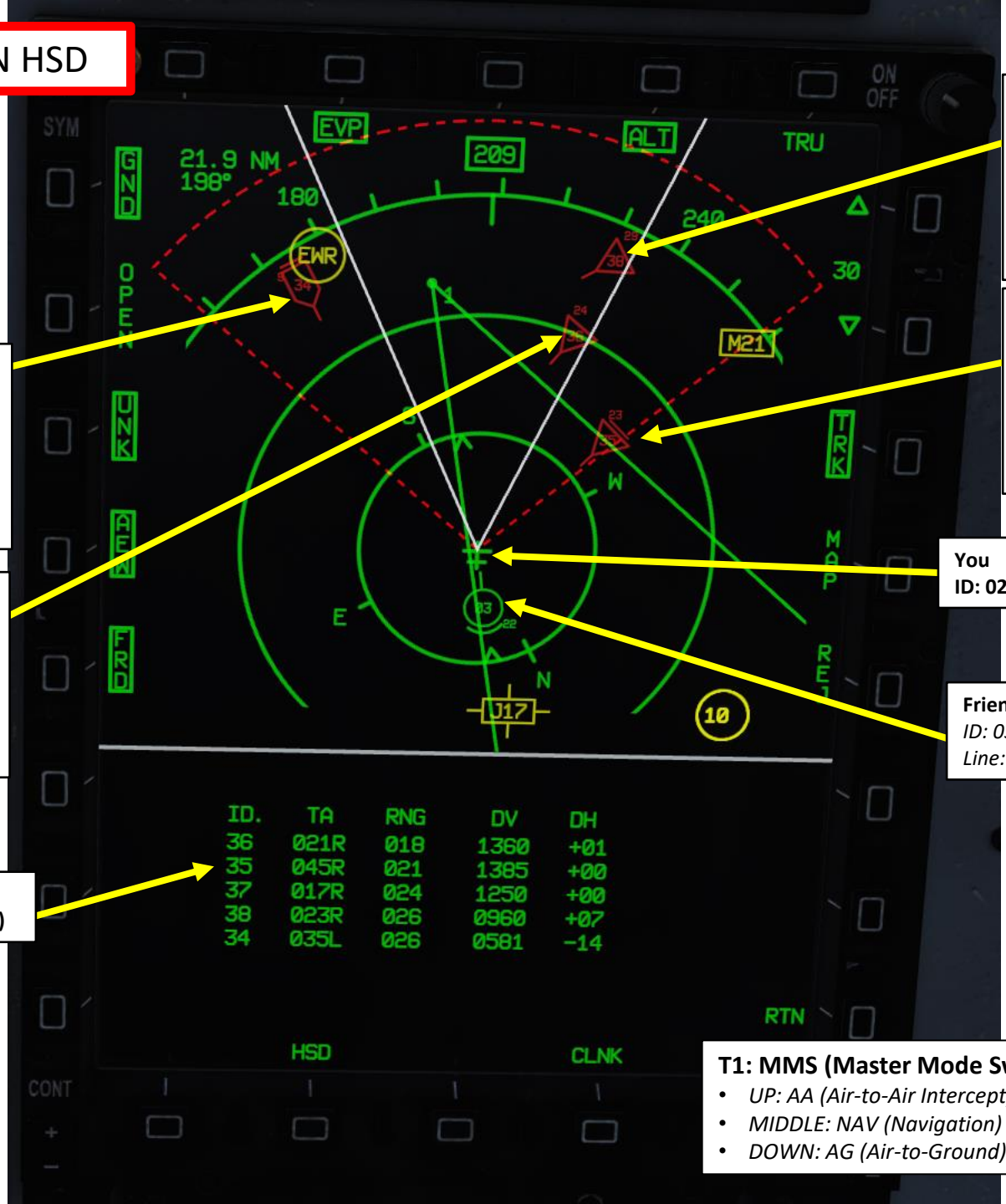
DATALINK INFORMATION ON HSD

If the aircraft is connected to a datalink network, the radar scan cone and SD-10 missile range will be visible on the HSD (Horizontal Situation Display).



DATALINK INFORMATION ON HSD

If you set your MMS (Master Mode Switch) UP to INTC (Intercept) and are connected to the correct datalink network, you will have datalink information listed on the upper and lower parts of the screen.



Hostile Ground Early Warning Radar Site
ID: 34
Angle Off: 35 deg Left
Range: 26 nm
Closure Speed: 581 kts
Height Deviation from you: -14000 ft (at ground level)
Line: target has not been scanned by your radar

Hostile MiG-21
ID: 36
Angle Off: 21 deg Right
Range: 18 nm
Closure Speed: 1360 kts
Height Deviation from you: +1000 ft
No line: target has been scanned by your radar

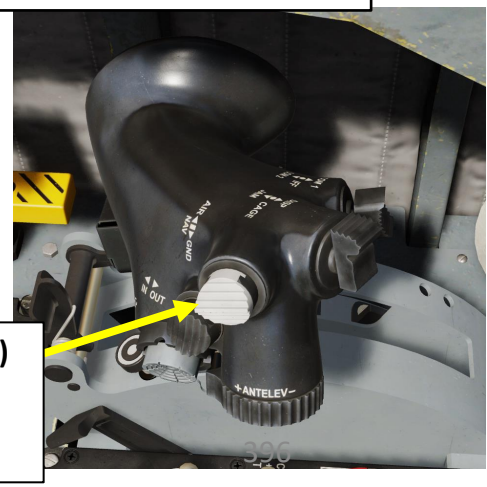
List of Datalink Trackfiles (by order of threat priority)

Hostile MiG-21
ID: 38
Angle Off: 23 deg Right
Range: 26 nm
Closure Speed: 960 kts
Height Deviation from you: +7000 ft
No line: target has been scanned by your radar

Hostile MiG-21
ID: 35
Angle Off: 45 deg Right
Range: 21 nm
Closure Speed: 1385 kts
Height Deviation from you: 0 ft (same altitude)
Line: target has not been scanned by your radar

You
ID: 02

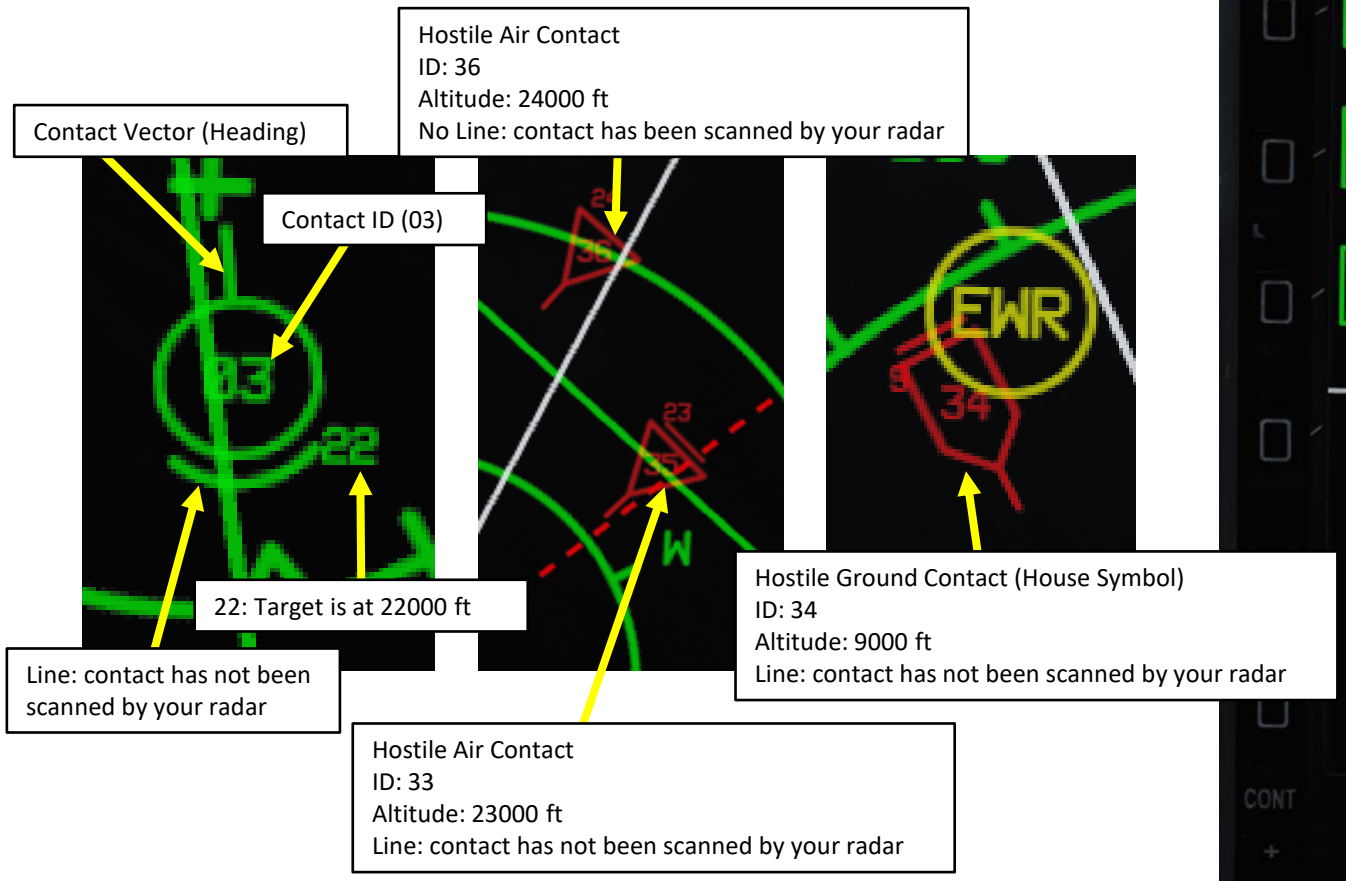
Friendly JF-17
ID: 03
Line: Has not been scanned by your radar



T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

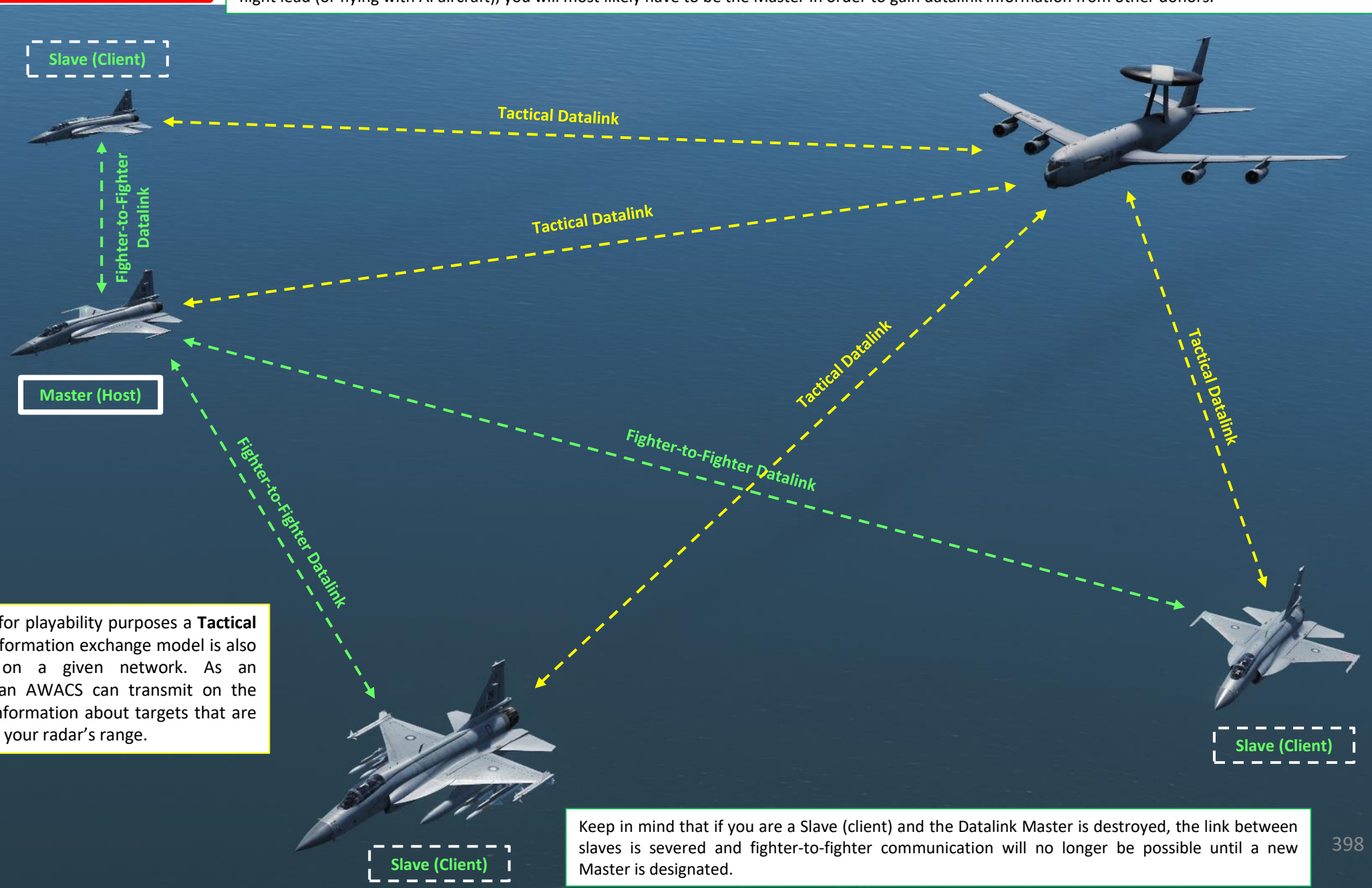
DATALINK INFORMATION ON HSD

- **Green** color is for friendly.
- **Red** is for unknown or hostile.
- The inner number is the contact ID (Identification) number.
- The outer number is the contact's altitude in thousands of feet.
- A circle indicates a friendly information donor.
- A triangle indicates an unknown or hostile air contact.
- A "house" symbol indicates a ground contact
- A line around the symbol indicates that the contact has not been scanned by your radar (i.e. information comes from another information donor on the network)
- The vector line indicates the direction of the contact



DATALINK TYPES

The JF-17 modelled in DCS is designed to operate using a **Fighter-to-Fighter** datalink information exchange model. A network is composed of a single Master (Host) that gathers information from all other information donors (Slave, or Client) and transmits them back to all other slaves (clients) on the same network. If you are the flight lead (or flying with AI aircraft), you will most likely have to be the Master in order to gain datalink information from other donors.

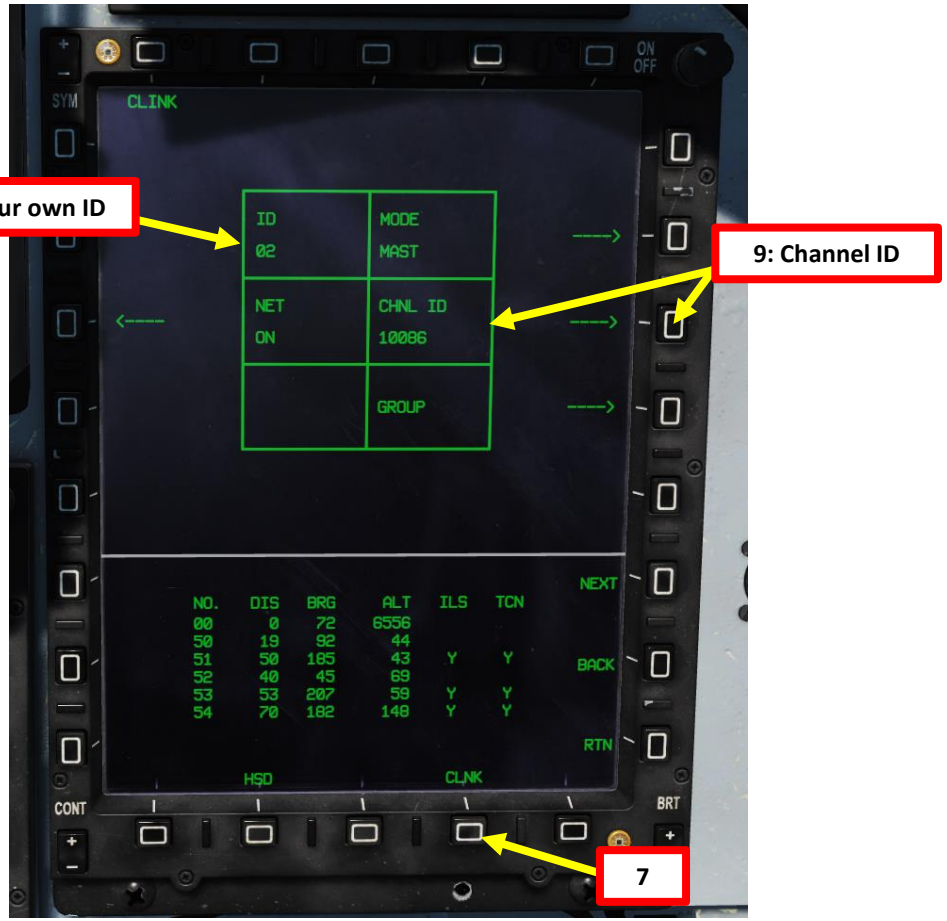


However, for playability purposes a **Tactical** datalink information exchange model is also available on a given network. As an example, an AWACS can transmit on the network information about targets that are way out of your radar's range.

Keep in mind that if you are a Slave (client) and the Datalink Master is destroyed, the link between slaves is severed and fighter-to-fighter communication will no longer be possible until a new Master is designated.

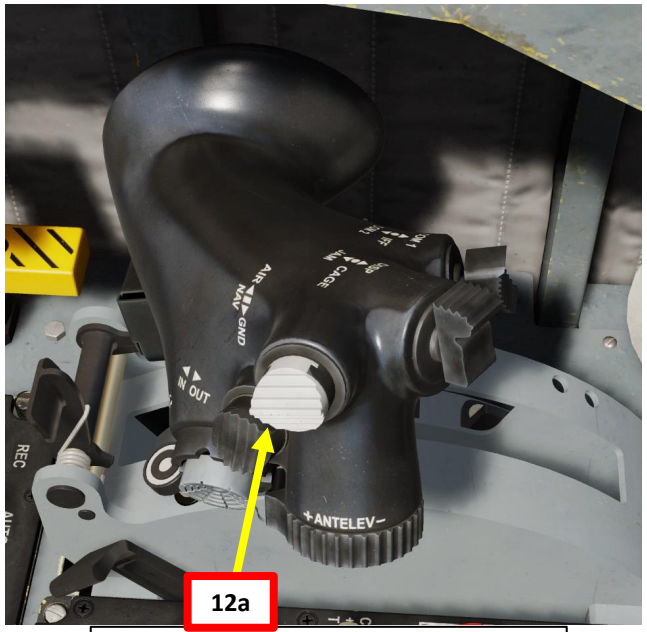
HOW TO SET UP DATALINK

1. On the UFCP, press RTN to go to the main menu.
2. Press on the Arrow Select button next to COM2 to select COM2.
3. Press on the Arrow Select button next to COM2 a second time to edit COM2 channel.
4. Enter Channel 199, then press Arrow Select button next to COM2. This channel is reserved exclusively for Datalink and must remain at this channel at all times.
5. Press on the Arrow Select button next to SLAV to toggle Datalink Mode to MASTER (HOST) if no Master is available on the Network (will most likely be the case in multiplayer servers).
6. Press on the Arrow Select button next to NE- to turn on the network. NET setting will change from NE- to NES (ON).
7. Click on the CLNK OSB to select the CLINK (Datalink) page. You will see your ID, mode, Datalink setting, Channel ID and Group.
8. Your ID is already set and cannot be changed. This will be how you are displayed on other people on the network.
9. Set Datalink Network Channel ID required by your coalition (should be available in the mission briefing).



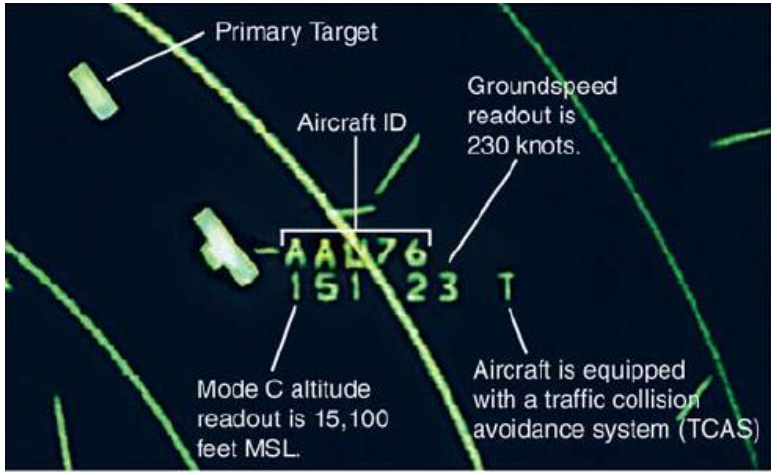
HOW TO SET UP DATALINK

10. You can select the GROUP menu to see who is the Master (*) and who are the slaves on the network. Flight Numbers, Roles (Lead/Wingman) and Fuel State data is available for every member.
11. Press the OSB next to HSD to display the Horizontal Situation Display.
12. If you want Datalink contacts to be listed below the HSD with information about their ID, Angle Off, Range, Closure Speed and Height Deviation... Press T1 Master Mode Switch UP to enter INTC (Air-to-Air) Mode.



T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

IFF INTRODUCTION



Identifying what you may or may not shoot should be your primary concern at all times. This is where the IFF (Identify-Friend-or-Foe) system comes into play.

An IFF system consists of an **INTERROGATOR** component and a **TRANSPONDER** component.

The **interrogator** component broadcasts an interrogation signal with a specific "code" (pulse frequency).

A **transponder** equipped on another aircraft will receive the interrogation signal and broadcast a reply signal with its own "code" (pulse frequency) as well. The information sent from this reply signal will vary based on the transponder mode selected.

Your own aircraft transponder will then see if the interrogation code and reply codes match, which in some cases can be used to determine whether the other aircraft is a friendly contact. The nature of the information determined will vary based on the transponder mode.

Take note that if you set an incorrect transponder code, friendly contacts may not be able to identify you as a friendly.

IFF MODES

In its simplest form, a "Mode" or interrogation type is generally determined by pulse spacing between two or more interrogation pulses. Various modes exist from Mode 1 to 5 for military use, to Mode A, C, and Mode S for civilian use. The takeaway from this table should be:

- **Mode 4 is the preferred mode in a combat** scenario because it is highly secure (encrypted). Encrypted interrogation codes cannot be detected by an enemy transponder, and your transponder will not broadcast a reply signal to the other team.
- **Mode 6** is simulated as a Mode 4, which is what we will use on the JF-17.
- **Mode 4 invalid/lack of reply cannot guarantee that an aircraft is hostile**, but a **valid reply is a guarantee of a friendly contact** (within DCS)
- **Modes 1, 2, and 3 are not secure to use** since any other aircraft from the opposing team could find what your Interrogator code is and set his transponder to it, fooling you into thinking he is a friendly contact. These modes also easily give away your position since every time your transponder broadcasts an answer, this signal can be intercepted by an enemy transponder, which can send your position to other enemy fighters via datalink.

Military Interrogation Mode	Civilian Interrogation Mode	Description
1		Provides 2-digit 5-bit mission code
2		Provides 4-digit octal unit code (set on ground for fighters, can be changed in flight by transport aircraft)
3	A	Provides a 4-digit octal identification code for the aircraft, set in the cockpit but assigned by the air traffic controller. Mode 3/A is often combined with Mode C to provide altitude information as well.
	C	Provides the aircraft's pressure altitude and is usually combined with Mode 3/A to provide a combination of a 4-digit octal code and altitude as Mode 3 A/C, often referred to as Mode A and C
4		Provides a 3-pulse reply, delay is based on the encrypted challenge
5		Provides a cryptographically secured version of Mode S and ADS-B GPS position
S		Mode S (Select) is designed to help avoiding overinterrogation of the transponder (having many radars in busy areas) and to allow automatic collision avoidance. Mode S transponders are compatible with Mode A and Mode C Secondary Surveillance Radar (SSR) systems. This is the type of transponder that is used for TCAS or ACAS II (Airborne Collision Avoidance System) functions
6		Simulated Mode created by Deka Ironwork to emulate an encrypted Mode 4 that is specific to the coalition (team) in multiplayer servers.

HOW IFF WORKS WITHIN DCS

ANY JF-17 vs ANY AIRCRAFT

An interrogation signal of your JF-17 against any aircraft that is not a JF-17 will automatically determine if the enemy aircraft is friendly or unknown (most likely enemy). The interrogation code and transponder code will not determine the nature of the contact interrogated; it will determine it based on:

- If the aircraft interrogated has his IFF transponder ON
- If the aircraft interrogated is part of the opposing team or not

Interrogation & Transponder Codes DO NOT matter in that case.

BLUE TEAM JF-17 vs RED TEAM JF-17

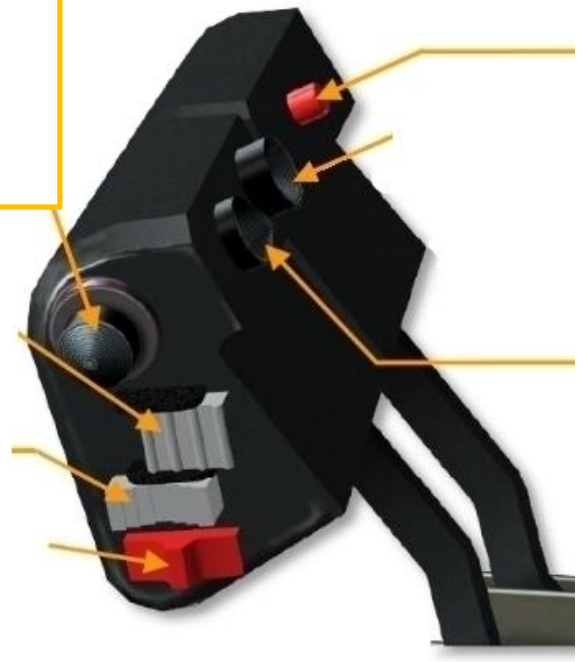
If JF-17s are operating for both your team and the opposing team, interrogation codes and transponder codes will determine if the interrogated contact is friendly or unknown (most likely enemy, or a friendly JF-17 with a malfunctioning transponder, or a friendly JF-17 with a transponder set on the wrong code).

Interrogation & Transponder Codes DO matter in that case. These codes should be known by all friendly JF-17 pilots on the server and mentioned in the mission briefing.

IFF CONTROLS

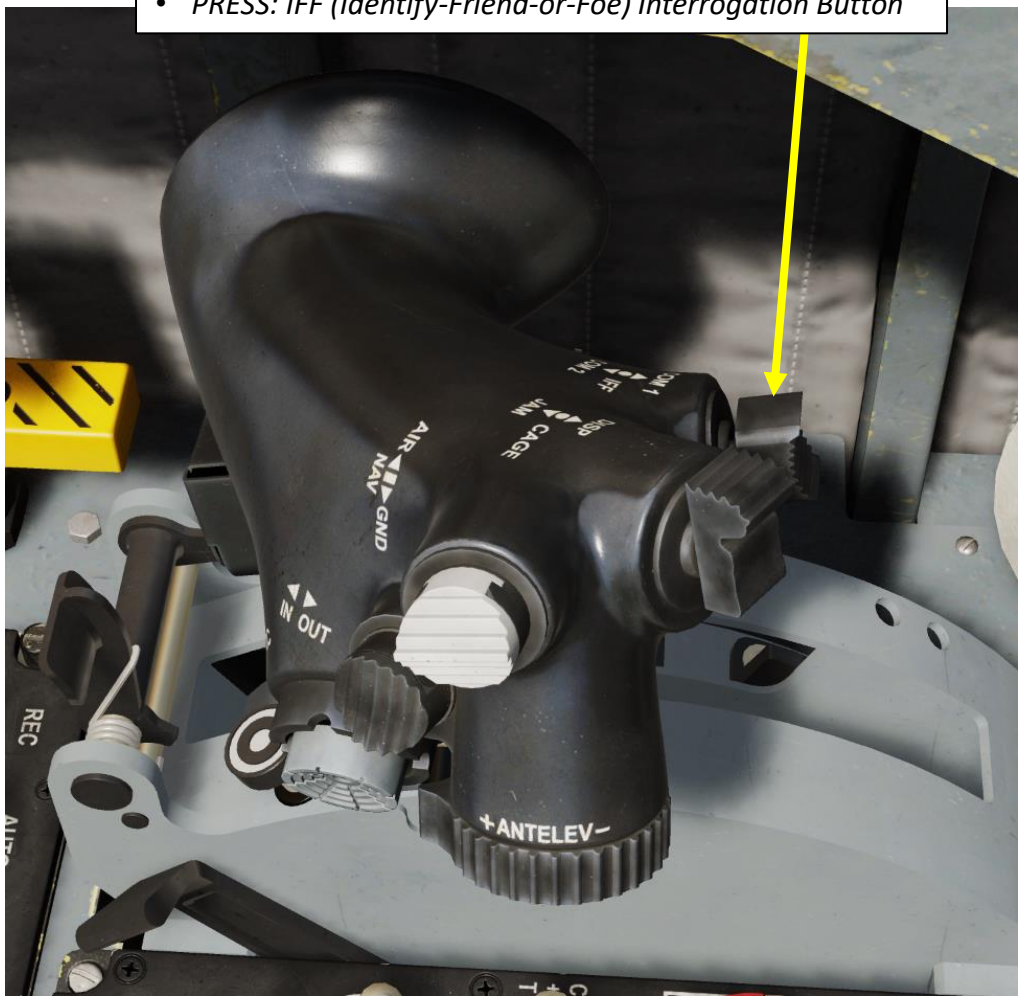
My Controls

P T4 PRESS – IFF Interrogation



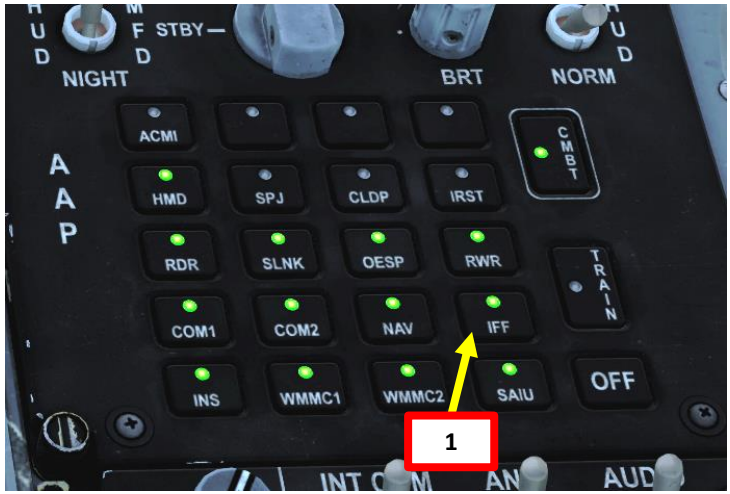
Real Aircraft Controls

T4 Switch
- *FWD: Radio PTT (Push-to-Talk) COMM1*
- *AFT: Radio PTT (Push-to-Talk) COMM2*
- *PRESS: IFF (Identify-Friend-or-Foe) Interrogation Button*



IFF TUTORIAL: JF-17 vs Other Aircraft

1. Power Up IFF (Identify-Friend-or-Foe) system by pressing the IFF Button on the AAP (Avionics Activation Panel).
2. Press “IFF” on the UFCP.
3. INT indicates that we are in the IFF Interrogation Menu (INT).
4. Press Arrow button next to the desired Interrogation Mode. This will determine what interrogation signal we send to the transponders of other aircraft. In our case, we will choose Mode 6.
5. A « + » next to « M6 » will indicate Mode 6 is selected.
6. No Interrogation Code is required when scanning other aircraft that are not of the JF-17 type.
7. Press on the Arrow button next to the dot to select the IFF Transponder Menu (TRS).
8. Press Arrow button next to the desired Transponder Mode. This will determine what response signal we send when our own aircraft is interrogated. In our case, we will choose Mode 6.
9. A « + » next to « M6 » will indicate Mode 6 is selected.
10. No Transponder Code is required when being interrogated by other aircraft that are not of the JF-17 type.

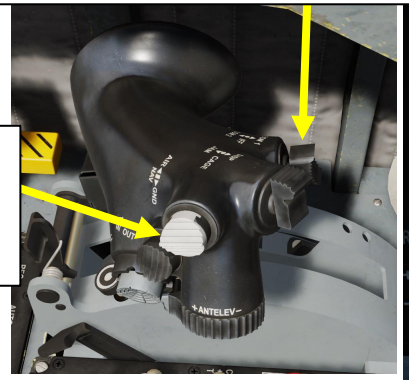


IFF TUTORIAL: JF-17 vs Other Aircraft

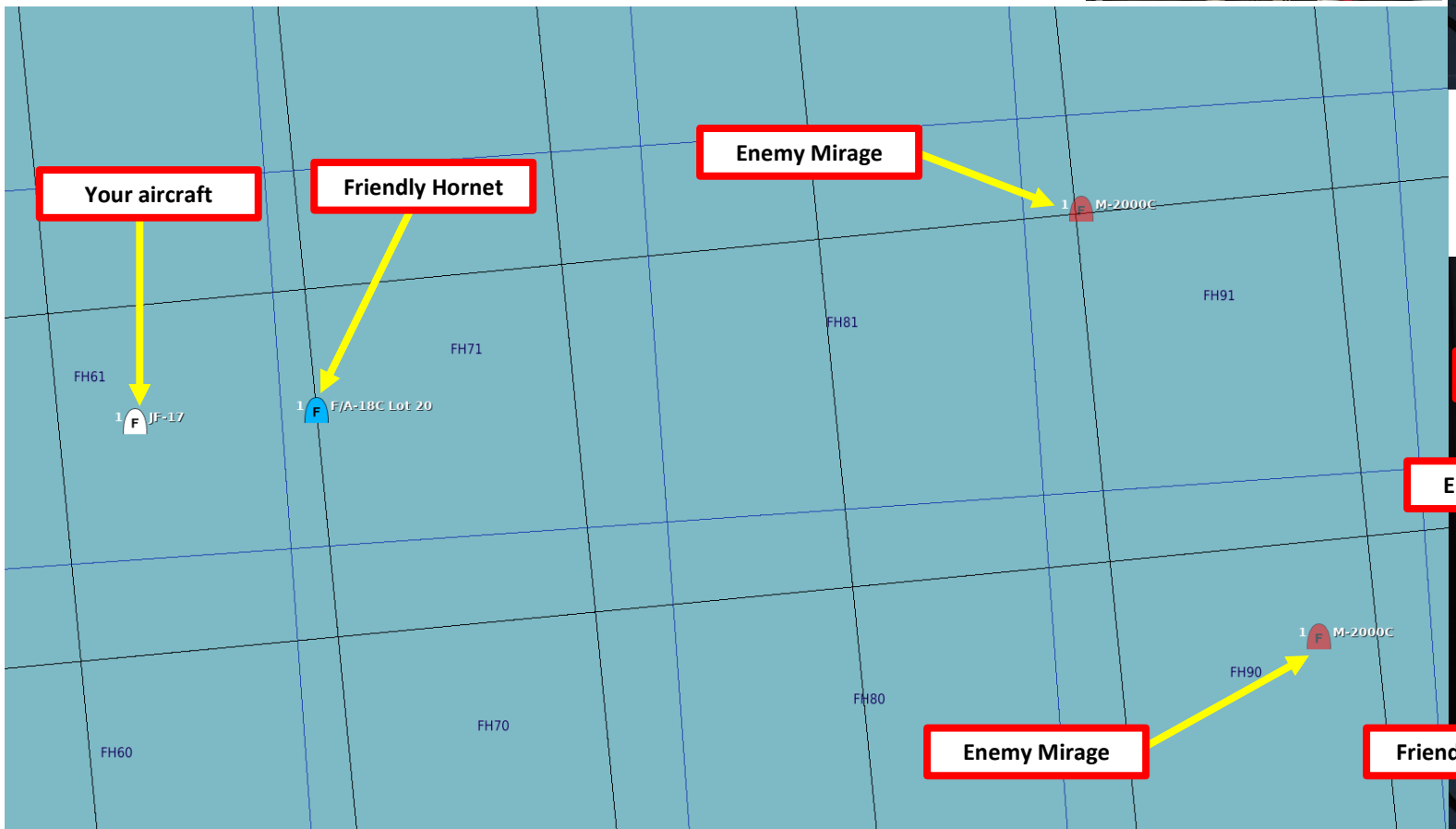
11. Press the MMS (Master Mode Switch) UP to INTC (Intercept).
12. To interrogate, press and hold the T4 Switch in the PRESS position ("I" binding).
13. Contacts in green will be displayed as friendly. Contacts in yellow indicate unknown aircraft.

T4 Switch — 12b
- *FWD: Radio PTT (Push-to-Talk) COMM1*
- *AFT: Radio PTT (Push-to-Talk) COMM2*
- *PRESS: IFF (Identify-Friend-or-Foe) Interrogation Button*

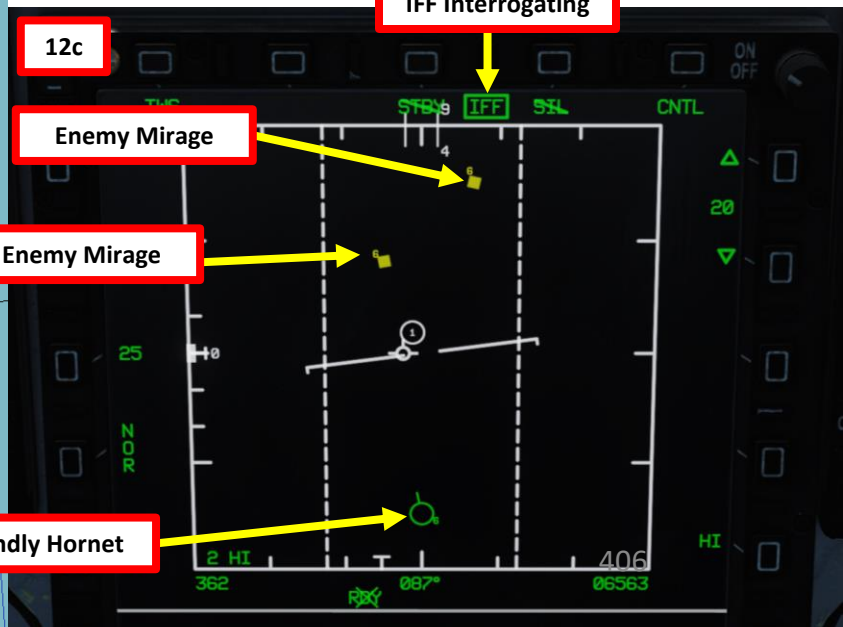
T1: MMS (Master Mode Switch) — 11
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*



12a

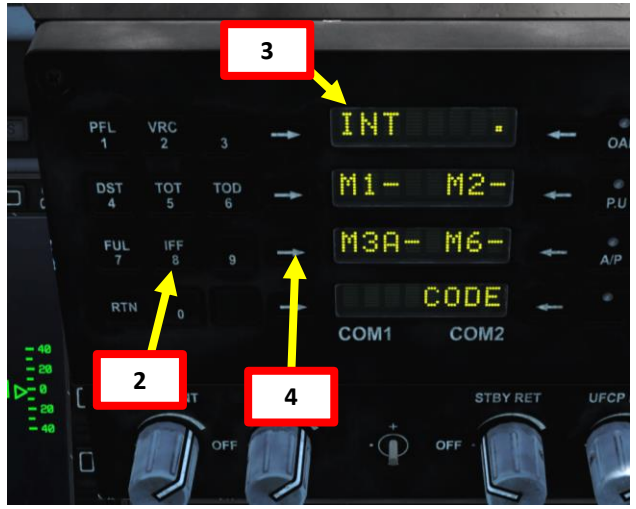


12c

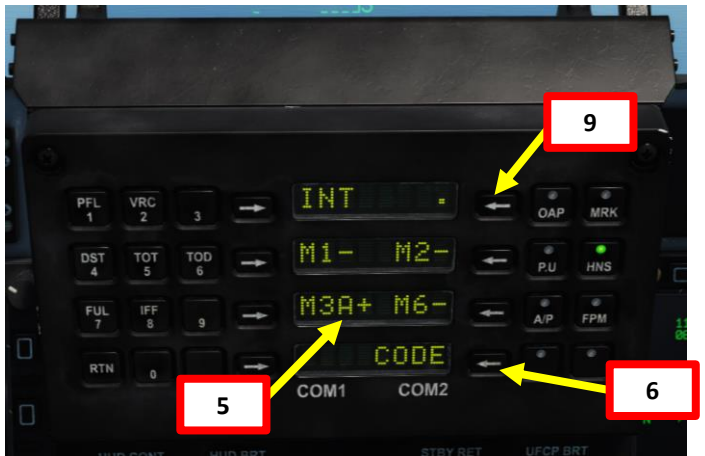


IFF TUTORIAL: JF-17 vs JF-17 (MODE 3A)

1. Power Up IFF (Identify-Friend-or-Foe) system by pressing the IFF Button on the AAP (Avionics Activation Panel).
2. Press “IFF” on the UFCP.
3. INT indicates that we are in the IFF Interrogation Menu (INT).
4. Press Arrow button next to the desired Interrogation Mode. This will determine what interrogation signal we send to the transponders of other aircraft. In our case, we will choose Mode 3A.
5. A « + » next to « M3A » will indicate Mode 3A is selected.
6. An Interrogation Code is required when scanning another JF-17 type. Press the Arrow button next to CODE.
7. Select code for desired mode. We will choose 1225 for Mode 3. Press arrow button next to 0000, enter code, then press arrow button again.
8. Press BACK to return to Interrogation menu.
9. Press on the Arrow button next to the dot to select the IFF Transponder Menu (TRS).
10. Press Arrow button next to the desired Transponder Mode. This will determine what response signal we send when our own aircraft is interrogated. In our case, we will choose Mode 3A.
11. A « + » next to « M3A » will indicate Mode 3A is selected.
12. A Transponder Code is required when being interrogated by other aircraft that are not of the JF-17 type. Press the Arrow button next to CODE.
13. Select code for desired mode. We will choose 1225 for Mode 3A. Press arrow button next to 0000, enter code, then press arrow button again.



Interrogation Code (Who are you?)	Transponder Code (Who am I?)
Mode 3A	Mode 3A
1225	1225



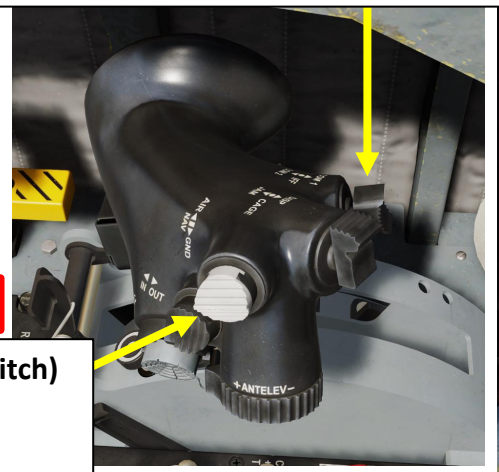
IFF TUTORIAL: JF-17 vs JF-17 (MODE 3A)

14. Press the MMS (Master Mode Switch) UP to INTC (Intercept).
15. To interrogate, press and hold the T4 Switch in the PRESS position ("I" binding).
16. Contacts in green will be displayed as friendly. Contacts in red indicate aircraft who did not have the same Mode 3 transponder code and did not respond properly.

T4 Switch

15b

- *FWD: Radio PTT (Push-to-Talk) COMM1*
- *AFT: Radio PTT (Push-to-Talk) COMM2*
- *PRESS: IFF (Identify-Friend-or-Foe) Interrogation Button*

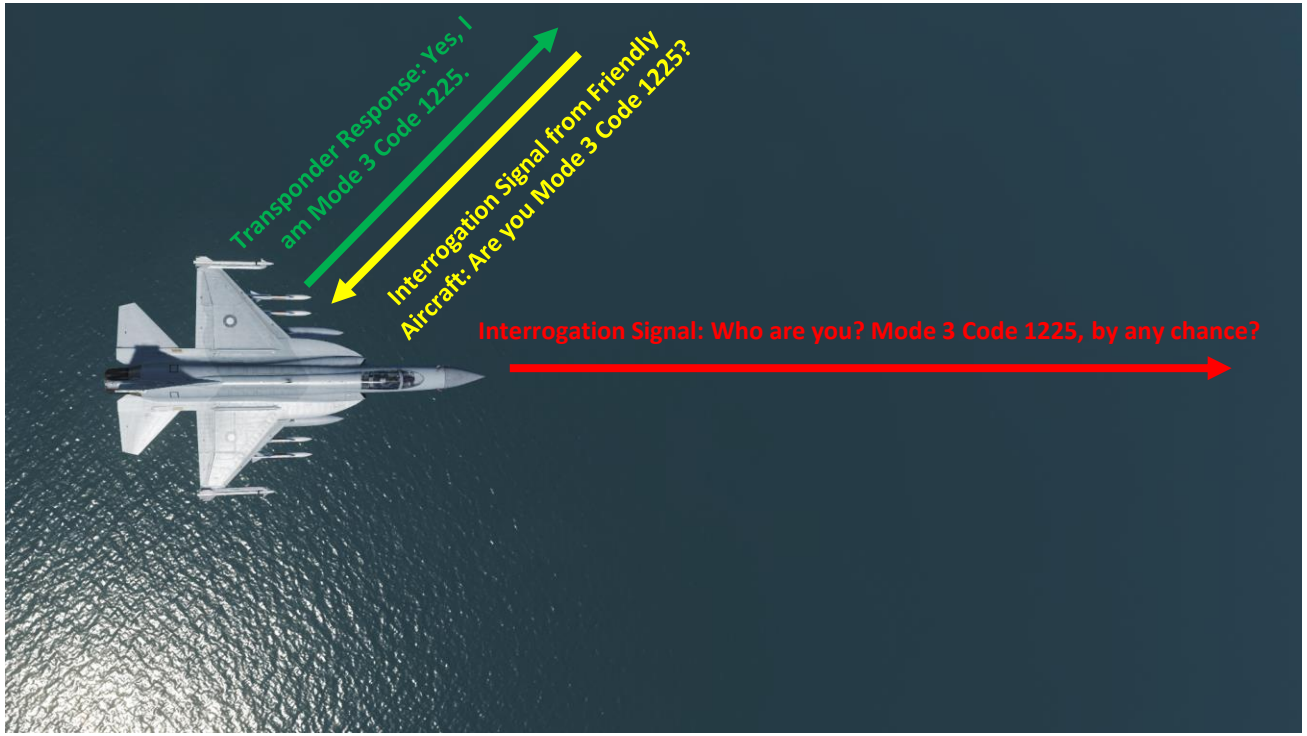


14

T1: MMS (Master Mode Switch)

- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

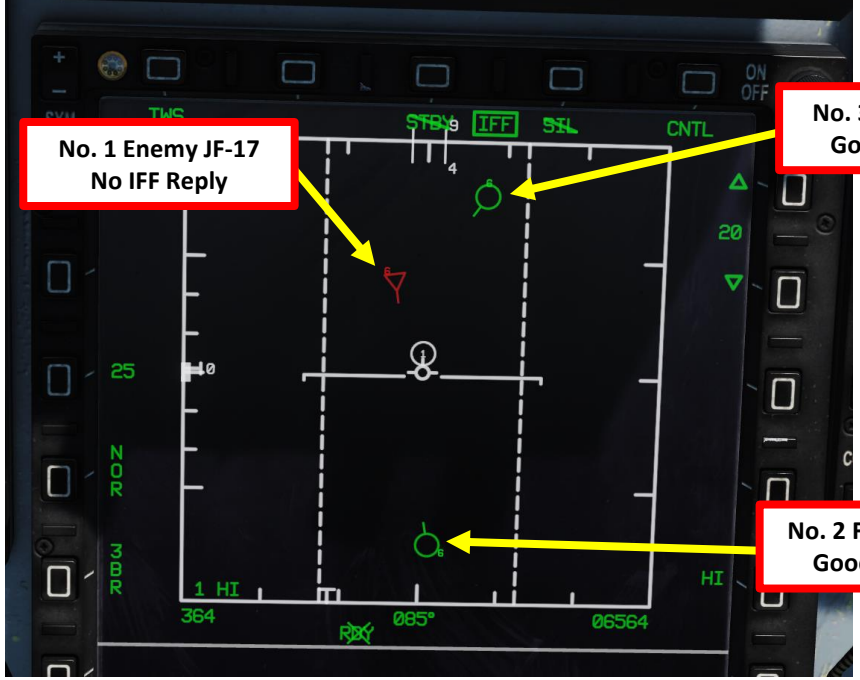
Interrogation Code (Who are you?)	Transponder Code (Who am I?)
Mode 3A	Mode 3A
1225	1225

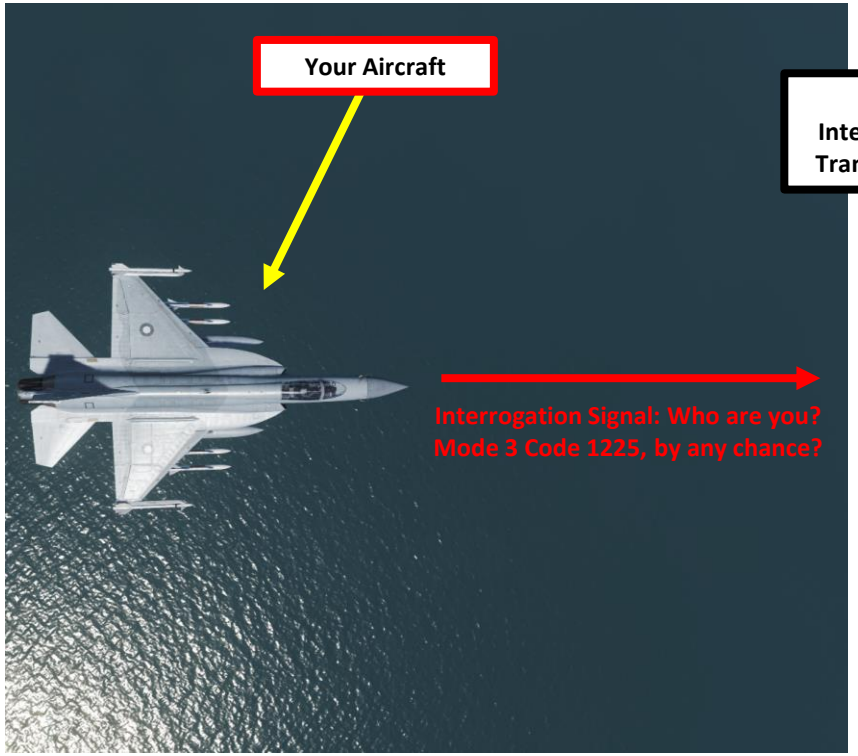


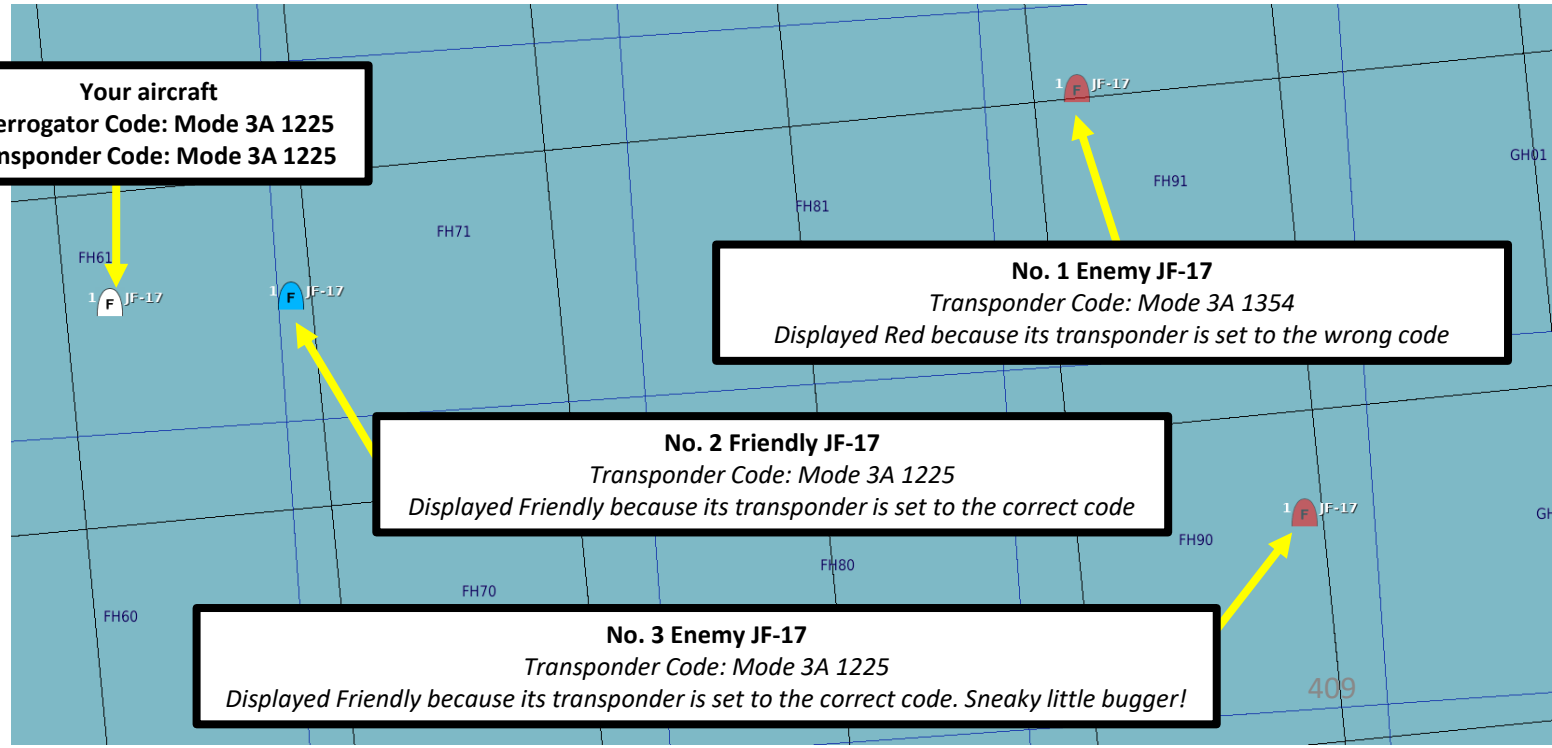
IFF TUTORIAL: JF-17 vs JF-17 (MODE 3A)

Take note than in Mode 3, an enemy fighter who found out your interrogator code could set his own transponder to this code, and fool you into thinking he is a friendly aircraft. Do not take Mode 3 IFF for granted.

Interrogation Code (Who are you?)	Transponder Code (Who am I?)
Mode 3A	Mode 3A
1225	1225

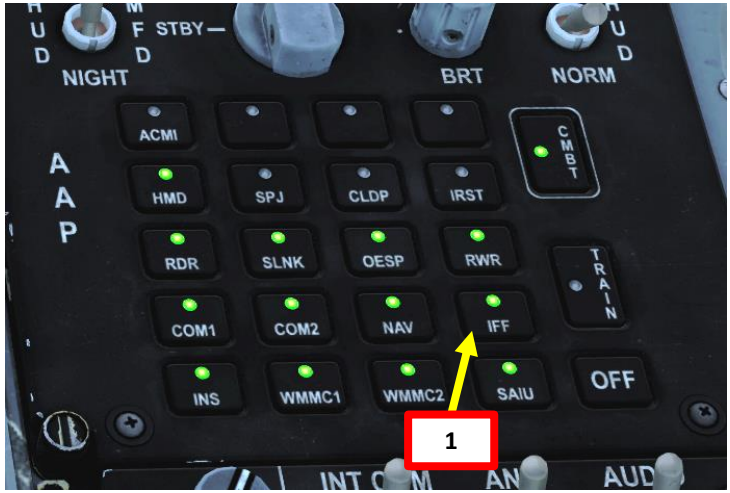






IFF TUTORIAL: JF-17 vs JF-17 (MODE 6)

1. Power Up IFF (Identify-Friend-or-Foe) system by pressing the IFF Button on the AAP (Avionics Activation Panel).
2. Press “IFF” on the UFCP.
3. INT indicates that we are in the IFF Interrogation Menu (INT).
4. Press Arrow button next to the desired Interrogation Mode. This will determine what interrogation signal we send to the transponders of other aircraft. In our case, we will choose Mode 6.
5. A « + » next to « M6 » will indicate Mode 6 is selected.
6. An Interrogation Code is required when scanning another JF-17 type. Press the Arrow button next to CODE.
7. Select code for desired mode. We will choose A for Mode 6.
8. Press BACK to return to Interrogation menu.
9. Press on the Arrow button next to the dot to select the IFF Transponder Menu (TRS).
10. Press Arrow button next to the desired Transponder Mode. This will determine what response signal we send when our own aircraft is interrogated. In our case, we will choose Mode 6.
11. A « + » next to « M6 » will indicate Mode 6 is selected.
12. A Transponder Code is required when being interrogated by other aircraft that are not of the JF-17 type. Press the Arrow button next to CODE.
13. Select code for desired mode. We will choose A for Mode 6.
14. Select IP+ option if desired. It will swap A and B encryption keys interleavely to allow other Mode 6 interrogators with A key to recognize you if you have your B key on.



Interrogation Code (Who are you?)	Transponder Code (Who am I?)
Mode 6	Mode 6
A	A

IFF TUTORIAL: JF-17 vs JF-17 (MODE 6)

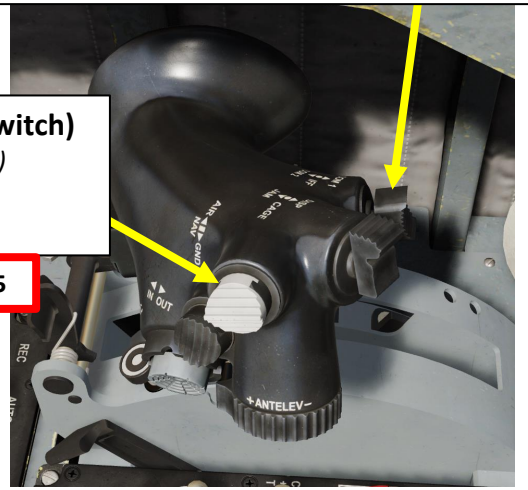
15. Press the MMS (Master Mode Switch) UP to INTC (Intercept).
16. To interrogate, press and hold the T4 Switch in the PRESS position ("I" binding).
17. Contacts in green will be displayed as friendly. Contacts in yellow indicate unknown aircraft.

T4 Switch
- *FWD: Radio PTT (Push-to-Talk) COMM1*
- *AFT: Radio PTT (Push-to-Talk) COMM2*
- *PRESS: IFF (Identify-Friend-or-Foe) Interrogation Button*

16b

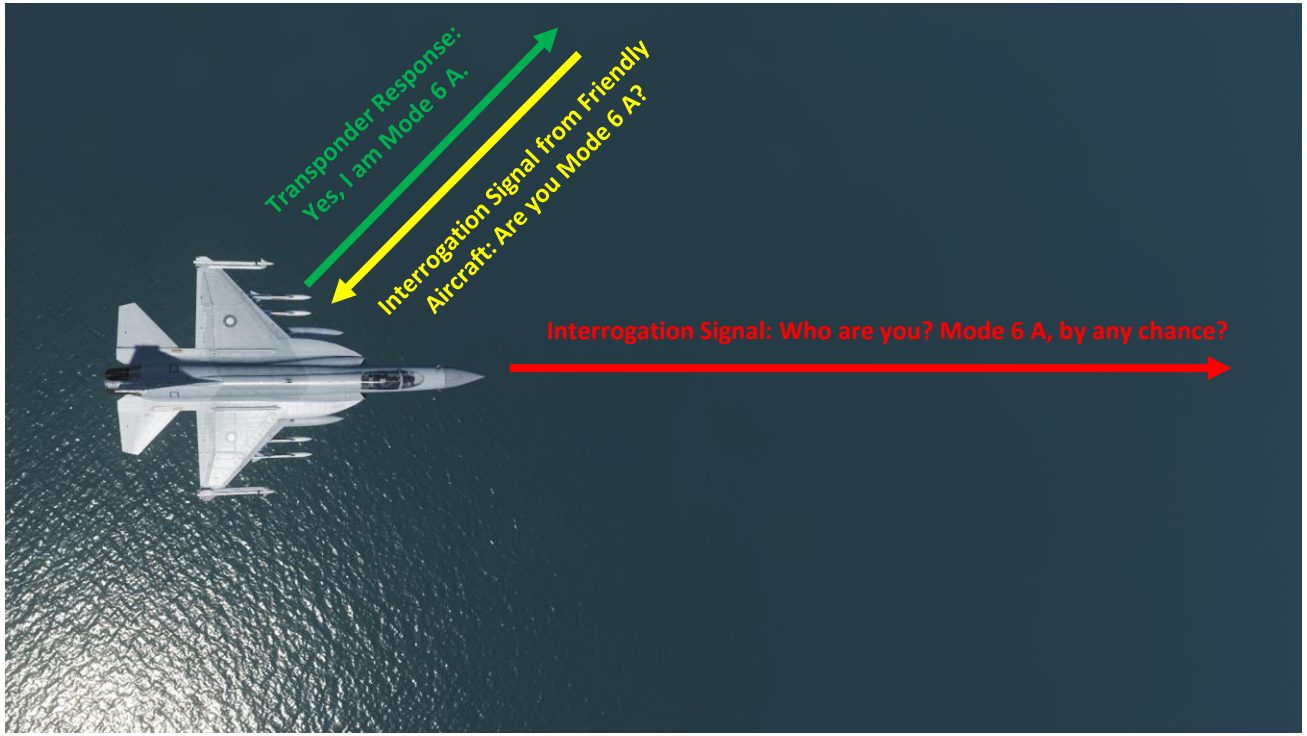
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

15



16a

Interrogation Code (Who are you?)	Transponder Code (Who am I?)
Mode 6	Mode 6
A	A

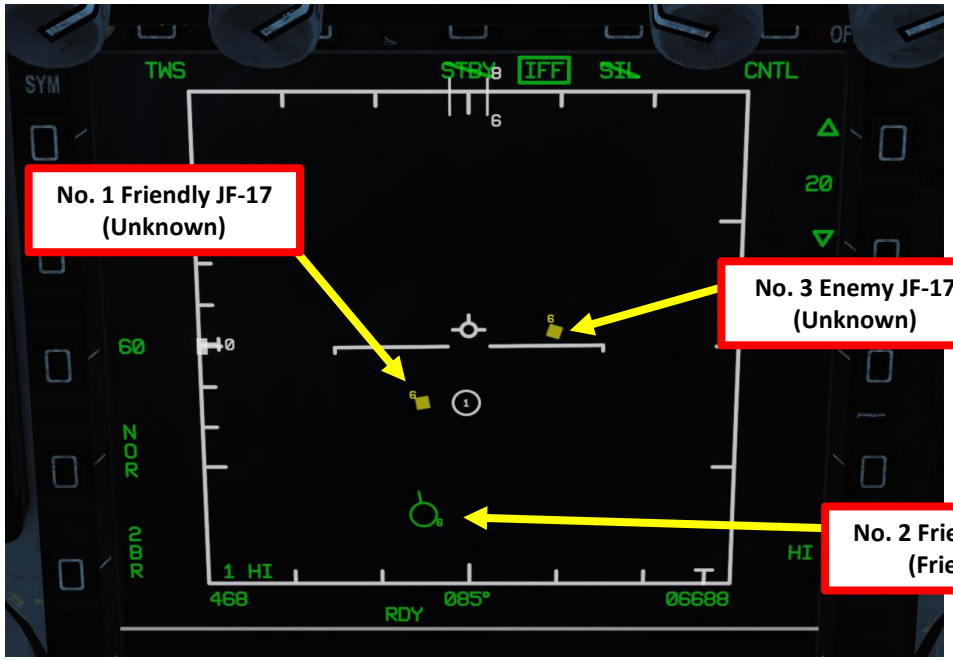


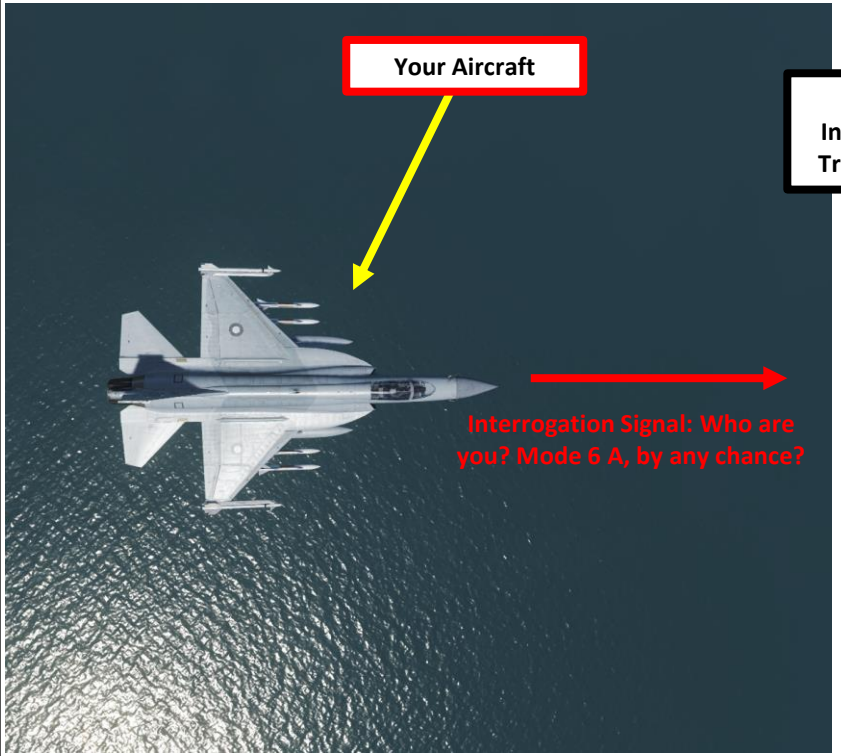
IFF Interrogating

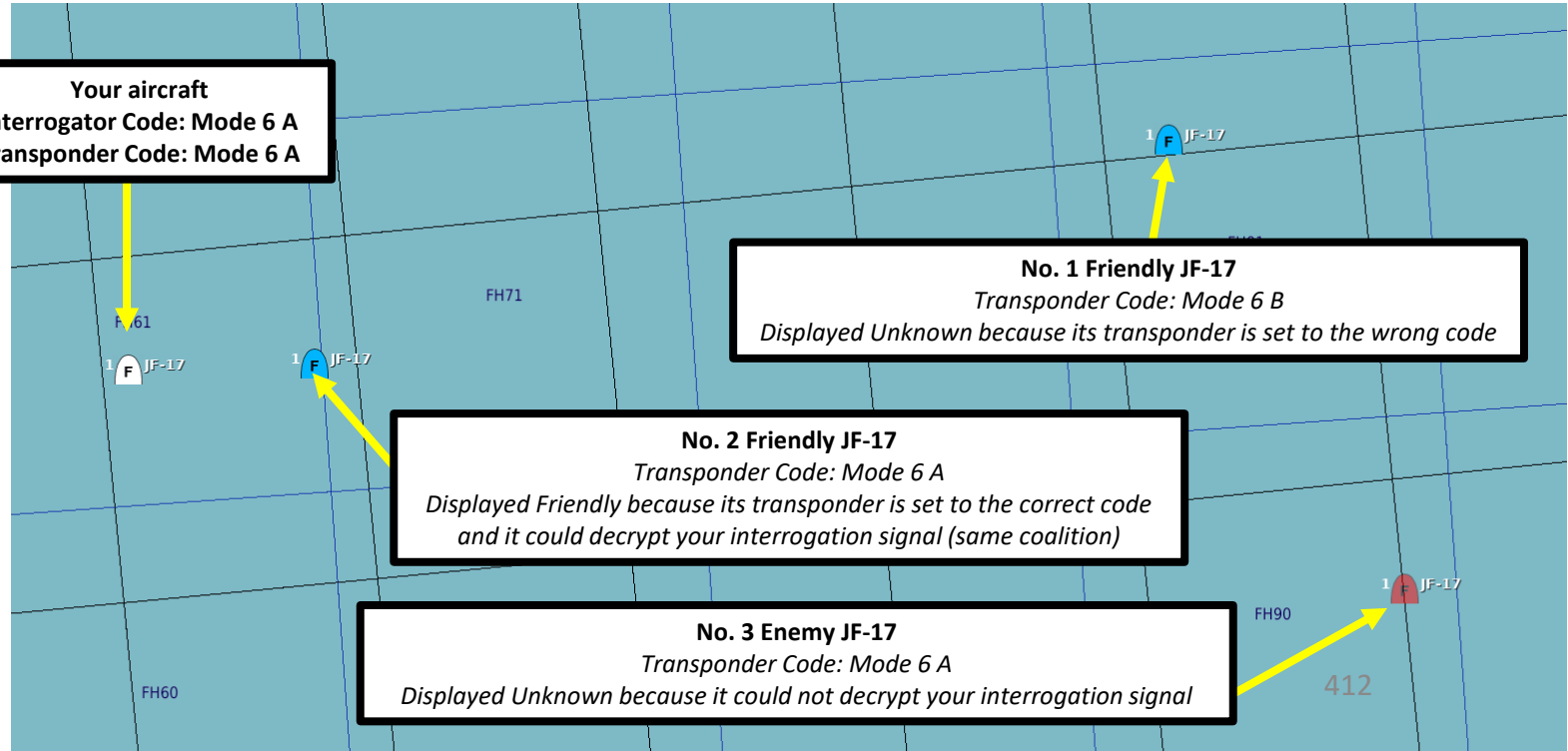
16b

IFF TUTORIAL: JF-17 vs JF-17 (MODE 6)

Interrogation Code (Who are you?)	Transponder Code (Who am I?)
Mode 6	Mode 6
A	A







IN CONCLUSION

The moral of the story is that Datalink and IFF are meant to be used together in order to complement the information gathered by your radar, radar warning receiver and other datalink information donors. This minimizes the chances of friendly fire.

R&S M3AR V/UHF RADIO

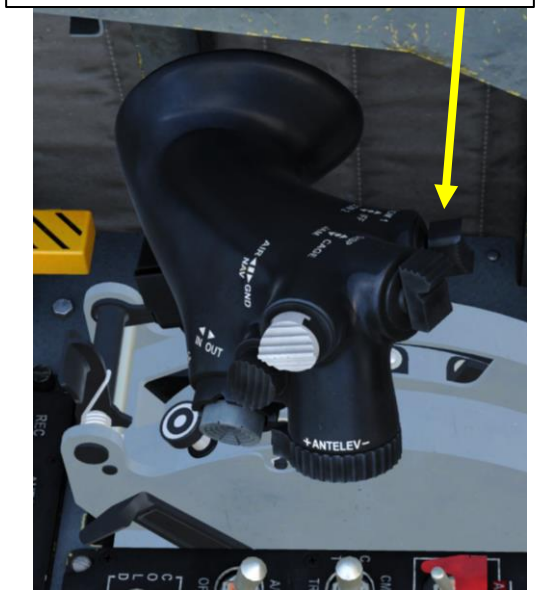
The JF-17 uses a R&S M3AR VHF/UHF radio.

- **COM1 covers the VHF band (108.000 – 173.975 MHz)** and is used for primary voice communications.
- **COM2 covers the UHF band (225.000 – 399.975 MHz)** and is used as a backup for voice communications. COM2 is also used for Datalink, which uses the dedicated Preset Channel 199.
- Radio transmission is done with the **T4 Radio Push-to-Talk switch** FWD (COM1 VHF, "RALT+\") or AFT (COM2 UHF, "RCTRL+\")

The **UFCP** panel is used to tune radios rapidly using preset frequencies in either VHF or UHF frequencies. The Main UFCP Menu appears when pressing the RTN button on the UFCP. 200 Preset Channels are available.

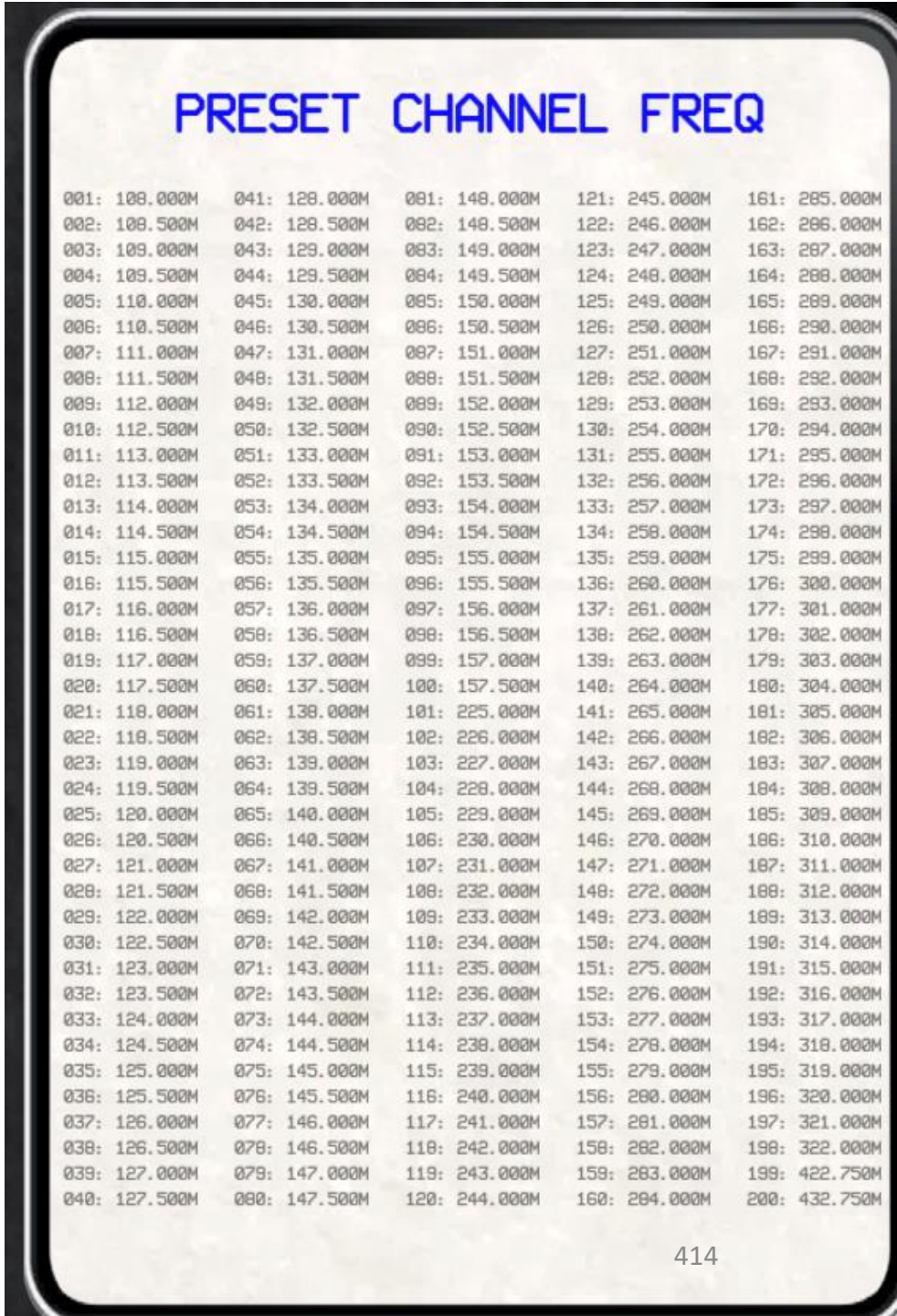
The **Communications Panel**, on the other hand, can be used for all radio functions. This includes selecting preset channels, seeing the frequency preset channels, changing radio transmission power, and modifying the frequency of a preset channel.

T4 Switch
- *FWD: Radio PTT (Push-to-Talk) COMM1*
  - *RALT+*
- *AFT: Radio PTT (Push-to-Talk) COMM2*
  - *RCTRL+*



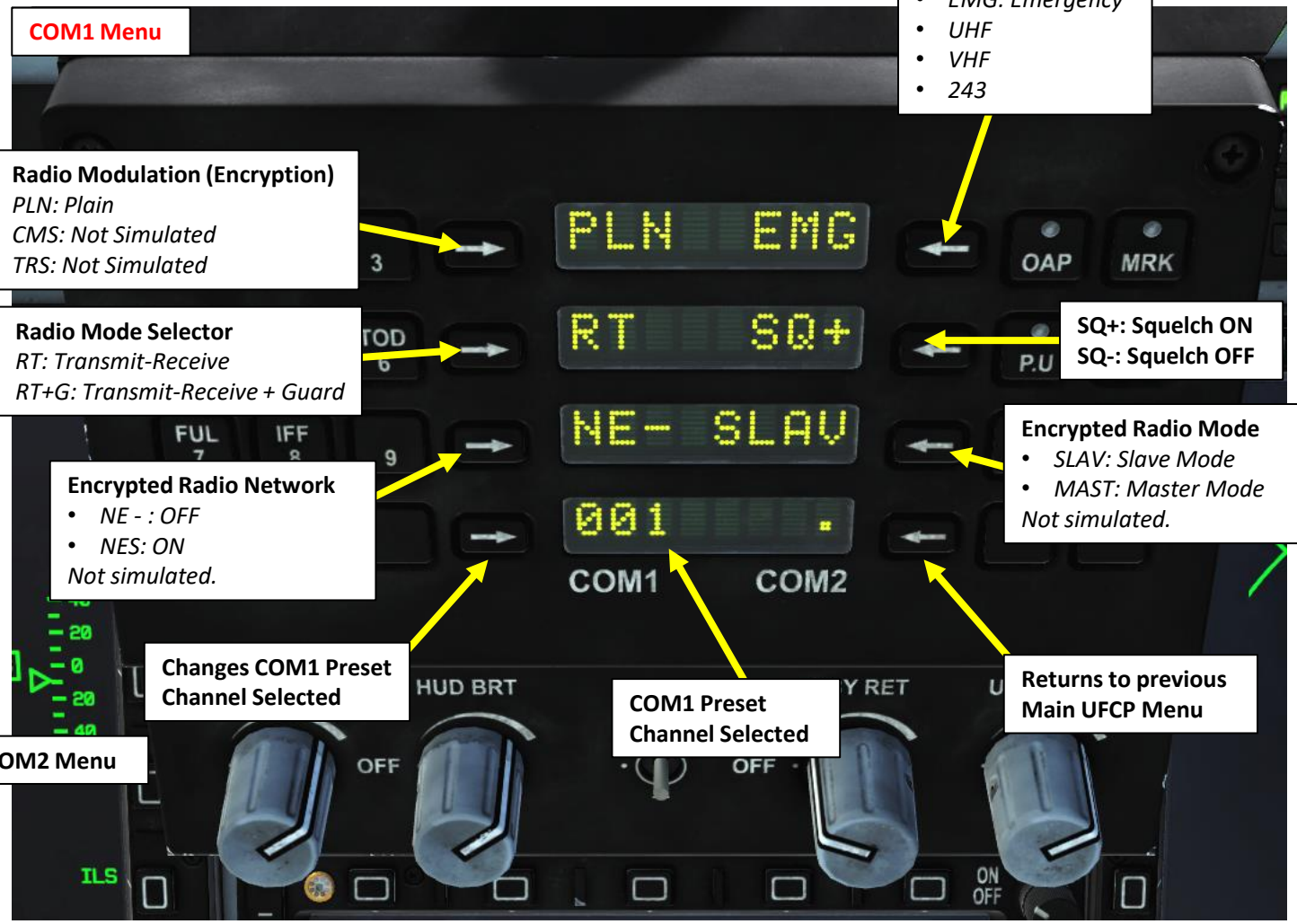
UFCP (Up-Front Control Panel)

Communications Panel

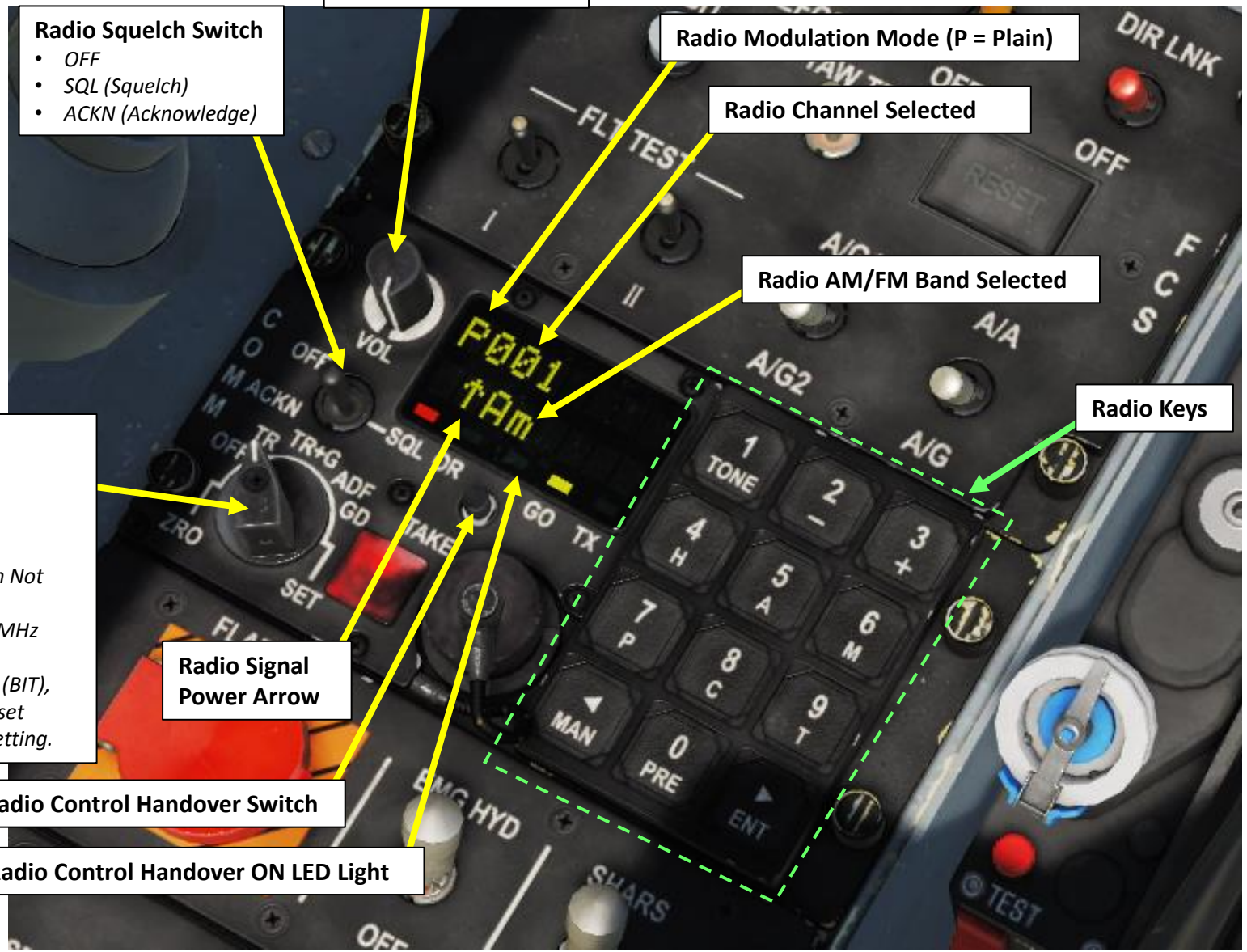


UFCP PANEL

The Main UFCP (Up-Front Control Panel) Menu appears when pressing the RTN button on the UFCP.



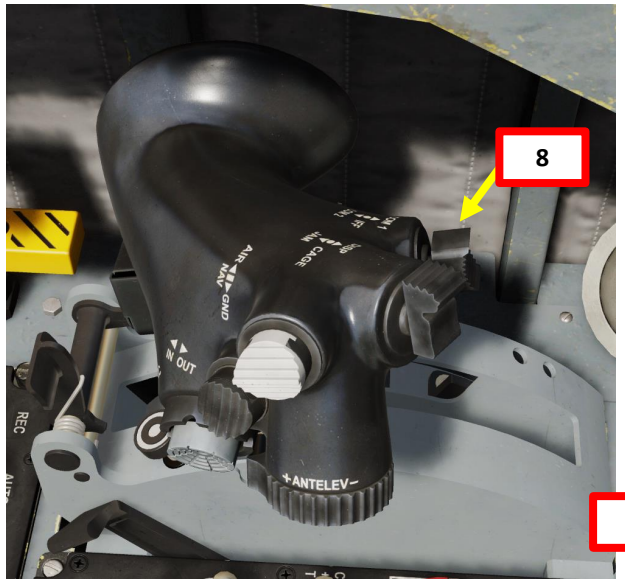
COMMUNICATIONS PANEL



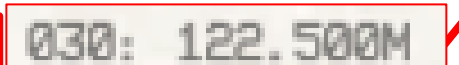
R&S M3AR V/UHF RADIO

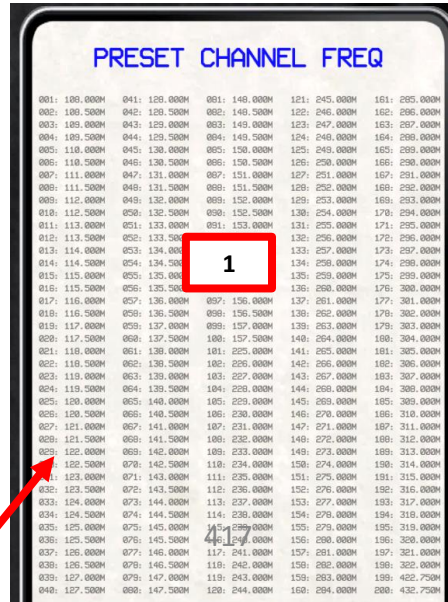
TUTORIAL 1
Use Preset Channel with UFCP Panel

1. Consult PRESET CHANNEL FREQ table using the kneeboard. Use “RSHIFT+K” to display kneeboard, then use “[“ and “]” to turn pages.
2. We will use COM1 VHF Channel 030 (122.500 MHz).
3. Make sure Radio Mode Selector is set to TR (Transmit-Receive)
4. On UFCP, press RTN button to display Main UFCP menu.
5. Press on Arrow button next to COM1. Display will show current Squelch and Network parameters on current preset channel.
6. Press on Arrow button next to COM1 again to enter EDIT mode.
7. Enter desired Preset Channel on keypad (030 will select Channel 30). Press on Arrow button next to COM1 to confirm the Edit.
8. To transmit on COM1, press the T4 Radio Push-to-Talk button FWD (“RALT + \” binding).



2



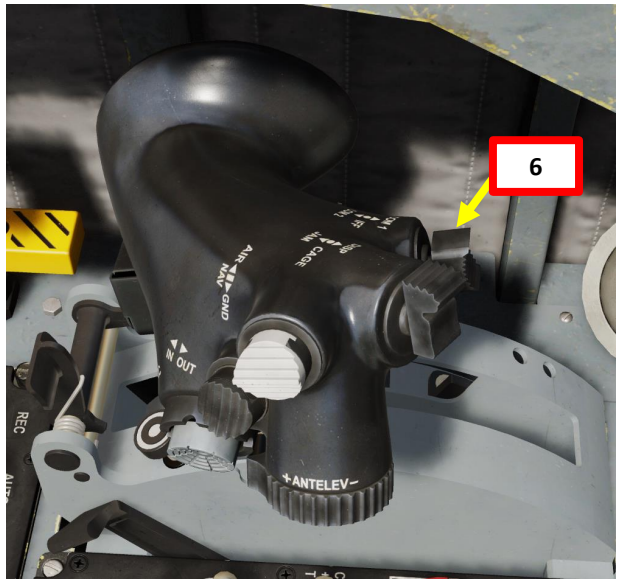


R&S M3AR V/UHF RADIO

TUTORIAL 2

Use Preset Channel with Communication Panel

1. Make sure Radio Mode Selector is set to TR (Transmit-Receive)
2. Press on the Radio Control Handover button. Confirm that corresponding yellow LED light illuminates. This will take control away from the UFCP and let you use the Communication Panel.
3. Select Preset Mode: Click PRE (0), then P (7) for Plain Modulation Mode.
4. Change Preset Channel Number: Type on keypad the desired preset channel number (i.e. 40), then press ENT.
5. Check current frequency of preset channel: Press ENT, then + (3). Frequency will be displayed for the selected preset channel (127.500). Press + (3) again to return to previous display.
6. To transmit on COM1, press the T4 Radio Push-to-Talk button FWD (“RALT + \” binding).

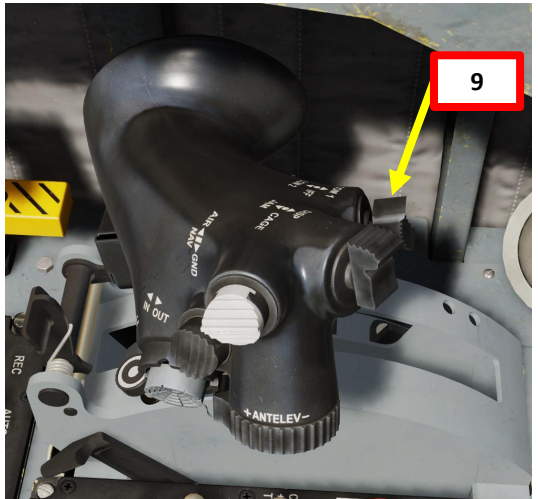


R&S M3AR V/UHF RADIO

TUTORIAL 3

Edit Preset Channel with Communication Panel

1. Make sure Radio Mode Selector is set to TR (Transmit-Receive)
2. Press on the Radio Control Handover button. Confirm that corresponding yellow LED light illuminates. This will take control away from the UFCP and let you use the Communication Panel.
3. Select Preset Mode: Click PRE (0), then P (7) for Plain Modulation Mode.
4. Change Preset Channel Number: Type on keypad the desired preset channel number (i.e. 40), then press ENT.
5. Set Radio Mode Selector to SET
6. Display should show the current frequency of the Preset Channel (127.500)
7. Press ENT, type the new frequency (126.75), then press ENT again. Channel 40 is now set to 126.750 MHz.
8. Set Radio Mode Selector to TR (Transmit-Receive)
9. To transmit on COM1, press the T4 Radio Push-to-Talk button FWD (“RALT + \” binding).

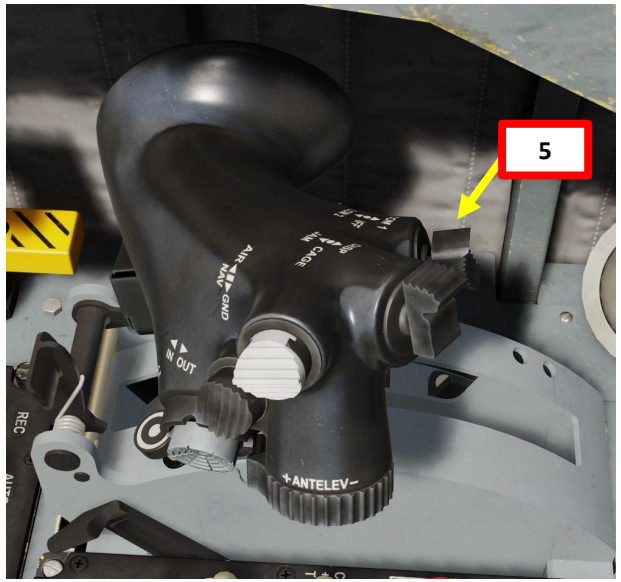


R&S M3AR V/UHF RADIO

TUTORIAL 4

Manual Frequency with Communication Panel

1. Make sure Radio Mode Selector is set to TR (Transmit-Receive)
2. Press on the Radio Control Handover button. Confirm that corresponding yellow LED light illuminates. This will take control away from the UFCP and let you use the Communication Panel.
3. Select MANUAL Mode: Click MAN, then P (7) for Plain Modulation Mode.
4. Type the new frequency (119.000), then press ENT. Manual frequency is now updated.
5. To transmit on COM1, press the T4 Radio Push-to-Talk button FWD (“RALT + \” binding).



FCS (FLIGHT CONTROL SYSTEM)

The JF-17 has a Fly-By-Wire system, which replaces conventional manual flight controls of an aircraft with an electronic interface. The FCS (Flight Control System) has a certain level of control over pitch, roll and yaw control inputs. The lateral and directional control system is a mix of mechanical control system and authority limited electrical CAS/SAS. Lateral CAS receives digital roll rate command from the stick, and uses roll rate feedback to provide dampening and roll rate control.

In the Pitch Axis:

- The FCS will automatically trim the aircraft, adjust leading edge flaps to achieve the best lift-to-drag ratio, automatically limit G loading and angle of attack to avoid structural damage or aircraft stall.
- At high speed, the stick controls the aircraft's vertical G.
- At low speed, the stick controls the aircraft's pitch rate.
- At high angle of attack, the aircraft forces the nose down to remain within AoA limits.
- After the landing gear is retracted, the FCS will maintain positive speed stability.
- If aircraft enters a spin, the DIRECT LINK mode switch must be engaged to automatically exit the spin. However, if the aircraft within AoA limits, this function will not work.
- There is an automatic takeoff trim function. It actives when wheel speed exceeds 41 kts and starts deflecting the horizontal stabilizer to 8 deg of deflection angle when reaching 108 kts.

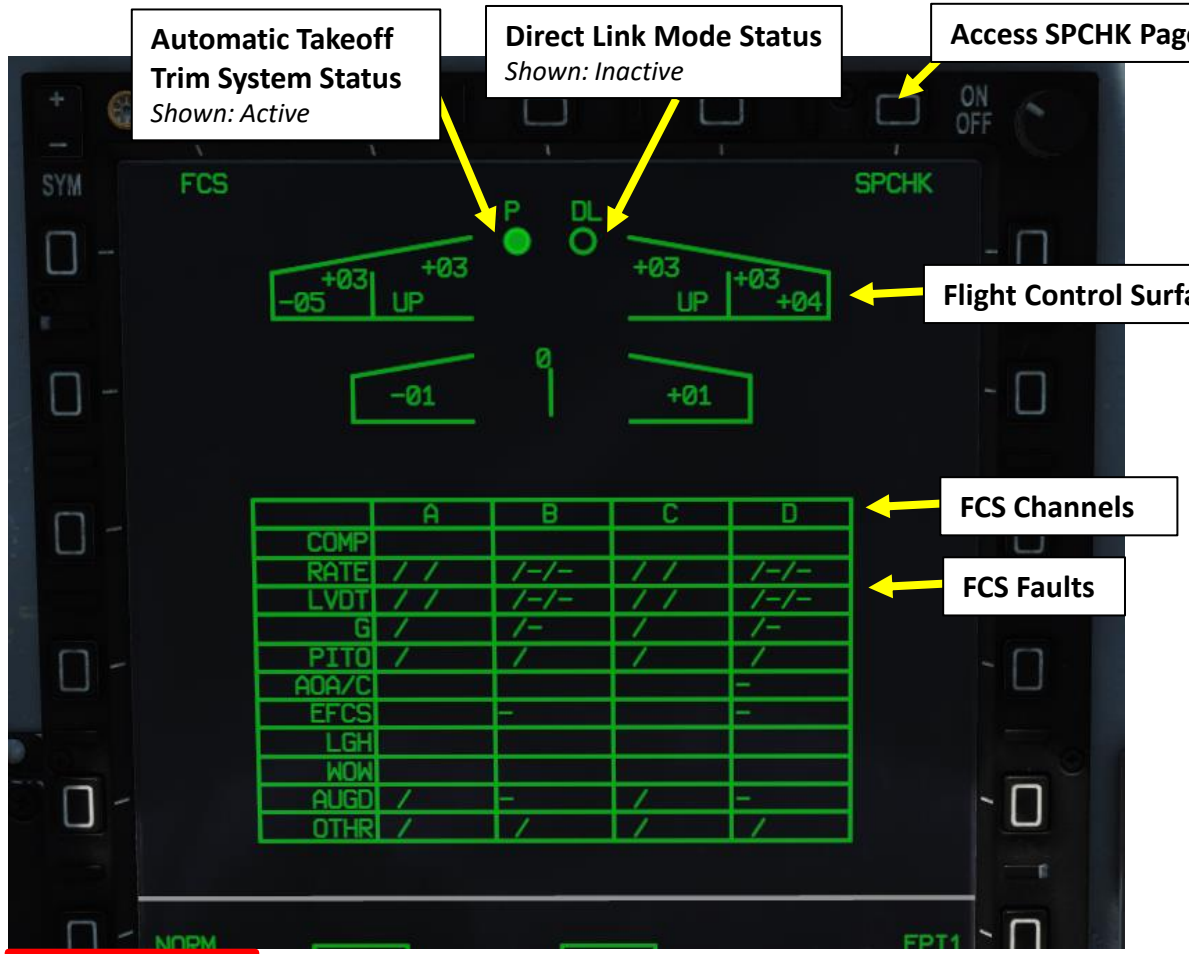
In the Roll and Yaw Axis:

- Control augmentation system will ensure adequate flight control performance, but roll and yaw control systems are not fly-by-wire. This means you will have to keep adjusting your roll and yaw with the stick and rudder throughout the flight.

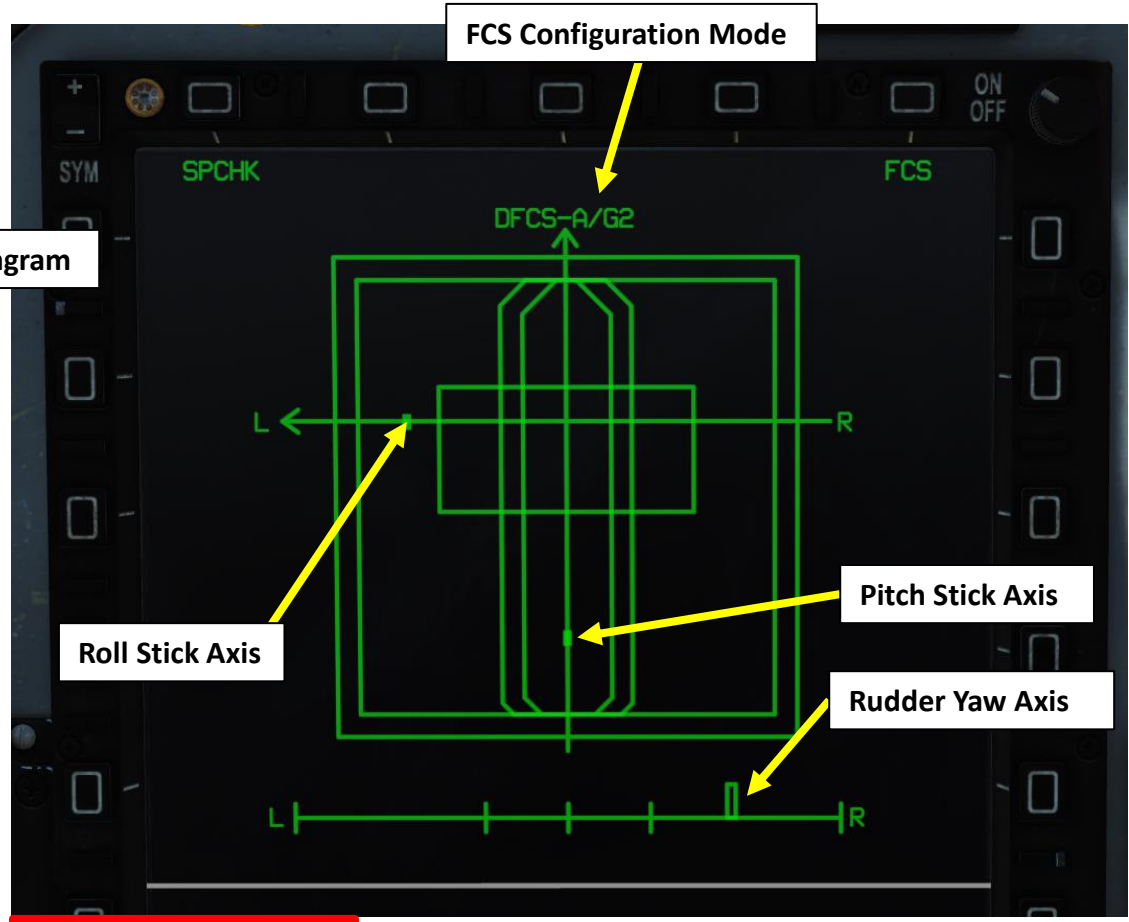
FCS (FLIGHT CONTROL SYSTEM)

Flight Control System faults and malfunctions can be monitored in the DATA – FCS sub-page. These faults are monitored for A, B, C and D individual FCS channels. A solid “P” circle will indicate that the automatic takeoff trim system is pulling up the aircraft. A solid “DL” circle indicates the Direct Link FCS mode is active.

From the FCS page, you can also check flight control position on the DATA – FCS – SPCHK sub-page.



DATA – FCS Page



DATA – FCS – SPCHK Page

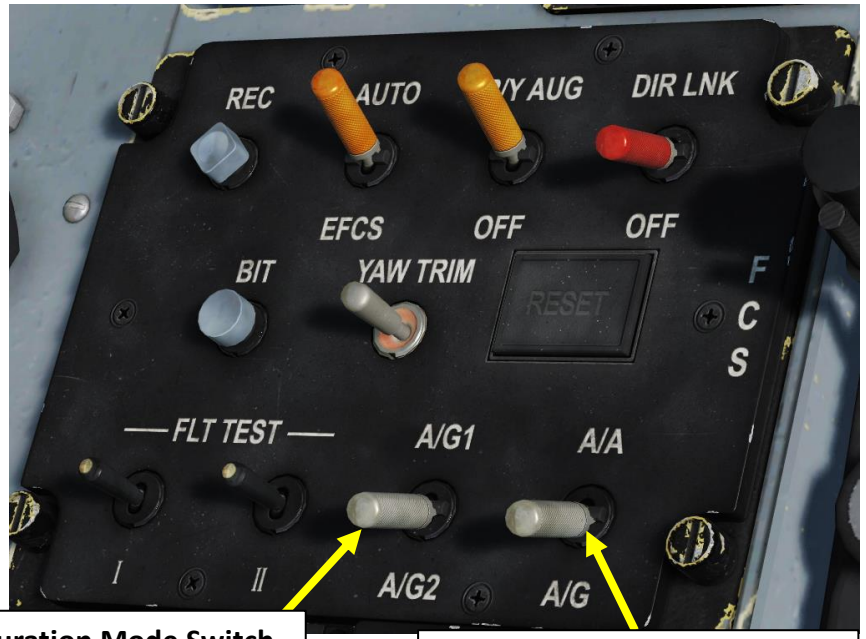
FCS (FLIGHT CONTROL SYSTEM)

FCS CONFIGURATION MODES

The Flight Control System can use three configuration modes: AA, AG1 and AG2. Depending on the weapon and external fuel tank loadout, the aircraft will automatically detect what CONFIG setting you should be in. The CONFIG warning indicates that the FCS Configuration Mode switches are not set properly. The selected CONFIG setting is indicated on the Status Light panel.

- **AA**: Air-to-Air configuration. FCS will limit aircraft G to 8 G.
- **AG1**: Air-to-Ground configuration 1, used when air-to-ground weapons are mounted and no external wing-mounted fuel tanks are mounted. AG1 G limit is 6g.
- **AG2**: Air-to-Ground configuration 2, used when air-to-ground weapons are mounted and external wing-mounted fuel tanks are mounted. AG2 G limit is 5g.

Be careful: Some munitions like the C-701 TV missile have a structural limit of 5.5g and the FCS config will still recommend AG1.



AG1/AG2 Flight Control System Configuration Mode Switch
- *AG1: Air-to-Ground Configuration 1*
- *AG2: Air-to-Ground Configuration 2*

AA/AG (Air-to-Air/Air-to-Ground) Flight Control System Configuration Mode Switch

AUTOPILOT

The JF-17 has a number of autopilot “relief modes” that assist the pilot in flying the aircraft.

AUTOPILOT MODES

1. **ATT**: Attitude Hold. Aircraft will maintain the existing pitch and roll attitude in pitch and +/- 70 degrees in roll.

2. **ALT**: Barometric Altitude Hold. When engaged, aircraft will maintain current barometric altitude when ALT mode is selected; altitude hold target will be displayed on the UFCP (0500 = 5000 ft)

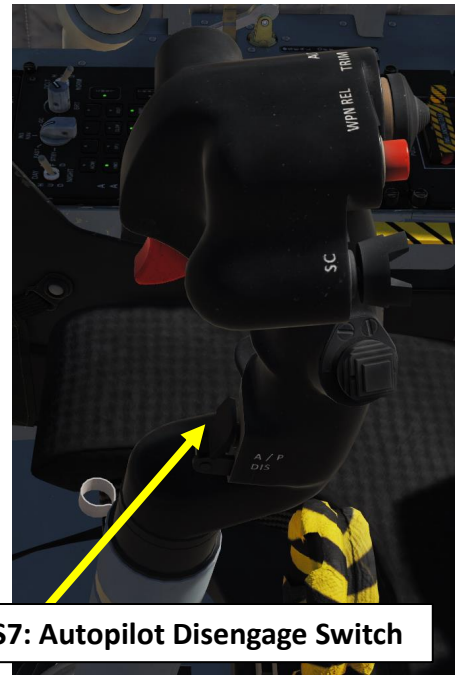
3. **ALT (SEL)**: Barometric Altitude Select. If Altitude Hold is engaged, you can press on the arrow next to the altitude value and edit it on the UFCP keypad. Once new target altitude is saved, autopilot will climb or descend to this altitude.

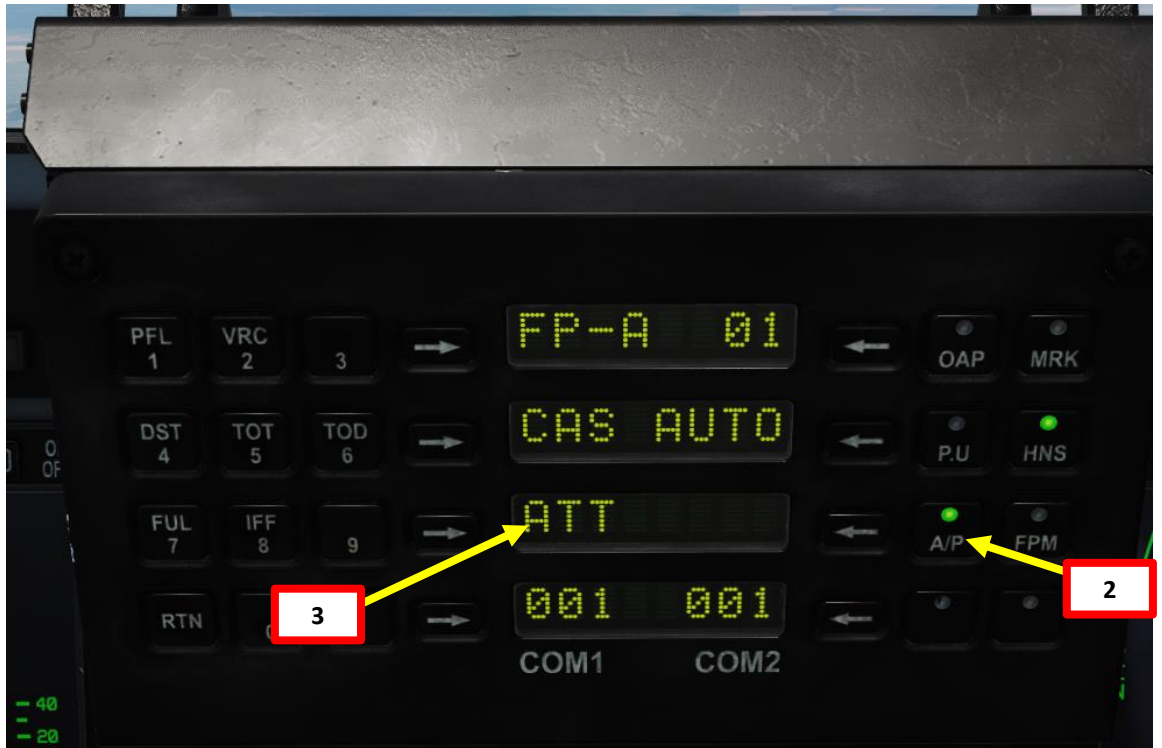
4. **HEADING HOLD**: If any autopilot mode is engaged and your bank angle is less than 7 degrees, the aircraft will attempt to maintain its current heading. This mode is implicit and is not displayed on the UFCP.

AUTOPILOT

ATTITUDE HOLD PROCEDURE

1. Set aircraft in desired attitude
2. Press the A/P button on the UFCP to power on the Autopilot.
3. When autopilot is powered on, ATT (Attitude Hold) mode will be ON by default and autopilot will maintain current attitude.
4. If bank angle is less than 7 deg, the aircraft will also automatically hold its current heading.
5. To disengage autopilot, press the S7 (Autopilot Disengage) Button.





AUTOPILOT

ALTITUDE SELECT PROCEDURE

1. Set aircraft in desired attitude
2. Press the A/P button on the UFCP to power on the Autopilot.
3. When autopilot is powered on, ATT (Attitude Hold) mode will be ON by default and autopilot will maintain current attitude.
4. Press on the Arrow button next to Autopilot mode (ATT) data field. This will set ALT (Altitude Hold) mode.
5. Autopilot will maintain current altitude, which will be displayed next to ALT (0500 = 5000 ft).
6. If bank angle is less than 7 deg, the aircraft will also automatically hold its current heading.
7. To set a new target altitude:
   a) Press on the arrow button right of the altitude value data field to edit the field
   b) Enter the new altitude value on the UFCP keypad (0600 will input 6000 ft)
   c) Press on the arrow button right of the altitude value data field again.
8. Autopilot will automatically pitch up to reach the new target altitude. Once target altitude is reached, aircraft will level off and maintain target altitude (6000 ft).
9. To disengage autopilot, press the S7 (Autopilot Disengage) Button.

PART 17 – NAVIGATION & ILS LANDING

NAVIGATION INTRODUCTION

Navigation in the JF-17 is mostly done through the HSD (Horizontal Situation Display), which is a top-down view that displays your heading and navigation aids such as TACAN (Tactical Air Navigation) beacons and waypoints entered before flight in the mission editor. The HUD (Heads-Up Display) also displays various steering cues. The EFIS (Electronic Flight Instrument System) page can also be used to consult steering cues for ILS landings.

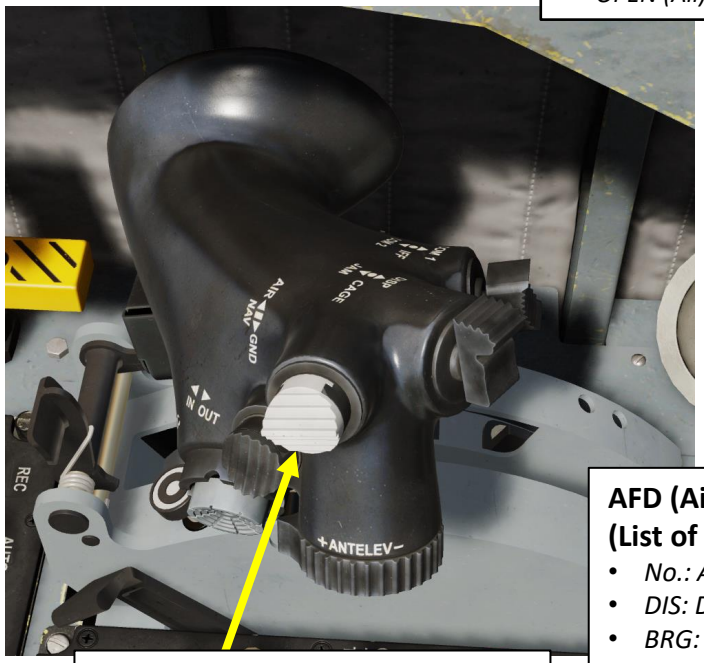
DIGITAL MAP

In order to display the digital map, select the MAP option (boxed when selected).

You can set the desired map type in the Special Options (see Kits & Options section).

HSD (HORIZONTAL SITUATION DISPLAY)

Setting the MMS (Master Mode Switch) in the MIDDLE position (NAV) will automatically display the AFD (Airfield Data) sub-page, which lists the closest airports.



T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

Distance to Selected Waypoint (nm)

Aircraft Heading

TRU (True Heading) / MAG (Magnetic Heading) Selector

Heading Scale

Map Scale Increase

Bearing to Selected Waypoint

Selected Waypoint

Map Scale (240/120/60/30/9)

RWR Threat Number Setting
Sets the number of RWR contacts displayed on the HSD
- *OPEN (All) / PRTY (Priority)*

Map Scale Decrease

Flight Plan

West / South / East / North Reference Marks

MAP Option

Aircraft Position

TCN: TACAN Data Display Toggle

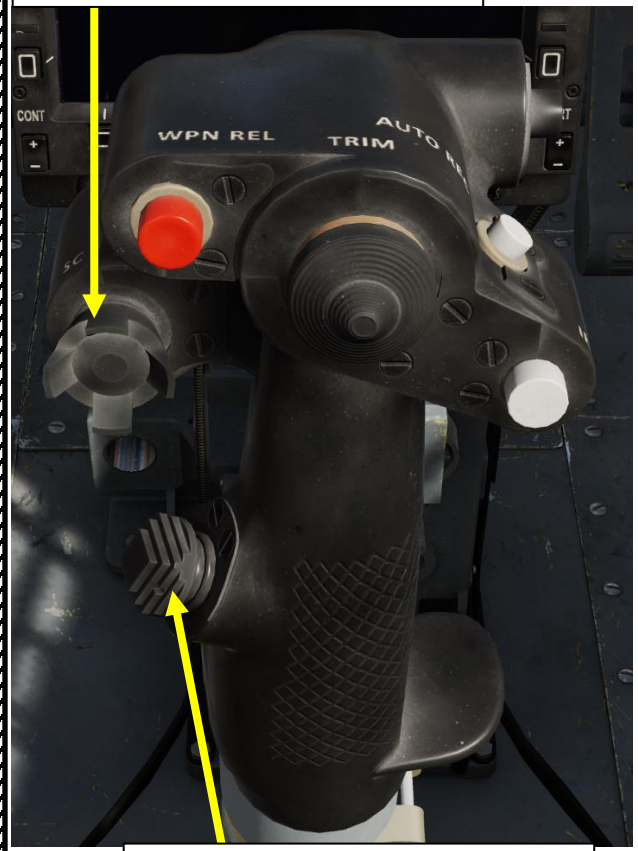
AFD (Airfield Data) Sub-Page (List of Closest Airports)
- *No.: Airport Number*
- *DIS: Distance to Airport (nm)*
- *BRG: Bearing to Airport*
- *ALT: Airport Elevation (ft)*
- *ILS: Instrument Landing System Availability (Y = YES)*
- *TCN: TACAN Availability (Y = YES)*

HSD Quick Select OSB

HSD (HORIZONTAL SITUATION DISPLAY)

If the HSD MFCD is set as the SOI (Sensor of Interest) with the S1 Sensor Select Switch pressed in the direction of the HSD display, using S2 Sensor Control Switch FWD increases the Map Scale range, while using S2 Sensor Control Switch AFT decreases the Map Scale range.

S2: SC (Sensor Control) Switch



S1: SS (Sensor Selection) Switch

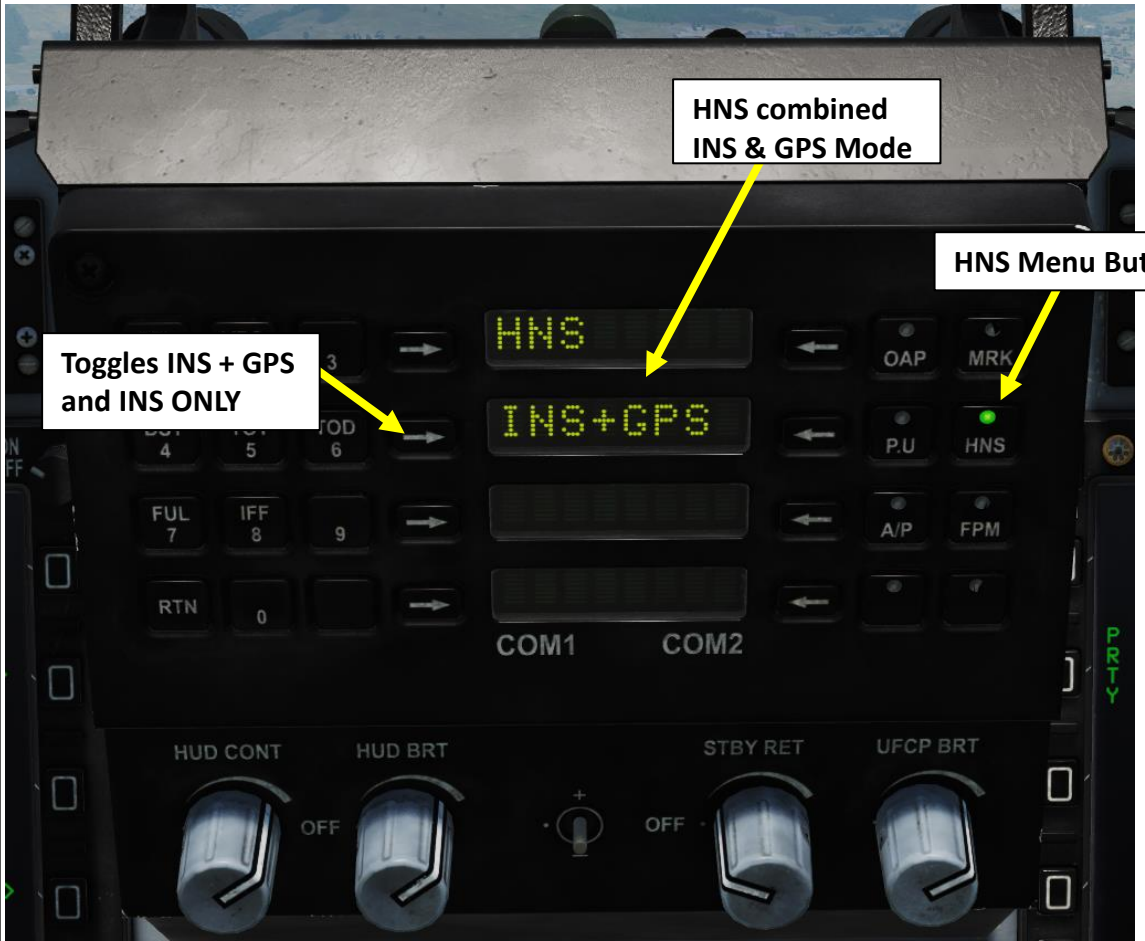
Map Scale (240/120/60/30/9)

MFCD SOI Asterisk

HNS (HYBRID NAVIGATION SYSTEM)

HNS (Hybrid Navigation System) combines GPS (Global Positioning System, which relies on satellites) and INS (Inertial Navigation System) data together to compute the aircraft's position. The HNS status menu is accessible by pressing the HNS Menu button on the UFCP.

During normal operation, the combined GPS + INS mode is recommended to increase your position precision. If GPS becomes unavailable or malfunctions, the "INS ONLY" mode can be used as a backup. However, Inertial Navigation Systems accumulate drift over time and decreases position precision as time increases and aircraft manoeuvers.



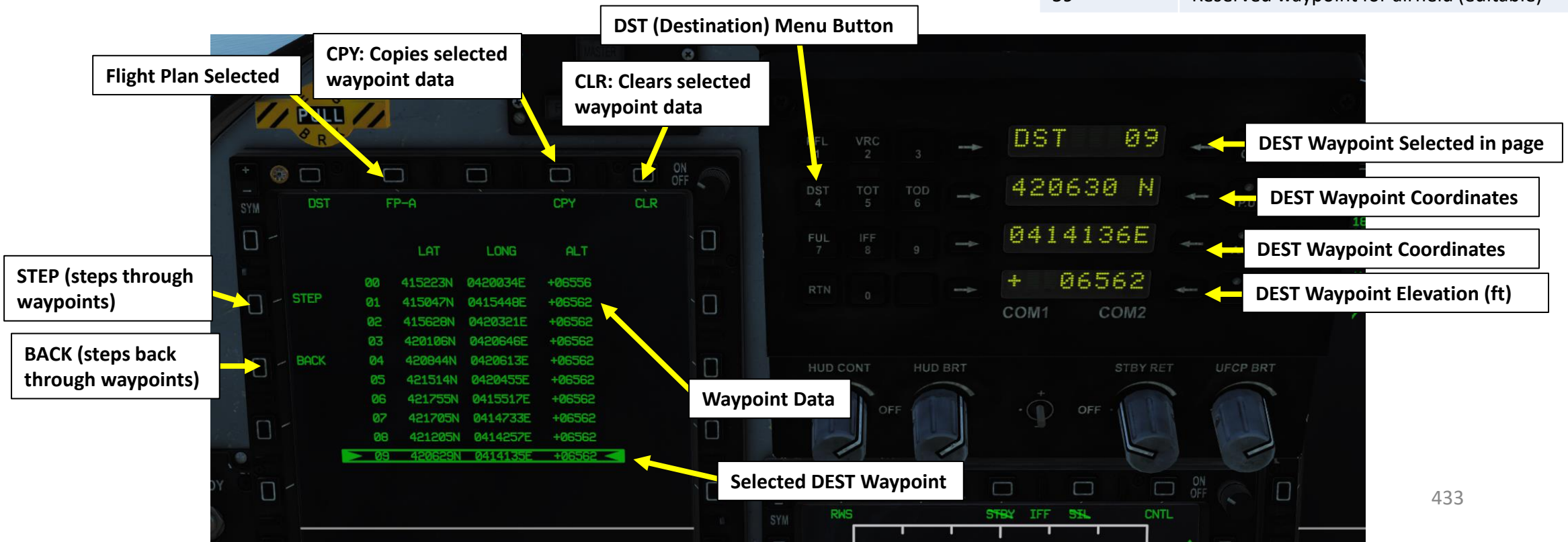
DEST WAYPOINT NAVIGATION INTRODUCTION

Your waypoints are known as DEST (Destination) Points. They are usually already set up with the mission editor, but you can manually edit them. Waypoints are set up as a "flight plan sequence" and numbered 1, 2, 3… for a maximum of 59 waypoints. You can have up to two different sequences of waypoints (FP-A for Flight Plan A, FP-B for Flight Plan B).

Certain Waypoint numbers have a specific use (see DEST Waypoint Database table). For instance, Waypoints 30 to 35 are reserved for cruise missile route points (RP), Waypoints 36 to 39 are reserved for GPS-guided bomb Pre-Planned Points (PP).

The DEST (Destination) menu (which is accessible through MFCD menus or through the UFCP) allows you to consult, create or edit waypoint data.

DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)
36 to 39 (PP1 to PP4)	Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)
40	SPI (Sensor Point of Interest) Coordinates
41 to 49	Reserved for Markpoints
50 to 58	Reserved waypoints for airfields closest to last navigation waypoint (non-editable)
59	Reserved waypoint for airfield (editable)

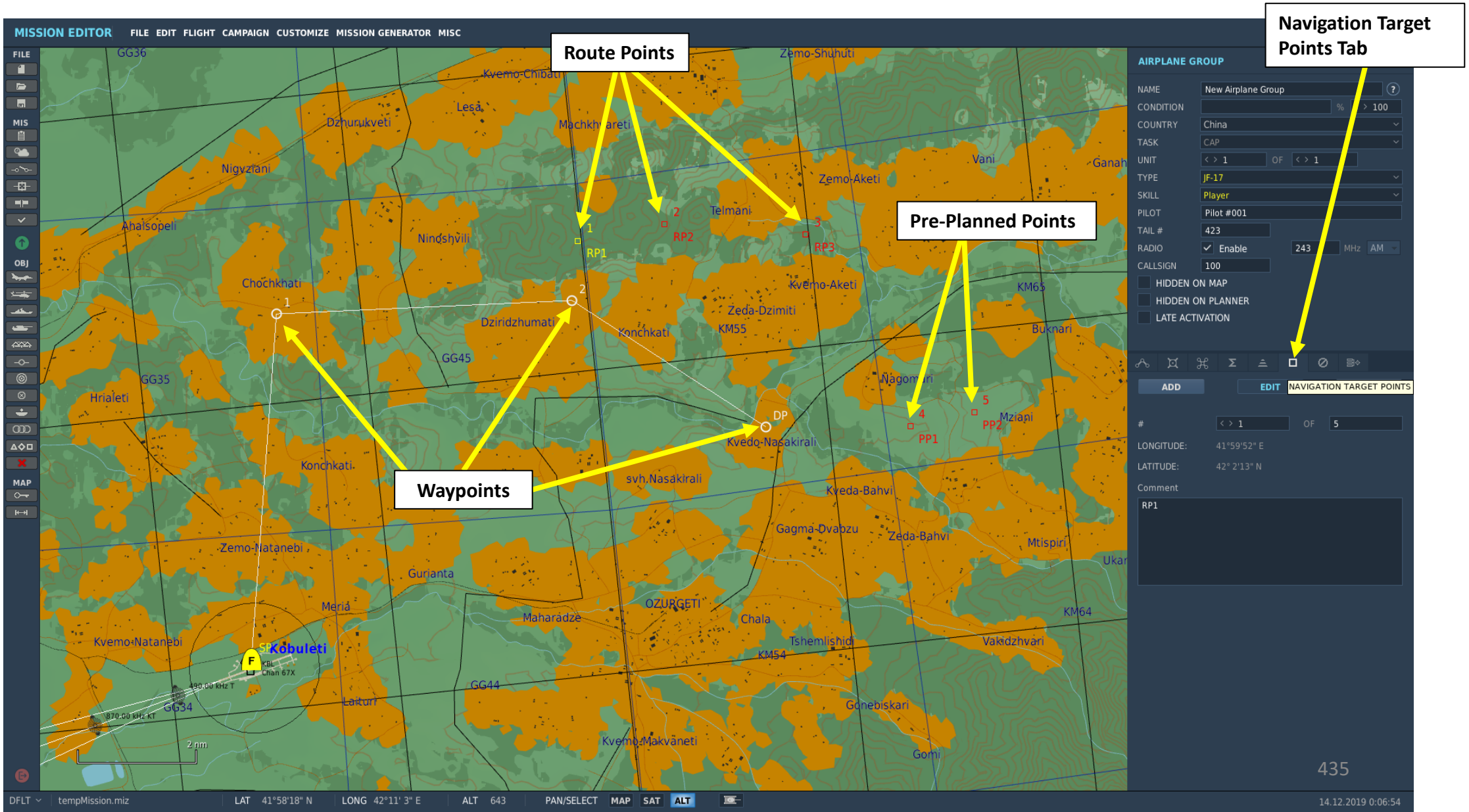


DEST WAYPOINT NAVIGATION INTRODUCTION

The Main UFCP Menu allows you to select what waypoint to track.

DEST WAYPOINT NAVIGATION INTRODUCTION

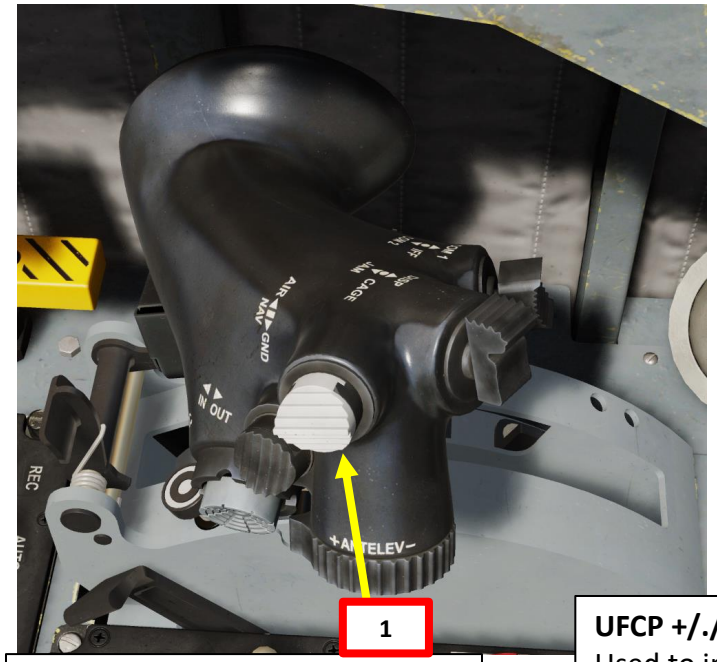
Here is an example of a flight plan already set up in the mission editor. Note the NAVIGATION TARGET POINTS tab that allows you to place different waypoint types (PP# for Pre-Planned Points, RP# for Route Points).



NAVIGATING TO A WAYPOINT

1. Set MMS (Master Mode Switch) to MIDDLE (NAV)
2. Press on RTN button to access the MAIN UFCP menu
3. To select Waypoint 2, press arrow button next to Waypoint Data Field. You will enter Edit Mode.
4. Press “02” on keypad, then press arrow button next to Waypoint Data Field to enter new waypoint.

   Note: alternatively, you could press the arrow next to the Waypoint Data Field, then use the UFCP Fast Select Rocker Switch to switch between waypoints.

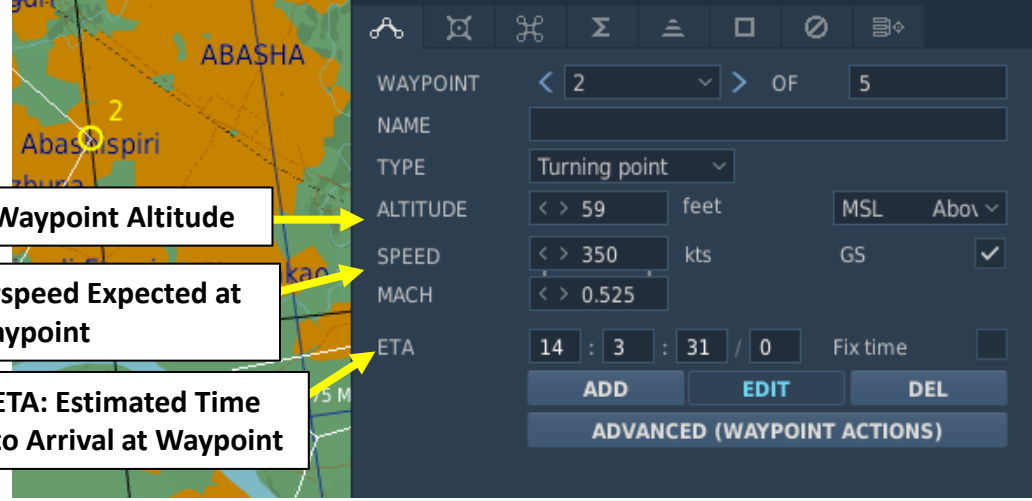


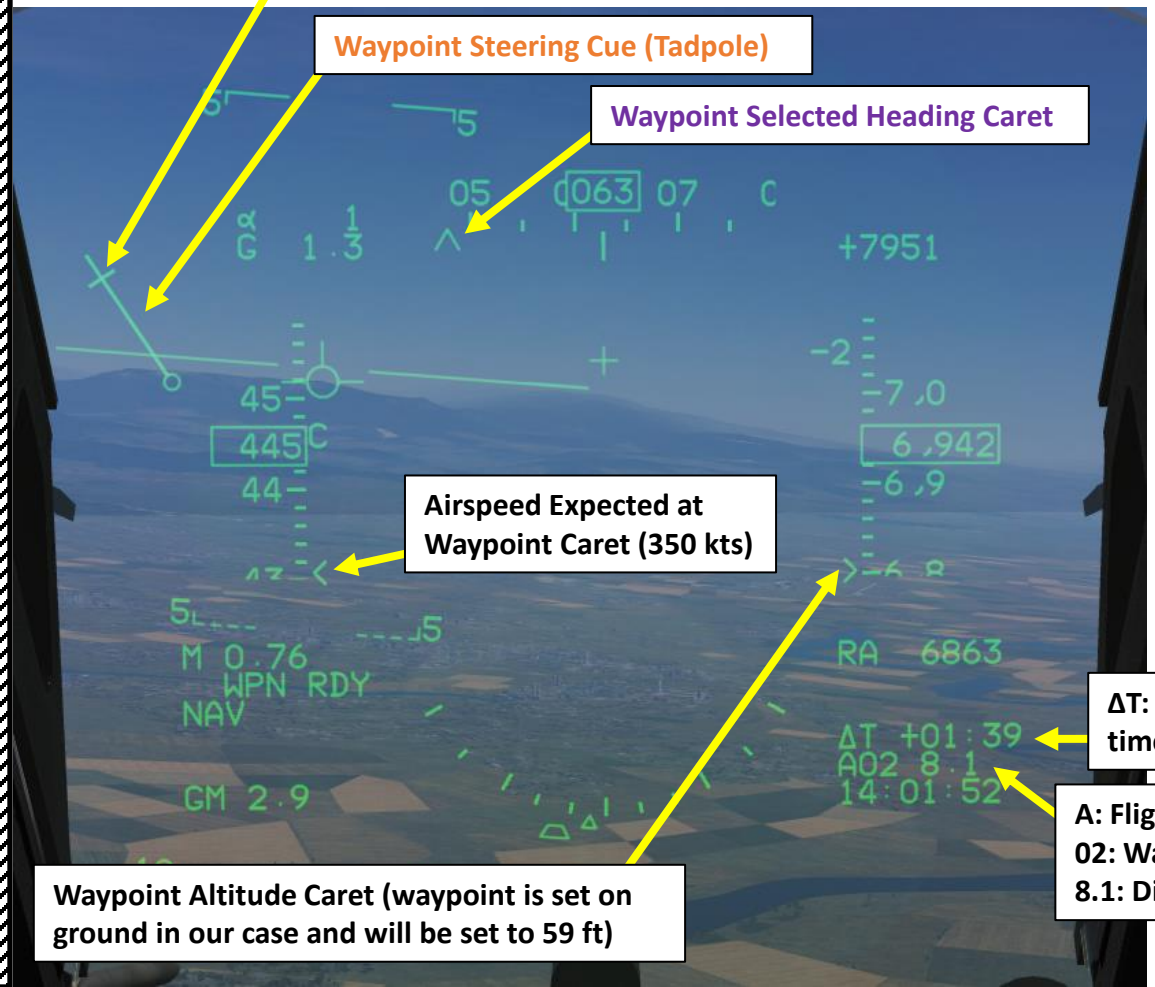
T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*

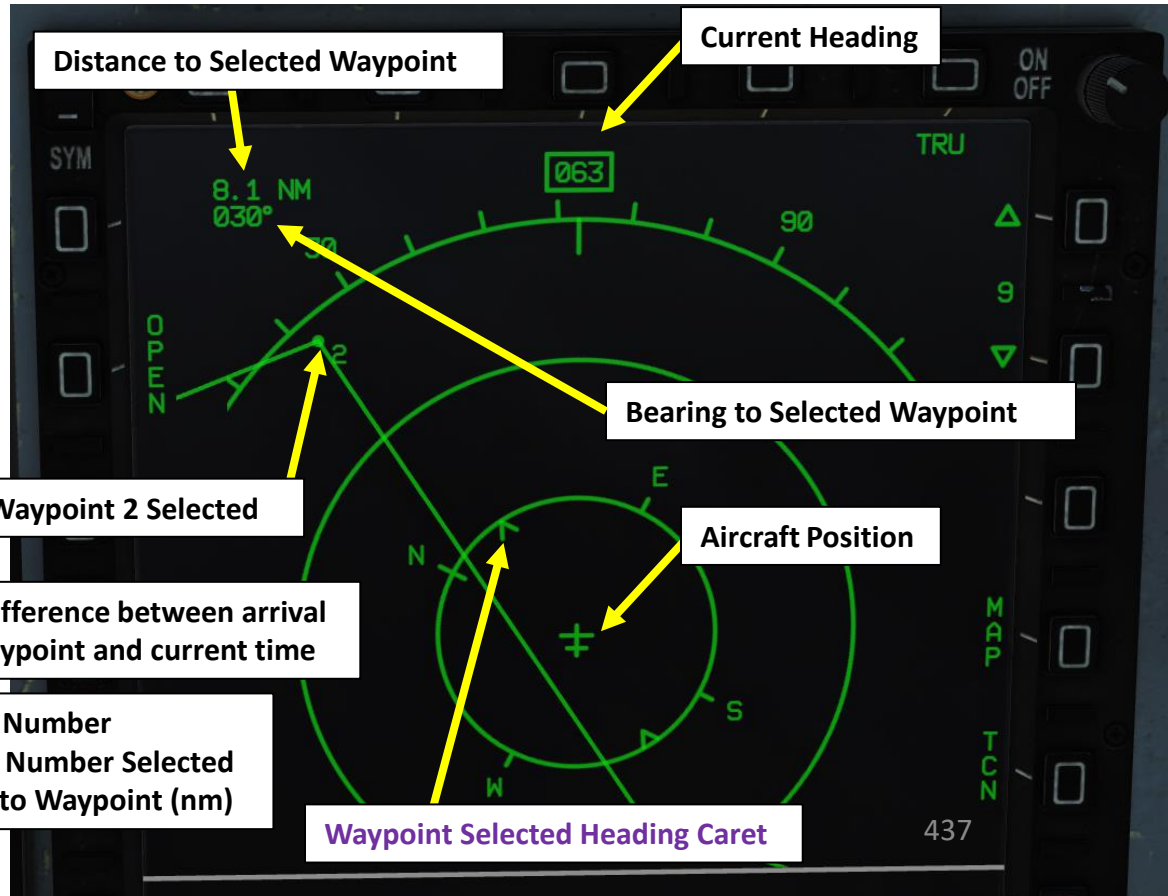
UFCP +/./- Fast Select Rocker Switch
Used to increase/decrease value selected in Data Display Fields. Short click increases/decreases by one, holding click continuously increases/decreases value.
Right Click: UP (+)
Left Click: DOWN (-)
Switch springs back to Middle (.) position

NAVIGATING TO A WAYPOINT

5. Steer towards the waypoint by following the **Navigation Tadpole** and **Selected Heading Caret**. In the picture below, we need to steer left.

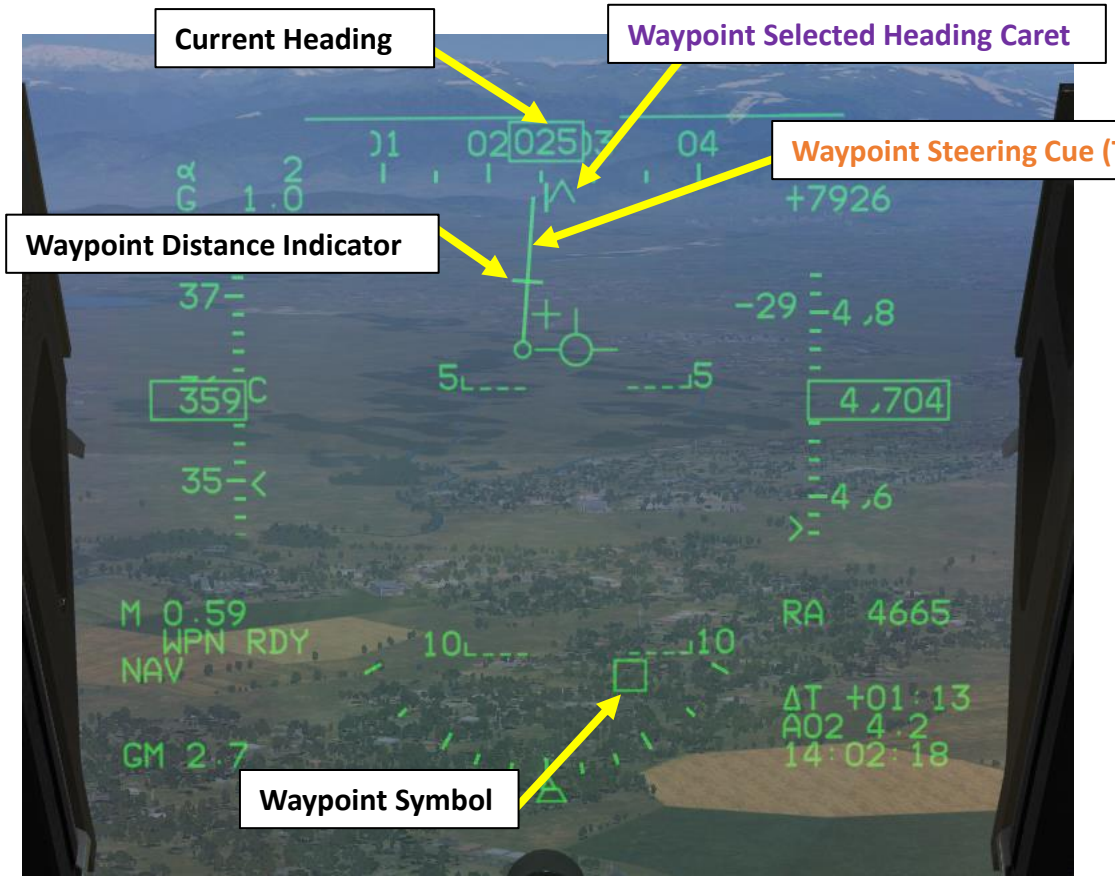






NAVIGATING TO A WAYPOINT

6. Once **Navigation Tadpole** is vertical and centered, you are on course towards the waypoint. The **Selected Heading Caret** should be lined up on your current heading.



WAYPOINT AUTO-UPDATE

The Waypoint Auto-Update system will automatically switch to the next waypoint when the aircraft is less than 2 nm from the selected waypoint. This allows you to minimize your workload.

However, you can disable this function by setting the Waypoint Update Setting to MANUAL. Manual mode is useful when you need to overfly a waypoint multiple times for close air support.

The Waypoint Update Setting is available in the MAIN UFCP Menu. You can access it by pressing the RTN button.

Waypoint Update Setting - AUTO: Toggles Waypoint switching automatically to the next waypoint when aircraft is less than 2 nm from selected waypoint

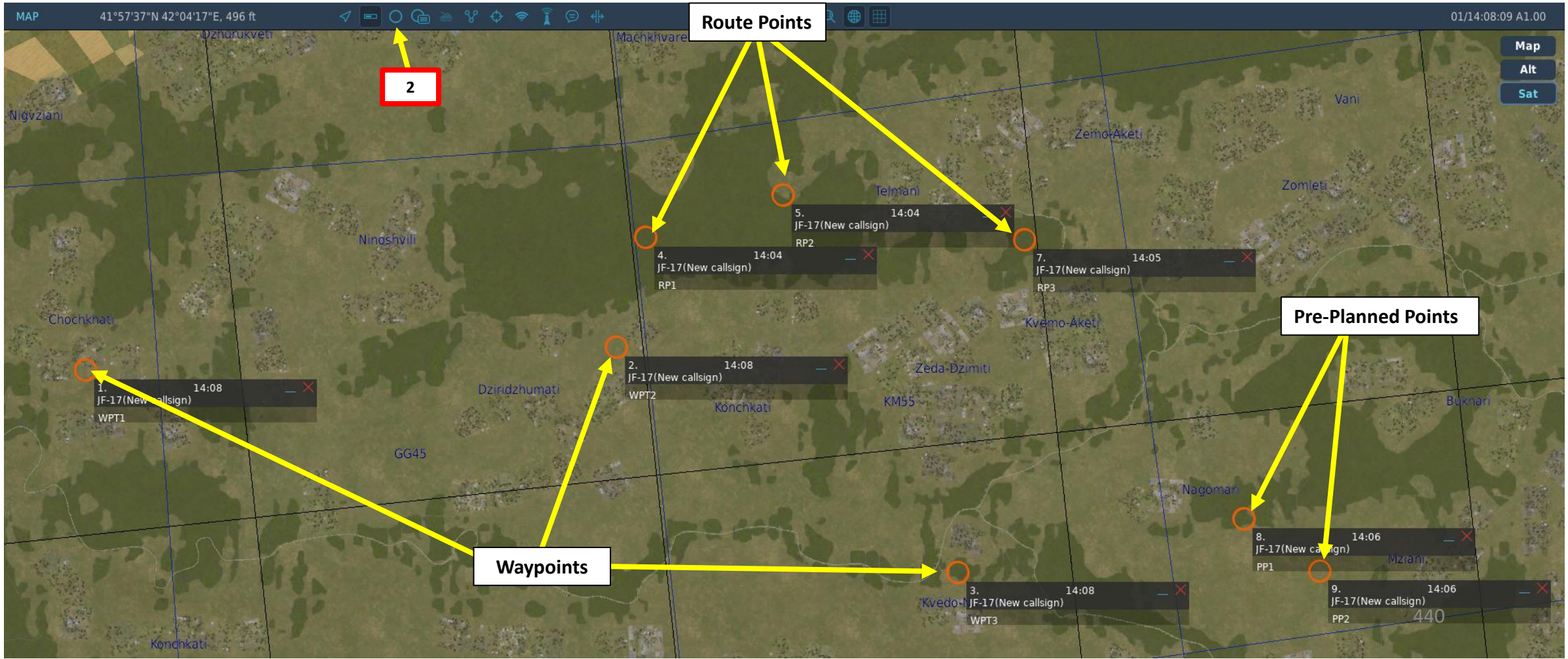
RTN button displays the MAIN UFCP Menu

Waypoint Update Setting - MANUAL : Waypoints need to be updated manually. Auto-Update function is disabled.

CREATING WAYPOINTS VIA DTC (DATA TRANSFER CARTRIDGE)

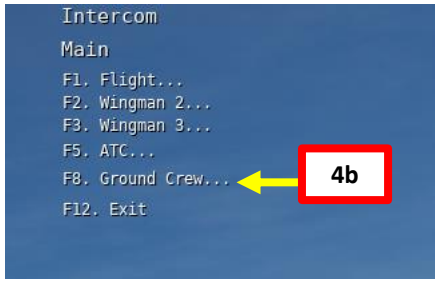
If you play in multiplayer and don't feel like adding the waypoint coordinates every time, there is a way to create a new mission data cartridge with waypoints created by using the F10 map.

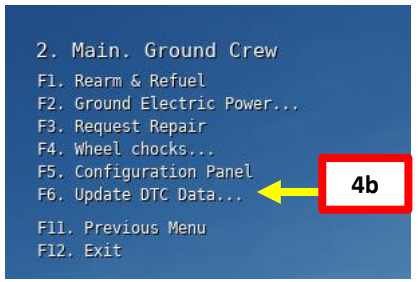
1. Make sure your aircraft's data cartridge is removed
2. Press F10 to display the map, then select the MARK LABEL button
3. Click where you want to create a waypoint, then type "WPT" followed by the waypoint number you want to create. "WPT3" would be "Navigation Waypoint 3". For a Route Point point, type "RP" followed by the route point number you want to create. "RP2" would be "Route Point 2". For a Pre-Planned Point, type "PP" followed by the pre-planned point number you want to create. "PP1" would be "Pre-Planned Point 1".

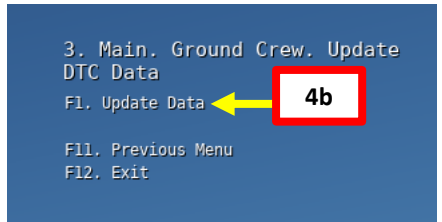


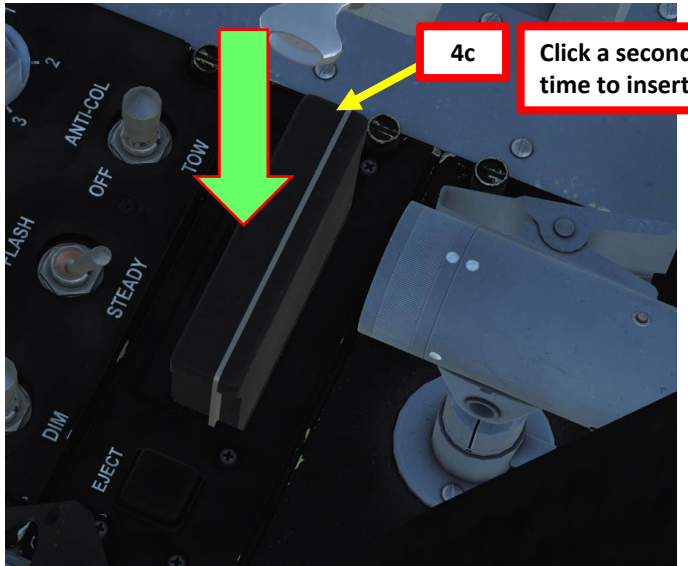
CREATING WAYPOINTS VIA DTC (DATA TRANSFER CARTRIDGE)

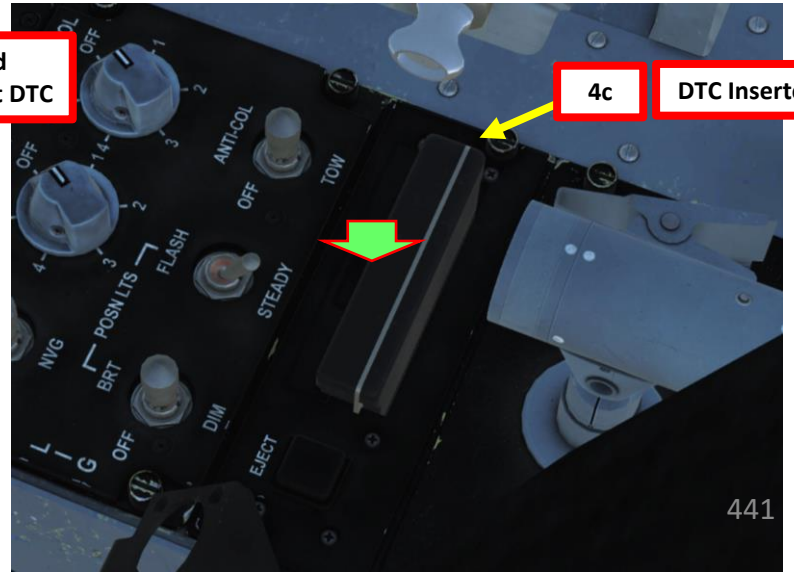
4. Load DTC (Data Transfer Cartridge) into the aircraft. The DTC is used to transfer weapon data, navigation data, approach data and electronic warfare system data to the airplane. Waypoints and Marked points on the F10 map (i.e. RP1, RP2… RP6 Route Points for 802AKG anti-ship missile and PP1, PP2… PP4 Pre-Planned Points for Precision-Guided Munitions like the LS-6 and GB-6) will also be entered via the DTC.
   a) Make sure DC Power is available (engine is started and DC GEN switch is ON) and DTC card is unmounted.
   b) Contact ground crew and request a DTC Data Update by pressing « \ », then pressing F8 (Ground Crew), F6 (Update DTC Data), then F1 (Update Data).
   c) Once DTC is updated, click twice on the DTC slot to insert the cartridge.
   d) Once DTC is inserted, left MFCD will automatically display to the DATA – DTC Sub-page with the « DTC LOCKED » message.
   e) Press OSB (Option Select Button) next to « ALL » to select all data fields to be updated (boxed when selected).









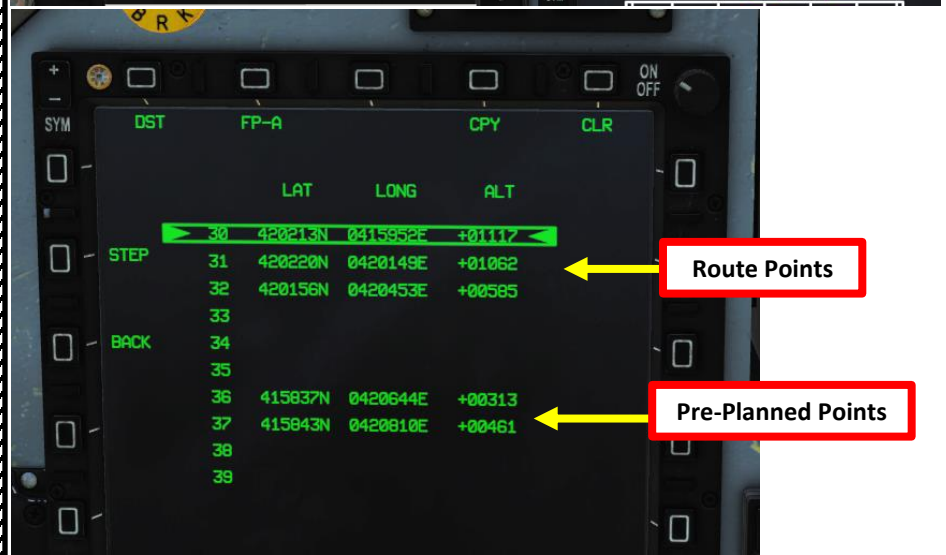


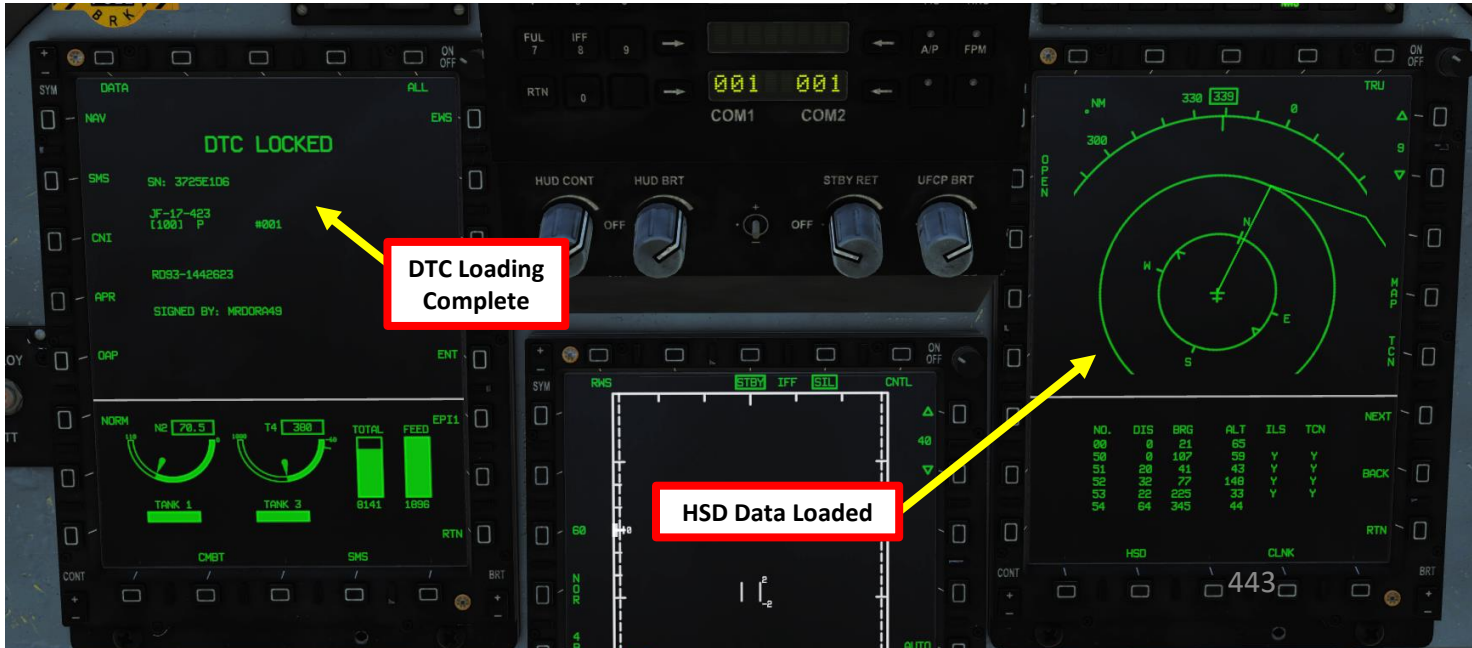
CREATING WAYPOINTS VIA DTC (DATA TRANSFER CARTRIDGE)

4. Load DTC (Data Transfer Cartridge) into the aircraft.
   f) Press OSB (Option Select Button) next to « ENT » (Enter) to transfer data.
   g) « DTC TRANS » message will indicate information transfer is in progress.
   h) « DTC LOCKED » message and unboxed data fields will indicate that the information transfer is complete.

CREATING WAYPOINTS VIA DTC (DATA TRANSFER CARTRIDGE)

5. Your navigation plan, waypoints, route points, and pre-planned points will then be loaded. You can check on the HSD and DST (Destination) page to see if the coordinates have been updated properly. Take note that Route Points will be set in DEST waypoints 30 to 35 (RP1 to RP6), and that Pre-Planned Points will be set in DEST waypoints 36 to 39 (PP1 to PP4).





CREATING WAYPOINTS VIA DST (DESTINATION) MENU

To create a new waypoint via the DST (Destination) menu:

1. Press on the ”DST” (Destination) button on the UFCP. It will display the DST Menu on the left MFCD.
2. Press the OSB next to STEP to select an empty Waypoint (i.e Waypoint 05 in our case). *Alternatively, you could also select Waypoint 05 by pressing on the arrow next to the Waypoint number, entering « 05 » on the UFCP keypad, then pressing the arrow again.*
3. The blinking DST 05 indication on the UFCP means no valid coordinates are entered yet.
4. Here are the coordinates of the new waypoint 05:
   - LATITUDE : **42°09’47.7’’ North** (deg, min, sec)
   - LONGITUDE: **042°00’35.1’’ East** (deg, min, sec)
   - ALTITUDE: **05000 (ft)**

CREATING WAYPOINTS VIA DST (DESTINATION) MENU

5. Enter Latitude:
   a) Press arrow left of Latitude Data Field to select Latitude coordinates
   b) Enter Latitude coordinates on the UFCP keypad: “4209477” for **42°09’47.7’’ North**.
   c) Press arrow left of Latitude Data Field to enter Latitude coordinates
   d) Press arrow right of Latitude Data Field to select North/South
6. Enter Longitude:
   a) Press arrow left of Longitude Data Field to select Longitude coordinates
   b) Enter Longitude coordinates on the UFCP keypad: “04200351” for **042°00’35.1’’ East**.
   c) Press arrow left of Longitude Data Field to enter Longitude coordinates
   d) Press arrow right of Latitude Data Field to select East/West
7. Enter Altitude:
   a) Press arrow right of Altitude Data Field to select Altitude
   b) Enter Altitude on the UFCP keypad: “05000” for **5000 ft**.
   c) Press arrow right of Altitude Data Field to enter Altitude
   d) Press arrow left of Altitude Data Field to select either + or – as required

Waypoint 05 Coordinates:
- LATITUDE : **42°09’47.7’’ North** (deg, min, sec)
- LONGITUDE: **042°00’35.1’’ East** (deg, min, sec)
- ALTITUDE: **05000 (ft)**

CREATING WAYPOINTS VIA DST (DESTINATION) MENU

8. And that's it! Once all data fields have been properly set on the UFCP, Waypoint 05 will automatically update itself to the coordinates you just entered.

Waypoint 05 Coordinates:

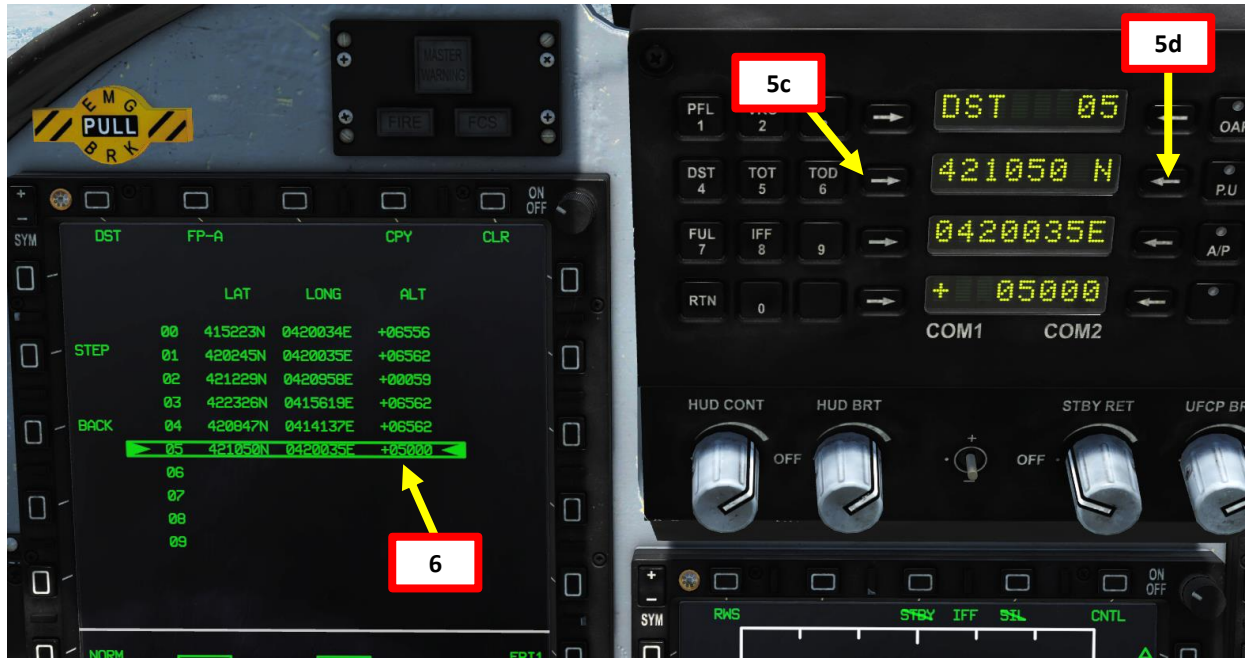
- LATITUDE : **42°09'47.7'' North** (deg, min, sec)
- LONGITUDE: **042°00'35.1'' East** (deg, min, sec)
- ALTITUDE: **05000 (ft)**

HOW TO EDIT WAYPOINTS

To create a new waypoint via the DST (Destination) menu:

1. Press on the ”DST” (Destination) button on the UFCP. It will display the DST Menu on the left MFCD.
2. Press the OSB next to STEP to select the Waypoint you want to edit (i.e Waypoint 05). *Alternatively, you could also select Waypoint 05 by pressing on the arrow next to the Waypoint number, entering « 05 » on the UFCP keypad, then pressing the arrow again.*
3. Here are the current coordinates of waypoint 05:
   - LATITUDE : **42°09’47.7’’ North** (deg, min, sec)
   - LONGITUDE: **042°00’35.1’’ East** (deg, min, sec)
   - ALTITUDE: **05000 (ft)**
4. We want to change the waypoint latitude. The new coordinates of waypoint 05 are:
   - LATITUDE : **42°10’50.2’’ North** (deg, min, sec)
   - LONGITUDE: **042°00’35.1’’ East** (deg, min, sec)
   - ALTITUDE: **05000 (ft)**
5. Edit Latitude:
   a) Press arrow left of Latitude Data Field to select Latitude coordinates
   b) Enter new Latitude coordinates on the UFCP keypad: “4210502” for **42°10’50.2’’ North**.
   c) Press arrow left of Latitude Data Field to enter Latitude coordinates
   d) Press arrow right of Latitude Data Field to select North/South

6. A… you ju…



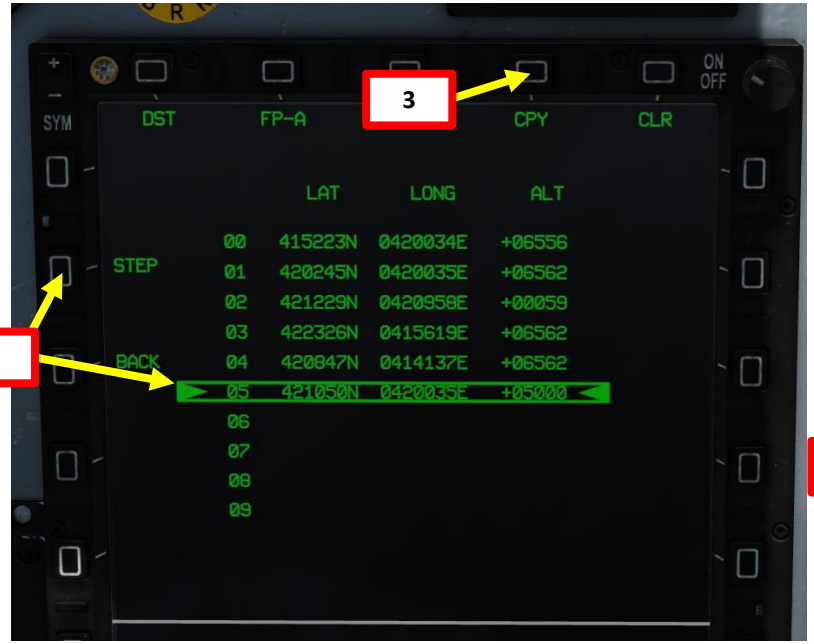
HOW TO COPY, PASTE & CLEAR WAYPOINTS

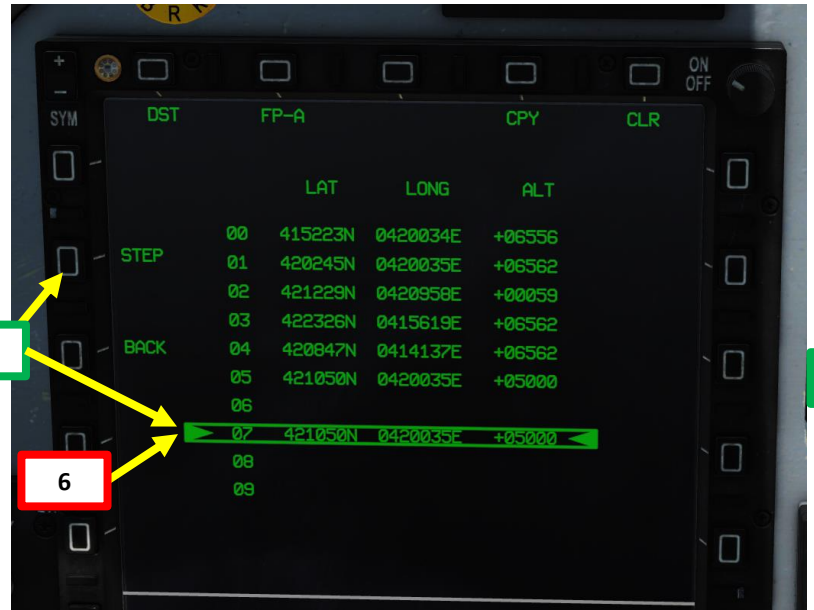
COPY-PASTE WAYPOINT

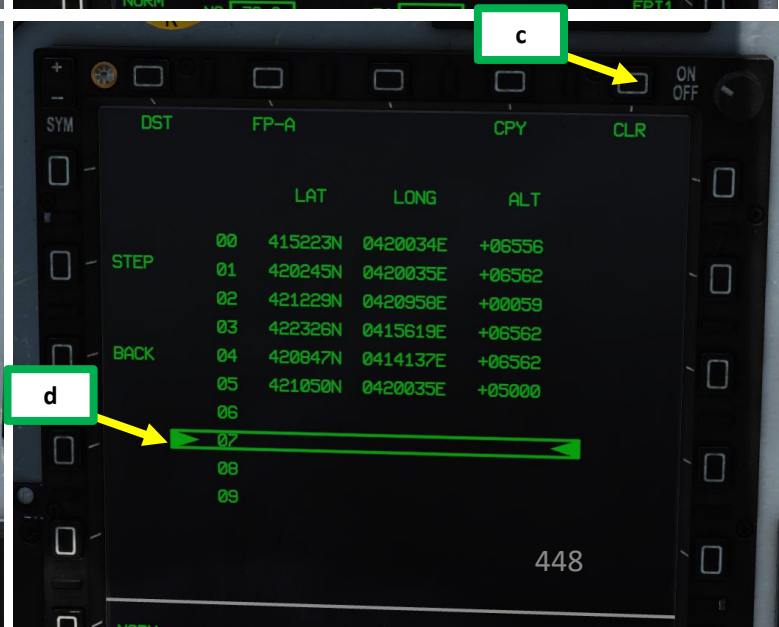
1. Press on the ”DST” (Destination) button on the UFCP. It will display the DST Menu on the left MFCD.
2. Press the OSB next to STEP to select the waypoint you want to copy. We will take Waypoint 05.
3. Press the OSB next to CPY (Copy).
4. Press the OSB next to STEP to select the waypoint you want to paste this data to. We will take Waypoint 07.
5. Press the OSB next to PST (Paste).
6. Waypoint 07 will now have the same coordinates and altitude as Waypoint 05.

CLEAR WAYPOINT

a) Press on the ”DST” (Destination) button on the UFCP. It will display the DST Menu on the left MFCD.
b) Press the OSB next to STEP to select the waypoint you want to clear. We will take Waypoint 07.
c) Press the OSB next to CLR (Clear).
d) Waypoint 07 is now deleted.







MARKPOINTS – OVFLY MODE

You can also designate a markpoint using the OFLY (Overfly) mode. Basically, when you press the MRK button, the aircraft will remember its current position and create a markpoint automatically.

1. Press MRK (Markpoint) button on the UFCP.
2. OFLY-41 means the Markpoint Set mode is set to Overfly and Markpoint will be created on DST Waypoint 41.
3. Fly over the area you want to place a markpoint on.
4. When over the desired markpoint area, press MRK (Markpoint) Button on the UFCP to create markpoint 41.
5. You can check on the DST page the new coordinates created.

Take note that markpoint altitude recorded with OFLY mode will be your aircraft altitude at the time the MRK button was pressed. You can edit your markpoint altitude to set target elevation if you want to use this point later on; see « How to Edit Waypoints » tutorial. Alternatively, you can use the Markpoint DSG (Designate) mode to have the correct target elevation straight away.

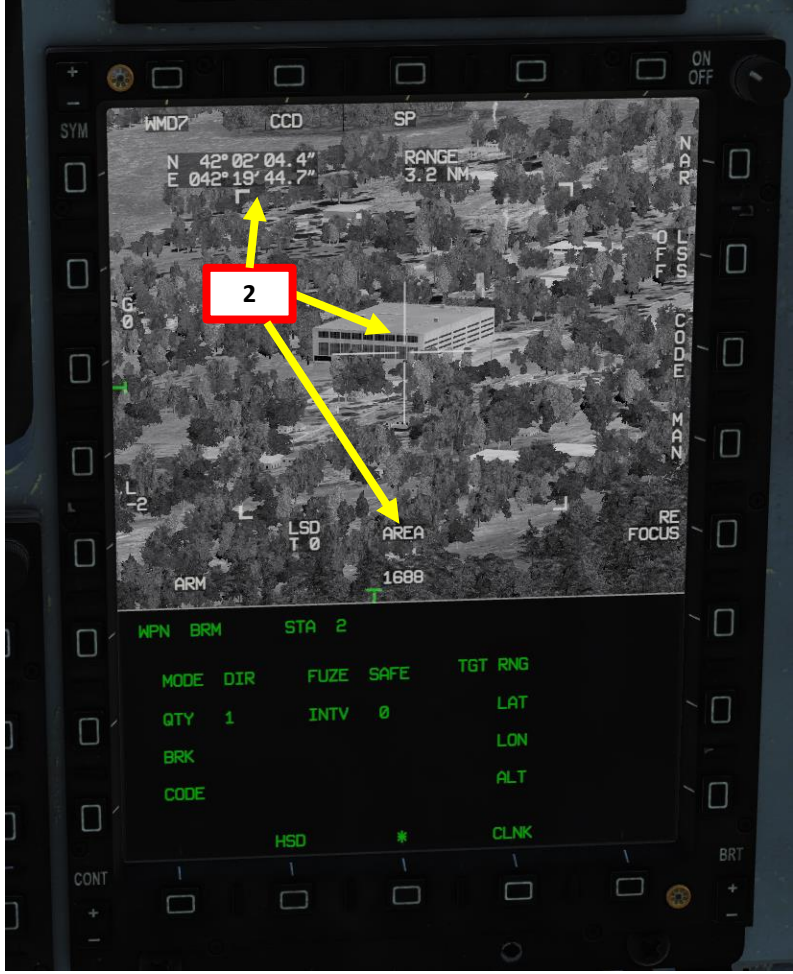
DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)
36 to 39 (PP1 to PP4)	Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)
40	SPI (Sensor Point of Interest) Coordinates
41 to 49	**Reserved for Markpoints**
50 to 58	Reserved waypoints for airfields closest to last navigation waypoint (non-editable)
59	Reserved waypoint for airfield (editable)

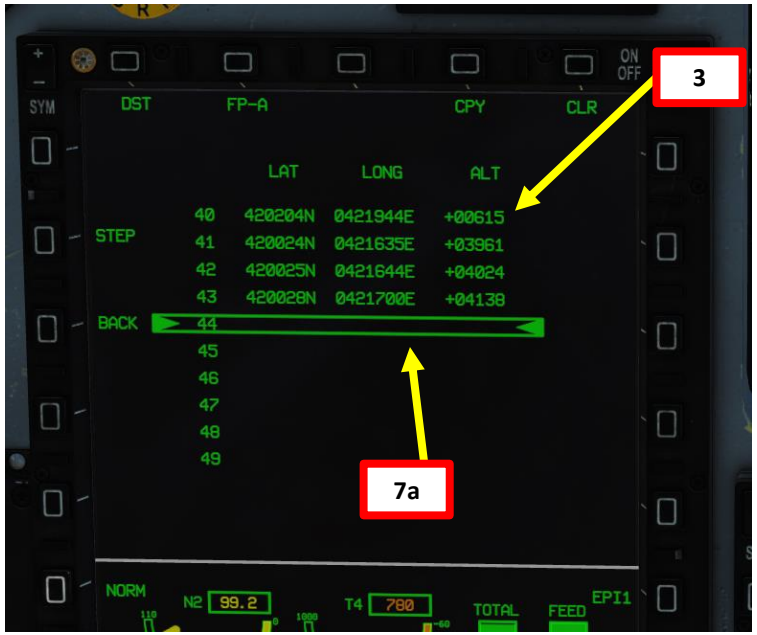
MARKPOINTS – DSG MODE

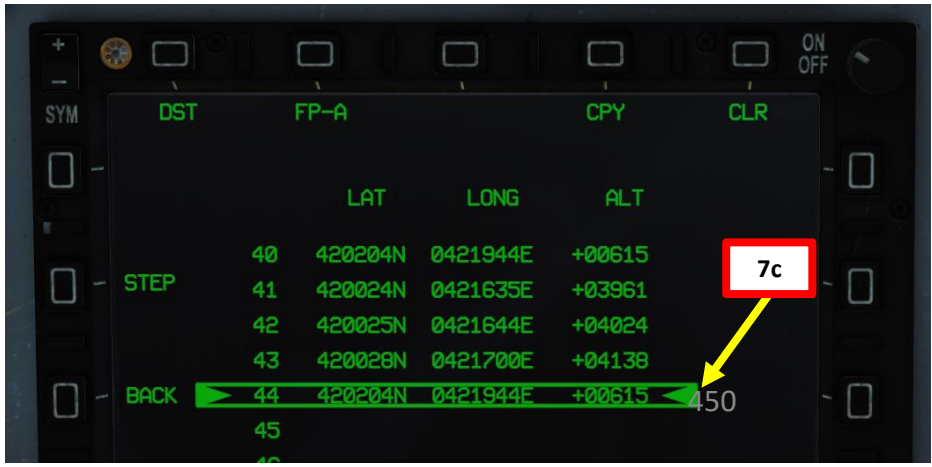
You can also designate a markpoint using any of your sensors (air-to-ground radar, air-to-sea radar, targeting pod, HUD).

1. MMS (Master Mode Switch) – AG
2. Designate a SPI (Sensor Point of Interest). For example, you can use the targeting pod, then use T5-TDC PRESS to designate the SPI.
3. If designated properly, DST Waypoint 40 will display the SPI coordinates.
4. Press MRK (Markpoint) button on the UFCP.
5. OFLY-44 means the Markpoint Set mode is set to Overfly and Markpoint will be created on DST Waypoint 44.
6. Press on the left arrow button next to OFLY to change Markpoint Set mode to DSG (Designate).
7. Press MRK (Markpoint) Button on the UFCP to create markpoint 44.

DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)
36 to 39 (PP1 to PP4)	Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)
40	**SPI (Sensor Point of Interest) Coordinates**
41 to 49	**Reserved for Markpoints**
50 to 58	Reserved waypoints for airfields closest to last navigation waypoint (non-editable)
59	Reserved waypoint for airfield (editable)







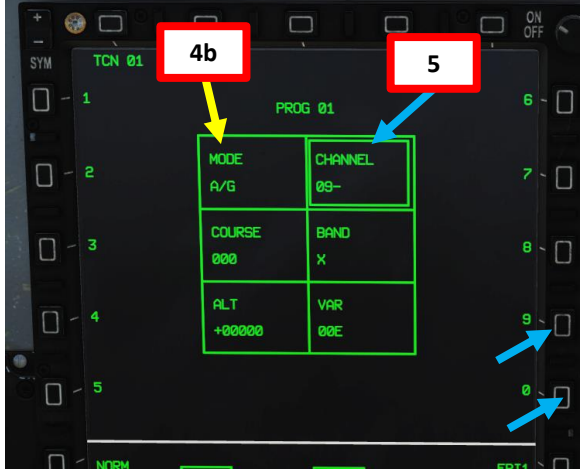
TACAN

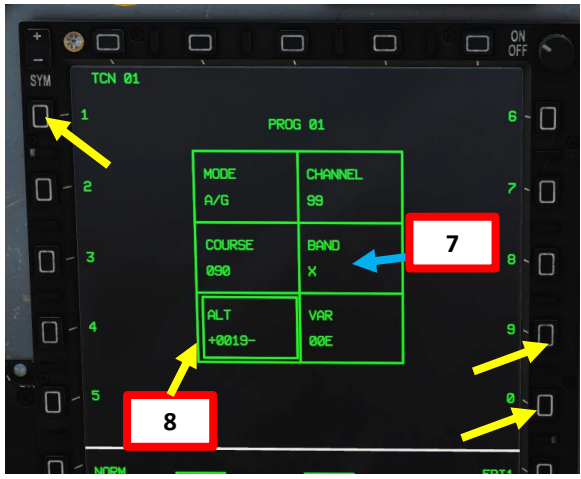
TACAN (Tactical Air Navigation) stations are navigation aids typically used by the military and provide you directional and distance guidance. They can be installed on airdromes, air refueling tankers or even aircraft carriers like the CVN-74 John Stennis (74-X frequency typically).

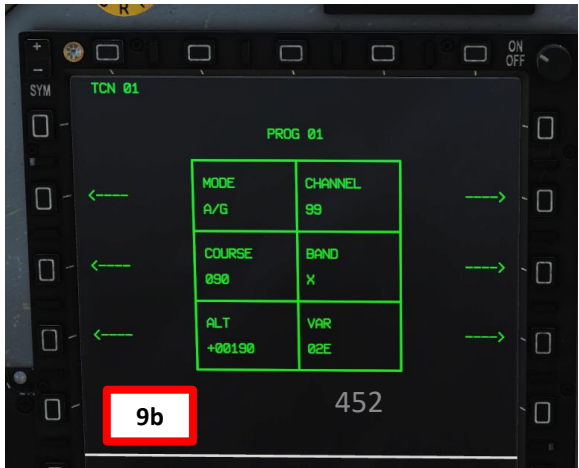
1. Determine the TACAN frequency you want to track by opening the map with F10 and by clicking on the airport you want to track. The frequency of the TACAN beacon for Al Minhad is 99X (MIN). We intend to intercept this TACAN a radial/course of 090.

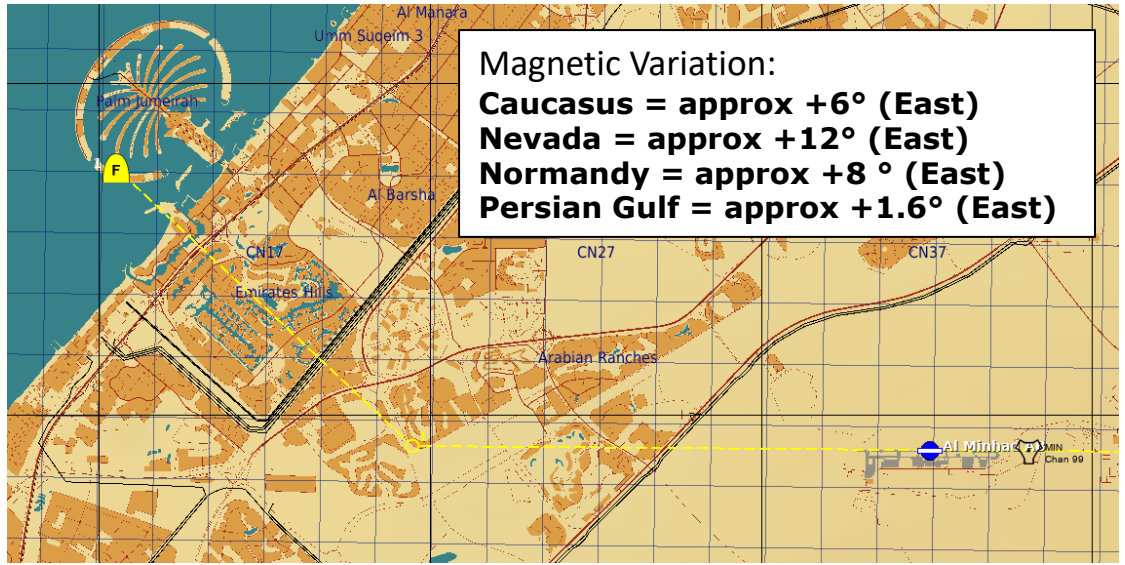
TACAN

2. Select MAIN MENU page
3. Press on the OSB next to « TACAN ».
4. Press on the OSB next to MODE to set A/G Mode for ground TACAN stations.
5. Press on the OSB next to CHANNEL and set TACAN station (099 for TACAN station 99X)
6. Press on the OSB next to COURSE and set desired course to TACAN (090).
7. If required, press on the OSB next to BAND to set « X » for TACAN 99X.
8. If required, press on the OSB next to ALT to set TACAN altitude. We will set it to the station's elevation (00190 for 190 ft).
9. Press OSB next to VAR to set TACAN station's Magnetic Variation. For the Persian Gulf theater, we will use 1.6 deg East, rounded up to 2 deg East.





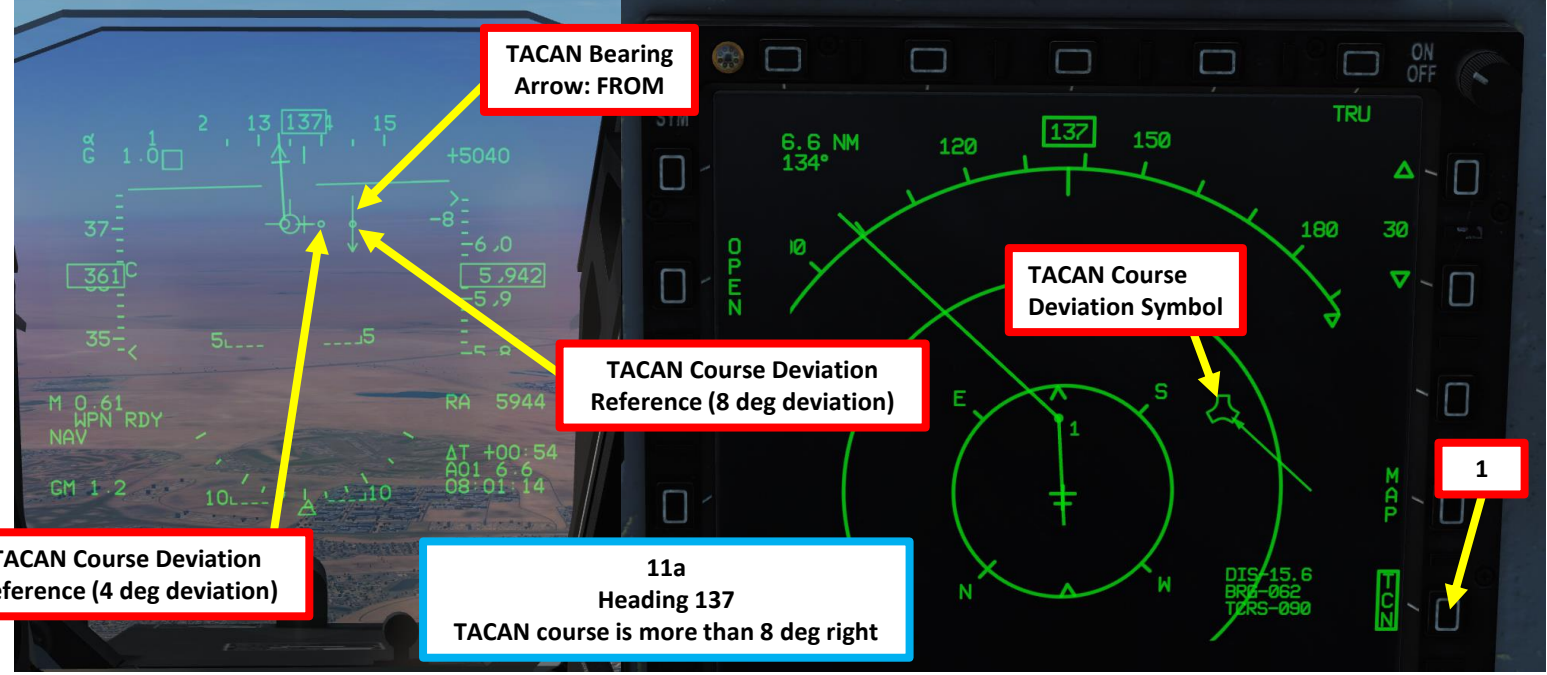


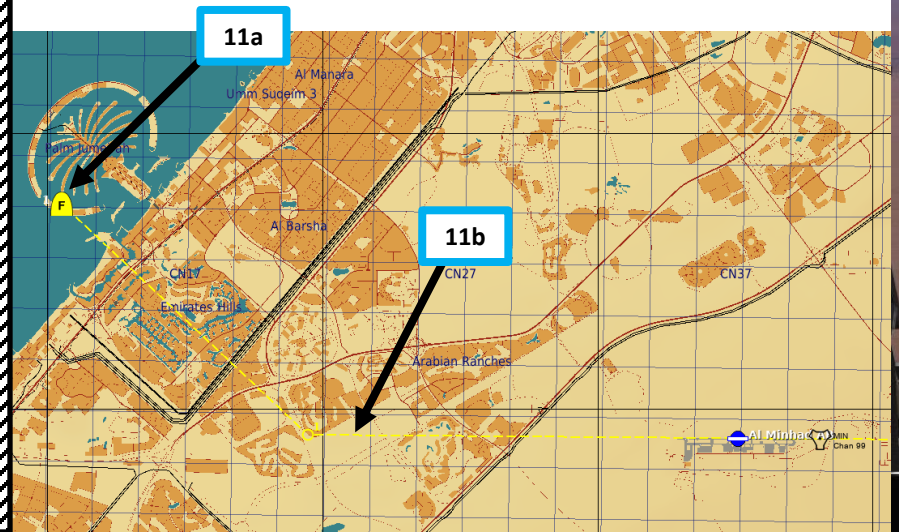


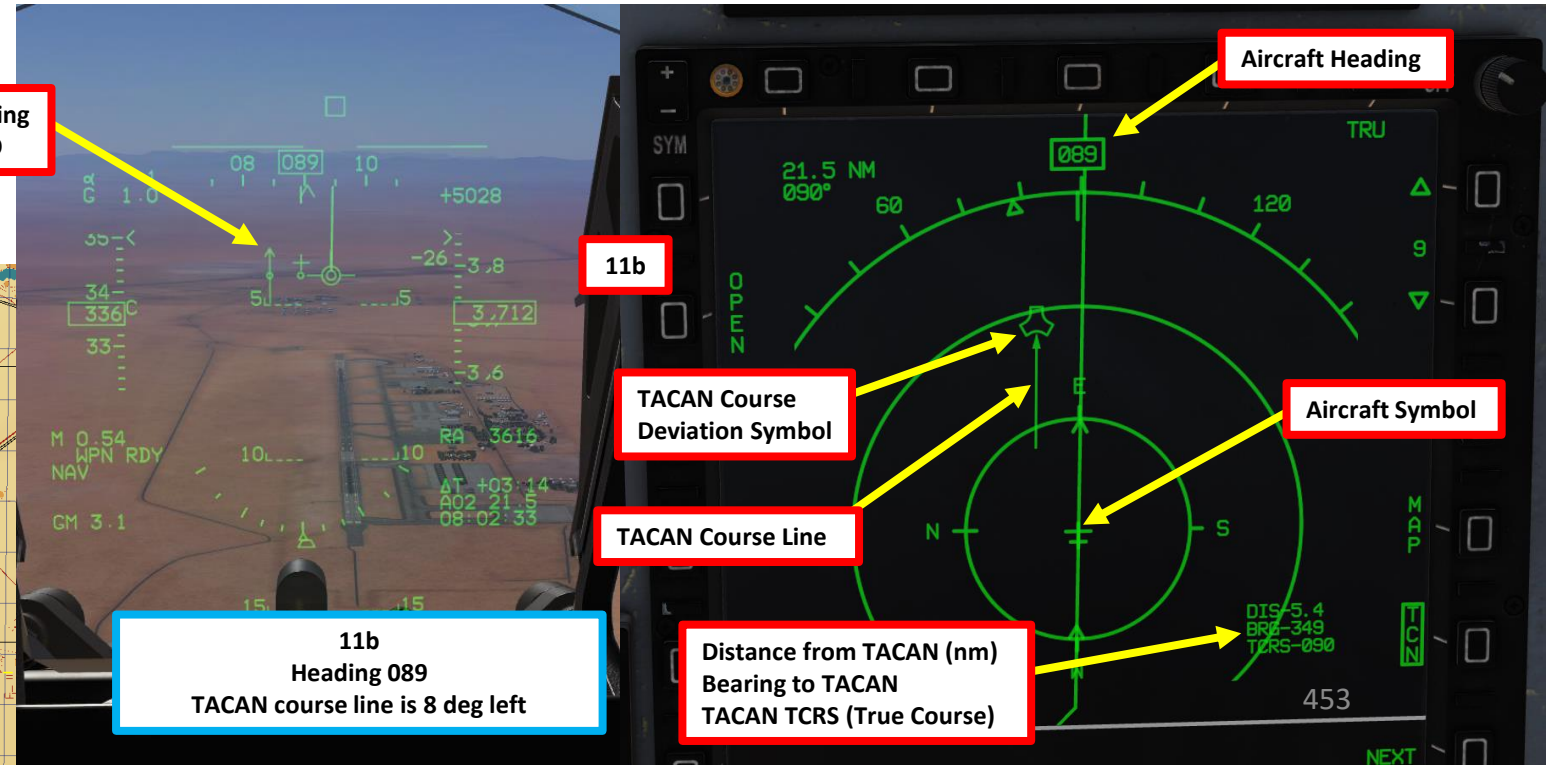
Magnetic Variation:
Caucasus = approx +6° (East)
Nevada = approx +12° (East)
Normandy = approx +8 ° (East)
Persian Gulf = approx +1.6° (East)

TACAN

10. On the HSD (Horizontal Situation Indicator), press the OSB next to TACAN (boxed when selected). This will display distance, bearing and course to TACAN station.
11. Steer the aircraft to set the TACAN Bearing Arrow on the HUD at the "0 deviation" position.

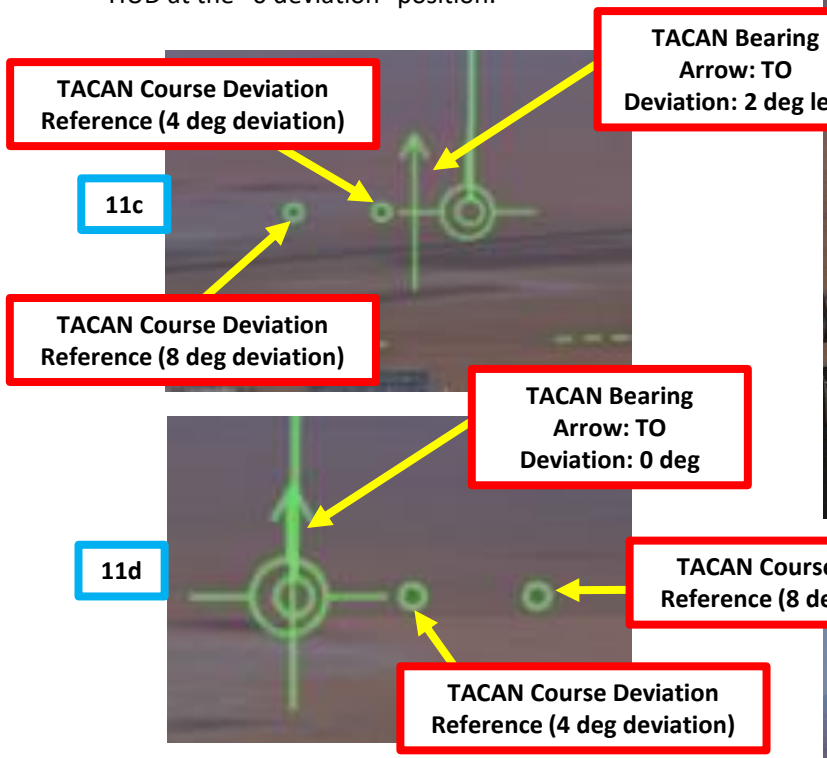


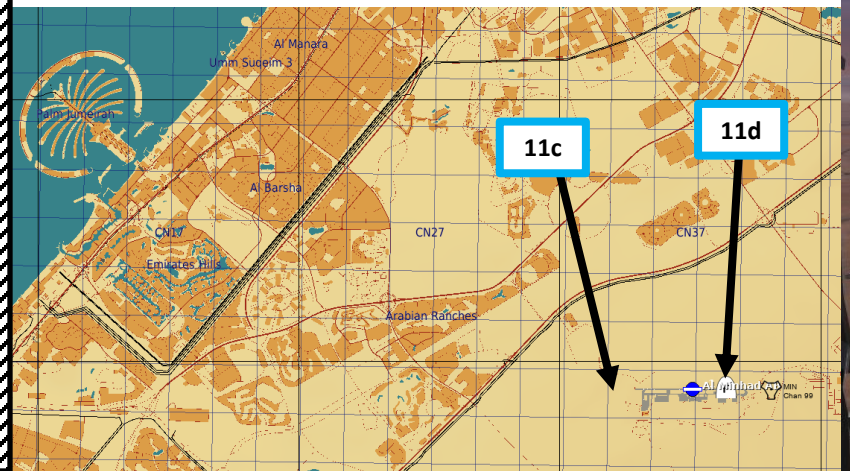


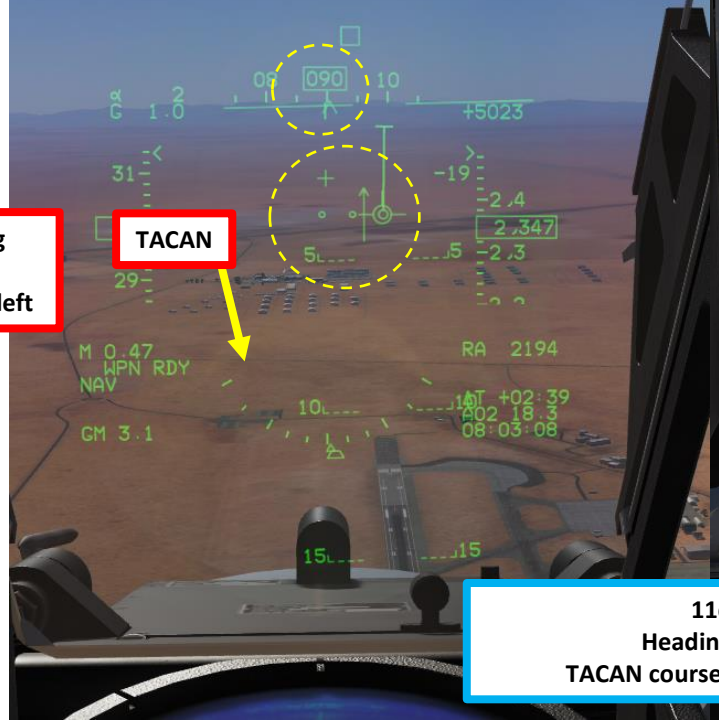


TACAN

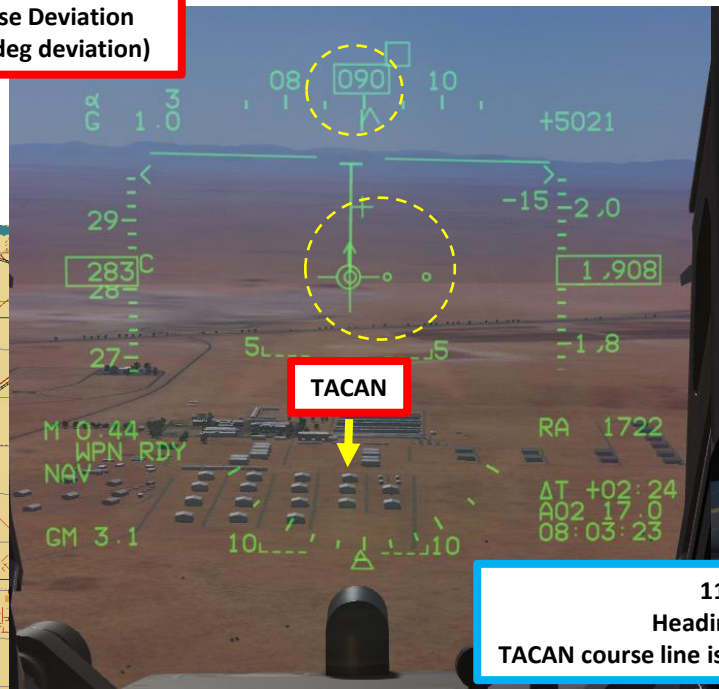
11. Steer the aircraft to set the TACAN Bearing Arrow on the HUD at the “0 deviation” position.







11c
Heading 090
TACAN course is 2 deg left



11d
Heading 090
TACAN course line is right on course 090

TACAN

Note 1:
TACAN function will not work while datalink is active. Weird? Yes indeed!

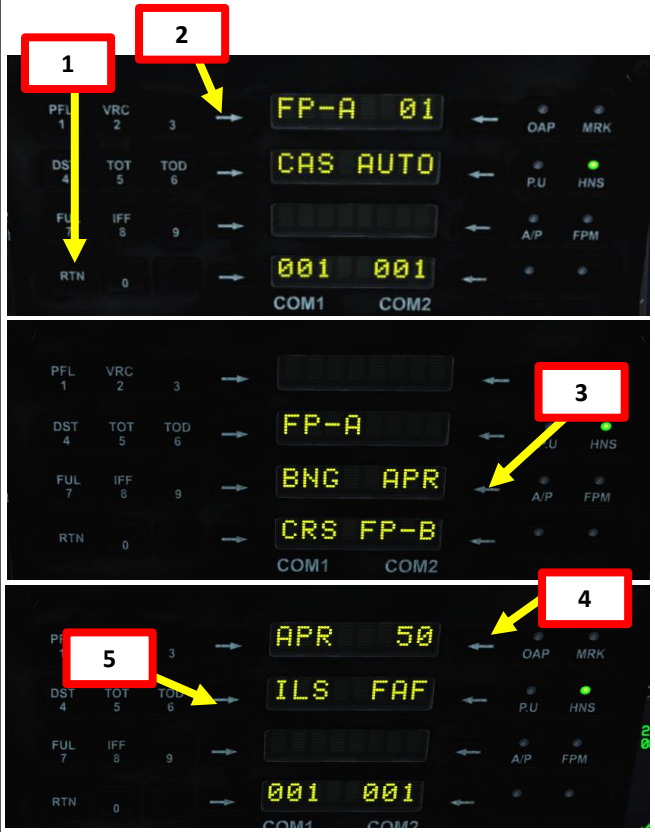
Note 2:
TACAN Programs can be selected with the OSB next to TCN 01 (or selected TACAN program number). There are a total of 10 programs, which are loaded via the Data Transfer Cartridge.

TACAN

Note 3:

If you select APR (Approach) Mode from the UFCP and choose an airport that has a TACAN available, you can automatically select this station.

1. Press RTN to access UFCP MAIN Menu
2. Press Arrow next to FP-A
3. Select APR (Approach) Mode
4. Select desired airport (i.e. Airport 50)
5. Press Arrow next to ILS to toggle between ILS, SCA and TACAN until you have TCN selected.
6. TACAN station on airport 50 will automatically be selected and steering cues will be visible on the HUD.
7. From the APR page, you can also set the desired course to TACAN.

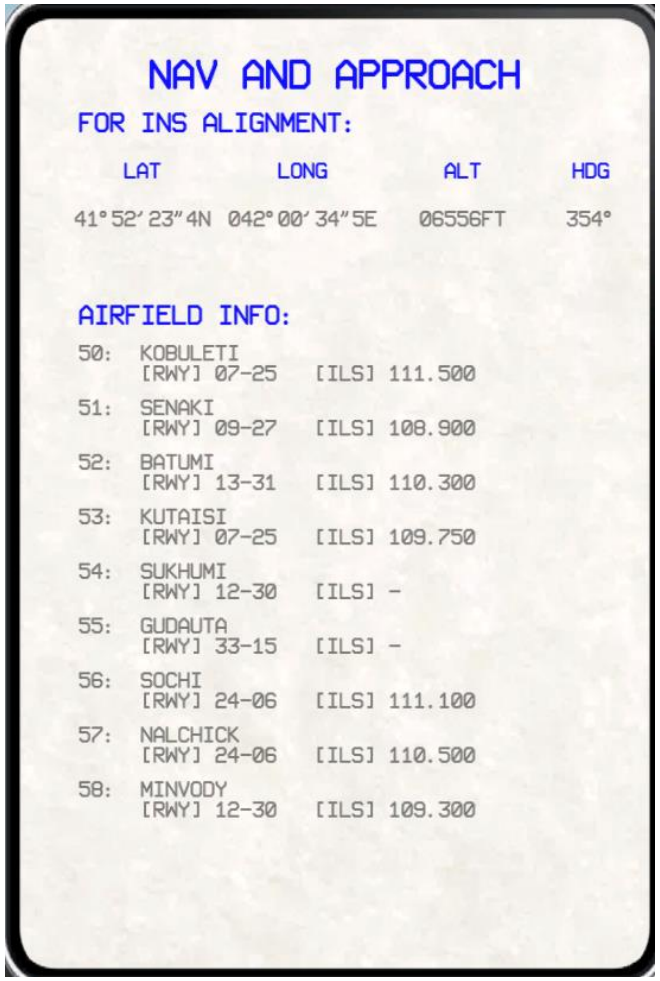


AFD (Airfield Data)

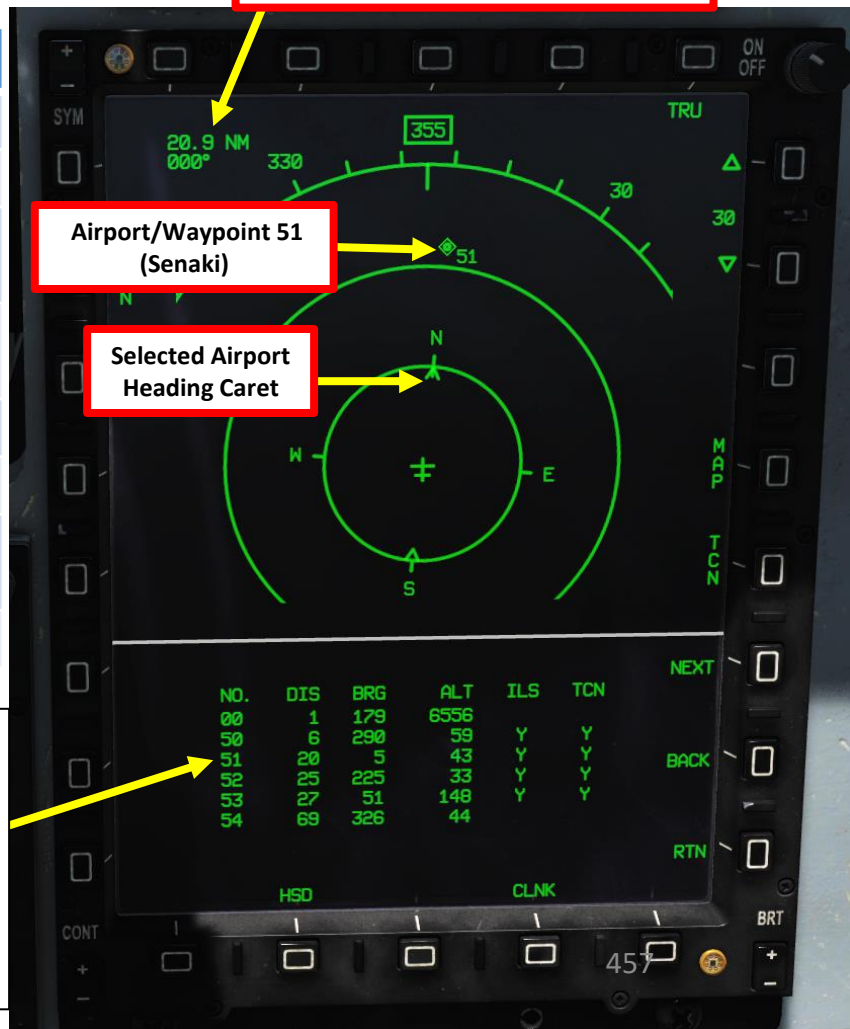
The DTC (Data Transfer Cartridge) has 9 Waypoints (DST 50 to 58) reserved for the closest airports to the last waypoint of your flight plan. Think of them as alternate airports available for landing. These waypoints are entered in the DTC automatically by the ground crew and cannot be edited. This list of airports is available on the AFD (Airfield Data) sub-page.

Setting the MMS (Master Mode Switch) in the MIDDLE position (NAV) will automatically display the AFD (Airfield Data) sub-page, which lists the closest airports.

Open your kneeboard (RSHIFT+K) to the NAV & APPROACH page to see what Airport Number corresponds to what airport.



DEST Waypoint Database	
00	Aircraft position for INS alignment
01 to 29	Waypoints reserved for navigation
30 to 35 (RP1 to RP6)	Waypoints reserved for CM-802AKG and C-802AK missile steerpoints (Route Points)
36 to 39 (PP1 to PP4)	Waypoints reserved for LS-6/GB-6 bomb targets (Pre-Planned Points)
40	SPI (Sensor Point of Interest) Coordinates
41 to 49	Reserved for Markpoints
50 to 58	**Reserved waypoints for airfields closest to last navigation waypoint (non-editable)**
59	Reserved waypoint for airfield (editable)



AFD (Airfield Data) Sub-Page (List of Closest Airports)

- *No.: Airport Number*
- *DIS: Distance to Airport (nm)*
- *BRG: Bearing to Airport*
- *ALT: Airport Elevation (ft)*
- *ILS: Instrument Landing System Availability (Y = YES)*
- *TCN: TACAN Availability (Y = YES)*

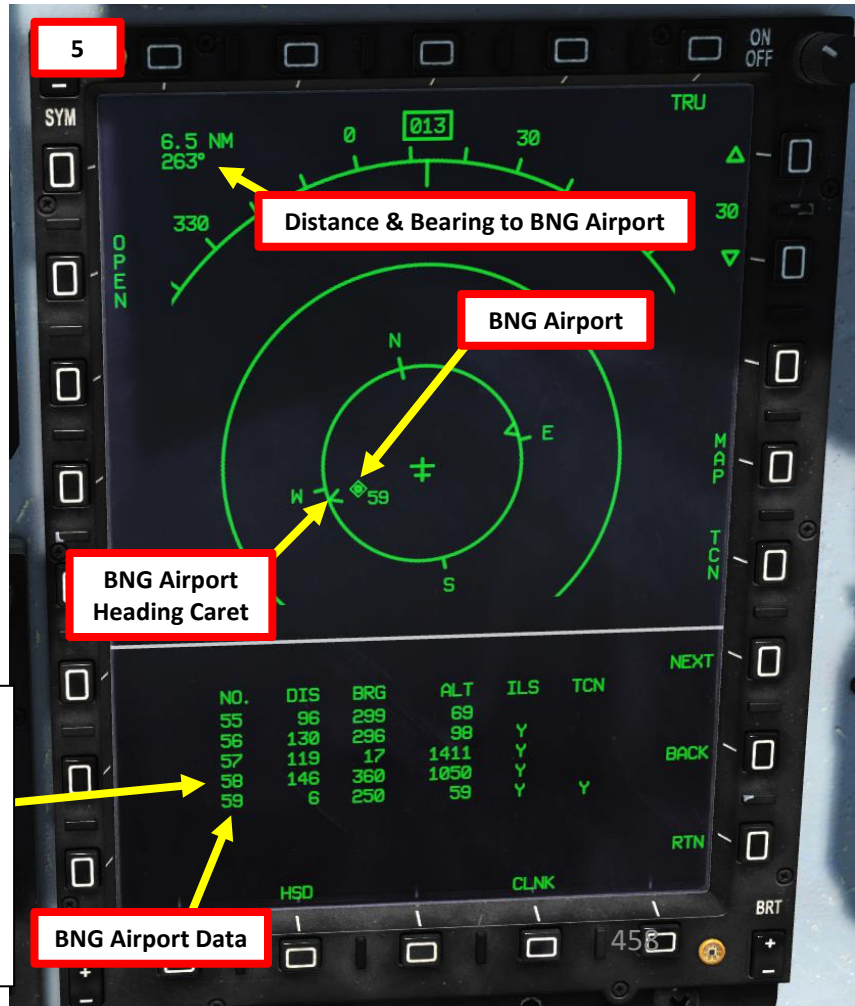
BINGO AIRPORT

The DTC (Data Transfer Cartridge) has 9 Waypoints (DST 50 to 58) reserved for the closest airports to the last waypoint of your flight plan. Think of them as alternate airports available for landing. These waypoints are entered in the DTC automatically by the ground crew and cannot be edited. This list of airports is available on the AFD (Airfield Data) sub-page.

Setting the MMS (Master Mode Switch) in the MIDDLE position (NAV) will automatically display the AFD (Airfield Data) sub-page, which lists the closest airports.

Waypoint 59 is for the "BINGO" airport. The BINGO function determines what airport within your database (DST 50 to 58) is the closest to you.

1. MMS (Master Mode Switch) – NAV
2. Press on RTN button to access the MAIN UFCP menu
3. Press Arrow next to FP-A
4. Press Arrow next to BNG (BINGO)
5. Closest airport within the AFD page will be selected as your current waypoint. In our case, DST 59 is selected.
6. Steering cues on the HUD and HSD page can be used to navigate towards the airport (see Waypoint Navigation tutorial).



DEST Waypoint Database	
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AFD (Airfield Data) Sub-Page (List of Closest Airports)

- *No.: Airport Number*
- *DIS: Distance to Airport (nm)*
- *BRG: Bearing to Airport*
- *ALT: Airport Elevation (ft)*
- *ILS: Instrument Landing System Availability (Y = YES)*
- *TCN: TACAN Availability (Y = YES)*

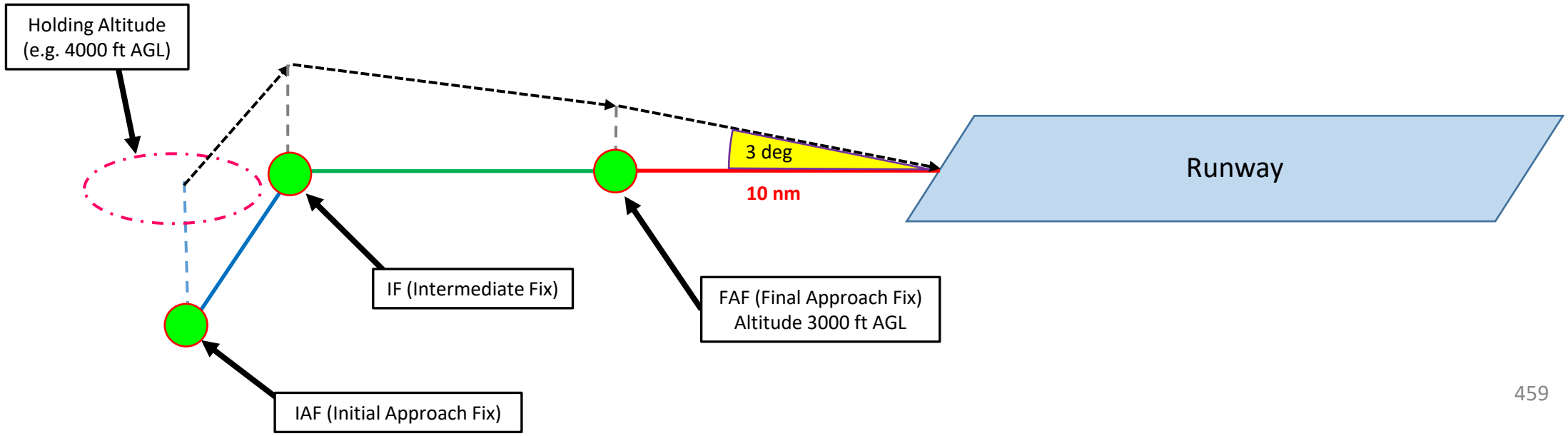
APPROACH INTRODUCTION

There are three main approach types available in the JF-17:

- **SCA**: Self-Controlled Approach. This approach is basically a VFR (Visual Flight Rules) approach. This approach will not give you any vertical deviation or lateral deviation information.
- **TACAN**: This approach is done with a TACAN (Tactical Air Navigation) beacon installed at the airport. This approach will not give you vertical deviation (glide slope) information; only lateral deviation from the course set to intercept the TACAN.
- **ILS**: This approach is done with an Instrument Landing System system, which consists of a glide slope station (provides vertical deviation from 3 deg descent) and a localizer array station (provides lateral deviation information).

An approach usually consists four reference points:

- **IAF** (Initial Approach Fix), the point where the initial approach segment of an instrument approach begins. You should be at a specific holding altitude at this point.
- **IF** (Intermediate Fix), fix that identifies the beginning of the intermediate approach segment of an instrument approach procedure. This point is usually not listed on charts.
- **FAF** (Final Approach Fix), specified point on a non-precision instrument approach which identifies the commencement of the final segment.
- The Runway itself

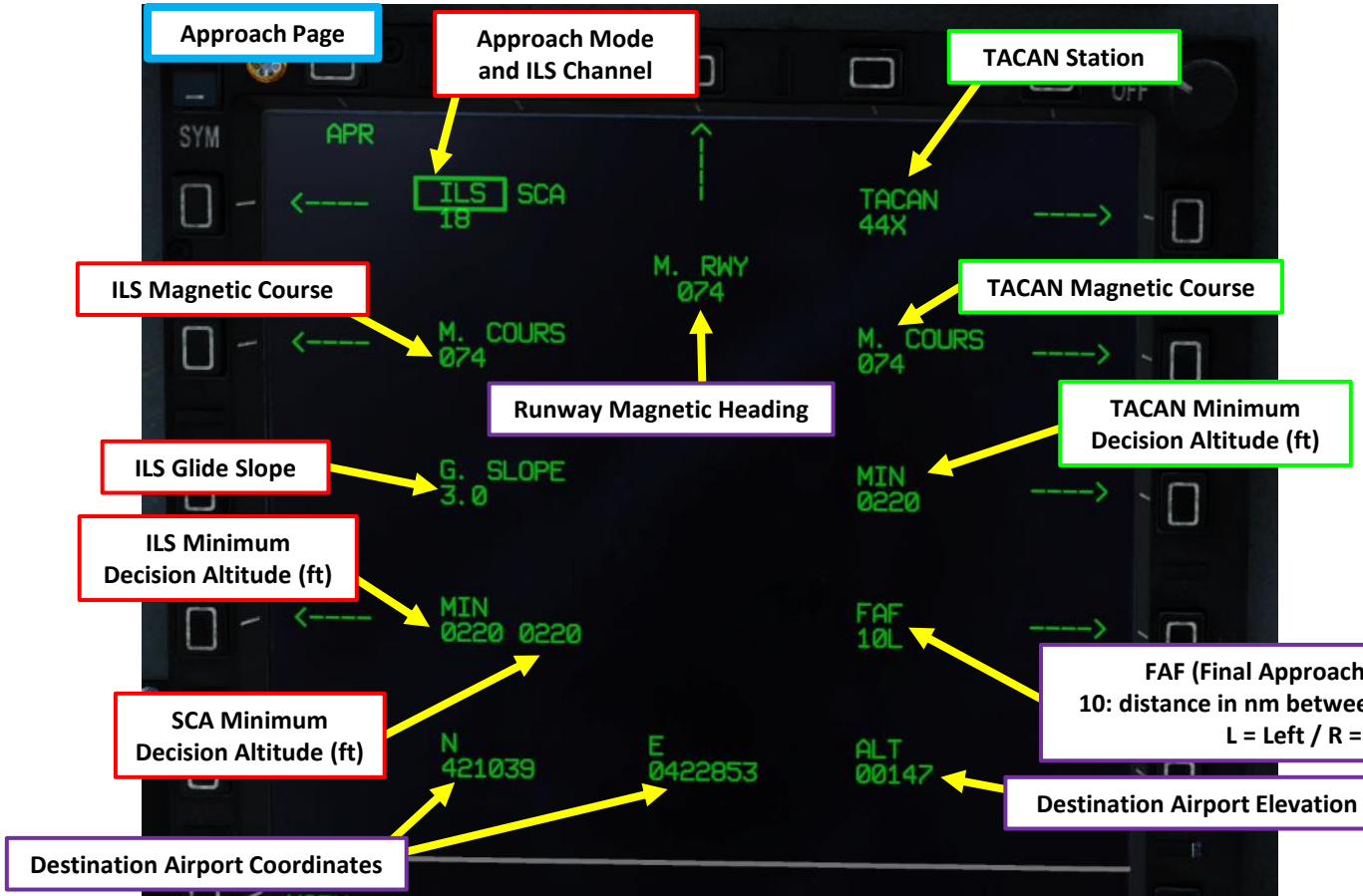


APPROACH INTRODUCTION

If you press the RTN button on the UFCP and select the Arrow button next to FP-A, you will enter the UFCP Navigation Mode menu. From there, you can choose the Approach Menu and select what kind of approach options to select.

- **ILS**: ILS Approach
- **TCN**: TACAN Approach
- **SCA**: Self-Controlled Approach (VFR)

- **FAF**: Final Approach Fix sub-mode will guide you to the FAF. You can select the FAF for either available runway.
- **RWY**: Runway sub-mode will guide you to the Runway selected with the ILS.



UFCP Main Menu

UFCP Navigation Mode Menu

UFCP Approach Mode Menu

ILS TUTORIAL

The DTC (Data Transfer Cartridge) has 9 Waypoints (DST 50 to 58) reserved for the closest airports to the last waypoint of your flight plan. Think of them as alternate airports available for landing. These waypoints are entered in the DTC automatically by the ground crew and cannot be edited. This list of airports is available on the AFD (Airfield Data) sub-page.

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- *TCN: TACAN Availability (Y = YES)*

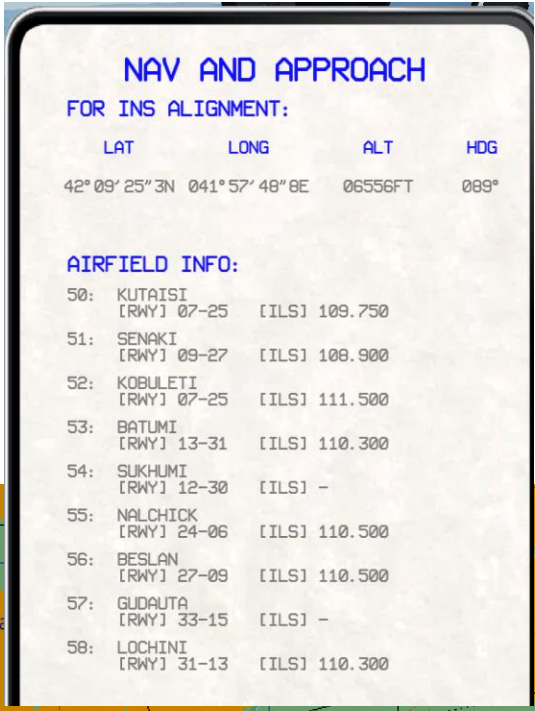
ILS Channel	Frequency	ILS Channel	Frequency
01	108.100	**21**	110.100
02	108.150	**22**	110.150
03	108.300	**23**	110.300
04	108.350	**24**	110.350
05	108.500	**25**	110.500
06	108.550	**26**	110.550
07	108.700	**27**	110.700
08	108.750	**28**	110.750
09	108.900	**29**	110.900
10	108.950	**30**	110.950
11	109.100	**31**	111.100
12	109.150	**32**	111.150
13	109.300	**33**	111.300
14	109.350	**34**	111.350
15	109.500	**35**	111.500
16	109.550	**36**	111.550
17	109.700	**37**	111.700
18	109.750	**38**	111.750
19	109.900	**39**	111.900
20	109.950	**40**	111.950

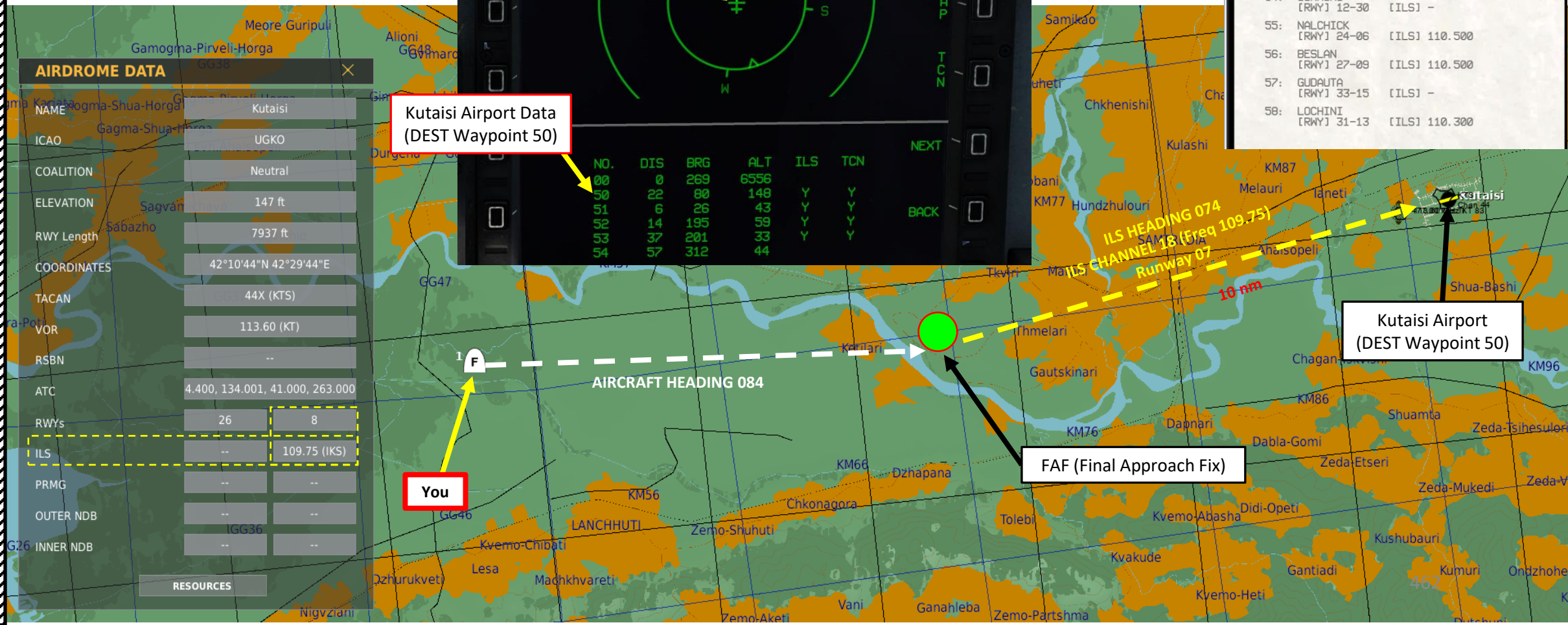
ILS TUTORIAL

We intend to land at Kutaisi's Runway 08.

We will first follow the FAF (Final Approach Fix) to Runway 07, then turn towards the ILS for Runway 07.

The Destination Airport will be DEST Waypoint 50.





ILS TUTORIAL

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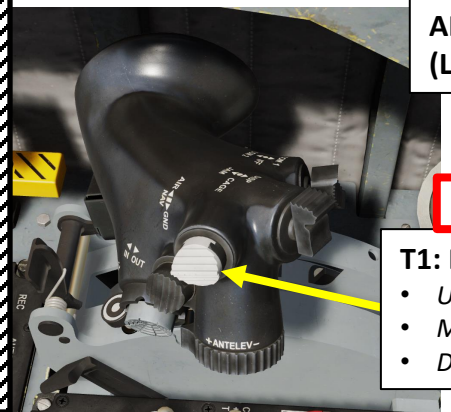
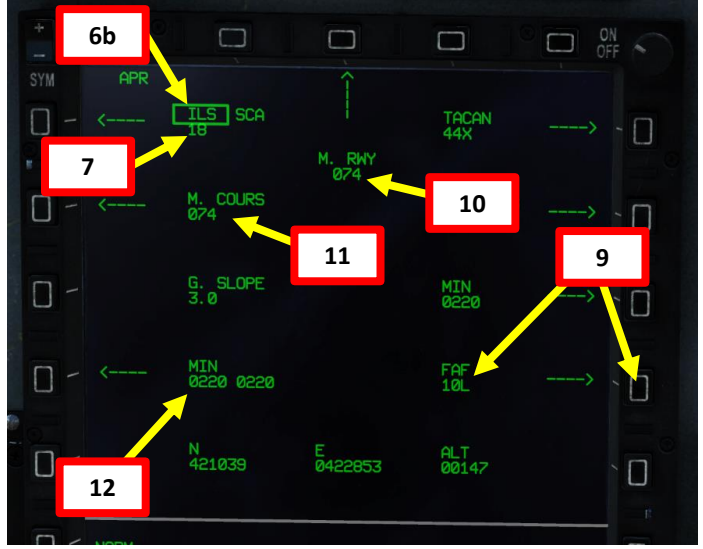
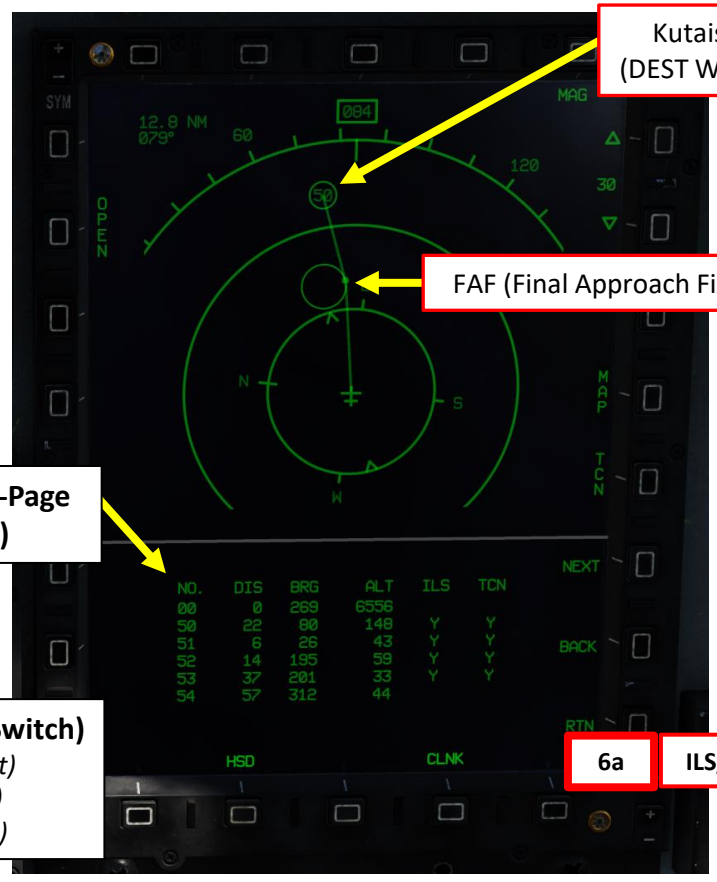
1. MMS (Master Mode Switch) – NAV
2. Press RTN to access UFCP MAIN Menu
3. Press Arrow next to FP-A
4. Select APR (Approach) Mode. Left MFCD will automatically switch to the APPROACH page.
5. Select desired airport (i.e. Airport 50)
6. Press Arrow next to ILS to toggle between ILS, SCA and TACAN until you have ILS selected.
7. ILS Channel 18 on airport 50 will automatically be selected.
8. Select FAF Approach Sub-Mode.
9. Set FAF (Final Approach Fix) setting to approach from either the Left (L) or the Right (R).
10. Runway Heading 074 to runway 07 will automatically be set.
11. Magnetic Course 074 to runway 07 will automatically be set.
12. Minimum Decision Altitude will automatically be set to 220 ft.



1

T1: MMS (Master Mode Switch)
- *UP: AA (Air-to-Air Intercept)*
- *MIDDLE: NAV (Navigation)*
- *DOWN: AG (Air-to-Ground)*





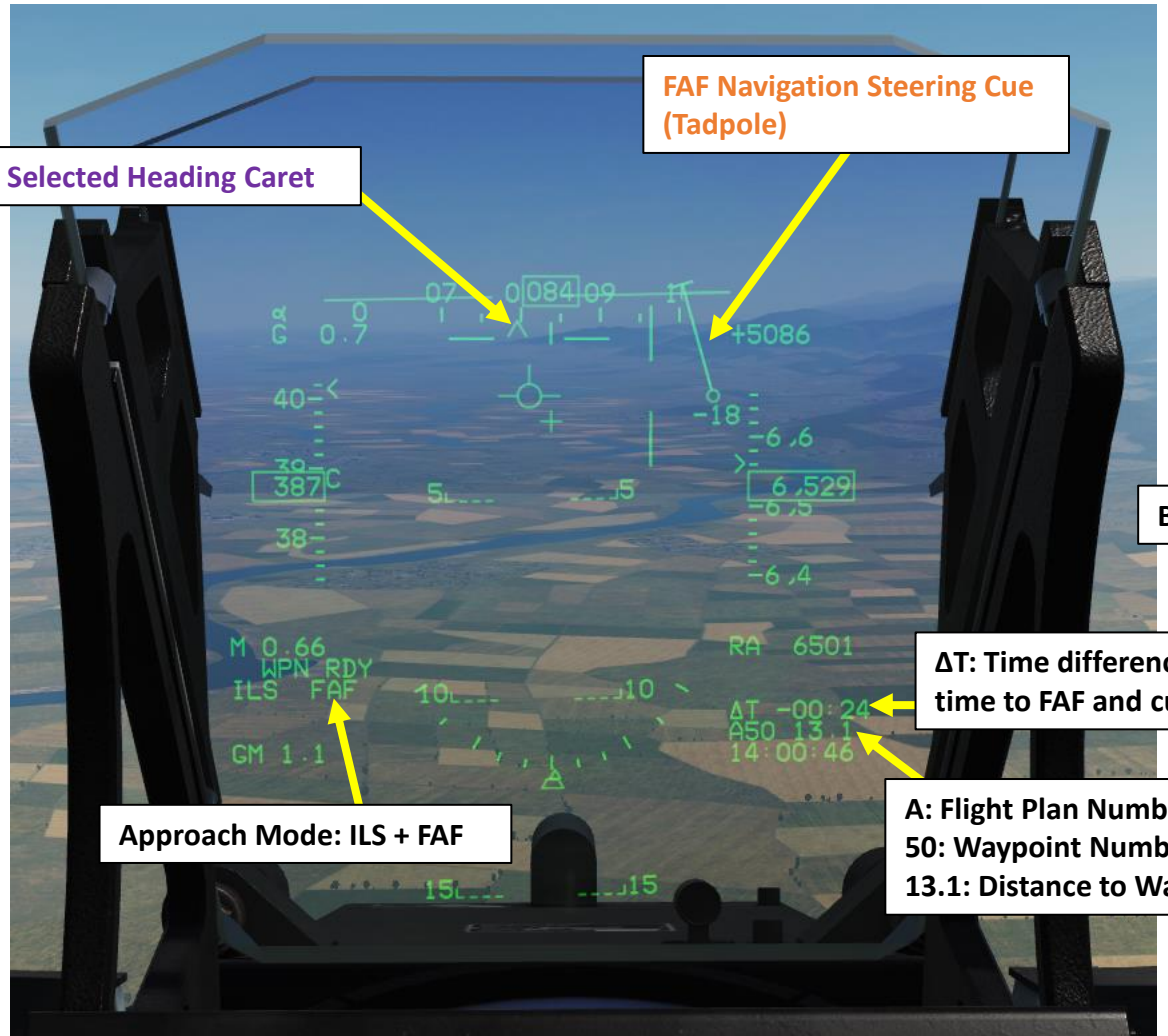
UFCP Main Menu

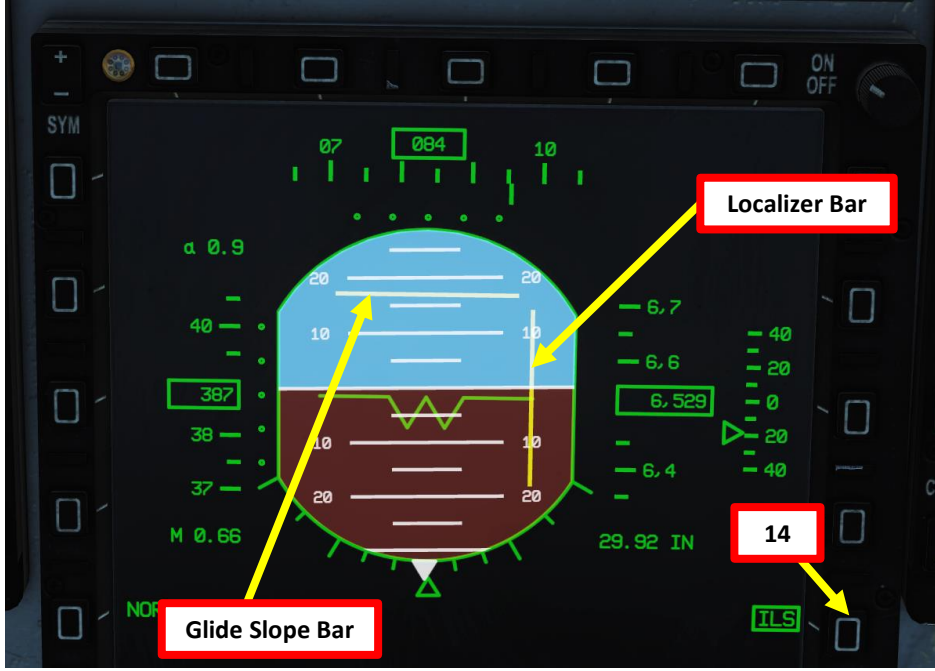
UFCP Navigation Mode Menu

UFCP Approach Mode Menu

ILS TUTORIAL

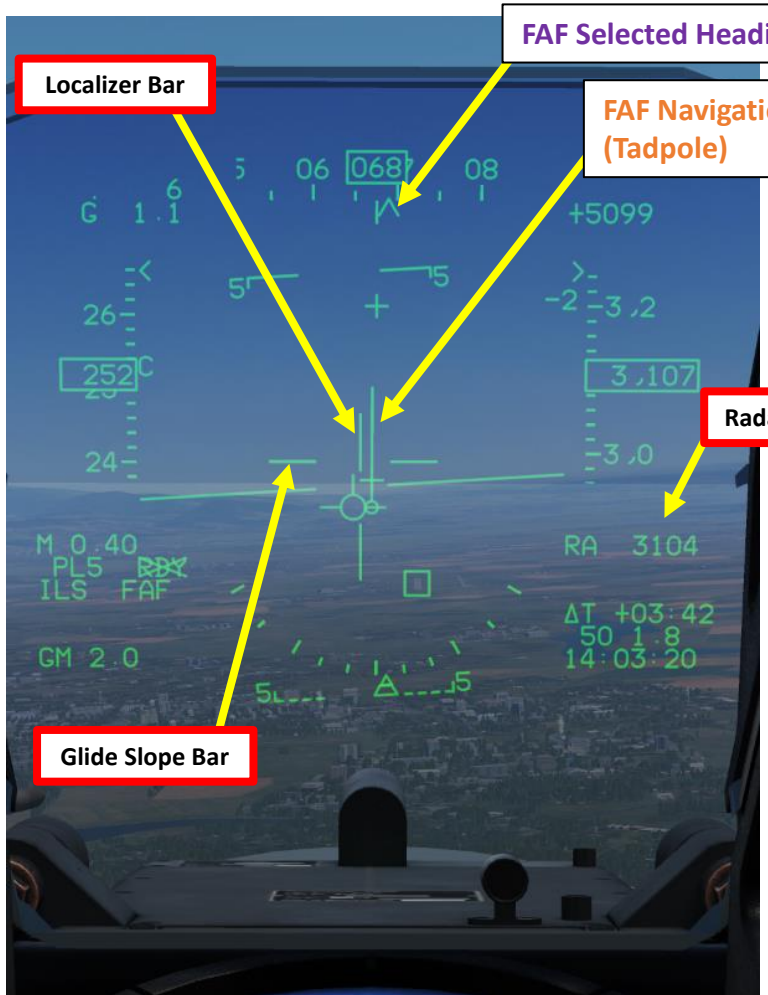
13. Set EFIS menu on the central MFCD.
14. Select OSB next to ILS to overlay Localizer and Glide Slope bars on the ADI (Attitude Director Indicator).
15. Steer towards the waypoint by following the **Navigation Tadpole** and **Selected Heading Caret**. In the picture below, we need to steer right.

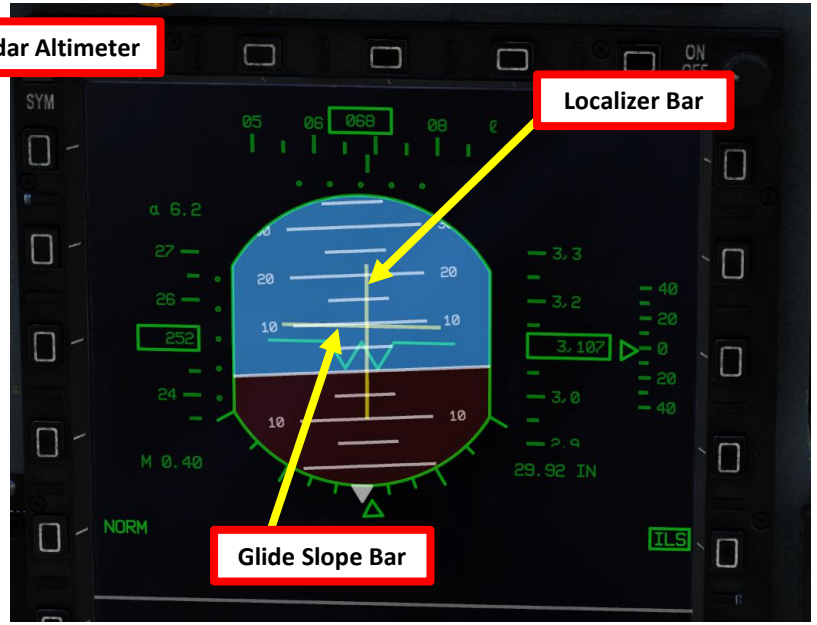




ILS TUTORIAL

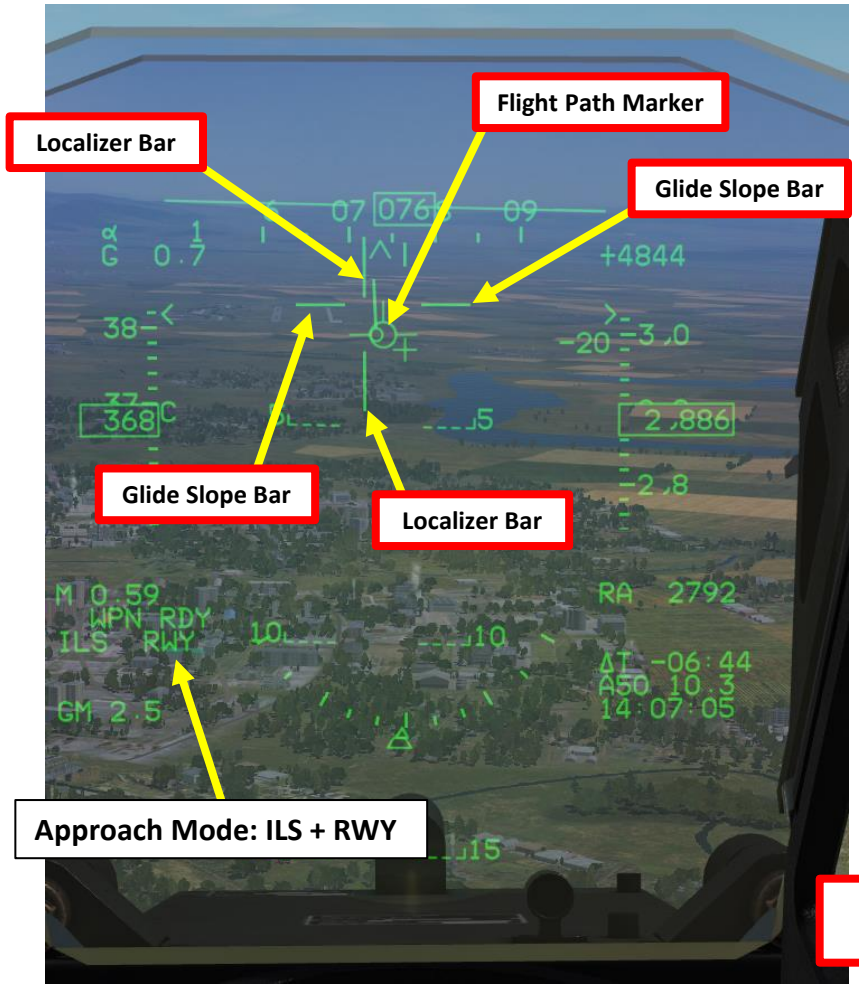
16. Once **Navigation Tadpole** is vertical and centered, you are on course towards the waypoint. The **Selected Heading Caret** should be lined up on your current heading.
17. Once approaching the FAF, the Glide Slope and Localizer bars should start moving on the HUD and EFIS.
18. Try to be above the FAF at an altitude of 3000 ft AGL (Above Ground Level). Consult the RA (Radar Altimeter) reading.





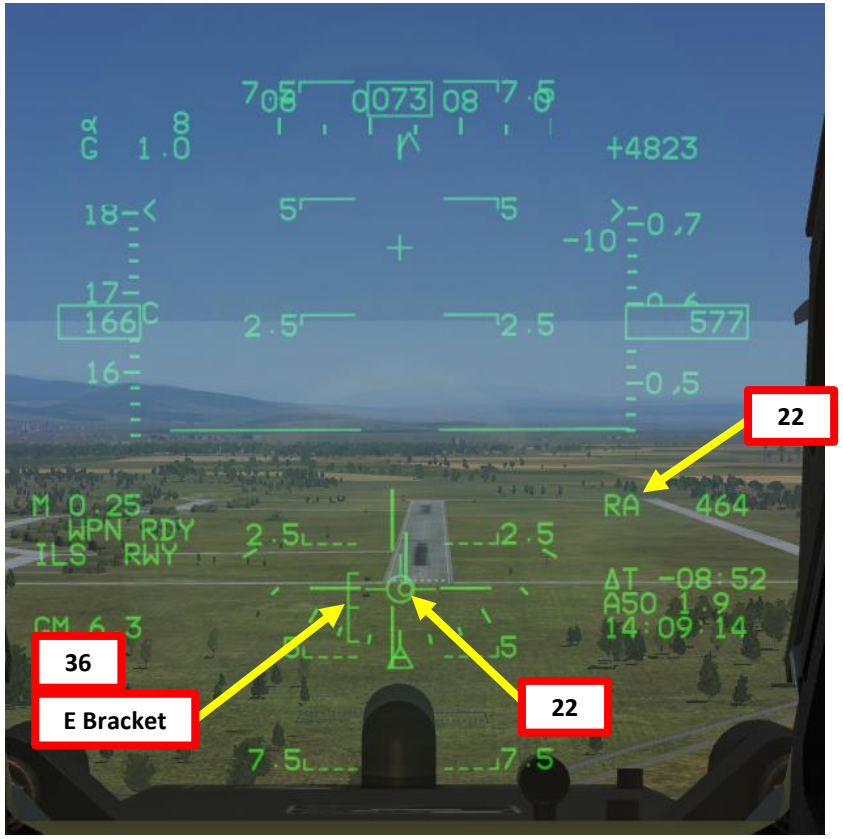
ILS TUTORIAL

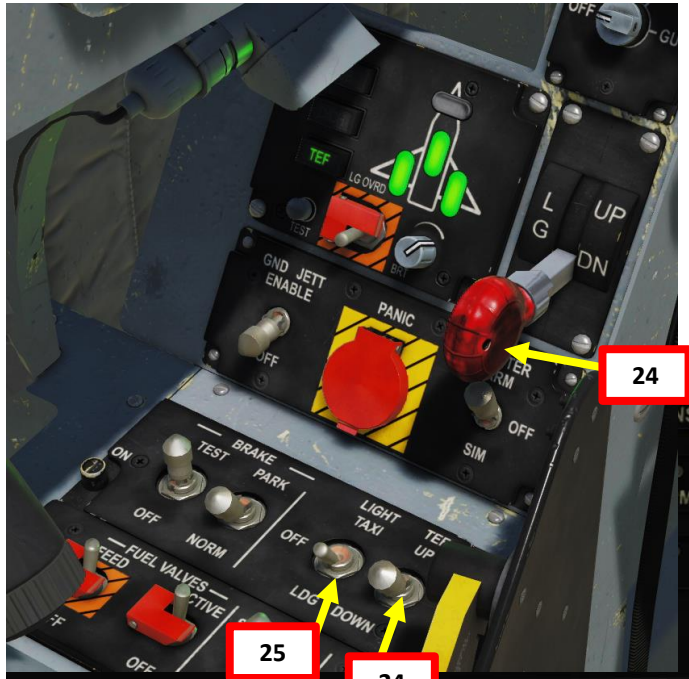
19. When you are less than 2 nm from the FAF, the Approach Mode will automatically switch from FAF (Final Approach Fix) to RWY (Runway). You will now be tracking the localizer and glide slope deviation bars on the HUD, EFIS and HSD.
20. Steer the aircraft to set the Localizer (Lateral Deviation) bar lined up with the Flight Path Marker (or the green W on the EFIS ADI).
21. You can switch from MAG (Magnetic Heading) to TRU (True Heading) if you want to double-check that the final heading is 074.

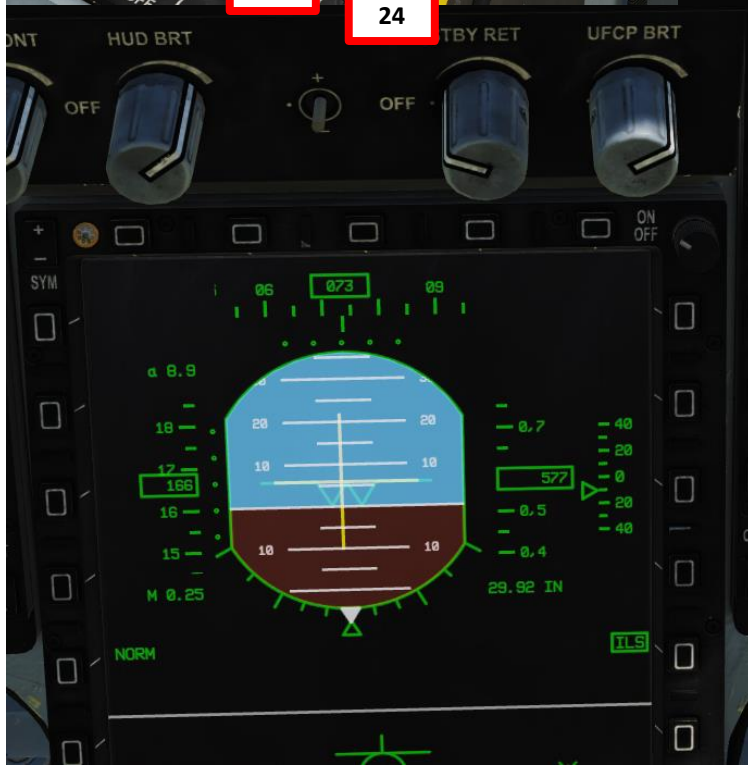


ILS TUTORIAL

22. Reduce throttle and control altitude to line up the Glide Slope Bar with the Flight Path Marker (or the green W on the EFIS ADI).
23. Once you are set on the localizer and glide slope, slow down using throttle and speed brakes,
24. Deploy flaps (TEF, Trailing Edge Flaps) and landing gear when below 300 kts
25. Turn on LANDING Light (AFT)
26. Adjust power and trim to maintain an “On Speed” AoA (Angle of Attack) of about 10 degrees. The Flight Path Marker should remain within the “E” bracket on the HUD.
27. Use Radar Altitude as a reference.







ILS TUTORIAL

28. The aural cue “Altitude, Altitude, Altitude!” will be heard once you reach the Minimum Decision Altitude (220 ft in our case. Aural signals for Outer and Inner markers are also audible.
29. Flare at 3 ft above ground level. The two main wheels should touch the ground first.
30. During touchdown, maintain your Angle of Attack (10 deg) to perform an aerobraking landing and set throttle to IDLE. This manoeuver will bleed speed in the process (your wings will act as a huge airbrake).
31. When aircraft slows down to 135 kts, deploy drag chute by setting the D/CH switch to DEPLOY (UP).
32. As the aircraft slows down, the nose gear will touch the ground by itself. Gently apply brakes when aircraft airspeed is below 145 kts.
33. When airspeed is below 20 kts, jettison drag chute by setting the D/CH switch to JETT (DOWN). For subsequent flights, the drag chute will have to be installed again by the ground crew once re-arming and re-fueling is performed.

REPAIRING AIRCRAFT

When a pilot ejects from the aircraft, the pilot should make sure that the aircraft gets every onboard data wiped out in case the aircraft crash does not destroy all sensitive information. This is why the "Zeroizer" functions exists: to wipe the aircraft clean from every flight plan, armament information, countermeasure programs, etc.

When repairing an aircraft, the ground crew needs to lift the seat. An "Ejection Seat Activate Zeroizer" switch set to ENABLE will automatically trigger the "Zeroizer" when the seat is ejected or lifted, which is something you might not want if you want to go on another mission. To prevent the ground crew from triggering the Zeroizer when they lift the seat for repairs, the "Ejection Seat Activate Zeroizer" must be set to DIsABLE. This way, the ground crew can do its job safely.

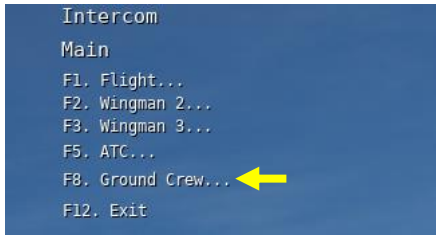
To repair an aircraft:

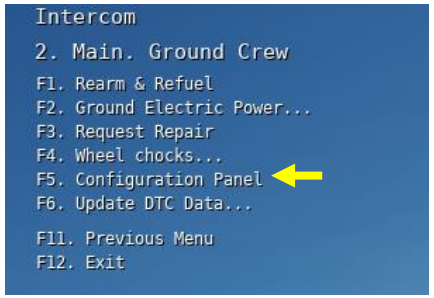
1. Set Ejection Seat Active Zeroizer Switch to DISABLE
2. Request repairs
3. When repairs are complete, set Ejection Seat Activate Zeroizer Switch back to ENABLE.

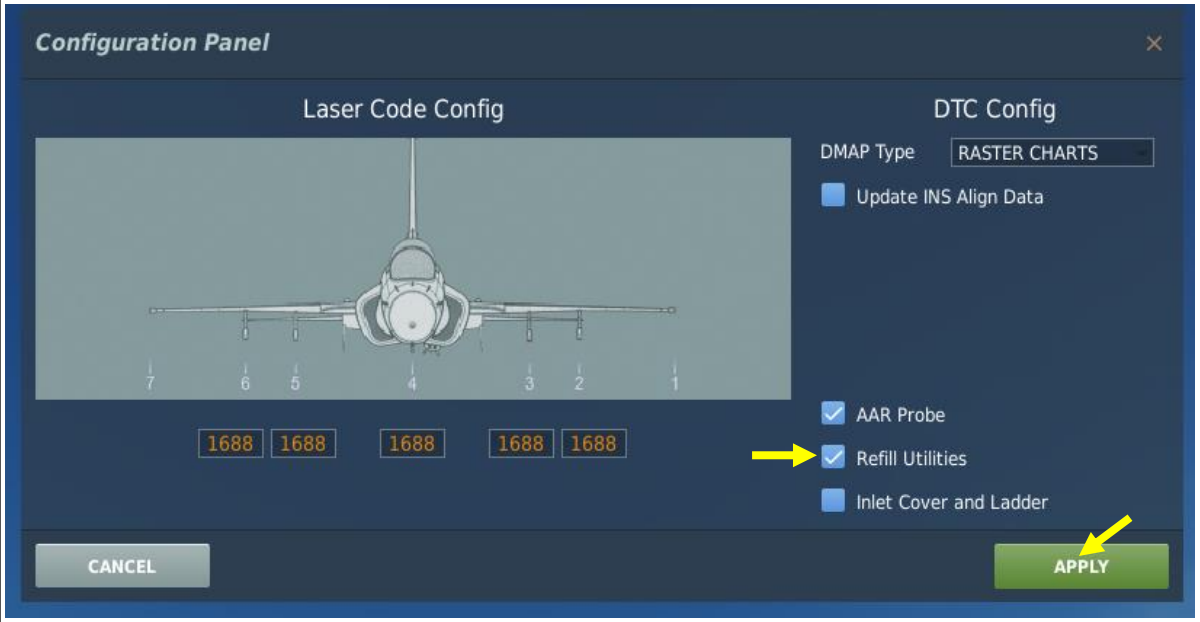
REARMING & RESUPPLYING AIRCRAFT

If you land the aircraft and want to go for another sortie, you will have to request the ground crew to re-install the drag chute and refill supplies like the oxygen bottle.

1. To Refill Utilities (Drag Chute, Oxygen Bottles, etc.), contact ground crew by pressing « \ »
2. Press F8 (Ground Crew)
3. Press F5 (Configuration Panel).
4. From the Configuration panel, select « Refill Utilities», then click APPLY.







DATA – RLS PAGE

One very cool thing to explore when returning from a mission lies in the DATA – RLS Sub-page. This pages stores the latest 10 ordnance release operations (including bombs, missiles, etc.).

PART 19 – AIR-TO-AIR REFUELING

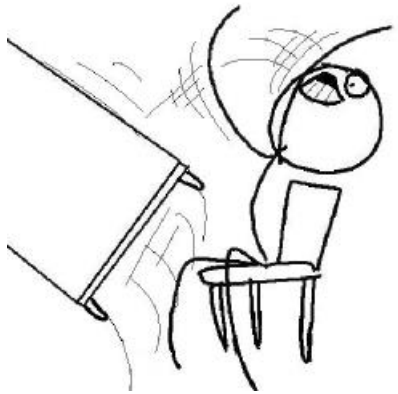
INTRODUCTION

AIR-TO-AIR REFUELING: WHY WE ALL HATE IT

Air-to-air refueling is one of the hardest, most hated, and most frustrating tasks in DCS. Ever. Of all time.

Why? Well, one of the main reasons for the difficulty behind refueling is the skill required to do formation flying. Flying in formation with another aircraft requires much more practice than you would initially think. Another reason is pure physics: there is this thing called “wake turbulence”. An aircraft flies through a fluid: air. Just like with any fluid, if you have something that displaces itself through it at a certain speed, the fluid will become disrupted (turbulence). Wingtip vortices and jetwash are both effects of this simple concept. Wake turbulence is the reason why airliners need to wait a minimum time between takeoffs: flying through disrupted air will destabilize the aircraft and it is unsafe, especially during critical phases of flight like takeoff and landing.

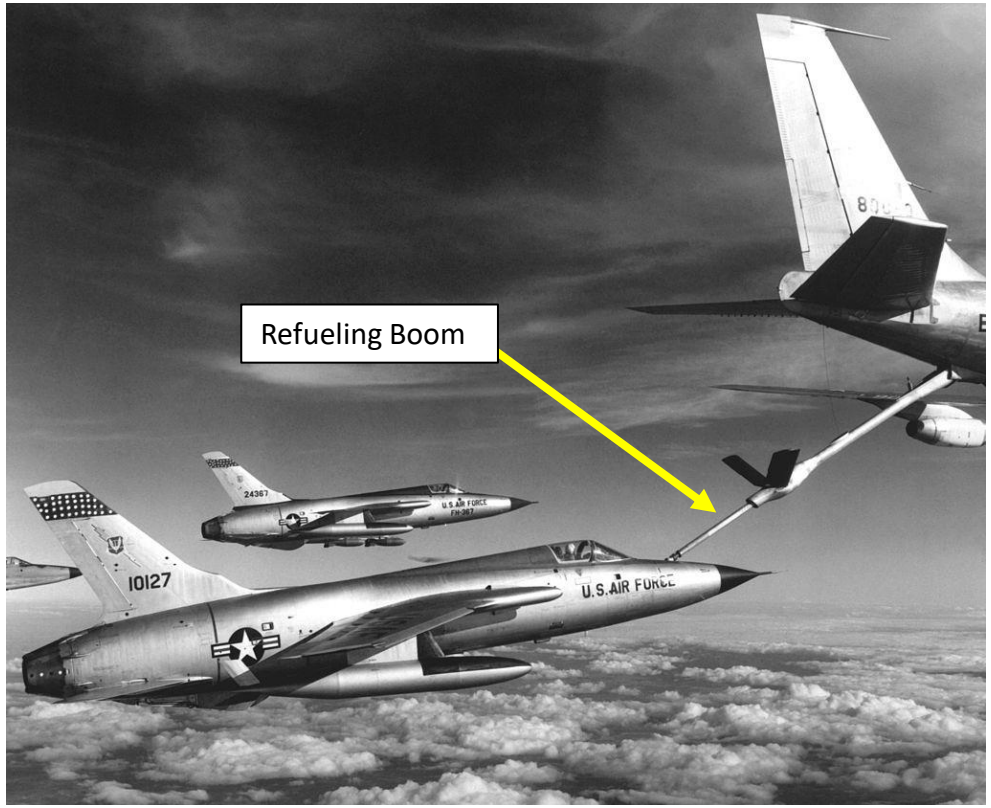
Unfortunately, wake turbulence is something a pilot **has** to deal with during air-to-air refueling. This is why the aircraft will fly just fine when approaching the tanker, but start wobbling around when flying in close proximity of the refueling basket/drogue and tanker engines.



TYPES OF AIR-TO-AIR REFUELING

There are four main air-to-air refueling techniques used in military aviation:

- Probe-and-drogue (refueling probe must be inserted in the tanker's drogue basket)
- Flying Refueling Boom (guided by boom operator aboard the tanker)
- Buddy Refueling (two fighters can refuel one another independently without a tanker)
- Nose-Probe refueling



F-105 Thunderchiefs being refueled by a Boom system during the Vietnam War

Tornado GR4 being refueling by a Probe-and-Drogue system

TYPES OF AIR-TO-AIR REFUELING

The refueling aircraft available in DCS are:

- The Ilyushin Il-78M “Midas”, a russian **probe-and-drogue** tanker, which was developed from the Il-76.
- The Boeing KC-135 “Stratotanker”, a US Air Force **flying boom** tanker, which was developed from the Boeing 367-80.
- The KC-135 MPRS (Multi-point Refueling Systems), a US Air Force KC-135 tanker modified to add refueling pods to the KC-135's wings, making it useable as a **probe-and-drogue** tanker.
- The Lockheed S-3B “Viking”, a US Navy **probe-and-drogue** tanker.
- The Lockheed KC-130 “Hercules”, a USMC **probe-and-drogue** tanker, which was developed from the C-130.

The JF-17 is equipped with a Probe-and-Drogue system, so air-to-air refueling will only be performed from either an Il-78M, a KC-130, a KC-135 MPRS or a S-3B tanker.

KC-135 MPRS

KC-135 Stratotanker

Il-78M

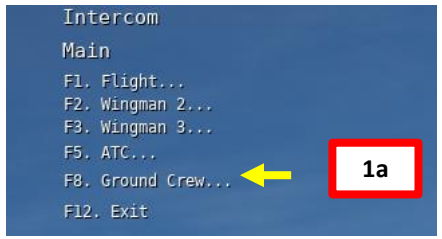
KC-130

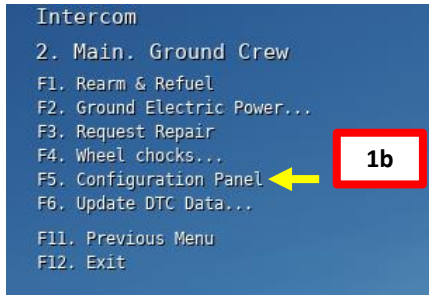
S-3B Viking

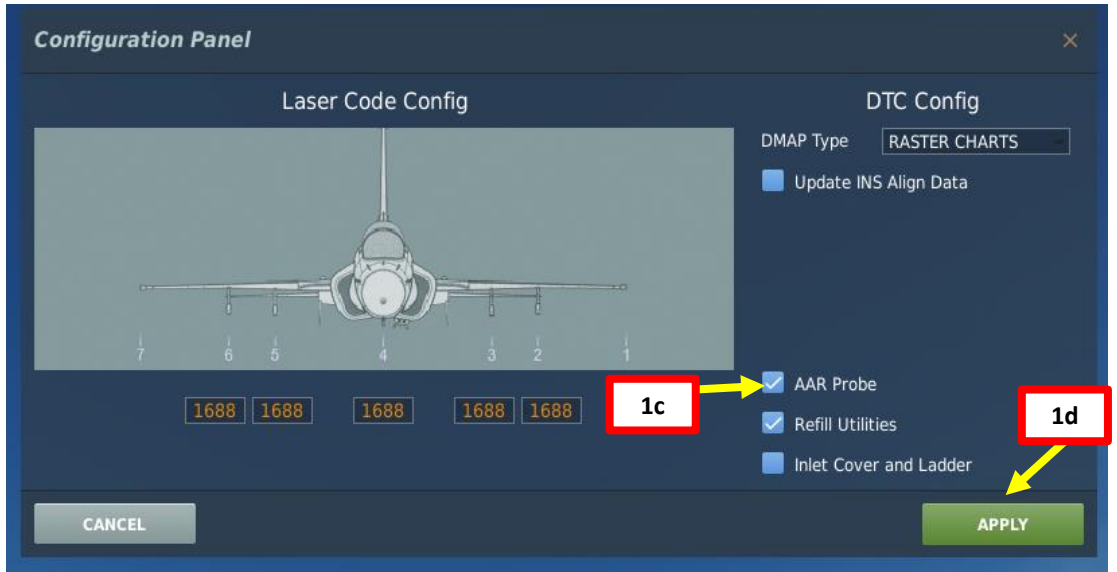
AIR-TO-AIR REFUELING DEMO

1. The first step in air-to-air refueling in the JF-17 starts from the ground **prior to engine start**. If the refueling probe is not installed already, you have to request the ground crew to install the air refueling probe. Contact ground crew by pressing « \ », then pressing F8 (Ground Crew), and F5 (Configuration Panel). From the Configuration panel, select « AAR Probe », then click APPLY. This process can take about a minute or so.

Note: You can request the ground crew to install or uninstall the **air refueling probe**. However, the engine **needs to be shut down prior to doing that**.



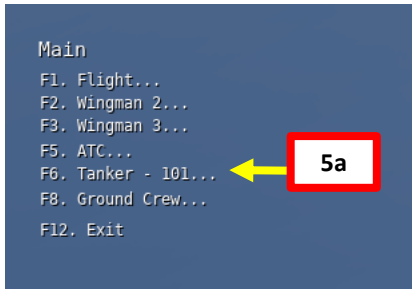


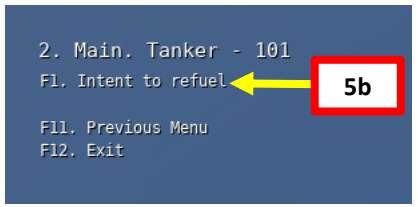


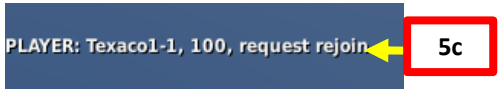
AIR-TO-AIR REFUELING DEMO

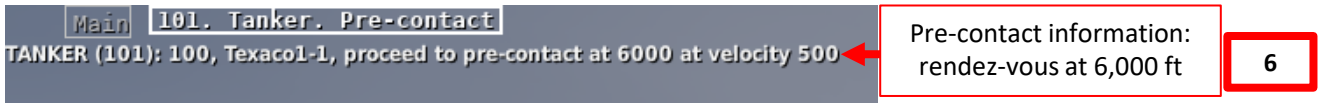
2. Consult mission briefing to know on which radio frequency/channel you need to contact the tanker. In our case, we will use the preset radio Channel 01 on the COM1 radio.
3. Find tanker using TACAN frequency as shown in the NAVIGATION - TACAN section.
4. Set your COM1 radio to Channel 01 and turn on volume knobs. Press “RALT+\” (T4 switch FWD) to communicate with TEXACO (tanker callsign).
5. Select Tanker – Texaco (F6) communication menu, and then select “Intent to Refuel”
6. TEXACO should give you a pre-contact altitude (in our case 6,000 ft).

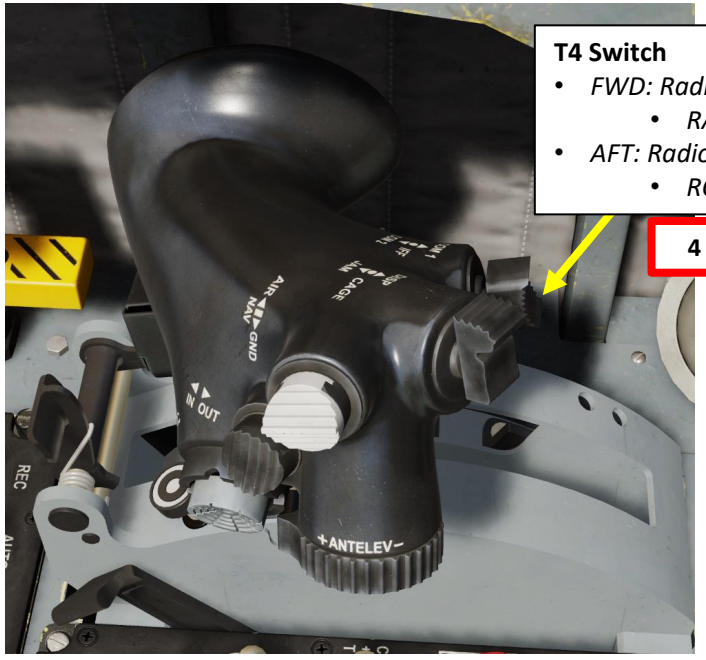
Note: Some tankers like the KC-130 are equipped with a TACAN beacon, which can give you a direction to find it easily. Just make sure you have the correct TACAN frequency set in the A/A (Air-to-Air) Mode. Set TACAN using the NAVIGATION TACAN tutorial.





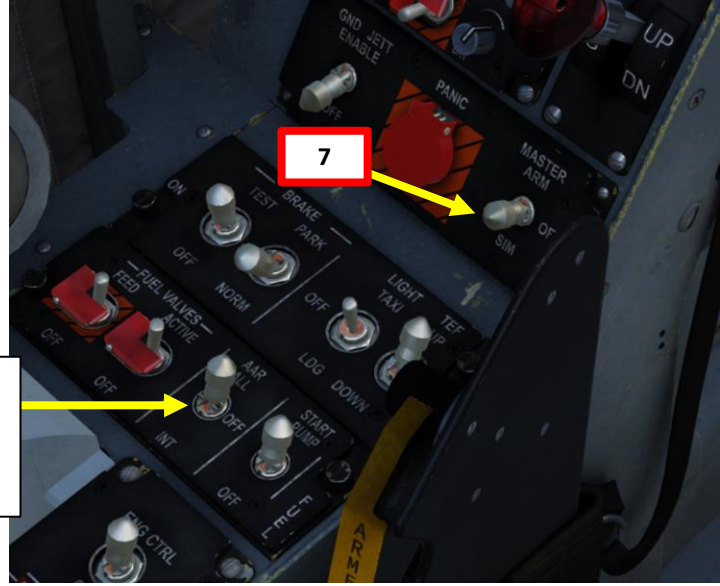


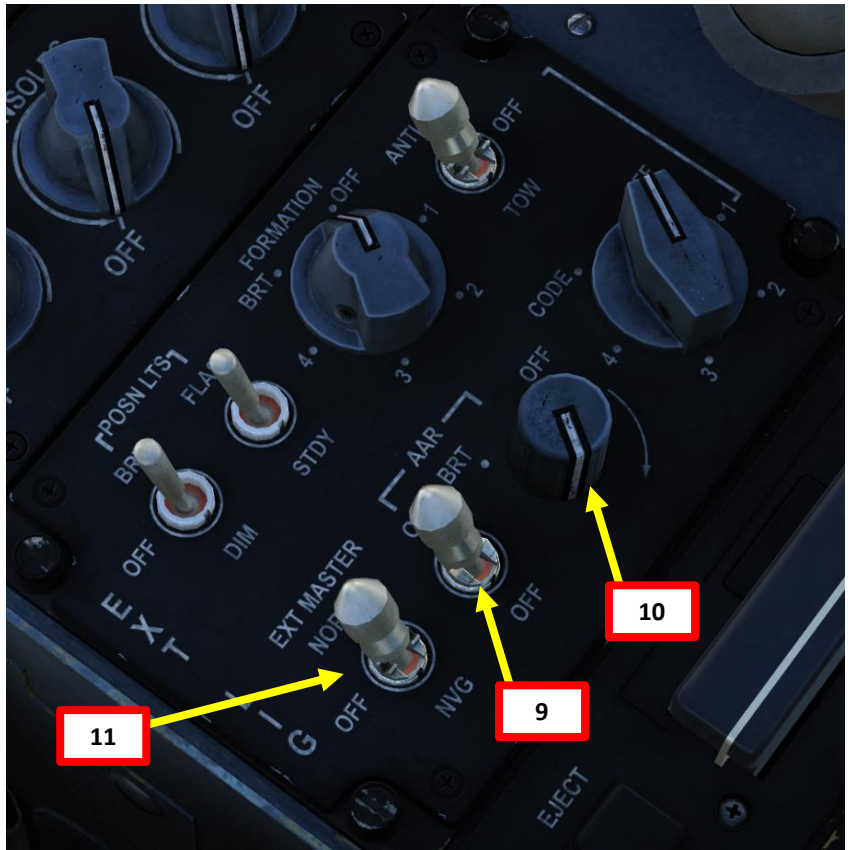




AIR-TO-AIR REFUELING DEMO

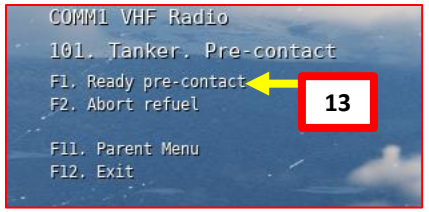
7. Set Master Arm Switch – OFF (MIDDLE)
8. Set Air-to-Air Refueling Switch – ALL TANKS (FWD).
9. Set Air-to-Air Refueling Probe Light Switch – ON (FWD) if required.
10. Set Air-to-Air Refueling Probe Light Brightness Control Knob – As required.
11. Set Exterior Lights Master Switch – NORM (FWD) if required.





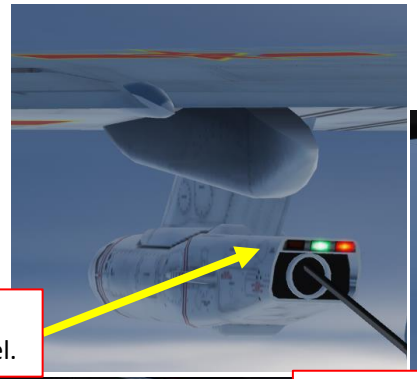
AIR-TO-AIR REFUELING DEMO

12. When you are less than 0.1 nm away from tanker, position yourself as shown on picture.
13. When in position, use your radio menu to select “Ready Pre-Contact” (F1).
14. The tanker’s pilot should answer you with “Cleared Contact” and should deploy his drogue basket and start to accelerate to cruising speed.
15. Fly formation with the tanker and approach the drogue basket very slowly (make sure you remain about 2-3 kts faster than the tanker) with very gentle inputs. Use stick for big corrections, but keep trimming constantly for small corrections.
16. Keep the aircraft **trimmed at ALL TIMES**. Approaching untrimmed is living hell. Be careful with the throttle since it has a long response time. Use airbrake if you need to slow down quickly while maintaining altitude.

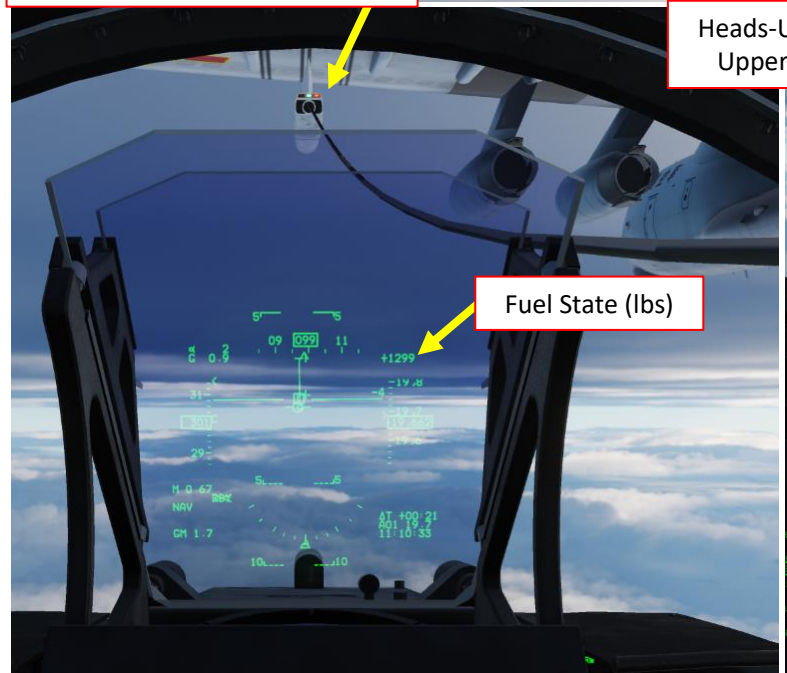


AIR-TO-AIR REFUELING DEMO

17. Insert your probe into the drogue basket by using your reference points. The **Heads-Up Display's upper section should be lined up vertically with the left-most refueling pod for vertical movements**, and your **velocity vector should be aligned with the flap track fairing for lateral movements**
18. Additional drag should be generated by the drogue once you have contact with the drogue: your aircraft will slightly decelerate. Throttle up a little to keep the probe in. Once the probe is taking fuel, the tanker pilot should tell you "You're taking fuel" and a green light should illuminate on the tanker's refueling pod.
19. Keep formation with the tanker until your refueling is complete. Fuel state is visible on the heads-up display. Don't look at the basket, look at the tanker's refueling pod.



Tanker's Refueling Pod
Green light = You're taking fuel.



Flap Track Fairing

Refueling Pod

Heads-Up Display
Upper Section

Use this vertical line as a reference point for lateral movements

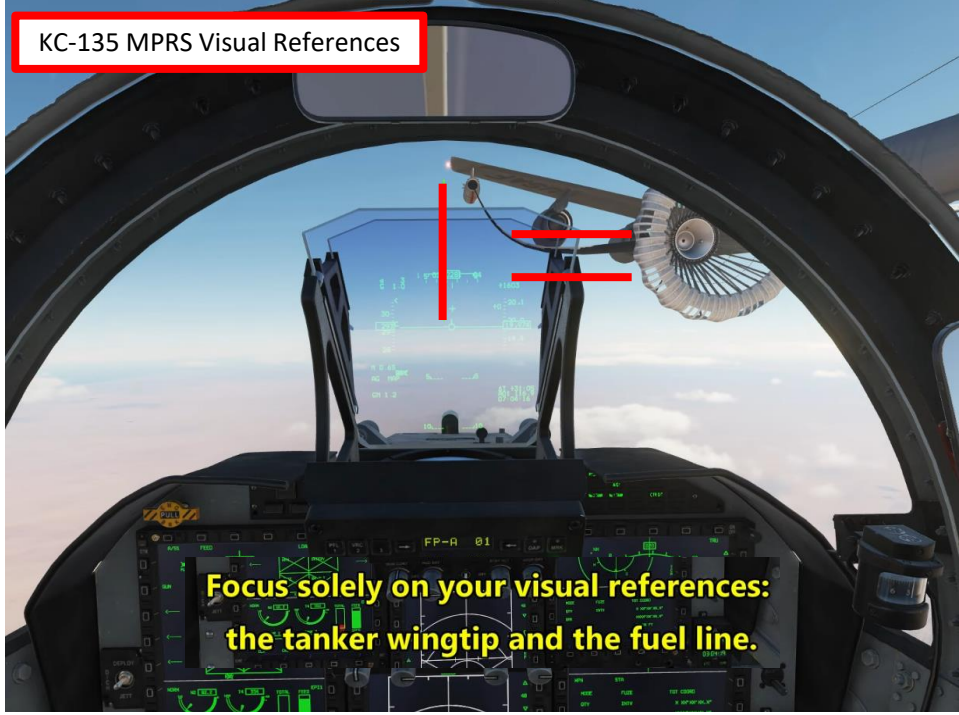
Velocity Vector

AIR-TO-AIR REFUELING DEMO

20. When refueling is complete, detach your probe from the basket by throttling down and set Air-to-Air Refueling Switch – OFF (MIDDLE).

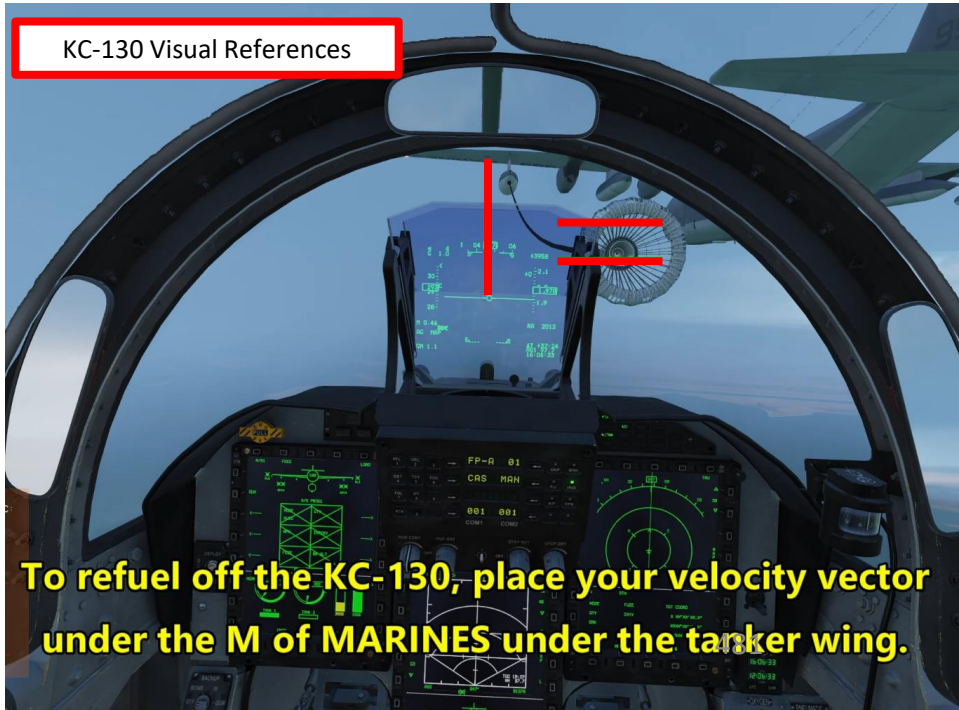
Note: Commander Steinsch has created a very nice list of visual references for various tankers such as the Il-78, KC-130 and KC-135 MPRS.
See the pictures below, which are adapted from this video: https://youtu.be/uS-O8X1-CR4

KC-135 MPRS Visual References



Il-78 Visual References

KC-130 Visual References



AIR-TO-AIR REFUELING DEMO

Of course, all of this seems much easier said than done. You will very likely do following mistakes:

- Approach too fast and miss the basket
- Oscillate vertically without being able to line up with the basket
- Keep going either too fast or too slow
- Drift left or right
- Overcompensate control inputs
- Forget the airbrake on

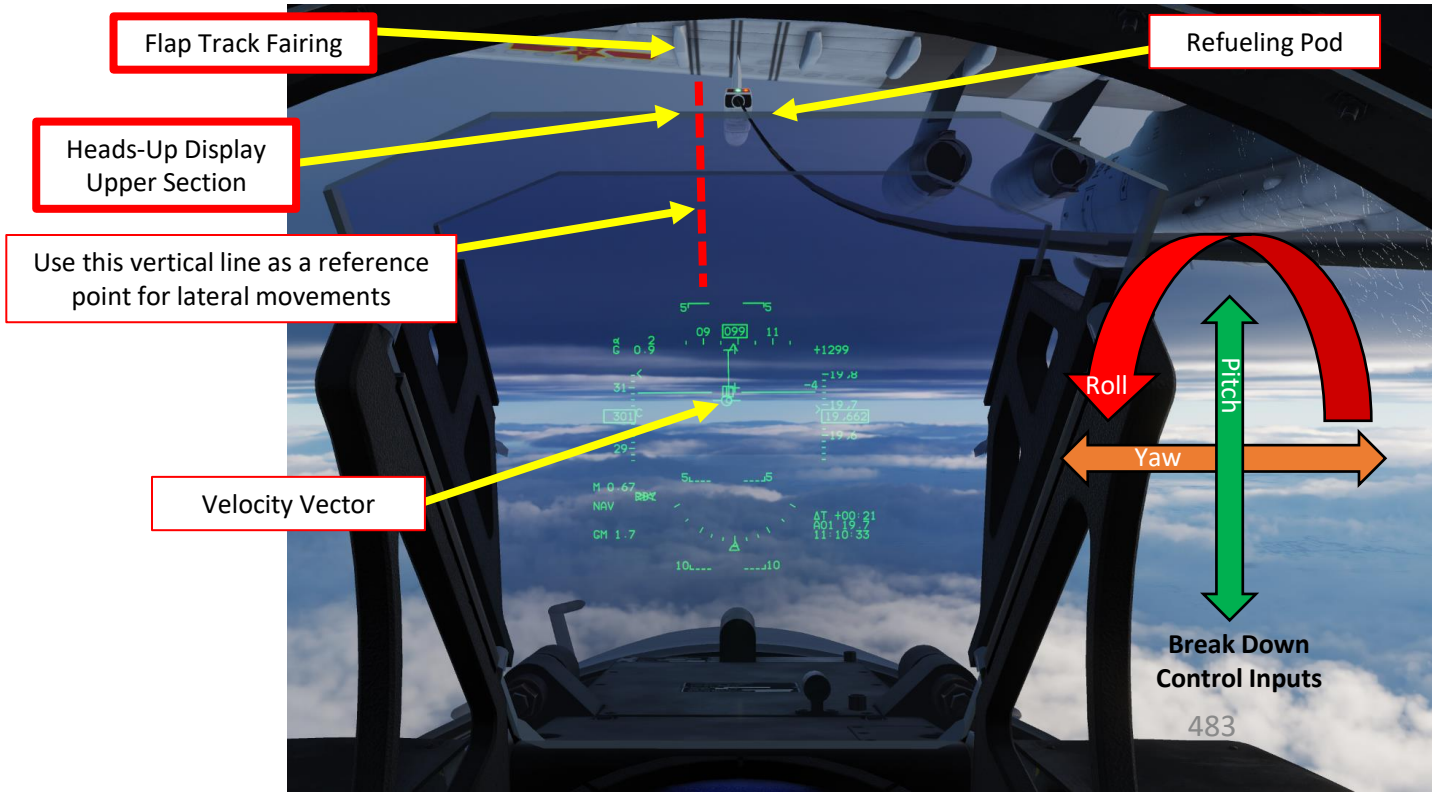
Here are various demos of air-to-air refueling.

- Tactical Pascale: https://youtu.be/cOOY66tLDek
- Commander Steinsch: https://youtu.be/uS-O8X1-CR4
- Tricker: https://youtu.be/TxOMvz6xzqM

The next slide will give you a couple of tips to help you catch that basket and slurp that delicious jet fuel like a crack addict.

TIPS & TRICKS

- Remaining **CALM is key** for a successful refueling. If you lose your cool, take a break and try again once you are relaxed. Silk hands and a clear head are needed for that part.
- If you overshoot (or are about to fly past) the tanker, you can bleed speed very fast by deploying your airbrakes. You can go from 400 kts to 300 kts in a matter of seconds.
- **Avoid combining roll, pitch and yaw movements at the same time** when you are tracking the basket. Failing to do so will make you drift vertically and horizontally, which doesn't help at all and may induce PIO (Pilot induced oscillations). Try to stay in the same horizontal plane as much as possible.
- It is easier if you try to "break down" your control inputs in **separate movements**. I try to avoid gunning my throttle, pitching up/down, rolling and using my rudder at the same time. I generally avoid using the rudder and instead focus on using small pitch and roll inputs only in order to make the **aircraft's response predictable**. Combining different control inputs can make the aircraft react in a way that makes it all very difficult for your brain to predict and process. I tend to make sure my plane is **straight and level at first** and that I am more or less lined up with the refueling pod.
- Once I have a satisfying attitude and that the refueling pod is placed as per the reference points (vertically: the upper part of the HUD glass is lined up with refueling pod, and laterally: the velocity vector is lined up with the flap track fairing near the refueling pod), **I gradually throttle up** and increase speed to **match the tanker's speed**.
- Avoid big throttle movements as the JF-17 engine power can fluctuate rapidly and throw you past the tanker.
- Once my speed matches the tanker's, I can gradually accelerate to a speed that is 2-3 kts faster, **approaching the basket very slowly**. At that part, the ONLY two things I am watching are my **airspeed** and the **flap track fairing being lined up with the velocity vector (NOT THE BASKET)**. Nothing else matters.
- Once I am approaching the basket, I make sure to avoid inducing yawing motion with the rudder pedals. I displace myself with roll and pitch (vertical) stick input only. It is acceptable to gently roll to move laterally, but keep in mind that this can induce a change in altitude if you are not careful. You can **fine-tune your vertical attitude** with your stick and adjust airspeed by gently moving the throttle.



ABBREVIATIONS

Abbr.	Full Name
A/A	Air to Air
A/C	Aircraft
A/G	Air to Ground
A/P	Auto Pilot
A/S	Air to Surface
AAP	Avionics Activation Panel
AB	Afterburner
AC	Alternate Current
ACB	Audio Control Box
ACM	Air Combat Mode
ACMI	Air Combat Maneuvering Instrumentation
AFD	Airfield Data
AGR	Air Ground Ranging
ALE	Altitude Line Echo
ALT	Altitude
AM	Amplitude Modulation
AOA	Angle of Attack
APR	Approach
ATC	Air Traffic Control
ATT	Attitude
AZ	Azimuth
BAU	Backup Acquisition Unit
BCN	Beacon
BIT	Built In Test
BRG	Bearing
BRT	Bright
BS	Boresight
CAS	Calibrated Air Speed
CCIP	Continuously Computed Impact Point
CCRP	Continuously Computed Release Point
CEP	Circular Error Probablity
CH	Chaff, Channel
CLDP	Convertible Laser Designator Pod
CLNK	Communication Data Link
CLR	Clear
CMBT	Combat
CMFD	Center Multi Function Display
CNI	Communication Navigation and Identification
CNTL	Control
COM	Communication Radio
CONT	Contrast
CPU	Central Processing Unit
CRS	Cruise
CSS	Control Stick Steering
CTVS	Cockpit Television Sensor
DADS	Distributed Air Data System
DBS	Doppler Beam Sharpening
DC	Direct Current
DCLT	Declutter
DD	Detail Design
DDM	Difference Depth Modulation
DEST/DST	Destination
DEV	Deviation
DGFT	Dogfight
DIS	Distance
DL	Data Link
DTC	Data Transfer Cartridge
DTOS	Dive Toss
DTT	Dual Targets Track
DVR	Digital Video Recorder
ECS	Environment Control System
EFIS	Electronic Flight Instrument System
EMMC	Electromechanical Management Computer
EMMS	Electromechanical Management System
ENG	Engine
EPI	Engine Performance Indicator
EW	Electronic Warfare
EXP	Expand
FAF	Final Approach Fix
FCS	Flight Control System
FL	Flare
FLR	Failure
FPM	Flight Path Mark
FRZ	Freeze
FWD	Forward
GC	Gyro Compass
GMTI	Ground Moving Target Indicator
GMTT	Ground Moving Target Track
GRS	Ground Speed
HDG	Heading
HNS	Hybrid Navigation System
HPT	High Priority Target
HSD	Horizontal Situation Display
IBIT	Initiated Built In Test
IFF	Identification of Friend and Foe
ILS	Instrument Landing System
INTRC	Intercept

ABBREVIATIONS

IP	Initial Point
IR	Infra Red
IRST	Infra Red Search and Track System
LAT	Latitude
LCOS	Lead Computing Optical Sight
LMFD	Left Multi Function Display
LOS	Line of Sight
LWC	Lamp Warning Computer
MAG	Magnetic
MAINT	Maintenance
MAN	Manual
MBIT	Maintenance BIT
MFD	Multifunction Display
MFL	Maintenance Fault List
MLF	Malfunction
MMS	Master Mode Switch
NAV	Navigation
NM	Nautical Mile
NVG	Night Vision Goggles
OAP	Offset Aiming Point
OESP	Optical-Electrical Self Protect
OSS	Optional Selection Switches
PFL	Pilot Fault List
POB	Power On BIT
R-ALT (RA)	Radio Altimeter
RCP	Radio Control Panel
RCV	Receive
RMFD	Right Multi Function Display
RWR	Radar Warning Receiver
RWS	Range-While-Scan
RWY	Runway
SAIU	Standard Armament Interface Unit
SCA	Self Controlled Approach
SEL-JET/SJ	Selective Jettison
SIL	Silence
SIM	Simulate
SLNK	SD-Link
SMS	Stores Management System
SMTI	Surface Moving Target Indication
SMTT	Sea Moving Target Track
SPJ	Self Protection Jammer
STT	Single Target Track
TACAN/TCN	Tactical Air Navigation
TAS	True Air Speed
UFCP	Up Front Control Panel
WMMC	Weapon and Mission Management Computer
WOW	Weight on Wheels
WPN	Weapon

USEFUL RESOURCES

Deka Ironwork Tutorials Playlist (Youtube)
https://www.youtube.com/watch?v=OeHtlV-Z0fo&list=PLpEU7kYTYExgrub0_lhoq4neVV6QzRXlD

Jabbers JF-17 Start-Up (Youtube)
https://youtu.be/3__K3lTt4hw

Redkite JF-17 Pre-Release Preview (Youtube)
https://youtu.be/hVN4U5qf-rs

Redkite JF-17 WMD-7 Targeting Pod Tutorial (Youtube)
https://youtu.be/Wlylh2AZ6EY

Redkite JF-17 BRM-1 Laser guided Rockets and GBU laser guided Bombs Tutorial (Youtube)
https://youtu.be/qyKtfZHijZg

Growling Sidewinder JF-17 BVR Fight SD-10 Capabilities (Youtube)
https://youtu.be/AtwKkNr5AMs

Grim Reapers JF-17 Tutorials Playlist (Youtube)
https://www.youtube.com/watch?v=7eoLZTelbYE&list=PL3kOAM2N1YJfX0JgLClesrw6SXUrv0isl

Pakistan Defence Documentary - JF-17 Thunder Program: Affordable Air Power (Youtube)
https://youtu.be/3HhuSmSE1vI

JF-17.com Website
http://www.jf-17.com/

THANK YOU TO ALL MY PATRONS

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