

DCS GUIDE

F-14B TOMCAT

BY CHUCK

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DISCLAIMER

This document has been created for recreative 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 F-14 Tomcat. The author has never had access to OEM (Original Equipment Manufacturer) data related to the F-14 Tomcat, its armament systems nor its defensive systems. All the information within this document is taken from public documentation (i.e. Heatblur F-14 Wiki) and non-official tutorials (player-made videos on Youtube). The list of references used is listed in Part 17 – Reference Material & Acronyms.

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 F-14 module by Heatblur.

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 F-14 Tomcat.

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

The **Grumman F-14 Tomcat** is an American supersonic, twin-engine, two-seat, twin-tail, variable-sweep wing fighter aircraft. It was the first such U.S. jet fighter with twin tails. The Tomcat was developed for the United States Navy's Naval Fighter Experimental (VFX) program after the collapse of the F-111B project. The F-14 was the first of the American Teen Series fighters, which were designed incorporating air combat experience against MiG fighters during the Vietnam War.

The F-14 first flew on 21 December 1970 and made its first deployment in 1974 with the U.S. Navy aboard USS Enterprise (CVN-65), replacing the McDonnell Douglas F-4 Phantom II. The F-14 served as the U.S. Navy's primary maritime air superiority fighter, fleet defense interceptor, and tactical aerial reconnaissance platform into the 2000s. The Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) pod system were added in the 1990s and the Tomcat began performing precision ground-attack missions.

In the 1980s, F-14s were used as land-based interceptors by the Islamic Republic of Iran Air Force during the Iran–Iraq War, where they saw combat against Iraqi warplanes. Iranian F-14s reportedly shot down at least 160 Iraqi aircraft during the war, while only 12 to 16 Tomcats were lost; at least half of these losses were due to accidents.

The Tomcat was retired from the U.S. Navy's active fleet on 22 September 2006, having been supplanted by the Boeing F/A-18E/F Super Hornet. The F-14 remains in service with Iran's air force, having been exported to Iran in 1976. In November 2015, reports emerged of Iranian F-14s reportedly flying escort for Russian Tu-95 bombers on air strikes in Syria.





The F-14 Tomcat was designed as both an air superiority fighter and a long-range naval interceptor, which enabled it to both serve as escort attack aircraft when armed with Sparrow missiles and fleet air defense loitering interceptor role when armed with Phoenix missiles. The F-14 was designed with a two-seat cockpit with a bubble canopy which affords all-around visibility aiding aircrew in air-to-air combat. It features variable geometry wings that swing automatically during flight. For high-speed intercept, they are swept back and they swing forward for lower speed flight. It was designed to improve on the F-4 Phantom's air combat performance in most respects. The F-14's fuselage and wings allow it to climb faster than the F-4, while the twin-tail arrangement offers better stability.

The F-14 is equipped with an internal 20 mm M61 Vulcan Gatling cannon mounted on the left side (unlike the Phantom, which was not equipped with an internal gun in the US Navy), and can carry AIM-54 Phoenix, AIM-7 Sparrow, and AIM-9 Sidewinder anti-aircraft missiles. The twin engines are housed in widely spaced nacelles. The flat area of the fuselage between the nacelles is used to contain fuel and avionics systems, such as the wing-sweep mechanism and flight controls, as well as weaponry since the wings are not used for carrying ordnance. By itself, the fuselage provides approximately 40 to 60 percent of the F-14's aerodynamic lifting surface depending on the wing sweep position, mainly due to the lifting body characteristics of the fuselage.



The F-14A was the initial two-seat, twin-engine, all-weather interceptor fighter variant for the U.S. Navy. It first flew on 21 December 1970. The first 12 F-14As were prototype versions (sometimes called YF-14As). Modifications late in its service life added precision strike munitions to its armament. The U.S. Navy received 478 F-14A aircraft and 79 were received by Iran. The final 102 F-14As were delivered with improved Pratt & Whitney TF30-P-414A engines. Additionally, an 80th F-14A was manufactured for Iran, but was delivered to the U.S. Navy.

The F-14 received its first of many major upgrades in March 1987 with the F-14A Plus (or F-14A+). The F-14A's TF30 engine was replaced with the improved GE F110-GE-400 engine. The F-14A+ also received the state-of-the-art ALR-67 Radar Homing and Warning (RHAW) system. Much of the avionics suite, as well as the AWG-9 radar, were retained. The F-14A+ was later redesignated F-14B (or “Bombcat”) on 1 May 1991. A total of 38 new aircraft were manufactured and 48 F-14A were upgraded into B variants.





The TF30 of the F-14A had been plagued from the start with susceptibility to compressor stalls at high AoA and during rapid throttle transients or above 30,000 ft. The F110-GE-400 engine installed on the F-14B provided a significant increase in thrust, producing 23,400 lbf (104 kN) with afterburner at sea level, which rose to 30,200 lbf (134 kN) at Mach 0.9. The increased thrust gave the Tomcat a better than 1:1 thrust-to-weight ratio at low fuel quantities. The basic engine thrust without afterburner was powerful enough for carrier launches, further increasing safety. Another benefit was allowing the Tomcat to cruise comfortably above 30,000 ft, which increased its range and survivability. The F-14B arrived in time to participate in Desert Storm.

Unfortunately, while the Tomcat was eventually upgraded in the F-14D “Super Tomcat” in 1991 and remained a superb fighter… the F-14’s complex airframe and tricky servicing became extremely expensive to maintain as the aircraft aged. After all, this was an aircraft designed in the 1960’s. The wing movement mechanism needed constant attention and the engines were also very troublesome in the early years of F-14 service. When new engines solved the engine problems, the constant need to repair the variable wing sweep mechanism and the servicing of the radar and other avionics drove the cost up again.

The Tomcat was equipped with the AIM-54 Phoenix, a radar-guided, long-range air-to-air missile (AAM), carried in clusters of up to six missiles. The Tomcat was its only operational launch platform. The Phoenix was the United States' only long-range air-to-air missile. The combination of Phoenix missile and the AN/AWG-9 guidance radar was the first aerial weapons system that could simultaneously engage multiple targets. Both the missile and the aircraft were used by Iran and the United States Navy. In US service both are now retired, the AIM-54 Phoenix in 2004 and the F-14 in 2006. They were replaced by the shorter-range AIM-120 AMRAAM, employed on the F/A-18 Hornet and F/A-18E/F Super Hornet—in its AIM-120D version, the latest version of the AMRAAM just matches the Phoenix's maximum range.

The F-14 fleet was smaller than the F-18 fleet. This made production runs of parts shorter, which had the adverse effect of making them more expensive. The AIM-54 Phoenix missile, while revolutionary in terms of capabilities and technological advancements, was an incredibly expensive one... Which added to the burden of operational costs. All these increasing costs eventually forced the Navy to retire both the Tomcat and the Phoenix.





In 1986, 20 years before the Tomcat's retirement, the movie “Top Gun” dominated the box office, but the success of the film did far more than just fill up American movie theaters. Navy recruitment boomed as recruiters set up tables right outside of screenings to field questions from aspiring aviators. Tom Cruise may have been the star, but for young Americans with dreams of flying a fighter jet, it was the Tomcat that truly stole the show.

One of the best articles I have seen on the Tomcat was written by Tyler Rogoway and hosted on FoxtrotAlpha.
Link: https://foxtrotalpha.jalopnik.com/an-elite-f-14-airman-explains-why-the-tomcat-was-so-imp-1610043625

“*With the 1960's technology in the jet and a multitude of sensors, weapons, and equipment, the Tomcat was too complicated and too cumbersome to be controlled by one individual. A typical mission's workload would be divided into segments: think on the ground, administrative in the air, combat, and then administrative back with a final of landing/trapping.*

[…]

In the Tomcat, the pilot's job was to maneuver the jet to get into a position where he could give a "Cleared Hot" call. With multiple strikers inbound separated by time (normally 30 seconds to a minute), this could be a challenge. Typically, one striker is off target with bombs away while the next striker is inbound and in a dive. This is where the RIO tends to earn his money as he visually acquires the inbound striker, talks his pilot's eyes onto him, and then switches to see where the first striker's bombs' hit. When you add SEAD and artillery coordination, close proximity of friendly troops, buddy lasing (having one jet designating a target while another drops the weapons) for laser guided bombs and a MANPAD being launched at someone, it becomes a dynamic and challenging mission; one where two aviators in the cockpit provides an added level of tactical advantage and situational awareness.

[…]

The hardest part for new WSO's (Weapon Systems Officers) is to not get "sucked inside" the cockpit by all of your sensors. You are still a co-pilot, not just R2D2 in the back. I used to tell new guys to strive for looking 50% inside the jet and 50% outside the jet. By looking outside you build air sense and situational awareness. This makes you a better crew member/co-pilot, which is the ultimate objective. Unfortunately for new guys, the ratio was 90% inside, 10% outside, but that is why you train.”



As mentioned earlier, one of the peculiarities of the Tomcat is that it is an aircraft crewed by a Pilot and a RIO (Radar Intercept Officer). The RIO, a category of NFO (Naval Flight Officer), was the second crewman in the F-14 Tomcat. For crew coordination purposes, RIOs were primarily responsible for communication and navigation, as well as operating the AWG-9 radar. RIOs in the F-14 did not have flight controls (throttles, control stick, and rudder pedals), but could control weapon release parameters and provide the pilot with all sorts of relevant information. As you are about to see in the next sections, operating the Tomcat is not limited to being a pilot; it is all about creating a team that is more than the sum of its parts. A pilot's situational awareness is exponentially better with a second set of eyes in the sky, and good pilot/RIO teams can do some real damage if they work well together. Flying in multiplayer with a buddy as your pilot or RIO is insane amounts of fun. The Tomcat brings to DCS an unexpected social aspect to flying in the virtual skies. Try it out!



This brings us to the Tomcat's AI for the RIO : JESTER. JESTER is Heatblur's solution to one of the biggest technical challenges in flight simulation : how to implement a RIO AI (Artificial Intelligence) that is smart, functional, useful, and intuitive to use.

JESTER looks deceptively simple at first : you press "A" to show a contextual menu with different options/commands available, which can be selected by either using the "LCTRL + 1" to "LCTRL + 8" keys or by moving your cursor with TrackIR. As you start flying the Tomcat for a couple of hours, you will learn to enjoy the elegant yet robust AI solution.

JESTER can accomplish a number of functions, which greatly reduces your workload. He can provide you assistance with start-up checklists, he can set up navigation systems for you, he can tune in on radio frequencies or datalink networks… all you need to do is ask.

Also, JESTER will dynamically scan the sky with his radar to find and call out targets. He will deploy countermeasures if needed, ~~crack jokes~~ give you advice in all sorts of situations. He also has access to the ejection handle… so be nice to him!

Graywolf (who lent his voice to JESTER) did not only a stellar job in creating a compelling voice-over for the AI, but also succeeded in giving different emotions to JESTER based on different situations. He will sound excited and encourage you when you're on a bandit's tail, he will sound focused when calling out bandit bearings, he will sound scared when telling you to break to evade a missile, he will sound annoyed when you mess up your landing or bolter, he will crack jokes once in a while… JESTER feels like a living, breathing person. JESTER is more than a set of functions glued together – He's **your** buddy.

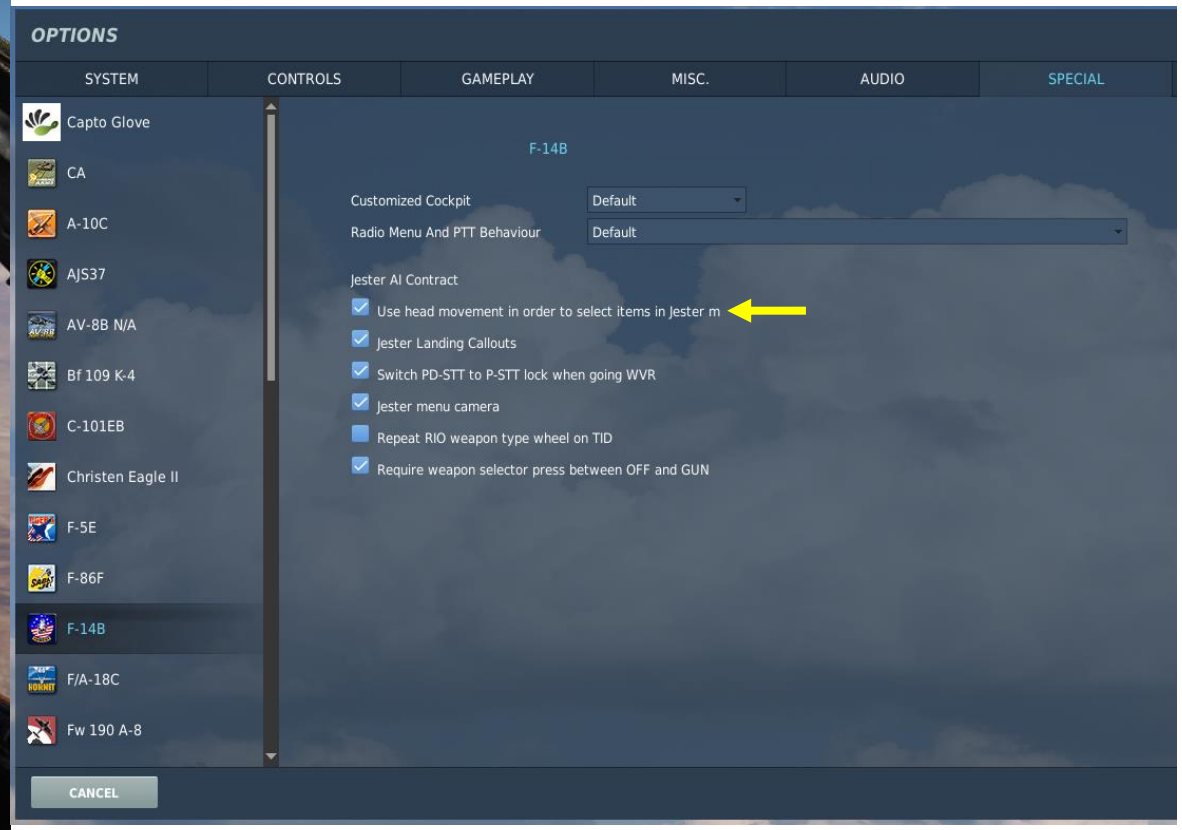
Heatblur has successfully done a tremendous technological achievement in the world of flight simulation: creating a crew member that is functional, helpful, relatively smart, and funny all at once.

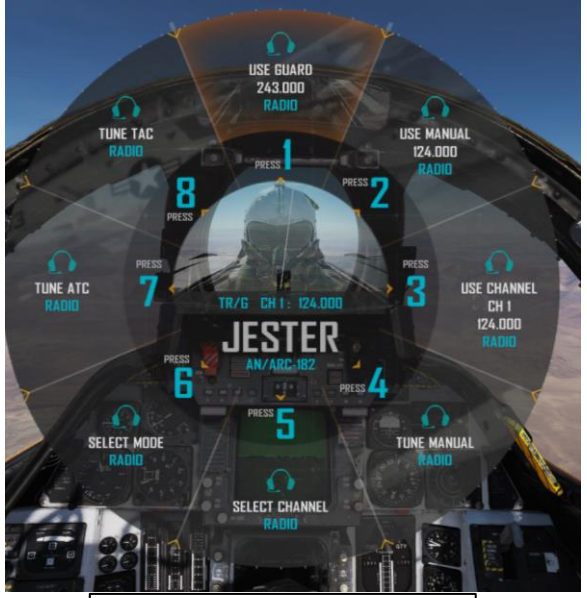


You can access JESTER by pressing “A” once or twice depending on the situation. If you have TrackIR, I strongly suggest that you tick the “Use Head Movement in order to select items in JESTER Menu” in the Special F14 Options menu.

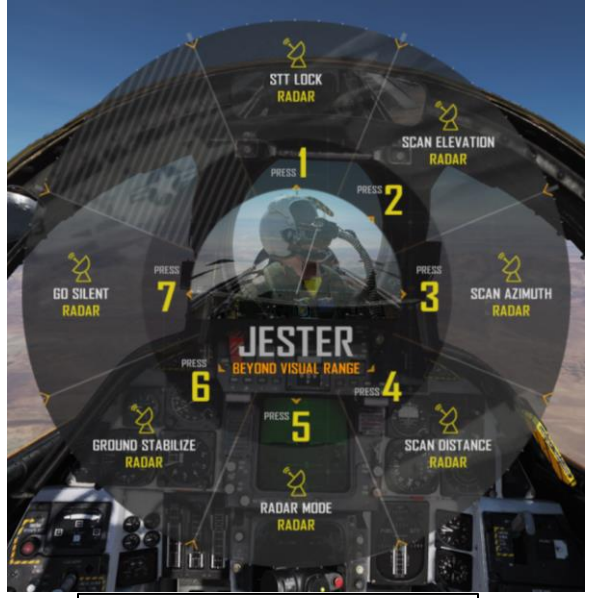


JESTER Main Menu

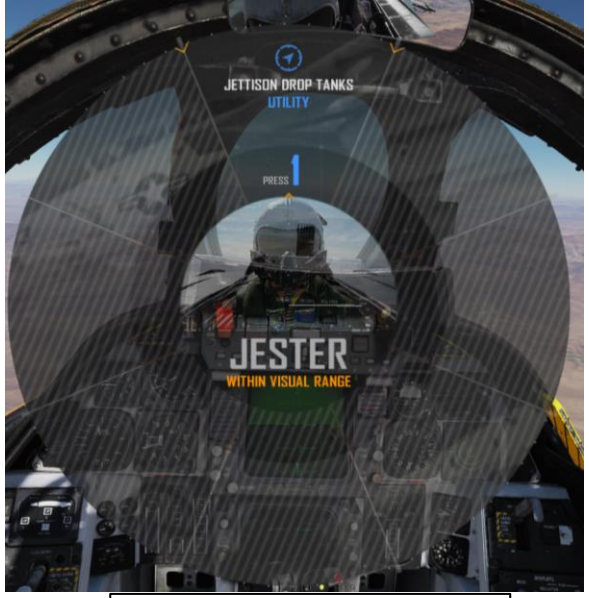




AN/ARC-182 RIO Radio Menu



RIO Beyond Visual Range Menu



RIO Within Visual Range Menu



RIO Air-to-Ground Weapons Menu

JESTER Sub-Menus

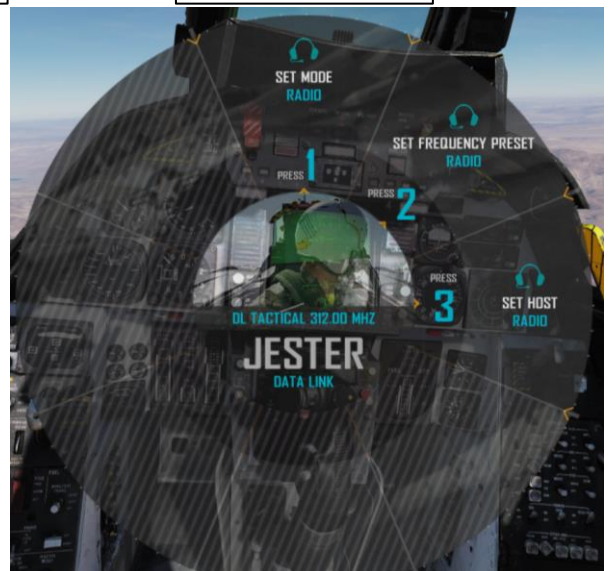
RIO Navigation Menu



Countermeasures/Radar Warning Receiver Menu



RIO Datalink Menu



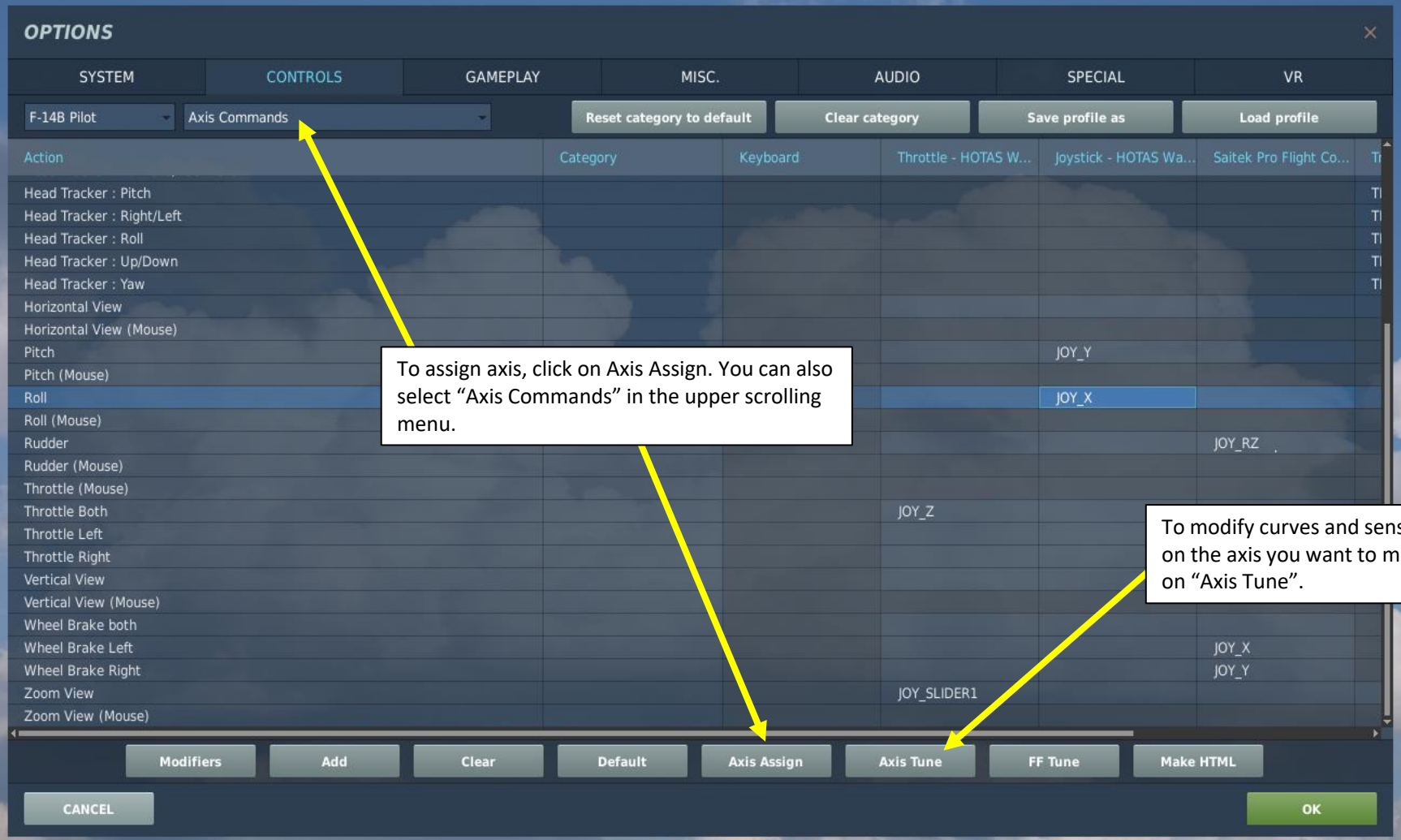
RIO Crew Contact Menu



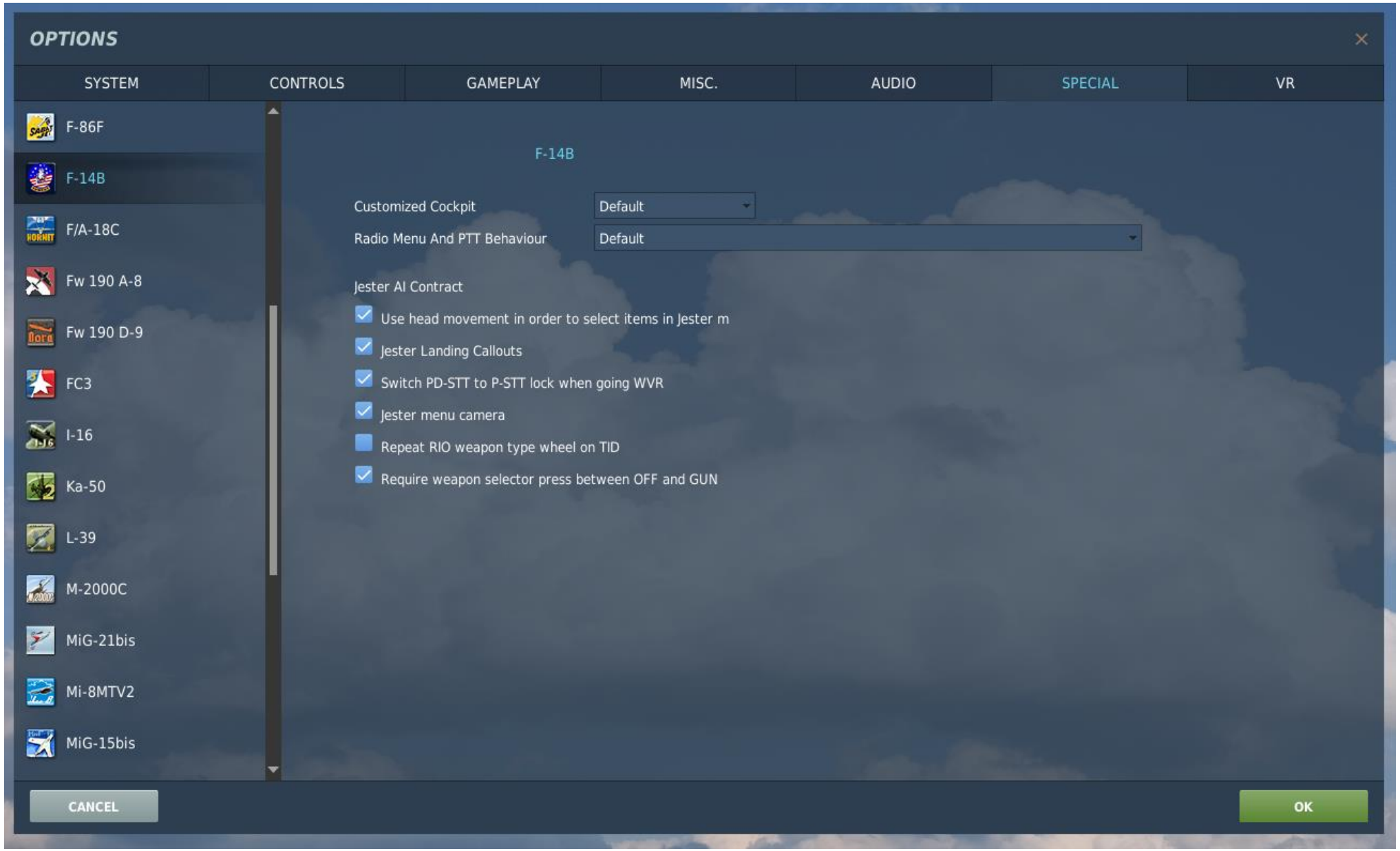
If you are in Single Player and occupy the RIO seat, you can give the AI Pilot “ICEMAN” some basic commands to set heading, speed and altitude (angels). Take note that ICEMAN will not be able to takeoff, land or fight while you are in the RIO seat.



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.

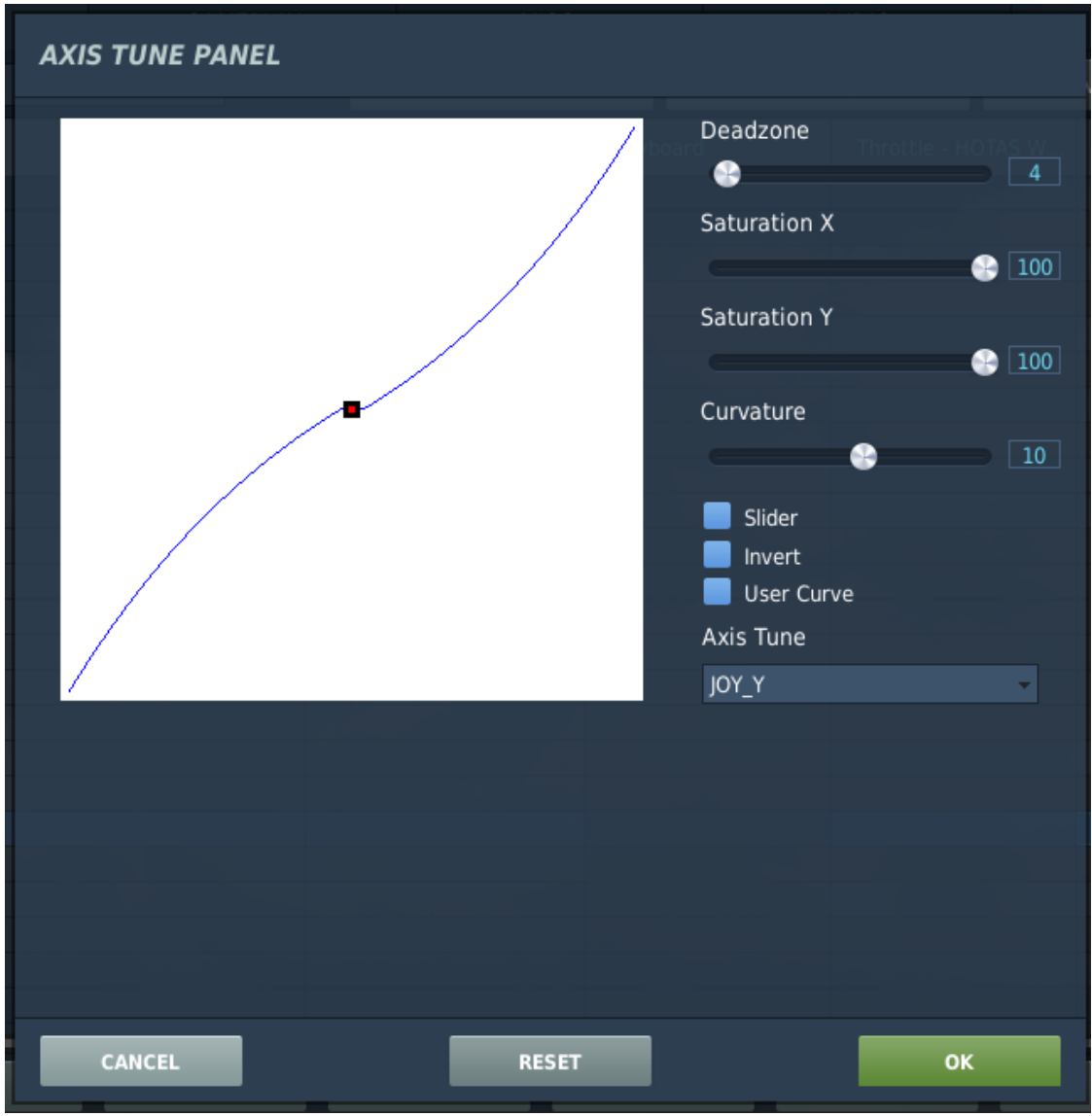


Special Options Setup



Bind the following axes:

- PITCH (DEADZONE AT 4, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 10)
- ROLL (DEADZONE AT 4, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 10)
- RUDDER (DEADZONE AT 0, SATURATION X AT 100, SATURATION Y AT 100, CURVATURE AT 10)
- THROTTLE BOTH – CONTROLS ENGINE RPM
- WHEEL BRAKE LEFT / RIGHT



MY SENSORS CONTROL SETUP
PILOT STICK

Toggle JESTER Menu: “A” (Toggle Menu binding)

↑ Trim Pitch Down
→ Trim Roll Right Wing Down
↓ Trim Pitch Up
← Trim Roll Left Wing Down

↑ Target Designate UP / VSL HI
→ Target Designate Forward / PAL
↓ Target Designate DOWN / VSL LO
←

↑ ZOOM IN SLOW / Weapon Selector UP (LSHIFT Modifier)
→ Weapon Selector Press
↓ ZOOM OUT SLOW / Weapon Selector DOWN (LSHIFT Modifier)
←

Store Release

Trigger (First Detent)
Trigger (Second Detent)

↑ DLC Thumbwheel FWD
→
↓ DLC Thumbwheel AFT
←
P DLC Toggle / Countermeasure Dispense

Autopilot Reference /Nosewheel Steering

Autopilot Emergency Disconnect Paddle



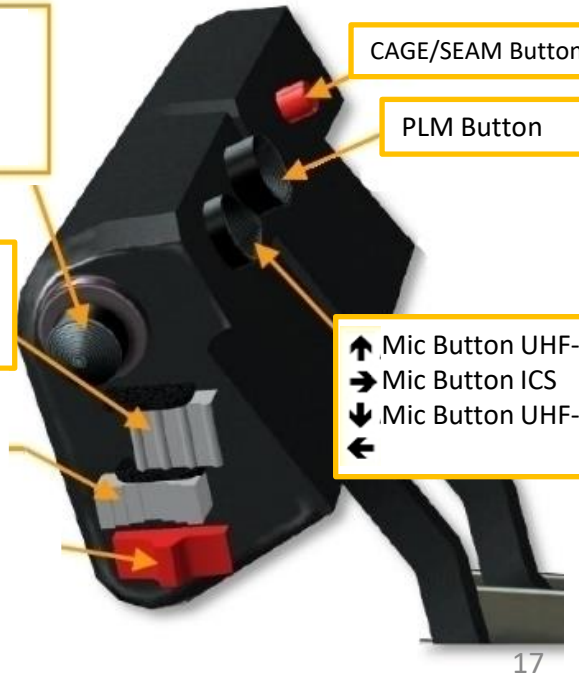
↑ Wing Sweep Auto Mode
→ Wing Sweep Forward
↓ Wing Sweep Bomb Mode
← Wing Sweep Aft

CAGE/SEAM Button

PLM Button

← SPEED BRAKE Retract

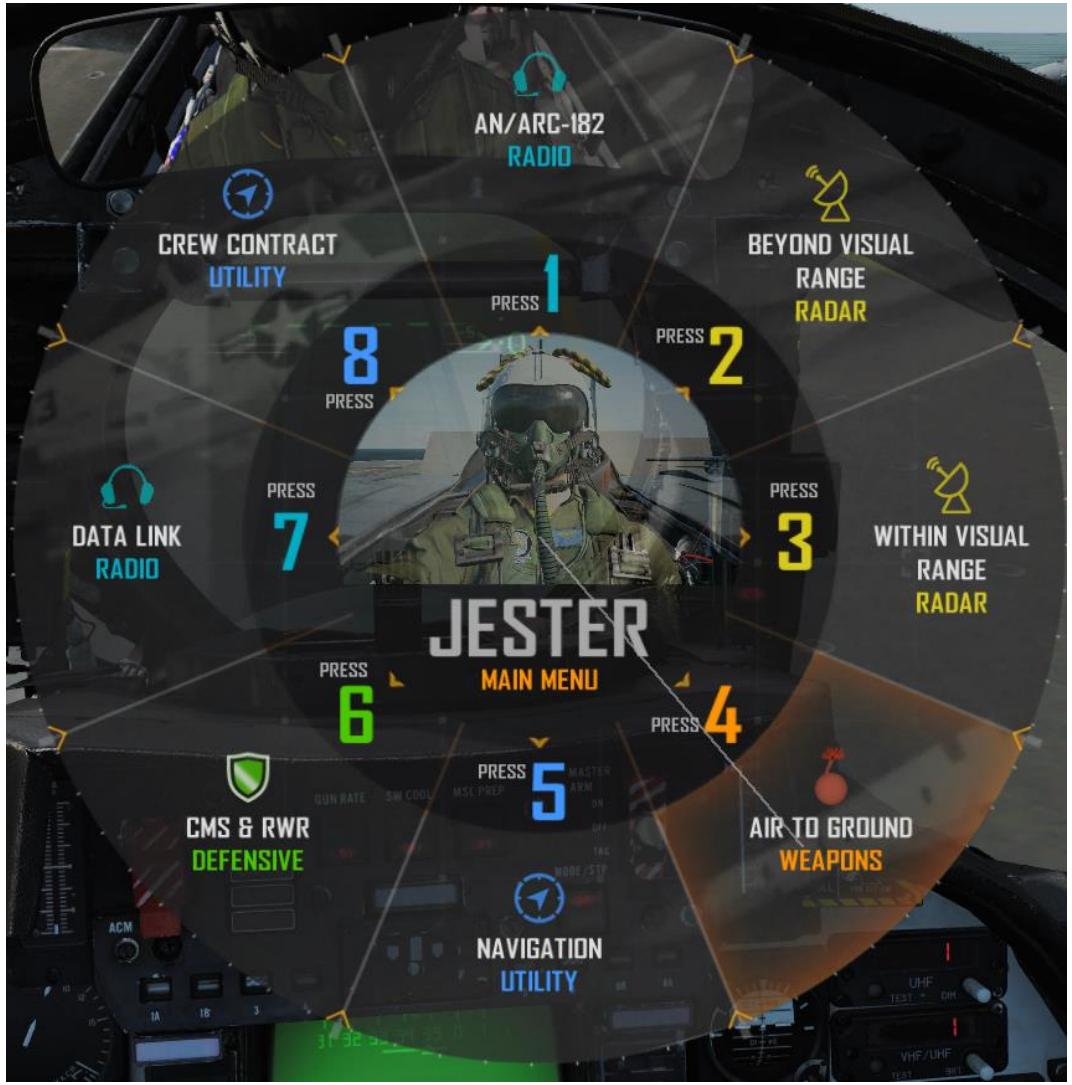
→ SPEED BRAKE Extend



↑ Mic Button UHF-2
→ Mic Button ICS
↓ Mic Button UHF-1
←

+ Toe Wheel Brakes (mapped on pedals)

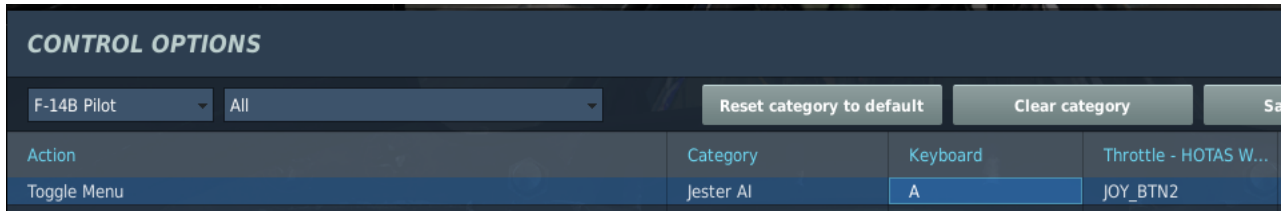
MY SENSORS CONTROL SETUP
JESTER AI INTERFACE



For the JESTER AI, the menu can be accessed by pressing the "Toggle Menu" binding ("A"). If you have a TrackIR device, I highly suggest that you activate the "Use head movement in order to select items in Jester Menu" option in the SPECIAL options tab. This way, the JESTER menu will be selectable by moving your head towards the desired sub-menu, then pressing "A" again.

If you do not have a TrackIR, you can use the "LCTRL+1", "LCTRL+2" […] "LCTRL+8" bindings to select the desired sub-menu.





MY SENSORS CONTROL SETUP
HCU STICK (RIO)

HCU MRL
(Grey button on RHS)

↑ Radar Elevation Up
→ Radar Azimuth Right
↓ Radar Elevation Down
← Radar Azimuth Left

↑ Radar Elevation Bars Increase
→ Radar Azimuth Scan Narrower
↓ Radar Elevation Bars Decrease
← Radar Azimuth Scan Wider

HCU Offset

↑
→ ZOOM IN SLOW
↓
← ZOOM OUT SLOW

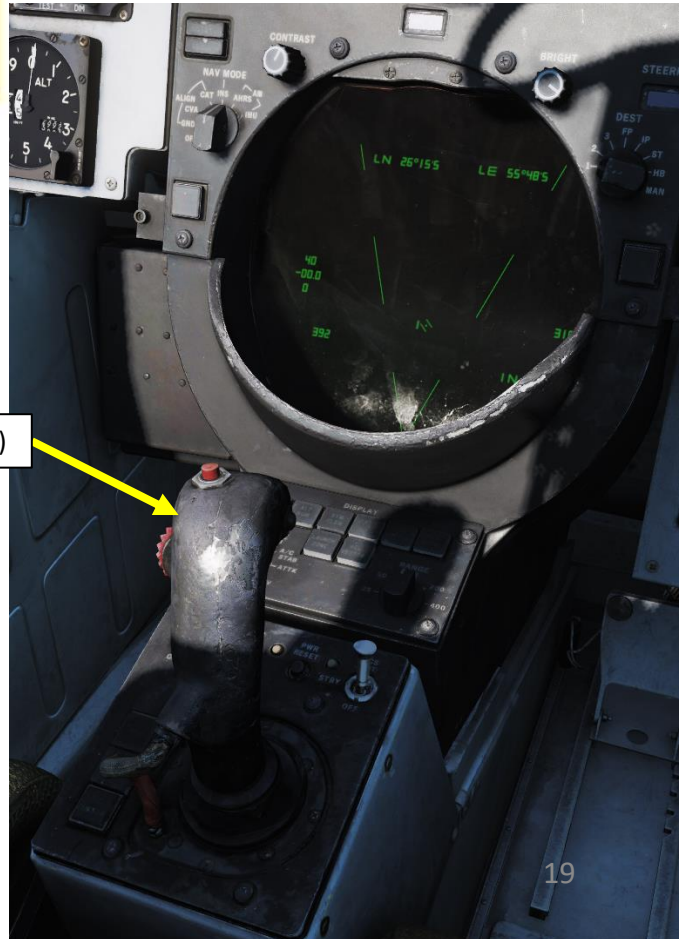
HCU Half-Action (First Detent)
HCU Full-Action (Second Detent)

↑ HCU Thumb Up
→ AN/ALE-39 Chaff SGL
↓ HCU Thumb Down
← AN/ALE-39 Flare SGL
P HCU Thumb Re-center

DDD Interrogate Friend or Foe

Paddle used as a modifier to toggle from HCU controls to LANTIRN stick controls



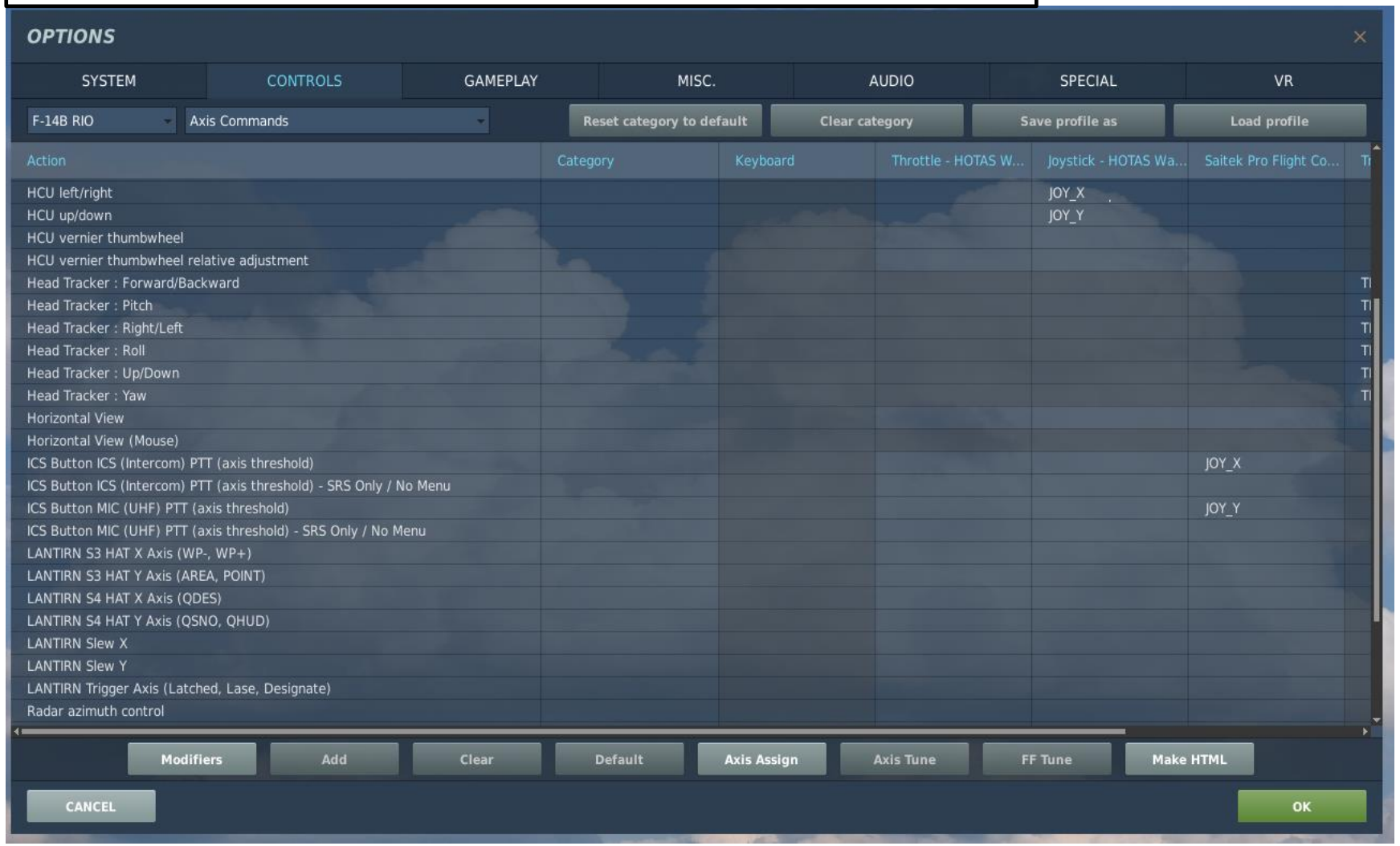


Hand Control Unit (HCU)

Left Toe Brake (mapped on pedals): ICS Foot Button
Right Toe Brake (mapped on pedals): Microphone Foot Button

MY SENSORS CONTROL SETUP
HCU STICK AXES (RIO)

X axis of the stick is mapped to the HCU left/right axis.
Y axis of the stick is mapped ot the HCU up/down axis.



MY SENSORS CONTROL SETUP
LANTIRN STICK (RIO)

LANTIRN Laser Latched
(Grey button on RHS)

LANTIRN Area Track
LANTIRN QWP +
LANTIRN Point Track
LANTIRN QWP -

LANTIRN S4 Hat Up
LANTIRN S4 Hat Right
LANTIRN S4 Hat Down
LANTIRN S4 Hat Left

LANTIRN Toggle FOV

ZOOM IN SLOW

ZOOM OUT SLOW

LANTIRN Trigger Half-Action (First Detent)
LANTIRN Trigger Full-Action (Second Detent)

LANTIRN Toggle WHOT/BHOT
LANTIRN Slider AGC/MGC
LANTIRN S4 Hat Press Declutter
LANTIRN Slider laser/focus
P LANTIRN Mode Toggle

LANTIRN Undesignate

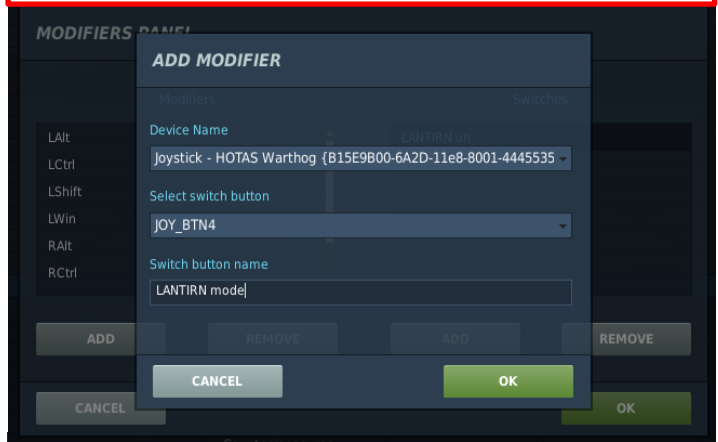
Paddle used as a modifier to toggle from HCU controls to LANTIRN stick controls

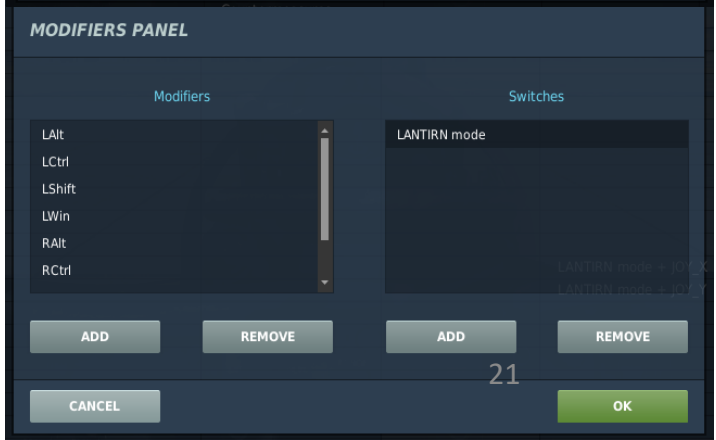


LANTIRN Control Stick

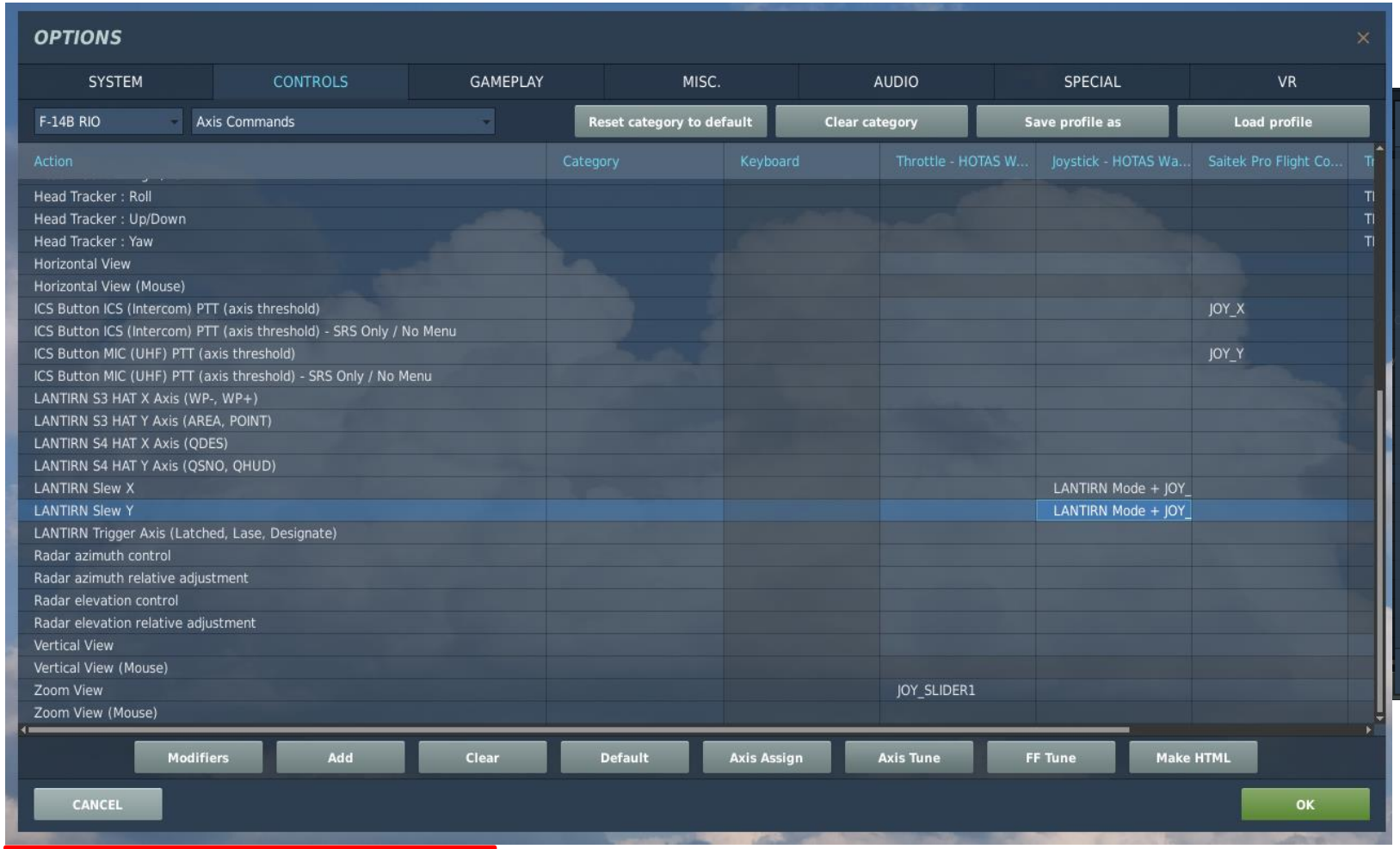


IMPORTANT NOTE: Every control in this page uses the "Paddle Lever" modifier.



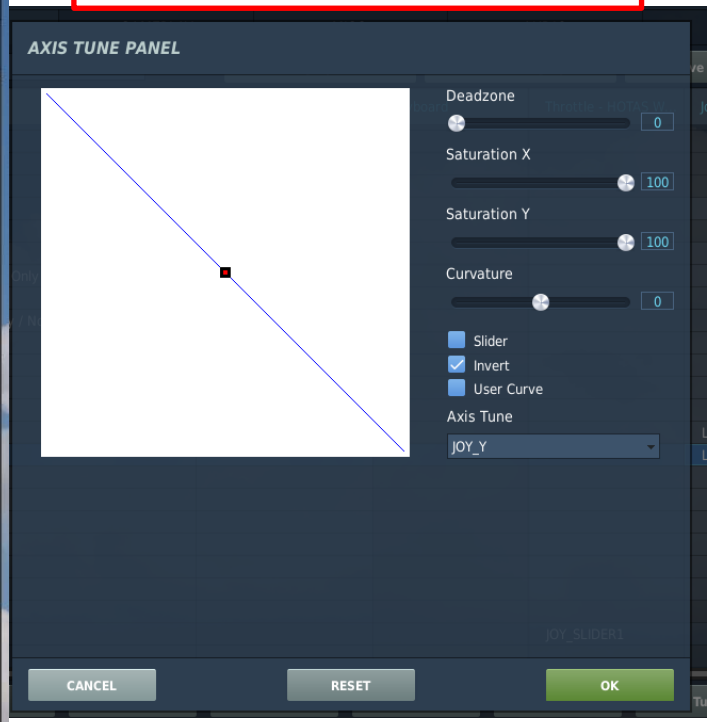


MY SENSORS CONTROL SETUP
LANTIRN STICK AXES (RIO)



IMPORTANT NOTE: Every control in this page uses the “Paddle Lever” modifier.

For the LANTIRN Slew Y axis, click on AXIS TUNE and tick the “Invert” box.



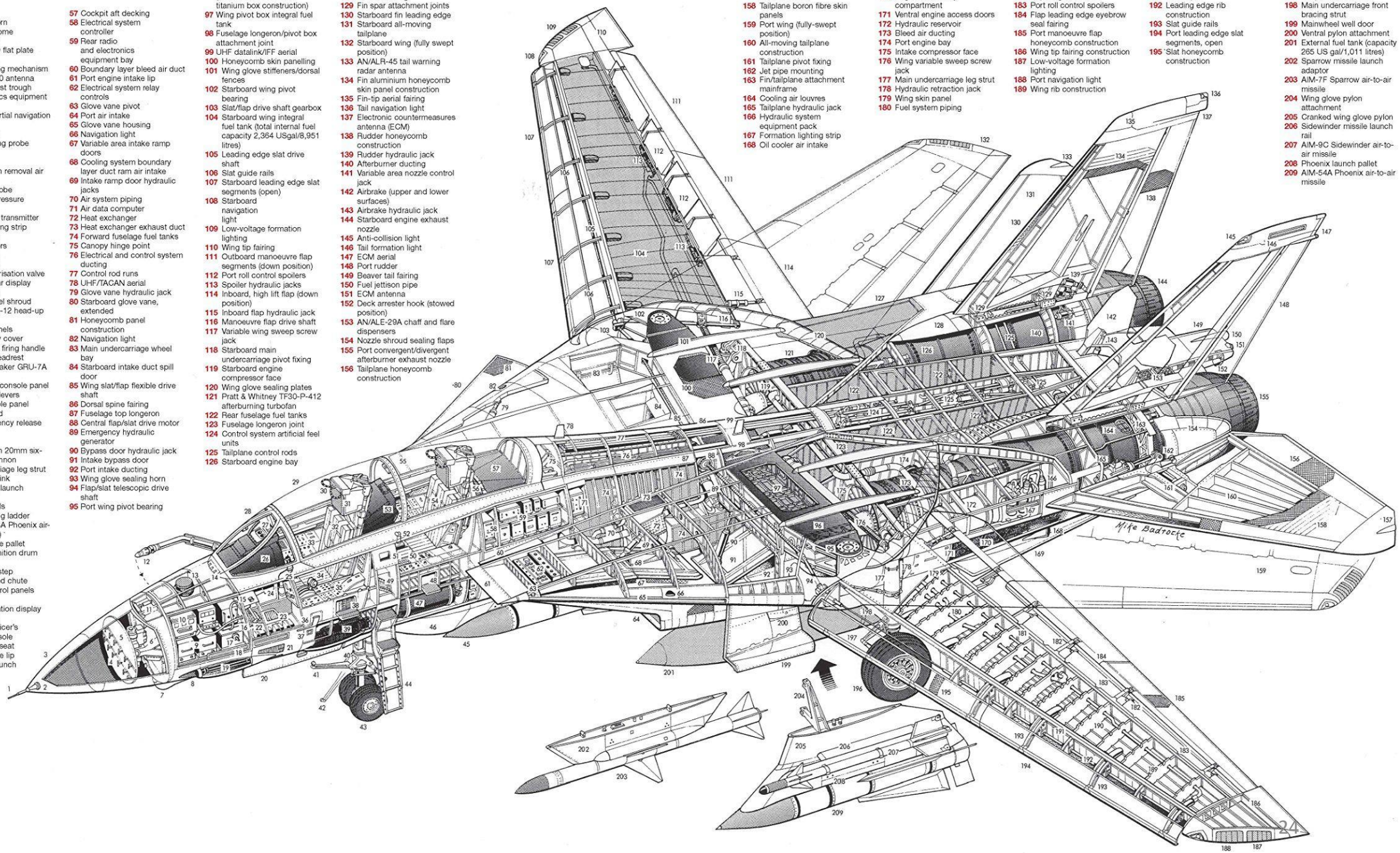
PART 3 – COCKPIT & EQUIPMENT



PART 3 – COCKPIT & EQUIPMENT

Grumman F-14A Tomcat. *(Mike Badrocke)*

1 Pitot tube
2 Radar target horn
3 Glass-fibre radome
4 IFF aerial array
5 Hughes AWG-9 flat plate radar scanner
6 Scanner tracking mechanism
7 Ventral ALQ-100 antenna
8 Gun muzzle blast trough
9 Radar electronics equipment bay
10 AN/ASN-92 inertial navigation unit
11 Radome hinge
12 In-flight refuelling probe (extended)
13 ADF aerial
14 Windscreen rain removal air duct
15 Temperature probe
16 Cockpit front pressure bulkhead
17 Angle of attack transmitter
18 Formation lighting strip
19 Cannon barrels
20 Nosewheel doors
21 Gun gas vents
22 Rudder pedals
23 Cockpit pressurisation valve
24 Navigation radar display
25 Control column
26 Instrument panel shroud
27 Kaiser AN/ANG-12 head-up display
28 Windscreen panels
29 Cockpit canopy cover
30 Face blind seat firing handle
31 Ejection seat headrest
32 Pilot's Martin-Baker GRU-7A ejection seat
33 Starboard side console panel
34 Engine throttle levers
35 Port side console panel
36 Pitot static head
37 Canopy emergency release handle
38 Fold out step
39 M-61-A1 Vulcan 20mm six-barrel rotary cannon
40 Nose undercarriage leg strut
41 Catapult strop link
42 Catapult strop, launch position
43 Twin nosewheels
44 Folding boarding ladder
45 Hughes AIM-54A Phoenix air-to-air missile (6)
46 Fuselage missile pallet
47 Cannon ammunition drum (675 rounds)
48 Rear boarding step
49 Ammunition feed chute
50 Armament control panels
51 Kick-in step
52 Tactical information display hand controller
53 Naval Flight Officer's instrument console
54 NFO's ejection seat
55 Starboard intake lip
56 Ejection seat launch rails
57 Cockpit aft decking
58 Electrical system controller
59 Rear radio and electronics equipment bay
60 Boundary layer bleed air duct
61 Port engine intake lip
62 Electrical system relay controls
63 Glove vane pivot
64 Port air intake
65 Glove vane housing
66 Navigation light
67 Variable area intake ramp doors
68 Cooling system boundary layer duct ram air intake
69 Intake ramp door hydraulic jacks
70 Air system piping
71 Air data computer
72 Heat exchanger
73 Heat exchanger exhaust duct
74 Forward fuselage fuel tanks
75 Canopy hinge point
76 Electrical and control system ducting
77 Control rod runs
78 UHF/TACAN aerial
79 Glove vane hydraulic jack
80 Starboard glove vane, extended
81 Honeycomb panel construction
82 Navigation light
83 Main undercarriage wheel bay
84 Starboard intake duct spill door
85 Wing slat/flap flexible drive shaft
86 Dorsal spine fairing
87 Fuselage top longeron
88 Central flap/slat drive motor
89 Emergency hydraulic generator
90 Bypass door hydraulic jack
91 Intake bypass door
92 Port intake ducting
93 Wing glove sealing horn
94 Flap/slat telescopic drive shaft
95 Port wing pivot bearing
96 Wing pivot carry through (electron beam welded titanium box construction)
97 Wing pivot box integral fuel tank
98 Fuselage longeron/pivot box attachment joint
99 UHF datalink/IFF aerial
100 Honeycomb skin panelling
101 Wing glove stiffeners/dorsal fences
102 Starboard wing pivot bearing
103 Slat/flap drive shaft gearbox
104 Starboard wing integral fuel tank (total internal fuel capacity 2,364 USgal/8,951 litres)
105 Leading edge slat drive shaft
106 Slat guide rails
107 Starboard leading edge slat segments (open)
108 Starboard navigation light
109 Low-voltage formation lighting
110 Wing tip fairing
111 Outboard manoeuvre flap segments (down position)
112 Port roll control spoilers
113 Spoiler hydraulic jacks
114 Inboard, high lift flap (down position)
115 Inboard flap hydraulic jack
116 Manoeuvre flap drive shaft
117 Variable wing sweep screw jack
118 Starboard main undercarriage pivot fixing
119 Starboard engine compressor face
120 Wing glove sealing plates
121 Pratt & Whitney TF30-P-412 afterburning turbofan
122 Rear fuselage fuel tanks
123 Fuselage longeron joint
124 Control system artificial feel units
125 Tailplane control rods
126 Starboard engine bay
127 Wing glove pneumatic seal
128 Fin root fairing
129 Fin spar attachment joints
130 Starboard fin leading edge
131 Starboard all-moving tailplane
132 Starboard wing (fully swept position)
133 AN/ALR-45 tail warning radar antenna
134 Fin aluminium honeycomb skin panel construction
135 Fin-tip aerial fairing
136 Tail navigation light
137 Electronic countermeasures antenna (ECM)
138 Rudder honeycomb construction
139 Rudder hydraulic jack
140 Afterburner ducting
141 Variable area nozzle control jack
142 Airbrake (upper and lower surfaces)
143 Airbrake hydraulic jack
144 Starboard engine exhaust nozzle
145 Anti-collision light
146 Tail formation light
147 ECM aerial
148 Port rudder
149 Beaver tail fairing
150 Fuel jettison pipe
151 ECM antenna
152 Deck arrester hook (stowed position)
153 AN/ALE-29A chaff and flare dispensers
154 Nozzle shroud sealing flaps
155 Port convergent/divergent afterburner exhaust nozzle
156 Tailplane honeycomb construction
157 AN/ALR-45(V) tail warning radar antenna
158 Tailplane boron fibre skin panels
159 Port wing (fully-swept position)
160 All-moving tailplane construction
161 Tailplane pivot fixing
162 Jet pipe mounting
163 Fin/tailplane attachment mainframe
164 Cooling air louvres
165 Tailplane hydraulic jack
166 Hydraulic system equipment pack
167 Formation lighting strip
168 Oil cooler air intake
169 Port ventral fin
170 Engine accessory compartment
171 Ventral engine access doors
172 Hydraulic reservoir
173 Bleed air ducting
174 Port engine bay
175 Intake compressor face
176 Wing variable sweep screw jack
177 Main undercarriage leg strut
178 Hydraulic retraction jack
179 Wing skin panel
180 Fuel system piping
181 Rear spar
182 Rap hinge brackets
183 Port roll control spoilers
184 Flap leading edge eyebrow seal fairing
185 Port manoeuvre flap honeycomb construction
186 Wing tip fairing construction
187 Low-voltage formation lighting
188 Port navigation light
189 Wing rib construction
190 Port wing integral fuel tank
191 Front spar
192 Leading edge rib construction
193 Slat guide rails
194 Port leading edge slat segments, open
195 Slat honeycomb construction
196 Port mainwheel
197 Torque scissor links
198 Main undercarriage front bracing strut
199 Mainwheel well door
200 Ventral pylon attachment
201 External fuel tank (capacity 265 US gal/1,011 litres)
202 Sparrow missile launch adaptor
203 AIM-7F Sparrow air-to-air missile
204 Wing glove pylon attachment
205 Cranked wing glove pylon
206 Sidewinder missile launch rail
207 AIM-9C Sidewinder air-to-air missile
208 Phoenix launch pallet
209 AIM-54A Phoenix air-to-air missile




RIO (Radar Intercept Officer)
Pilot
CDR M A VIZCARRA
SCAR
CDR R J KELLEY
TRIGGER
EJECTION SEAT
DANGER
EJECTION SEAT
DANGER



TIP: Pilot body can be toggled on/off by pressing “RSHIFT+P”

Pilot Cockpit



Pilot Cockpit



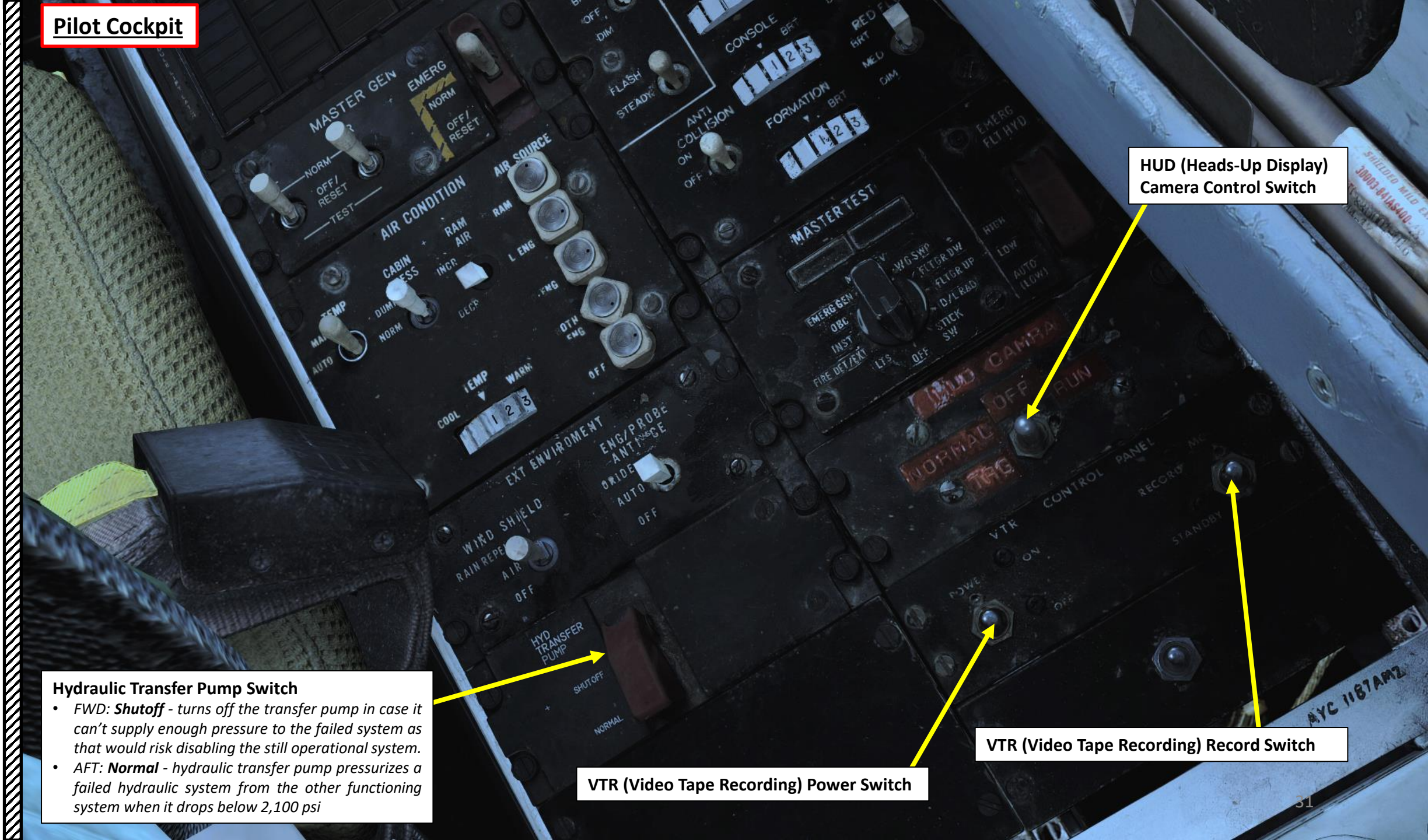
Pilot Cockpit



Pilot Cockpit



Pilot Cockpit



HUD (Heads-Up Display) Camera Control Switch

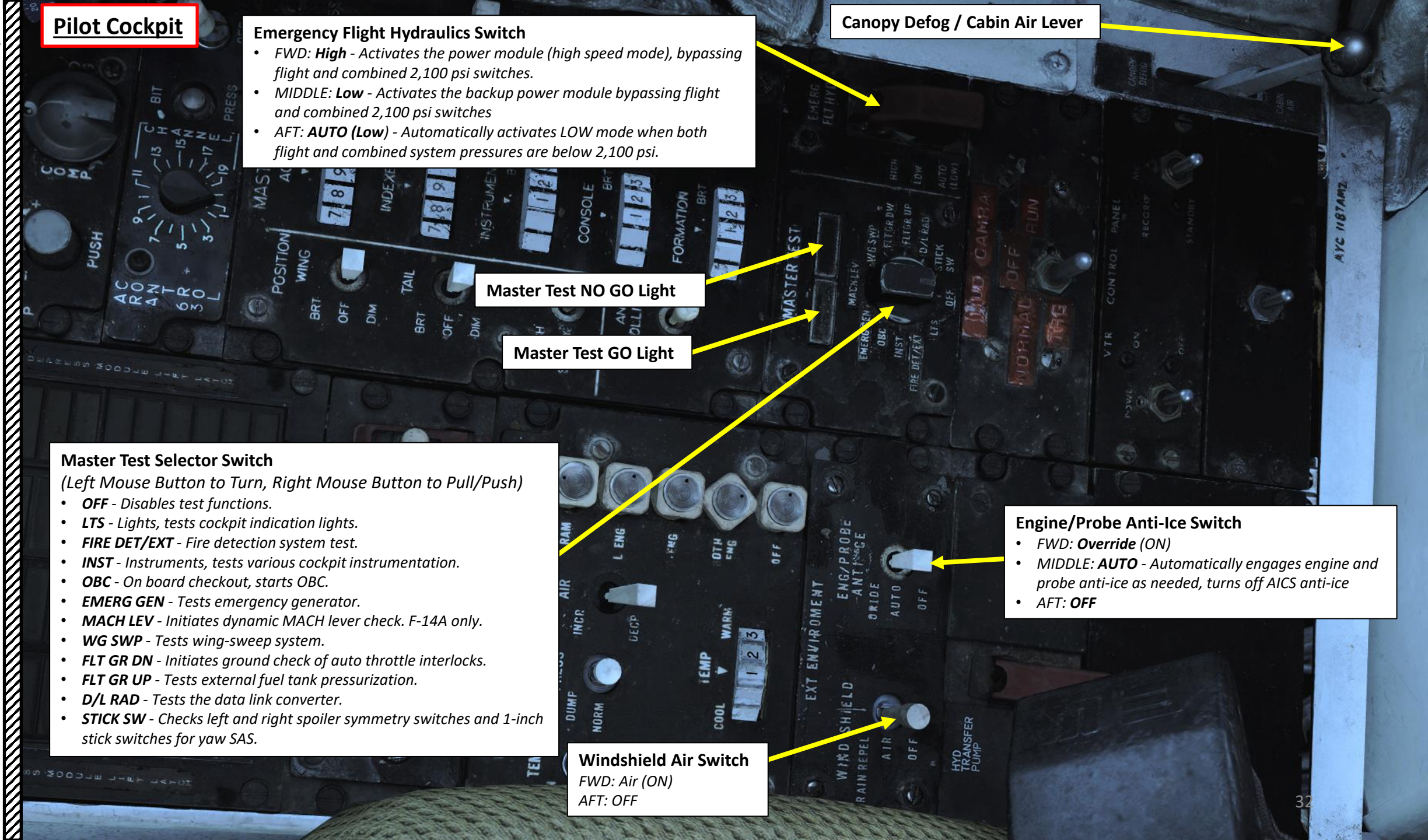
Hydraulic Transfer Pump Switch

- *FWD: **Shutoff** - turns off the transfer pump in case it can't supply enough pressure to the failed system as that would risk disabling the still operational system.*
- *AFT: **Normal** - hydraulic transfer pump pressurizes a failed hydraulic system from the other functioning system when it drops below 2,100 psi*

VTR (Video Tape Recording) Power Switch

VTR (Video Tape Recording) Record Switch

Pilot Cockpit



Emergency Flight Hydraulics Switch
- *FWD: **High** - Activates the power module (high speed mode), bypassing flight and combined 2,100 psi switches.*
- *MIDDLE: **Low** - Activates the backup power module bypassing flight and combined 2,100 psi switches*
- *AFT: **AUTO (Low)** - Automatically activates LOW mode when both flight and combined system pressures are below 2,100 psi.*

Canopy Defog / Cabin Air Lever

Master Test NO GO Light

Master Test GO Light

Master Test Selector Switch
(Left Mouse Button to Turn, Right Mouse Button to Pull/Push)
- ***OFF** - Disables test functions.*
- ***LTS** - Lights, tests cockpit indication lights.*
- ***FIRE DET/EXT** - Fire detection system test.*
- ***INST** - Instruments, tests various cockpit instrumentation.*
- ***OBC** - On board checkout, starts OBC.*
- ***EMERG GEN** - Tests emergency generator.*
- ***MACH LEV** - Initiates dynamic MACH lever check. F-14A only.*
- ***WG SWP** - Tests wing-sweep system.*
- ***FLT GR DN** - Initiates ground check of auto throttle interlocks.*
- ***FLT GR UP** - Tests external fuel tank pressurization.*
- ***D/L RAD** - Tests the data link converter.*
- ***STICK SW** - Checks left and right spoiler symmetry switches and 1-inch stick switches for yaw SAS.*

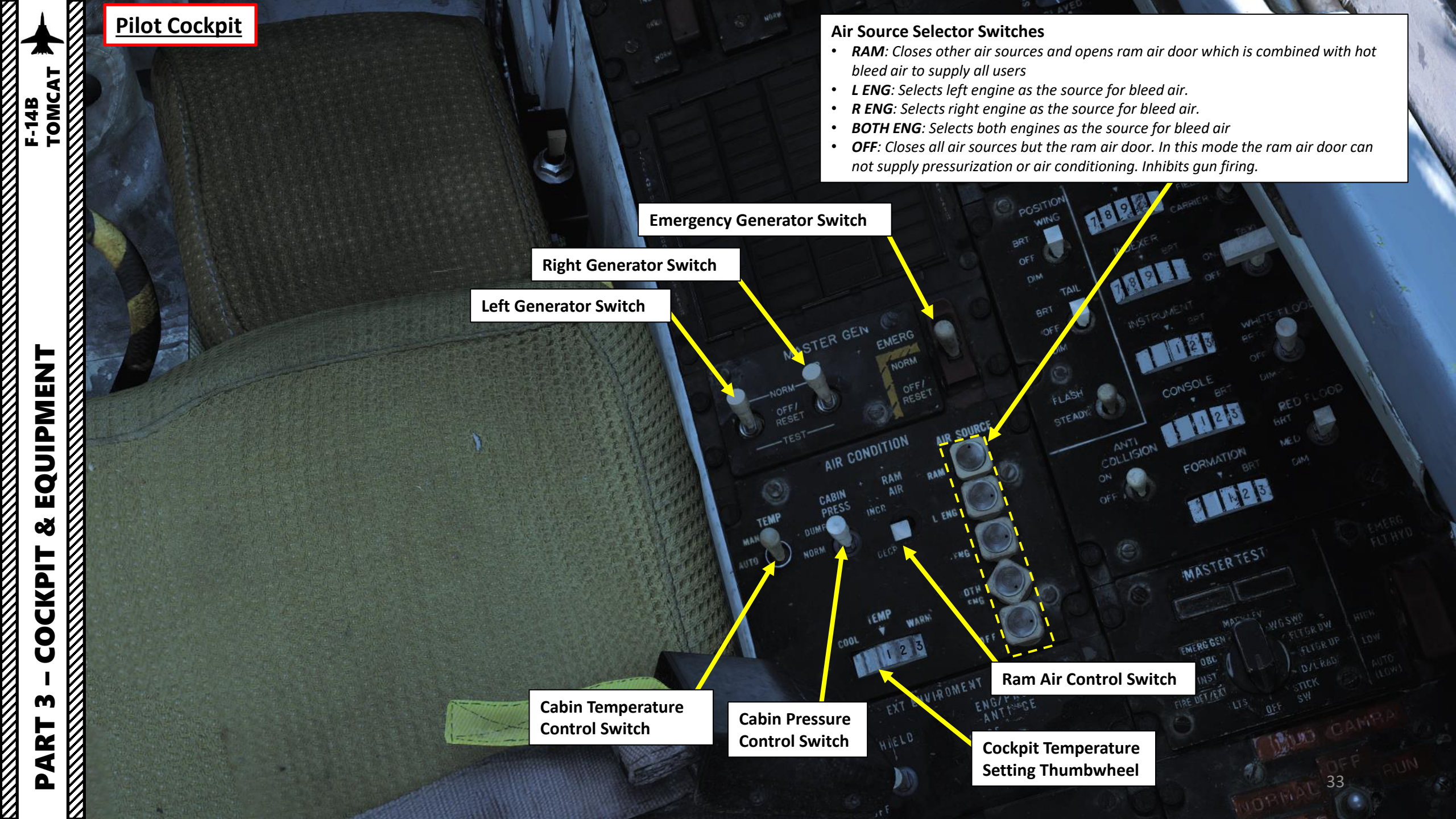
Engine/Probe Anti-Ice Switch
- *FWD: **Override** (ON)*
- *MIDDLE: **AUTO** - Automatically engages engine and probe anti-ice as needed, turns off AICS anti-ice*
- *AFT: **OFF***

Windshield Air Switch
FWD: Air (ON)
AFT: OFF

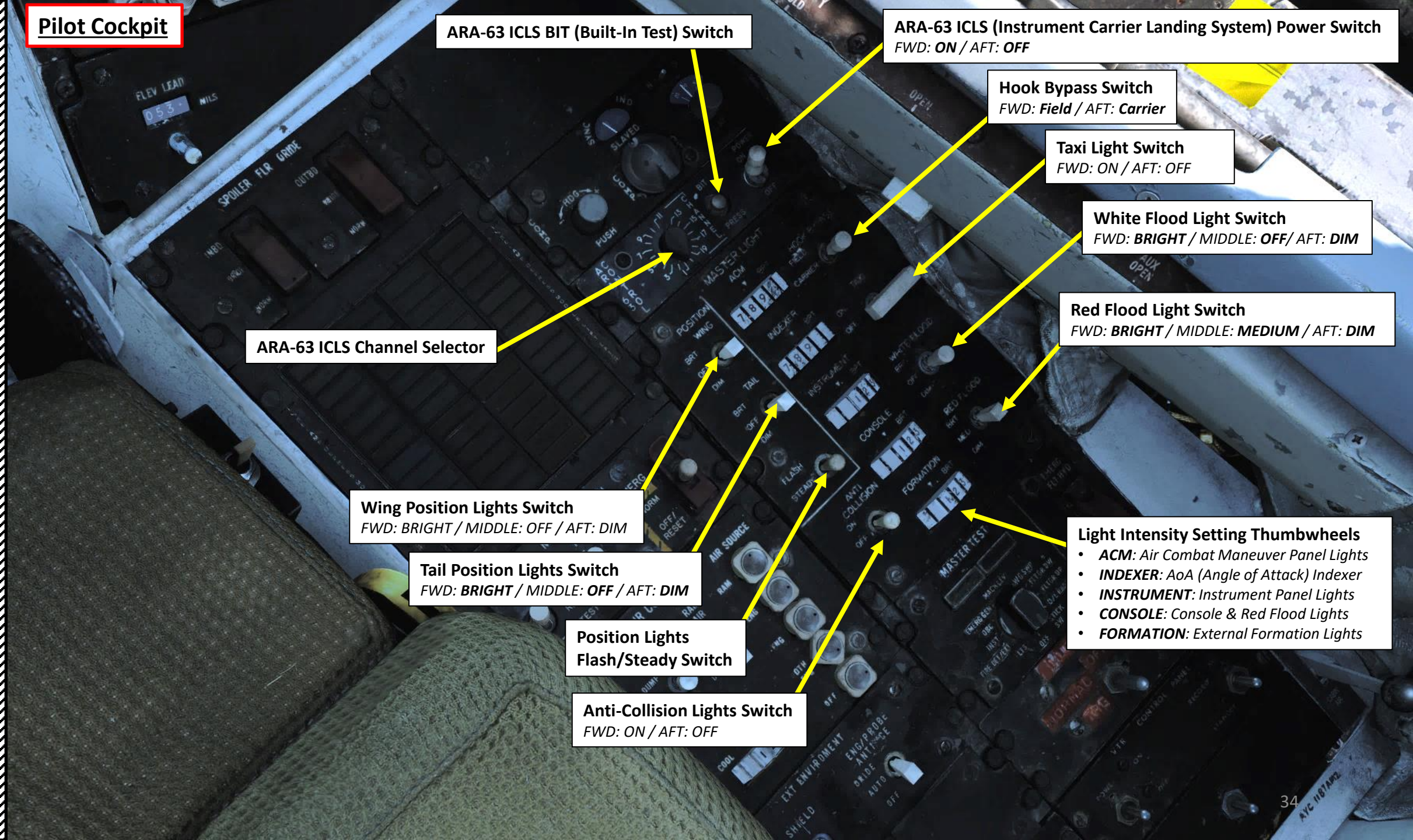
Pilot Cockpit

Air Source Selector Switches

- ***RAM****: Closes other air sources and opens ram air door which is combined with hot bleed air to supply all users*
- ***L ENG****: Selects left engine as the source for bleed air.*
- ***R ENG****: Selects right engine as the source for bleed air.*
- ***BOTH ENG****: Selects both engines as the source for bleed air*
- ***OFF****: Closes all air sources but the ram air door. In this mode the ram air door can not supply pressurization or air conditioning. Inhibits gun firing.*



Pilot Cockpit



ARA-63 ICLS BIT (Built-In Test) Switch

ARA-63 ICLS (Instrument Carrier Landing System) Power Switch
*FWD: **ON** / AFT: **OFF***

Hook Bypass Switch
*FWD: **Field** / AFT: **Carrier***

Taxi Light Switch
FWD: ON / AFT: OFF

White Flood Light Switch
*FWD: **BRIGHT** / MIDDLE: **OFF**/ AFT: **DIM***

Red Flood Light Switch
*FWD: **BRIGHT** / MIDDLE: **MEDIUM** / AFT: **DIM***

ARA-63 ICLS Channel Selector

Wing Position Lights Switch
FWD: BRIGHT / MIDDLE: OFF / AFT: DIM

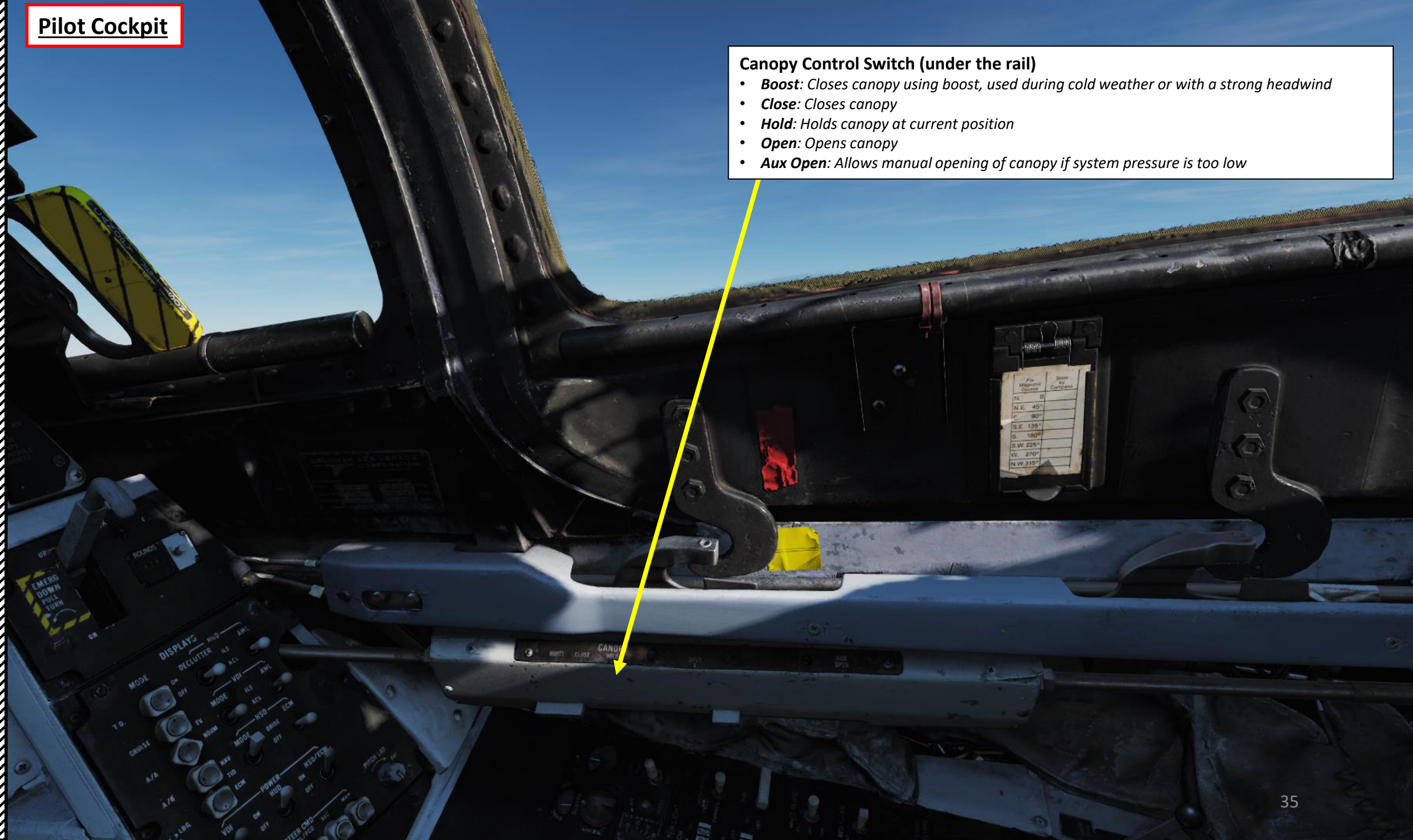
Tail Position Lights Switch
*FWD: **BRIGHT** / MIDDLE: **OFF** / AFT: **DIM***

Position Lights Flash/Steady Switch

Anti-Collision Lights Switch
FWD: ON / AFT: OFF

Light Intensity Setting Thumbwheels
- ***ACM**: Air Combat Maneuver Panel Lights*
- ***INDEXER**: AoA (Angle of Attack) Indexer*
- ***INSTRUMENT**: Instrument Panel Lights*
- ***CONSOLE**: Console & Red Flood Lights*
- ***FORMATION**: External Formation Lights*

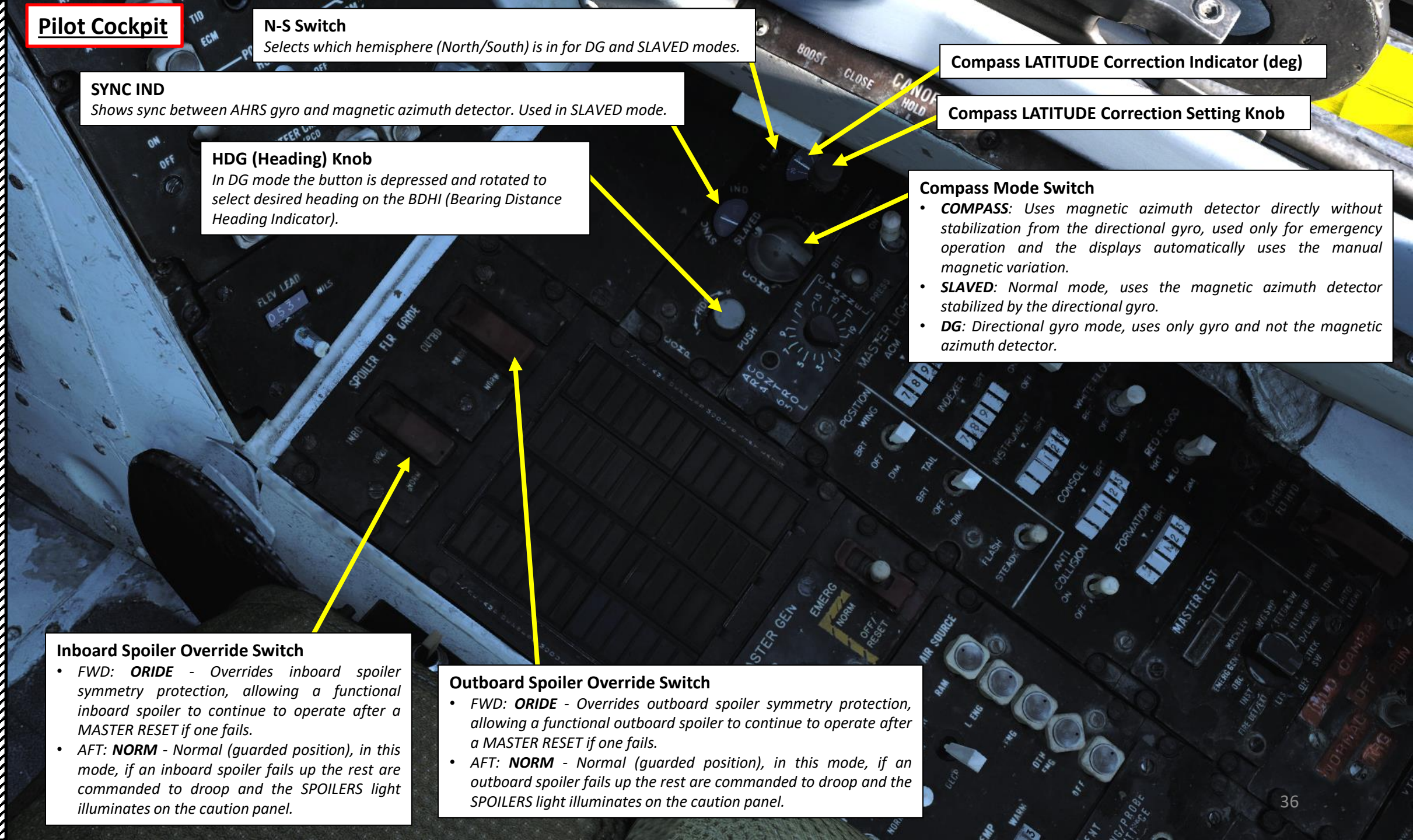
Pilot Cockpit



Canopy Control Switch (under the rail)

- ***Boost***: *Closes canopy using boost, used during cold weather or with a strong headwind*
- ***Close***: *Closes canopy*
- ***Hold***: *Holds canopy at current position*
- ***Open***: *Opens canopy*
- ***Aux Open***: *Allows manual opening of canopy if system pressure is too low*

Pilot Cockpit



N-S Switch
Selects which hemisphere (North/South) is in for DG and SLAVED modes.

SYNC IND
Shows sync between AHRS gyro and magnetic azimuth detector. Used in SLAVED mode.

HDG (Heading) Knob
In DG mode the button is depressed and rotated to select desired heading on the BDHI (Bearing Distance Heading Indicator).

Compass LATITUDE Correction Indicator (deg)

Compass LATITUDE Correction Setting Knob

Compass Mode Switch
- ***COMPASS****: Uses magnetic azimuth detector directly without stabilization from the directional gyro, used only for emergency operation and the displays automatically uses the manual magnetic variation.*
- ***SLAVED****: Normal mode, uses the magnetic azimuth detector stabilized by the directional gyro.*
- ***DG****: Directional gyro mode, uses only gyro and not the magnetic azimuth detector.*

Inboard Spoiler Override Switch
- *FWD: **ORIDE** - Overrides inboard spoiler symmetry protection, allowing a functional inboard spoiler to continue to operate after a MASTER RESET if one fails.*
- *AFT: **NORM** - Normal (guarded position), in this mode, if an inboard spoiler fails up the rest are commanded to droop and the SPOILERS light illuminates on the caution panel.*

Outboard Spoiler Override Switch
- *FWD: **ORIDE** - Overrides outboard spoiler symmetry protection, allowing a functional outboard spoiler to continue to operate after a MASTER RESET if one fails.*
- *AFT: **NORM** - Normal (guarded position), in this mode, if an outboard spoiler fails up the rest are commanded to droop and the SPOILERS light illuminates on the caution panel.*

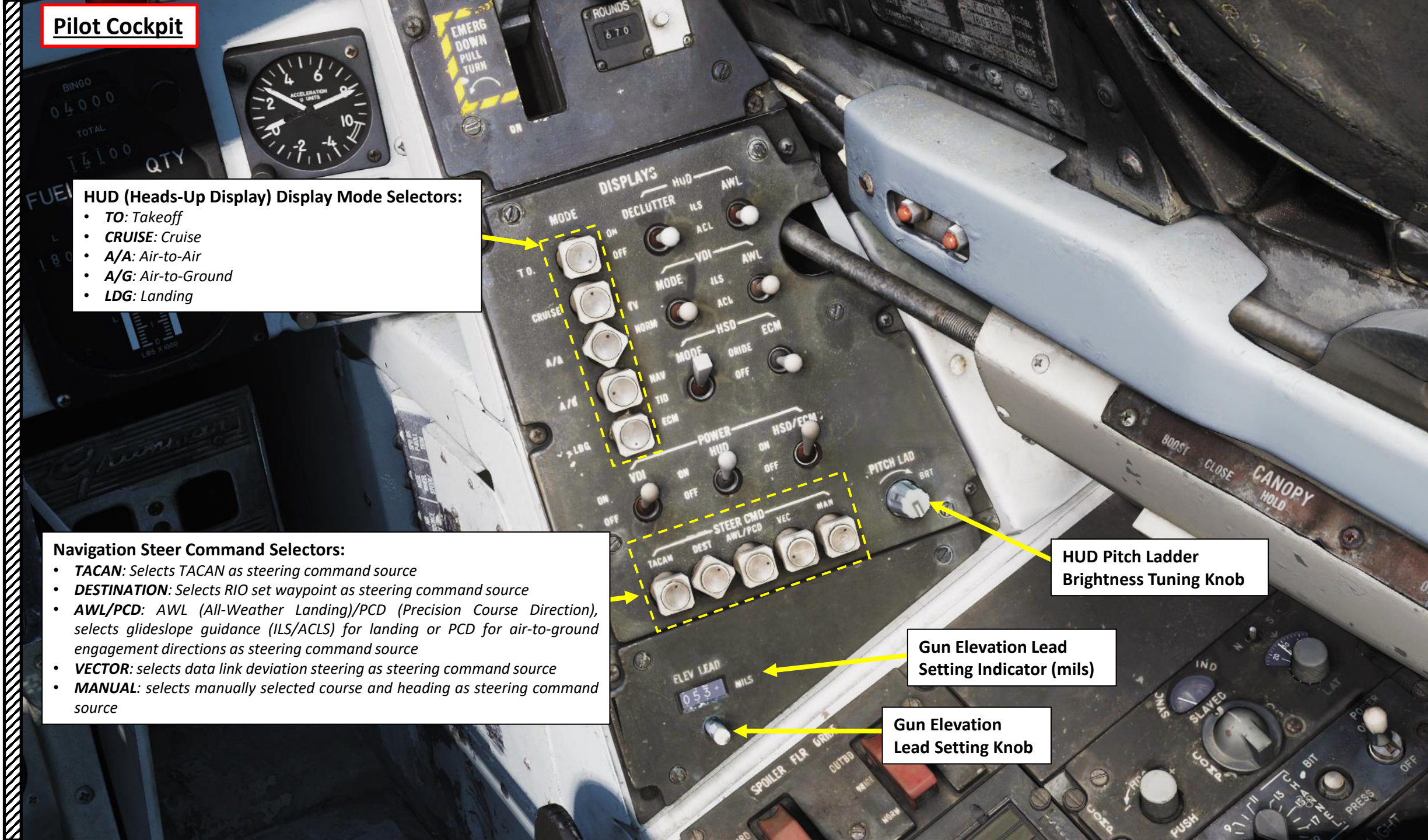
Pilot Cockpit

Caution/Advisory Indicator

PITCH STAB 1: Inoperative Pitch Channel 1	**ROLL STAB 1**: Inoperative SAS Roll Channel 1	**YAW STAB OP**: One inoperative yaw channel	**EMERG JETTI**: Activation of EMERG STORES JETT button
PITCH STAB 2: Inoperative Pitch Channel 2	**ROLL STAB 2**: Inoperative SAS Roll Channel 2	**YAW STAB OUT**: Two inoperative yaw channels	**LADDER**: boarding ladder not correctly stowed
FLAP: flap failure or airspeed greater than 225 knots with flaps down	-	**SPOILERS**: Spoilers system failure	**START VALVE**: starter solenoid air valve is open after start
HZ TAIL AUTH: Lateral Tail Authority Failure	**RUDDER AUTH**: Rudder Authority Failure	**AUTO PILOT**: Autopilot system failure	**INLET ICE**: accumulation of ice on ice detector in left engine inlet
L INLET: Left AICS programmer and/or system failure	**R INLET**: Right AICS programmer and/or system failure	**OIL PRESS**: left/right engine oil pressure below 11 psi	**BLEED DUCT**: high temperature air leak in the engine compartments
L RAMPS: left ramp not locked in position during critical flight conditions	**R RAMPS**: right ramp not locked in position during critical flight conditions	**L ENG SEC**: left engine AFTC is in secondary mode	**R ENG SEC**: right engine AFTC is in secondary mode
L GEN: left engine generator is inoperative	**R GEN**: right engine generator is inoperative	**CANOPY**: canopy is not down and locked	**BINGO**: fuel quantity at or below set BINGO quantity
L OIL HOT: left engine oil too hot	**R OIL HOT**: right engine oil too hot	**CADC**: Air Data Computer failure	**HYD PRESS**: pressure in either engine hydraulic pump below 2,100 psi
L FUEL PRESS: pressure below 9 psi in left engine fuel boost pump	**R FUEL PRESS**: pressure below 9 psi in right engine fuel boost pump	**L FUEL LOW**: fuel quantity below 1,000 pounds in aft and left feed	**R FUEL LOW**: fuel quantity below 1,000 pounds in aft and right and forward feed
-	**WING SWEEP**: failure of a single channel in wing-sweep system	**RATS**: RATS (Reduced Arrestment Thrust System) enabled	-
TRANS/RECT: failure in one or both transformer-rectifiers	**MACH TRIM**: failure in Mach trim actuator	**WINDSHLD HOT**: central windshield overheat	**LAUNCH BAR**: *Weight on wheels* - Aircraft kneeled, either throttle below MIL and launch bar not up and locked. *Weight off wheels* - Launch bar not up and locked, launch bar not within 15º off center (cocked nosegear) or nose strut not fully extended.
INTER TRIM: failure in trim system or computer failure	-	**AHRS**: attitude or heading information from the AHRS is unreliable	-
ENG FIRE EXT: low pressure in the fire extinguishing container (90 psi below nominal 600 psi)	**AUX FIRE EXT**: low pressure in the auxiliary fire extinguishing container (90 psi below nominal 600 psi)	-	-



Pilot Cockpit



HUD (Heads-Up Display) Display Mode Selectors:

- ***TO***: *Takeoff*
- ***CRUISE***: *Cruise*
- ***A/A***: *Air-to-Air*
- ***A/G***: *Air-to-Ground*
- ***LDG***: *Landing*

Navigation Steer Command Selectors:

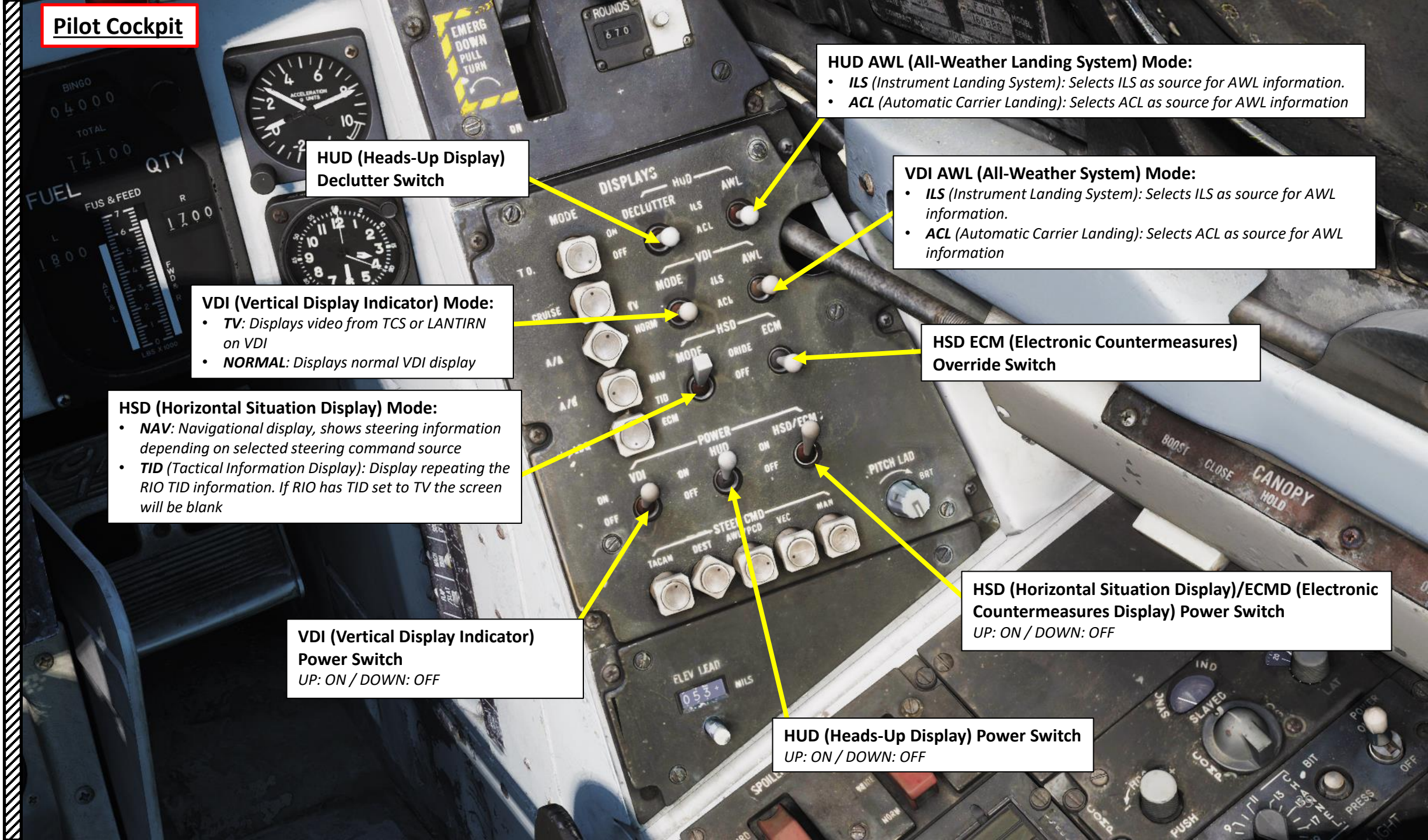
- ***TACAN***: *Selects TACAN as steering command source*
- ***DESTINATION***: *Selects RIO set waypoint as steering command source*
- ***AWL/PCD***: *AWL (All-Weather Landing)/PCD (Precision Course Direction), selects glideslope guidance (ILS/ACLS) for landing or PCD for air-to-ground engagement directions as steering command source*
- ***VECTOR***: *selects data link deviation steering as steering command source*
- ***MANUAL***: *selects manually selected course and heading as steering command source*

HUD Pitch Ladder Brightness Tuning Knob

Gun Elevation Lead Setting Indicator (mils)

Gun Elevation Lead Setting Knob

Pilot Cockpit



HUD AWL (All-Weather Landing System) Mode:
- ***ILS*** *(Instrument Landing System): Selects ILS as source for AWL information.*
- ***ACL*** *(Automatic Carrier Landing): Selects ACL as source for AWL information*

HUD (Heads-Up Display) Declutter Switch

VDI AWL (All-Weather System) Mode:
- ***ILS*** *(Instrument Landing System): Selects ILS as source for AWL information.*
- ***ACL*** *(Automatic Carrier Landing): Selects ACL as source for AWL information*

VDI (Vertical Display Indicator) Mode:
- ***TV****: Displays video from TCS or LANTIRN on VDI*
- ***NORMAL****: Displays normal VDI display*

HSD ECM (Electronic Countermeasures) Override Switch

HSD (Horizontal Situation Display) Mode:
- ***NAV****: Navigational display, shows steering information depending on selected steering command source*
- ***TID*** *(Tactical Information Display): Display repeating the RIO TID information. If RIO has TID set to TV the screen will be blank*

HSD (Horizontal Situation Display)/ECMD (Electronic Countermeasures Display) Power Switch
UP: ON / DOWN: OFF

VDI (Vertical Display Indicator) Power Switch
UP: ON / DOWN: OFF

HUD (Heads-Up Display) Power Switch
UP: ON / DOWN: OFF

Pilot Cockpit



Pilot Cockpit



Pilot Cockpit

Bingo Fuel Setting Knob

Right Fuel Tanks Quantity Indicator (lbs)
Shows fuel quantity in currently selected respective (R) tanks (feed, wing or external) set by the QTY SEL switch on the fuel management panel.

Accelerometer (G)

Bingo Fuel Setting
"Bingo Fuel" is the fuel quantity required to go back to base safely. This is set by the pilot manually.

Total Fuel Quantity Indicator (lbs)

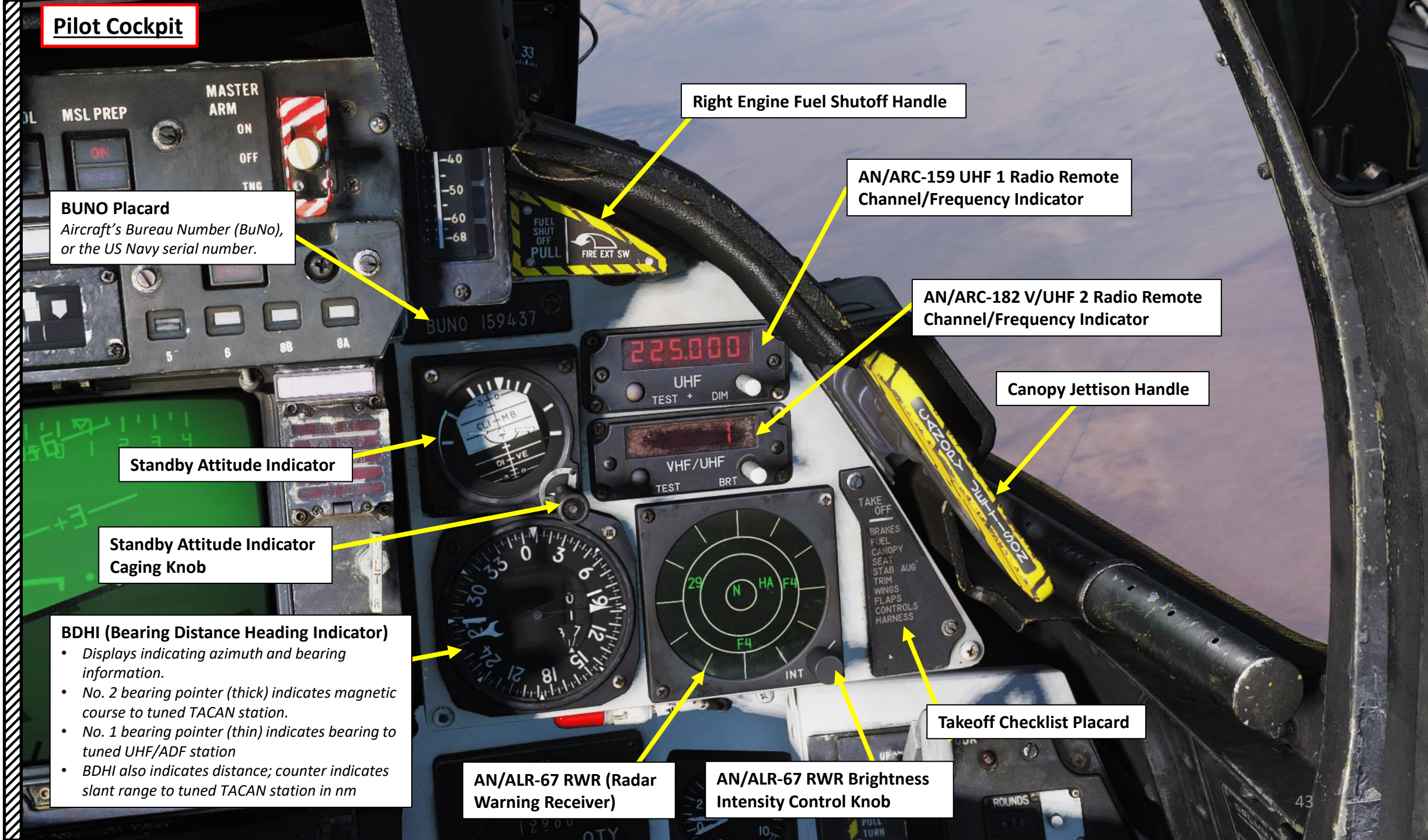
Clock

Left Fuel Tanks Quantity Indicator (lbs)
Shows fuel quantity in currently selected respective (L) tanks (feed, wing or external) set by the QTY SEL switch on the fuel management panel.

Fuselage & Feed Fuel Tanks Quantity Indicator (lbs)
Shows fuel quantity in respective fuselage tanks. Left tape indicates left feed and aft fuselage tanks. Right tape indicates right feed and forward fuselage tanks.

Fuel QTY SEL Switch

Pilot Cockpit



BUNO Placard
Aircraft's Bureau Number (BuNo), or the US Navy serial number.

Right Engine Fuel Shutoff Handle

AN/ARC-159 UHF 1 Radio Remote Channel/Frequency Indicator

AN/ARC-182 V/UHF 2 Radio Remote Channel/Frequency Indicator

Canopy Jettison Handle

Standby Attitude Indicator

Standby Attitude Indicator Caging Knob

BDHI (Bearing Distance Heading Indicator)
- *Displays indicating azimuth and bearing information.*
- *No. 2 bearing pointer (thick) indicates magnetic course to tuned TACAN station.*
- *No. 1 bearing pointer (thin) indicates bearing to tuned UHF/ADF station*
- *BDHI also indicates distance; counter indicates slant range to tuned TACAN station in nm*

AN/ALR-67 RWR (Radar Warning Receiver)

AN/ALR-67 RWR Brightness Intensity Control Knob

Takeoff Checklist Placard

Pilot Cockpit



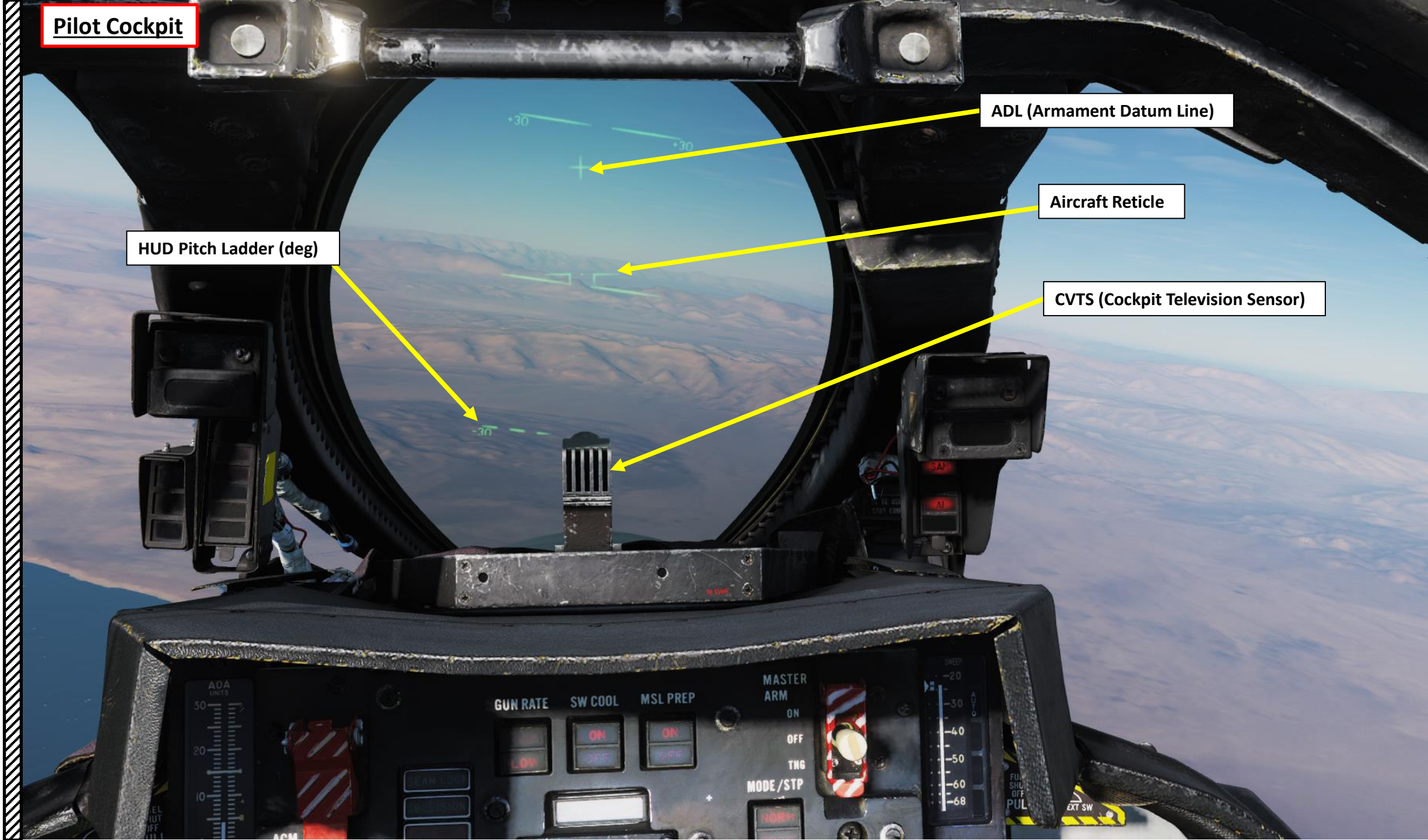
Pilot Cockpit



Pilot Cockpit



Pilot Cockpit



Pilot Cockpit

HUD Information changes based on selected Display Mode
Selected: Takeoff Mode

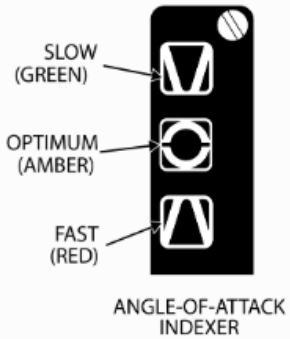
Vertical Speed Scale (x1000 ft/min)
Appears when HUD Takeoff Mode is selected



Pilot Cockpit

Left Engine Compressor STALL Light

Approach Indexer



APPROACH LIGHT	INDEXER	ANGLE -OF-ATTACK UNITS	AIRSPEED
GREEN		16 TO 30	SLOW
AMBER		15.5 TO 16	SLIGHTLY SLOW
AMBER		14.5 TO 15.5	OPTIMUM ON SPEED
AMBER		14.0 TO 14.5	SLIGHTLY FAST
RED		0 TO 14	FAST

Reference: Heatblur F-14 Wiki

Warning Lights

- ***WHEELS***: *Landing gear is not down and locked, flaps below 10 deg and either throttle below 85 %*
- ***BRAKES***: *Antiskid or brake failure or Parking Brake is set*
- ***ACLS/AP***: *Automatic Carrier Landing System or Autopilot is disengaged*
- ***NWS ENGA***: *Nosewheel Steering is engaged*
- ***AUTO THROT***: *Disengagement of automatic throttle control mode not resulting from throttle mode switch*

Pilot Cockpit



ACM Jettison Button

SW COOL (AIM-9 Sidewinder Cooling) Switch

Gun Rate Switch
High/Low

MSL PREP (AIM-54/AIM-7 Missile Preparation) Switch

ACM (Air Combat Maneuver) Switch/Cover
- *Lifting the ACM cover activates the ACM mode and allows access to the ACM jettison button.*
- *Button under the ACM cover that enables jettison of stores selected on the RIO's ARMAMENT panel. Will not jettison Sidewinders regardless if selected.*

AoA (Angle of Attack) Indicator (AoA Units)

SEAM (Sidewinder Expanded Acquisition Mode) LOCK Light

COLLISION Light

HOT TRIGGER Light

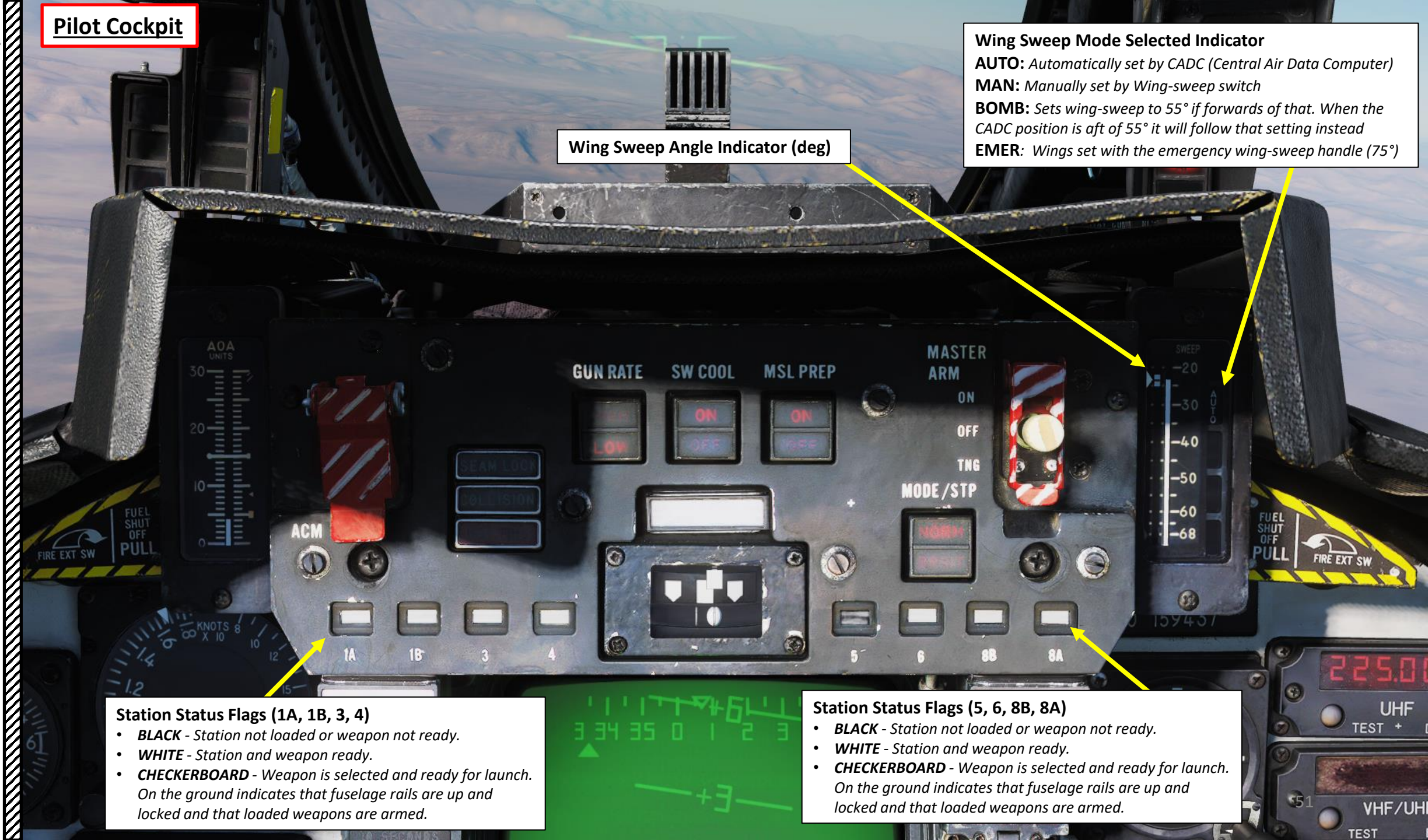
Turn & Slip Indicator

Master Caution Light/Switch

Master Arm Switch
*UP: **ON***
*MIDDLE: **OFF***
*DOWN: **TNG** (Training) Mode*

MSL MODE (Missile Mode) Switch
NORM: Normal
BRSIT: Boresight

Pilot Cockpit



Wing Sweep Angle Indicator (deg)

Wing Sweep Mode Selected Indicator

AUTO: *Automatically set by CADC (Central Air Data Computer)*

MAN: *Manually set by Wing-sweep switch*

BOMB: *Sets wing-sweep to 55° if forwards of that. When the CADC position is aft of 55° it will follow that setting instead*

EMER: *Wings set with the emergency wing-sweep handle (75°)*

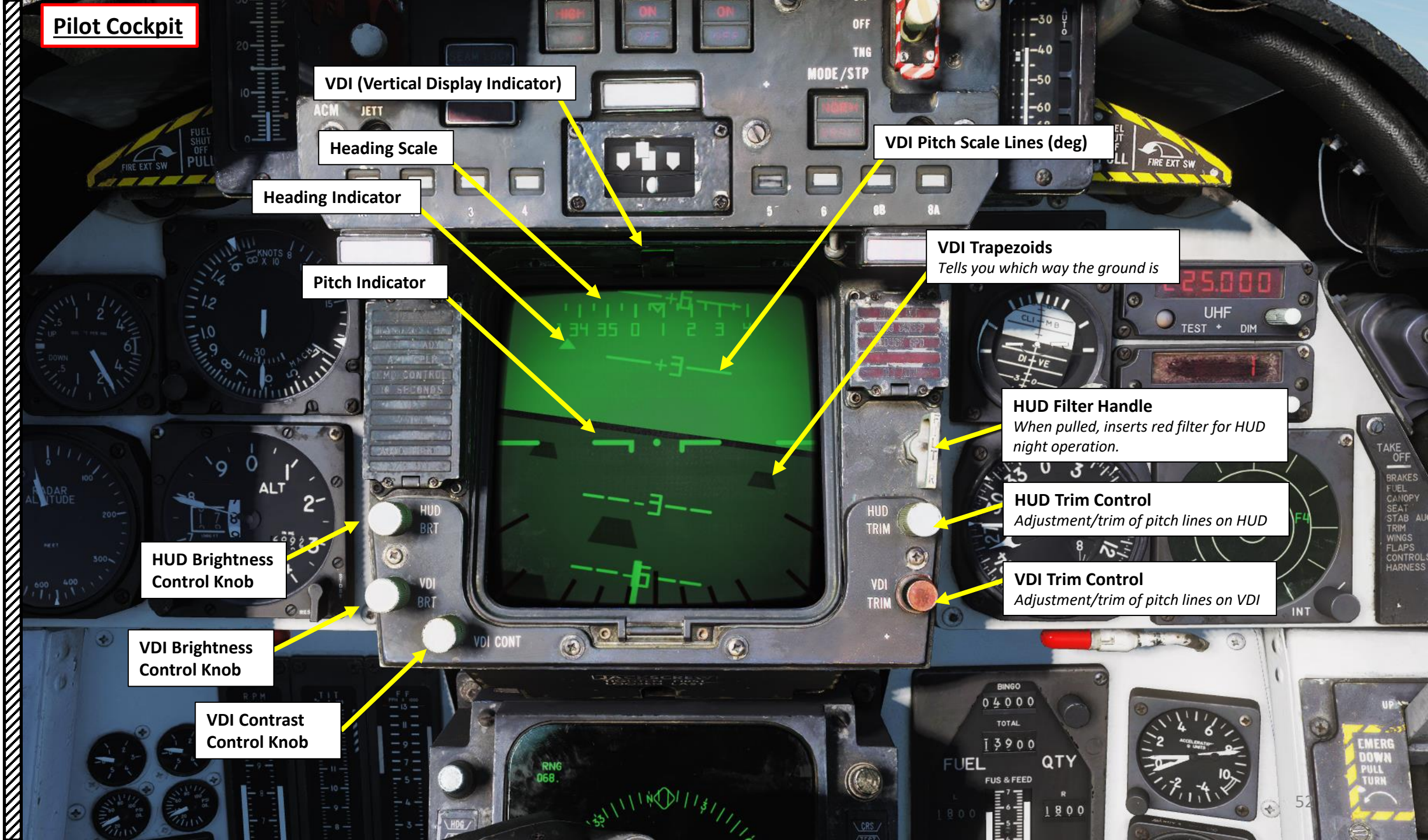
Station Status Flags (1A, 1B, 3, 4)

- ***BLACK*** *- Station not loaded or weapon not ready.*
- ***WHITE*** *- Station and weapon ready.*
- ***CHECKERBOARD*** *- Weapon is selected and ready for launch. On the ground indicates that fuselage rails are up and locked and that loaded weapons are armed.*

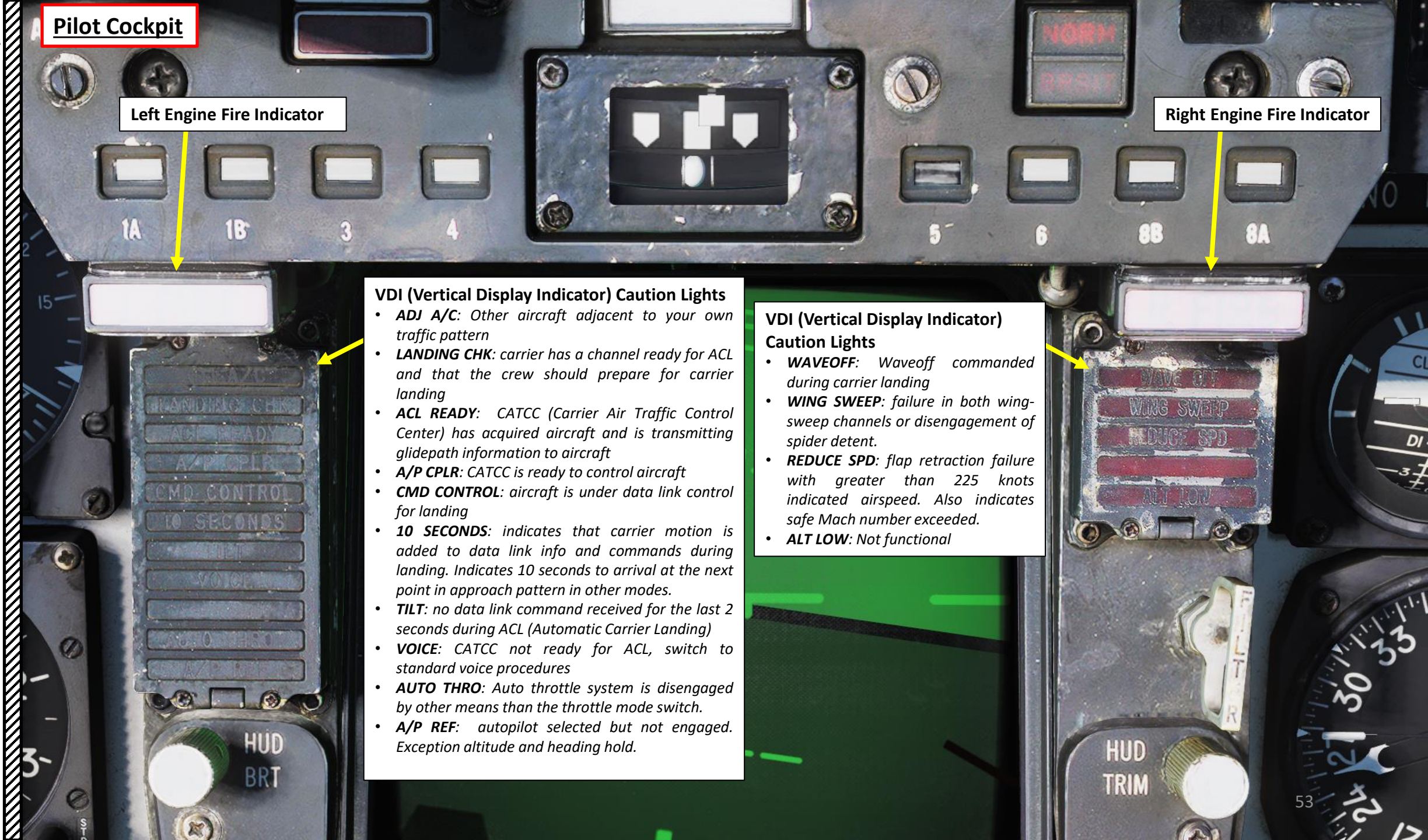
Station Status Flags (5, 6, 8B, 8A)

- ***BLACK*** *- Station not loaded or weapon not ready.*
- ***WHITE*** *- Station and weapon ready.*
- ***CHECKERBOARD*** *- Weapon is selected and ready for launch. On the ground indicates that fuselage rails are up and locked and that loaded weapons are armed.*

Pilot Cockpit



Pilot Cockpit



VDI (Vertical Display Indicator) Caution Lights

- ***ADJ A/C****: Other aircraft adjacent to your own traffic pattern*
- ***LANDING CHK****: carrier has a channel ready for ACL and that the crew should prepare for carrier landing*
- ***ACL READY****: CATCC (Carrier Air Traffic Control Center) has acquired aircraft and is transmitting glidepath information to aircraft*
- ***A/P CPLR****: CATCC is ready to control aircraft*
- ***CMD CONTROL****: aircraft is under data link control for landing*
- ***10 SECONDS****: indicates that carrier motion is added to data link info and commands during landing. Indicates 10 seconds to arrival at the next point in approach pattern in other modes.*
- ***TILT****: no data link command received for the last 2 seconds during ACL (Automatic Carrier Landing)*
- ***VOICE****: CATCC not ready for ACL, switch to standard voice procedures*
- ***AUTO THRO****: Auto throttle system is disengaged by other means than the throttle mode switch.*
- ***A/P REF****: autopilot selected but not engaged. Exception altitude and heading hold.*

VDI (Vertical Display Indicator) Caution Lights

- ***WAVEOFF****: Waveoff commanded during carrier landing*
- ***WING SWEEP****: failure in both wing-sweep channels or disengagement of spider detent.*
- ***REDUCE SPD****: flap retraction failure with greater than 225 knots indicated airspeed. Also indicates safe Mach number exceeded.*
- ***ALT LOW****: Not functional*

Pilot Cockpit



HSD (Horizontal Situation Display)

HSD Selected Heading Knob
Controls heading reference bug in TACAN mode.

HSD Brightness Control Knob

HSD Course (CRS) Setting Knob
Controls desired course in MAN (manual) and TACAN mode.

HSD Test Button

HSD BIT (Built-In Test) Failure Indicator Light
White flag indicates failure. Black flag indicates normal operation mode. Rotate clockwise to reset.

Pilot Cockpit



Pilot Cockpit

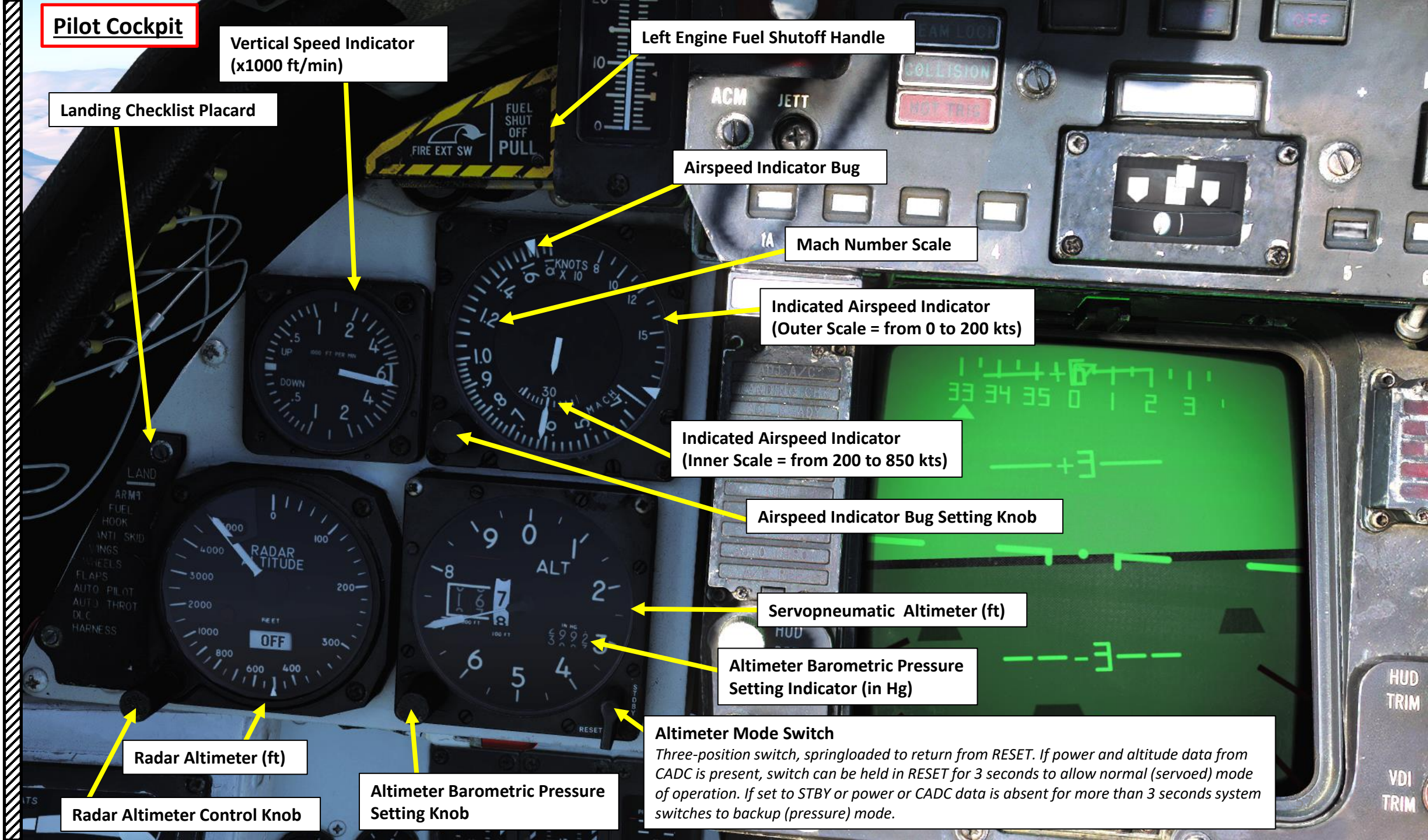
Reference: Heatblur F-14 Wiki





Control	Function
1.Bomb release button	Stores release button, used for air-to-ground ordnance (except rockets) and loaded external countermeasures.
2.Pitch and roll trim hat	Hat used to control trim, up/down trims pitch and left/right trims roll.
3.Weapon select hat	Selector hat moveable up and down and depressable. SP or PH - Selects AIM-7 or AIM-54, depression toggles between type. SW - Selects AIM-9, depression toggles between stations. GUN - Selects M-61A1 Vulcan gun. OFF - Inhibits weapon release.
4.DLC & maneuver flap command wheel	Thumbwheel used to control DLC or maneuver flaps. With DLC engaged forward rotation extends spoilers and aft rotation retracts spoilers. With gear and flaps up and DLC disengaged forward rotation retracts maneuvering flaps/slats and aft rotation extends them.
5.DLC engage/disengage & countermeasure dispense button	Momentary depression with flaps down, throttles less than MIL and no spoiler system failure engages DLC. With flaps up button sends command to ALE-39 to dispense chaff or flares according to RIO setting. DLC is disengaged by further momentary depression of button, raising flaps or advancing either throttle to MIL.
6.Autopilot reference & nosewheel steering button	Button toggling nosewheel steering with weight on wheels. Without weight on wheels is used to engage enabled autopilot modes.
7.Autopilot emergency disengage paddle	Disengages all autopilot modes and DLC and releases all autopilot switches and roll and pitch SAS switches to OFF position. With weight on wheels additionally reverts throttle mode to MAN (manual) while depressed.
8.Weapon firing trigger	Two-stage trigger. First detent enables CTVS and gun camera. Second detent releases selected forwards firing weapon.

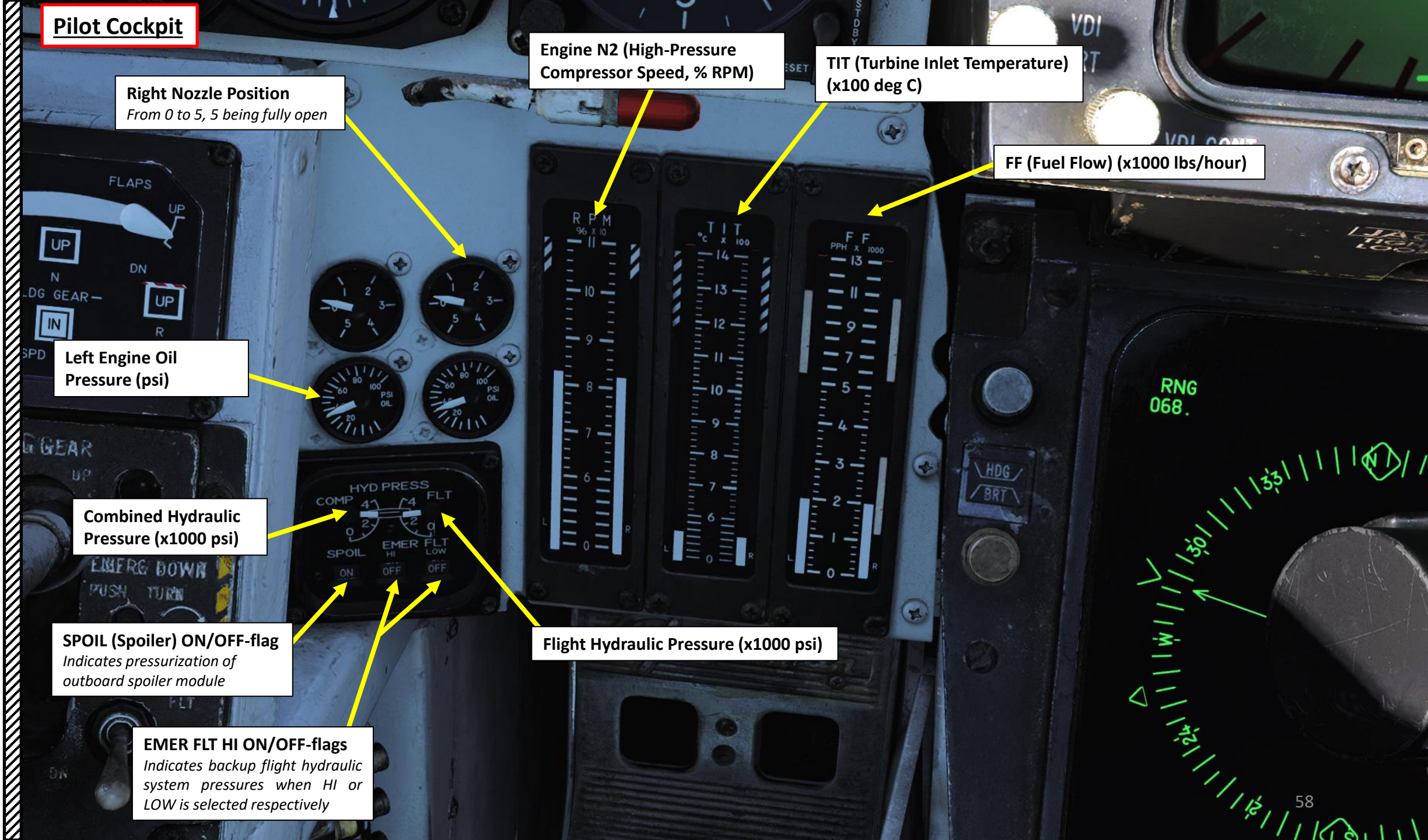
Pilot Cockpit



Altimeter Mode Switch

Three-position switch, springloaded to return from RESET. If power and altitude data from CADC is present, switch can be held in RESET for 3 seconds to allow normal (servoed) mode of operation. If set to STBY or power or CADC data is absent for more than 3 seconds system switches to backup (pressure) mode.

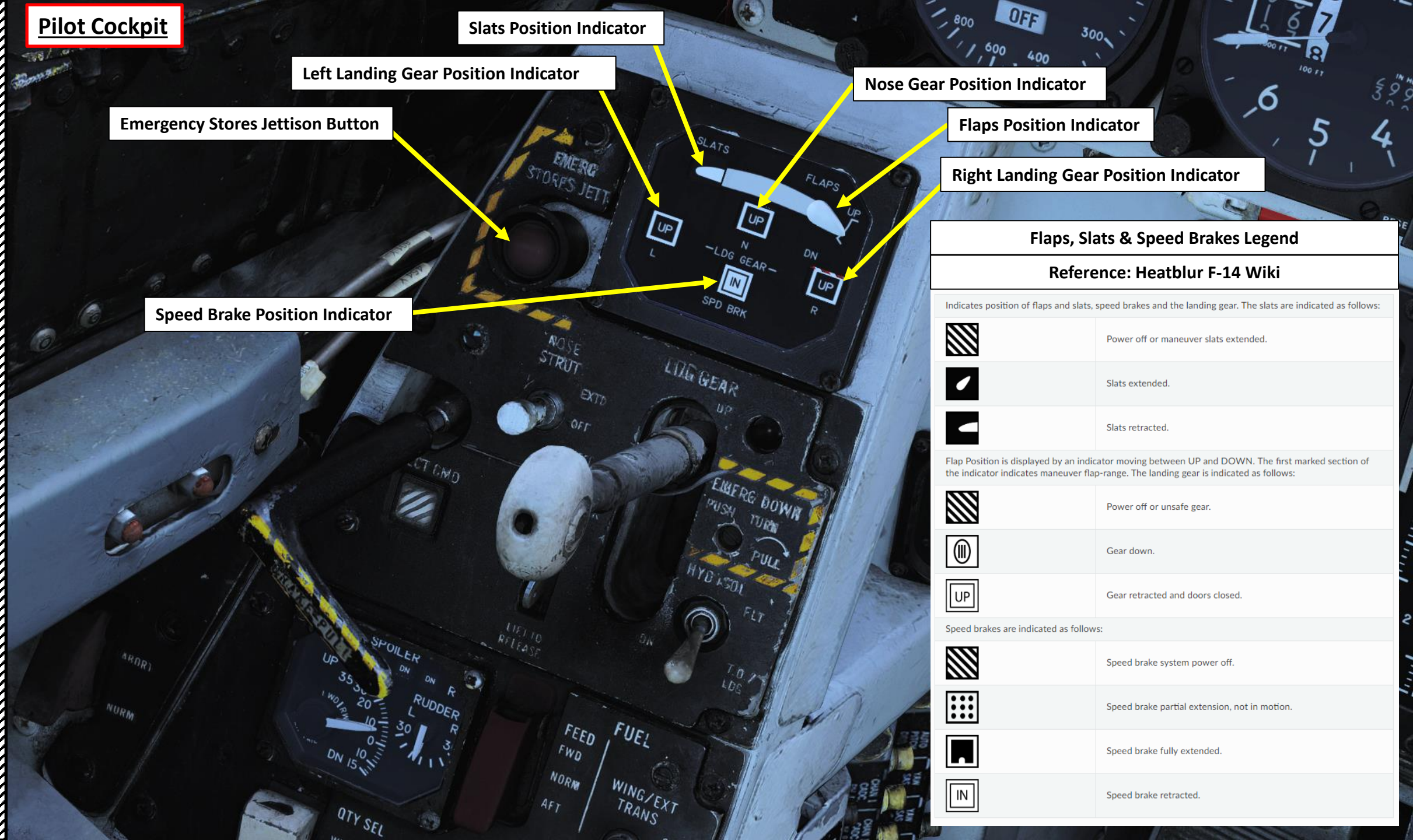
Pilot Cockpit



Pilot Cockpit



Pilot Cockpit



Flaps, Slats & Speed Brakes Legend

Reference: Heatblur F-14 Wiki

Indicates position of flaps and slats, speed brakes and the landing gear. The slats are indicated as follows:

	Power off or maneuver slats extended.
	Slats extended.
	Slats retracted.

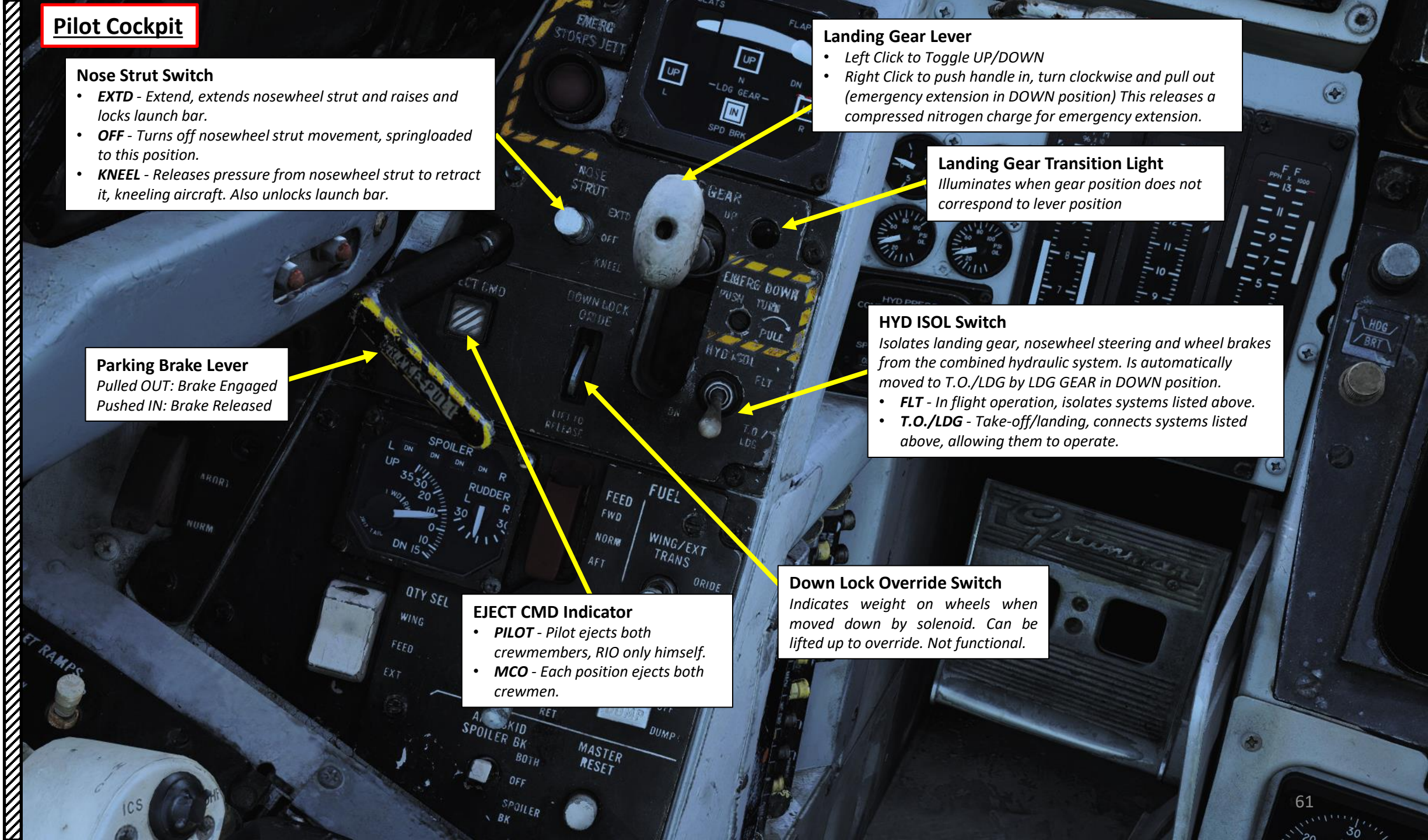
Flap Position is displayed by an indicator moving between UP and DOWN. The first marked section of the indicator indicates maneuver flap-range. The landing gear is indicated as follows:

	Power off or unsafe gear.
	Gear down.
	Gear retracted and doors closed.

Speed brakes are indicated as follows:

	Speed brake system power off.
	Speed brake partial extension, not in motion.
	Speed brake fully extended.
	Speed brake retracted.

Pilot Cockpit



Nose Strut Switch
- ***EXTD*** *- Extend, extends nosewheel strut and raises and locks launch bar.*
- ***OFF*** *- Turns off nosewheel strut movement, springloaded to this position.*
- ***KNEEL*** *- Releases pressure from nosewheel strut to retract it, kneeling aircraft. Also unlocks launch bar.*

Landing Gear Lever
- *Left Click to Toggle UP/DOWN*
- *Right Click to push handle in, turn clockwise and pull out (emergency extension in DOWN position) This releases a compressed nitrogen charge for emergency extension.*

Landing Gear Transition Light
Illuminates when gear position does not correspond to lever position

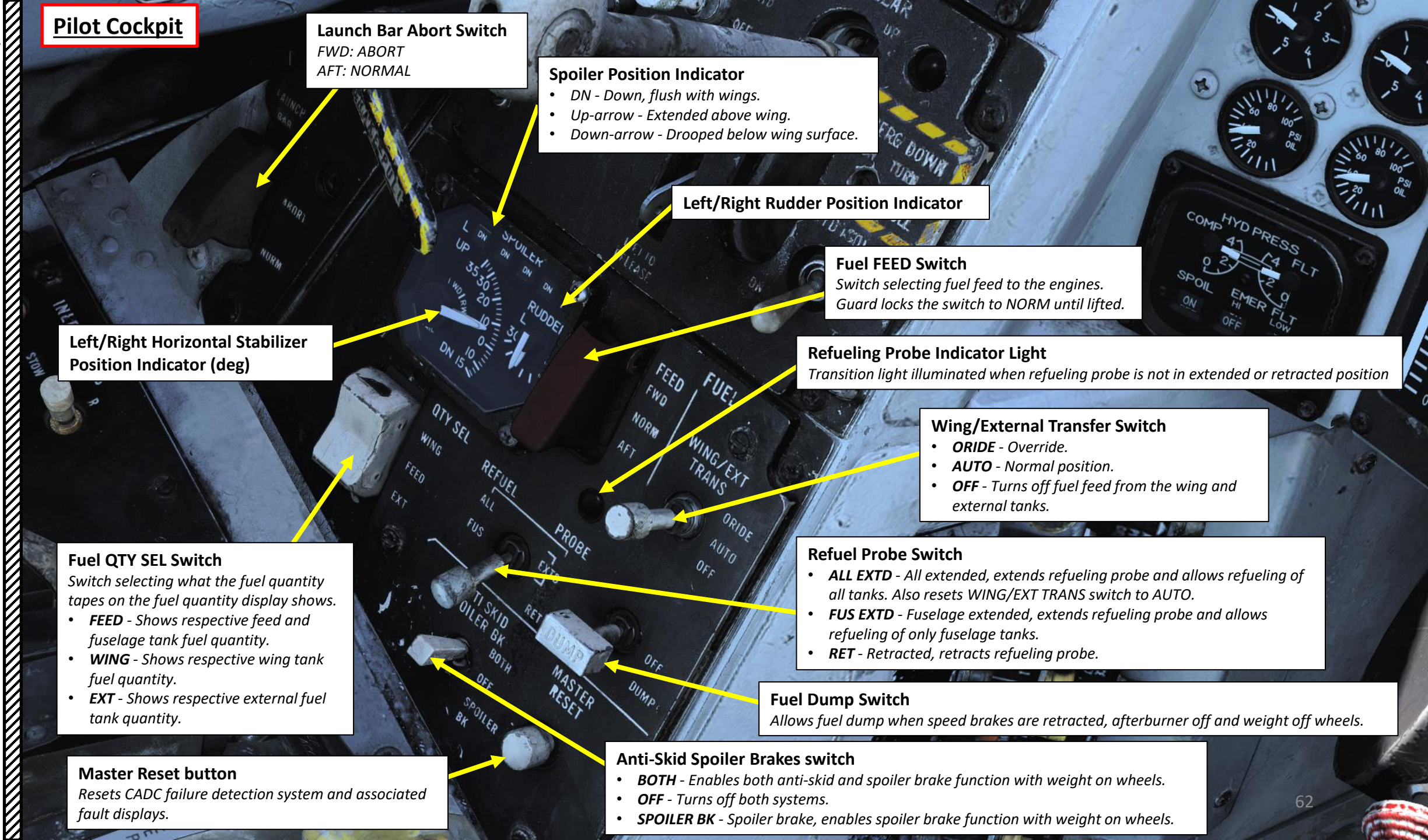
HYD ISOL Switch
Isolates landing gear, nosewheel steering and wheel brakes from the combined hydraulic system. Is automatically moved to T.O./LDG by LDG GEAR in DOWN position.
- ***FLT*** *- In flight operation, isolates systems listed above.*
- ***T.O./LDG*** *- Take-off/landing, connects systems listed above, allowing them to operate.*

Parking Brake Lever
Pulled OUT: Brake Engaged
Pushed IN: Brake Released

EJECT CMD Indicator
- ***PILOT*** *- Pilot ejects both crewmembers, RIO only himself.*
- ***MCO*** *- Each position ejects both crewmen.*

Down Lock Override Switch
Indicates weight on wheels when moved down by solenoid. Can be lifted up to override. Not functional.

Pilot Cockpit



Launch Bar Abort Switch
FWD: ABORT
AFT: NORMAL

Spoiler Position Indicator
- *DN - Down, flush with wings.*
- *Up-arrow - Extended above wing.*
- *Down-arrow - Drooped below wing surface.*

Left/Right Rudder Position Indicator

Fuel FEED Switch
Switch selecting fuel feed to the engines.
Guard locks the switch to NORM until lifted.

Left/Right Horizontal Stabilizer Position Indicator (deg)

Refueling Probe Indicator Light
Transition light illuminated when refueling probe is not in extended or retracted position

Wing/External Transfer Switch
- ***ORIDE*** *- Override.*
- ***AUTO*** *- Normal position.*
- ***OFF*** *- Turns off fuel feed from the wing and external tanks.*

Fuel QTY SEL Switch
Switch selecting what the fuel quantity tapes on the fuel quantity display shows.
- ***FEED*** *- Shows respective feed and fuselage tank fuel quantity.*
- ***WING*** *- Shows respective wing tank fuel quantity.*
- ***EXT*** *- Shows respective external fuel tank quantity.*

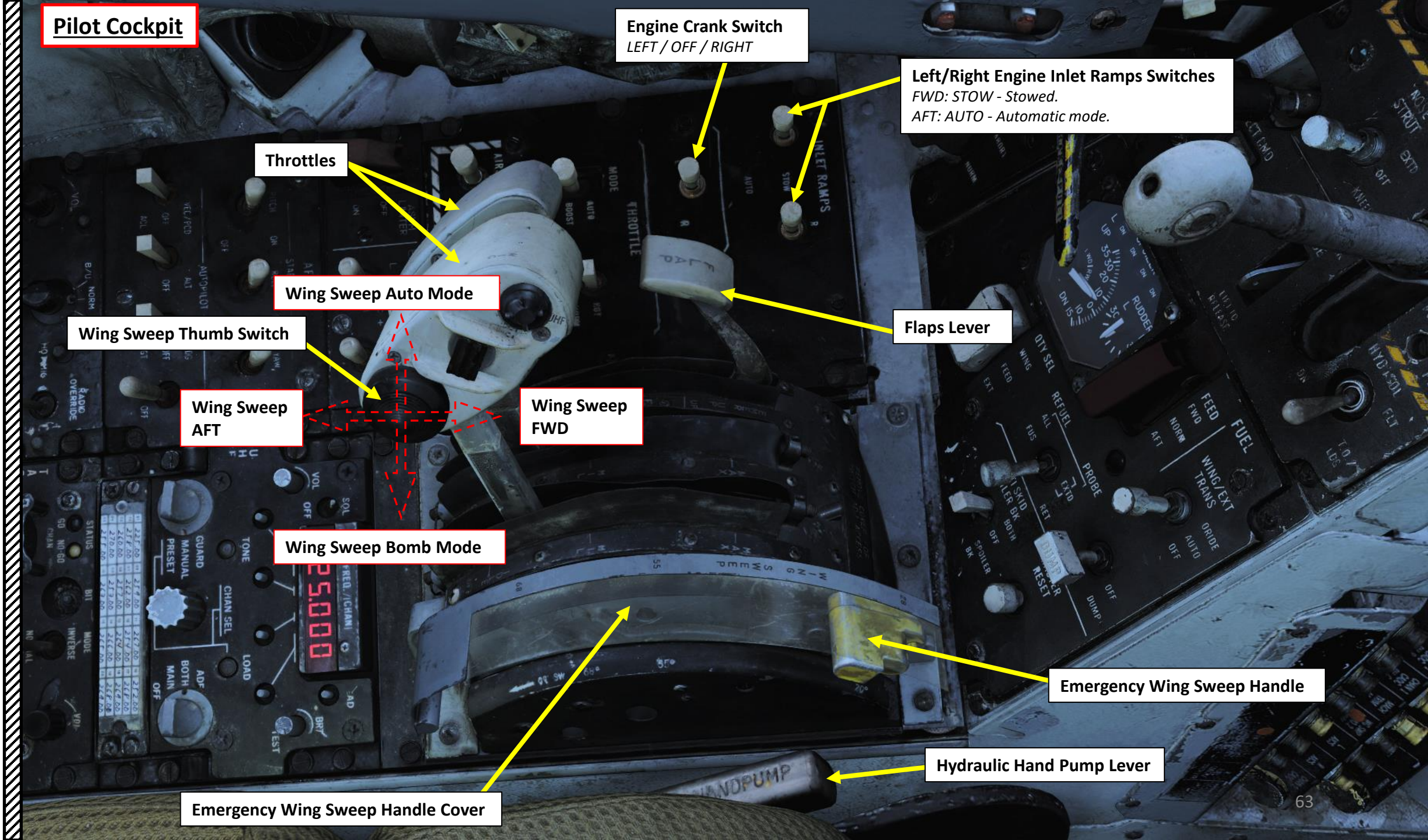
Refuel Probe Switch
- ***ALL EXTD*** *- All extended, extends refueling probe and allows refueling of all tanks. Also resets WING/EXT TRANS switch to AUTO.*
- ***FUS EXTD*** *- Fuselage extended, extends refueling probe and allows refueling of only fuselage tanks.*
- ***RET*** *- Retracted, retracts refueling probe.*

Fuel Dump Switch
Allows fuel dump when speed brakes are retracted, afterburner off and weight off wheels.

Anti-Skid Spoiler Brakes switch
- ***BOTH*** *- Enables both anti-skid and spoiler brake function with weight on wheels.*
- ***OFF*** *- Turns off both systems.*
- ***SPOILER BK*** *- Spoiler brake, enables spoiler brake function with weight on wheels.*

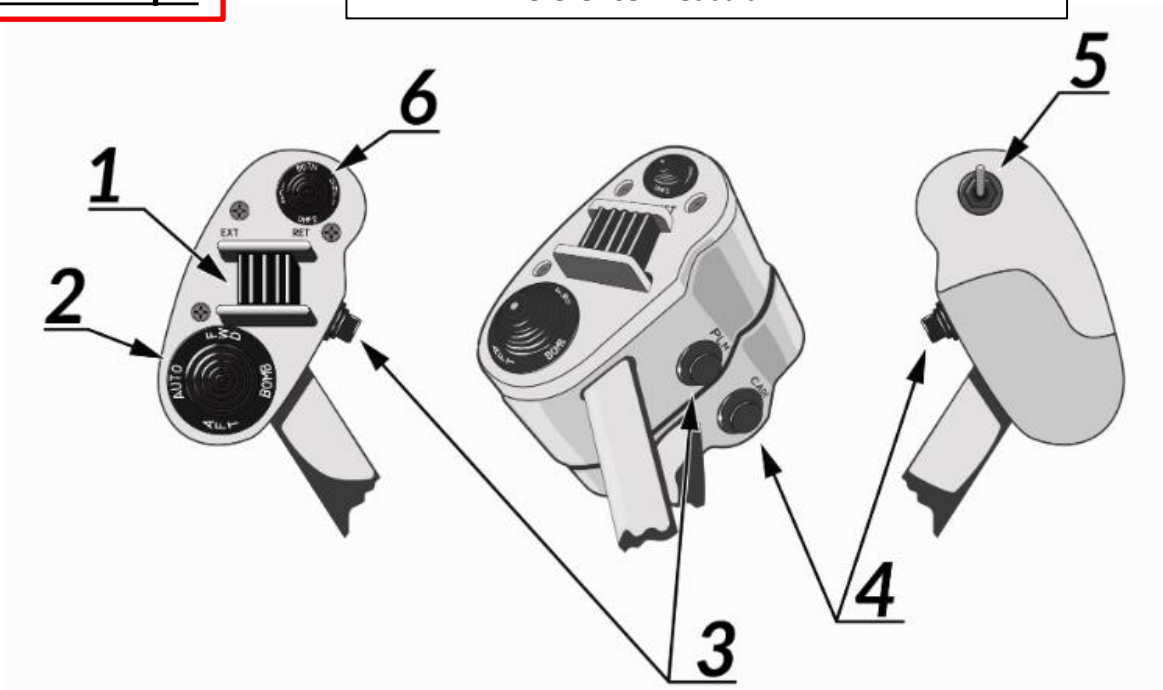
Master Reset button
Resets CADC failure detection system and associated fault displays.

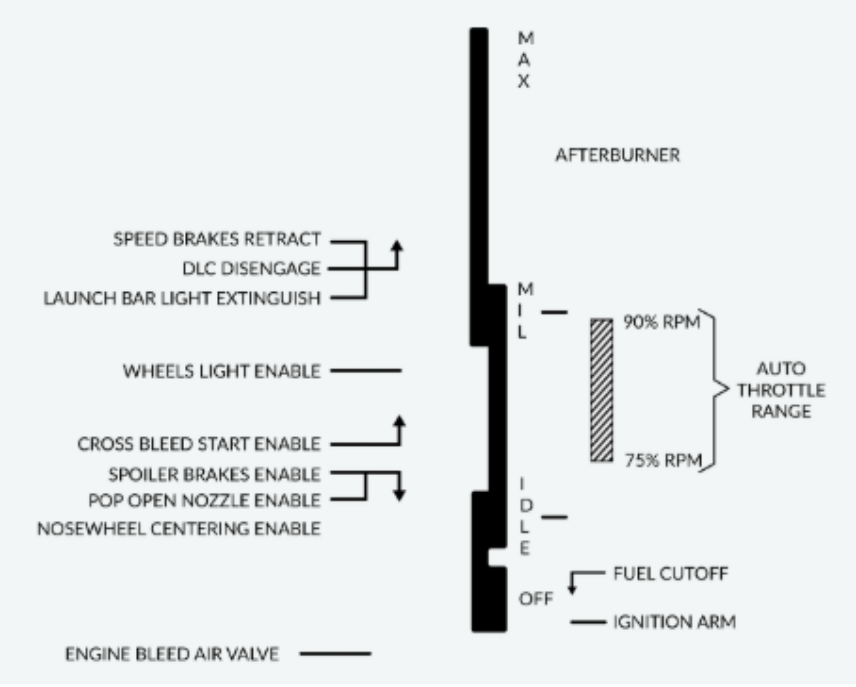
Pilot Cockpit



Pilot Cockpit

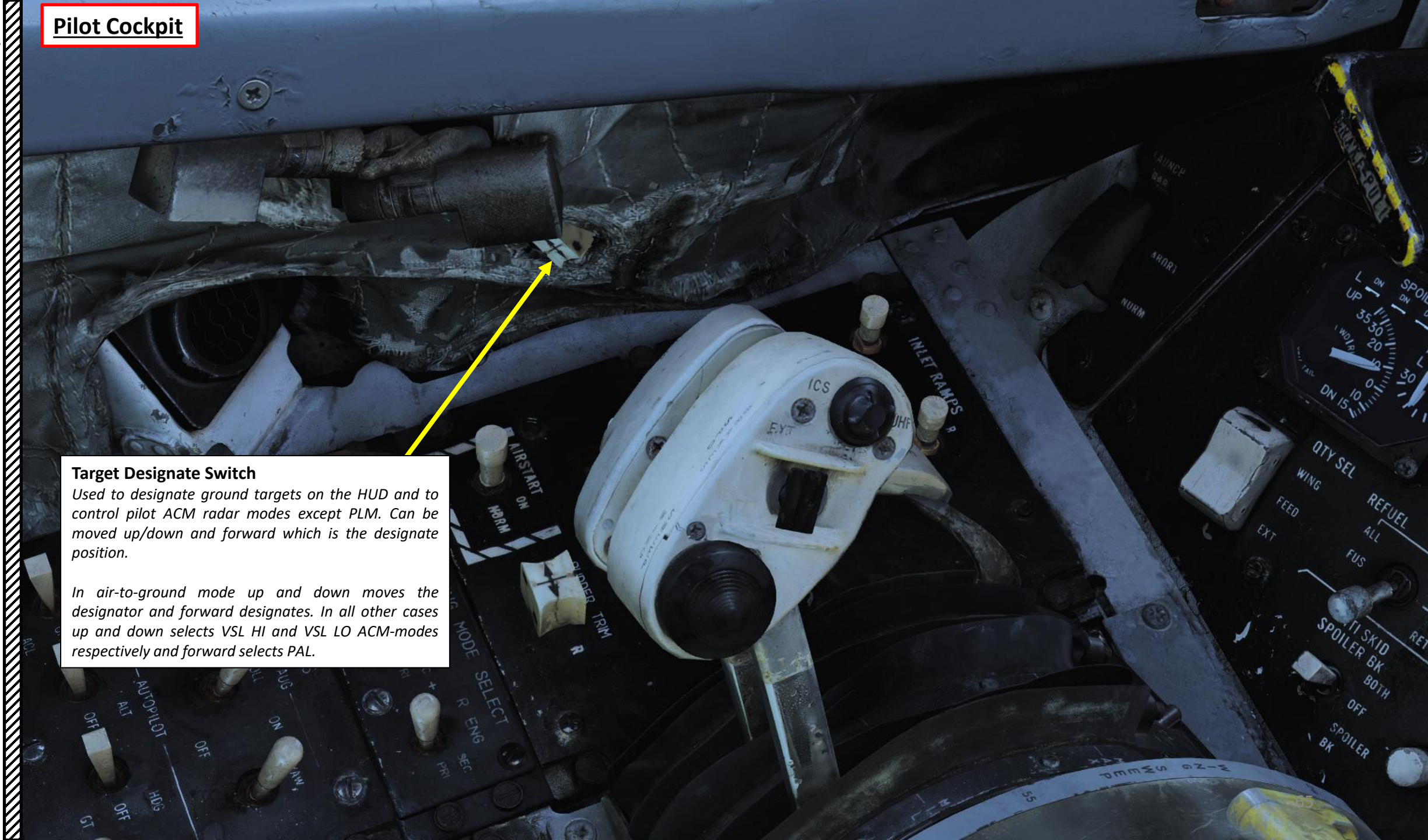
Reference: Heatblur F-14 Wiki





Throttle Control	Function
1.Speed brake switch	Switch controlling extension of the speed brake. EXT - Momentary position returning to center when released. Incrementally extends speed brake while held. Speed brake remains in position it's at when released. RET - Toggle position retracting speed brake.
2.Wing-sweep switch	Switch controlling wing-sweep function. Manual mode only allows positions aft of CADC set position. AUTO - Wing-sweep automatically set by CADC. FWD - Sweeps wings forward manually. AFT - Sweeps wings aft manually. BOMB - Sets wing-sweep to 55° if forwards of that. When the CADC position is aft of 55° it will follow that setting instead.
3.PLM button	Button used to command pilot lockon mode (PLM) of AWG-9. Also used to disengage autopilot while in ACL.
4.CAGE/SEAM button	Button used to command CAGE/SEAM to AIM-9 initiating lockon. Also used to disengage APC when in use.
5.Exterior light switch	Switch used to control exterior lights. OFF disable all exterior lights and increases approach light intensity. ON enables all exterior lights and dims approach lights.
6.ICS PTT switch	Switch allowing pilot to key one or both radios and intercommunication to RIO. ICS - Keys intercommunication to RIO. BOTH - Keys both UHF 1 and V/UHF 2 for transmission. UHF1 - Keys UHF 1 for transmission. UHF2 - Keys V/UHF 2 for transmission.

Pilot Cockpit

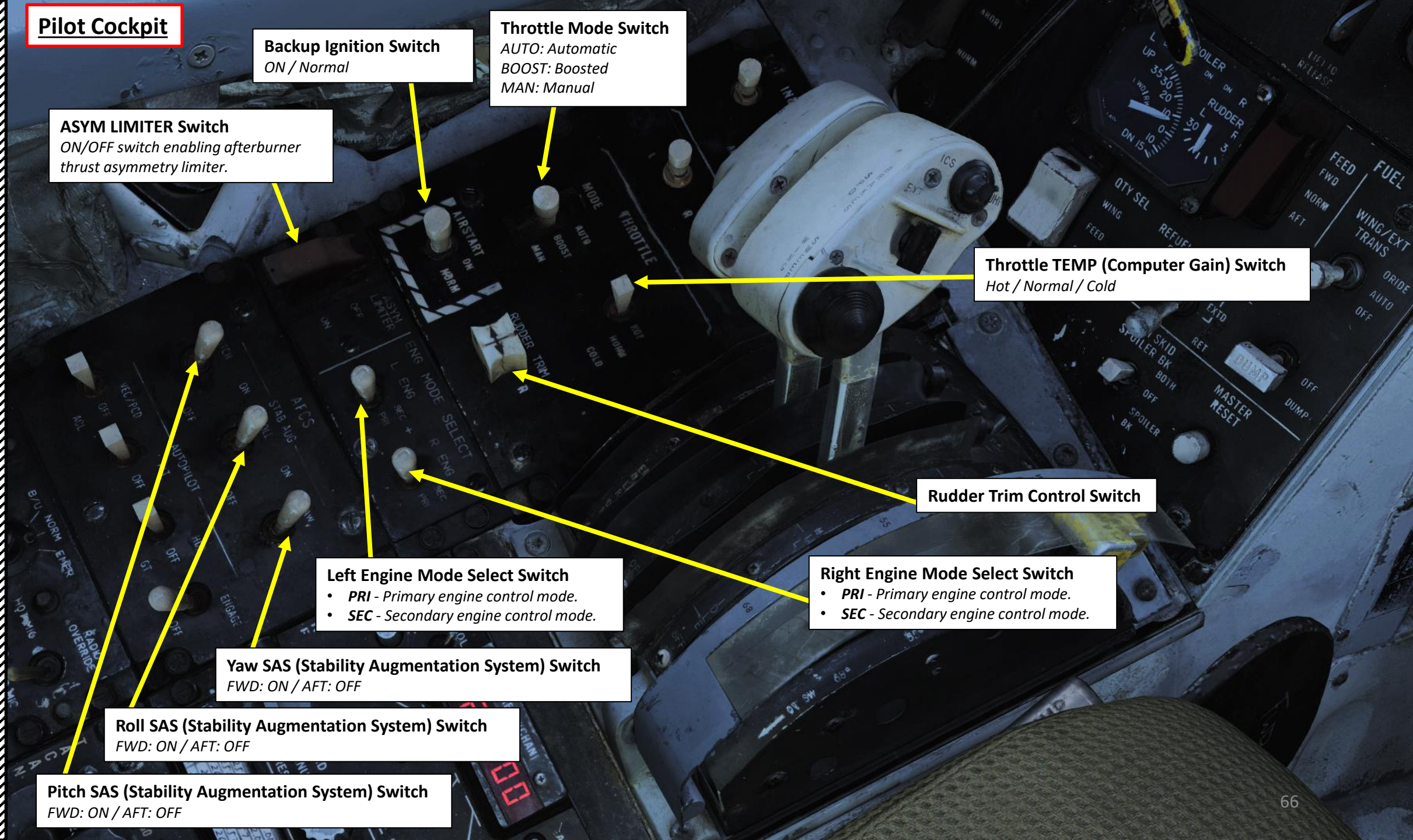


Target Designate Switch

Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.

Pilot Cockpit



Backup Ignition Switch
ON / Normal

Throttle Mode Switch
AUTO: Automatic
BOOST: Boosted
MAN: Manual

ASYM LIMITER Switch
ON/OFF switch enabling afterburner thrust asymmetry limiter.

Throttle TEMP (Computer Gain) Switch
Hot / Normal / Cold

Rudder Trim Control Switch

Left Engine Mode Select Switch
- ***PRI*** *- Primary engine control mode.*
- ***SEC*** *- Secondary engine control mode.*

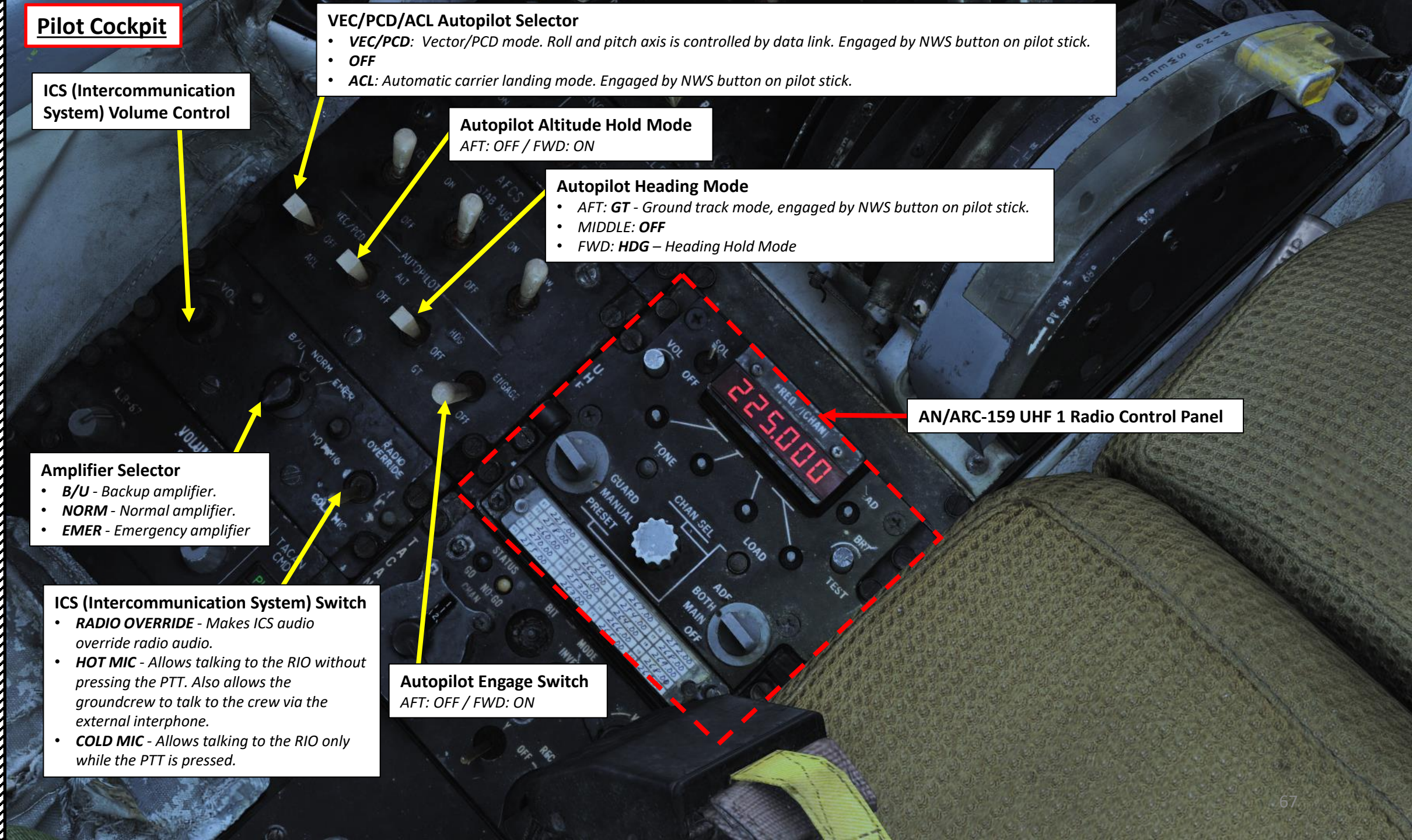
Right Engine Mode Select Switch
- ***PRI*** *- Primary engine control mode.*
- ***SEC*** *- Secondary engine control mode.*

Yaw SAS (Stability Augmentation System) Switch
FWD: ON / AFT: OFF

Roll SAS (Stability Augmentation System) Switch
FWD: ON / AFT: OFF

Pitch SAS (Stability Augmentation System) Switch
FWD: ON / AFT: OFF

Pilot Cockpit



VEC/PCD/ACL Autopilot Selector
- ***VEC/PCD***: *Vector/PCD mode. Roll and pitch axis is controlled by data link. Engaged by NWS button on pilot stick.*
- ***OFF***
- ***ACL***: *Automatic carrier landing mode. Engaged by NWS button on pilot stick.*

ICS (Intercommunication System) Volume Control

Autopilot Altitude Hold Mode
AFT: OFF / FWD: ON

Autopilot Heading Mode
- *AFT:* ***GT*** *- Ground track mode, engaged by NWS button on pilot stick.*
- *MIDDLE:* ***OFF***
- *FWD:* ***HDG*** *– Heading Hold Mode*

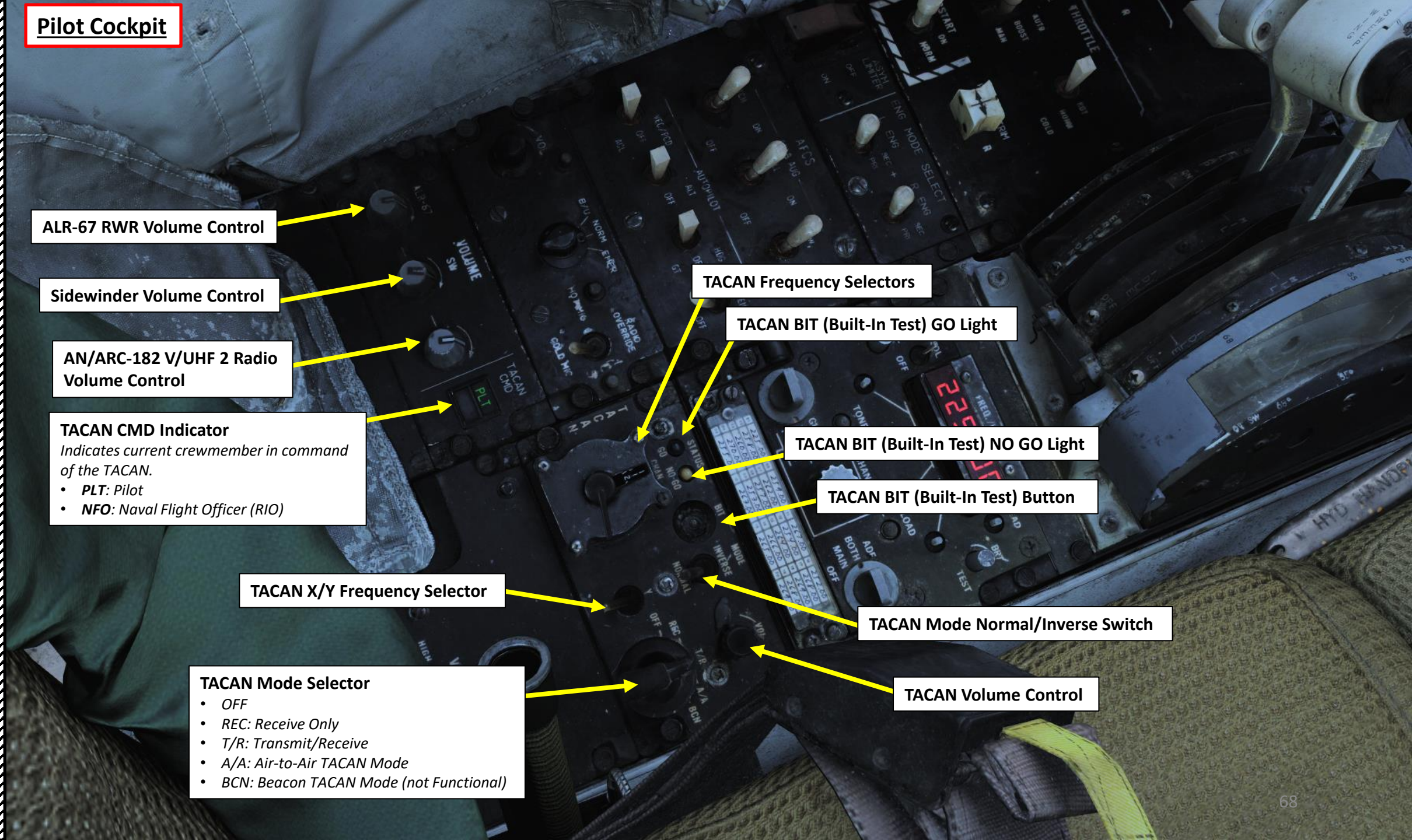
AN/ARC-159 UHF 1 Radio Control Panel

Amplifier Selector
- ***B/U*** *- Backup amplifier.*
- ***NORM*** *- Normal amplifier.*
- ***EMER*** *- Emergency amplifier*

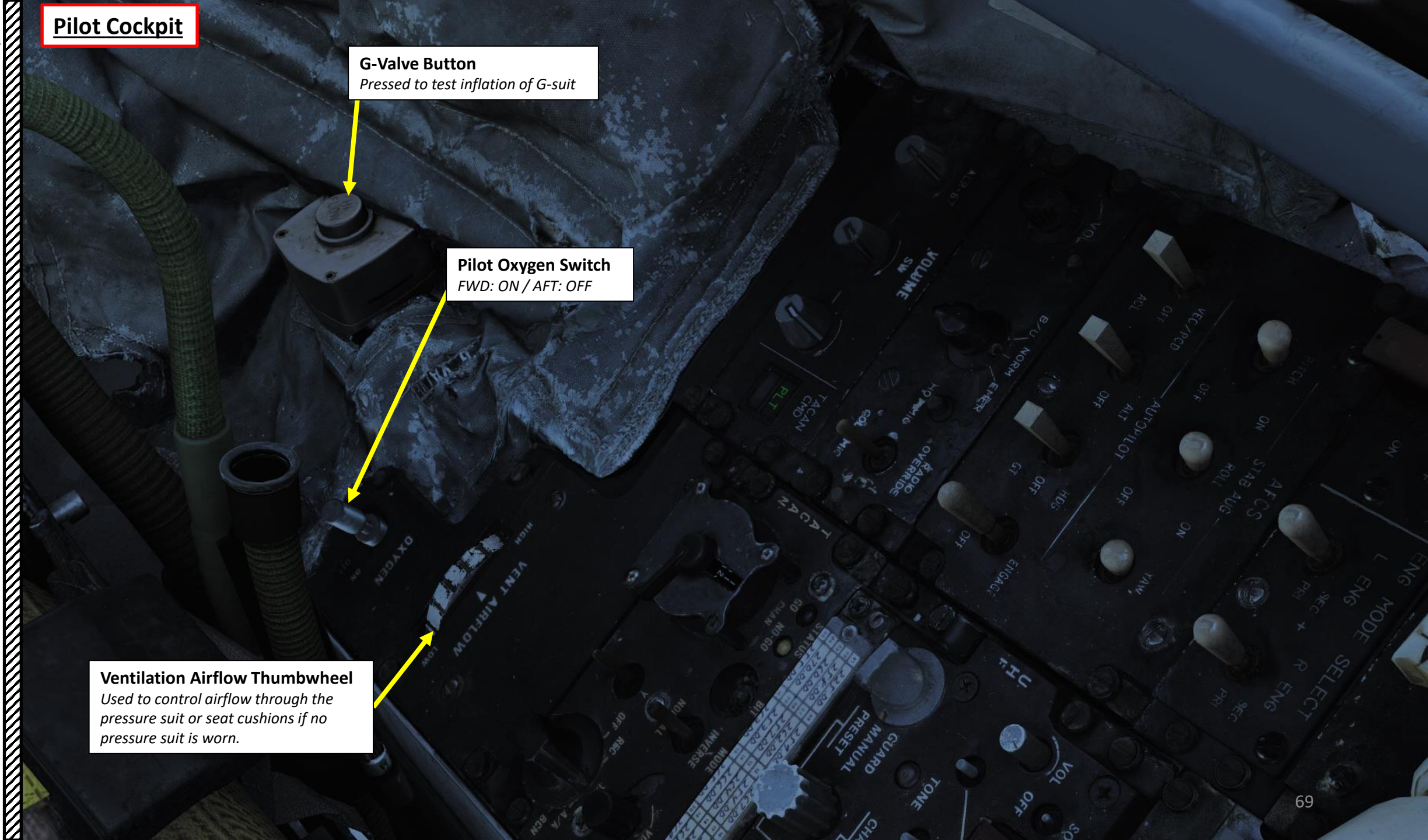
ICS (Intercommunication System) Switch
- ***RADIO OVERRIDE*** *- Makes ICS audio override radio audio.*
- ***HOT MIC*** *- Allows talking to the RIO without pressing the PTT. Also allows the groundcrew to talk to the crew via the external interphone.*
- ***COLD MIC*** *- Allows talking to the RIO only while the PTT is pressed.*

Autopilot Engage Switch
AFT: OFF / FWD: ON

Pilot Cockpit



Pilot Cockpit



Pilot Cockpit



Pilot Cockpit



Pilot Cockpit



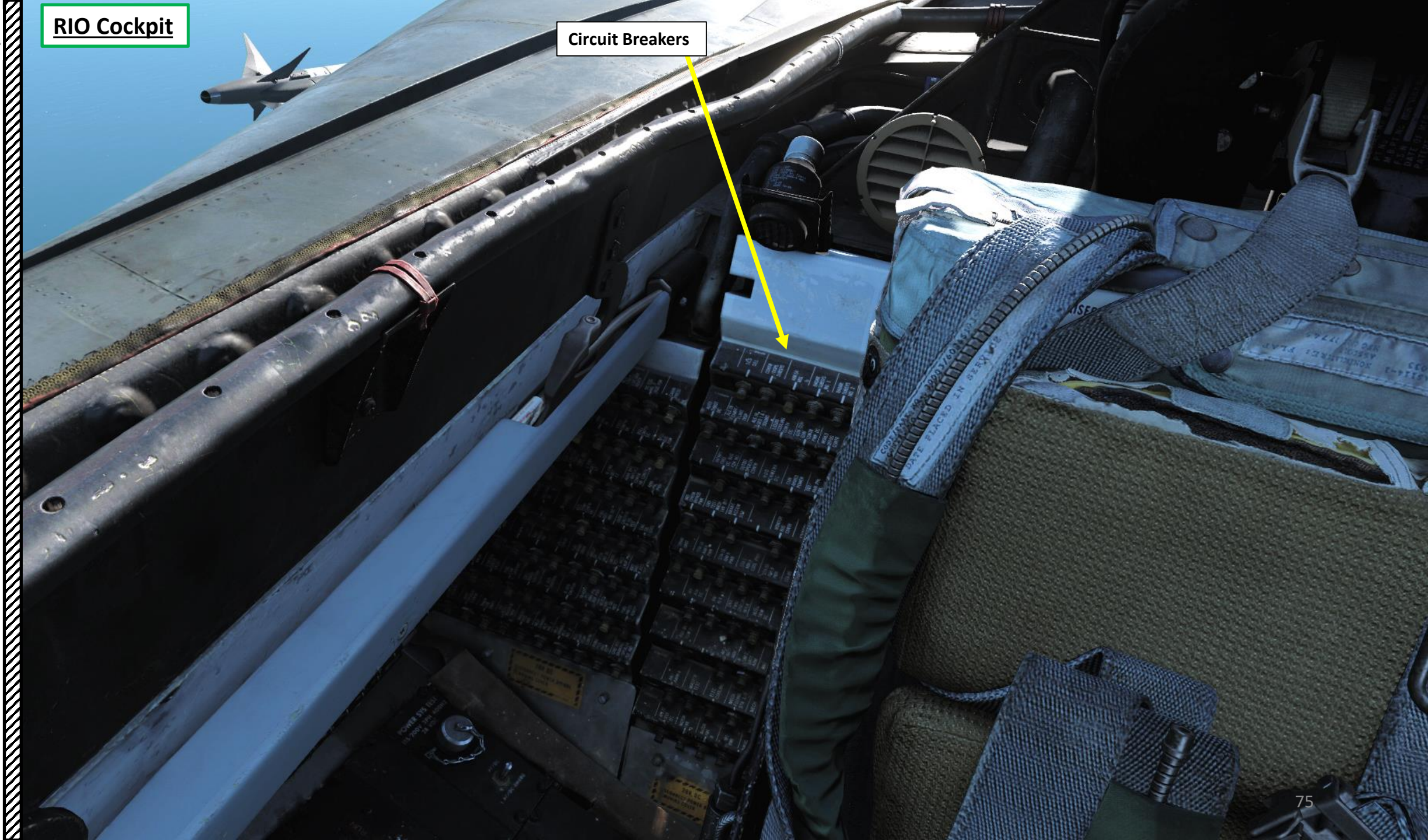
RIO Cockpit



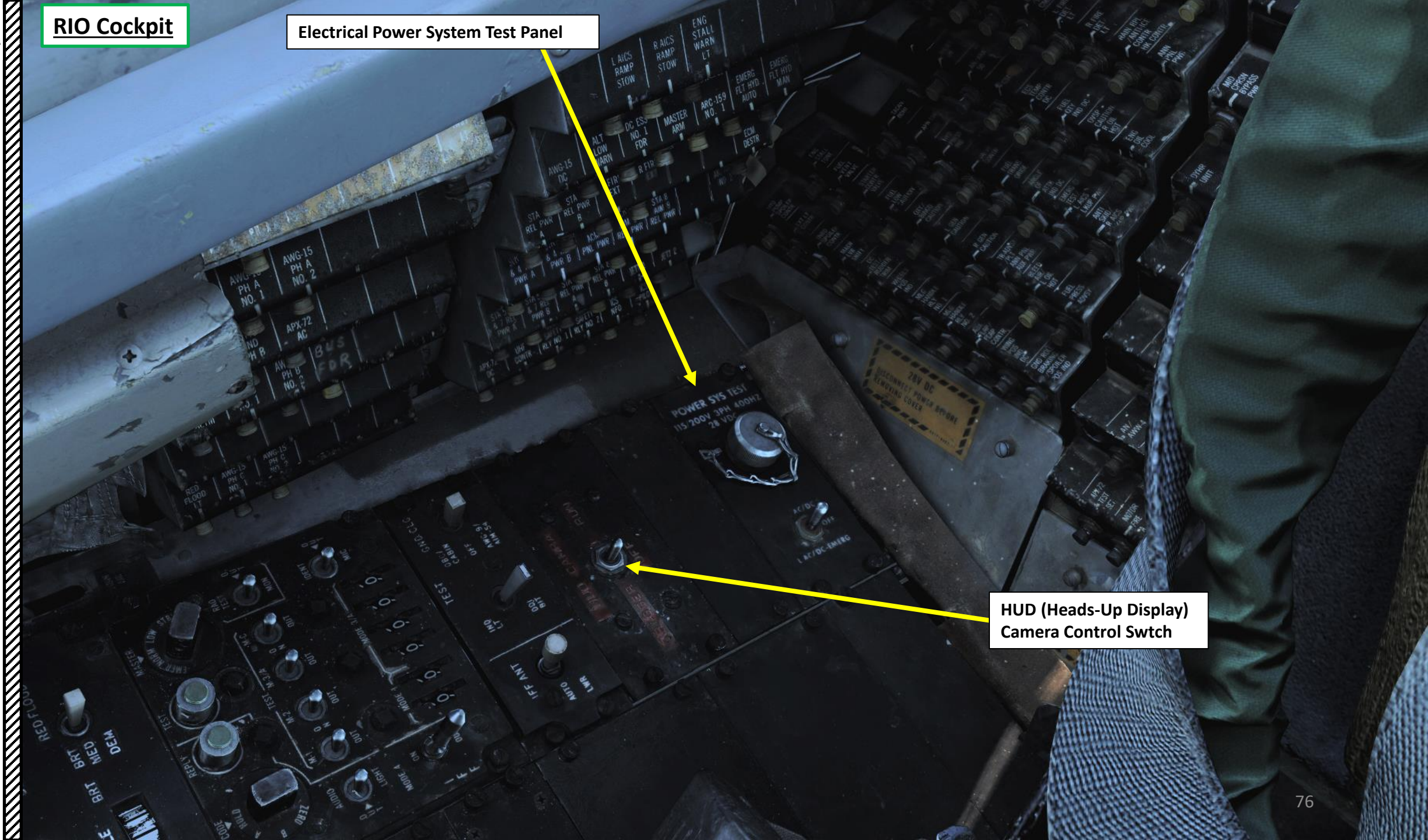
RIO Cockpit



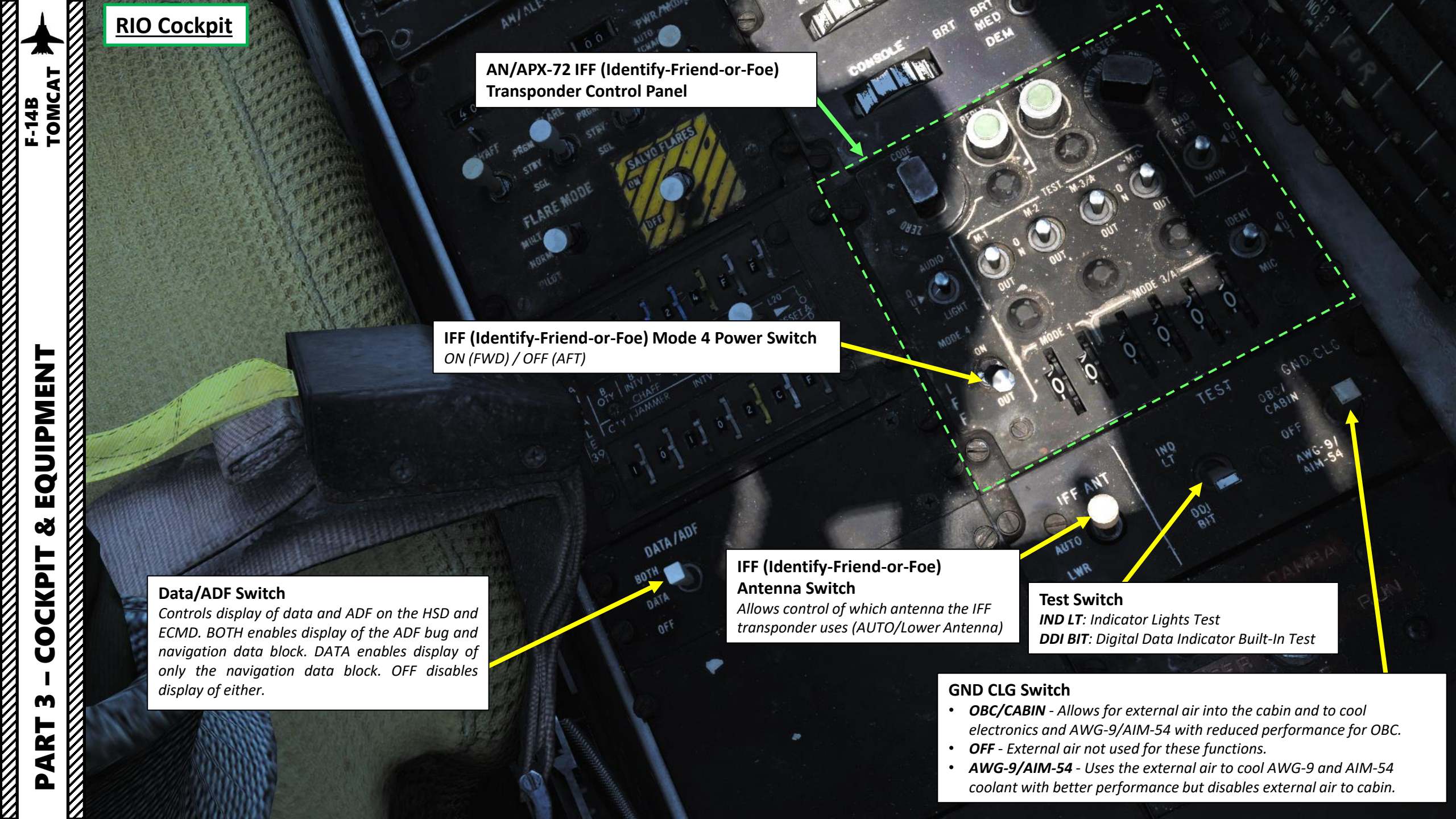
RIO Cockpit



RIO Cockpit


Electrical Power System Test Panel
HUD (Heads-Up Display) Camera Control Swtch

RIO Cockpit



AN/APX-72 IFF (Identify-Friend-or-Foe) Transponder Control Panel

IFF (Identify-Friend-or-Foe) Mode 4 Power Switch
ON (FWD) / OFF (AFT)

Data/ADF Switch
Controls display of data and ADF on the HSD and ECMD. BOTH enables display of the ADF bug and navigation data block. DATA enables display of only the navigation data block. OFF disables display of either.

IFF (Identify-Friend-or-Foe) Antenna Switch
Allows control of which antenna the IFF transponder uses (AUTO/Lower Antenna)

Test Switch
***IND LT**: Indicator Lights Test*
***DDI BIT**: Digital Data Indicator Built-In Test*

GND CLG Switch
- ***OBC/CABIN** - Allows for external air into the cabin and to cool electronics and AWG-9/AIM-54 with reduced performance for OBC.*
- ***OFF** - External air not used for these functions.*
- ***AWG-9/AIM-54** - Uses the external air to cool AWG-9 and AIM-54 coolant with better performance but disables external air to cabin.*

RIO Cockpit

Flare Program - Quantity Thumbwheel
Sets quantity of flares to be released in a program.

Chaff Program Thumbwheels

- ***B QTY**: Quantity, sets quantity of chaff to release in one program salvo, can also be set to C (continuous) or R (random).*
- ***B INTV**: Interval (sec), sets interval between chaff burst to release in one program salvo, can also be set to R (random).*
- ***S QTY**: Quantity, selects number of salvoes to release in a program.*
- ***S INTV**: Interval (sec), selects interval between salvoes in a program.*

AN/ALE-37 Programmer Reset Switch

LOAD Control Thumbwheels
Thumbwheels inputting into AN/ALE-39 what is loaded into each launcher subsection.

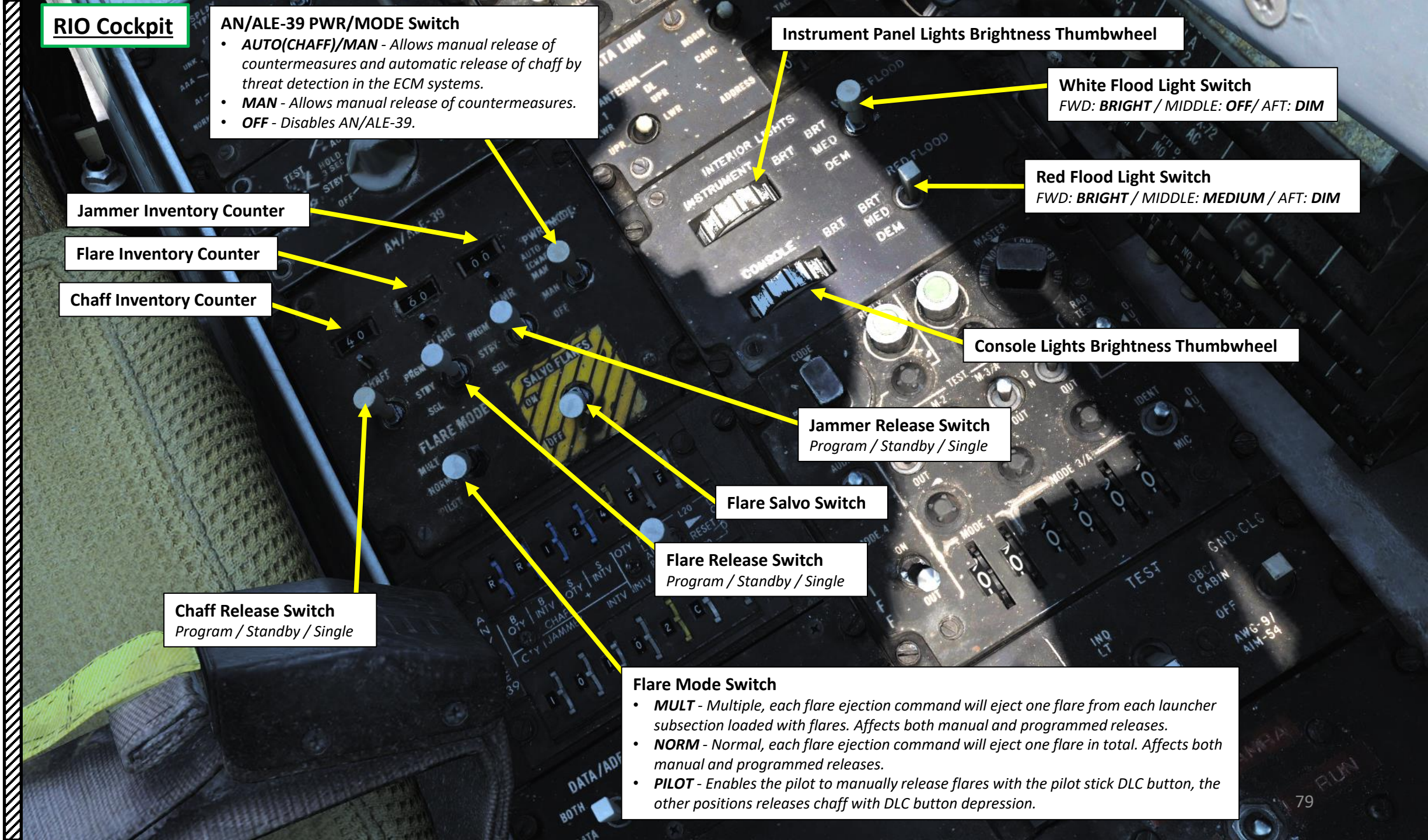
- ***L10** - Sets loaded countermeasure in Left 10 subsection.*
- ***L20** - Sets loaded countermeasure in Left 20 subsection.*
- ***R10** - Sets loaded countermeasure in Right 10 subsection.*
- ***R20** - Sets loaded countermeasure in Right 20 subsection.*

AN/ALE-39 Countermeasures Program Panel

Flare Program - Interval Thumbwheel
Sets interval between flare releases in a program (sec)

Jammer Program Thumbwheels
Quantity / Interval Hundreds (sec) / Interval Tens (sec) / Interval Units (sec)

RIO Cockpit



AN/ALE-39 PWR/MODE Switch
- ***AUTO(CHAFF)/MAN*** *- Allows manual release of countermeasures and automatic release of chaff by threat detection in the ECM systems.*
- ***MAN*** *- Allows manual release of countermeasures.*
- ***OFF*** *- Disables AN/ALE-39.*

Instrument Panel Lights Brightness Thumbwheel

White Flood Light Switch
FWD: ***BRIGHT*** */ MIDDLE:* ***OFF*** */ AFT:* ***DIM***

Red Flood Light Switch
FWD: ***BRIGHT*** */ MIDDLE:* ***MEDIUM*** */ AFT:* ***DIM***

Jammer Inventory Counter

Flare Inventory Counter

Chaff Inventory Counter

Console Lights Brightness Thumbwheel

Jammer Release Switch
Program / Standby / Single

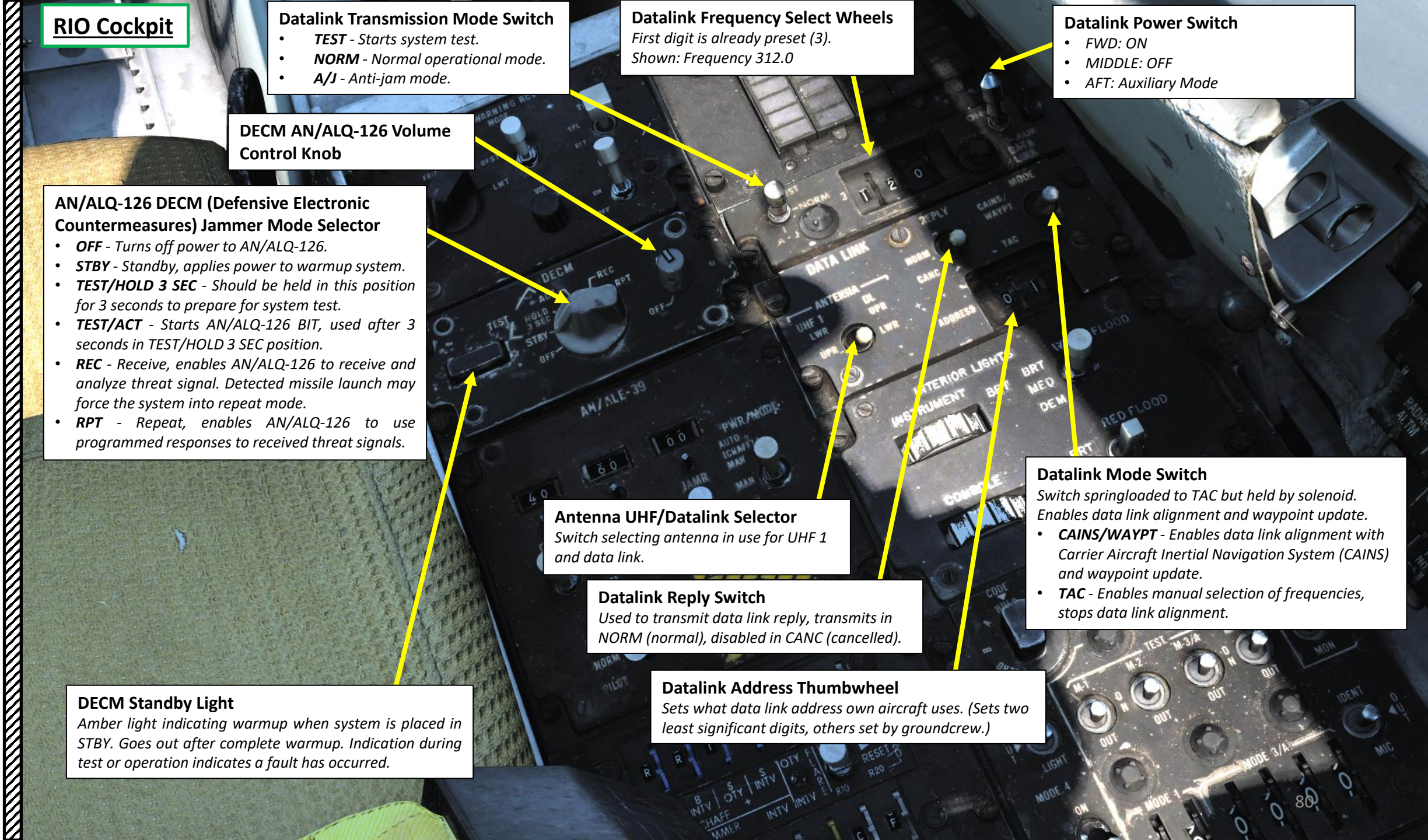
Flare Salvo Switch

Flare Release Switch
Program / Standby / Single

Chaff Release Switch
Program / Standby / Single

Flare Mode Switch
- ***MULT*** *- Multiple, each flare ejection command will eject one flare from each launcher subsection loaded with flares. Affects both manual and programmed releases.*
- ***NORM*** *- Normal, each flare ejection command will eject one flare in total. Affects both manual and programmed releases.*
- ***PILOT*** *- Enables the pilot to manually release flares with the pilot stick DLC button, the other positions releases chaff with DLC button depression.*

RIO Cockpit



Datalink Transmission Mode Switch
- ***TEST*** *- Starts system test.*
- ***NORM*** *- Normal operational mode.*
- ***A/J*** *- Anti-jam mode.*

Datalink Frequency Select Wheels
First digit is already preset (3).
Shown: Frequency 312.0

Datalink Power Switch
- *FWD: ON*
- *MIDDLE: OFF*
- *AFT: Auxiliary Mode*

DECM AN/ALQ-126 Volume Control Knob

AN/ALQ-126 DECM (Defensive Electronic Countermeasures) Jammer Mode Selector
- ***OFF*** *- Turns off power to AN/ALQ-126.*
- ***STBY*** *- Standby, applies power to warmup system.*
- ***TEST/HOLD 3 SEC*** *- Should be held in this position for 3 seconds to prepare for system test.*
- ***TEST/ACT*** *- Starts AN/ALQ-126 BIT, used after 3 seconds in TEST/HOLD 3 SEC position.*
- ***REC*** *- Receive, enables AN/ALQ-126 to receive and analyze threat signal. Detected missile launch may force the system into repeat mode.*
- ***RPT*** *- Repeat, enables AN/ALQ-126 to use programmed responses to received threat signals.*

Antenna UHF/Datalink Selector
Switch selecting antenna in use for UHF 1 and data link.

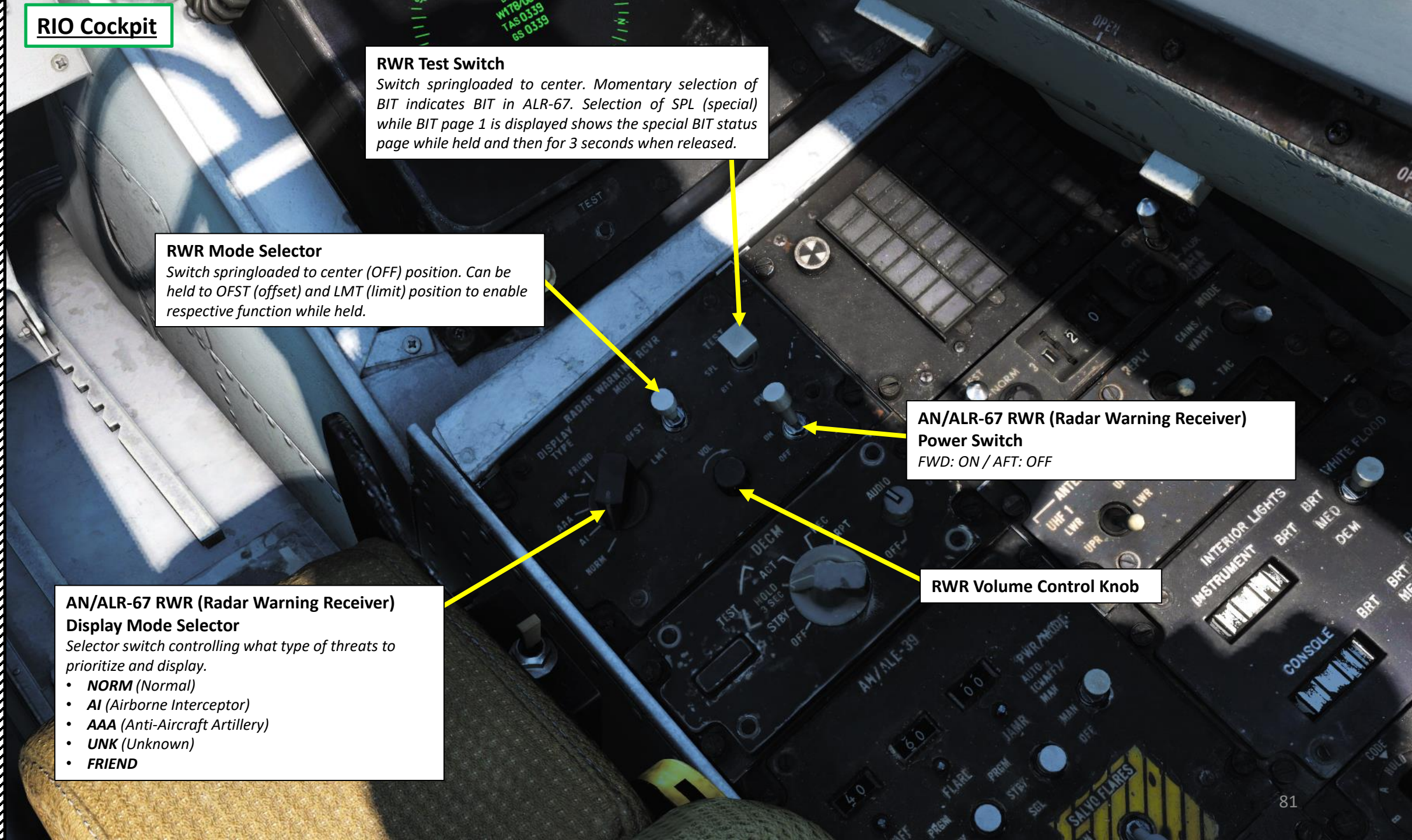
Datalink Reply Switch
Used to transmit data link reply, transmits in NORM (normal), disabled in CANC (cancelled).

Datalink Mode Switch
Switch springloaded to TAC but held by solenoid. Enables data link alignment and waypoint update.
- ***CAINS/WAYPT*** *- Enables data link alignment with Carrier Aircraft Inertial Navigation System (CAINS) and waypoint update.*
- ***TAC*** *- Enables manual selection of frequencies, stops data link alignment.*

Datalink Address Thumbwheel
Sets what data link address own aircraft uses. (Sets two least significant digits, others set by groundcrew.)

DECM Standby Light
Amber light indicating warmup when system is placed in STBY. Goes out after complete warmup. Indication during test or operation indicates a fault has occurred.

RIO Cockpit



RWR Test Switch
Switch springloaded to center. Momentary selection of BIT indicates BIT in ALR-67. Selection of SPL (special) while BIT page 1 is displayed shows the special BIT status page while held and then for 3 seconds when released.

RWR Mode Selector
Switch springloaded to center (OFF) position. Can be held to OFST (offset) and LMT (limit) position to enable respective function while held.

AN/ALR-67 RWR (Radar Warning Receiver) Power Switch
FWD: ON / AFT: OFF

RWR Volume Control Knob

AN/ALR-67 RWR (Radar Warning Receiver) Display Mode Selector
Selector switch controlling what type of threats to prioritize and display.

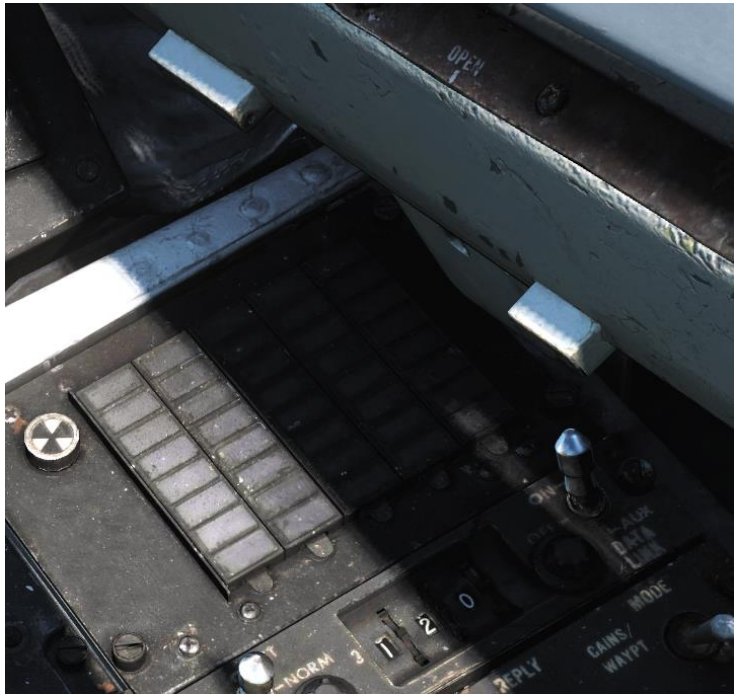
- ***NORM*** *(Normal)*
- ***AI*** *(Airborne Interceptor)*
- ***AAA*** *(Anti-Aircraft Artillery)*
- ***UNK*** *(Unknown)*
- ***FRIEND***

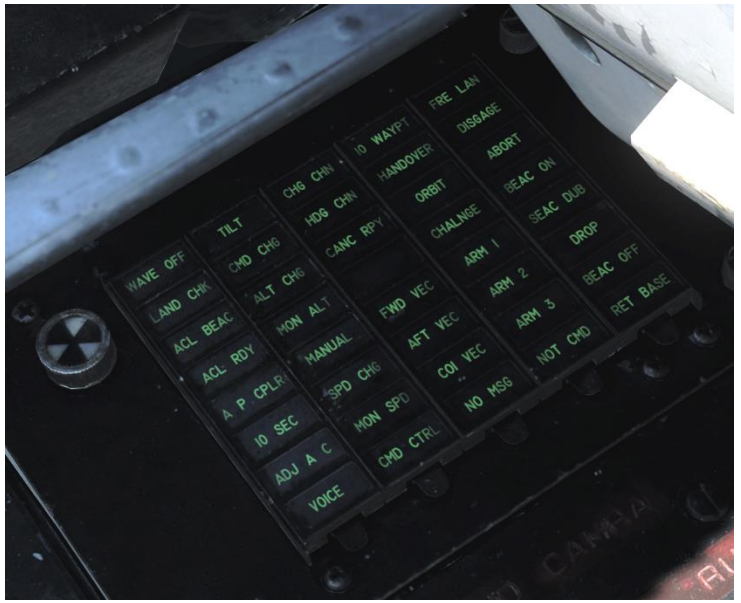
RIO Cockpit

DDI (Digital Data Indicator)

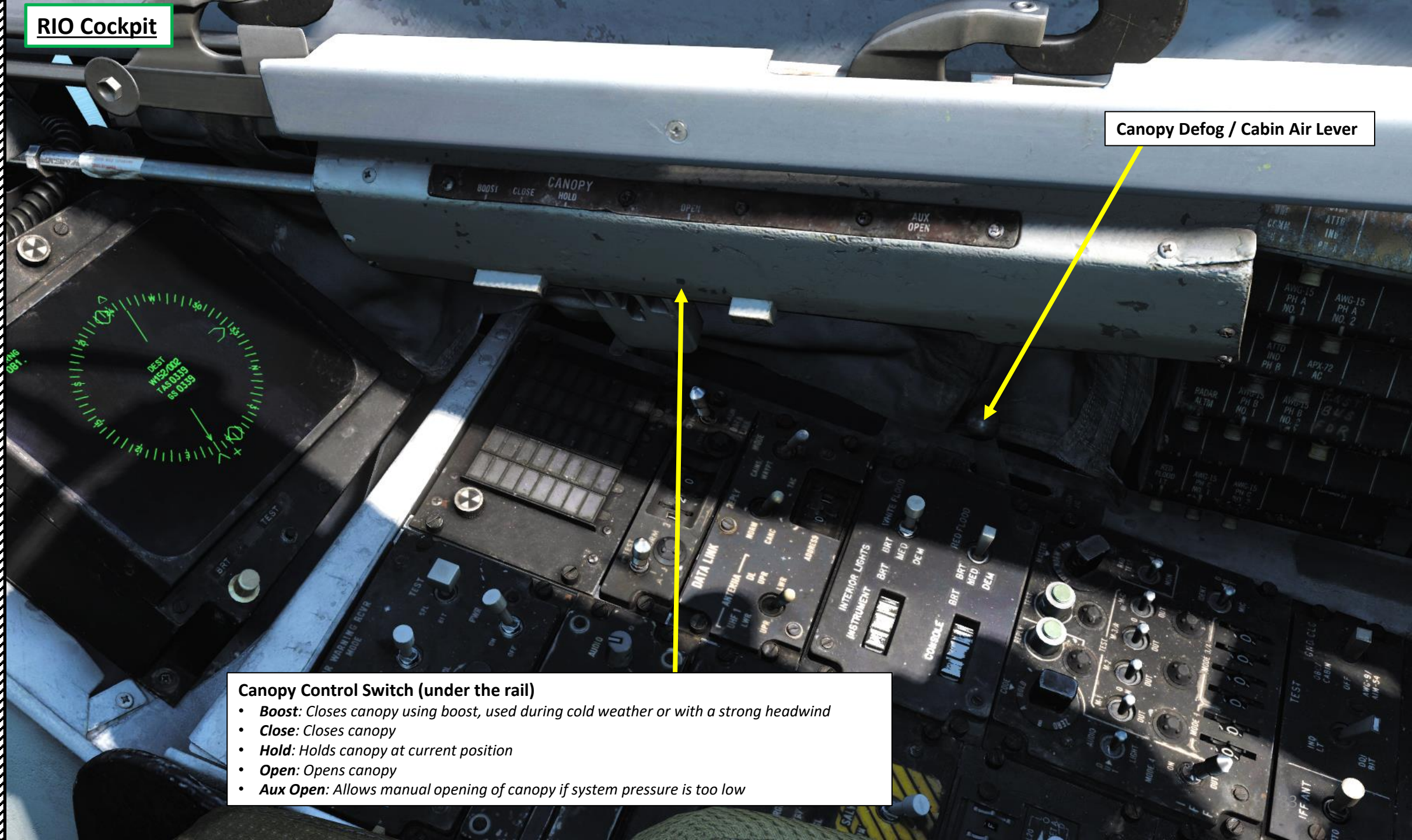
Displays commands received via Datalink

WAVE OFF: Automatic AFCS disengagement	**TILT**: No datalink message received in last 10 sec. In ACL, indicates no messages in last 2 seconds, will disengage AFCS.	**CMD CHN**: Command to change datalink channel	**TO WAY PT**: Proceed to the point being indicated by target information.	**FRE LAN**: Free to attack most suitable target
LAND CHK: CATCC has datalink channel available for AFCS	**CMD CHG**: Imminent or recently changed command instructions	**HDG CHN**: Imminent or recently changed heading command	**HANDOVER**: TDS is handing own aircraft over to another control center	**DISGAGE**: Cease fire, Disengage.
ACL BEAC: Directed by carrier to enable APN-154 beacon	**ALT CHG**: Imminent or recently changed altitude command	**CANC RPY**: TDS (Tactical Data System) has cancelled reply messages	**ORBIT**: Assume orbit at present position maintaining maximum endurance	**ABORT**: Abort action.
ACL RDY: Automatic Carrier Landing system has locked onto aircraft APN-154 beacon and is transmitting in zero pitch and bank signals. Glideslope information is now available to pilot.	**MON ALT**: Altitude command not being followed with enough precision – you need to monitor altitude.	-	**CHALNGE**: Intercept and visually identify (challenge) target	**BEAC ON**: Enable APN-154 tracking beacon.
A P CPLR: Automatic Carrier Landing system is ready to take control of aircraft for ACL approach, autopilot should be engaged	**MANUAL**: Autopilot should not be engaged.	**FWD VEC**: Aircraft is being vectored to approach target from the front hemisphere	**ARM 1**: Intercept and destroy indicated hostile target using AIM-54	**BEAC DUB**: Set APN-154 to double-pulse mode.
10 SEC: Indicates 10 seconds to next action or waypoint. In ACL, indicates that ships motion is taken into account for ACL.	**SPD CHG**: Imminent or recently changed speed command	**AFT VEC**: Aircraft is being vectored to approach target from the rear hemisphere	**ARM 2**: Intercept and destroy indicated hostile target using AIM-7	**DROP**: Command to release weapon in data link A/G attack, manually or automatically if in datalink attack mode.
ADJ A C: Indication from control station of another adjacent aircraft near own aircraft	**MON SPD**: Speed command not being followed with enough precision – you need to monitor airspeed.	**COI VEC**: Aircraft is being vectored on a collision course to target	**ARM 3**: Intercept and destroy indicated hostile target using AIM-9	**BEAC OFF**: Turn off APN-154 tracking beacon.
VOICE: Indicates ACL not available, switch to voice procedures	**CMD CTRL**: Aircraft under datalink control for landing	**NO MSG**: No message at this time. Indicates presence of datalink communication while not receiving a command.	**NOT CMD**: Ignore currently received heading, speed and altitude.	**RET BASE**: Return to indicated home base.





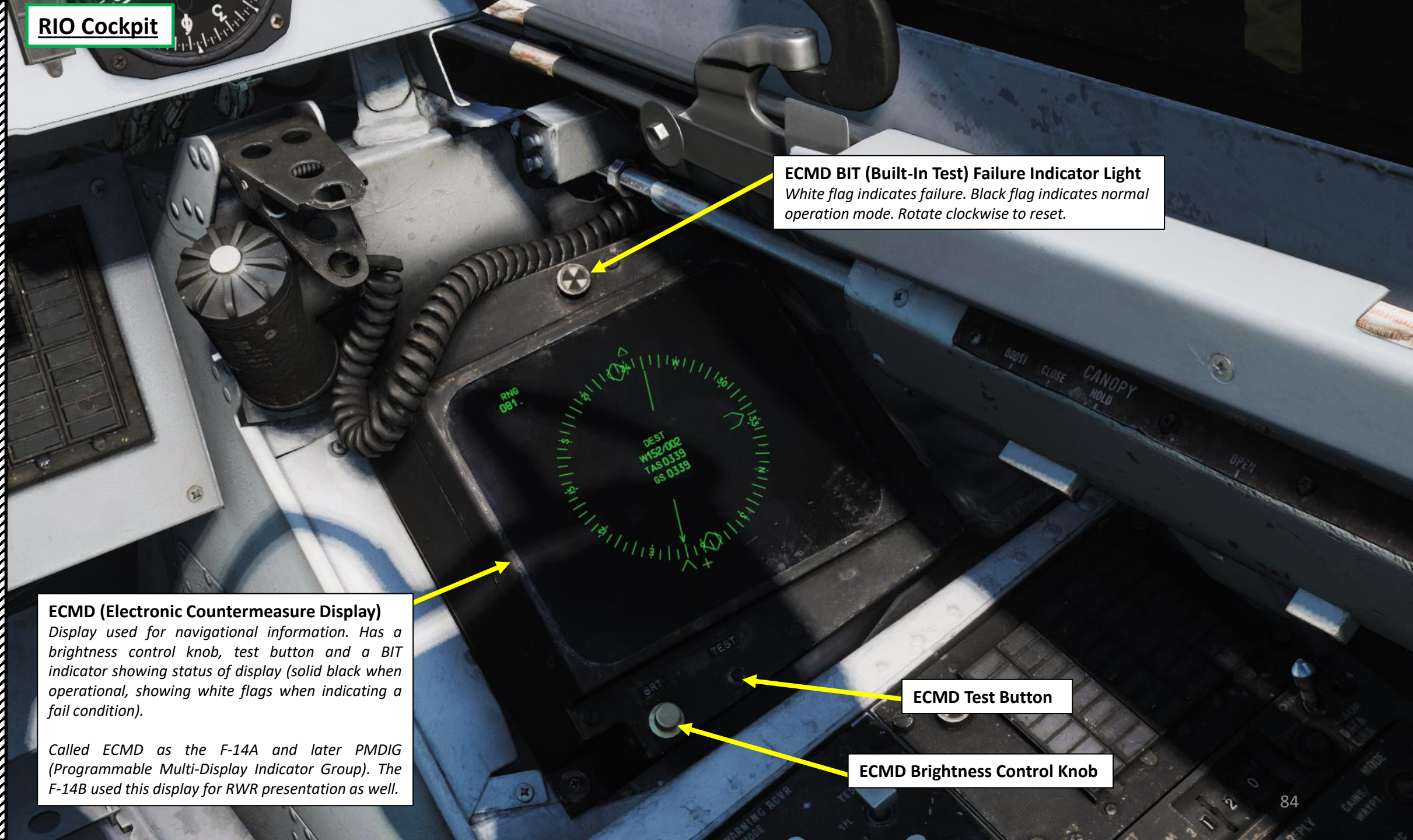
RIO Cockpit



Canopy Control Switch (under the rail)

- ***Boost****: Closes canopy using boost, used during cold weather or with a strong headwind*
- ***Close****: Closes canopy*
- ***Hold****: Holds canopy at current position*
- ***Open****: Opens canopy*
- ***Aux Open****: Allows manual opening of canopy if system pressure is too low*

RIO Cockpit



ECMD BIT (Built-In Test) Failure Indicator Light
White flag indicates failure. Black flag indicates normal operation mode. Rotate clockwise to reset.

ECMD (Electronic Countermeasure Display)
Display used for navigational information. Has a brightness control knob, test button and a BIT indicator showing status of display (solid black when operational, showing white flags when indicating a fail condition).

Called ECMD as the F-14A and later PMDIG (Programmable Multi-Display Indicator Group). The F-14B used this display for RWR presentation as well.

ECMD Test Button

ECMD Brightness Control Knob

RIO Cockpit


Caution/Advisory Indicator
RNG
081
DEST
W152/002
TAS 0339
GS 0339
BRT
TEST
BOOST
CLOSE
CANOPY
HOLD
OPEN
RADAR WARNING RCVR
MODE
DISPLAY
TYPE

RIO Cockpit

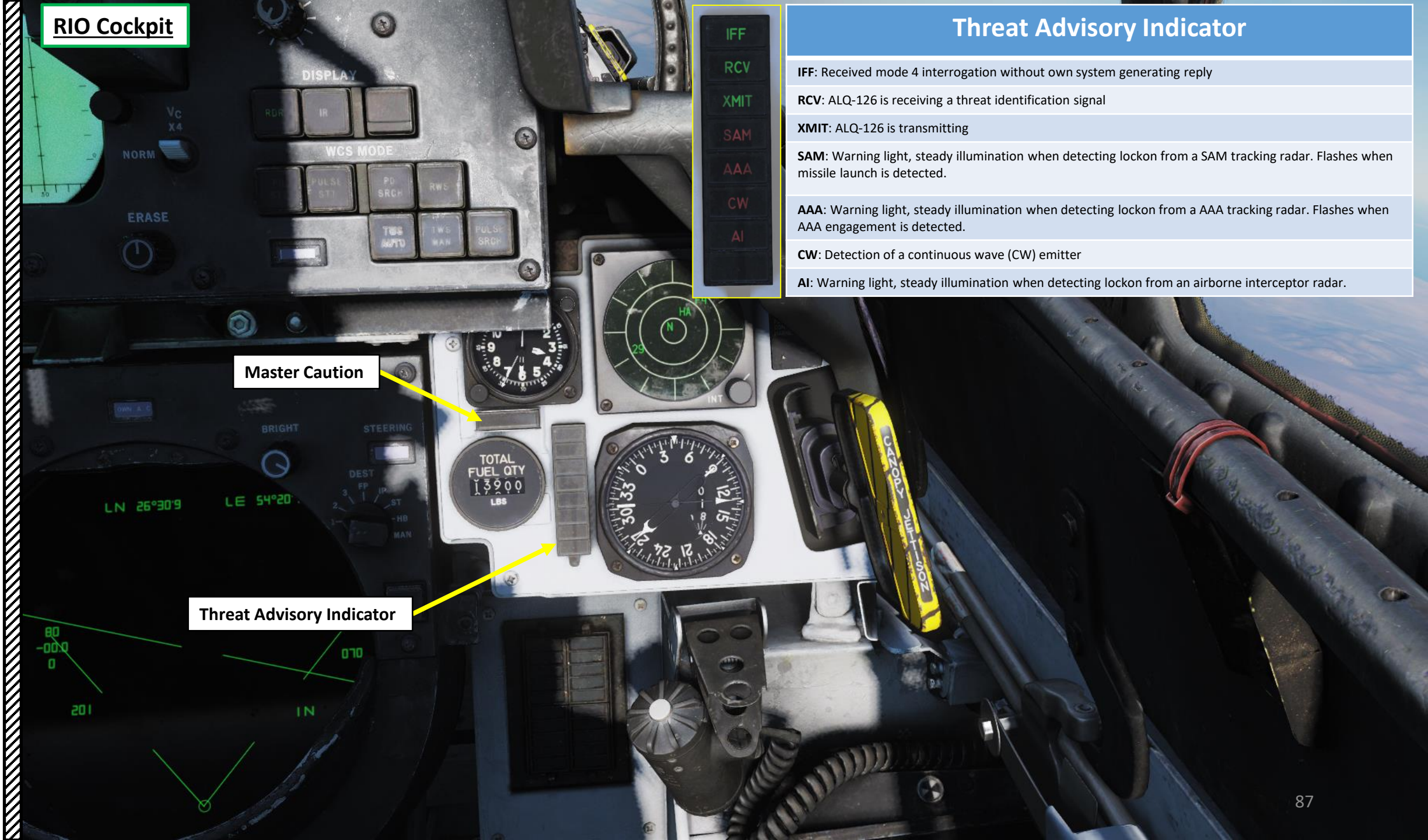




Caution/Advisory Indicator

C & D HOT: Overheat in RIO controls and displays	-
-	**CABIN PRESS**: Cabin pressure is too low
FUEL LOW: Fuel below 1000 lbs in either aft and left or forward and right fuel feed groups.	**OXY LOW**: Oxygen quantity is below 2 liters or pressure too low.
CANOPY: Canopy not down and locked	**FUSE HV**: AWW-4 electric fuse inoperative
RDR ENABLED: Caution light indicating that radar operation with weight on wheels is possible.	-
COOLING AIR: Overtemperature condition in the electronic forced air cooling system	-
MSL COND: Overtemperature or underpressure in missile coolant flow. Can also indicate that the LIQ COOLING switch is not in the AWG-9/AIM-54 position with the WCS in STBY or ON when the Phoenix fairing are installed	**AWG 9 COND**: Overheat or overpressure in AWG-9 coolant flow or overtemperature switch has shut down the coolant pump
-	**NAV COMP**: Failure in INS or CSDC with the NAV MODE switch in INS
FILM LOW: Low remaining quantity of mission recorder film	**IMU**: Failure in Inertial Measuring Unit or navigation system is in AHRS/AM mode
-	**AHRS**: Attitude or heading information from AHRS is unreliable

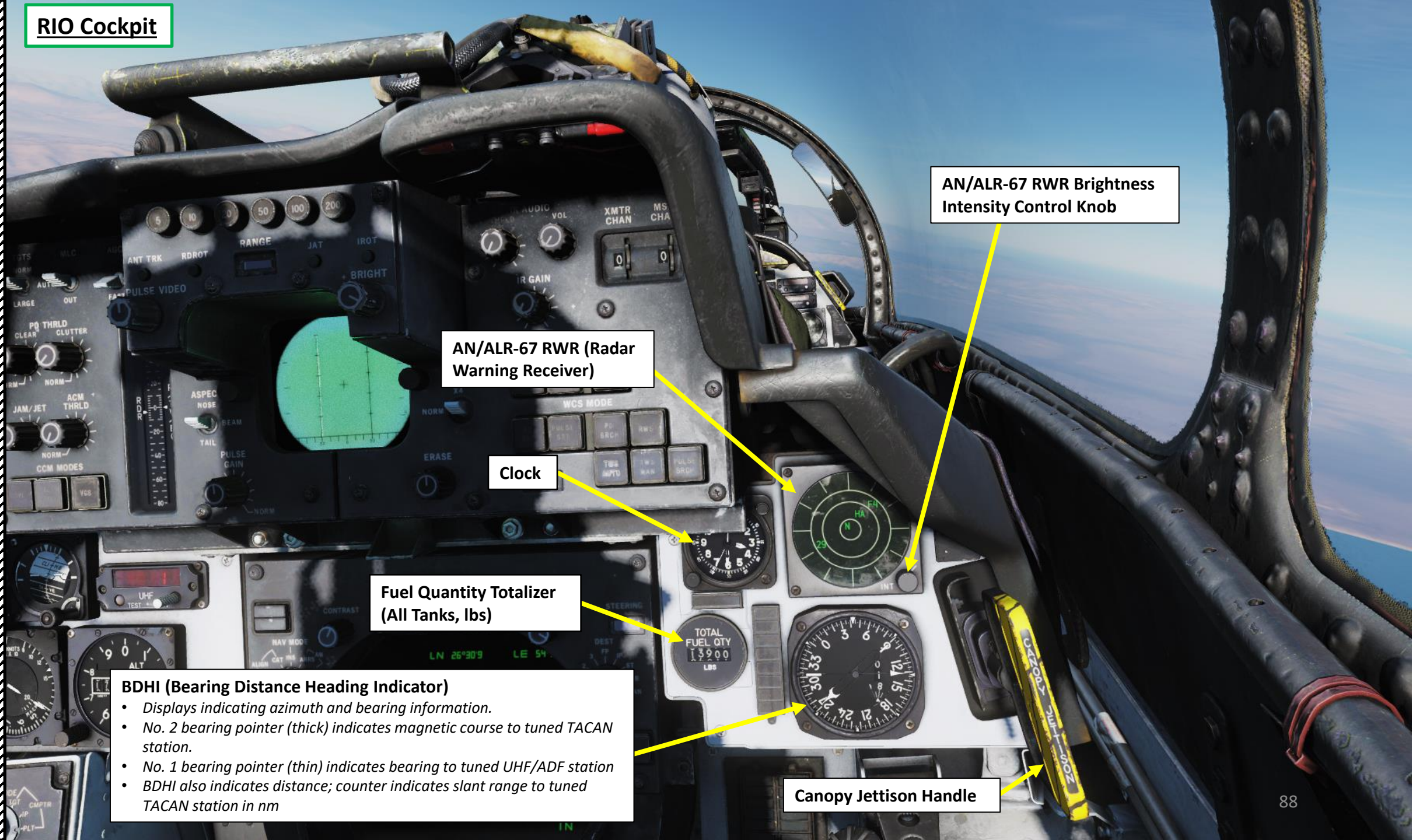
RIO Cockpit



Threat Advisory Indicator

IFF: Received mode 4 interrogation without own system generating reply
RCV: ALQ-126 is receiving a threat identification signal
XMIT: ALQ-126 is transmitting
SAM: Warning light, steady illumination when detecting lockon from a SAM tracking radar. Flashes when missile launch is detected.
AAA: Warning light, steady illumination when detecting lockon from a AAA tracking radar. Flashes when AAA engagement is detected.
CW: Detection of a continuous wave (CW) emitter
AI: Warning light, steady illumination when detecting lockon from an airborne interceptor radar.

RIO Cockpit

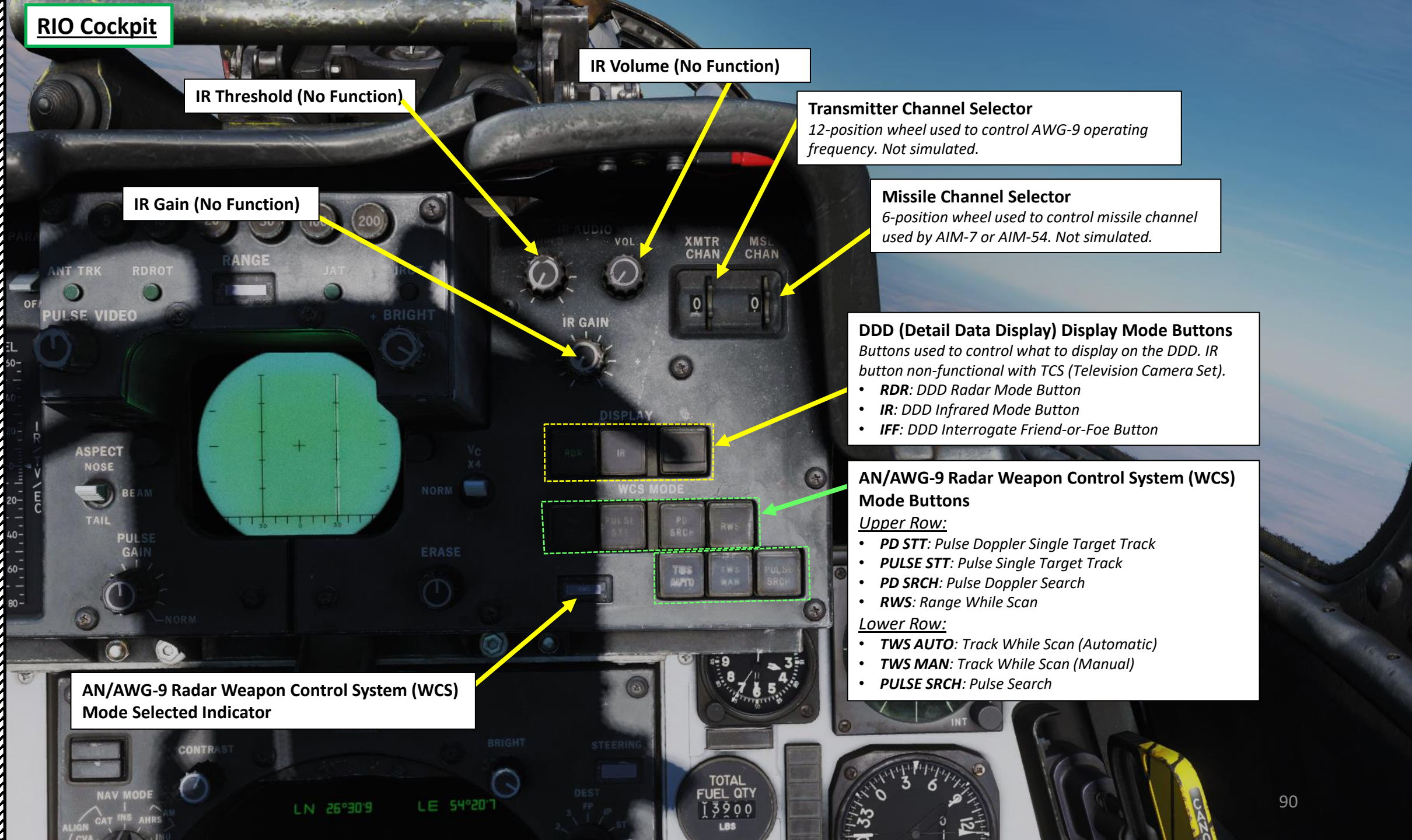

AN/ALR-67 RWR Brightness Intensity Control Knob
AN/ALR-67 RWR (Radar Warning Receiver)
Clock
Fuel Quantity Totalizer (All Tanks, lbs)
BDHI (Bearing Distance Heading Indicator)
• Displays indicating azimuth and bearing information.
• No. 2 bearing pointer (thick) indicates magnetic course to tuned TACAN station.
• No. 1 bearing pointer (thin) indicates bearing to tuned UHF/ADF station
• BDHI also indicates distance; counter indicates slant range to tuned TACAN station in nm
Canopy Jettison Handle

RIO Cockpit

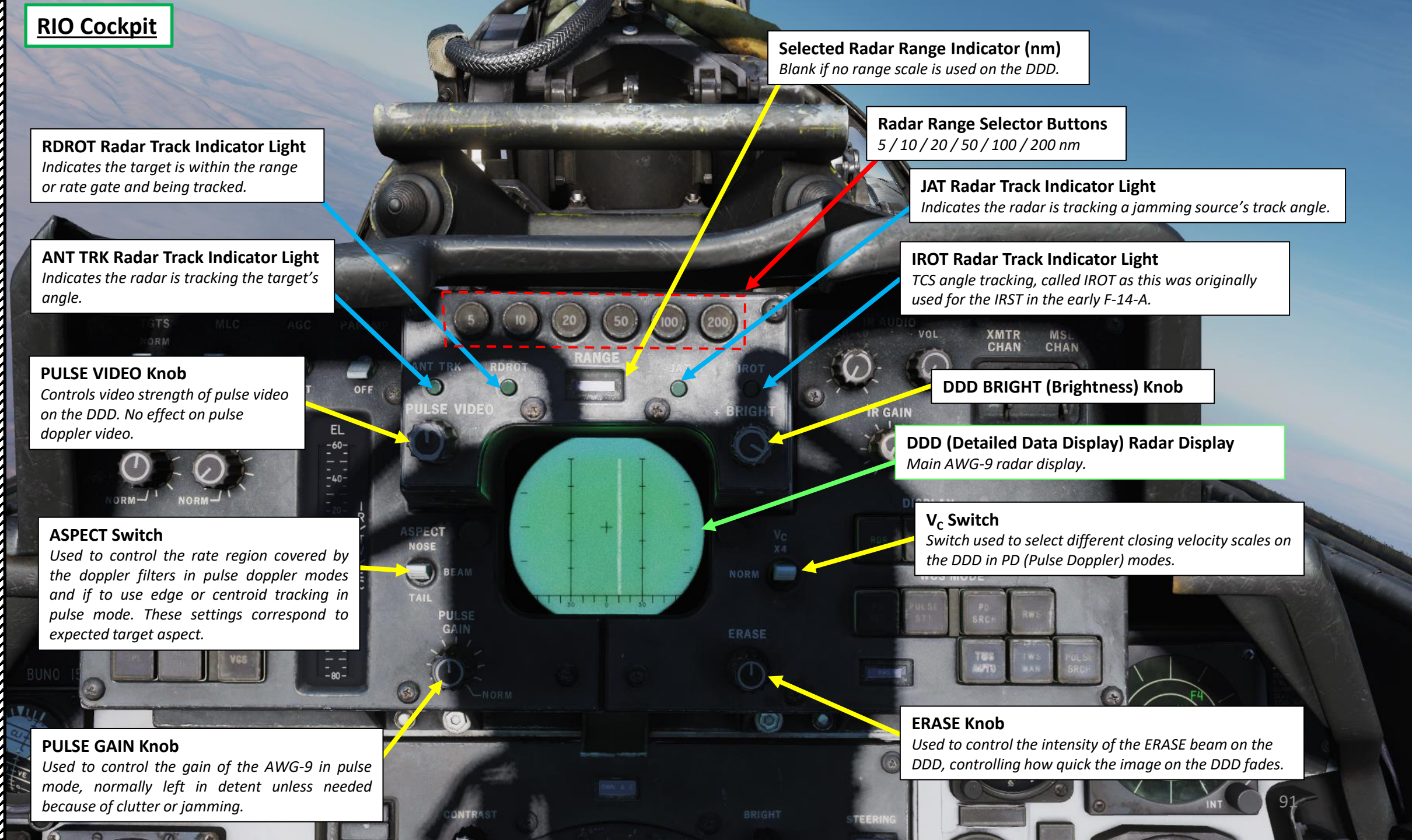
Chaff/Flare Dispense Hat Switch
- *DOWN: Initiates set chaff release program.*
- *UP: Initiates a single chaff release.*
- *LEFT (Outboard): Initiates set flare release program.*
- *RIGHT (Inboard): Initiates set jammer release program.*

Chaff/Flare Dispense Hat Switch
- *DOWN: Initiates set chaff release program.*
- *UP: Initiates a single chaff release.*
- *LEFT (Inboard): Initiates set jammer release program.*
- *RIGHT (Outboard): Initiates set flare release program.*

RIO Cockpit


IR Threshold (No Function)
IR Volume (No Function)
Transmitter Channel Selector
12-position wheel used to control AWG-9 operating frequency. Not simulated.
IR Gain (No Function)
Missile Channel Selector
6-position wheel used to control missile channel used by AIM-7 or AIM-54. Not simulated.
DDD (Detail Data Display) Display Mode Buttons
Buttons used to control what to display on the DDD. IR button non-functional with TCS (Television Camera Set).
RDR: DDD Radar Mode Button
IR: DDD Infrared Mode Button
IFF: DDD Interrogate Friend-or-Foe Button
AN/AWG-9 Radar Weapon Control System (WCS) Mode Buttons
Upper Row:
PD STT: Pulse Doppler Single Target Track
PULSE STT: Pulse Single Target Track
PD SRCH: Pulse Doppler Search
RWS: Range While Scan
Lower Row:
TWS AUTO: Track While Scan (Automatic)
TWS MAN: Track While Scan (Manual)
PULSE SRCH: Pulse Search
AN/AWG-9 Radar Weapon Control System (WCS) Mode Selected Indicator
IR AUDIO
VOL
XMTR CHAN
MSL CHAN
IR GAIN
DISPLAY
WCS MODE
RDR
IR
PULSE STT
PD SRCH
RWS
TWS AUTO
TWS MAN
PULSE SRCH
RANGE
ANT TRK
RDROT
PULSE VIDEO
BRIGHT
ASPECT
NOSE
BEAM
TAIL
PULSE GAIN
NORM
ERASE
CONTRAST
BRIGHT
STEERING
NAV MODE
TOTAL FUEL QTY
13900
LBS

RIO Cockpit



Selected Radar Range Indicator (nm)
Blank if no range scale is used on the DDD.

Radar Range Selector Buttons
5 / 10 / 20 / 50 / 100 / 200 nm

JAT Radar Track Indicator Light
Indicates the radar is tracking a jamming source's track angle.

RDROT Radar Track Indicator Light
Indicates the target is within the range or rate gate and being tracked.

ANT TRK Radar Track Indicator Light
Indicates the radar is tracking the target's angle.

IROT Radar Track Indicator Light
TCS angle tracking, called IROT as this was originally used for the IRST in the early F-14-A.

PULSE VIDEO Knob
Controls video strength of pulse video on the DDD. No effect on pulse doppler video.

DDD BRIGHT (Brightness) Knob

DDD (Detailed Data Display) Radar Display
Main AWG-9 radar display.

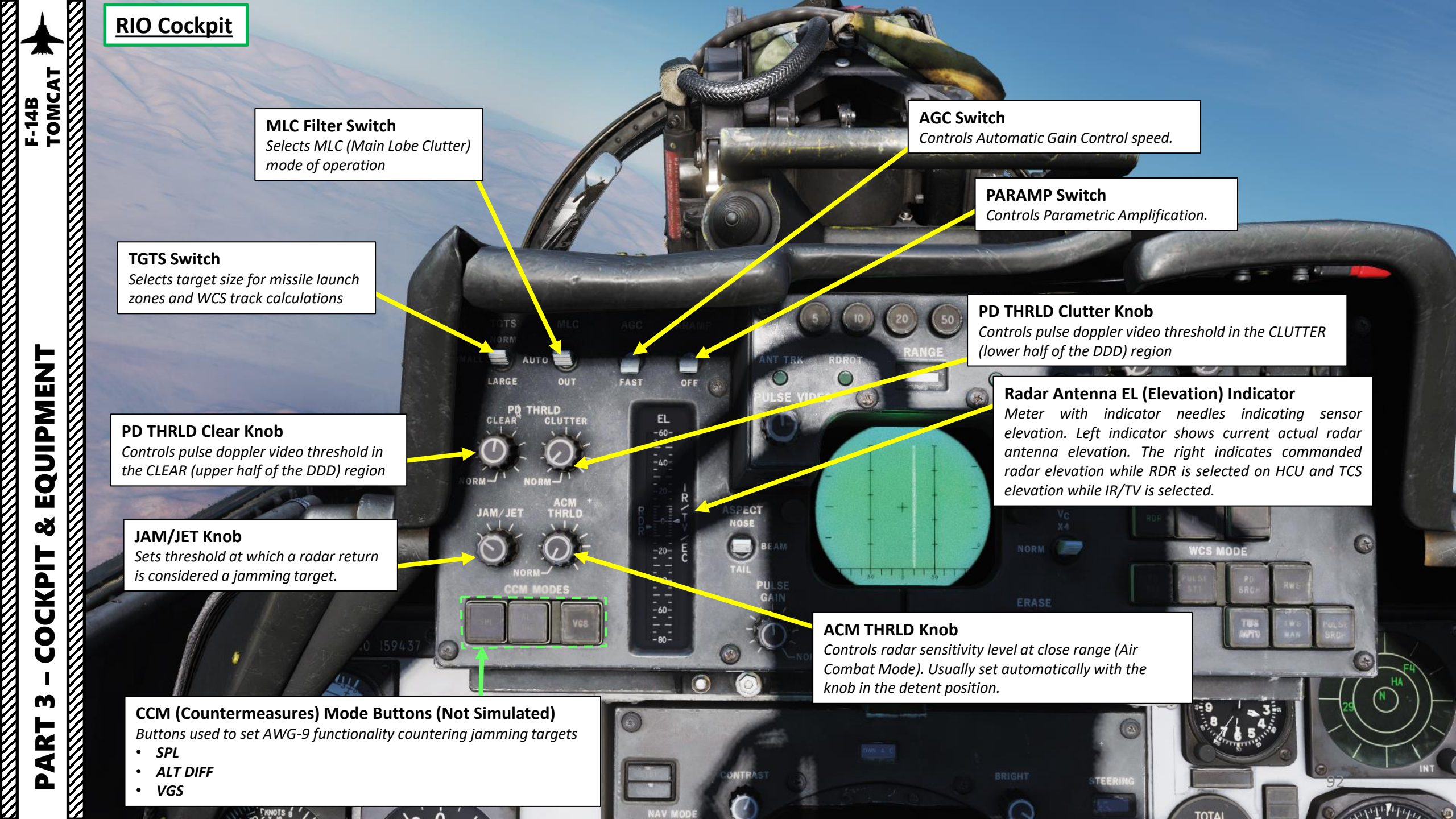
ASPECT Switch
Used to control the rate region covered by the doppler filters in pulse doppler modes and if to use edge or centroid tracking in pulse mode. These settings correspond to expected target aspect.

V_C Switch
Switch used to select different closing velocity scales on the DDD in PD (Pulse Doppler) modes.

PULSE GAIN Knob
Used to control the gain of the AWG-9 in pulse mode, normally left in detent unless needed because of clutter or jamming.

ERASE Knob
Used to control the intensity of the ERASE beam on the DDD, controlling how quick the image on the DDD fades.

RIO Cockpit



MLC Filter Switch
Selects MLC (Main Lobe Clutter) mode of operation

AGC Switch
Controls Automatic Gain Control speed.

PARAMP Switch
Controls Parametric Amplification.

TGTS Switch
Selects target size for missile launch zones and WCS track calculations

PD THRLD Clutter Knob
Controls pulse doppler video threshold in the CLUTTER (lower half of the DDD) region

Radar Antenna EL (Elevation) Indicator
Meter with indicator needles indicating sensor elevation. Left indicator shows current actual radar antenna elevation. The right indicates commanded radar elevation while RDR is selected on HCU and TCS elevation while IR/TV is selected.

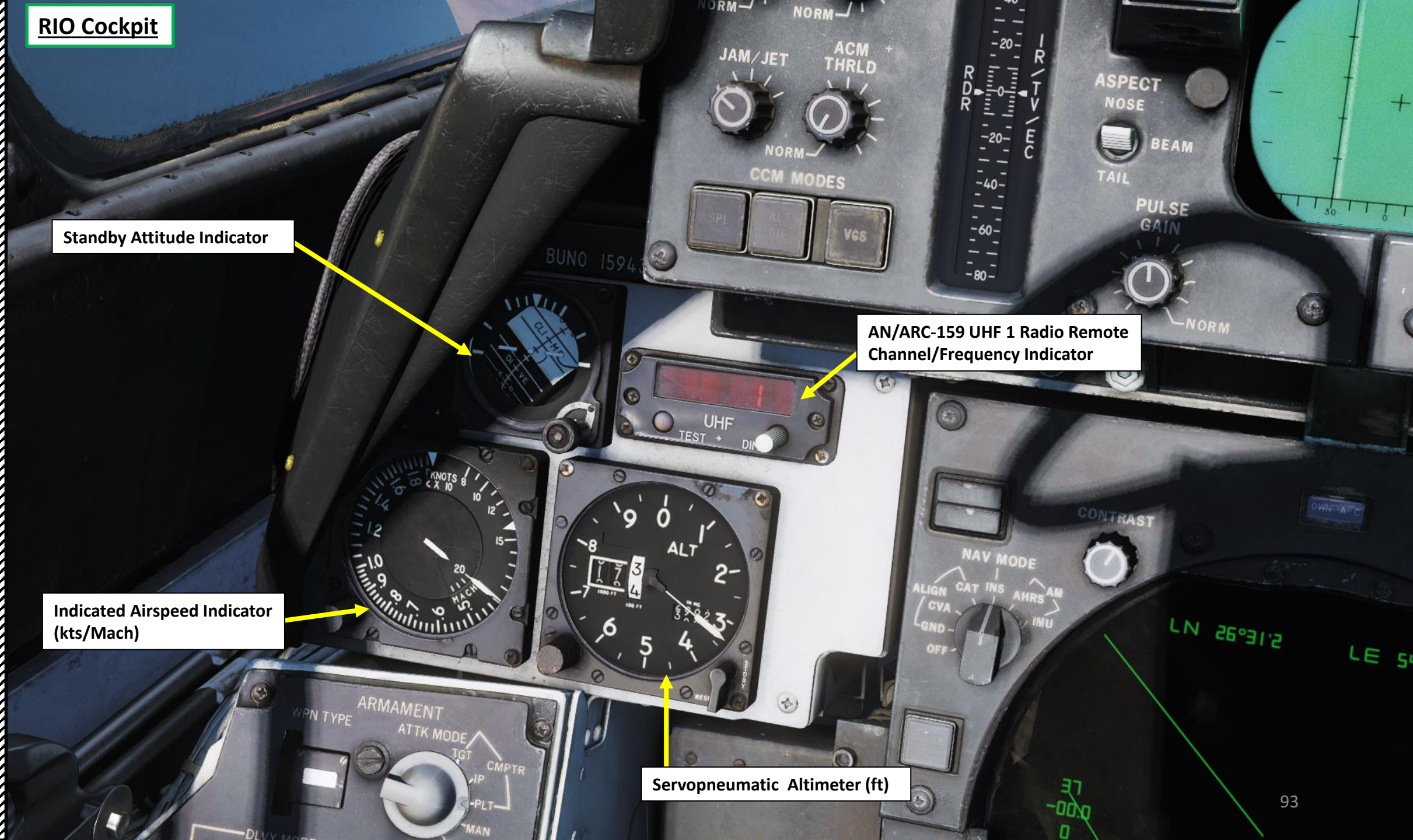
PD THRLD Clear Knob
Controls pulse doppler video threshold in the CLEAR (upper half of the DDD) region

JAM/JET Knob
Sets threshold at which a radar return is considered a jamming target.

ACM THRLD Knob
Controls radar sensitivity level at close range (Air Combat Mode). Usually set automatically with the knob in the detent position.

CCM (Countermeasures) Mode Buttons (Not Simulated)
Buttons used to set AWG-9 functionality countering jamming targets
- ***SPL***
- ***ALT DIFF***
- ***VGS***

RIO Cockpit


Standby Attitude Indicator
AN/ARC-159 UHF 1 Radio Remote Channel/Frequency Indicator
Indicated Airspeed Indicator (kts/Mach)
Servopneumatic Altimeter (ft)
JAM/JET
ACM THRLD
NORM
CCM MODES
SPL
VGS
RDR
IR/TV/EC
ASPECT
NOSE
BEAM
TAIL
PULSE GAIN
UHF
TEST
ARMAMENT
WPN TYPE
ATTK MODE
CMPTR
PLT
MAN
CONTRAST
NAV MODE
ALIGN
CAT
INS
AHRS
CVA
IMU
GND
OFF
ALT
KNOTS
MACH

RIO Cockpit

WPN TYPE (Weapon Type) Selector Switch
Selector wheel selecting type of weapon used for WCS A/G calculation.

WPN TYPE (Weapon Type) Selected

Armament ATTK (Attack) Mode Selector
Selects Air-to-Ground Attack Mode
- ***CMPTR TGT**: Computer target, a semi-automatic computer guided mode similar to a CCRP mode in newer aircraft*
- ***CMPTR IP**: Computer initial point, an extended CMPTR TGT mode using a known initial point (IP) as reference for store delivery.*
- ***CMPTR PLT**: Computer pilot, a manual computer and pilot guided mode using the WCS for store impact point indication on HUD. Similar to a CCIP mode in newer aircraft*
- ***MAN**: Manual backup mode in which the HUD displays a pipper (crosshair) on the HUD at the deflection set by the pilot. Used in case of a systems failure prehibiting the other modes.*
- ***D/L Bomb**: Data-link bomb, an automatic mode in which the pilot is steered via data-link cues for remotely controlled store delivery.*

Weapon DLVY (Delivery) Mode Switch
- ***STP**: Step (Releases single bomb per bomb release button press)*
- ***RPL**: Ripple (Release multiple bombs per bomb release button press)*

Weapon DLVY (Delivery) Mode Switch
- ***SGL**: Step (Releases single bomb per bomb release button press)*
- ***PRS**: Pairs (Release a pair of bombs per bomb release button press)*

Electrical Fuze Mode Selector
Sets the electrical fuse of the store to be released:
- ***SAFE** - Inhibits electrical bomb fusing.*
- ***VT** - Sets air-burst mode at preset burst height for compatible stores.*
- ***INST** - Sets instantaneous burst mode.*
- ***DLY 1** - Sets preset time delay 1.*
- ***DLY 2** - Sets preset time delay 2.*

Selective Jettison Switch Guard

Selective Jettison Switch
- ***JETT**: Selective Jettison*
- ***SAFE**: Safety On*
- ***AUX**: Auxiliary (Backup) Mode*

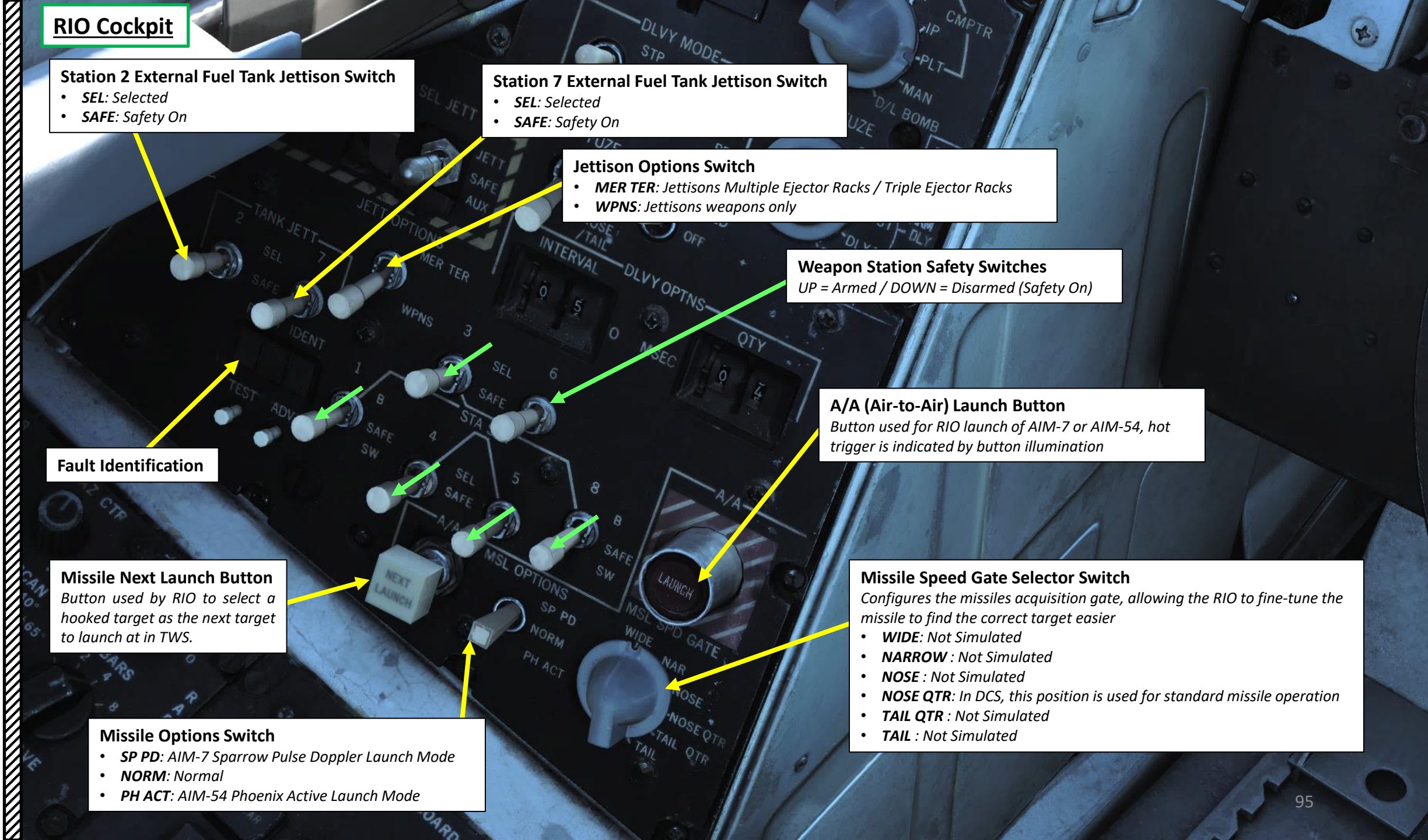
A/G Gun Mode Switch
Gun mode in A/G master mode. MIXED enables gun in addition to selected A/G ordnance.

Mechanical Fuze Mode Selector Switch
- *Nose*
- *Safe*
- *Nose/Tail*

Weapon Delivery Option Interval Selector Wheels & Indicator (milliseconds)

Weapon Delivery Option Quantity Selector Wheels & Indicator

RIO Cockpit



Station 2 External Fuel Tank Jettison Switch
- ***SEL**: Selected*
- ***SAFE**: Safety On*

Station 7 External Fuel Tank Jettison Switch
- ***SEL**: Selected*
- ***SAFE**: Safety On*

Jettison Options Switch
- ***MER TER**: Jettisons Multiple Ejector Racks / Triple Ejector Racks*
- ***WPNS**: Jettisons weapons only*

Weapon Station Safety Switches
UP = Armed / DOWN = Disarmed (Safety On)

A/A (Air-to-Air) Launch Button
Button used for RIO launch of AIM-7 or AIM-54, hot trigger is indicated by button illumination

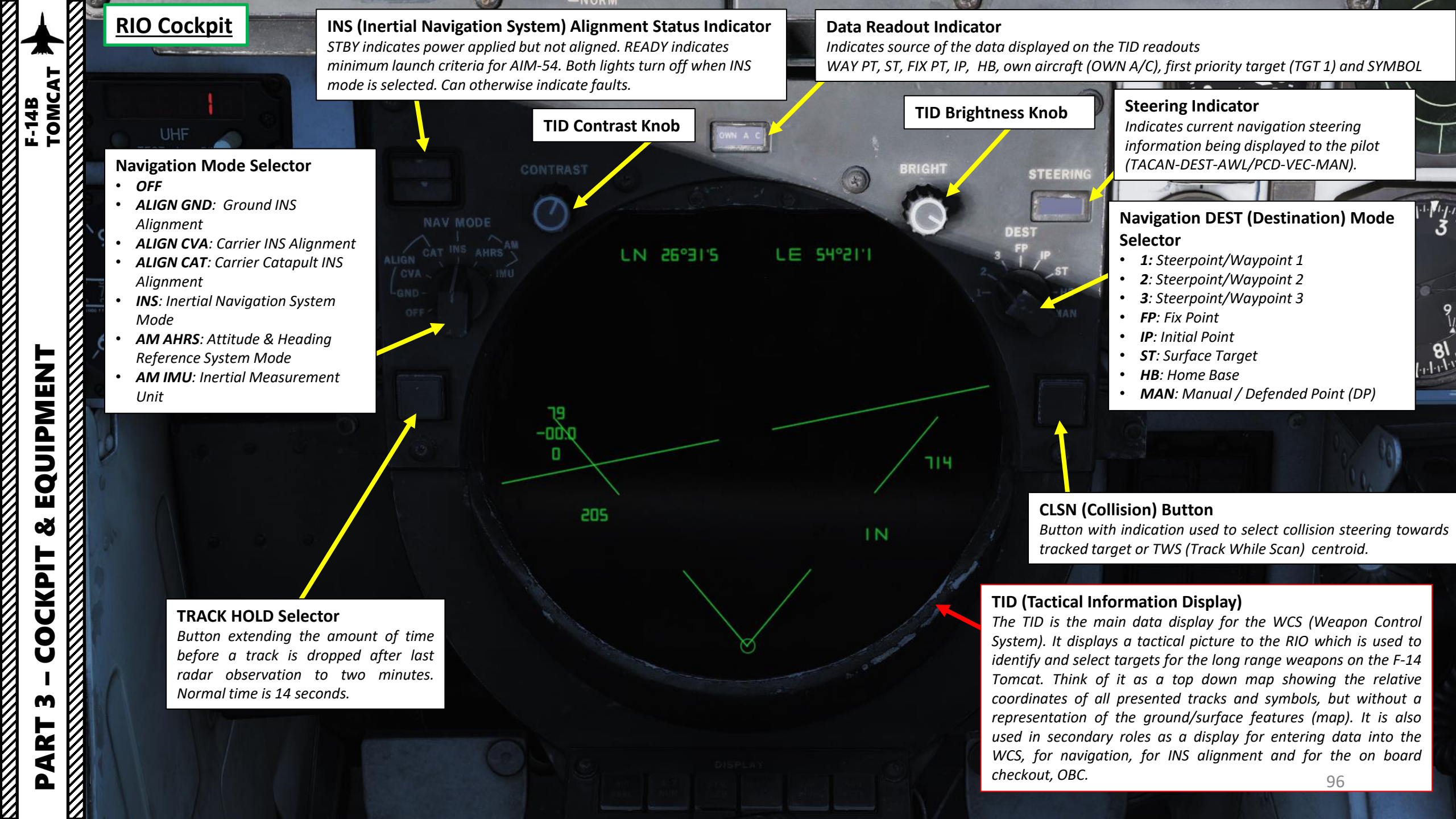
Fault Identification

Missile Next Launch Button
Button used by RIO to select a hooked target as the next target to launch at in TWS.

Missile Speed Gate Selector Switch
Configures the missiles acquisition gate, allowing the RIO to fine-tune the missile to find the correct target easier
- ***WIDE**: Not Simulated*
- ***NARROW** : Not Simulated*
- ***NOSE** : Not Simulated*
- ***NOSE QTR**: In DCS, this position is used for standard missile operation*
- ***TAIL QTR** : Not Simulated*
- ***TAIL** : Not Simulated*

Missile Options Switch
- ***SP PD**: AIM-7 Sparrow Pulse Doppler Launch Mode*
- ***NORM**: Normal*
- ***PH ACT**: AIM-54 Phoenix Active Launch Mode*

RIO Cockpit



INS (Inertial Navigation System) Alignment Status Indicator
STBY indicates power applied but not aligned. READY indicates minimum launch criteria for AIM-54. Both lights turn off when INS mode is selected. Can otherwise indicate faults.

Data Readout Indicator
Indicates source of the data displayed on the TID readouts
WAY PT, ST, FIX PT, IP, HB, own aircraft (OWN A/C), first priority target (TGT 1) and SYMBOL

TID Contrast Knob

TID Brightness Knob

Steering Indicator
Indicates current navigation steering information being displayed to the pilot (TACAN-DEST-AWL/PCD-VEC-MAN).

Navigation Mode Selector
- ***OFF***
- ***ALIGN GND**: Ground INS Alignment*
- ***ALIGN CVA**: Carrier INS Alignment*
- ***ALIGN CAT**: Carrier Catapult INS Alignment*
- ***INS**: Inertial Navigation System Mode*
- ***AM AHRS**: Attitude & Heading Reference System Mode*
- ***AM IMU**: Inertial Measurement Unit*

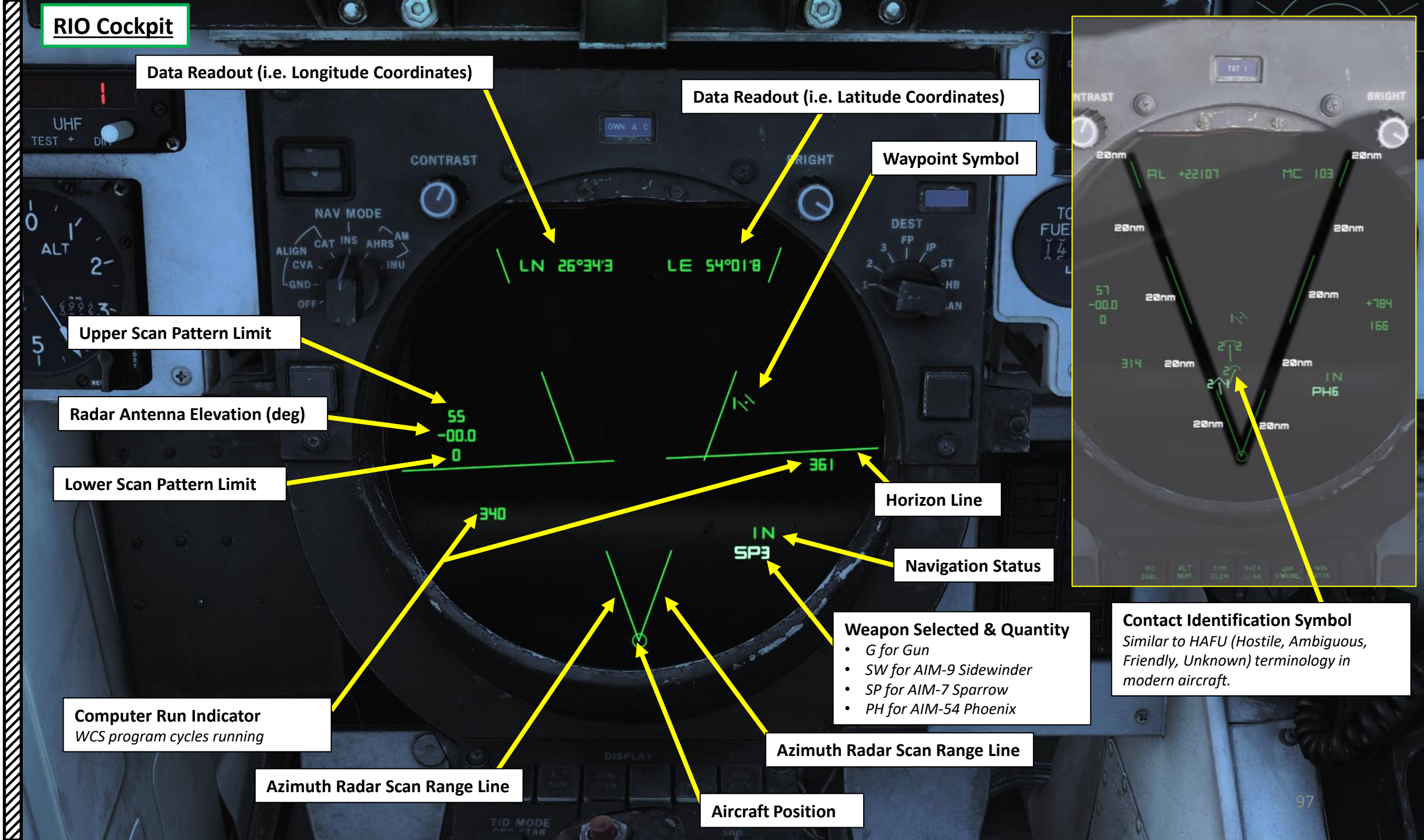
Navigation DEST (Destination) Mode Selector
- ***1:** Steerpoint/Waypoint 1*
- ***2**: Steerpoint/Waypoint 2*
- ***3**: Steerpoint/Waypoint 3*
- ***FP**: Fix Point*
- ***IP**: Initial Point*
- ***ST**: Surface Target*
- ***HB**: Home Base*
- ***MAN**: Manual / Defended Point (DP)*

CLSN (Collision) Button
Button with indication used to select collision steering towards tracked target or TWS (Track While Scan) centroid.

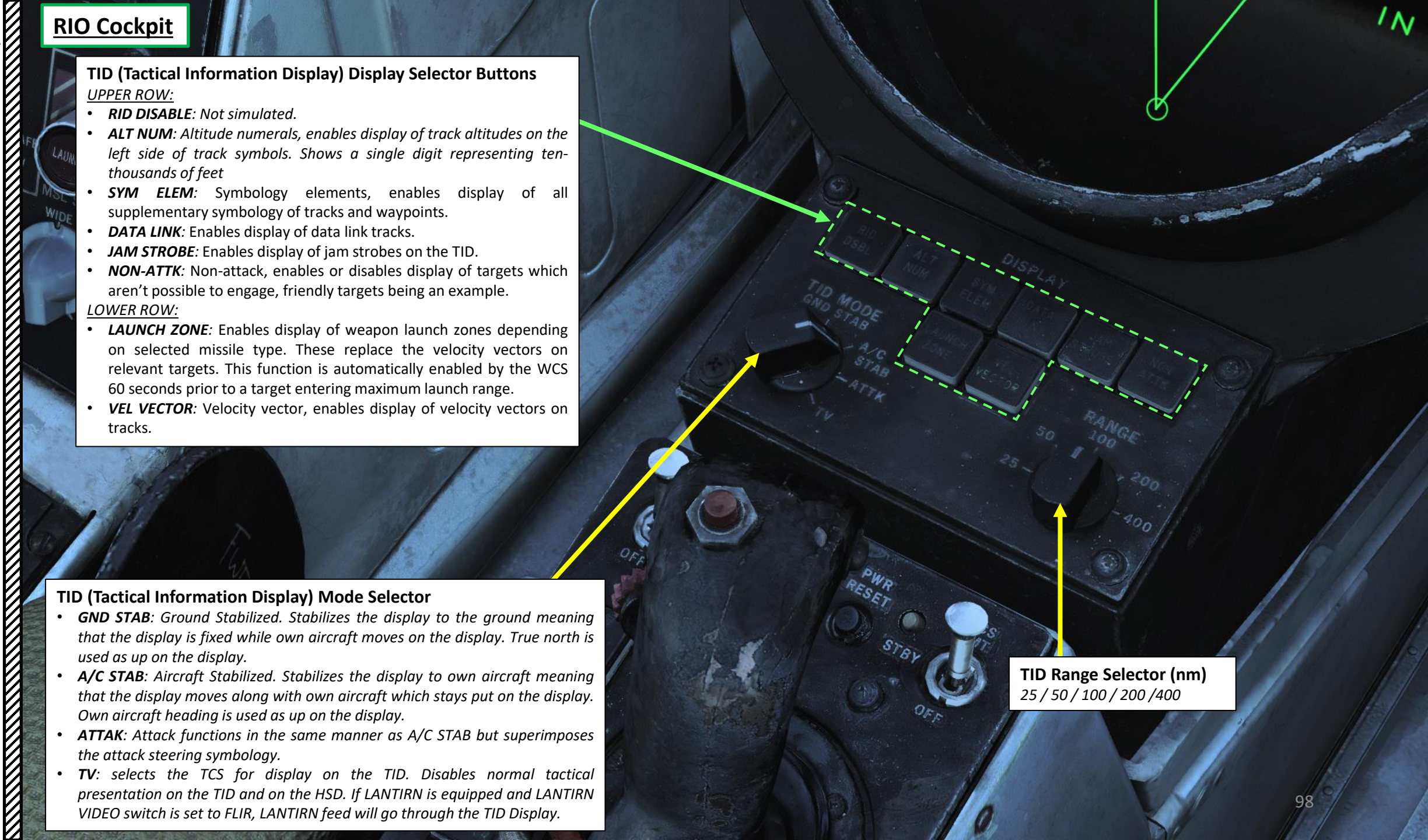
TRACK HOLD Selector
Button extending the amount of time before a track is dropped after last radar observation to two minutes. Normal time is 14 seconds.

TID (Tactical Information Display)
The TID is the main data display for the WCS (Weapon Control System). It displays a tactical picture to the RIO which is used to identify and select targets for the long range weapons on the F-14 Tomcat. Think of it as a top down map showing the relative coordinates of all presented tracks and symbols, but without a representation of the ground/surface features (map). It is also used in secondary roles as a display for entering data into the WCS, for navigation, for INS alignment and for the on board checkout, OBC.

RIO Cockpit


Data Readout (i.e. Longitude Coordinates)
Data Readout (i.e. Latitude Coordinates)
Waypoint Symbol
LN 26°34'3
LE 54°01'8
Upper Scan Pattern Limit
Radar Antenna Elevation (deg)
Lower Scan Pattern Limit
55
-00.0
0
361
340
Horizon Line
IN
SP3
Navigation Status
Weapon Selected & Quantity
• G for Gun
• SW for AIM-9 Sidewinder
• SP for AIM-7 Sparrow
• PH for AIM-54 Phoenix
Contact Identification Symbol
Similar to HAFU (Hostile, Ambiguous, Friendly, Unknown) terminology in modern aircraft.
Computer Run Indicator
WCS program cycles running
Azimuth Radar Scan Range Line
Azimuth Radar Scan Range Line
Aircraft Position
20nm
IN
PH6

RIO Cockpit



TID (Tactical Information Display) Display Selector Buttons

UPPER ROW:

- ***RID DISABLE**: Not simulated.*
- ***ALT NUM**: Altitude numerals, enables display of track altitudes on the left side of track symbols. Shows a single digit representing ten-thousands of feet*
- ***SYM ELEM**:* Symbology elements, enables display of all supplementary symbology of tracks and waypoints.
- ***DATA LINK**:* Enables display of data link tracks.
- ***JAM STROBE**:* Enables display of jam strobes on the TID.
- ***NON-ATTK**:* Non-attack, enables or disables display of targets which aren't possible to engage, friendly targets being an example.

LOWER ROW:

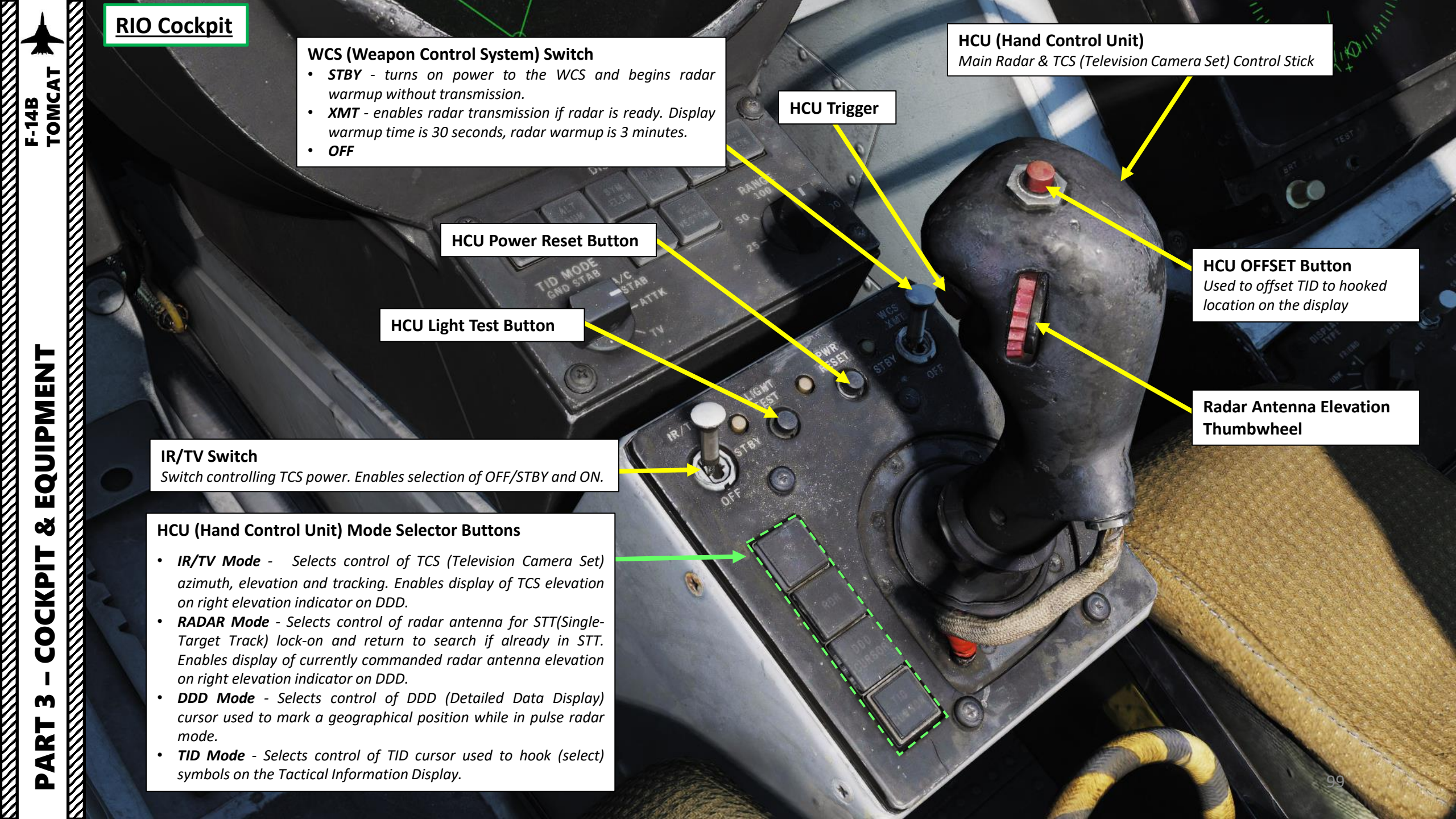
- ***LAUNCH ZONE**:* Enables display of weapon launch zones depending on selected missile type. These replace the velocity vectors on relevant targets. This function is automatically enabled by the WCS 60 seconds prior to a target entering maximum launch range.
- ***VEL VECTOR**:* Velocity vector, enables display of velocity vectors on tracks.

TID (Tactical Information Display) Mode Selector

- ***GND STAB**: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.*
- ***A/C STAB**: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.*
- ***ATTAK**: Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.*
- ***TV**: selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD. If LANTIRN is equipped and LANTIRN VIDEO switch is set to FLIR, LANTIRN feed will go through the TID Display.*

TID Range Selector (nm)
25 / 50 / 100 / 200 /400

RIO Cockpit



WCS (Weapon Control System) Switch

- ***STBY*** *- turns on power to the WCS and begins radar warmup without transmission.*
- ***XMT*** *- enables radar transmission if radar is ready. Display warmup time is 30 seconds, radar warmup is 3 minutes.*
- ***OFF***

HCU (Hand Control Unit)
Main Radar & TCS (Television Camera Set) Control Stick

HCU Trigger

HCU Power Reset Button

HCU Light Test Button

HCU OFFSET Button
Used to offset TID to hooked location on the display

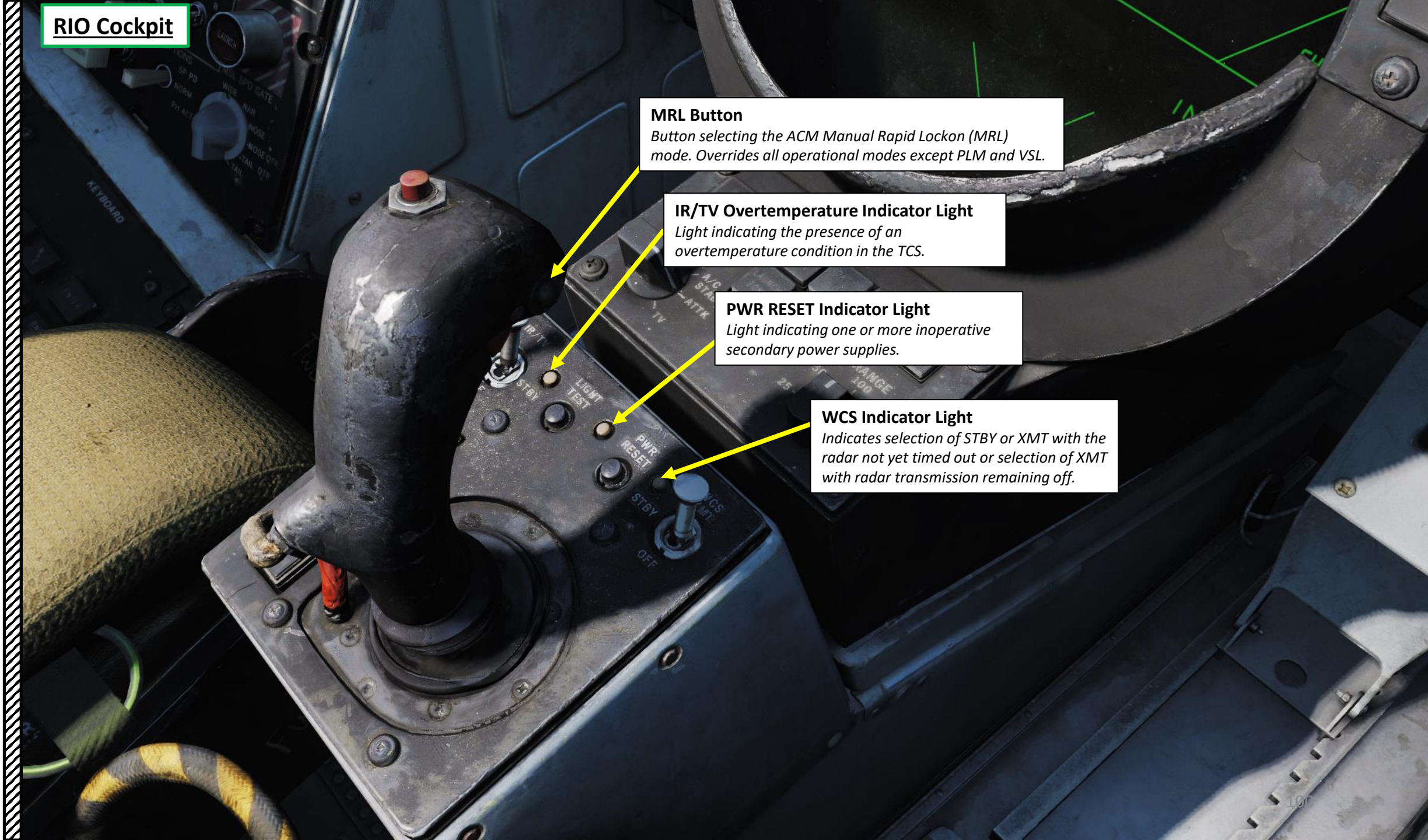
Radar Antenna Elevation Thumbwheel

IR/TV Switch
Switch controlling TCS power. Enables selection of OFF/STBY and ON.

HCU (Hand Control Unit) Mode Selector Buttons

- ***IR/TV Mode*** *- Selects control of TCS (Television Camera Set) azimuth, elevation and tracking. Enables display of TCS elevation on right elevation indicator on DDD.*
- ***RADAR Mode*** *- Selects control of radar antenna for STT(Single-Target Track) lock-on and return to search if already in STT. Enables display of currently commanded radar antenna elevation on right elevation indicator on DDD.*
- ***DDD Mode*** *- Selects control of DDD (Detailed Data Display) cursor used to mark a geographical position while in pulse radar mode.*
- ***TID Mode*** *- Selects control of TID cursor used to hook (select) symbols on the Tactical Information Display.*

RIO Cockpit


MRL Button
Button selecting the ACM Manual Rapid Lockon (MRL) mode. Overrides all operational modes except PLM and VSL.
IR/TV Overtemperature Indicator Light
Light indicating the presence of an overtemperature condition in the TCS.
PWR RESET Indicator Light
Light indicating one or more inoperative secondary power supplies.
WCS Indicator Light
Indicates selection of STBY or XMT with the radar not yet timed out or selection of XMT with radar transmission remaining off.
LIGHT TEST
PWR RESET
STBY
OFF

RIO Cockpit



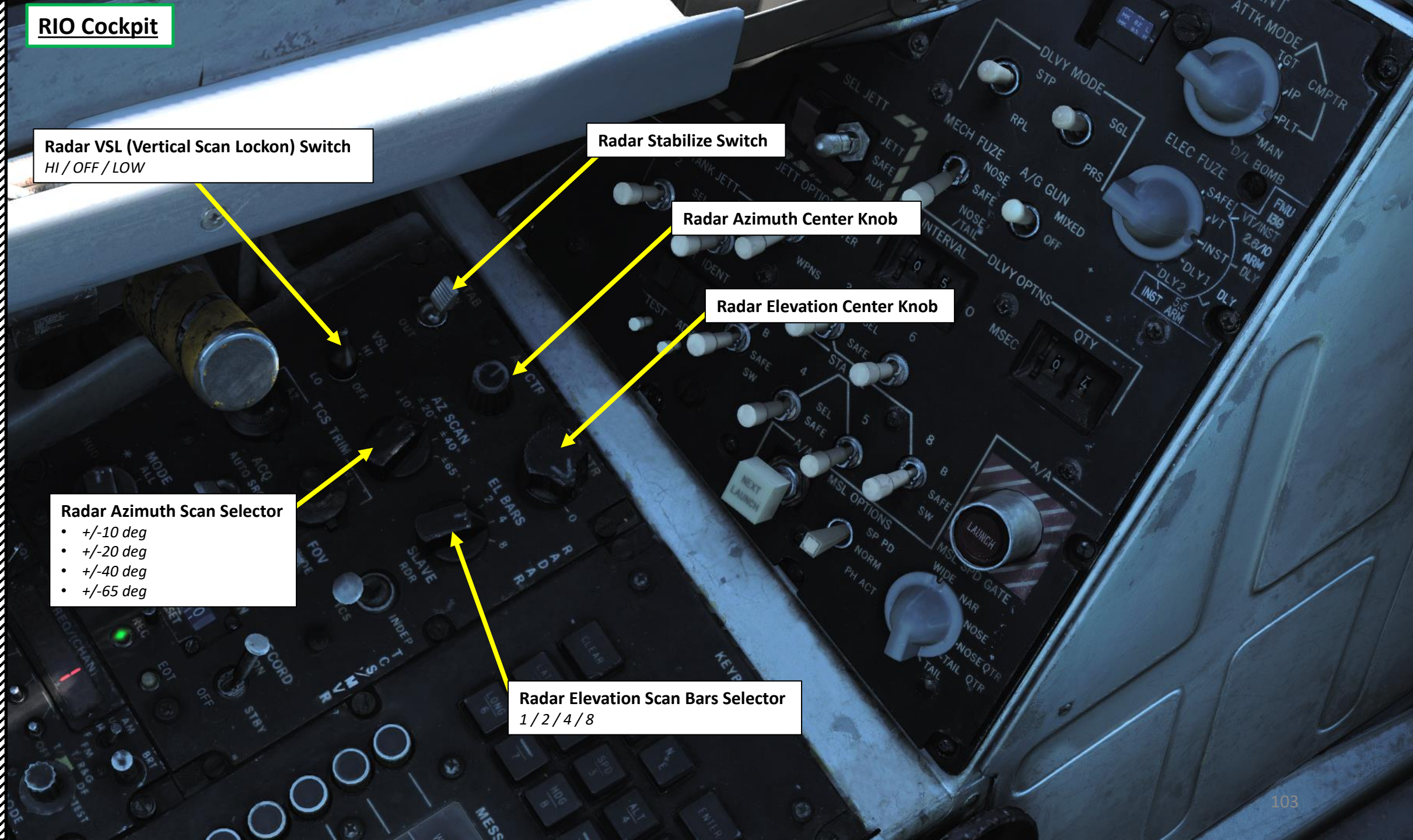
ICS Foot Button
Left footrest containing ICS PTT (Intercom System Push-to-Talk) for COLD MIC intercommunication

Microphone Foot Button
Right footrest containing PTT (Push-to-Talk) for transmission on UHF 1, V/UHF 2 or both depending on ICS (Intercom System) setting.

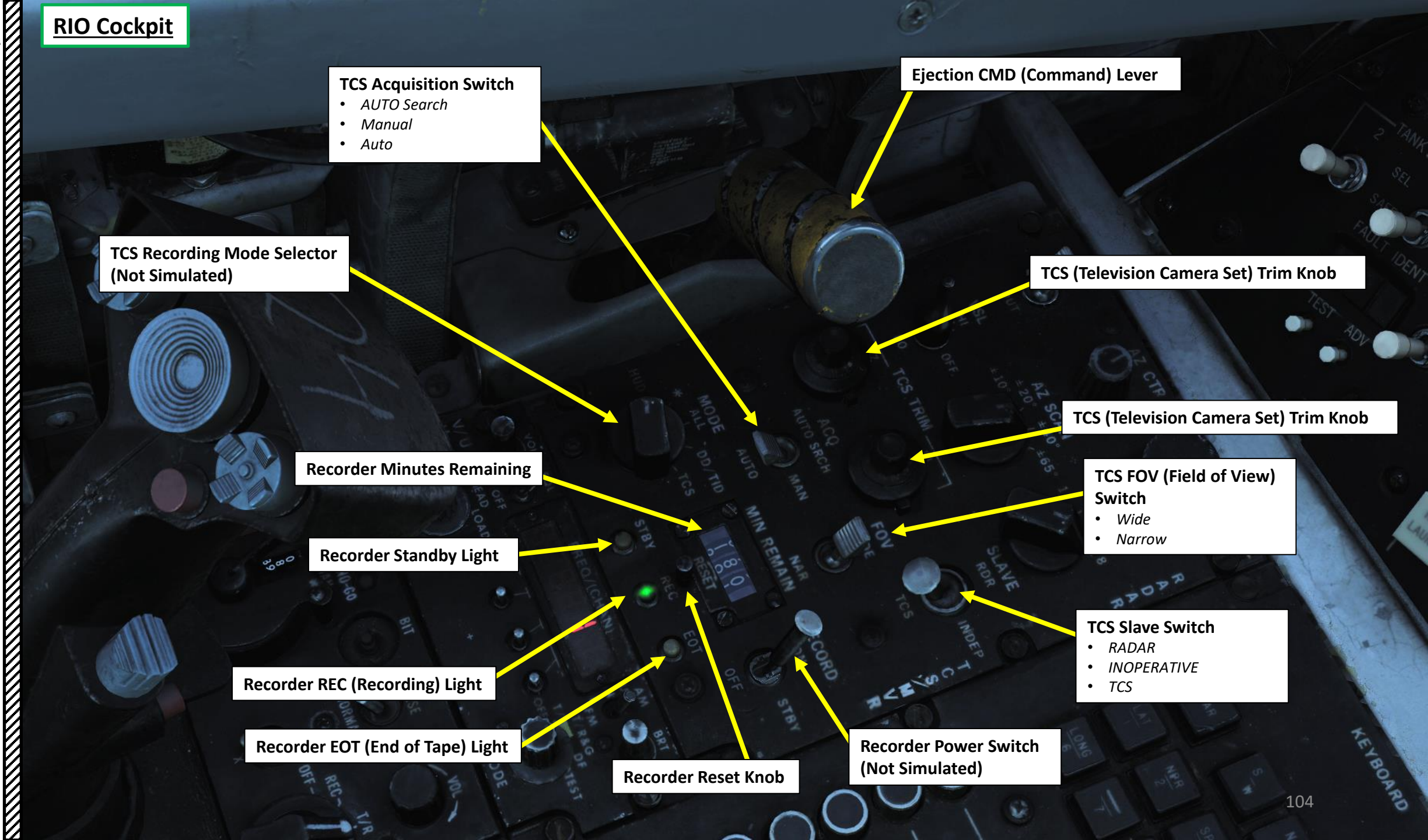
RIO Cockpit



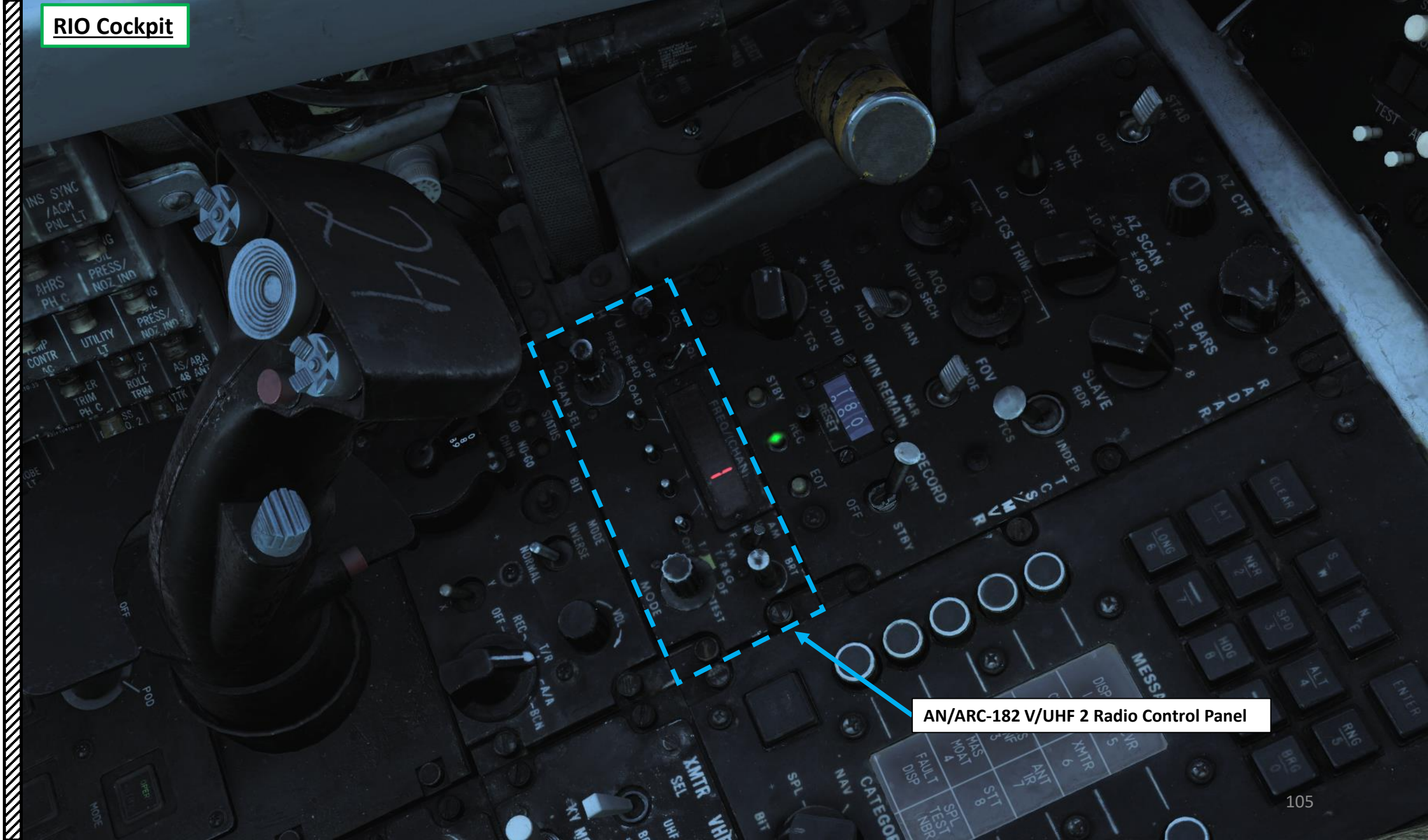
RIO Cockpit


Radar VSL (Vertical Scan Lockon) Switch
HI / OFF / LOW
Radar Stabilize Switch
Radar Azimuth Center Knob
Radar Elevation Center Knob
Radar Azimuth Scan Selector
+/-10 deg
+/-20 deg
+/-40 deg
+/-65 deg
Radar Elevation Scan Bars Selector
1 / 2 / 4 / 8

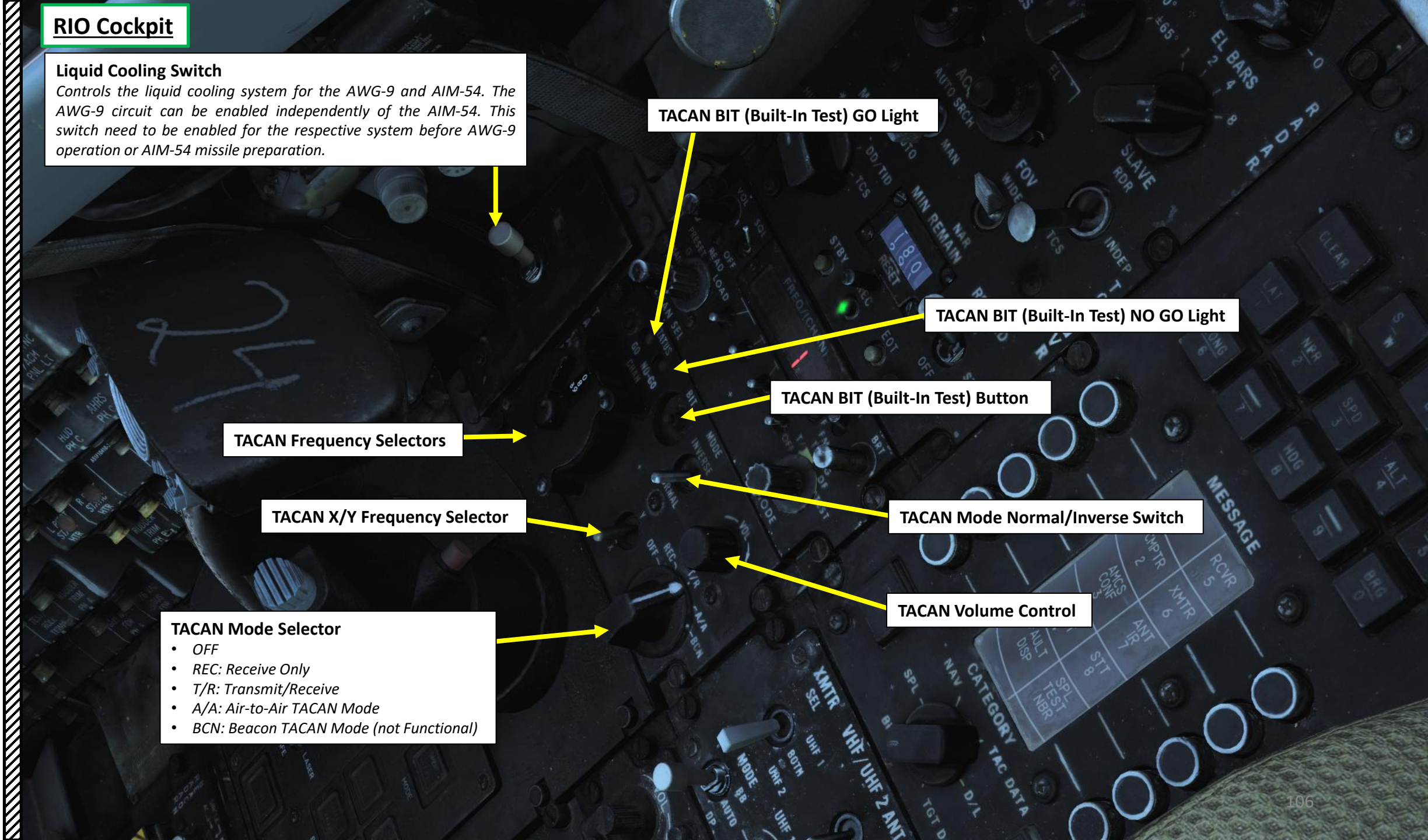
RIO Cockpit


TCS Acquisition Switch
• AUTO Search
• Manual
• Auto
Ejection CMD (Command) Lever
TCS Recording Mode Selector (Not Simulated)
TCS (Television Camera Set) Trim Knob
TCS (Television Camera Set) Trim Knob
Recorder Minutes Remaining
TCS FOV (Field of View) Switch
• Wide
• Narrow
Recorder Standby Light
TCS Slave Switch
• RADAR
• INOPERATIVE
• TCS
Recorder REC (Recording) Light
Recorder EOT (End of Tape) Light
Recorder Reset Knob
Recorder Power Switch (Not Simulated)

RIO Cockpit



RIO Cockpit



Liquid Cooling Switch
Controls the liquid cooling system for the AWG-9 and AIM-54. The AWG-9 circuit can be enabled independently of the AIM-54. This switch need to be enabled for the respective system before AWG-9 operation or AIM-54 missile preparation.

TACAN BIT (Built-In Test) GO Light

TACAN BIT (Built-In Test) NO GO Light

TACAN BIT (Built-In Test) Button

TACAN Frequency Selectors

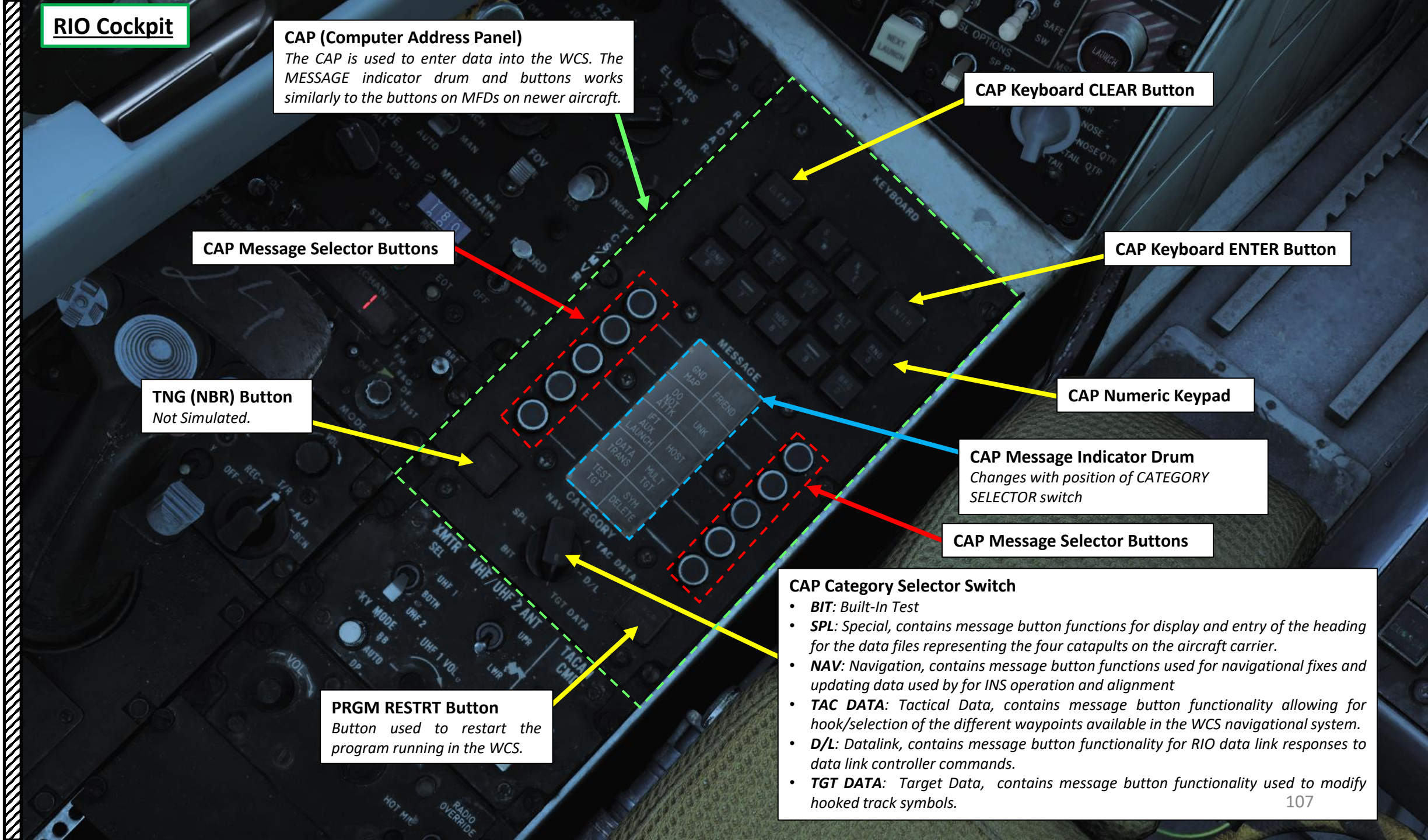
TACAN X/Y Frequency Selector

TACAN Mode Normal/Inverse Switch

TACAN Volume Control

TACAN Mode Selector
- *OFF*
- *REC: Receive Only*
- *T/R: Transmit/Receive*
- *A/A: Air-to-Air TACAN Mode*
- *BCN: Beacon TACAN Mode (not Functional)*

RIO Cockpit



CAP (Computer Address Panel)
The CAP is used to enter data into the WCS. The MESSAGE indicator drum and buttons works similarly to the buttons on MFDs on newer aircraft.

CAP Keyboard CLEAR Button

CAP Message Selector Buttons

CAP Keyboard ENTER Button

TNG (NBR) Button
Not Simulated.

CAP Numeric Keypad

CAP Message Indicator Drum
Changes with position of CATEGORY SELECTOR switch

CAP Message Selector Buttons

PRGM RESTRT Button
Button used to restart the program running in the WCS.

CAP Category Selector Switch

- ***BIT***: *Built-In Test*
- ***SPL***: *Special, contains message button functions for display and entry of the heading for the data files representing the four catapults on the aircraft carrier.*
- ***NAV***: *Navigation, contains message button functions used for navigational fixes and updating data used by for INS operation and alignment*
- ***TAC DATA***: *Tactical Data, contains message button functionality allowing for hook/selection of the different waypoints available in the WCS navigational system.*
- ***D/L***: *Datalink, contains message button functionality for RIO data link responses to data link controller commands.*
- ***TGT DATA***: *Target Data, contains message button functionality used to modify hooked track symbols.*

RIO Cockpit



CAP BIT Message Menu



CAP SPL Message Menu



CAP NAV Message Menu

RIO Cockpit



CAP TAC DATA Message Menu

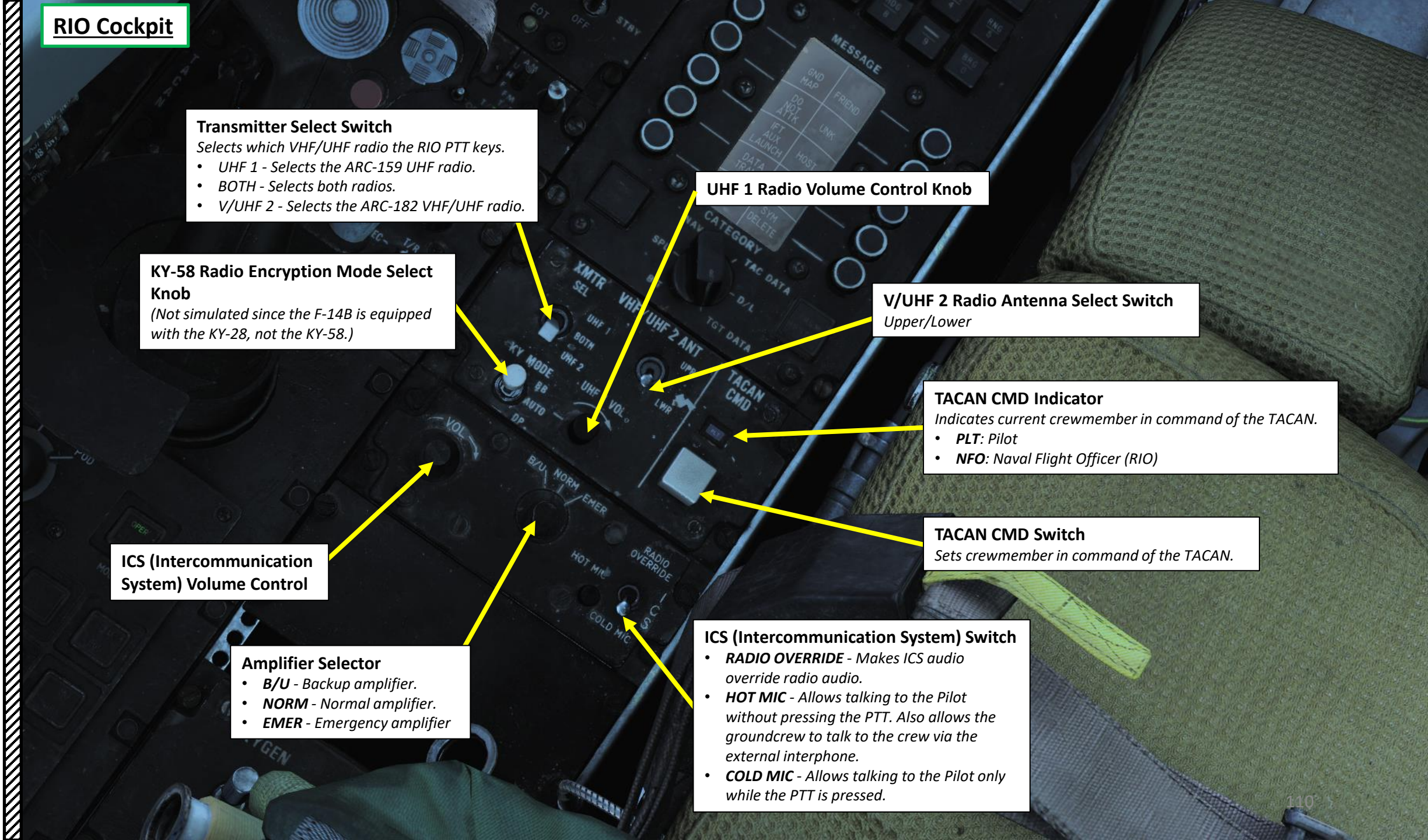


CAP D/L Message Menu



CAP TGT DATA Message Menu

RIO Cockpit



Transmitter Select Switch
Selects which VHF/UHF radio the RIO PTT keys.
- *UHF 1 - Selects the ARC-159 UHF radio.*
- *BOTH - Selects both radios.*
- *V/UHF 2 - Selects the ARC-182 VHF/UHF radio.*

KY-58 Radio Encryption Mode Select Knob
(Not simulated since the F-14B is equipped with the KY-28, not the KY-58.)

UHF 1 Radio Volume Control Knob

V/UHF 2 Radio Antenna Select Switch
Upper/Lower

TACAN CMD Indicator
Indicates current crewmember in command of the TACAN.
- ***PLT**: Pilot*
- ***NFO**: Naval Flight Officer (RIO)*

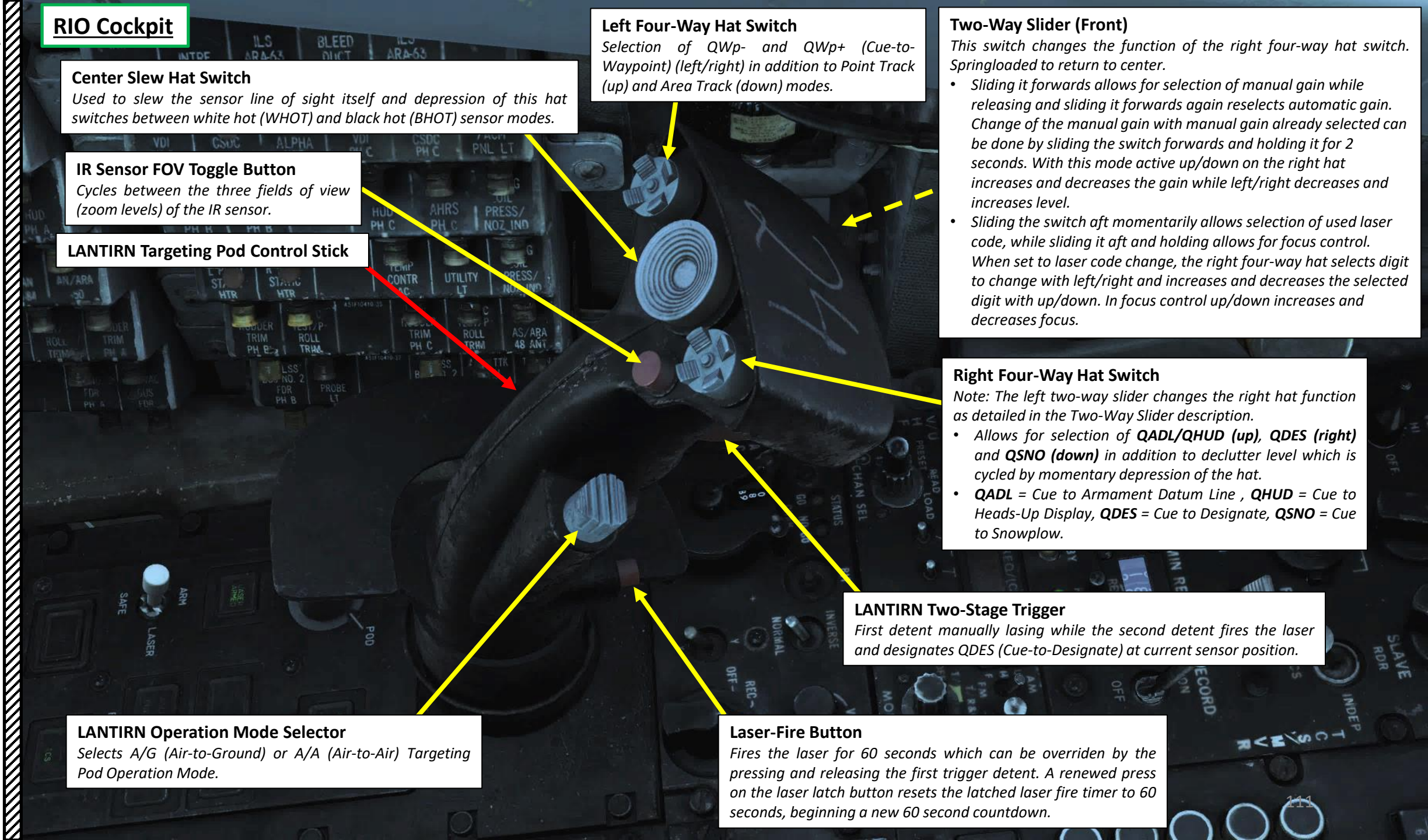
TACAN CMD Switch
Sets crewmember in command of the TACAN.

ICS (Intercommunication System) Volume Control

Amplifier Selector
- ***B/U** - Backup amplifier.*
- ***NORM** - Normal amplifier.*
- ***EMER** - Emergency amplifier*

ICS (Intercommunication System) Switch
- ***RADIO OVERRIDE** - Makes ICS audio override radio audio.*
- ***HOT MIC** - Allows talking to the Pilot without pressing the PTT. Also allows the groundcrew to talk to the crew via the external interphone.*
- ***COLD MIC** - Allows talking to the Pilot only while the PTT is pressed.*

RIO Cockpit



Center Slew Hat Switch
Used to slew the sensor line of sight itself and depression of this hat switches between white hot (WHOT) and black hot (BHOT) sensor modes.

IR Sensor FOV Toggle Button
Cycles between the three fields of view (zoom levels) of the IR sensor.

LANTIRN Targeting Pod Control Stick

Left Four-Way Hat Switch
Selection of QWp- and QWp+ (Cue-to-Waypoint) (left/right) in addition to Point Track (up) and Area Track (down) modes.

Two-Way Slider (Front)
This switch changes the function of the right four-way hat switch. Springloaded to return to center.

- *Sliding it forwards allows for selection of manual gain while releasing and sliding it forwards again reselects automatic gain. Change of the manual gain with manual gain already selected can be done by sliding the switch forwards and holding it for 2 seconds. With this mode active up/down on the right hat increases and decreases the gain while left/right decreases and increases level.*
- *Sliding the switch aft momentarily allows selection of used laser code, while sliding it aft and holding allows for focus control. When set to laser code change, the right four-way hat selects digit to change with left/right and increases and decreases the selected digit with up/down. In focus control up/down increases and decreases focus.*

Right Four-Way Hat Switch
Note: The left two-way slider changes the right hat function as detailed in the Two-Way Slider description.

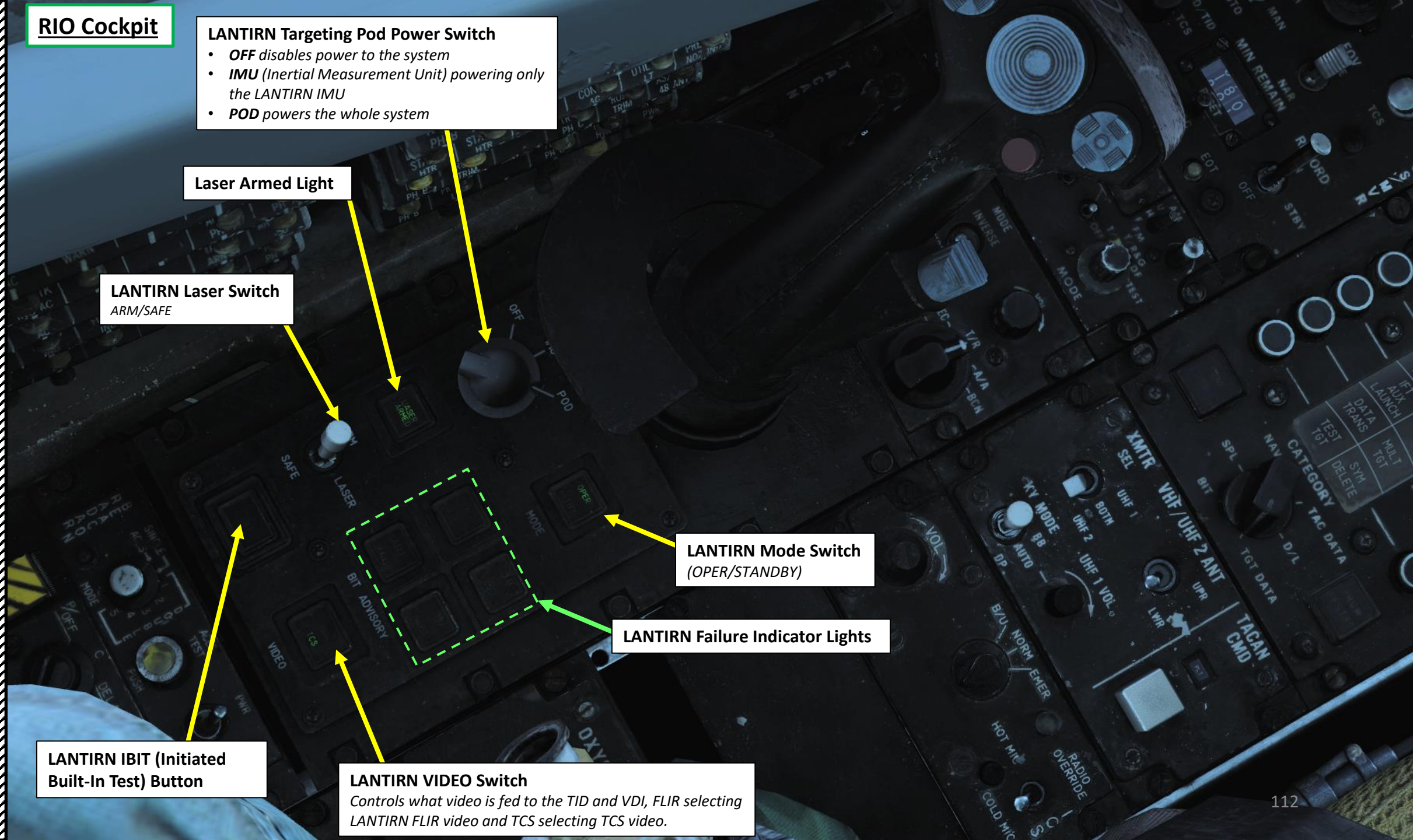
- *Allows for selection of **QADL/QHUD (up)**, **QDES (right)** and **QSNO (down)** in addition to declutter level which is cycled by momentary depression of the hat.*
- ***QADL** = Cue to Armament Datum Line , **QHUD** = Cue to Heads-Up Display, **QDES** = Cue to Designate, **QSNO** = Cue to Snowplow.*

LANTIRN Two-Stage Trigger
First detent manually lasing while the second detent fires the laser and designates QDES (Cue-to-Designate) at current sensor position.

LANTIRN Operation Mode Selector
Selects A/G (Air-to-Ground) or A/A (Air-to-Air) Targeting Pod Operation Mode.

Laser-Fire Button
Fires the laser for 60 seconds which can be overriden by the pressing and releasing the first trigger detent. A renewed press on the laser latch button resets the latched laser fire timer to 60 seconds, beginning a new 60 second countdown.

RIO Cockpit


LANTIRN Targeting Pod Power Switch
• OFF disables power to the system
• IMU (Inertial Measurement Unit) powering only the LANTIRN IMU
• POD powers the whole system
Laser Armed Light
LANTIRN Laser Switch
ARM/SAFE
LANTIRN Mode Switch
(OPER/STANDBY)
LANTIRN Failure Indicator Lights
LANTIRN IBIT (Initiated Built-In Test) Button
LANTIRN VIDEO Switch
Controls what video is fed to the TID and VDI, FLIR selecting LANTIRN FLIR video and TCS selecting TCS video.

RIO Cockpit

KY-28 Radio Encryption Zeroize Switch

AN/APN-154 Radar Beacon Selector Switch

- ***SINGLE*** *- Enables beacon response to single pulse codes.*
- ***DOUBLE*** *- Enables beacon response to set double pulse code.*
- ***ACLS*** *- Enables augmenter operation for ACLS. Required for CATCC radar lockon for ACLS.*

KY-28 Radio Encryption Power-Mode Switch
P/OFF (Power Off) / C (Cipher) / DELAY

ACLS (Automatic Carrier Landing System) Push-to-Test Switch

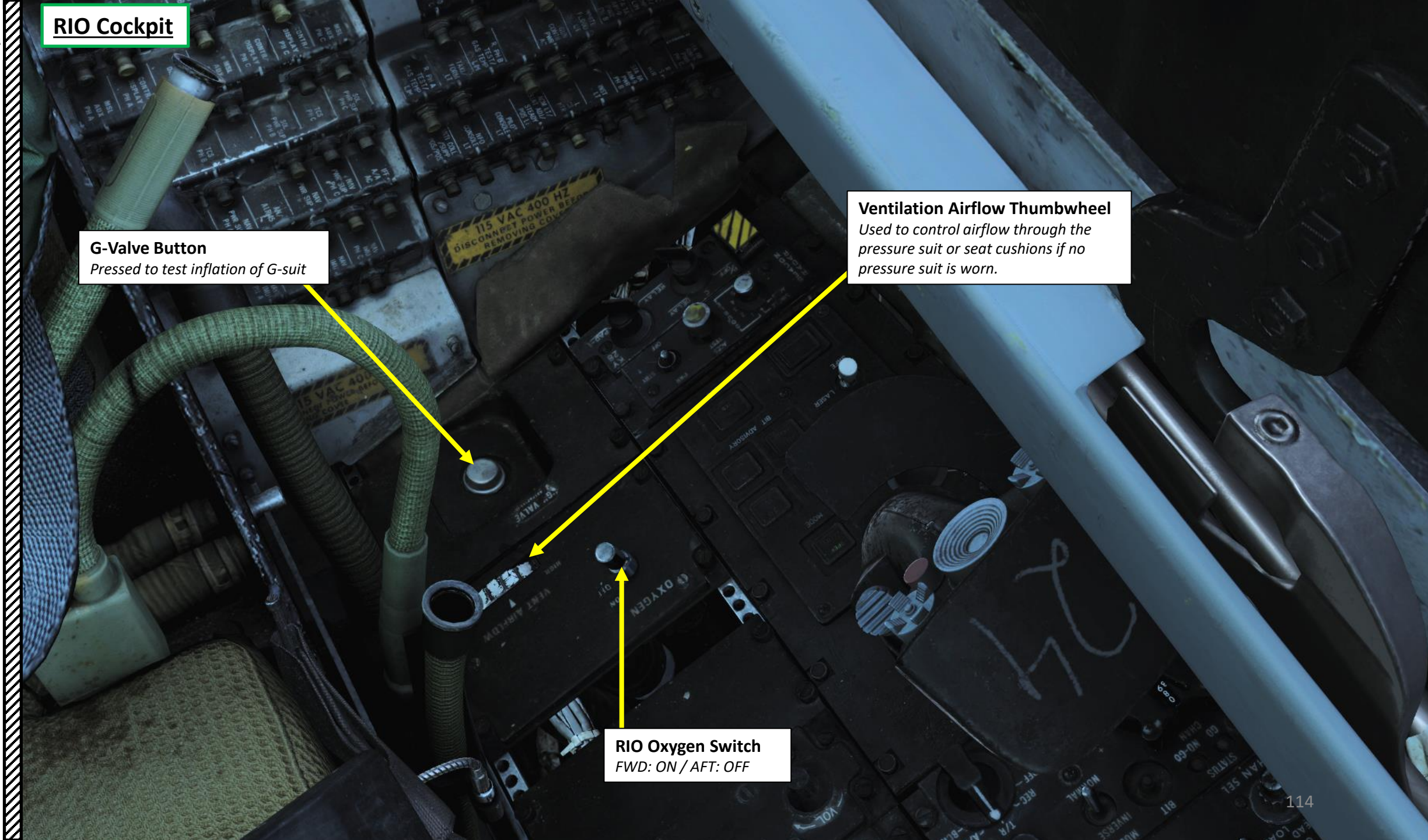
KY-28 Radio Encryption Radio Select Switch

- ***RELAY:*** *Not Functional*
- ***RAD-1****: Radio 1*
- ***RAD-2****: Radio 2*

ACLS Radar Beacon Power Switch



RIO Cockpit

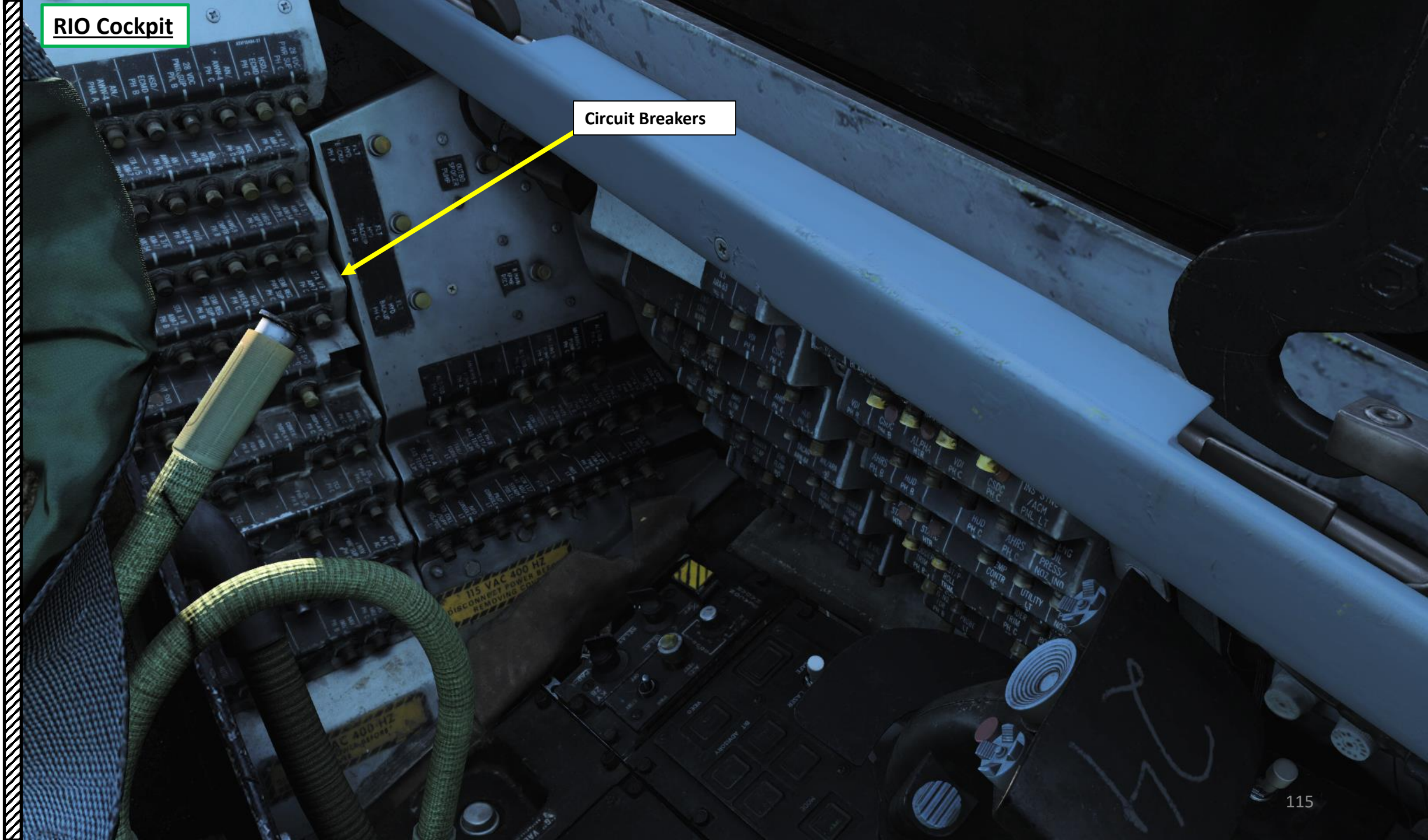


G-Valve Button
Pressed to test inflation of G-suit

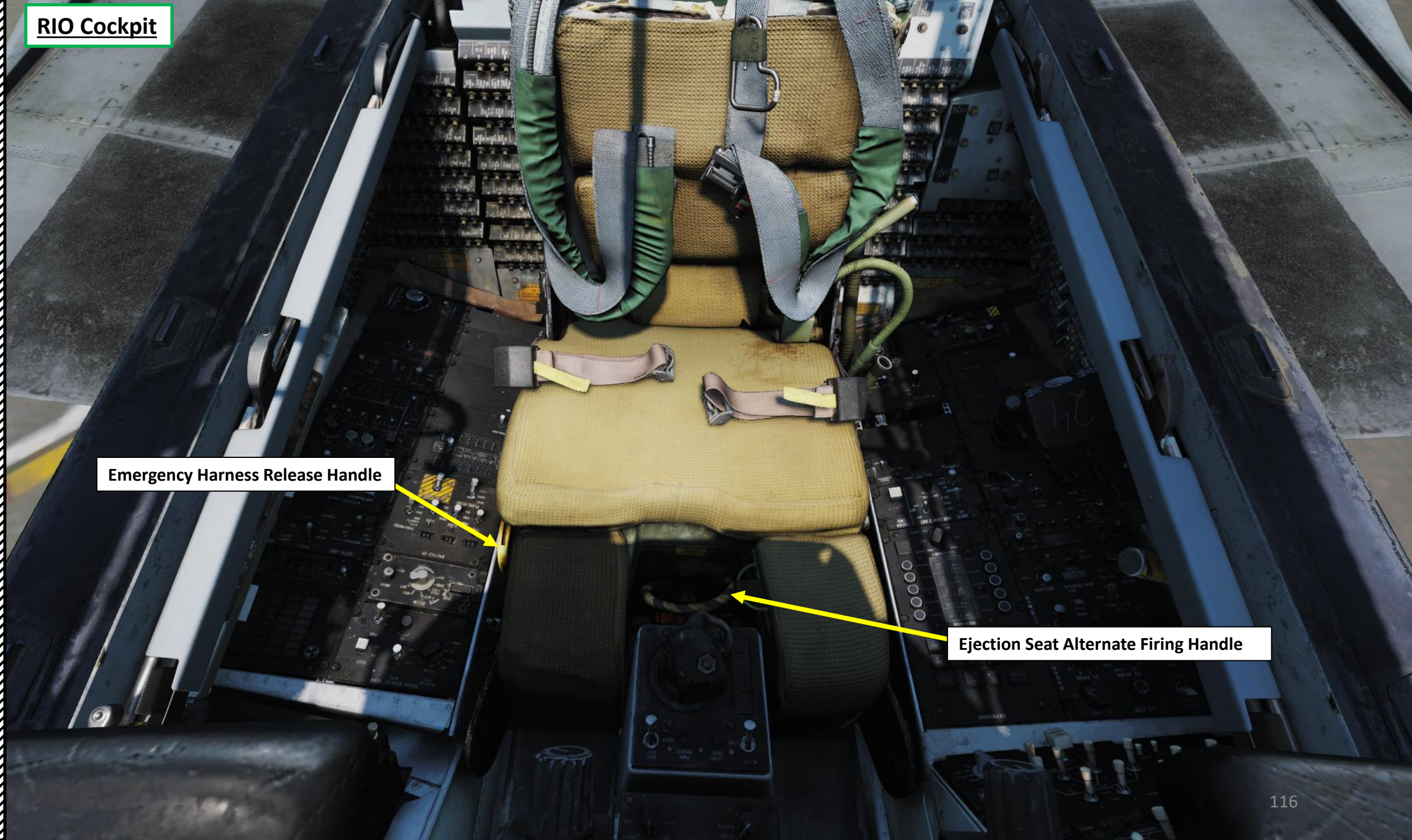
Ventilation Airflow Thumbwheel
Used to control airflow through the pressure suit or seat cushions if no pressure suit is worn.

RIO Oxygen Switch
FWD: ON / AFT: OFF

RIO Cockpit



RIO Cockpit


Emergency Harness Release Handle
Ejection Seat Alternate Firing Handle



RIO Cockpit



Yaw String
Performs the same function as the slip-skid indicator ball, but is more sensitive, and does not require the pilot to look down at the instrument panel. Technically, it measures sideslip angle, not yaw angle, but this indicates how the aircraft must be yawed to return the sideslip angle to zero.





Total Temperature Probe (AIC, Air Inlet Control Computer)

Angle of Attack Probe (AIC, Air Inlet Control Computer)

Pitot Static Probe

Chinpod / TCS (Television Camera Set)

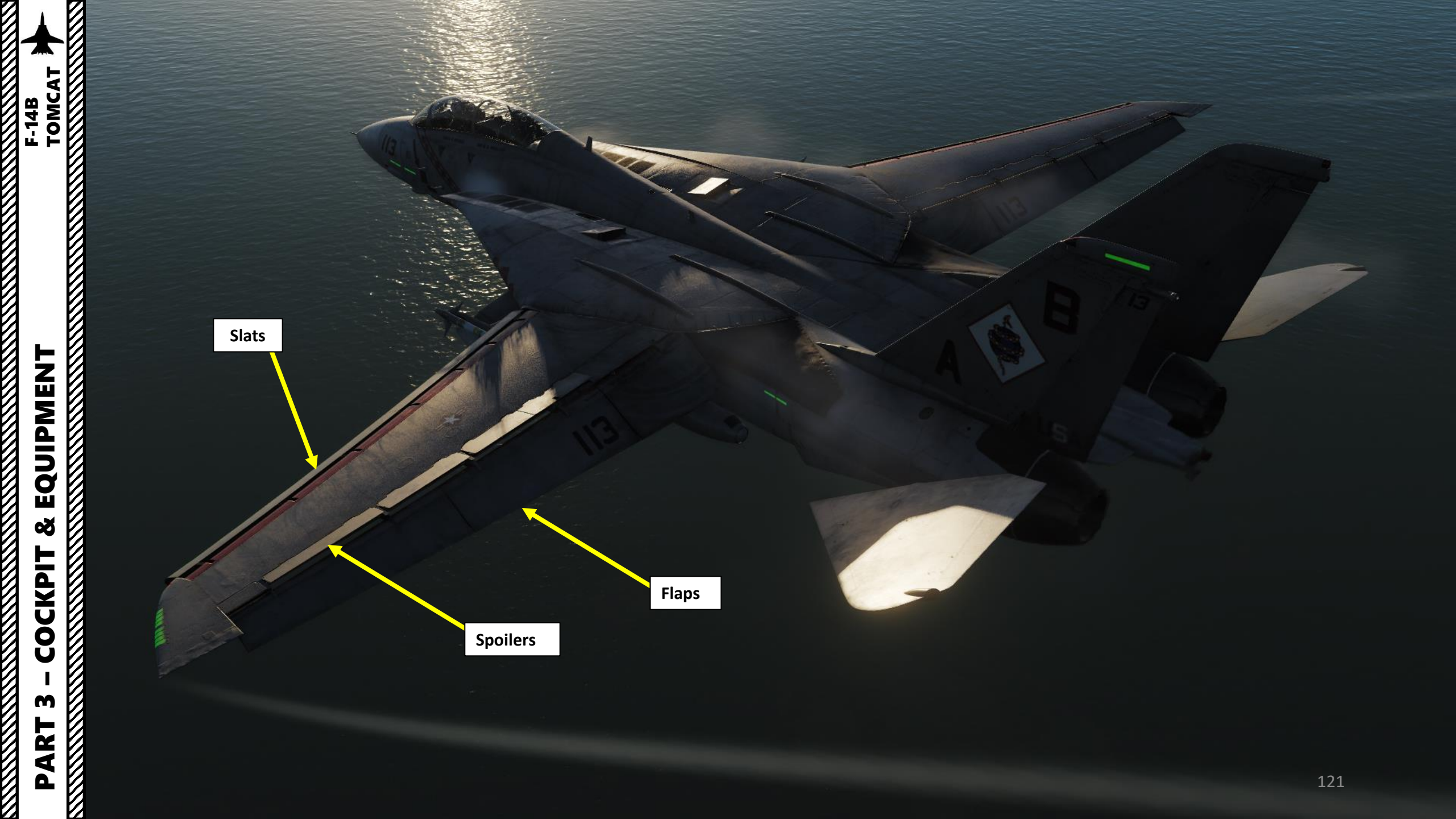


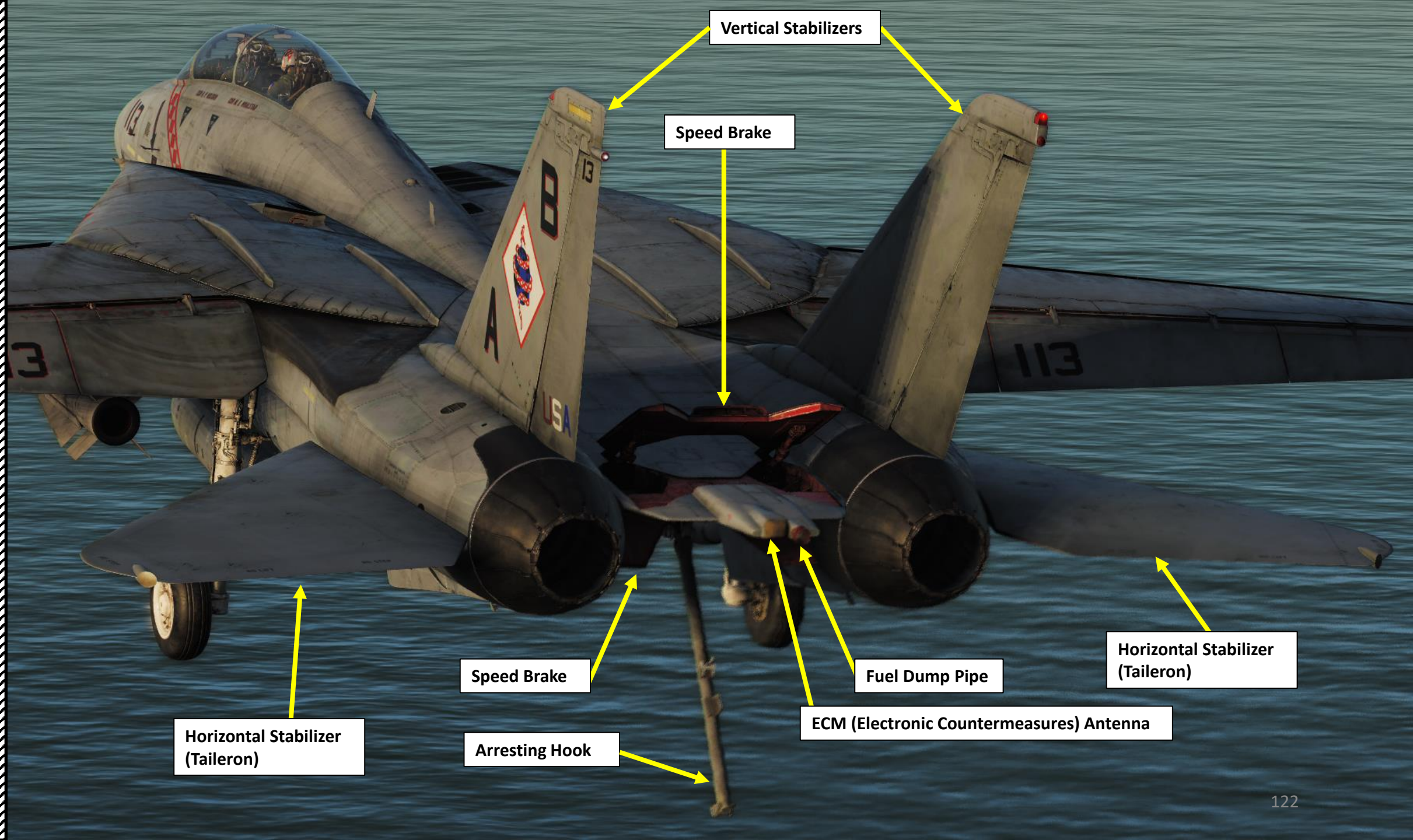
Angle of Attack Probe

Angle of Attack Transmitter

Pitot Static Probe

Angle of Attack Probe (AIC, Air Inlet Control Computer)


Slats
Flaps
Spoilers

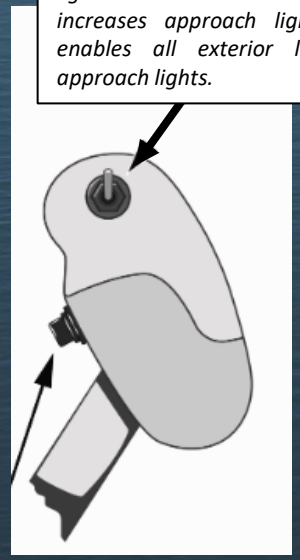

Vertical Stabilizers
Speed Brake
Speed Brake
Horizontal Stabilizer (Taileron)
Arresting Hook
Fuel Dump Pipe
ECM (Electronic Countermeasures) Antenna
Horizontal Stabilizer (Taileron)

Tail Position Light

Formation Lights

Formation Lights

Exterior Lights Master Switch
ON (pressed) / OFF (released)
Switch on throttle used to control exterior lights. OFF disable all exterior lights and increases approach light intensity. ON enables all exterior lights and dims approach lights.



Anti-Collision Light (Strobe)

Formation Lights

Formation Lights


Anti-Collision Light (Strobe)
Wing Position (Navigation) Light (Green)
Illuminates when wings are swept back
Wing Position (Navigation) Light (Red)
Illuminates when wings are swept back



Wing Position (Navigation) Light (Red)
Illuminates when wings are un-swept

Wing Position (Navigation) Light (Green)
Illuminates when wings are un-swept


Chinpod Position Light


Catapult Shuttle
Launch Bar
(Hooked in catapult shuttle)

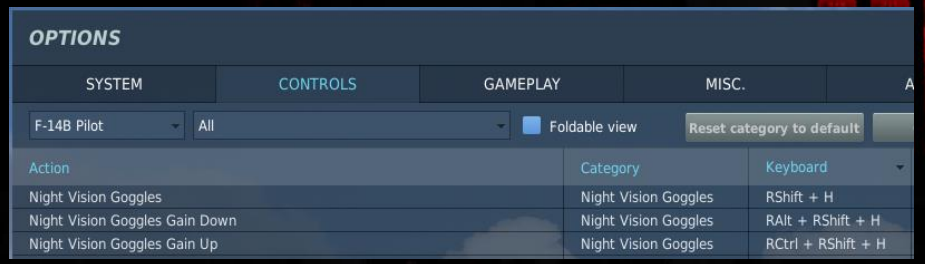

Launch Bar
(Retracted)


Nosewheel Taxi Light


113
113
Landing Gear Angle of Attack Indexer

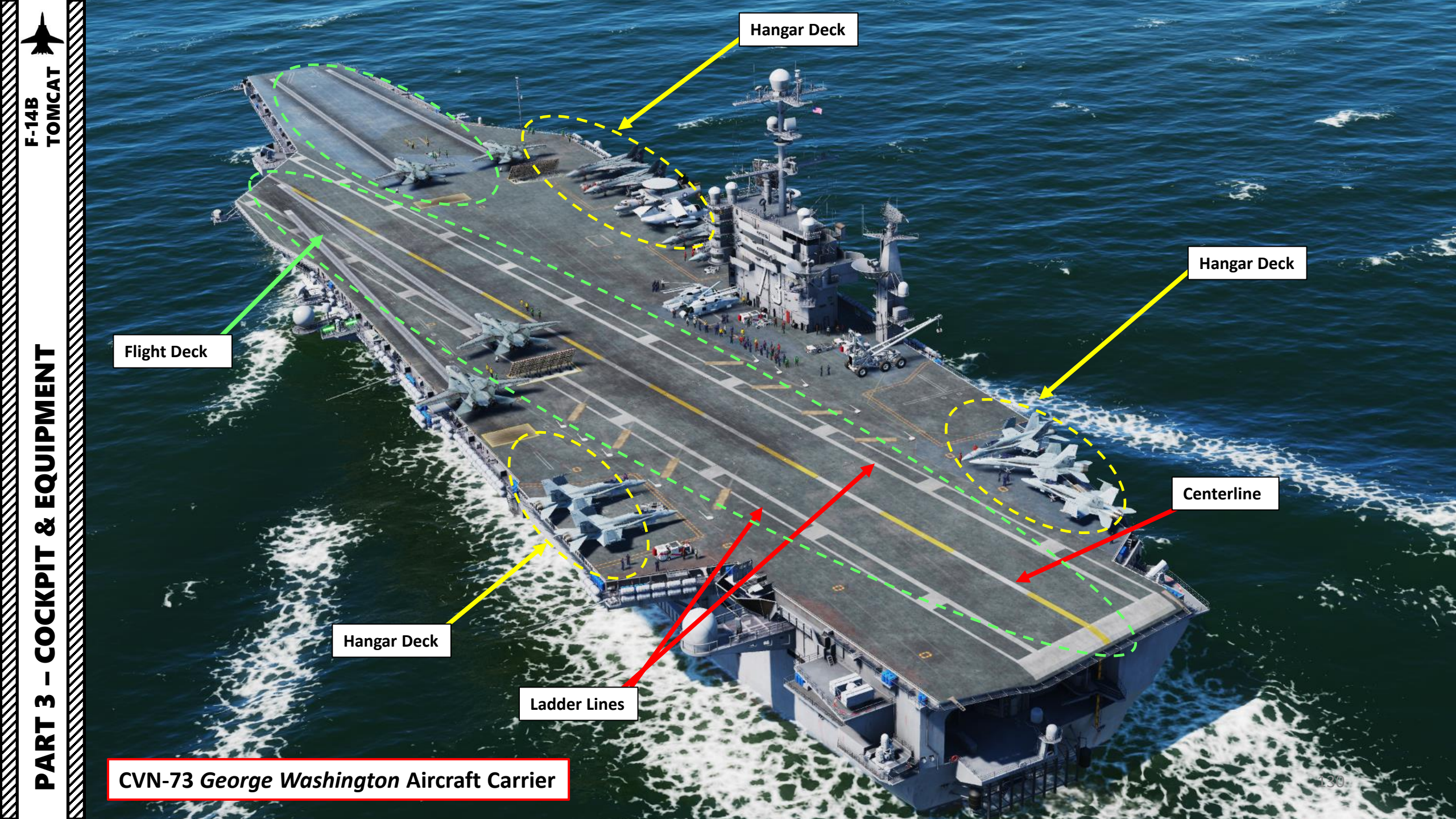




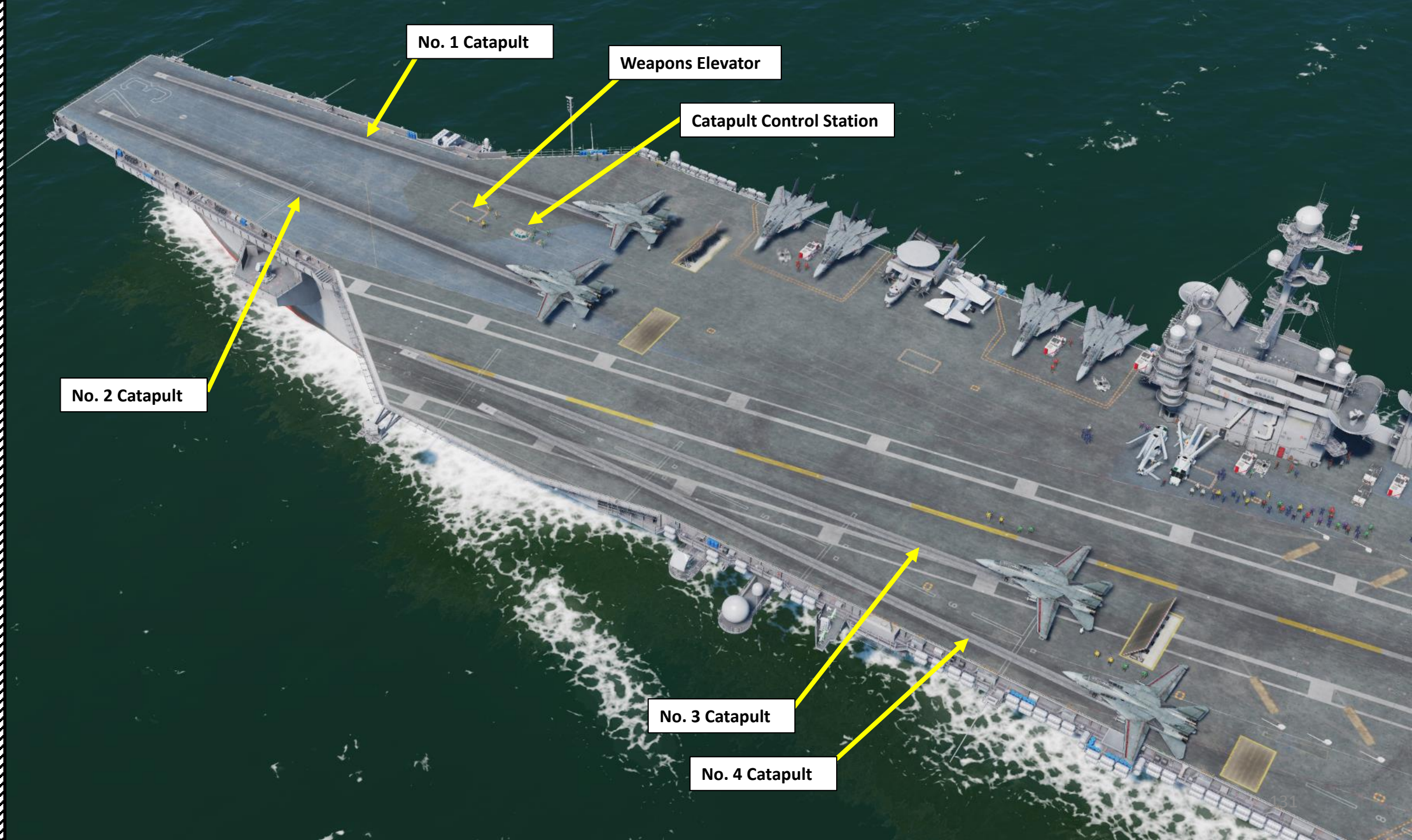


Night Vision Goggles (NVG) Controls:

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



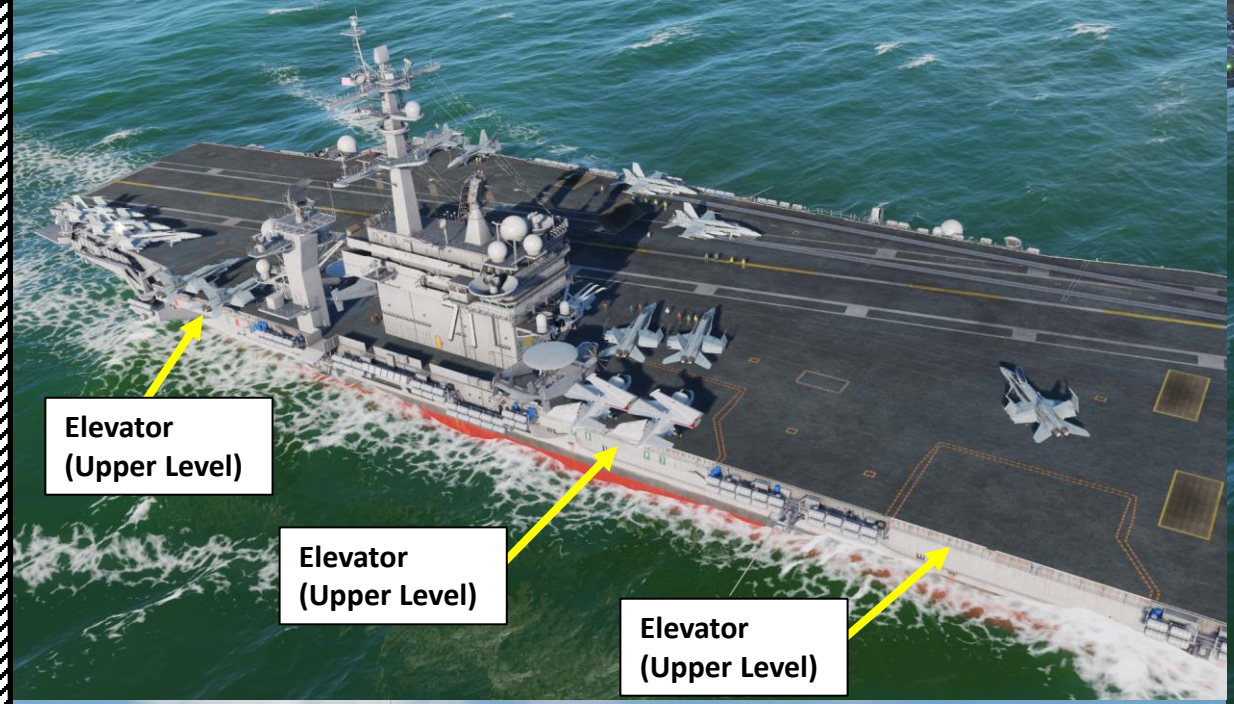
CVN-73 *George Washington* Aircraft Carrier

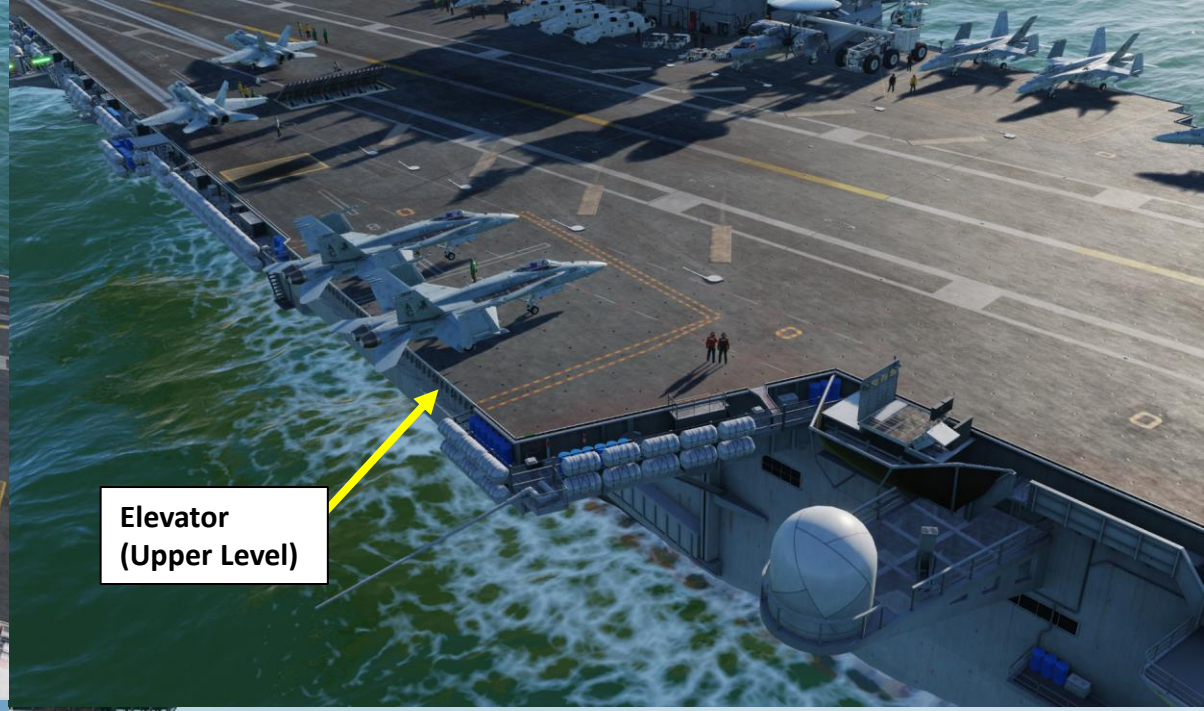

No. 1 Catapult
Weapons Elevator
Catapult Control Station
No. 2 Catapult
No. 3 Catapult
No. 4 Catapult

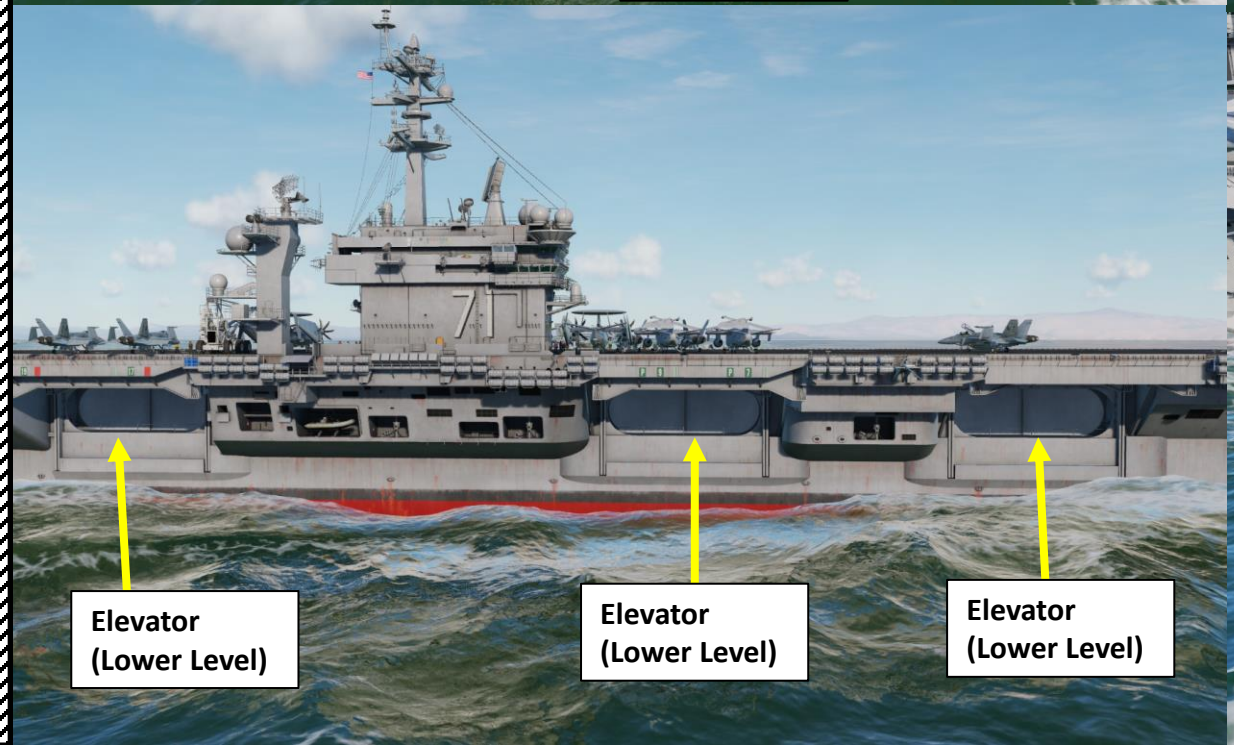

JBD (Jet Blast Deflector)
Deflects engine jet blast in order to not damage any aircraft or injure carrier crew. They also act as heat shields since many carrier-launched aircraft takeoff with afterburners on.
Steam Catapult Launch Rail
113
CDR H. P. MOLIDOR
CDR M. E. WRALSTAD



Integrated Catapult Control Station (ICCS), also called “The Bubble”.

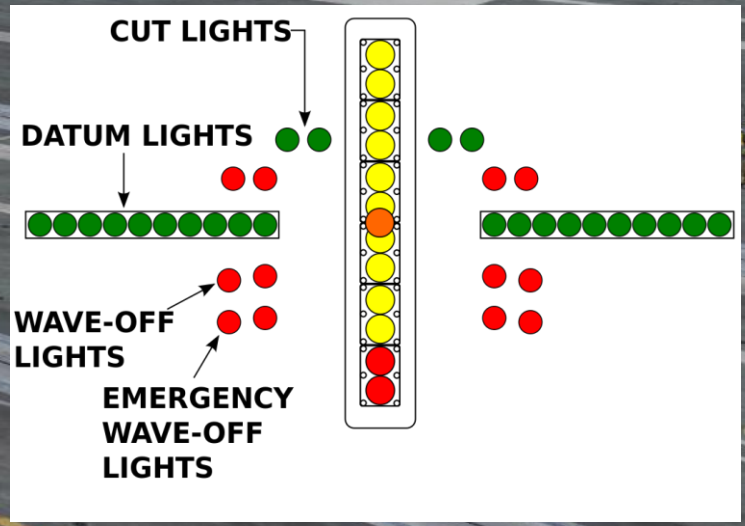

Elevator
(Upper Level)
Elevator
(Upper Level)
Elevator
(Upper Level)


Elevator
(Upper Level)

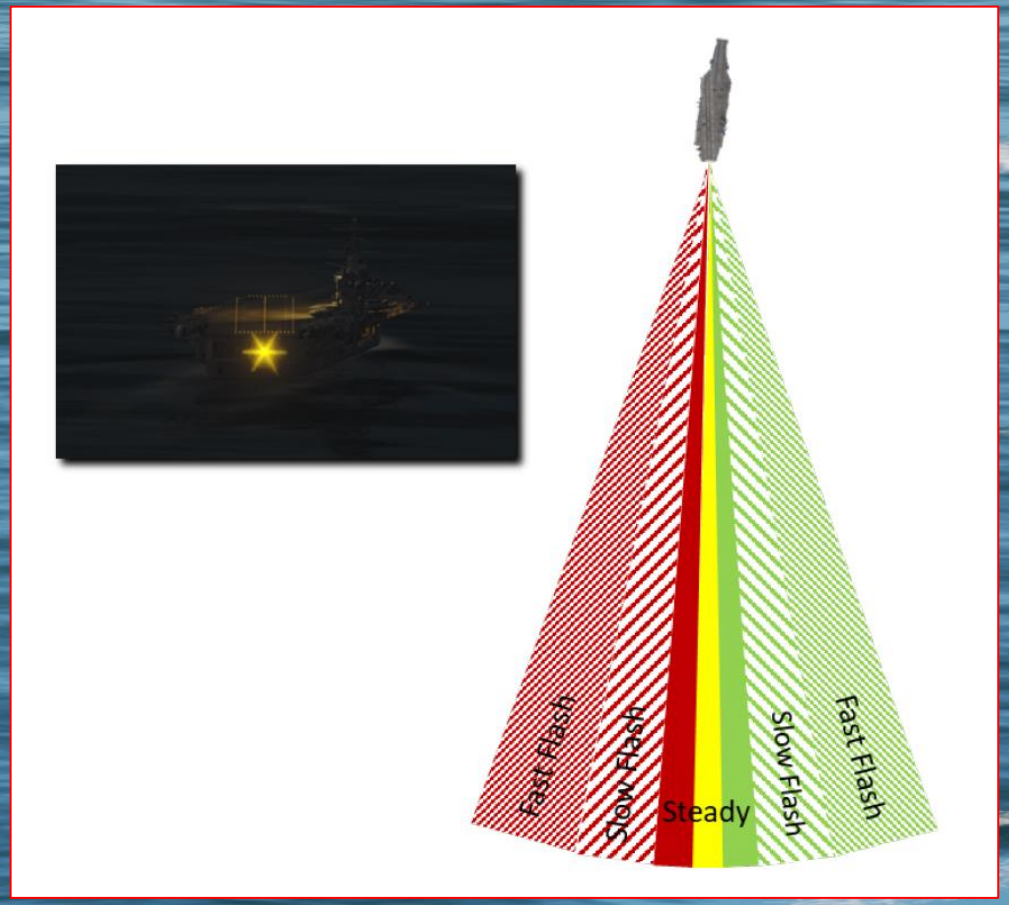

Elevator
(Lower Level)
Elevator
(Lower Level)
Elevator
(Lower Level)


Elevator
(Lower Level)


Arresting Wires
These wires are used to help the aircraft brake when landing on the carrier. The aircraft hook catches one of these wires and brings the aircraft to a full stop. When landing, you have to aim for the third wire. The first wire landing is a short landing, while a fourth wire landing is a long one.



IFLOLS (Improved Fresnel Lens Optical Landing System)
Also called as “the ball” or “meatball”, the IFLOLS is used as visual aid to land on the carrier.



LRLLS (Long Range Laser Lineup System)
Used for Case III recoveries to provide a visual cue to see the lateral deviation from the centerline.


“The Island”
Building used to direct flight operations


Primary Flight Control
Bridge
Flag Bridge



LSO (Landing Signal Officer) Station
Used for directing players in a multiplayer setting or observing aircraft in a single player setting.



Yellow Shirts

These include the **Plane Directors** who will guide you around the deck and into position for launch. All taxi guidance comes from these personnel.

Other yellow shirts include Flight Deck Officers, Arresting Gear Officers, Catapult Officers (Shooters), Catapult Spotters and Aircraft Handling Officers.



Green Shirts

You will encounter these personnel during launch as Catapult and Arresting Gear crews position the holdback bar and ensure proper attachment to the catapult shuttle. Maintenance personnel of various specialties may also be on hand to troubleshoot last minute problems with the aircraft.

Other green shirts include Helicopter Landing Signal Enlisted (LSE), Cargo-handling personnel, Ground support equipment troubleshooters, Hook runners and Photographers mates.



White Shirts

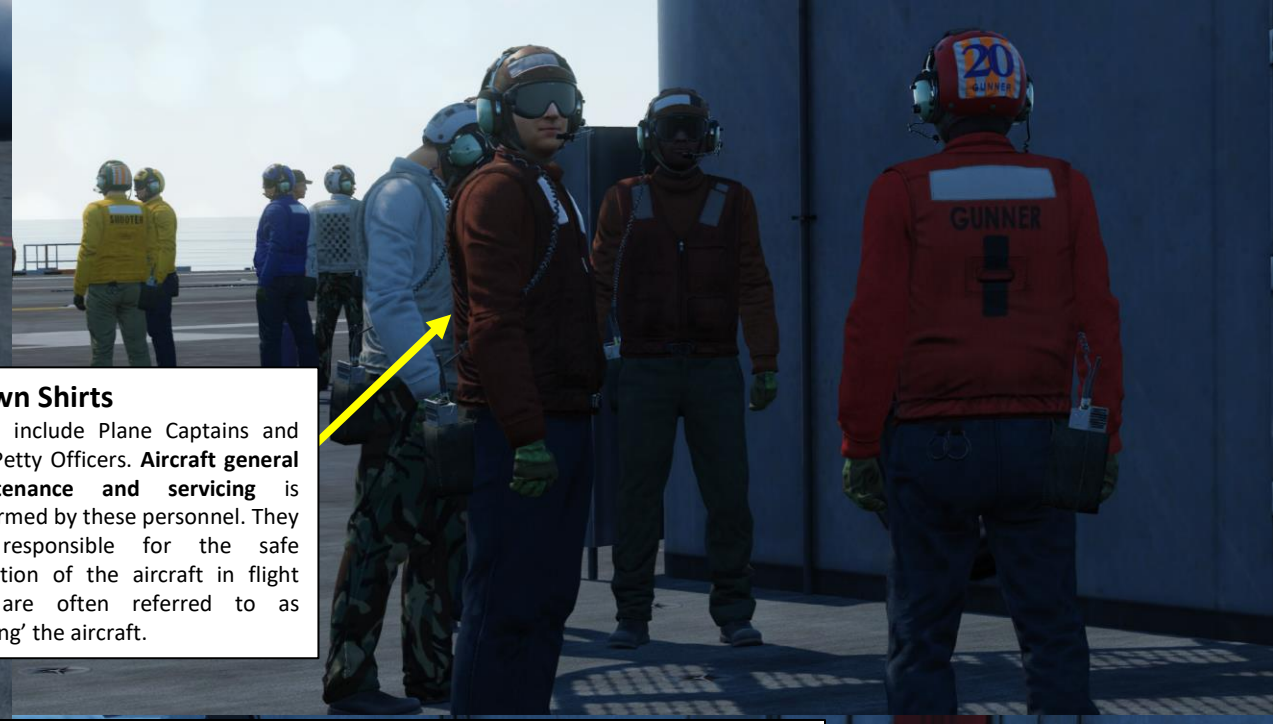
You will encounter these personnel during launch as **Final Checkers** give your aircraft a last-minute look for problems. The Landing Signal Officers (LSO) are also white shirts.

Other white shirts include Safety personnel, Medical personnel, Quality Assurance personnel and Air Transfer Officers (ATO).



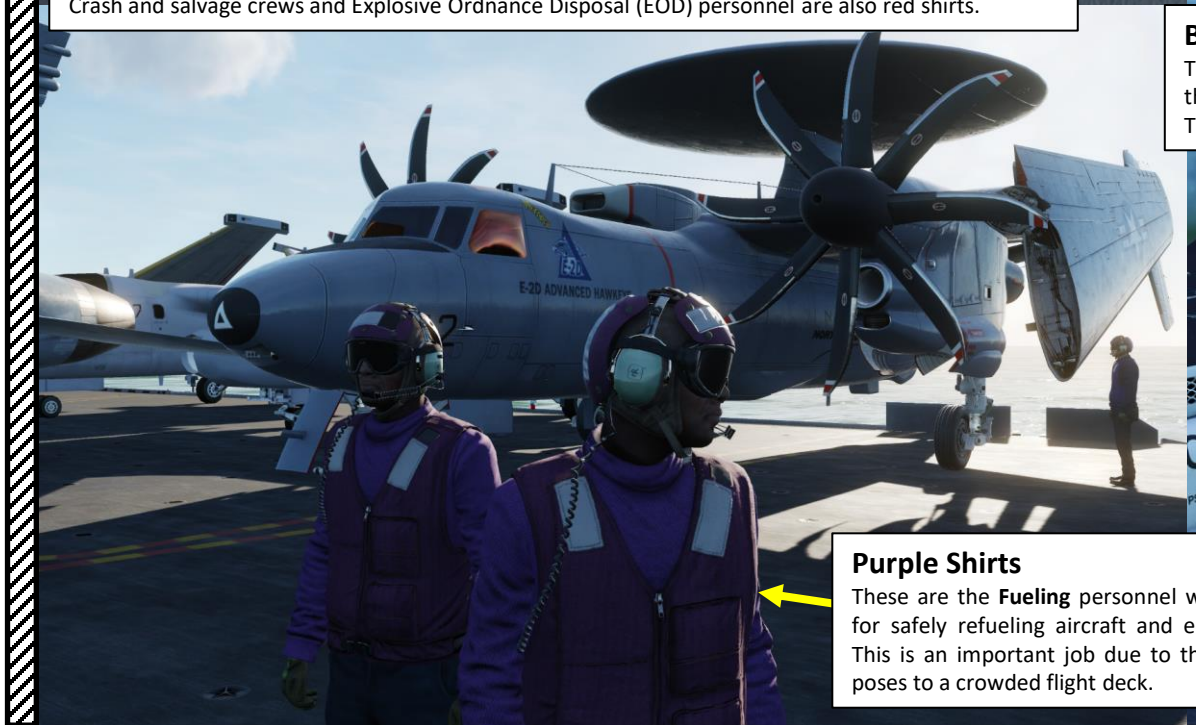
Red Shirts

These are the **Aviation Ordnancemen** who build, test, transport, and load **weapons** on the aircraft. They also test and maintain the aircraft gun systems, as well as avionics and release equipment used to employ weapons in the air.
Crash and salvage crews and Explosive Ordnance Disposal (EOD) personnel are also red shirts.



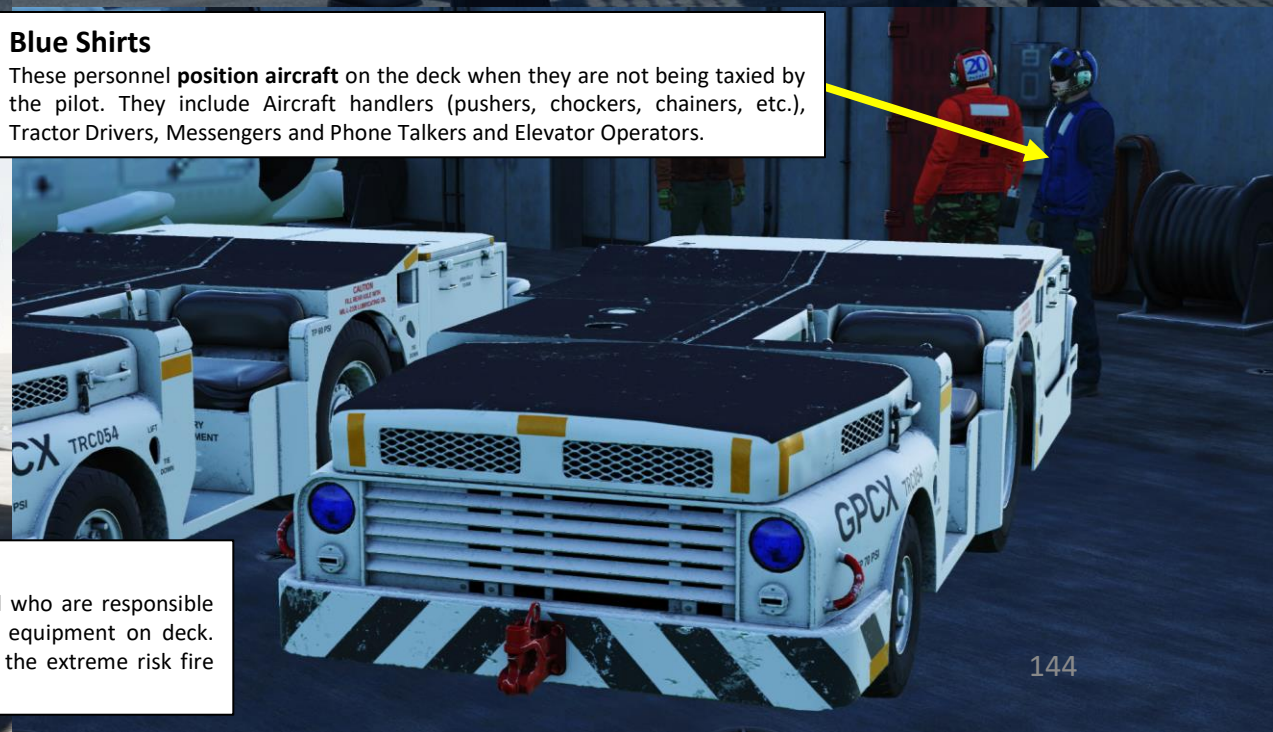
Brown Shirts

These include Plane Captains and Line Petty Officers. **Aircraft general maintenance and servicing** is performed by these personnel. They are responsible for the safe operation of the aircraft in flight and are often referred to as 'owning' the aircraft.



Purple Shirts

These are the **Fueling** personnel who are responsible for safely refueling aircraft and equipment on deck. This is an important job due to the extreme risk fire poses to a crowded flight deck.



Blue Shirts

These personnel **position aircraft** on the deck when they are not being taxied by the pilot. They include Aircraft handlers (pushers, chockers, chainers, etc.), Tractor Drivers, Messengers and Phone Talkers and Elevator Operators.

PART 3 – COCKPIT & EQUIPMENT

SUMMARY

The start-up procedure will be separated in the following sections:

1. PILOT PRE-START
2. PILOT ENGINE START
3. PILOT POST-START
4. RIO INS ALIGNMENT (SHORE)
5. RIO INS ALIGNMENT (CARRIER)
6. RIO POST-ALIGNMENT PROCEDURE



Note: Steps preceded by [J] are done with the JESTER AI, which means that a human RIO can perform them too.

1 – PILOT PRE-START

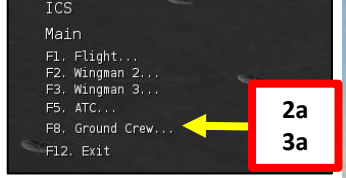


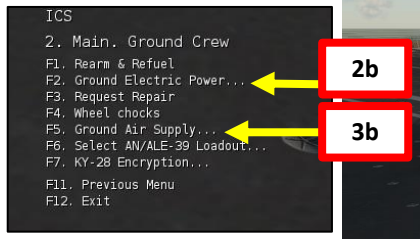
1 – PILOT PRE-START

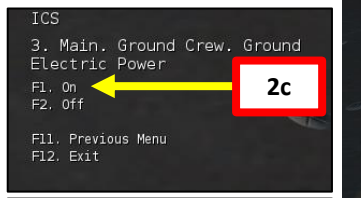
1. Ensure Parking Brake Lever is ENGAGED (Pulled AFT)

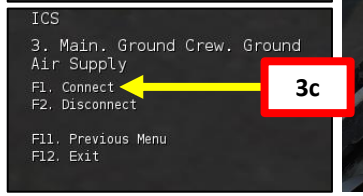
Note: The Tomcat does not have a battery switch nor an APU (Auxiliary Power Unit) – its electrical systems run strictly on either engine generator power or an external power source. GE F110 engines have pneumatic starters and require an external air pressure source, which can be provided by contacting the Ground Crew.

2. Call ground crew to connect Ground Electric Power
    a) Press "\" (Communication Menu) and "F8" to select ground crew
    b) Select "Ground Electric Power" by pressing "F2"
    c) Select "ON" by pressing "F1" to turn on ground power
3. Connect compressed air supply unit:
    a) Press "\" to open radio menu and "F8" to select ground crew
    b) Press "F5" to select Ground air supply
    c) Press "F1" to connect air supply unit

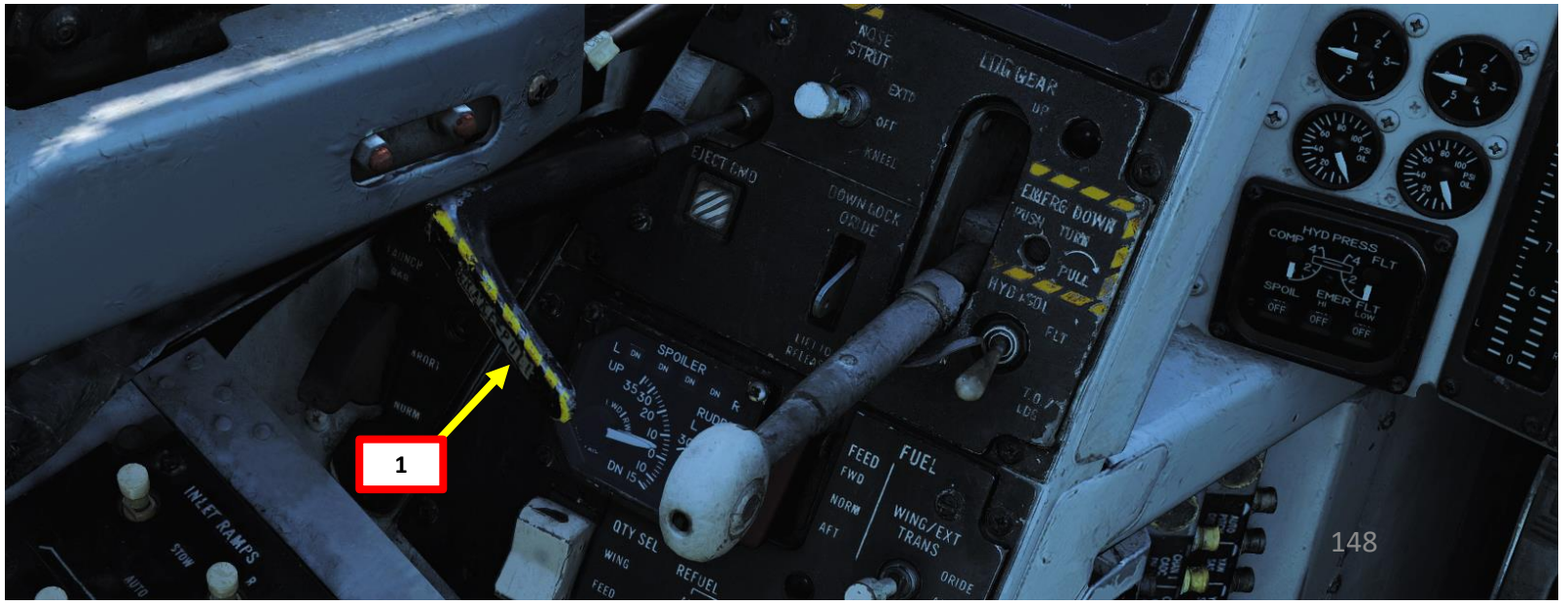






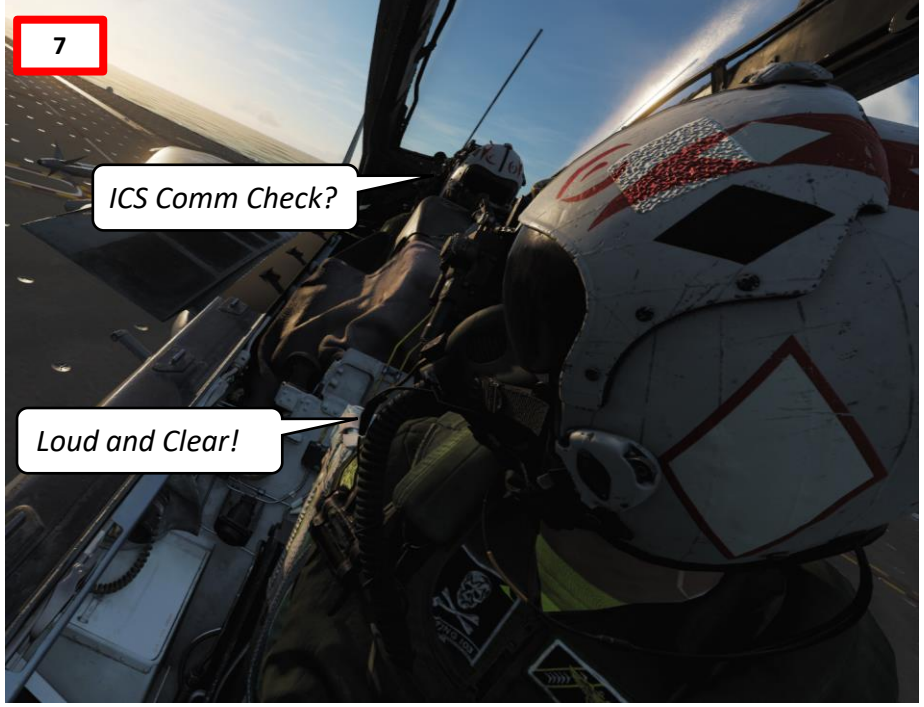


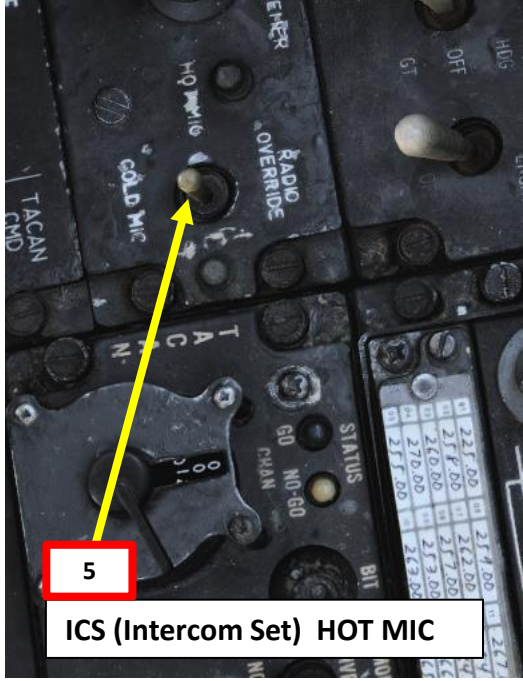


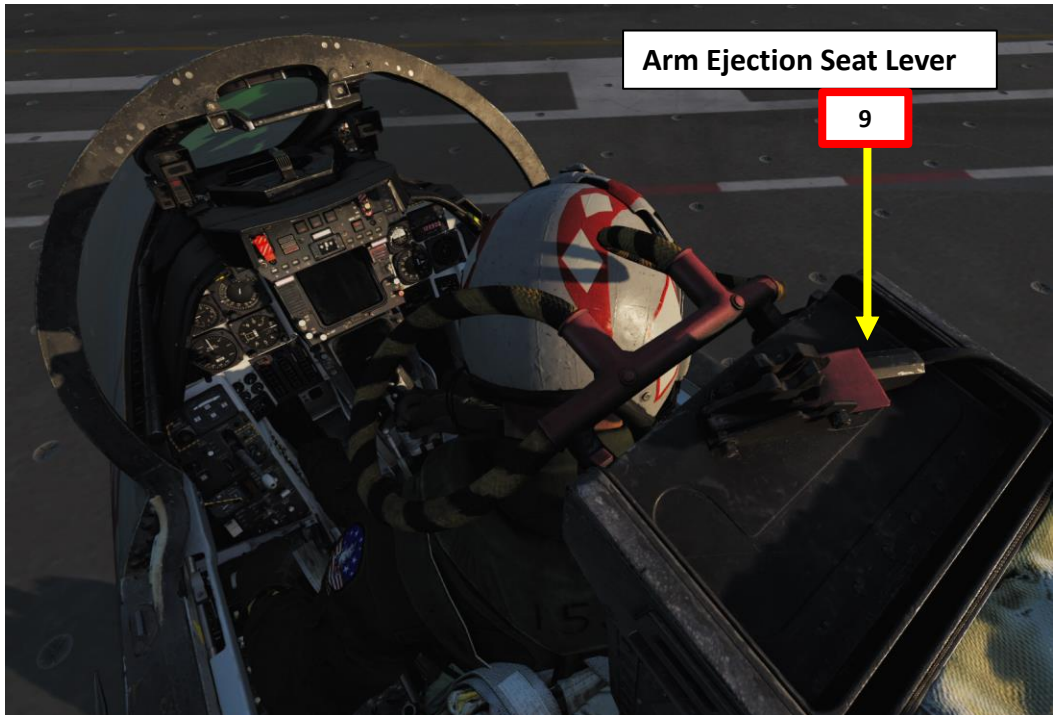


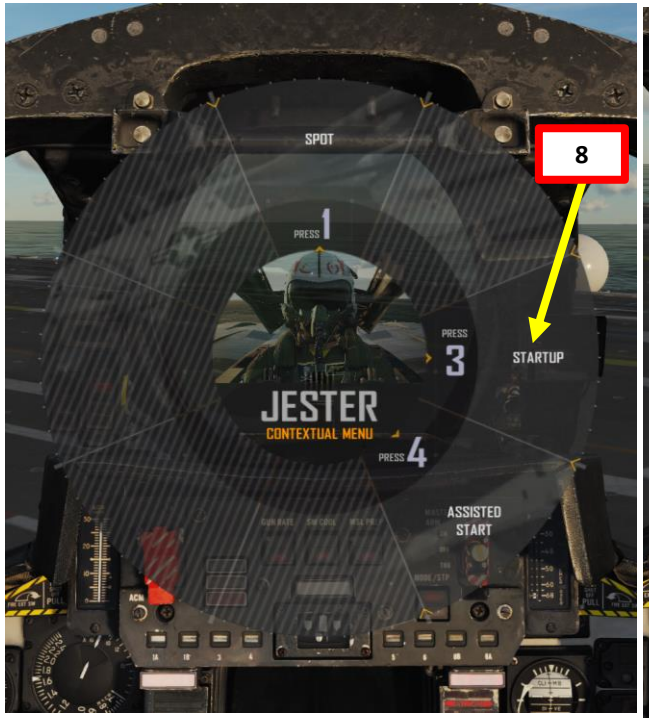
1 – PILOT PRE-START

4. Once ground power is connected, the RIO can proceed with his own start-up procedure.
5. Set ICS (Intercom Set) switch to HOT MIC
6. [J] Use the JESTER Contextual Menu by pressing “A” and selecting “STARTUP” (LCTRL+3) to request start-up.
7. [J] After a few seconds, your RIO will request a Comm Check to test the ICS (Intercom Set).
8. [J] Use the JESTER Contextual Menu again by pressing “A” and confirm that you heard him by selecting “LOUD AND CLEAR” (LCTRL+4).
9. Arm the pilot ejection seat by clicking the Ejection Seat Arming Handle (DOWN) or pressing “LSHIFT+E”.





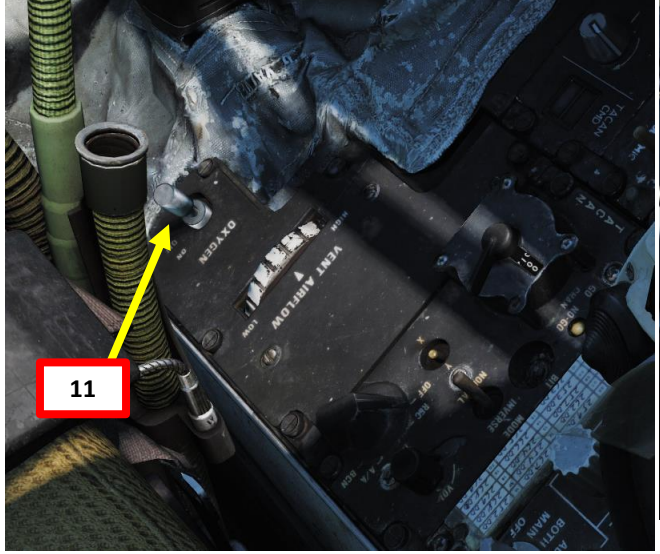




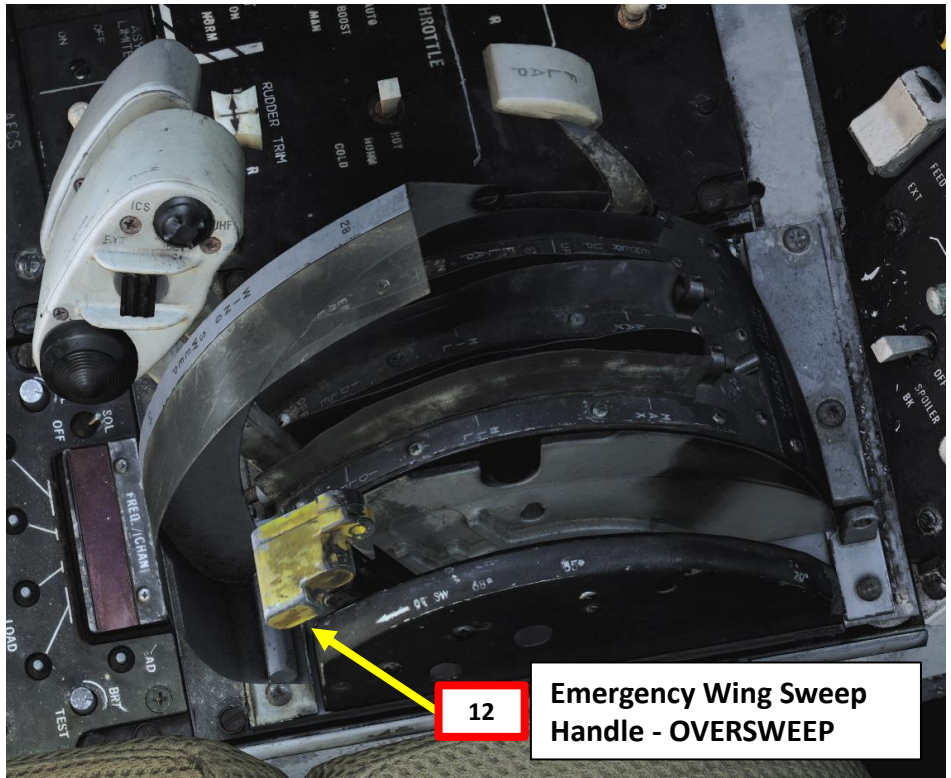


1 – PILOT PRE-START

10. [J] Jester will automatically close the canopy for you once your ejection seat is armed properly. He will then resume running through his start-up checklist. If flying with a human RIO, the RIO can close the canopy with "LCTRL+C".
11. Set Oxygen Switch – ON (FWD)
12. Set Emergency Wing Sweep Handle – OVERSWEEP (AFT)









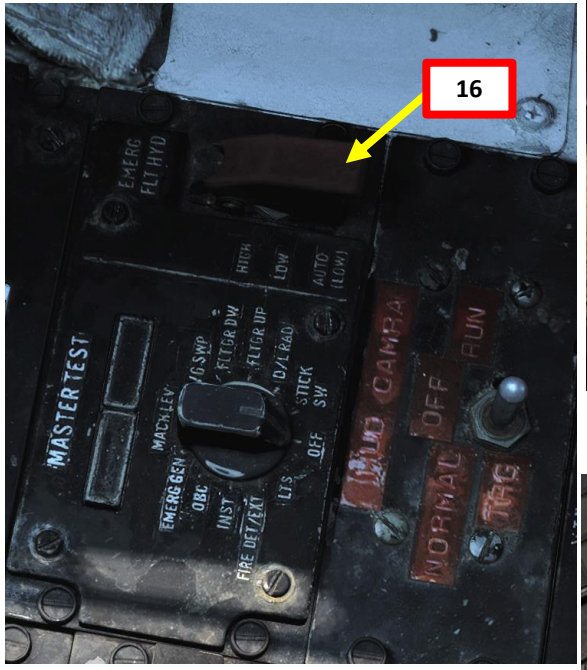


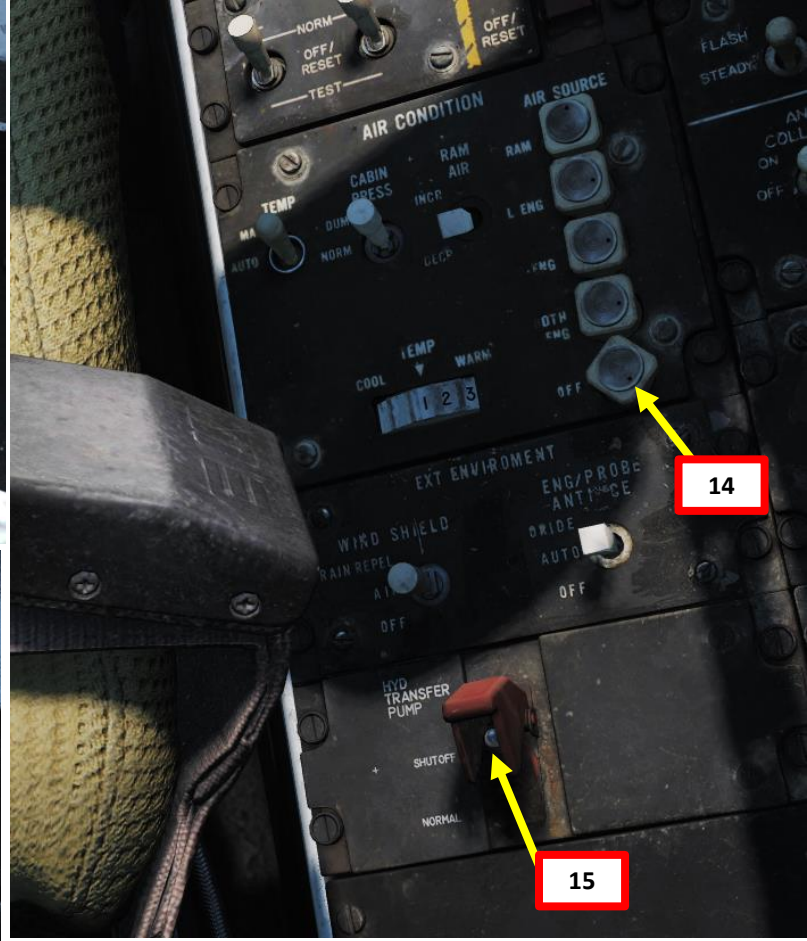
2 – PILOT ENGINE START

13. Verify that Ground Power and Air Pressure Cart are connected
14. Set AIR SOURCE – OFF
15. Set HYD TRANSFER Pump – SHUTOFF
16. Set Emergency Flight Hydraulics Switch – AUTO (LOW)
17. Verify that L MASTER GEN and R MASTER GEN switches are set to NORM (FWD)





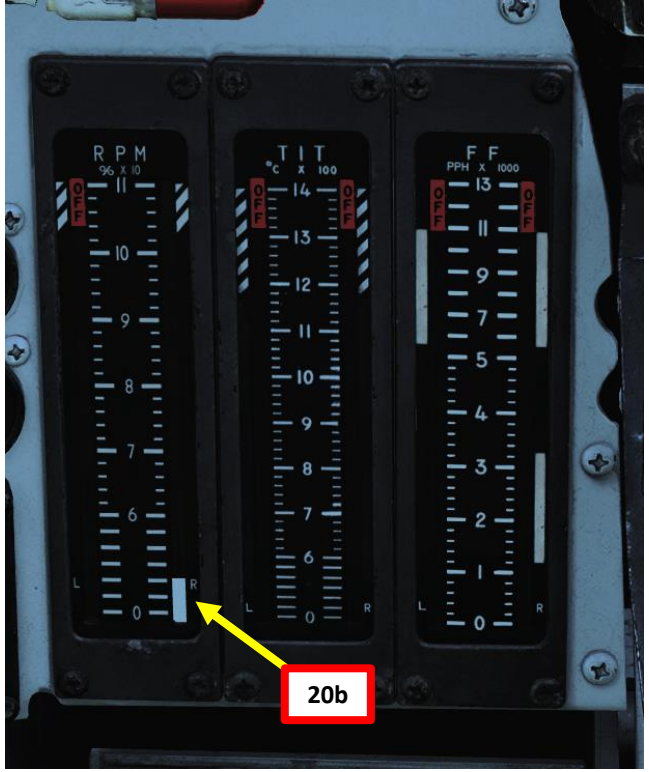


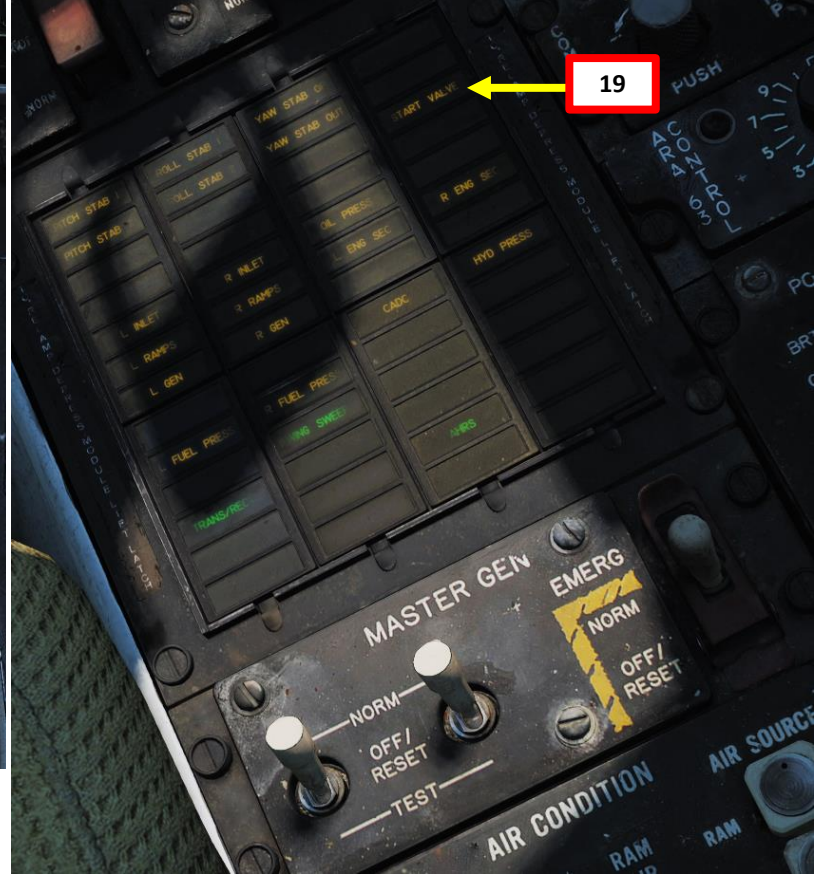


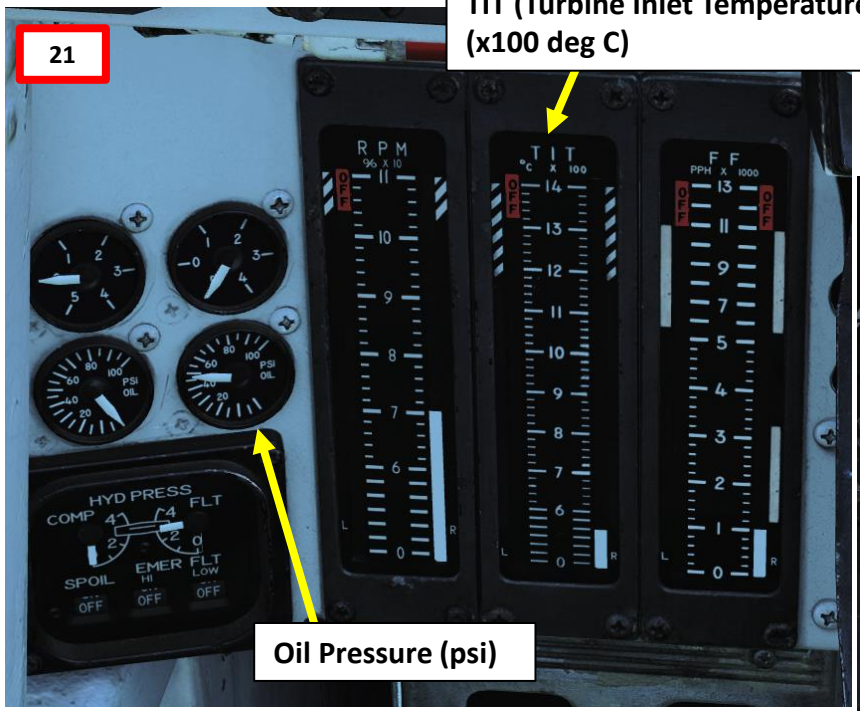


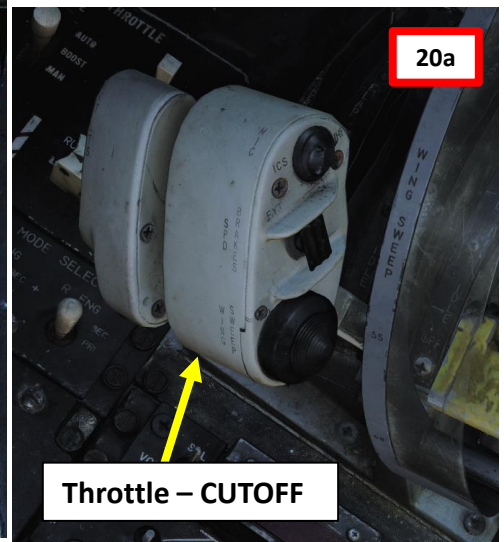
2 – PILOT ENGINE START

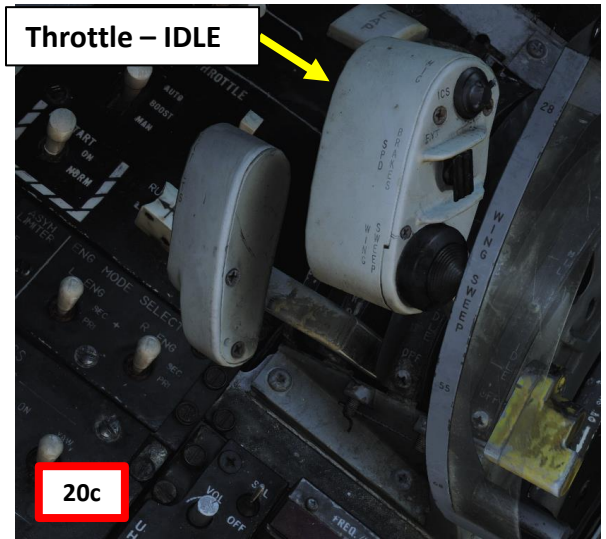
18. Start right engine first by setting Engine Crank switch – R (RIGHT) using right-click.
19. Right Engine cranking will initiate and the START VALVE caution will appear. Engine N2 (High-Pressure Compressor Speed) will rise to approx. 20 % RPM.
20. When Right Engine N2 reaches 20 % RPM , click on the Right Throttle to move it from the OFF detent to the IDLE detent to open the fuel valves and introduce fuel. Igniters will kick in and trigger an engine lightoff. TIT should rise within 5 to 15 sec.
21. Verify that oil pressure rises and that TIT (Turbine Inlet Temperature) does not exceed 890 deg C until engine stabilizes.
22. Around 50 % RPM N2, Engine Cranking switch will spring back to the OFF position, starter will disengage and START VALVE caution will disappear









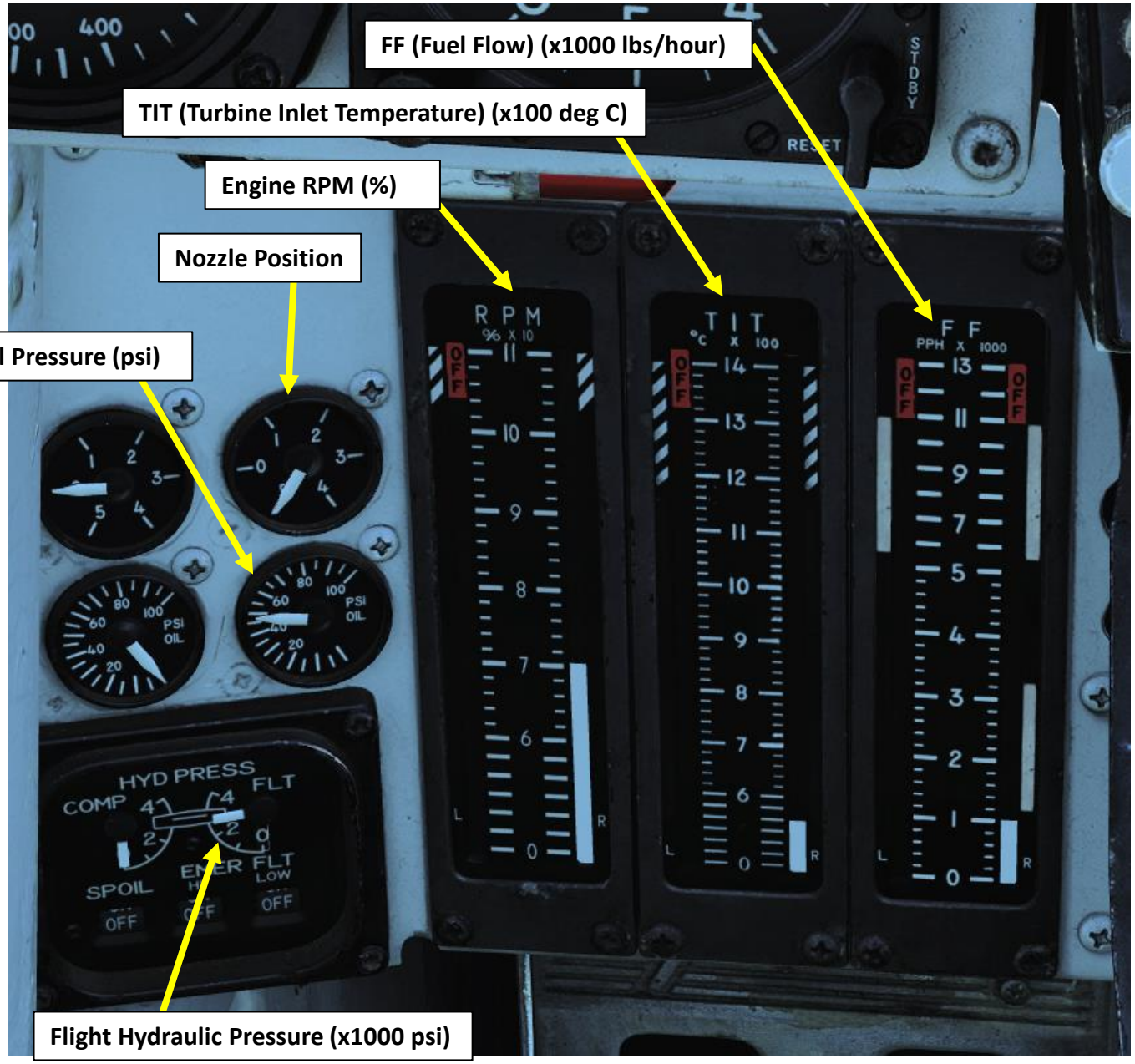




2 – PILOT ENGINE START

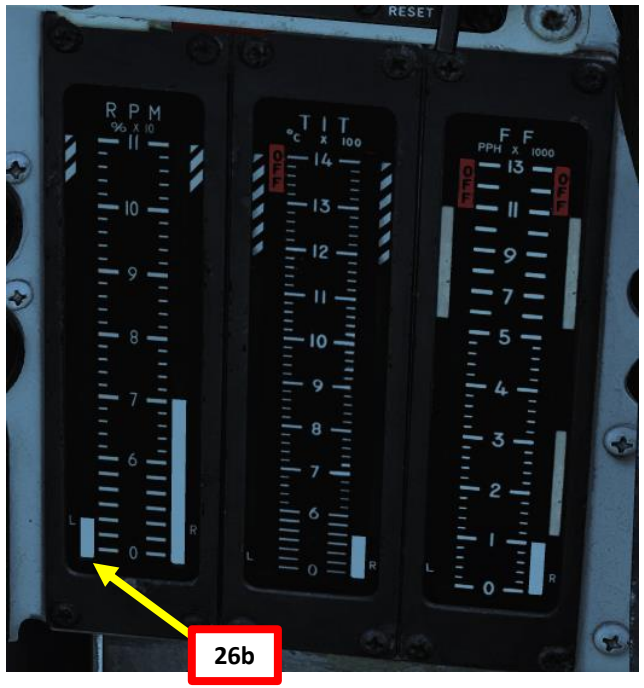
23. Wait for Right Engine RPM to stabilize around 70 % RPM N2. Confirm that right generator is running by checking that the R GEN caution is extinguished. Engine should be stabilized at the following parameters:
    - RPM between 62 and 78 %
    - TIT around 500 deg C
    - Fuel Flow between 950 and 1400 lbs/hour (pph)
    - NOZ (Nozzle) position fully open at 100 % (5)
    - Oil Pressure between 25 and 35 PSI (15 psi minimum)
    - Flight Hydraulic Pressure – 3000 psi

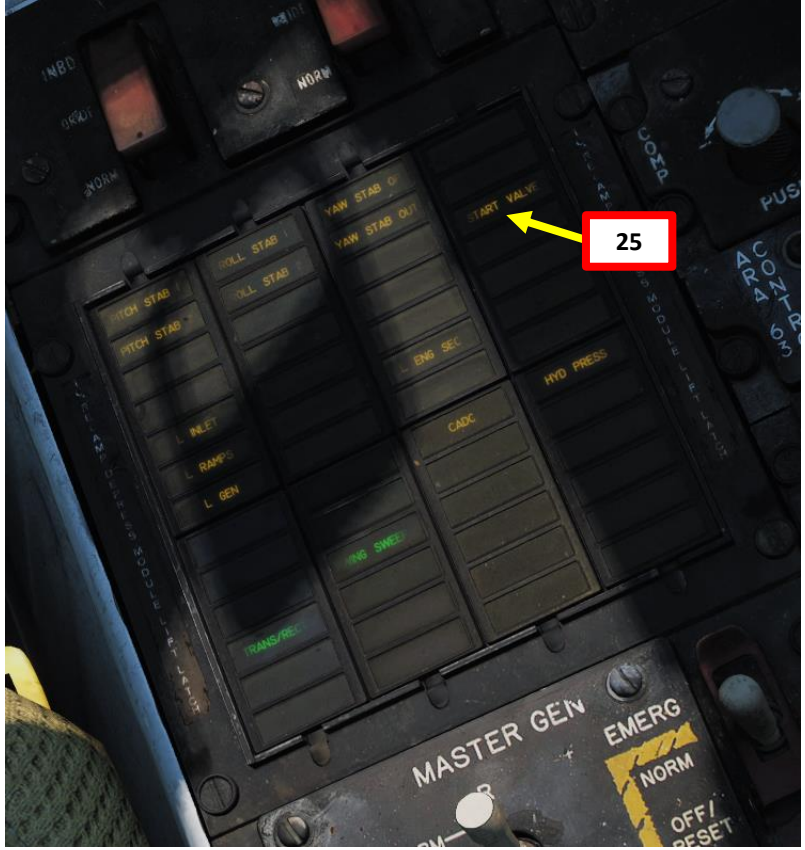


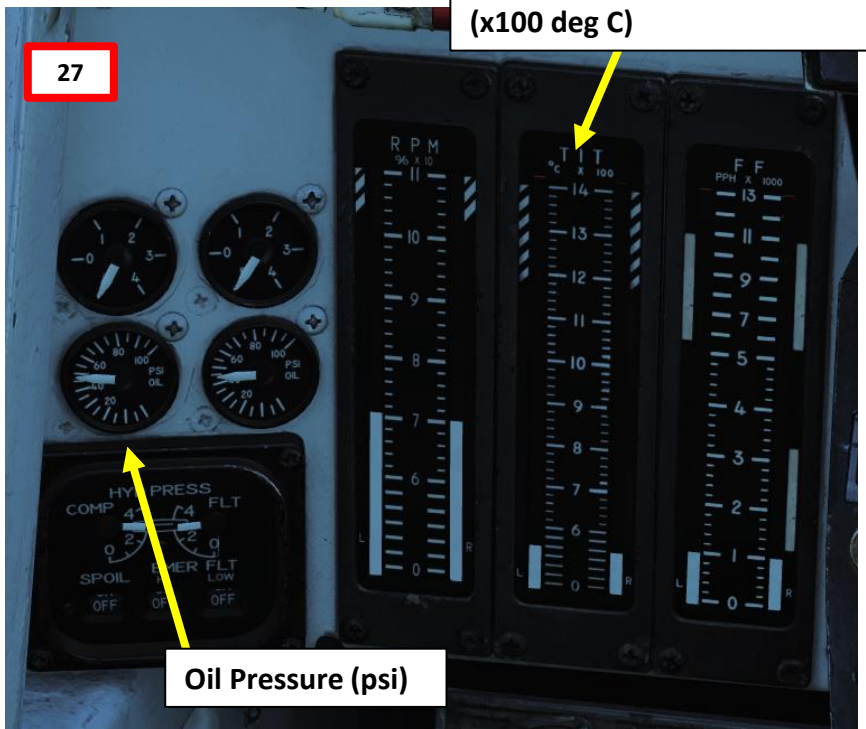


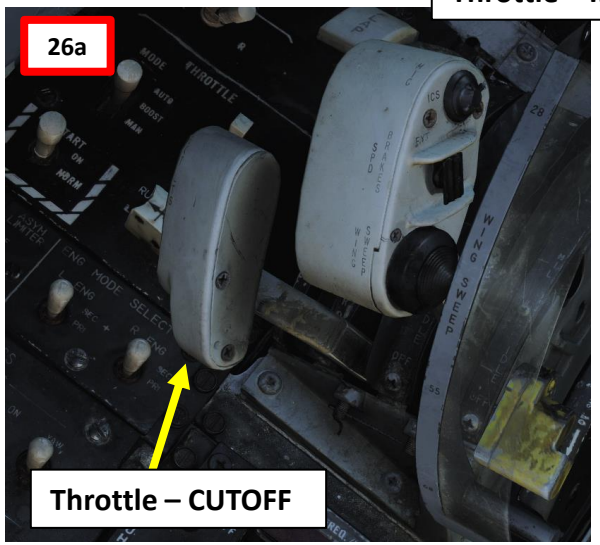
2 – PILOT ENGINE START

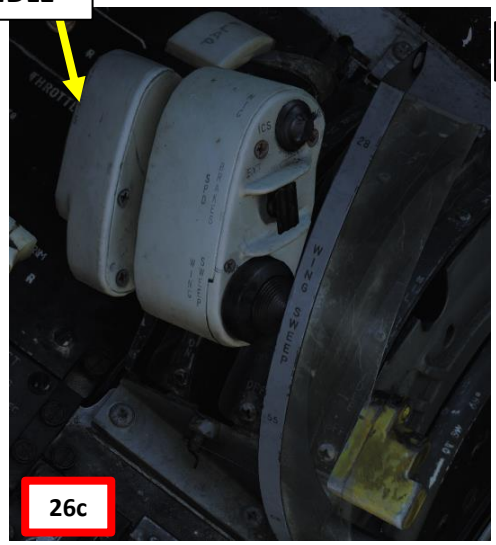
24. Start left engine first by setting Engine Crank switch – L (LEFT) using left-click.
25. Left Engine cranking will initiate and the START VALVE caution will appear. Engine N2 (High-Pressure Compressor Speed) will rise to approx. 20 % RPM.
26. When Left Engine N2 reaches 20 % RPM , click on the Left Throttle to move it from the OFF detent to the IDLE detent to open the fuel valves and introduce fuel. Igniters will kick in and trigger an engine lightoff. TIT should rise within 5 to 15 sec.
27. Verify that oil pressure rises and that TIT (Turbine Inlet Temperature) does not exceed 890 deg C until engine stabilizes.
28. Around 50 % RPM N2, Engine Cranking switch will spring back to the OFF position, starter will disengage and START VALVE caution will disappear

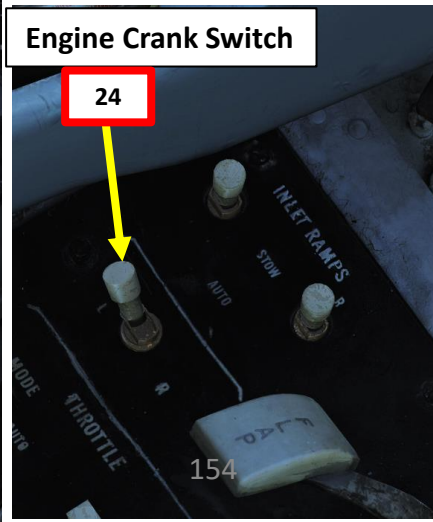






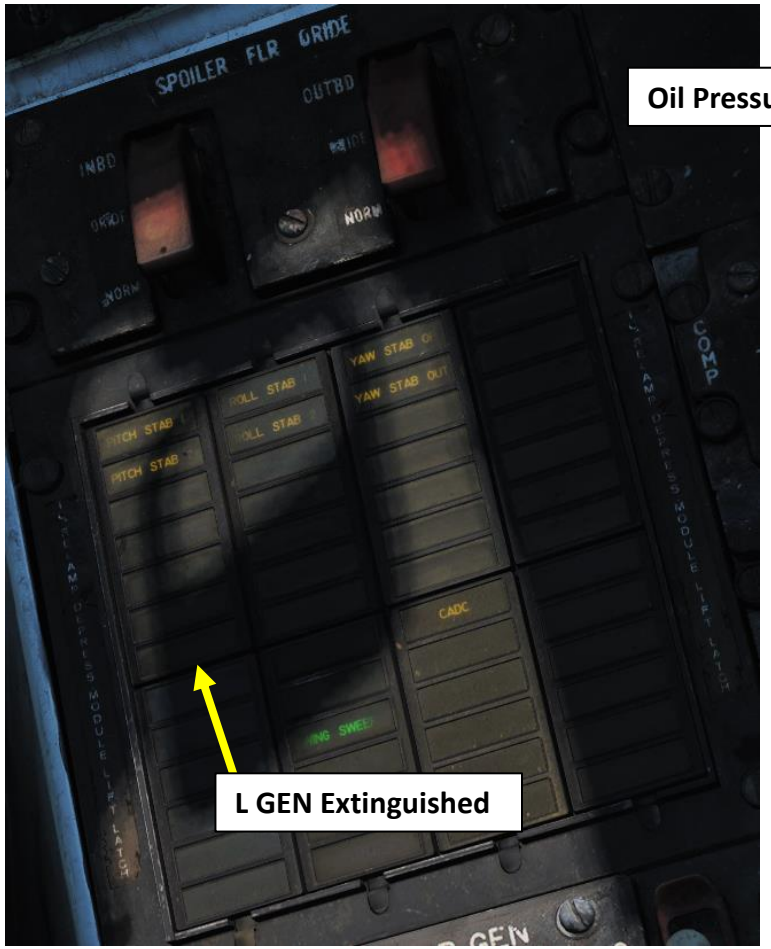


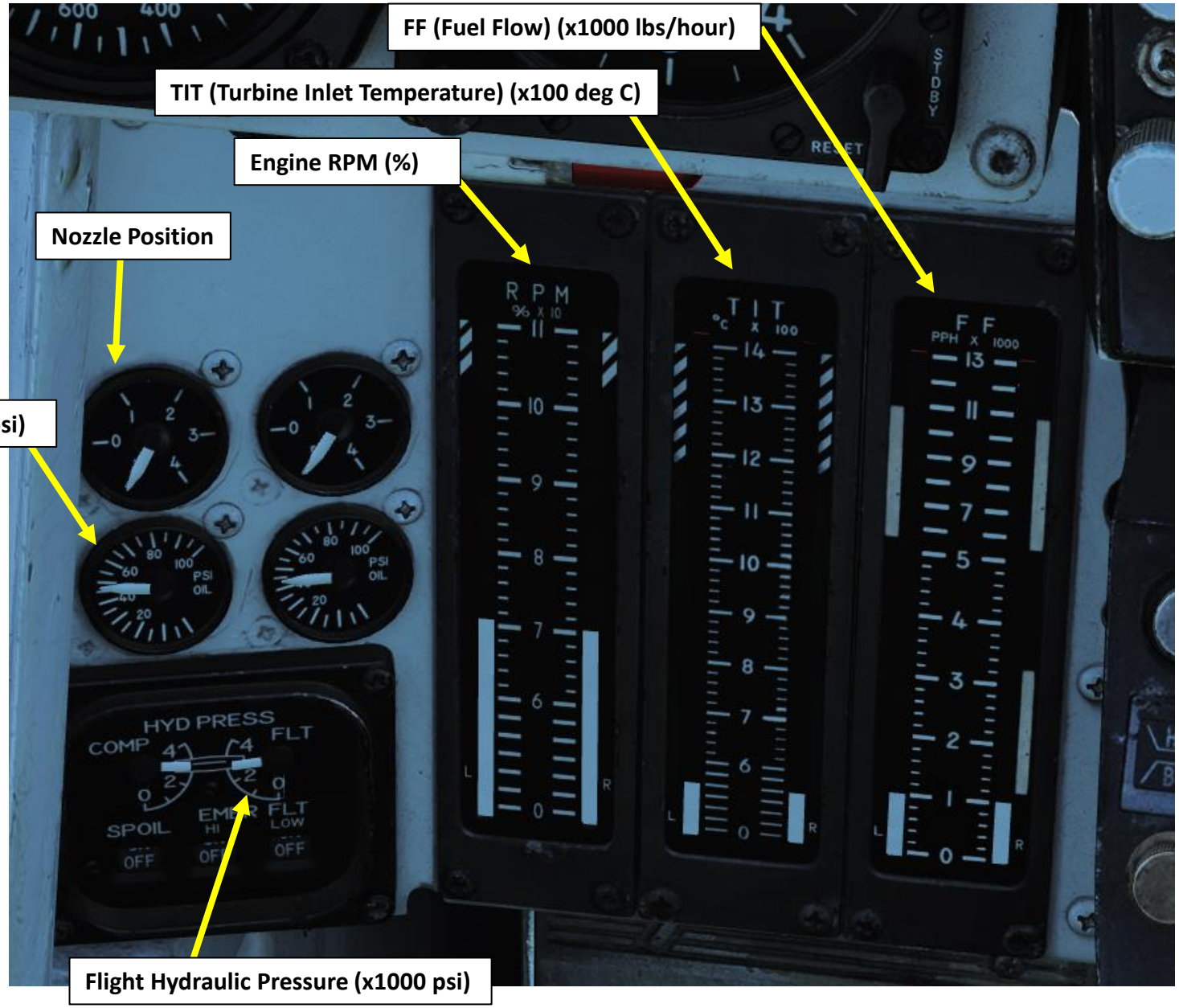




2 – PILOT ENGINE START

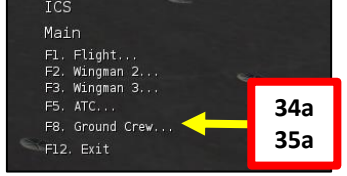
29. Wait for Left Engine RPM to stabilize around 70 % RPM N2. Confirm that left generator is running by checking that the L GEN caution is extinguished. Engine should be stabilized at the following parameters:
    - RPM between 62 and 78 %
    - TIT around 500 deg C
    - Fuel Flow between 950 and 1400 lbs/hour (pph)
    - NOZ (Nozzle) position fully open at 100 % (5)
    - Oil Pressure between 25 and 35 PSI (15 psi minimum)
    - Flight Hydraulic Pressure – 3000 psi

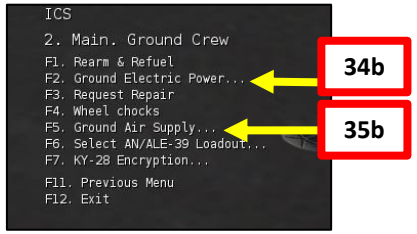


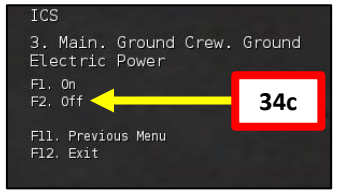


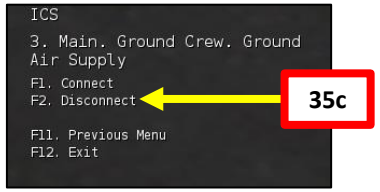
2 – PILOT ENGINE START

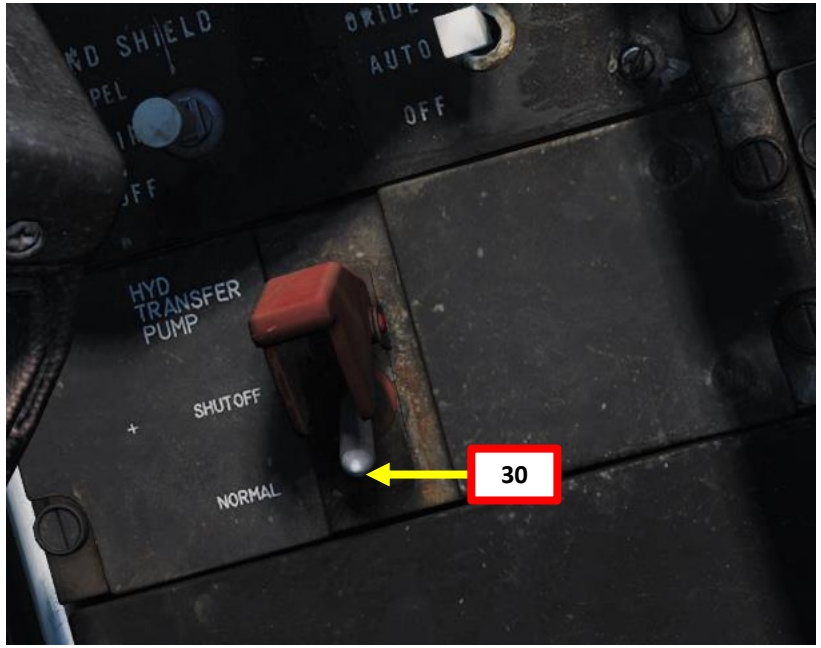
30. Set HYD TRANSFER PUMP – NORM
31. Confirm that both the COMBINED HYDRAULIC PRESSURE and FLIGHT HYDRAULIC PRESSURE indications are equal to 3000 psi each.
32. Confirm that no HYD PRESS caution is visible
33. Set Air Source – BOTH ENG
34. Call ground crew to disconnect Ground Electric Power
    a) Press "\" (Communication Menu) and "F8" to select ground crew
    b) Select "Ground Electric Power" by pressing "F2"
    c) Select "OFF" by pressing "F2" to turn off ground power
35. Disconnect compressed air supply unit:
    a) Press "\" to open radio menu and "F8" to select ground crew
    b) Press "F5" to select Ground air supply
    c) Press "F2" to disconnect air supply unit

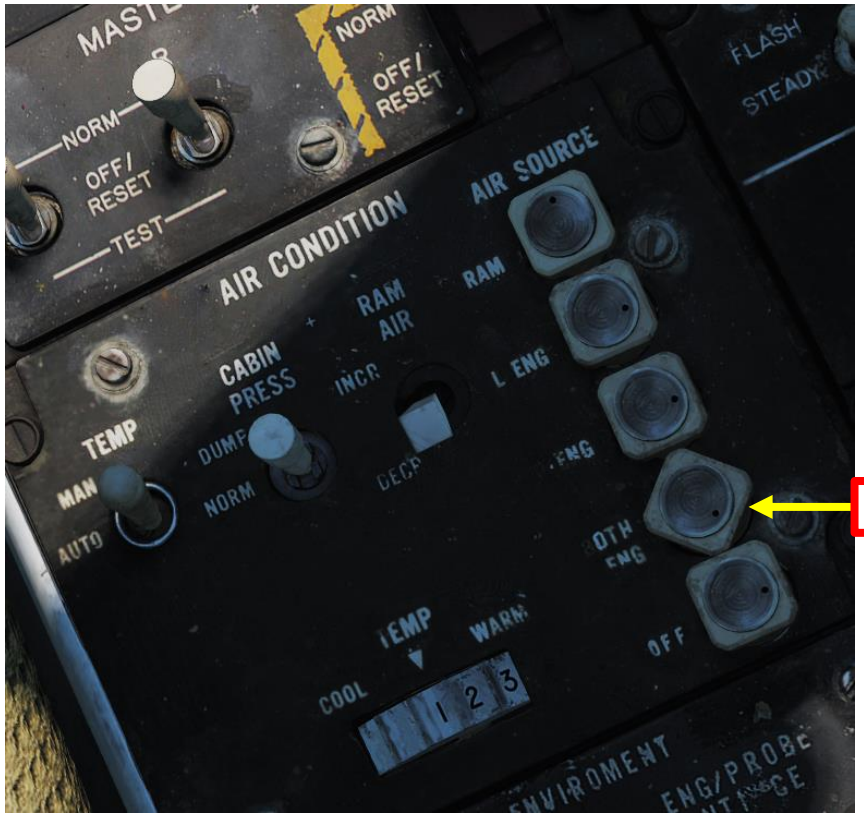


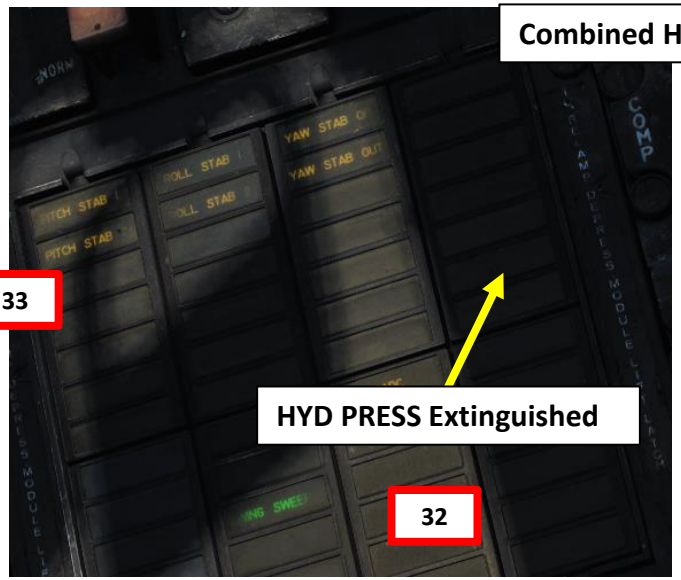


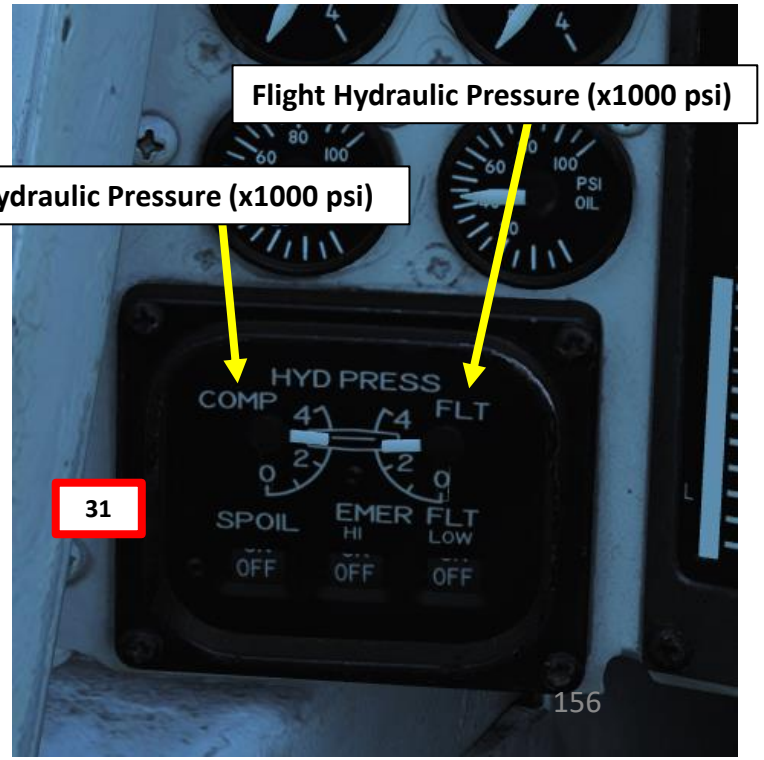






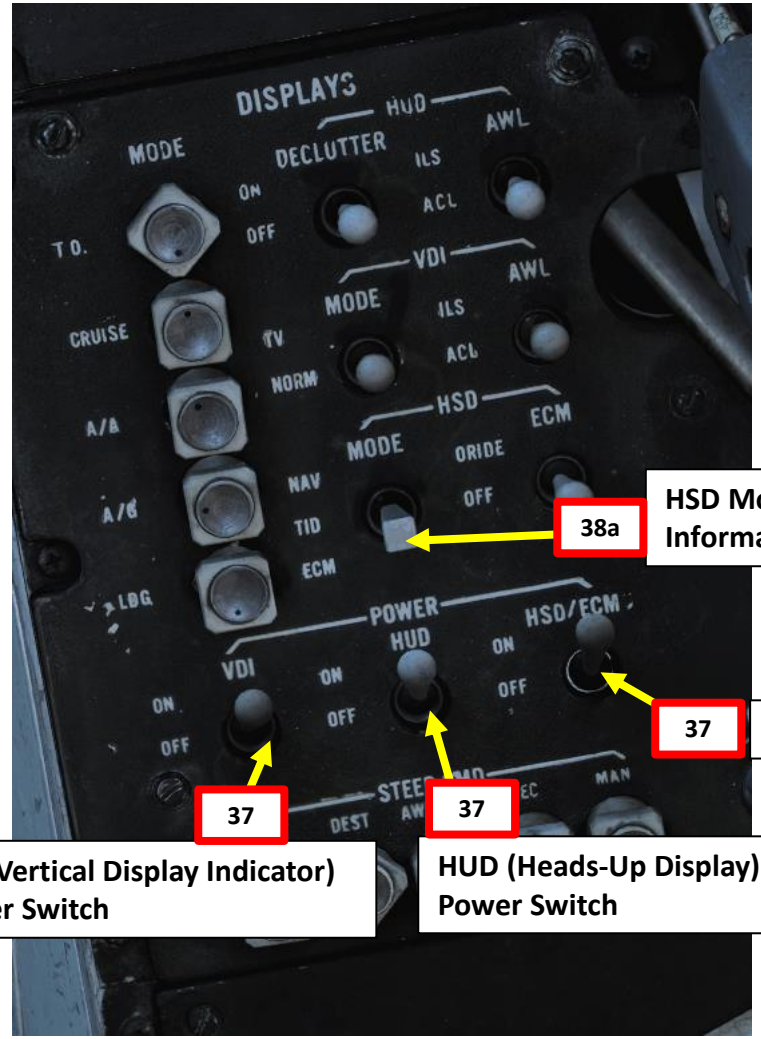


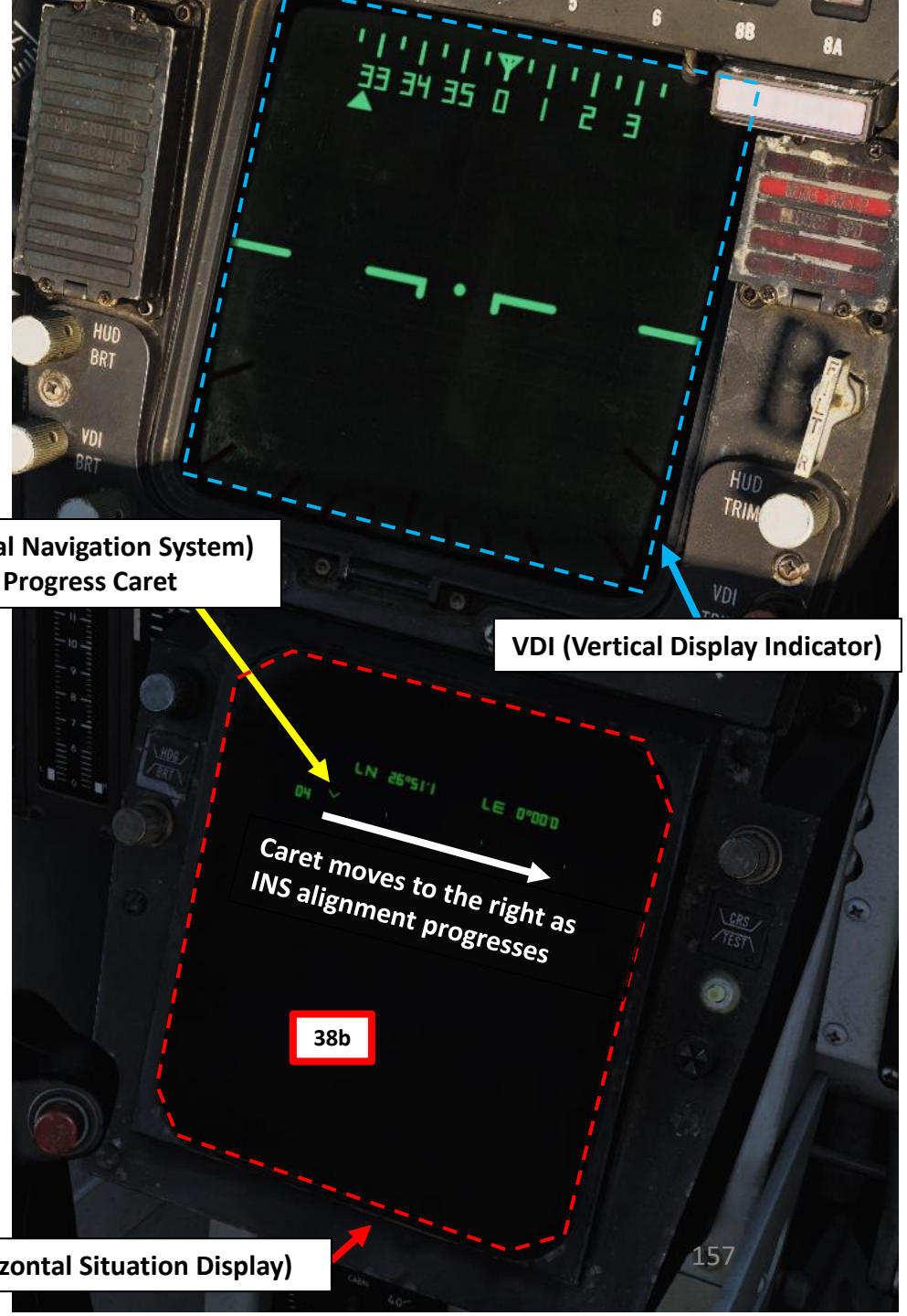




3 – PILOT POST-START

36. [J] Now that our engines are started, the RIO will automatically start flicking more switches to **start the INS (Inertial Navigation System) alignment process**.
37. Switch your VDI (Vertical Display Indicator), HUD (Heads Up Display) and HSD (Horizontal Situation Display) Power switches ON.
38. Set the HSD Mode switch to "TID". This will make the HSD screen act as a repeater for the RIO's Tactical Information Display (TID) and allow you to monitor the progress of the INS alignment.





3 – PILOT POST-START

39. [J] Use the Jester Contextual Menu by pressing “A” and select your INS alignment precision (press either “LCTRL+4”, “LCTRL+5”, “LCTRL+6”, or “LCTRL+7”). We will use FINE.
    - INS GO NOW: Shortest but least precise INS alignment
    - INS GO COARSE: Coarse alignment does not meet Alert Launch Criteria to use AIM-7 or AIM-54
    - INS GO MIN WPN LAUNCH (Alert Launch Criteria): Alignment meets Alert Launch Criteria to use AIM-7 or AIM-54
    - INS GO FINE: Fine alignment, longest but most precise INS alignment
40. [J] If you choose the FINE precision, the INS alignment takes about 8 minutes.



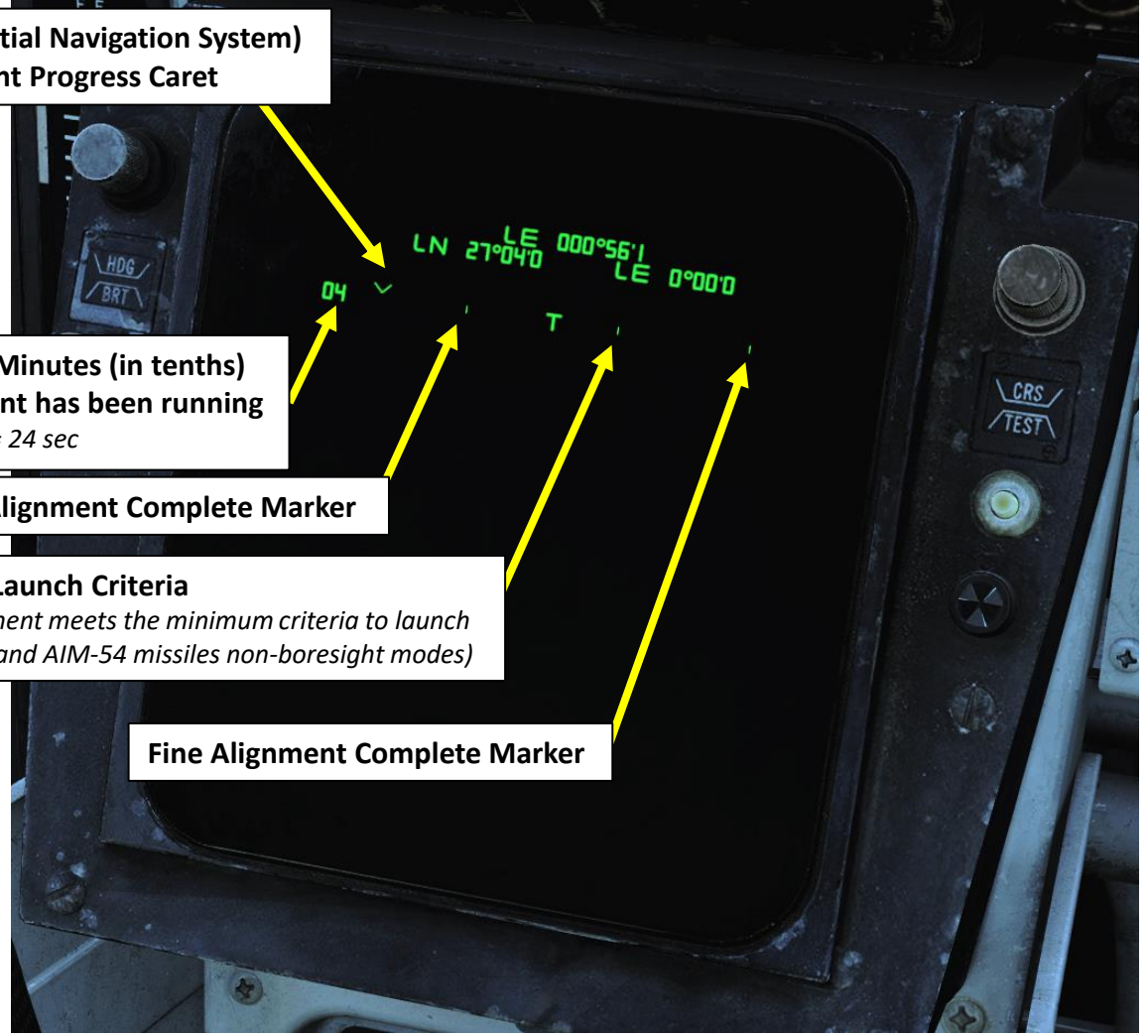
INS (Inertial Navigation System) Alignment Progress Caret

Number of Minutes (in tenths) INS alignment has been running
04 = 0.4 min = 24 sec

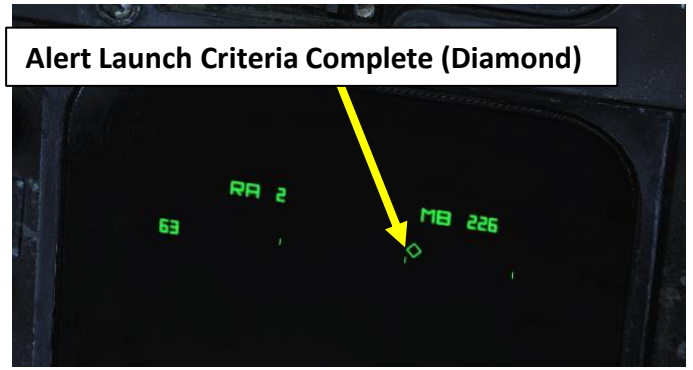
Coarse Alignment Complete Marker

Alert Launch Criteria
(Alignment meets the minimum criteria to launch AIM-7 and AIM-54 missiles non-boresight modes)

Fine Alignment Complete Marker



Alert Launch Criteria Complete (Diamond)



3 – PILOT POST-START

41. [J] While INS is aligning, JESTER will also automatically enter all Waypoint and Target Point coordinates of your flight plan. A player-controlled RIO will have to enter all this data manually.

    Once INS alignment is complete, the INS Alignment progress bar will disappear and JESTER will call out “Ready to Taxi”

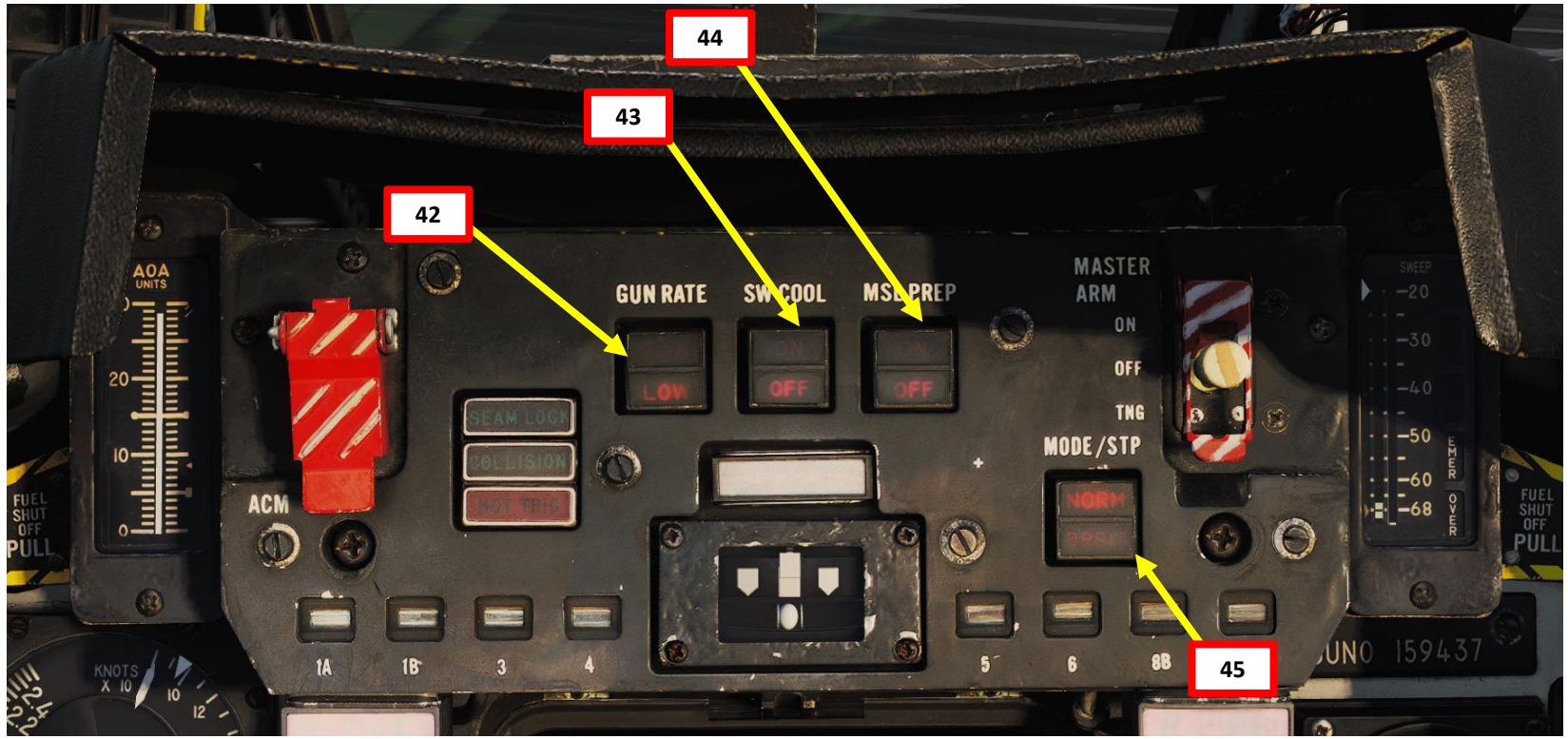




3 – PILOT POST-START

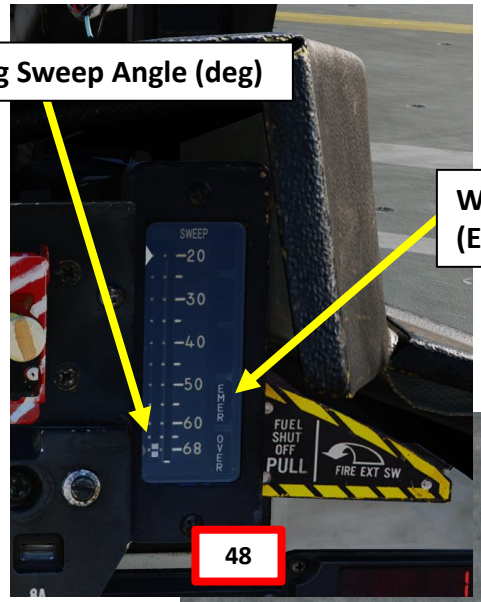
42. Set GUN RATE switch – As required (LOW/HIGH)
43. Set SW COOL switch – OFF
44. Set MSL PREP switch – OFF
45. Set Missile MODE/STP switch – NORM
46. Set **ANTI-SKID SPOILER BK** switch **OFF** before taxiing.
    Note: When the ANTI SKID SPOILER BK switch is in BOTH during low-speed taxi (less than 10 knots for more than a few seconds), subsequent acceleration of the aircraft through approximately 15 knots will cause a temporary loss of brakes lasting from 2 to 10 seconds.

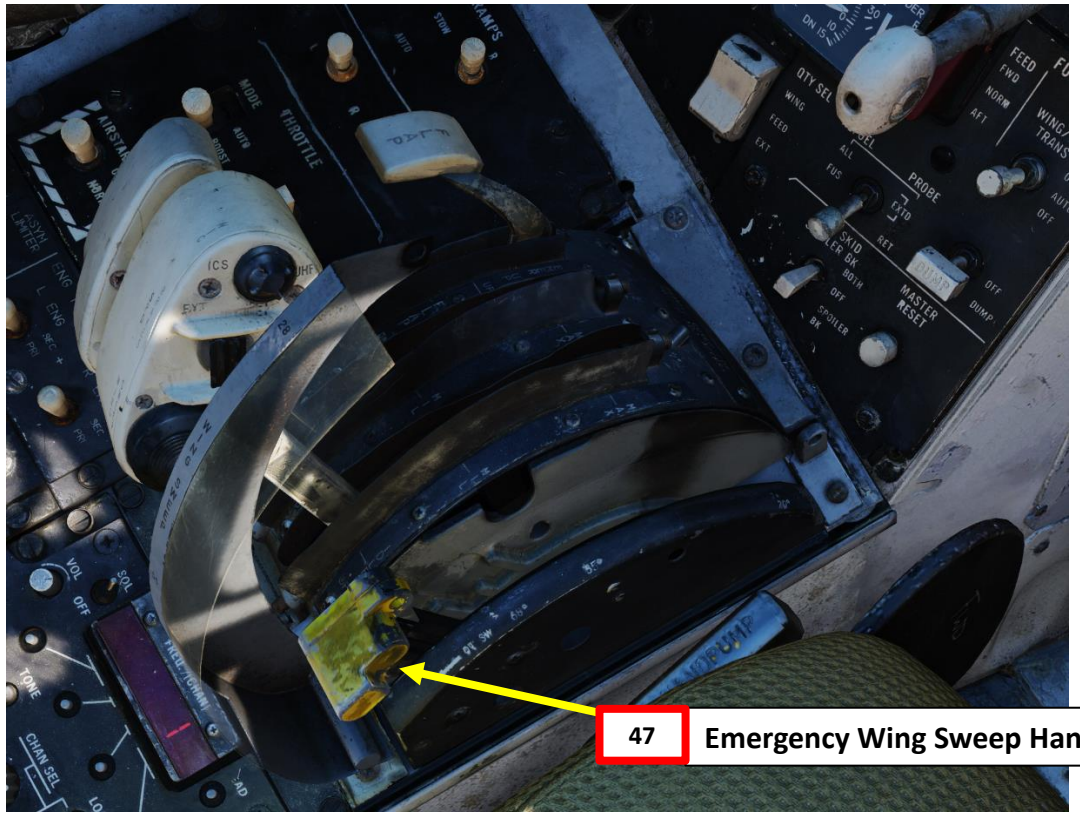




3 – PILOT POST-START

47. Verify that the Emergency Wing Sweep Handle all the way AFT. This will ensure the *Wing Sweep Angle remains set to FULLY SWEPT BACK (or in OVERSWEEP).*
48. Ensure the Wing Sweep Angle is at 68 deg (swept back). This is very important since the carrier deck is typically very crowded and you will want to avoid bumping your wings into someone.

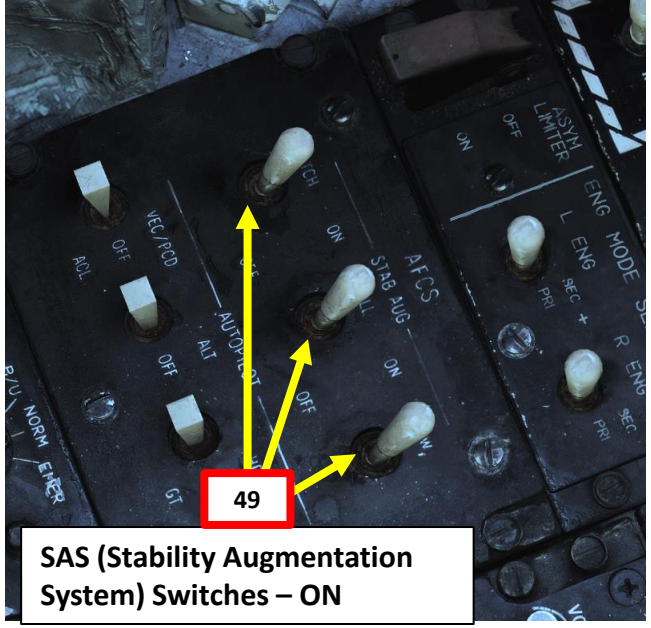






3 – PILOT POST-START

49. Turn AFCS (Automatic Flight Control System) SAS (Stability Augmentation System) PITCH, ROLL & YAW switches ON
50. Set WING/EXT TRANS switch AUTO
51. Set UHF 1 Radio Function Selector to BOTH
52. Set TACAN function selector to T/R (Transmit Receive)
53. Set ARA-63 ICLS (Instrument Carrier Landing System) Receiver Power switch ON
54. Set Radar Altitude by turning the control knob one click clockwise. The RADALT will display 6000 ft for about 2 to 3 minutes while it is warming up, then revert back to 0 ft once the BIT (Built-In Test) is complete.
55. At least 2 minutes before takeoff, erect the standby attitude gyro (ADI) by clicking on the control knob and turning it until the indicator matches the current attitude.



SAS (Stability Augmentation System) Switches – ON



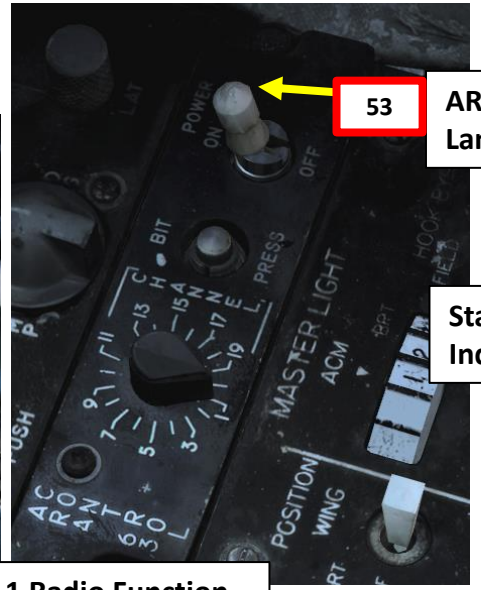
WING/EXT TRANS Switch - AUTO



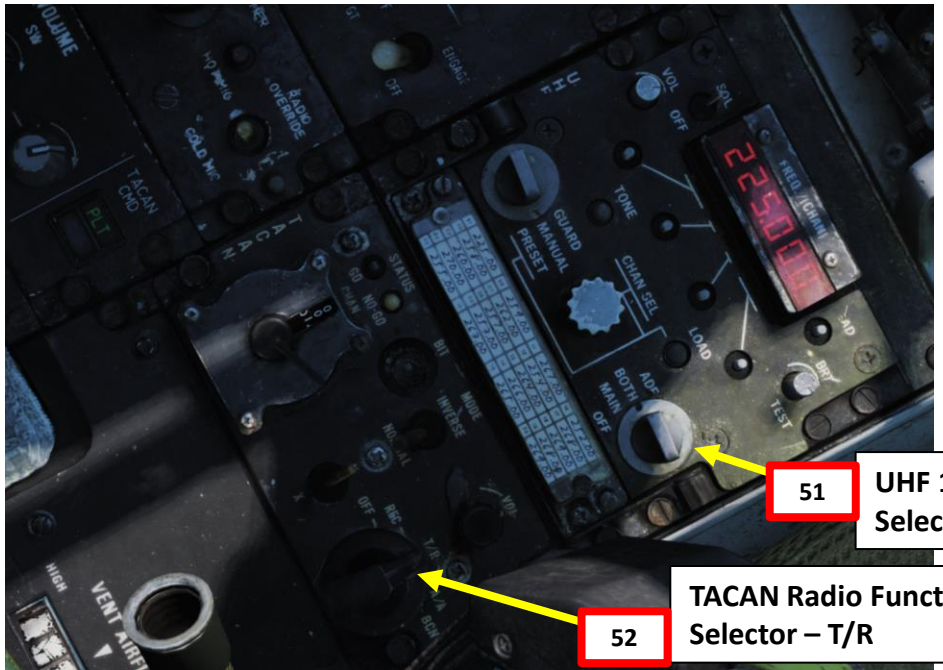
Turn Radar Altimeter knob clockwise to start BIT (Built-In Test)



Radar Altimeter Test Complete



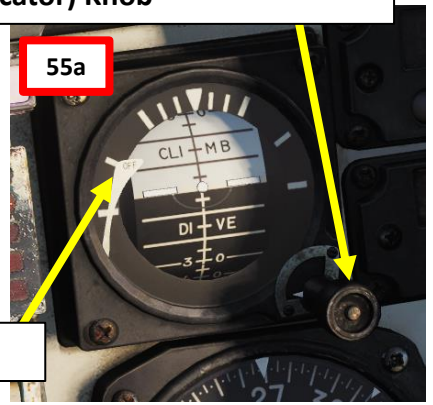
ARA-63 ICLS (Instrument Carrier Landing System) Power Switch - ON



UHF 1 Radio Function Selector - BOTH

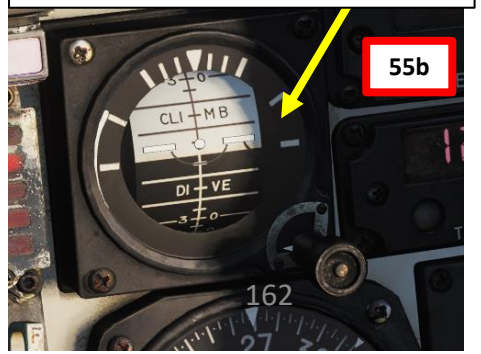
TACAN Radio Function Selector – T/R

Standby ADI (Attitude Director Indicator) Knob



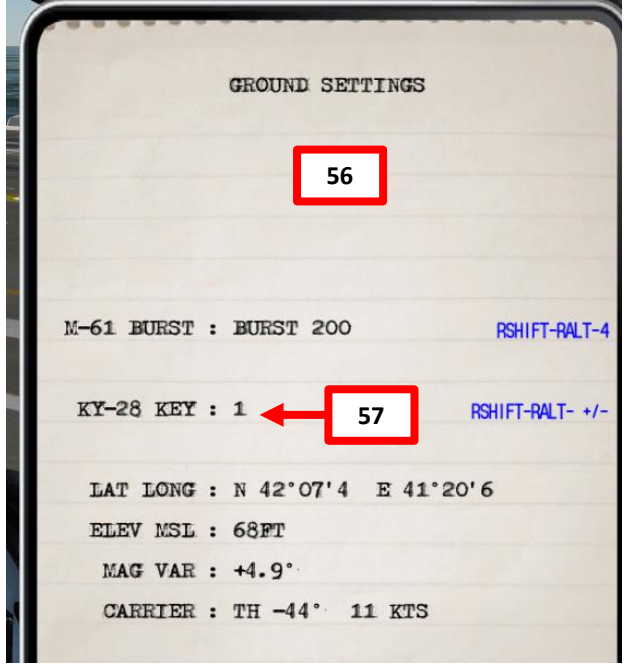
Standby ADI Caged Flag

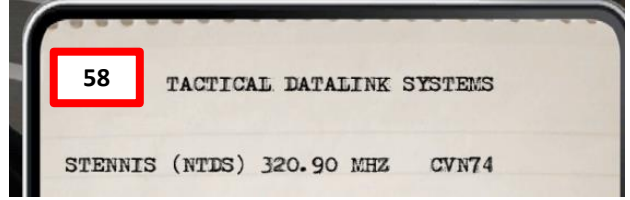
Standby ADI (Attitude Director Indicator) Uncaged

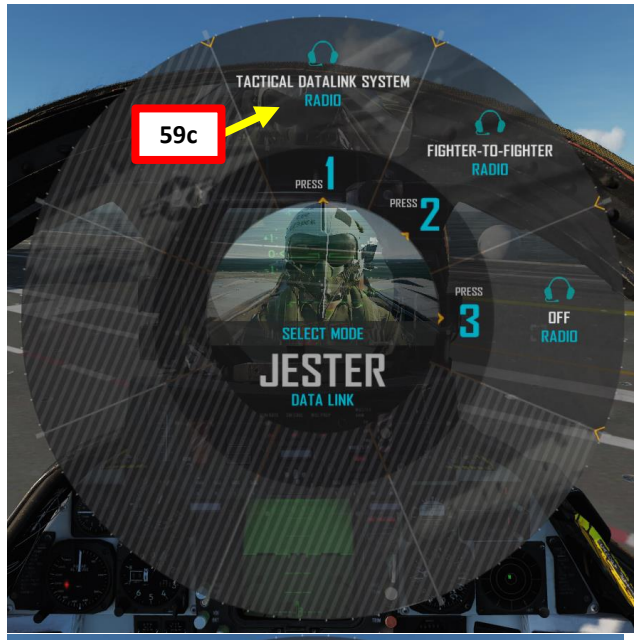


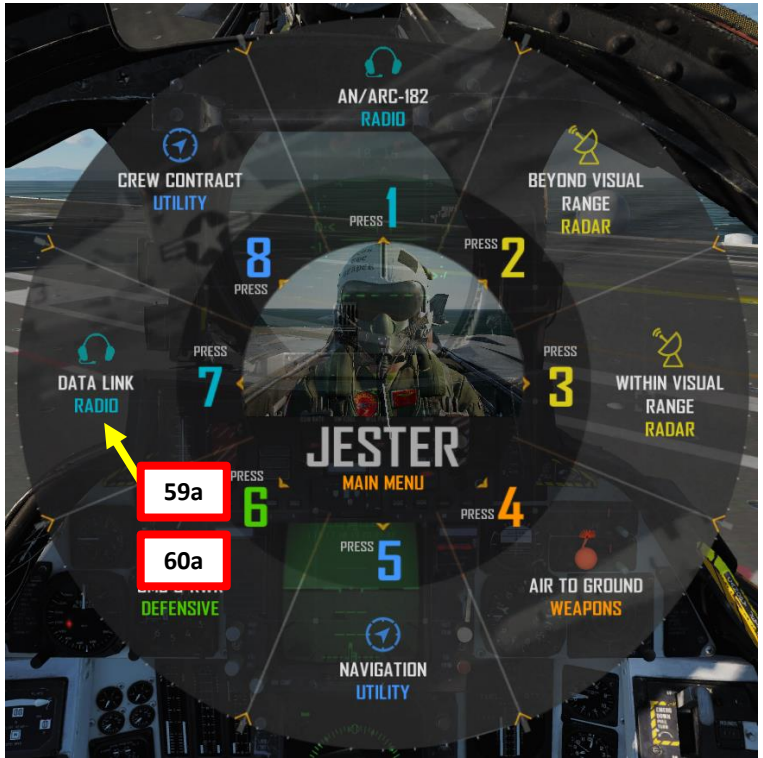
3 – PILOT POST-START

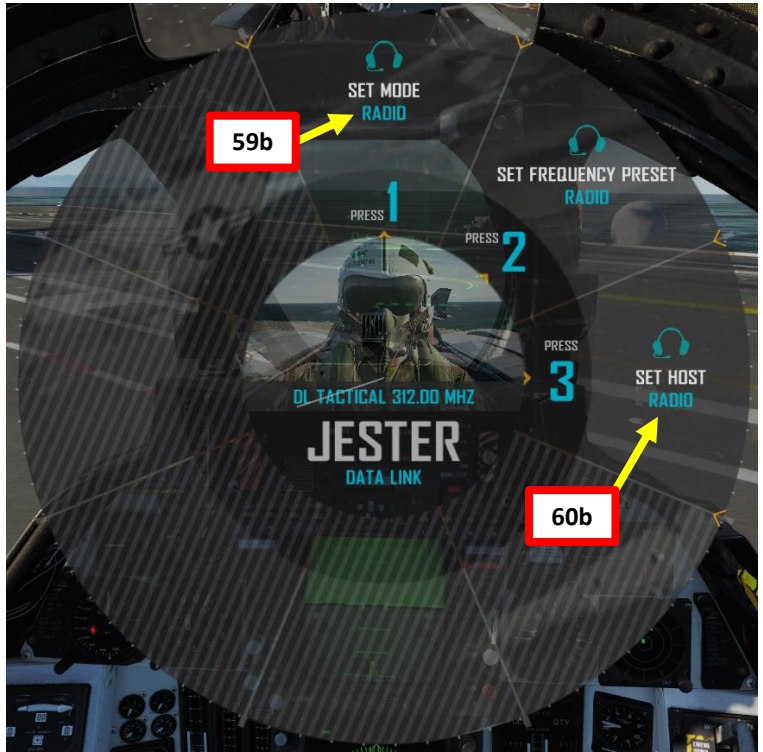
56. Open up your kneeboard using “RSHIFT+K”. This will bring you to the GROUND SETTINGS page.
57. Press “RSHIFT+RALT+ Numpad+” or “RSHIFT+RALT+ Numpad-” to request the ground crew to change the KY-28 encryption key if mentioned in the mission briefing. Most missions stick to Key #1.
58. Cycle through pages using the “[“ and “]” (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
59. [J] Set Datalink Mode to the Tactical Datalink System. Use the JESTER Contextual Menu by pressing “A” twice and selecting “DATA LINK RADIO” (LCTRL+7). Then, select “SET MODE” (LCTRL+1) and select “TACTICAL DATALINK SYSTEM” (LCTRL+1).
60. [J] Set Datalink Frequency to the desired network. Use the JESTER Contextual Menu by pressing “A” twice and selecting “DATA LINK RADIO” (LCTRL+7). Then, select “SET HOST” (LCTRL+1) and select desired datalink host (AWACS, CVN74 Stennis Carrier, etc.).
61. Close your kneeboard using “RSHIFT+K”.
62. Set lights as required, then start taxiing when ready.

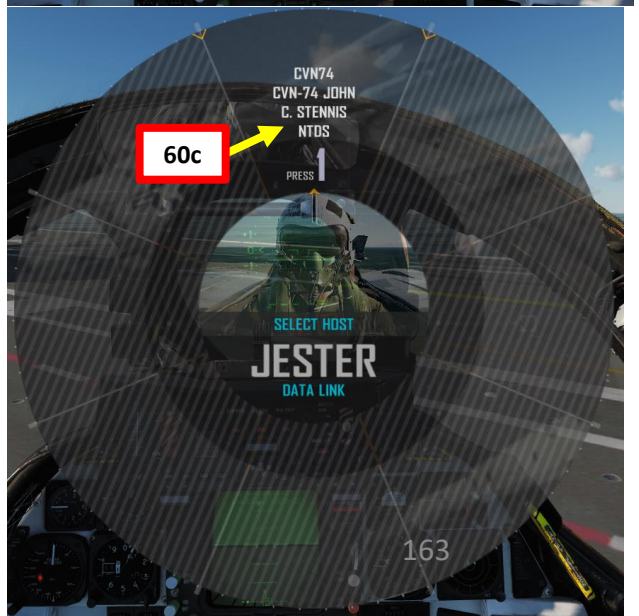






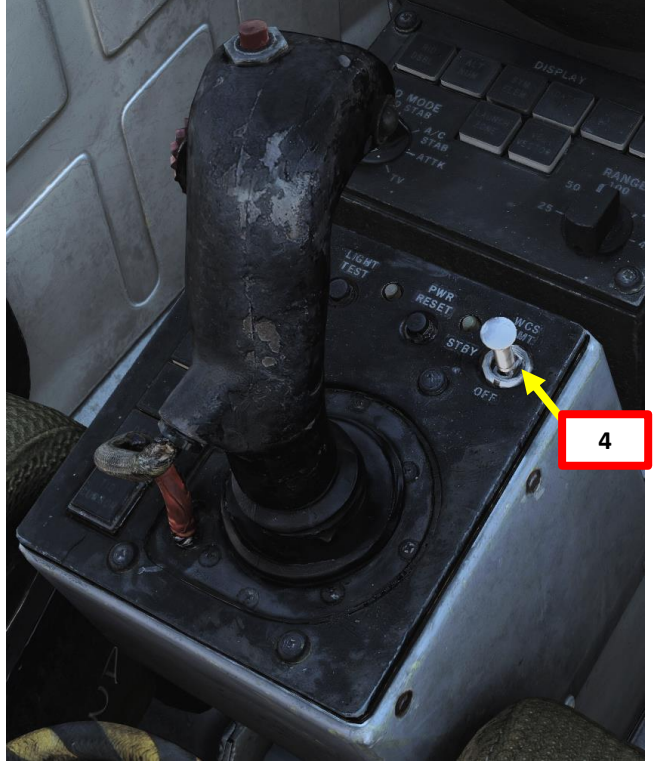


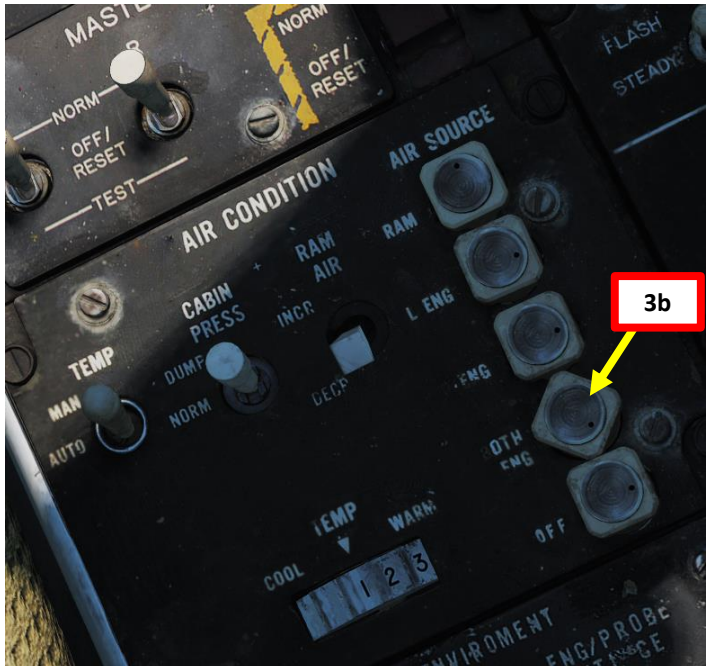


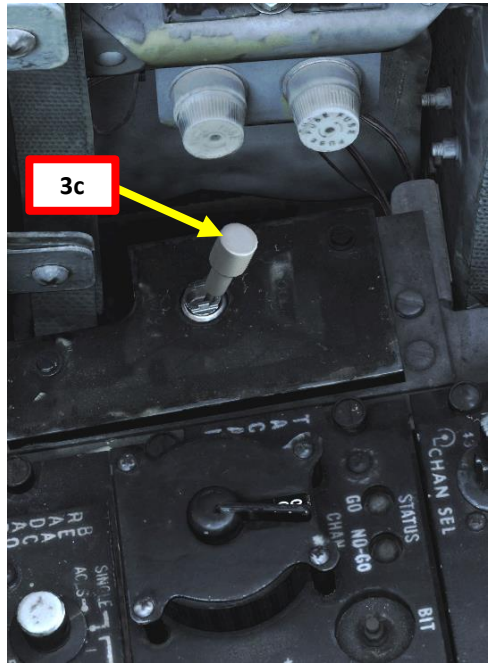


4 – RIO INS ALIGNMENT (SHORE)

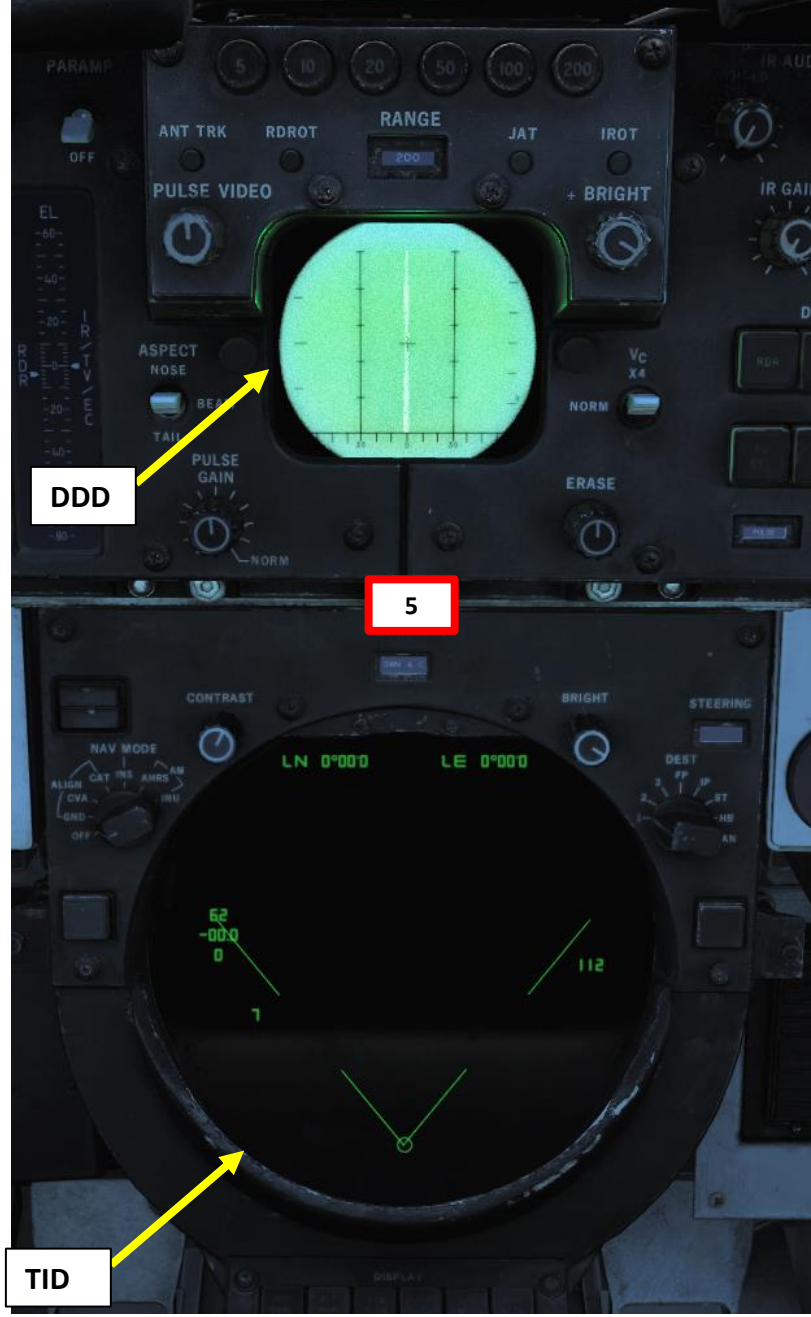
1. Set ICS (Intercom Set) switch to HOT MIC
2. Before starting INS alignment, make sure ground power is connected.
3. Communicate with the pilot to know when engines are started and engine bleed air is available. Why? The INS (Inertial Navigation System) alignment requires the WCS (Weapon Control System). The WCS requires cooling air from the ECS (Environment Control System), which in turn means:
    a) Both engines need to be running (started by the pilot)
    b) The AIR SOURCE selector needs to be set to BOTH ENG in the pilot's cockpit.
    c) The LIQUID COOLING switch needs to be set to FWD in the RIO's cockpit
4. Set WCS (Weapon Control System) Switch – STANDBY (MIDDLE)
5. Wait approx. 40 seconds for the TID (Tactical Awareness Display) and DDD (Detail Data Display) to power on





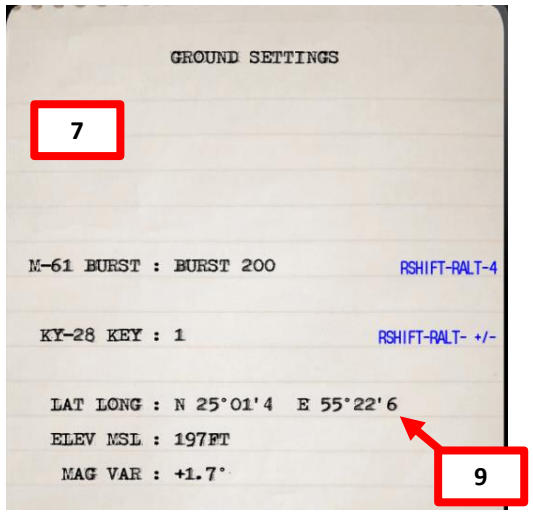


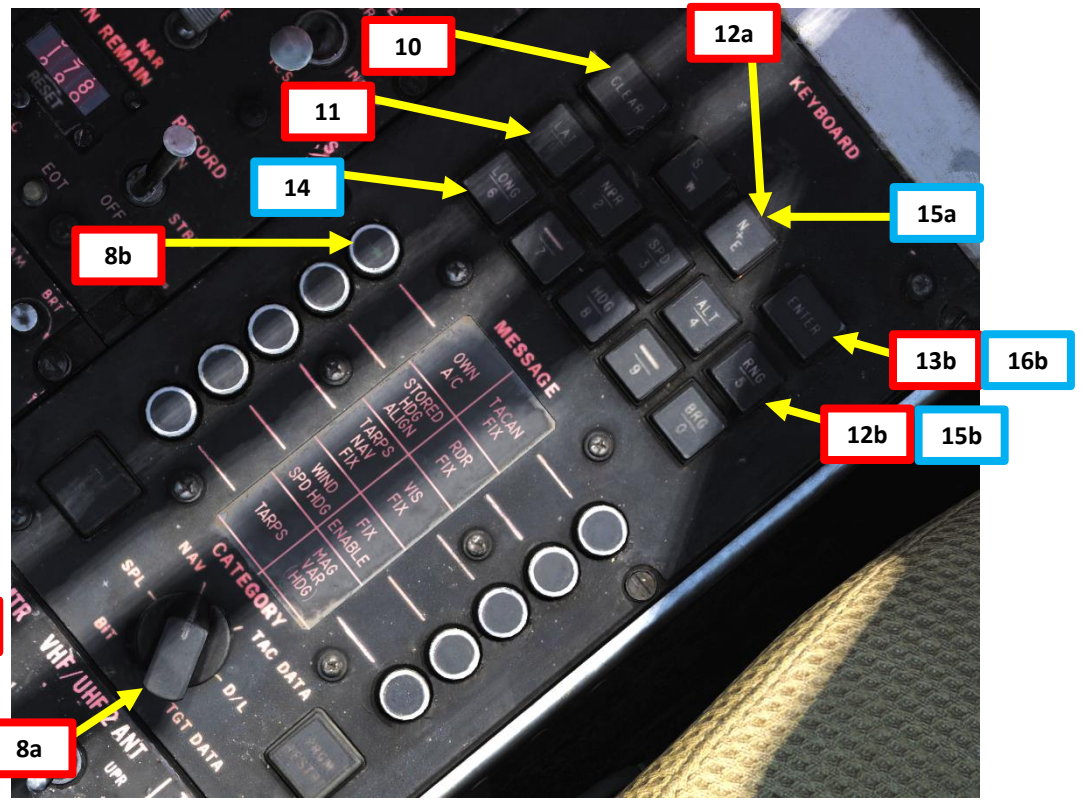




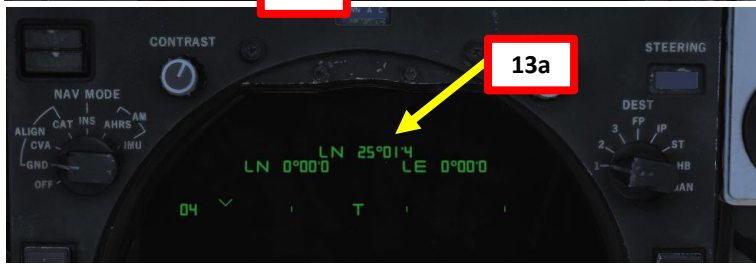
4 – RIO INS ALIGNMENT (SHORE)

6. Set Navigation Mode Selector to GND ALIGN to start INS alignment from the ground
7. Open up your kneeboard using “RSHIFT+K”. This will bring you to the GROUND SETTINGS page. This will display your coordinates, elevation and magnetic variation.
8. Set CAP (Computer Address Panel) CATEGORY selector to NAV and verify that OWN AC (Own Aircraft) Message Button is selected.
9. From the GROUND SETTINGS page, our coordinates are:
   25°01’4 North **55°22’6 East** in deg, min, tenth of a min
10. On the CAP keyboard, press the CLEAR button.
11. On the CAP keyboard, press the « 1 » (LAT for Latitude) button.
12. On the CAP keyboard, press « N+E » to select North coordinates, then type « **25014** »
13. Look at the top of the TID and confirm that the latitude coordinates are correct, then press “ENTER” to enter coordinates.
14. On the CAP keyboard, press the « 6 » (LONG for Longitude) button.
15. On the CAP keyboard, press « N+E » to select East coordinates, then type « **55226** »
16. Look at the top of the TID and confirm that the latitude coordinates are correct, then press “ENTER” to enter coordinates.



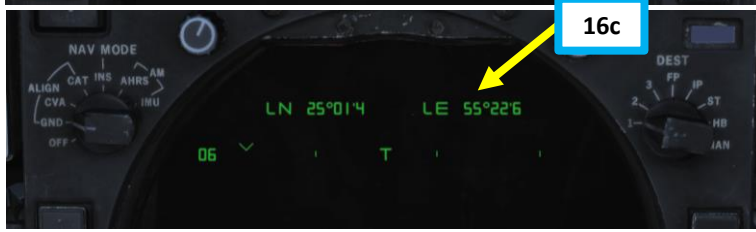






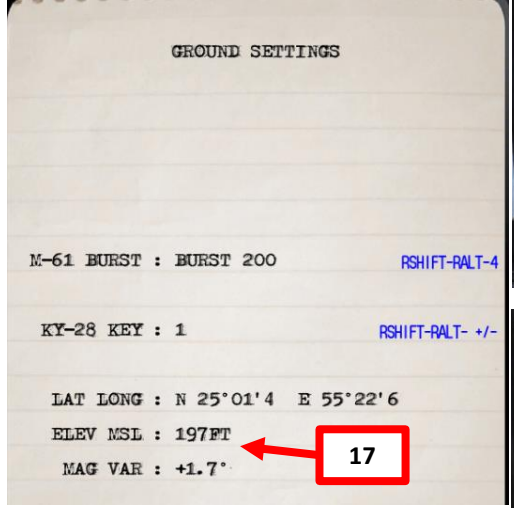






4 – RIO INS ALIGNMENT (SHORE)

17. From the kneeboard GROUND SETTINGS page, our current **altitude is 197 ft** and our **magnetic variation is +1.7 deg**.
18. On the CAP keyboard, press the « 4 » (ALT for Altitude) button.
19. On the CAP keyboard, press « N+E » to select a positive altitude, then type « **197** »
20. Look at the top of the TID and confirm that the altitude is correct, then press "ENTER" to enter altitude.
21. Press the CAP Message Selector Button next to « MAG VAR HDG » (Magnetic Variation / Heading) button.
22. On the CAP keyboard, press the « 8 » (HDG for Heading) button
23. On the CAP keyboard, press « N+E » to select a positive magnetic variation, then type « **17** » for +1.7 deg.
24. Look at the top of the TID and confirm that the magnetic variation heading is correct, then press "ENTER" to enter heading.

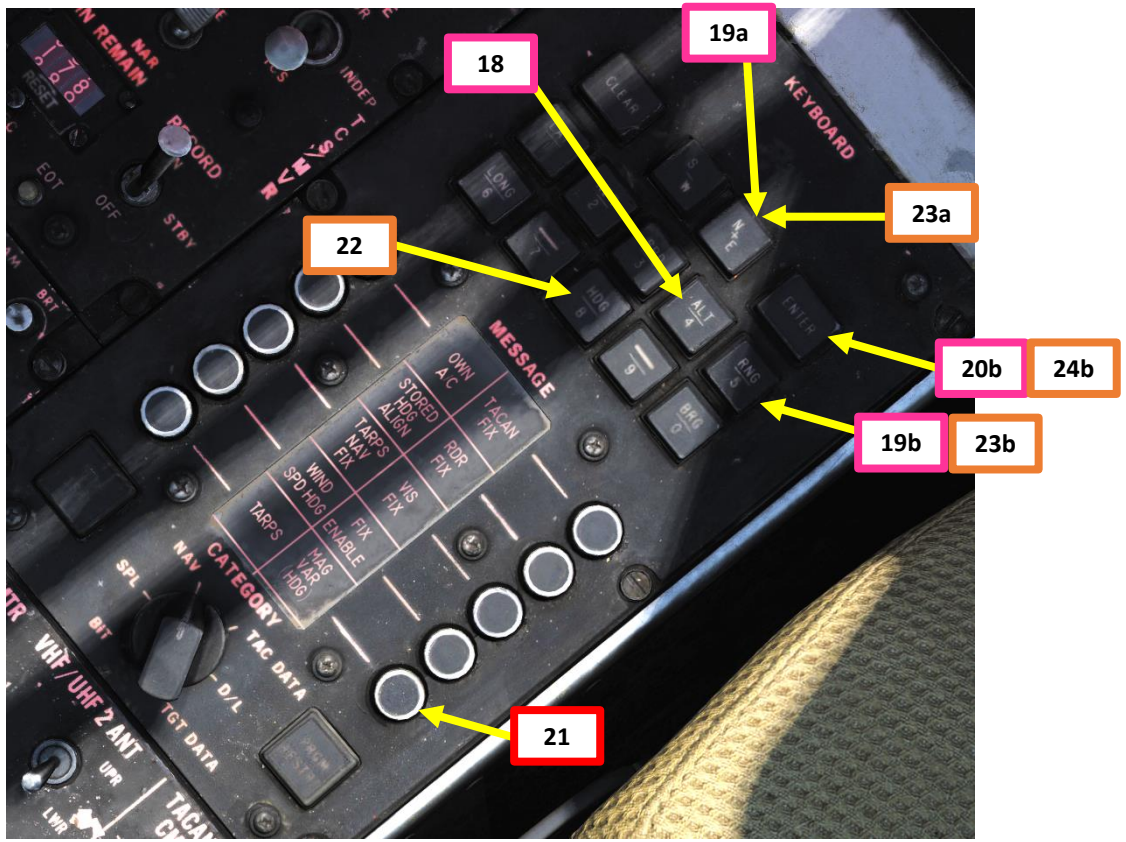






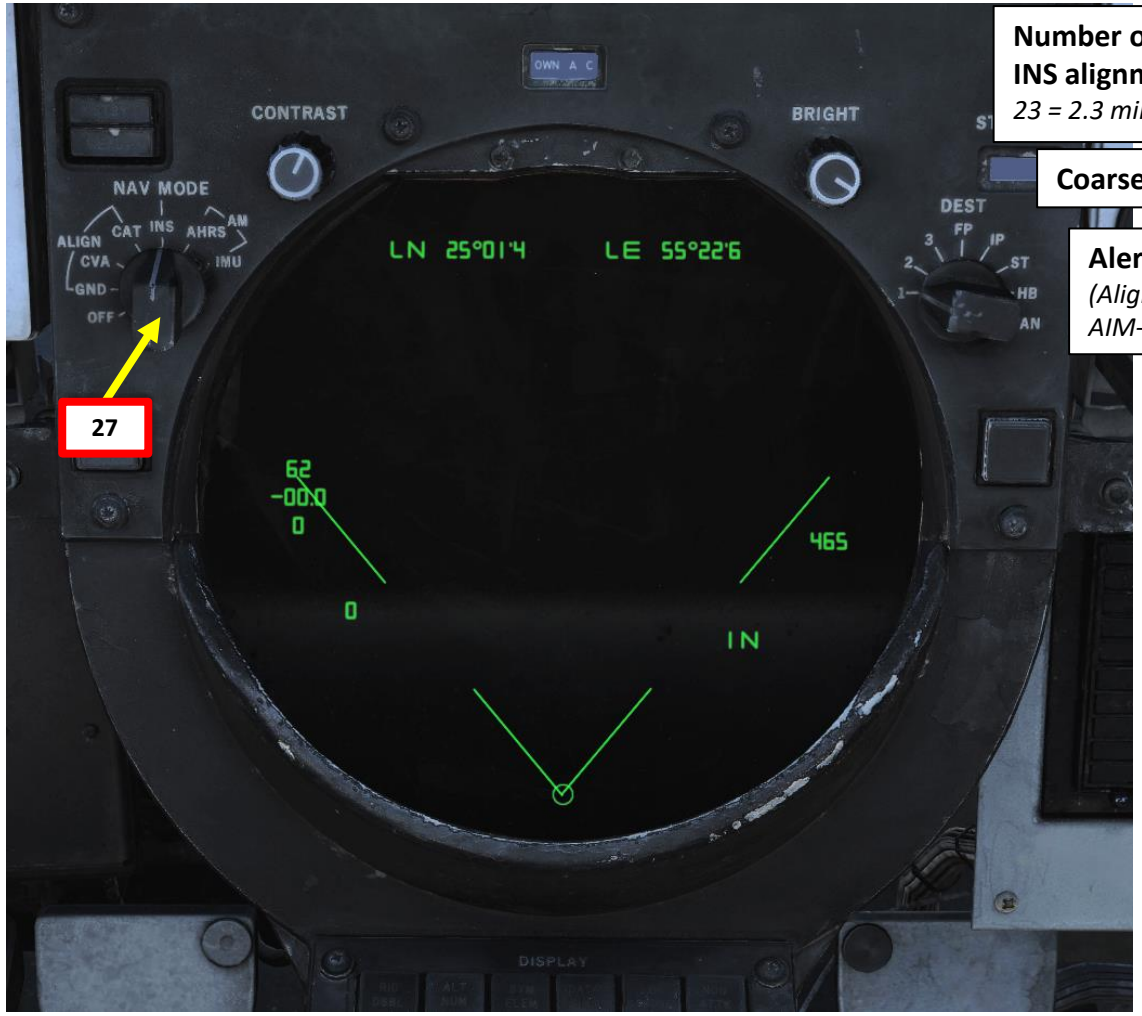


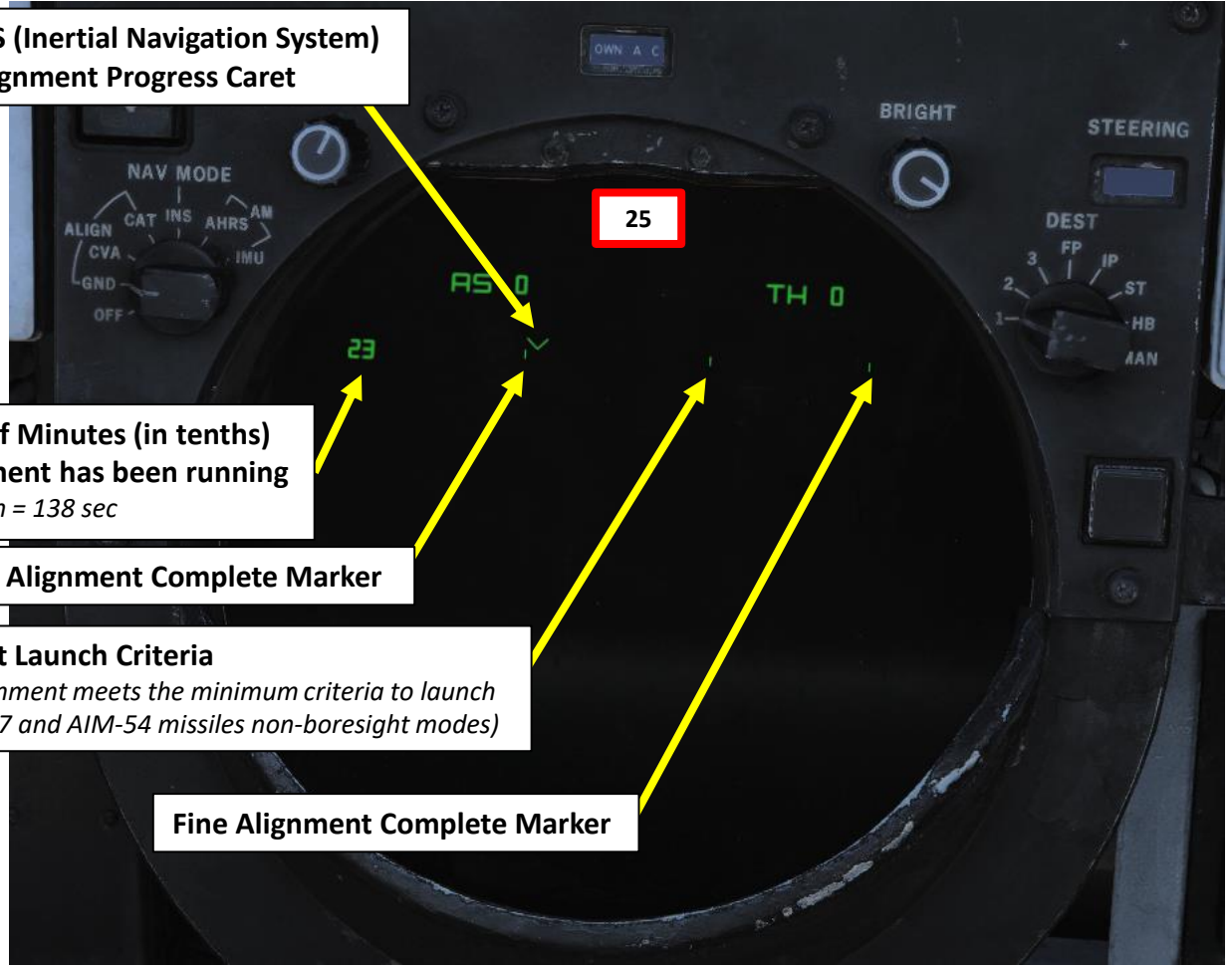




4 – RIO INS ALIGNMENT (SHORE)

25. Monitor the alignment progress
26. INS alignment takes about 8 minutes to reach the FULL FINE marker. Fine alignment is complete when the INS Progress Caret turns into a diamond with a dot in the center.
27. When alignment is complete, set Navigation Mode Selector to INS NAV MODE.





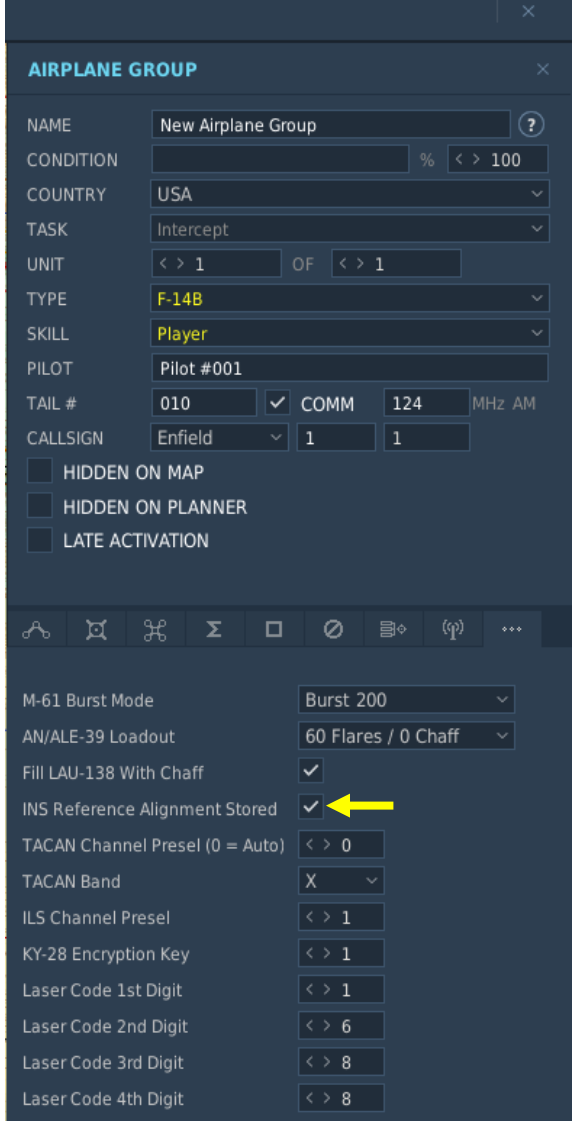


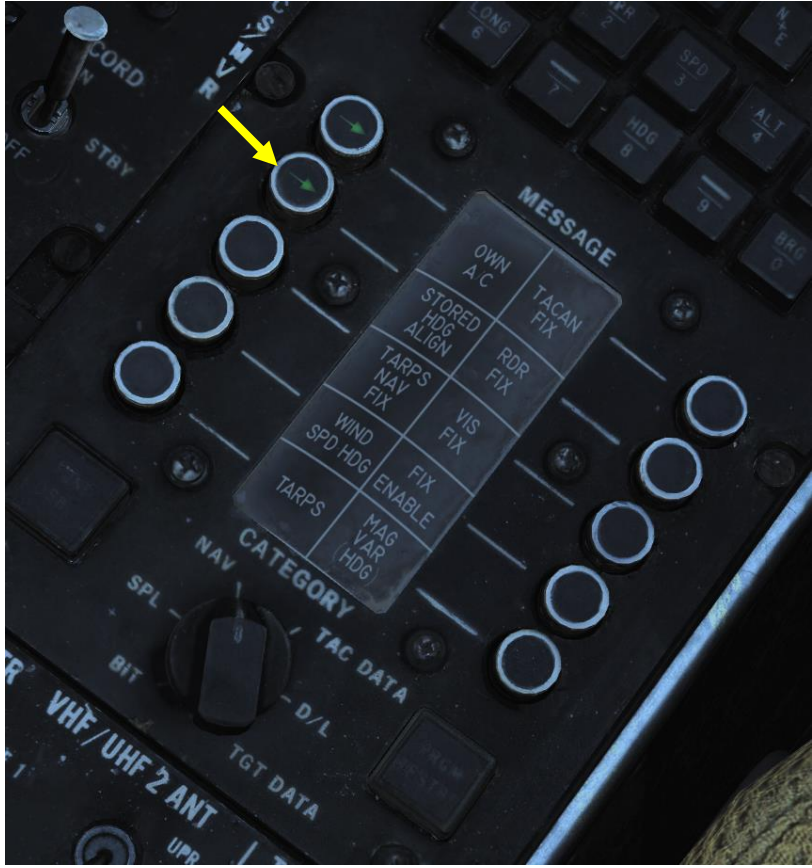
4 – RIO INS ALIGNMENT (SHORE)

Note:
The alignment will be much quicker if you have an Automatic Stored Heading (ASH), which is an option set through the Mission Editor. You will recognize the presence of a stored heading with the "ASH" indication on the TID or a green arrow next to the CAP Message Button "STORED HDG ALIGN". You do not need to set up anything more than the usual alignment procedure to use the Stored Heading.

Keep in mind that since ASH alignment is faster, I suggest that you enter the aircraft coordinates BEFORE starting the GND ALIGN process since you could run into issues if the alignment finishes before you are done entering the coordinates.

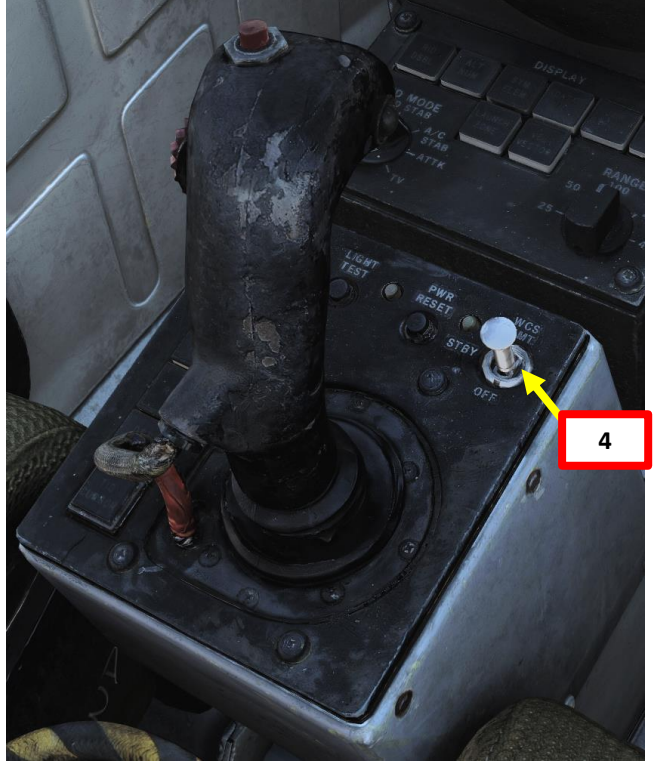


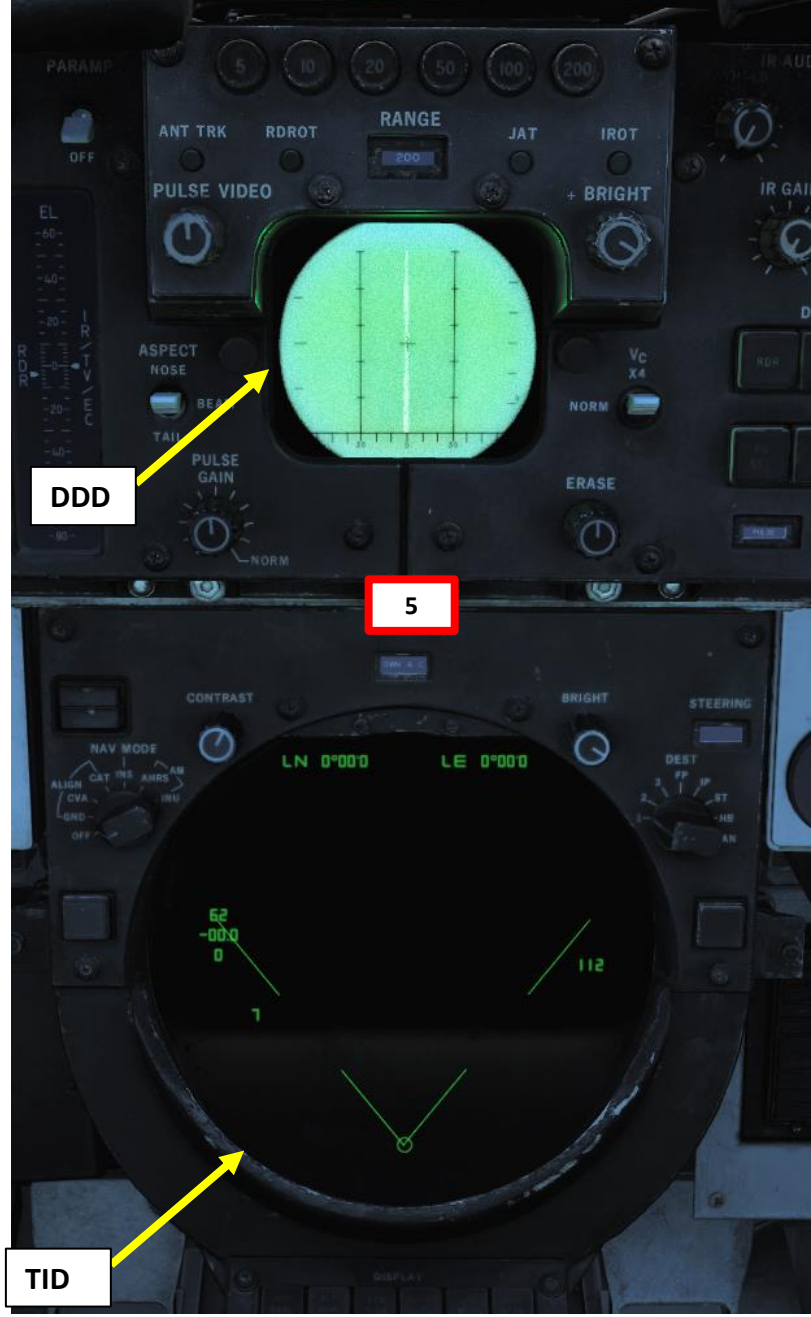


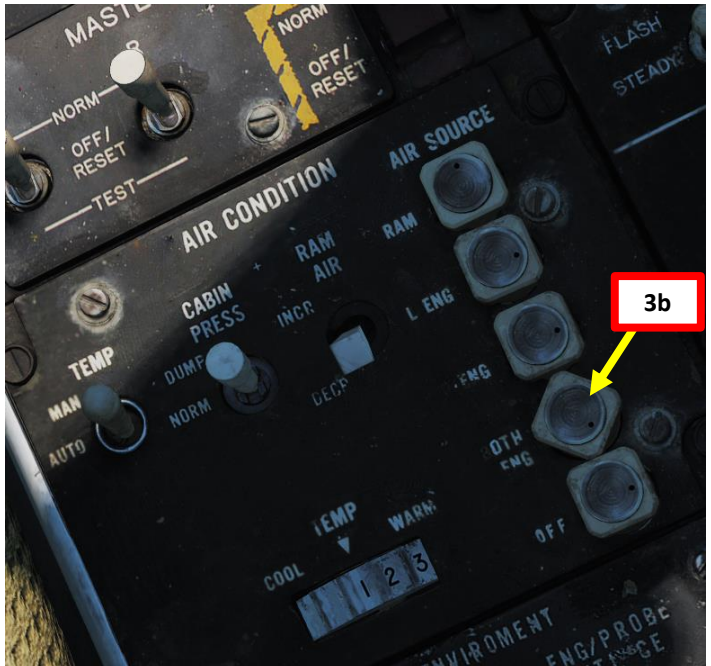


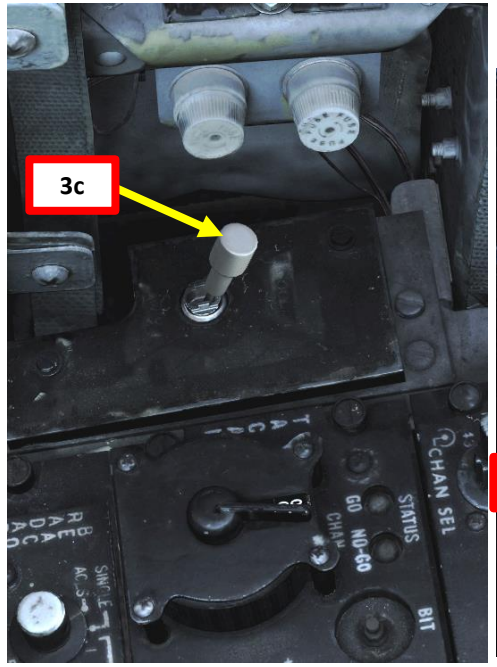
5 – RIO INS ALIGNMENT (CARRIER)

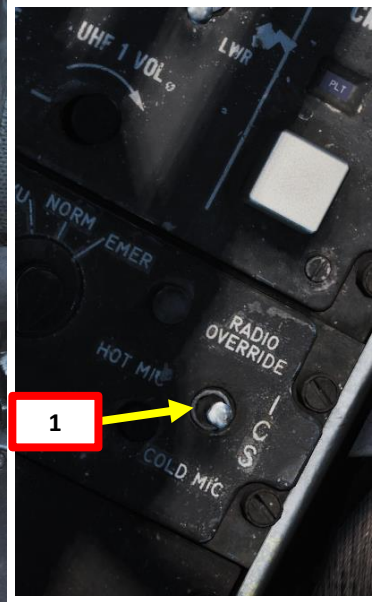
1. Set ICS (Intercom Set) switch to HOT MIC
2. Before starting INS alignment, make sure ground power is connected.
3. Communicate with the pilot to know when engines are started and engine bleed air is available. Why? The INS (Inertial Navigation System) alignment requires the WCS (Weapon Control System). The WCS requires cooling air from the ECS (Environment Control System), which in turn means:
    a) Both engines need to be running (started by the pilot)
    b) The AIR SOURCE selector needs to be set to BOTH ENG in the pilot's cockpit.
    c) The LIQUID COOLING switch needs to be set to FWD in the RIO's cockpit
4. Set WCS (Weapon Control System) Switch – STANDBY (MIDDLE)
5. Wait approx. 40 seconds for the TID (Tactical Awareness Display) and DDD (Detail Data Display) to power on





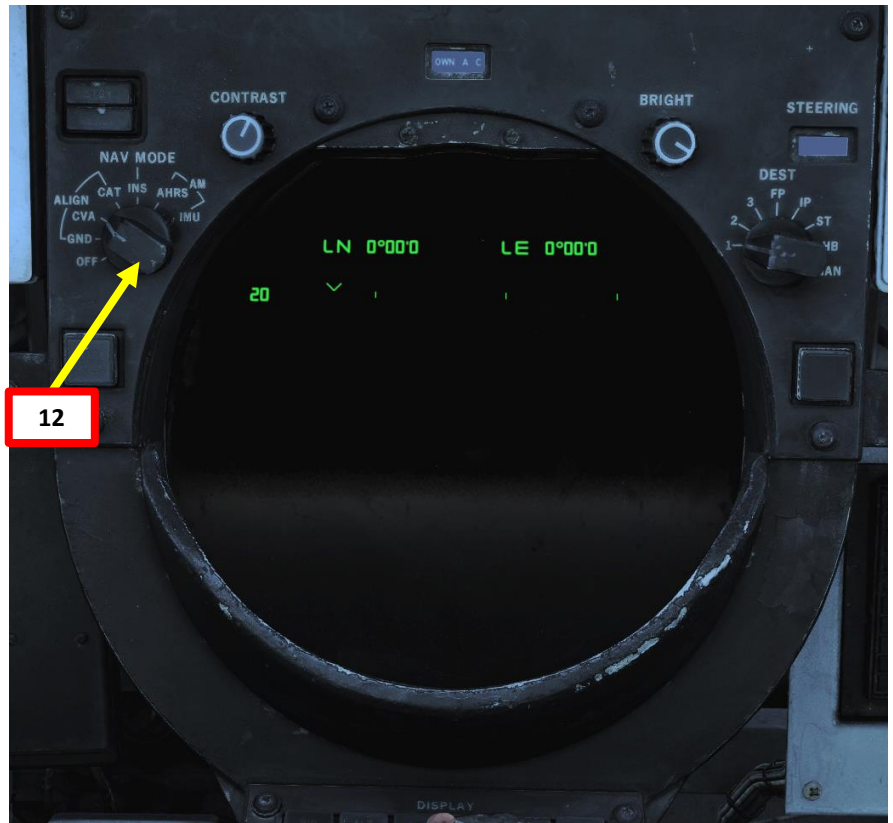


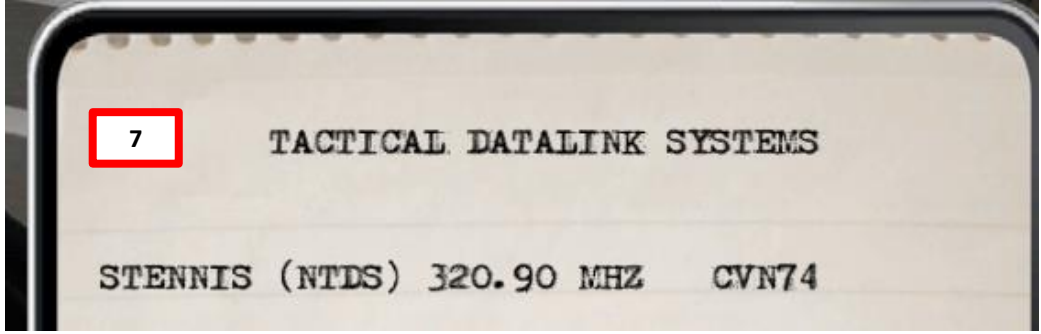


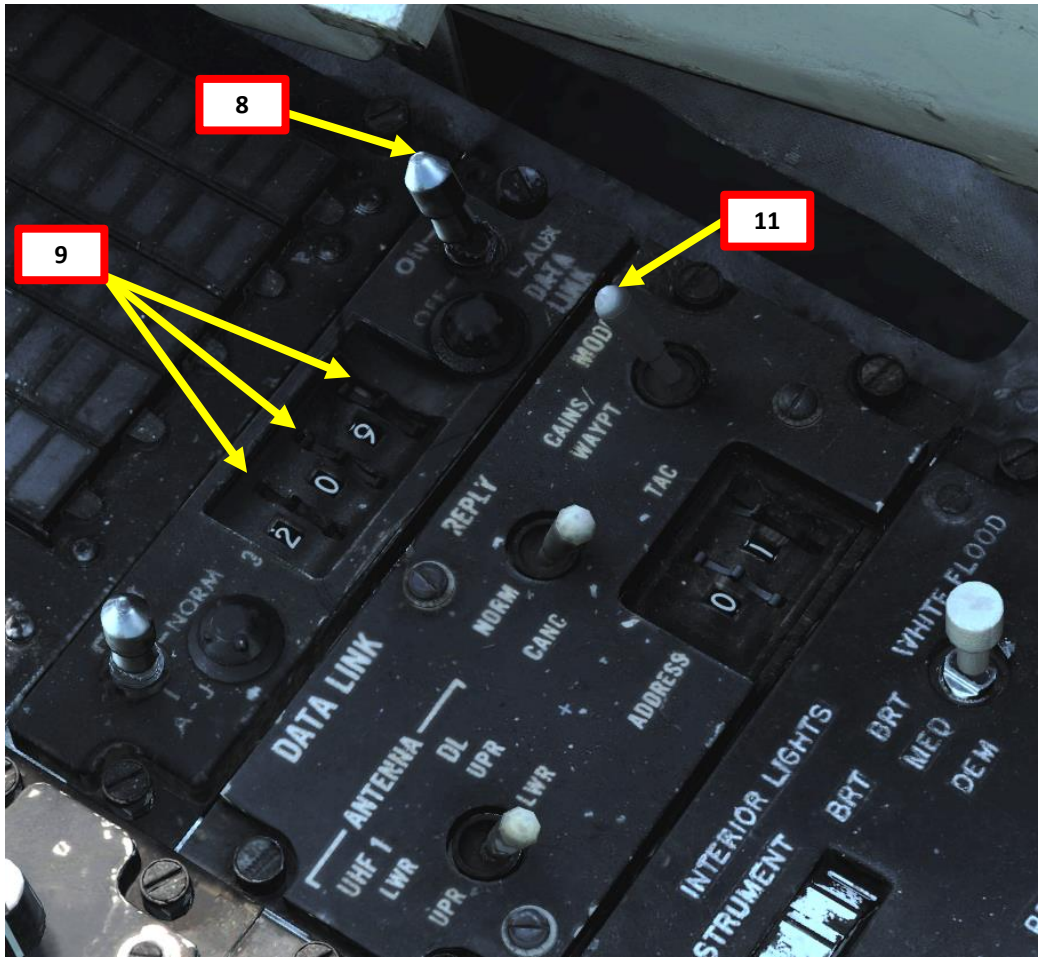


5 – RIO INS ALIGNMENT (CARRIER)

6. Open up your kneeboard using “RSHIFT+K”.
7. Cycle through pages using the “[“ and “]” (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
8. Set Datalink Power Switch – ON (FWD)
9. Set Datalink Frequency to the desired network (in our case the CVN74 John C. Stennis Carrier). Our desired frequency is listed on the kneeboard TACTICAL DATALINK SYSTEMS as 320.90 MHz. Rotate the Datalink Frequency Select wheels to 20.9 as shown (the 3 is preset and cannot be modified).
10. Close your kneeboard using “RSHIFT+K”.
11. Set Datalink Mode switch to CAINS/WAYPT (FWD). This allows communication between the aircraft and the Carrier Aircraft Inertial Navigation System (CAINS).
12. Set Navigation Mode Selector to CVA (Carrier INS Alignment) to start INS alignment from the carrier

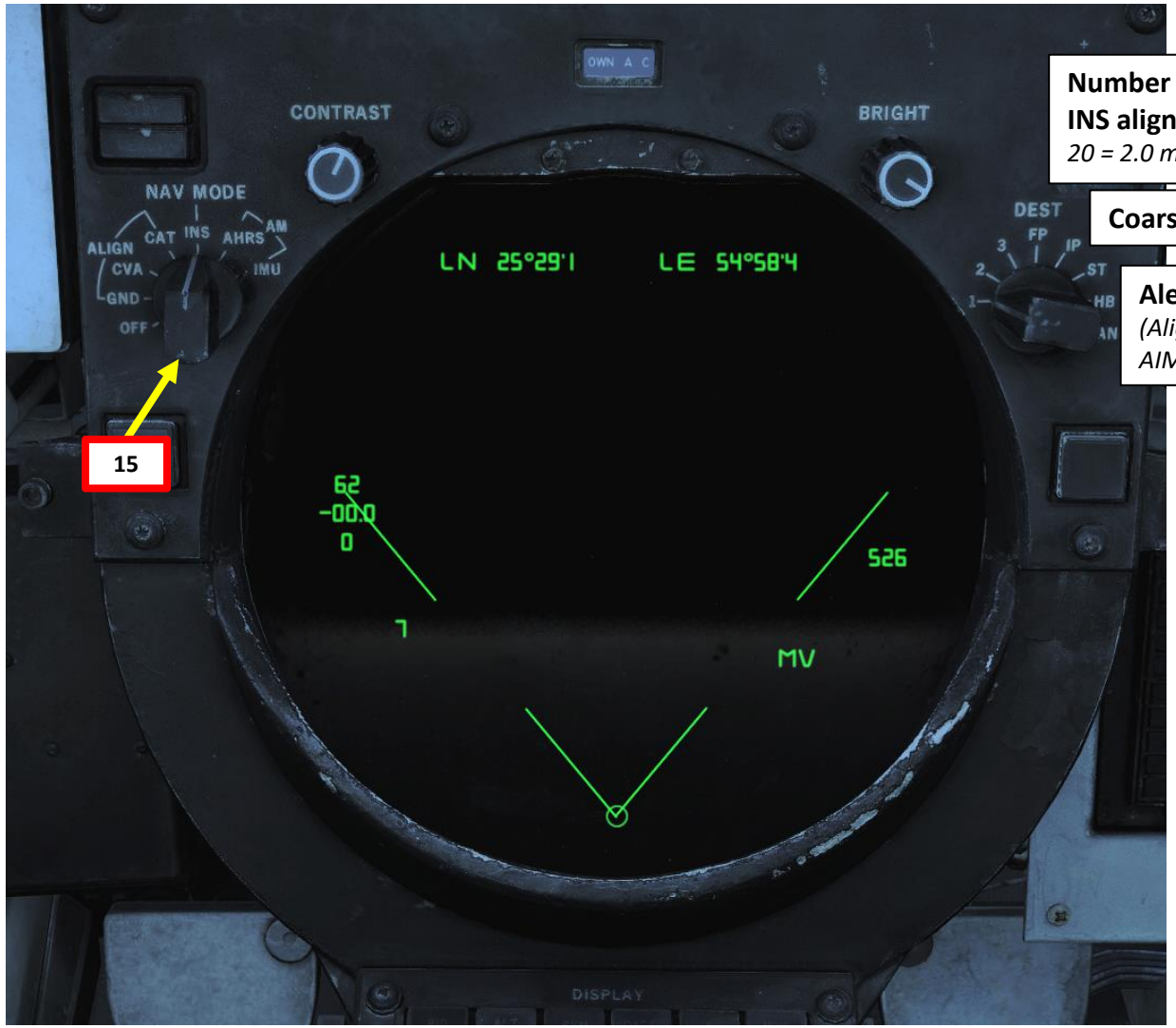




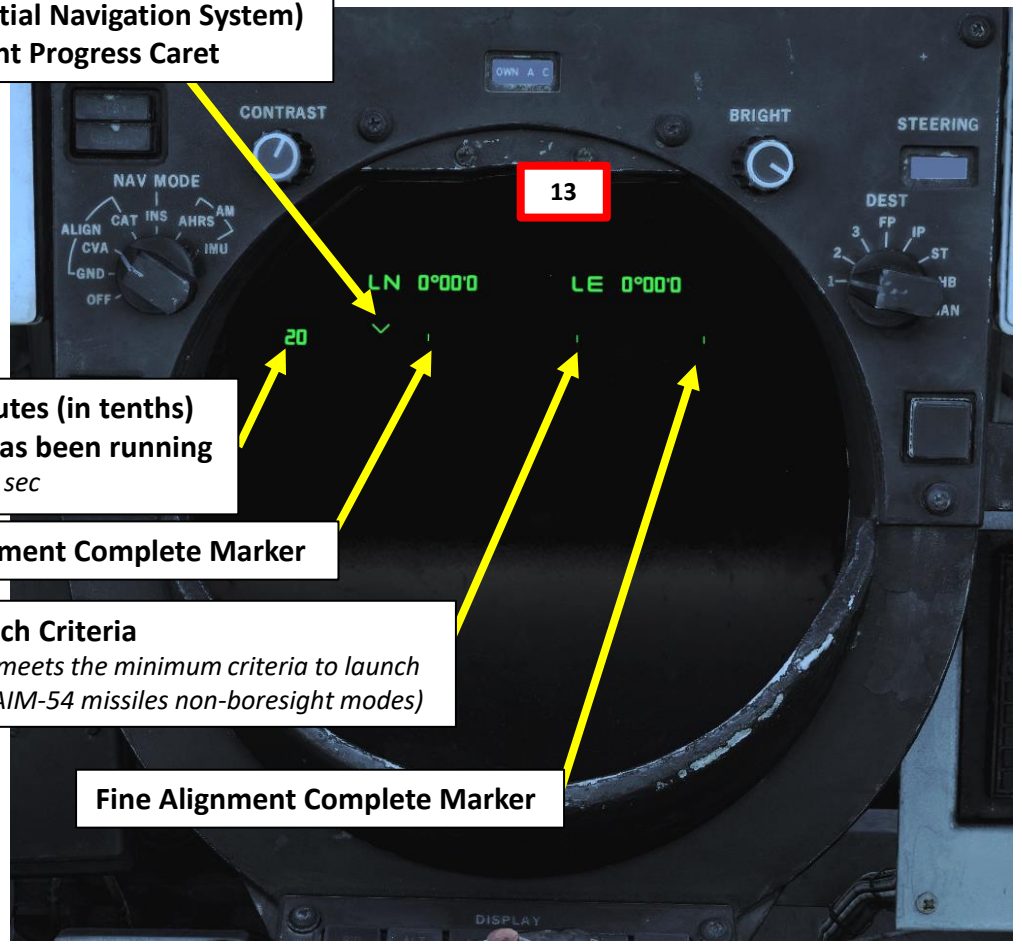


5 – RIO INS ALIGNMENT (CARRIER)

13. Monitor the alignment progress. There is no need to input aircraft position coordinates since the aircraft's INS system takes information directly through the aircraft carrier's own INS system.
14. CVA INS alignment takes about 9 minutes to reach the FULL FINE marker. Fine alignment is complete when the INS Progress Caret turns into a diamond with a dot in the center.
15. When alignment is complete, set Navigation Mode Selector to INS NAV MODE.



INS (Inertial Navigation System) Alignment Progress Caret



Number of Minutes (in tenths) INS alignment has been running
20 = 2.0 min = 120 sec

Coarse Alignment Complete Marker

Alert Launch Criteria
(Alignment meets the minimum criteria to launch AIM-7 and AIM-54 missiles non-boresight modes)

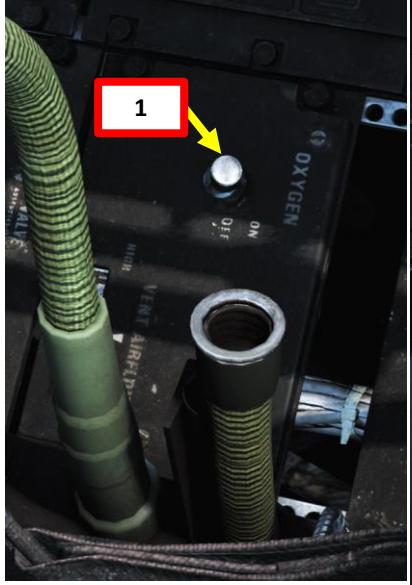
Fine Alignment Complete Marker



Fine Alignment Complete!

6 – RIO POST-ALIGNMENT

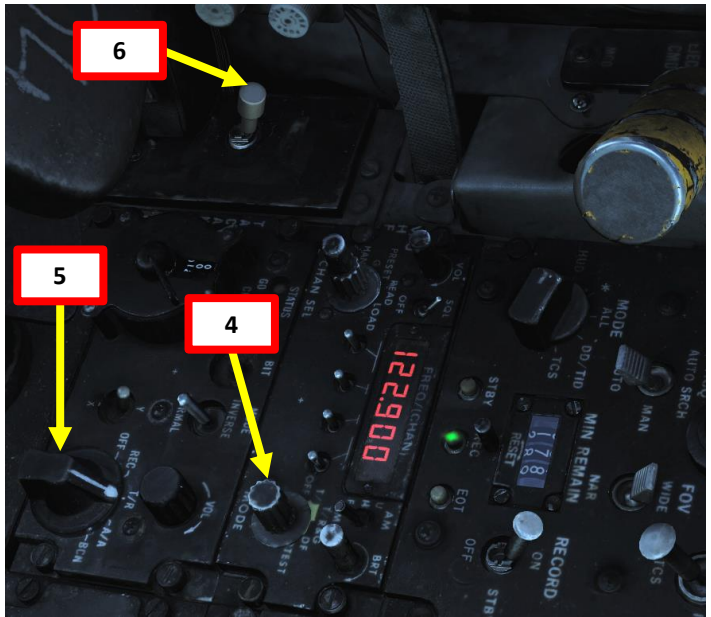
1. Set RIO Oxygen Switch – ON
2. Arm the RIO ejection seat by clicking the Ejection Seat Arming Handle (DOWN) or pressing "LSHIFT+E".
3. Close the canopy with "LCTRL+C"
4. Set V/UHF radio Function Selector to T/R +G (Transmit Receive + Guard)
5. Set TACAN function selector to T/R (Transmit Receive)
6. Set Liquid Cooling Switch – ON (FWD). This will start the AWG-9 radar cooling process.
7. At least 2 minutes before takeoff, erect the standby attitude gyro (ADI) by clicking on the control knob and turning it until the indicator matches the current attitude.
8. Set IR/TV Power switch - STANDBY
9. Set AN/ALR-67 RWR Power switch – ON. RWR will only activate once aircraft is in the air.
10. Set AN/ALQ-126 DECM Jammer Mode Selector Switch – STANDBY

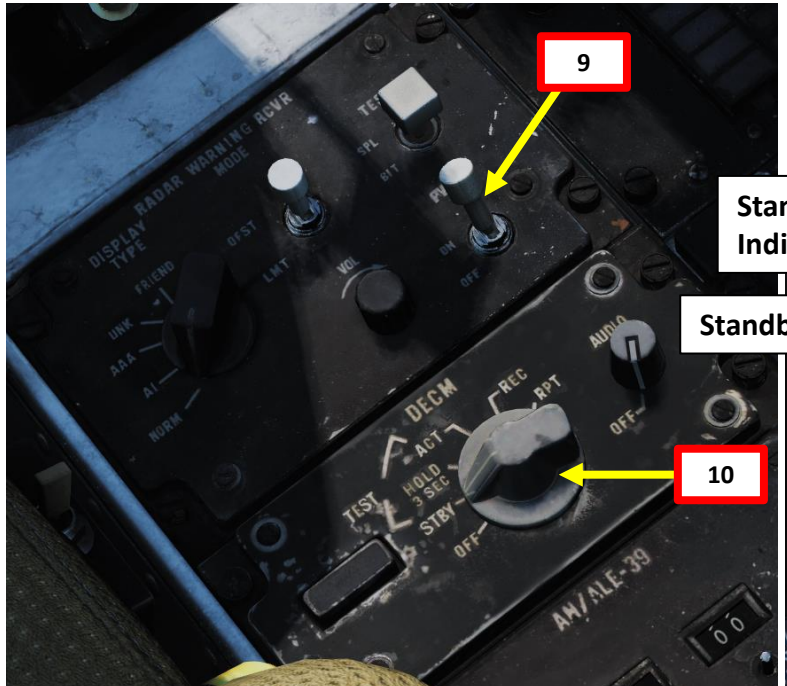


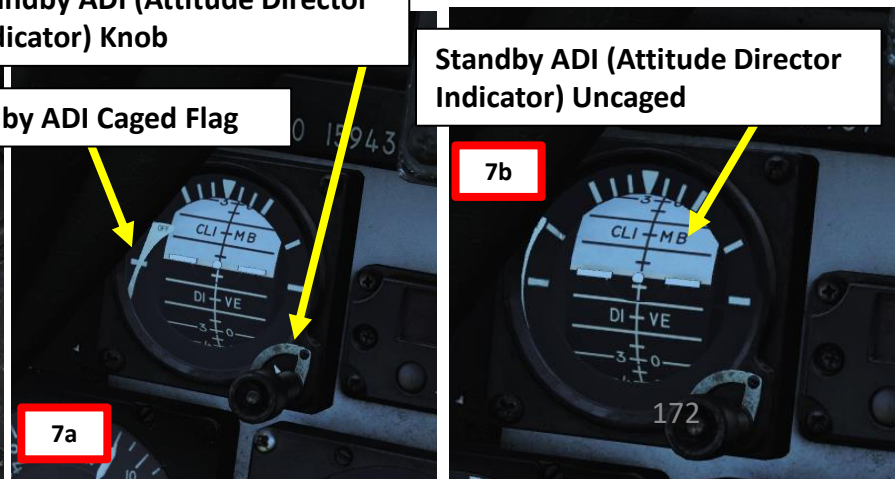










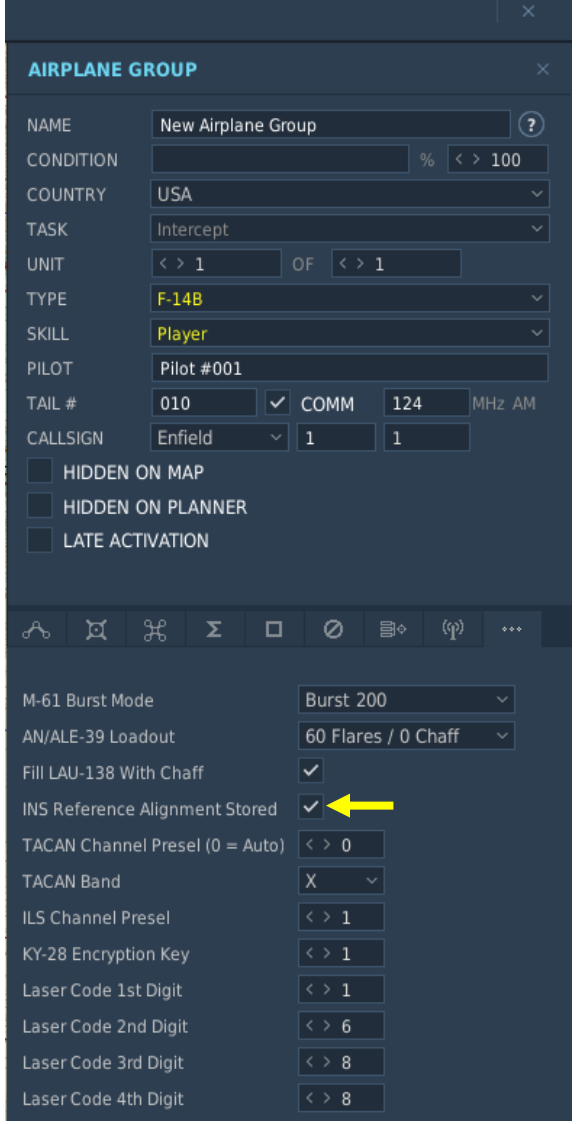


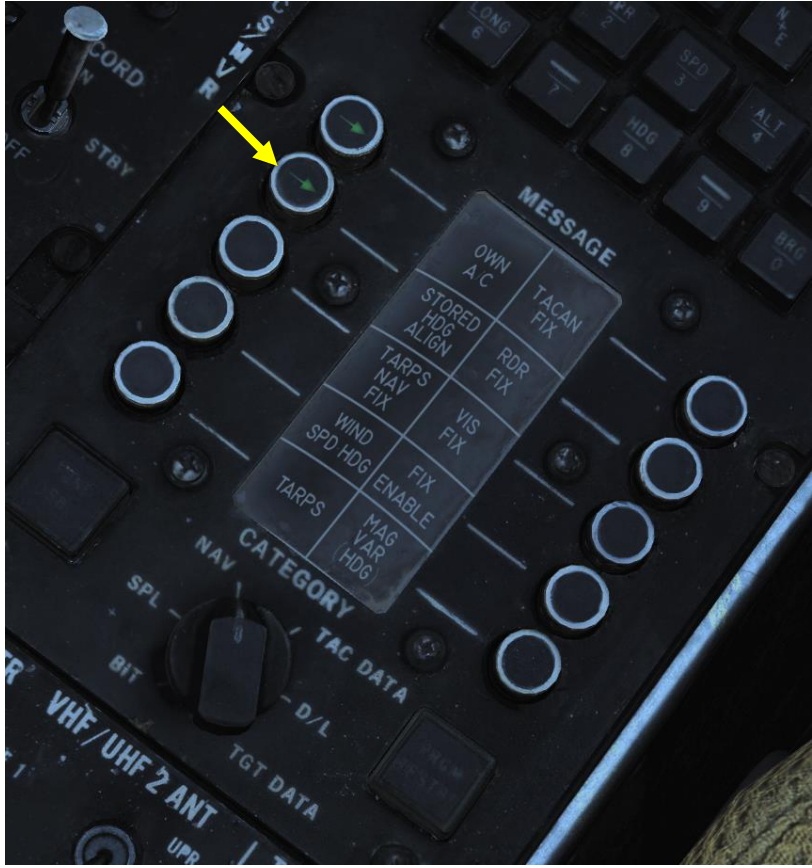
6 – RIO POST-ALIGNMENT

Note:

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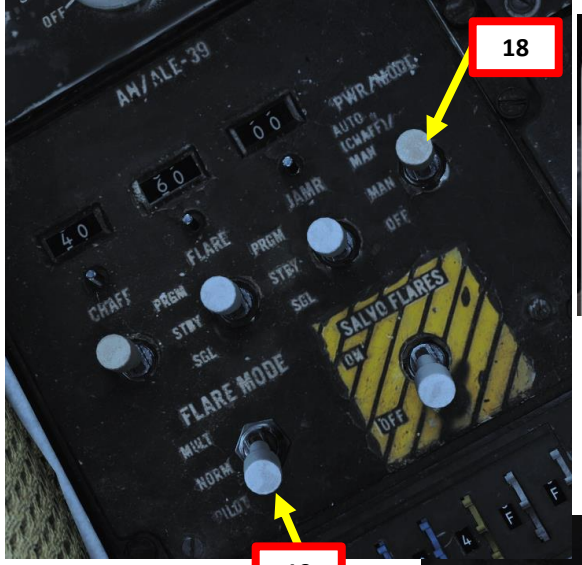


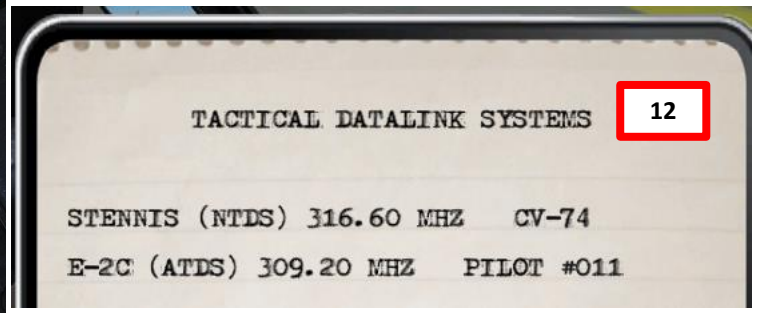


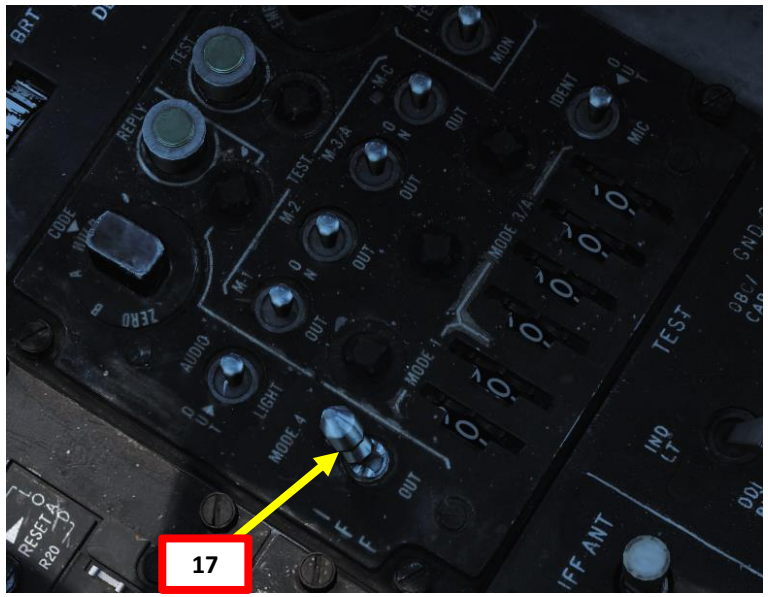


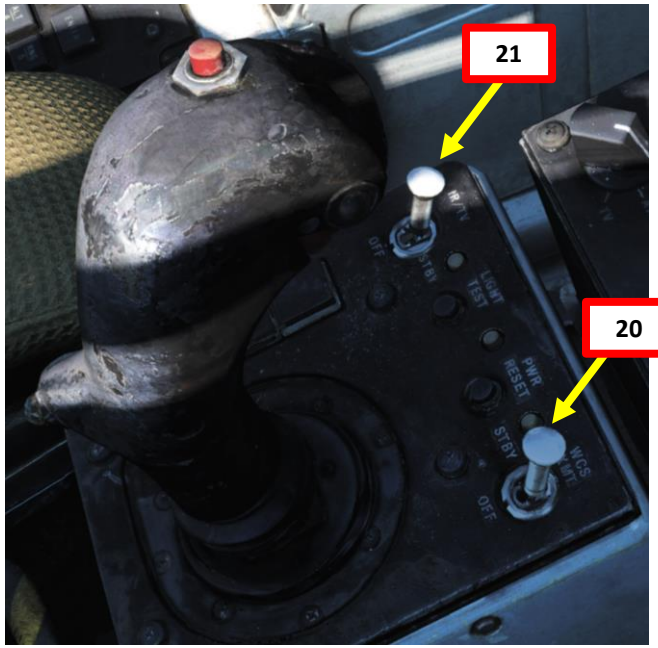
6 – RIO POST-ALIGNMENT

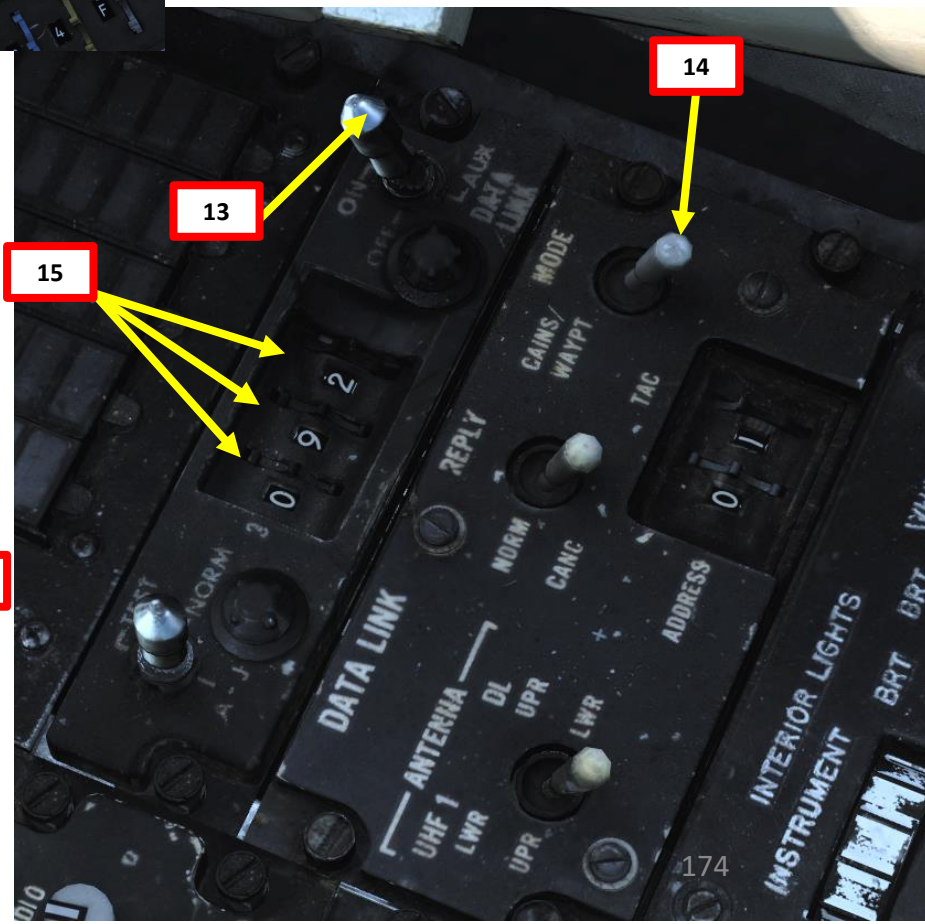
11. Open up your kneeboard using “RSHIFT+K”.
12. Cycle through pages using the “[“ and “]” (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
13. Set Datalink Power Switch – ON (FWD)
14. Set Datalink Mode Switch – TAC (AFT)
15. Set Datalink Frequency to the desired network. Our desired frequency for the E2C AWACS is listed on the kneeboard TACTICAL DATALINK SYSTEMS as 309.20 MHz. Rotate the Datalink Frequency Select wheels to 09.2 as shown (the 3 is preset and cannot be modified). *Not a mandatory step, but recommended.*
16. Close your kneeboard using “RSHIFT+K”.
17. Set IFF Mode 4 Power Switch – ON (FWD)
18. Set AN/ALE-39 PWR/Mode Switch to either AUTO(CHAFF)/MAN or MAN, as required.
19. Set Flare Mode Switch to PILOT (allows pilot to deploy flares with DLC button).
20. Once the three-minute warm-up period for the radar is done and aircraft is in the air, set WCS (Weapon Control System) Switch – WCS XMT (Transmit)
21. Set IR/TV (TCS Power) Switch to STBY, wait for a 2-minute warm-up period. Then, when aircraft is in the air, set to ON.
22. You should now be ready to taxi.











6 – RIO POST-ALIGNMENT

Note: Keep in mind that while your INS system is aligned and functional, you will still need to add the coordinates of every waypoint. Adding waypoints will be done in the NAVIGATION section.



REFERENCE POINTS

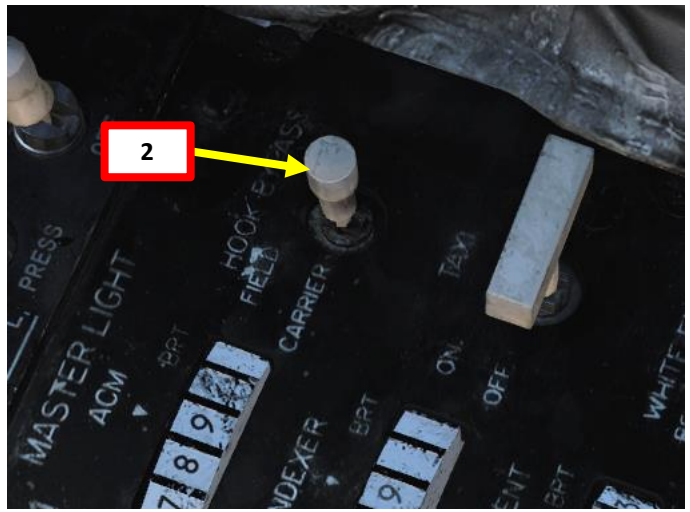
	LAT	LON	ALT	MAG VAR
RAMP:	N 25°01'4	E 55°22'6	197	+1.7
WP1:	N 26°01'5	E 55°56'1	0	+1.8
WP2:	N 26°11'2	E 56°03'1	0	+1.8
WP3:	N 26°10'2	E 56°14'4	73	+1.8
FP:				
IP:				
ST:				
HB:	N 25°01'6	E 55°23'0	191	+1.7
DP:				
HA:				
WP4:				
WP5:				
WP6:				
WP7:				
WP8:				
WP9:				
WP10:				

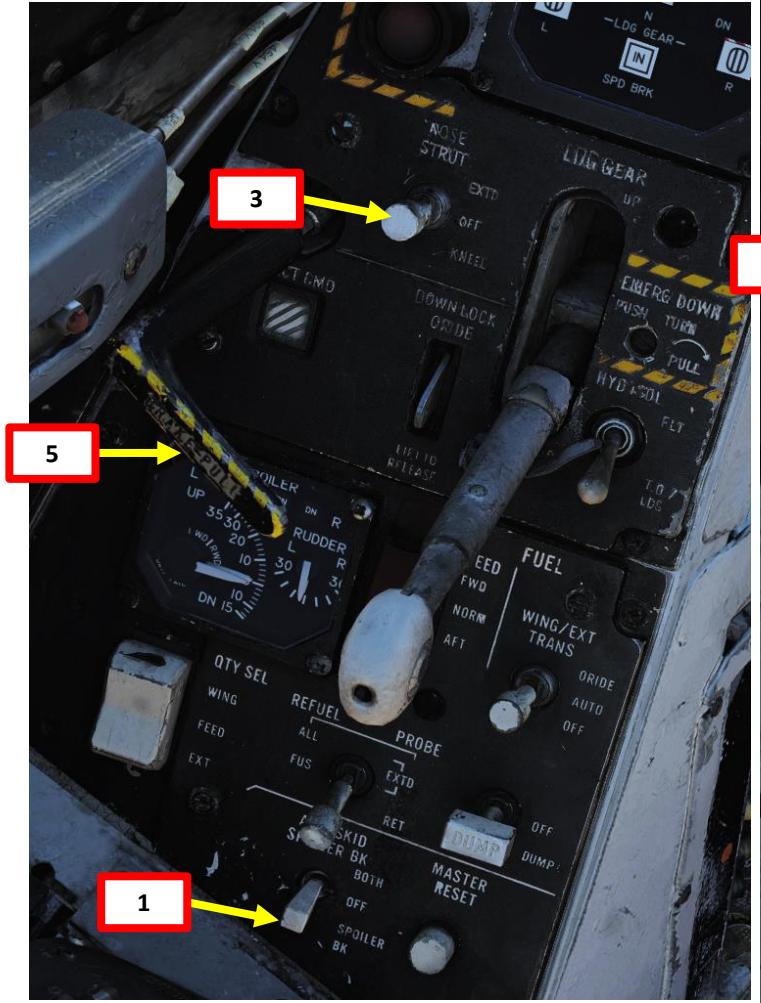
SHORE TAKEOFF



SHORE TAKEOFF

1. Set ANTI-SKID SPOILER BK switch OFF before taxiing. *Note: When the ANTI SKID SPOILER BK switch is in BOTH during low-speed taxi (less than 10 knots for more than a few seconds), subsequent acceleration of the aircraft through approximately 15 knots will cause a temporary loss of brakes lasting from 2 to 10 seconds.*
2. Set HOOK BYPASS switch to FIELD if operating on an airfield
3. Check that Nose Strut is RETRACTED (OFF)
4. Set HUD Display Mode to TO (Takeoff)
5. Release Parking Brake Lever (Pushed IN)
6. Throttle up and start taxiing





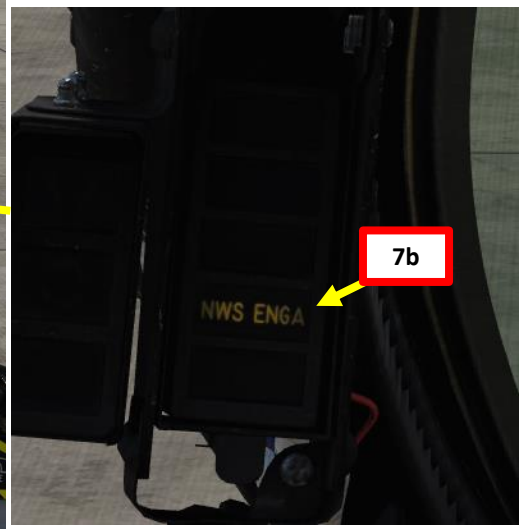


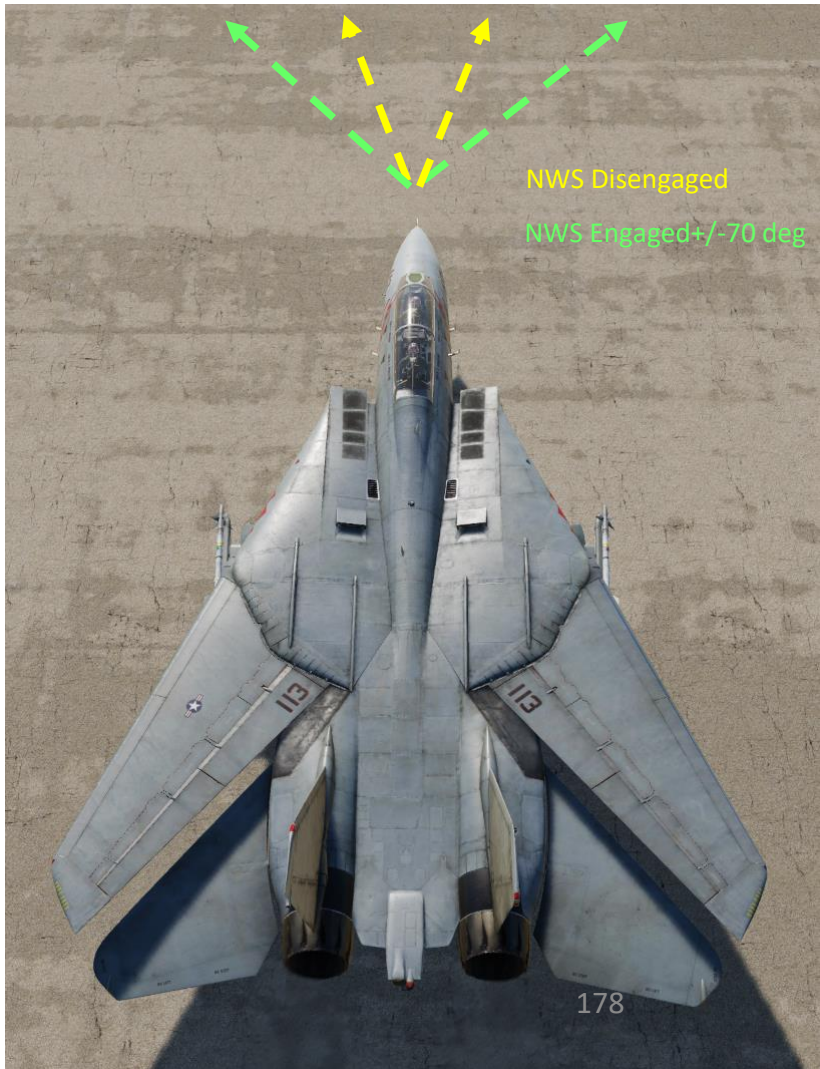
SHORE TAKEOFF

7. Aircraft is steered using the nosewheel steering (NWS), controlled with rudder pedals.
    - The NWS Mode allows +/- 70 deg steering, which is useful on aircraft carriers or small spaces. You can activate it by pressing the «Nosewheel Steering button» (key binding: « N ») button on your HOTAS.
    - When engaged, the NWS ENGA indication will illuminate.
    - Disengagement of this system occurs automatically with weight off wheels (take-off), electrical supply failure or lowering of the launch bar. It's also possible to deactivate the system by depression of the nosewheel steering button.



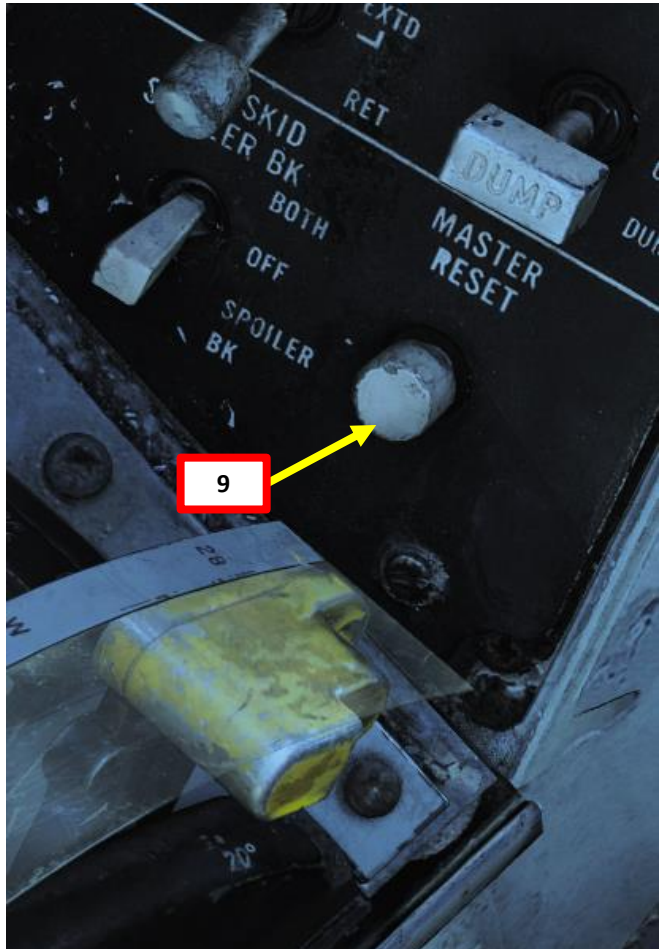


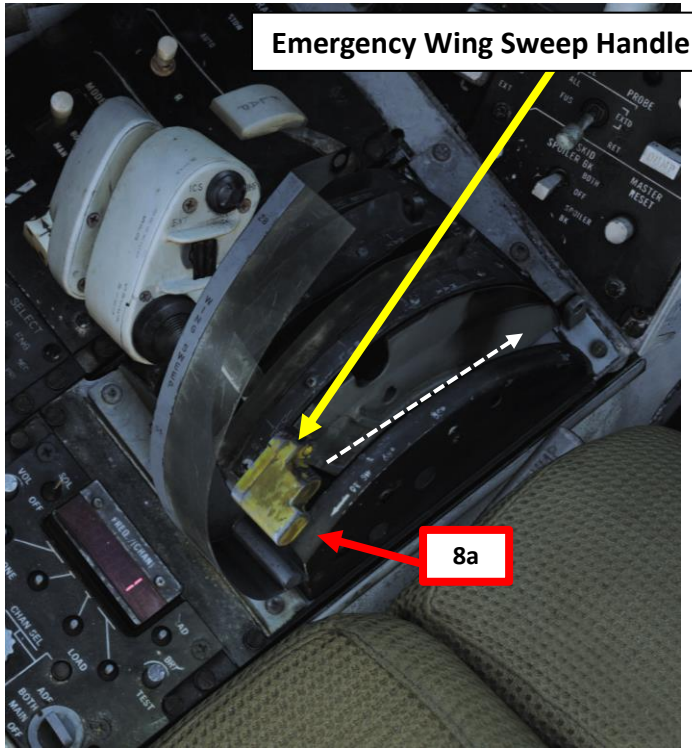


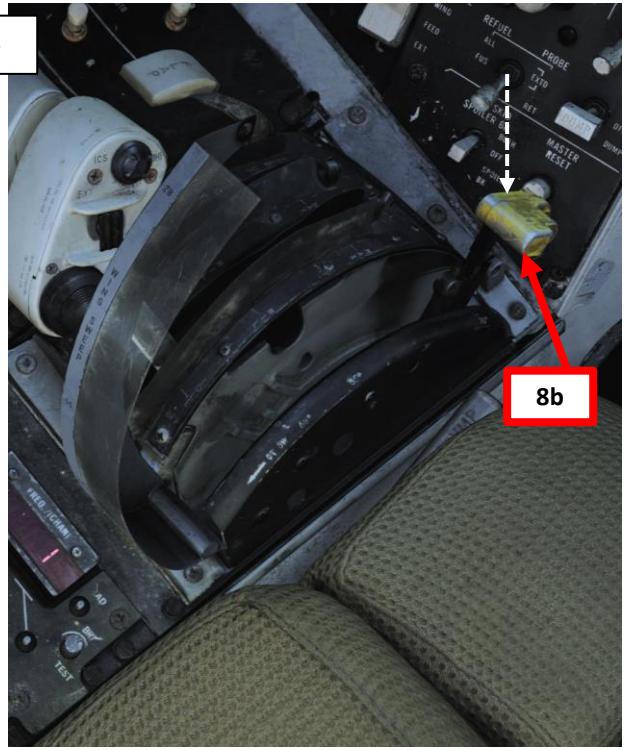


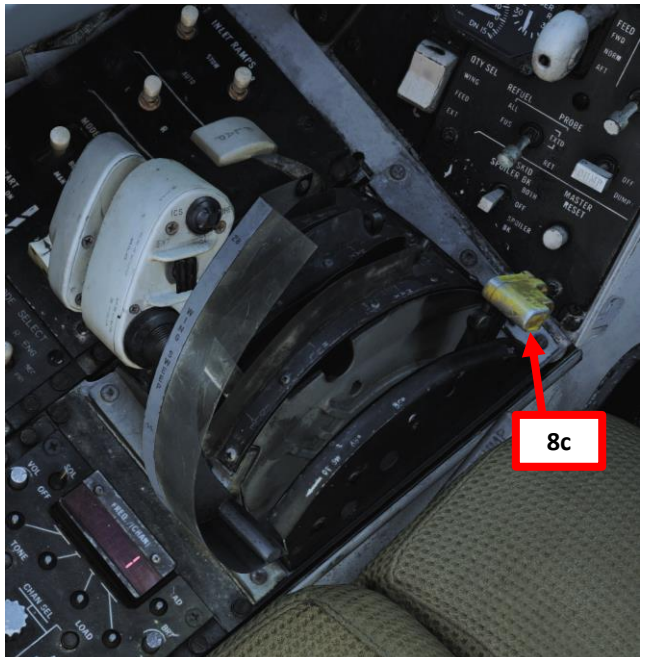
SHORE TAKEOFF

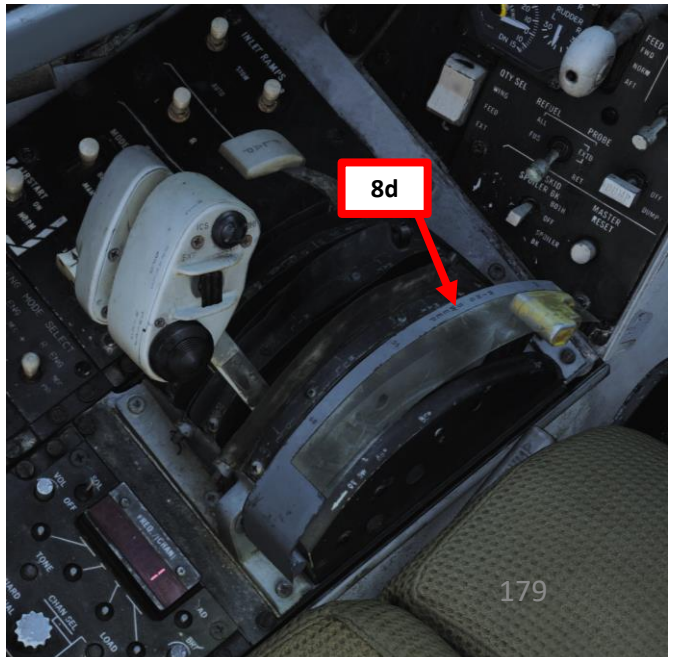
8. Once lined up on the runway, set the Emergency Wing Sweep Handle all the way forward to 20 degrees (scroll mousewheel or left click & drag), then push the lever down with a right click and flip the handle cover over it.
9. Press the MASTER RESET button (**very important** or the Wing Sweep AUTO mode will not work properly).





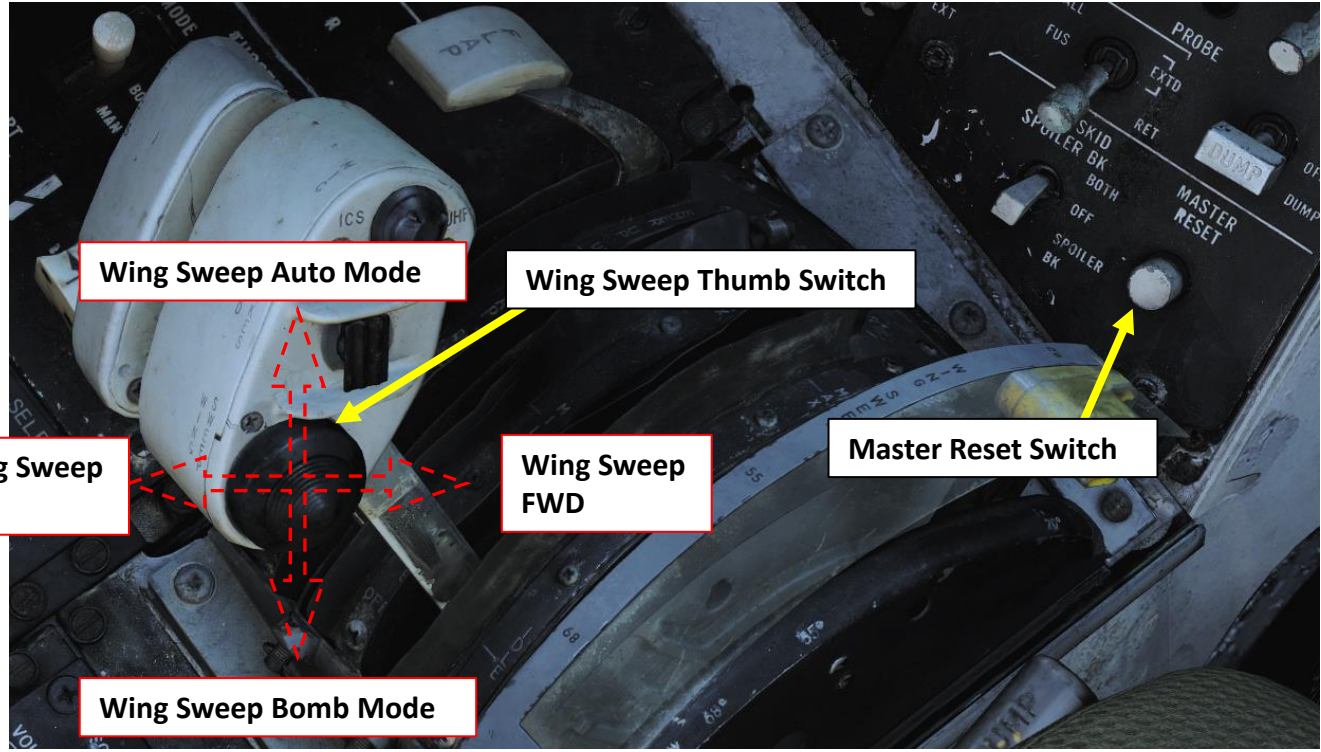


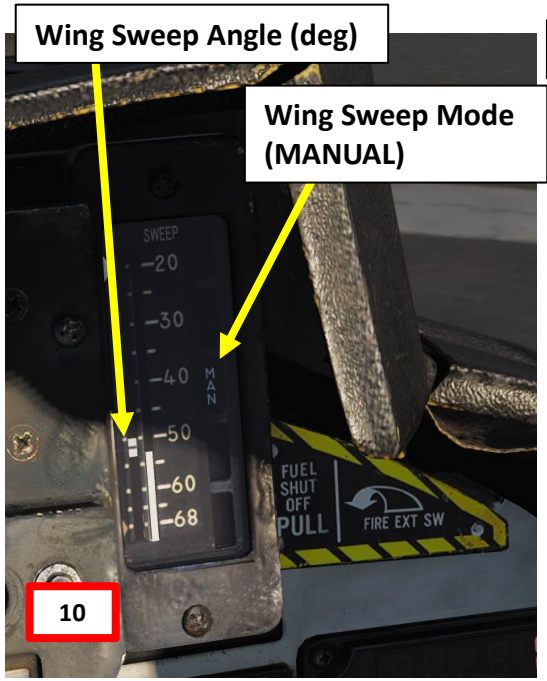


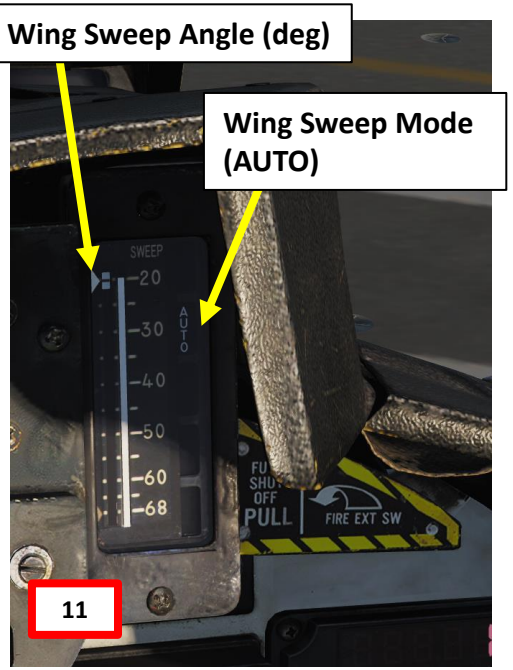


SHORE TAKEOFF

10. Use the Wing Sweep AFT & FWD (Manual) buttons on your Wing Sweep Thumb switch (throttle) to exercise the wings through their whole range of motion. Don't forget to press the Master Reset switch before using the Wing Sweep Thumb switch.
11. Set the Wing Sweep Thumb Switch UP to AUTO mode. The Wing Sweep Angle indicator should show that the wings automatically set themselves to 20 deg.











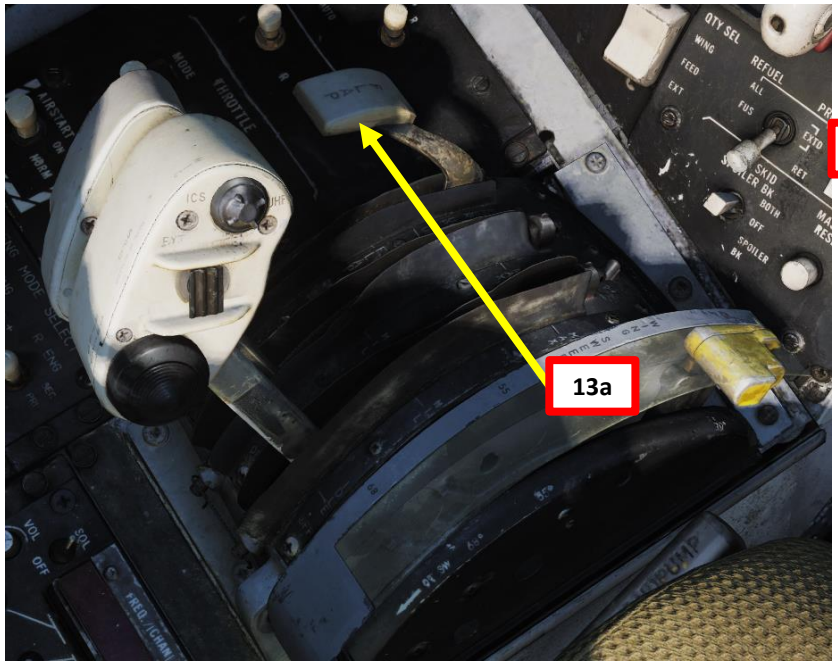
SHORE TAKEOFF

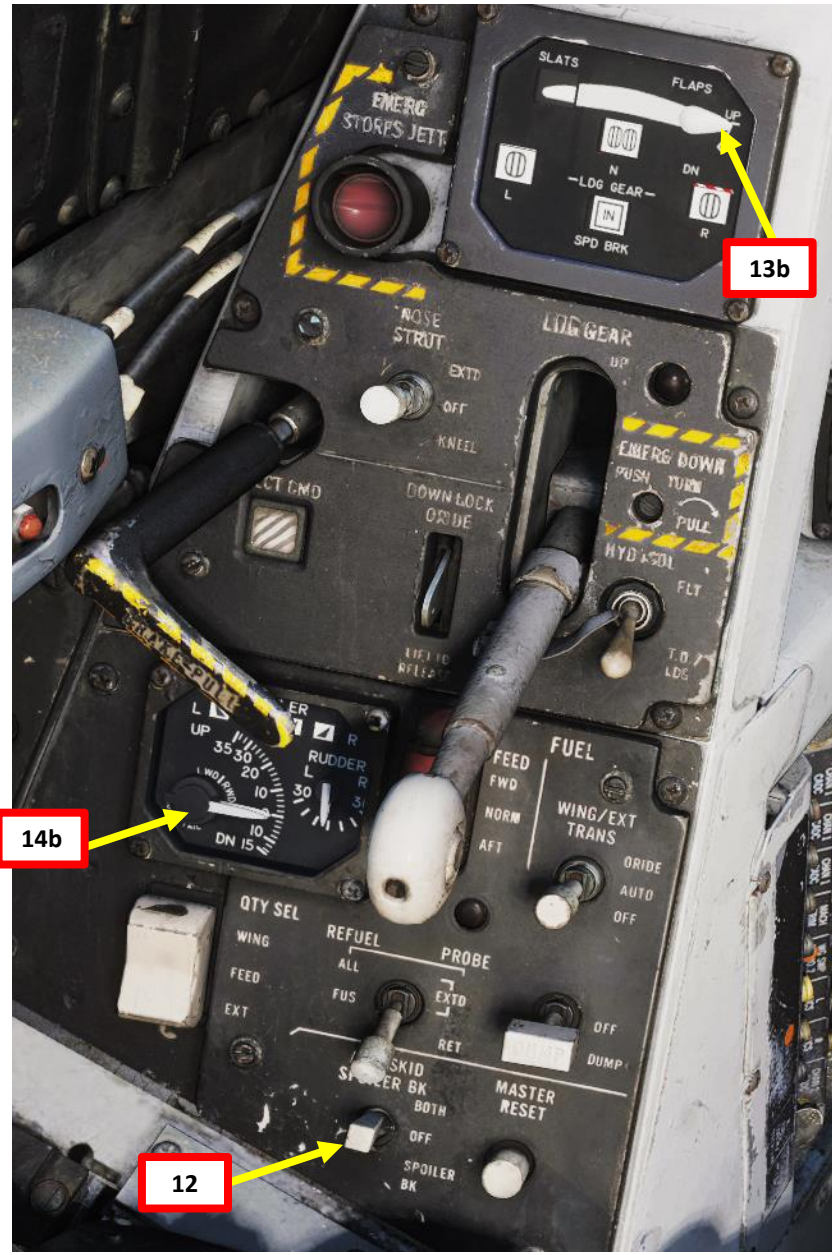
12. Once lined up on the runway, set ANTI-SKID SPOILER BK switch BOTH (UP)
13. Set Flaps – Up
14. Set Takeoff Elevator Trim to 0 deg using the Trim Hat switch
15. Disengage Nosewheel Steering. NWS ENGA caution should extinguish.





Nosewheel Steering / Autopilot Reference Switch





SHORE TAKEOFF

16. Throttle up to MIL Power (90 % RPM N2).
    ***Note**: Full afterburner takeoff is prohibited with the GE F110 engines of the F-14B. This limitation is based on controllability concerns in the event of an engine failure during takeoff.*
17. When reaching approx. 130 kts, slowly hold stick back. Rotation should occur at approx. 140 kts.
18. Set Landing Gear lever – UP (before reaching 250 kts)
19. You may engage afterburners as required once you have your wheels off the ground.







SHORE TAKEOFF



CARRIER TAKEOFF



CARRIER TAKEOFF

1. Make sure the INS alignment was done with the INS Selector switch to CVA. With CVA mode and the Datalink Mode set to CAINS (Carrier Inertial Navigation System), the alignment will take its positional data directly from the carrier. Once alignment is finished, remember to verify that the INS Selector switch is set back to INS NAV.





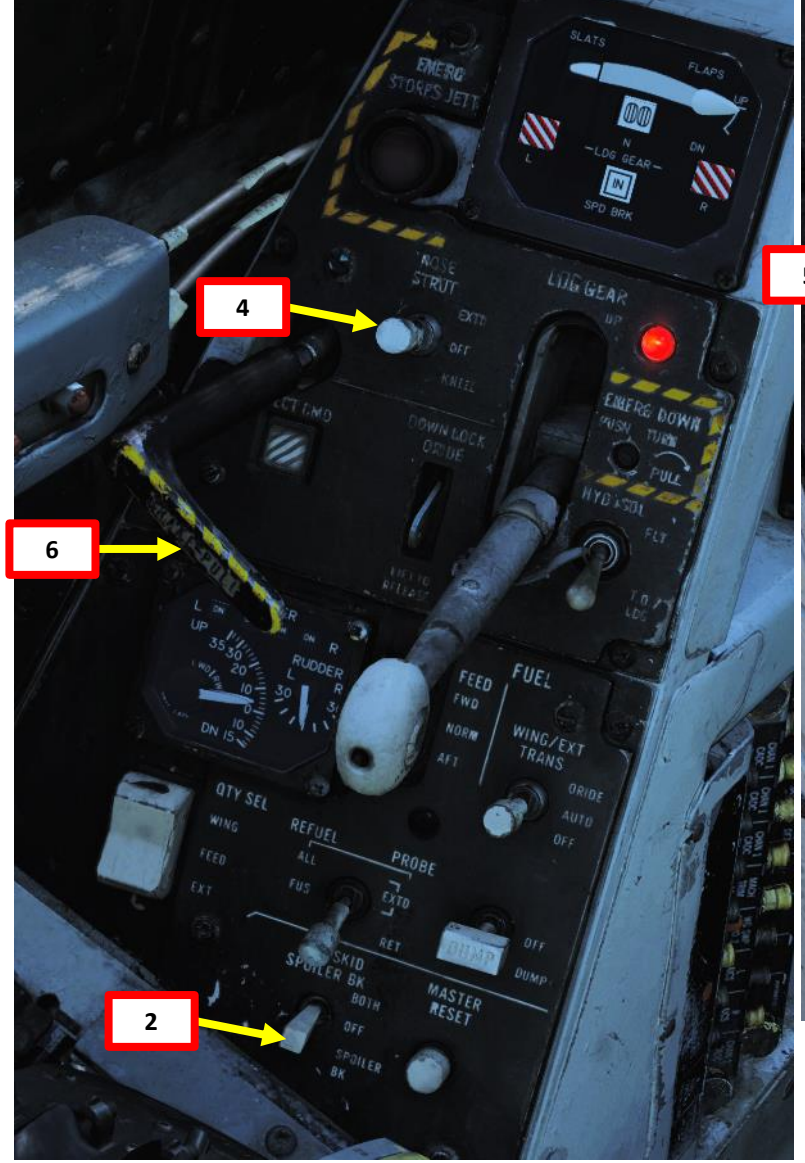


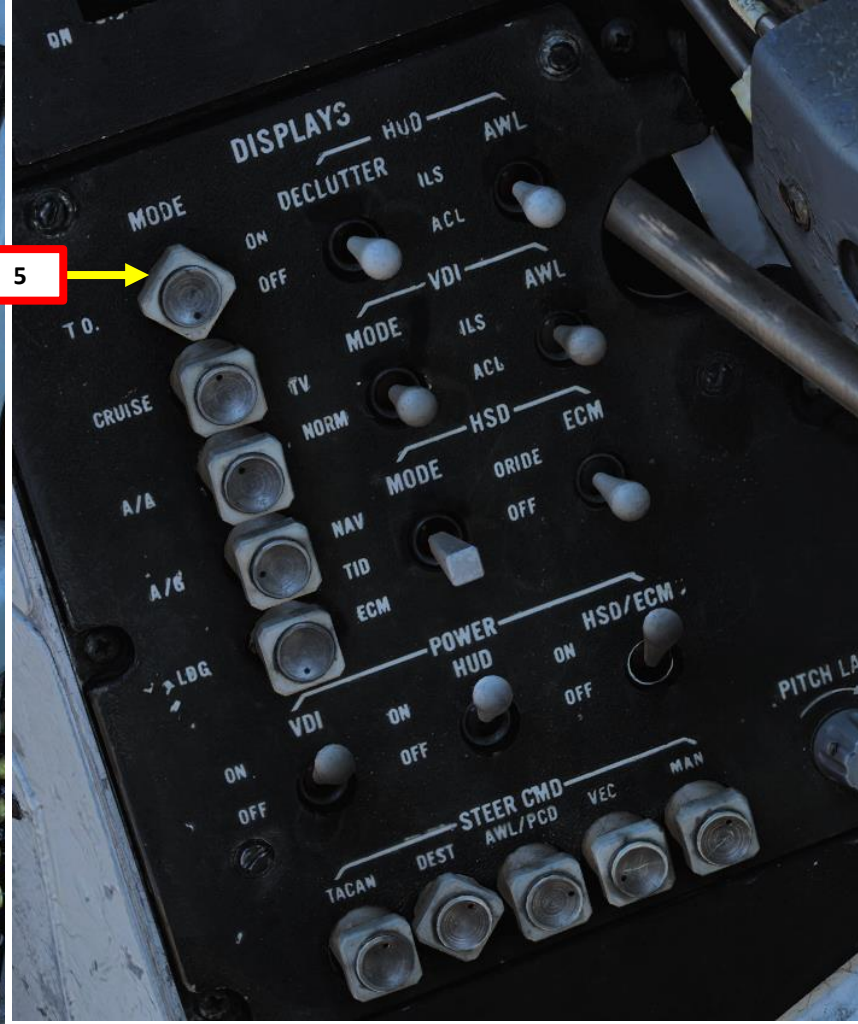
CARRIER TAKEOFF

2. Set ANTI-SKID SPOILER BK switch OFF before taxiing.
3. Set HOOK BYPASS switch to CARRIER if operating on a carrier
4. Check that Nose Strut is RETRACTED (OFF)
5. Set HUD Display Mode to TO (Takeoff)
6. Release Parking Brake Lever (Pushed IN)
7. Throttle up and start taxiing

Note: *In a carrier environment, it is highly recommended to taxi with your wings fully swept back (in OVERSWEEP) to facilitate movement on the deck and minimize any risk of collision with obstacles or other aircraft.*







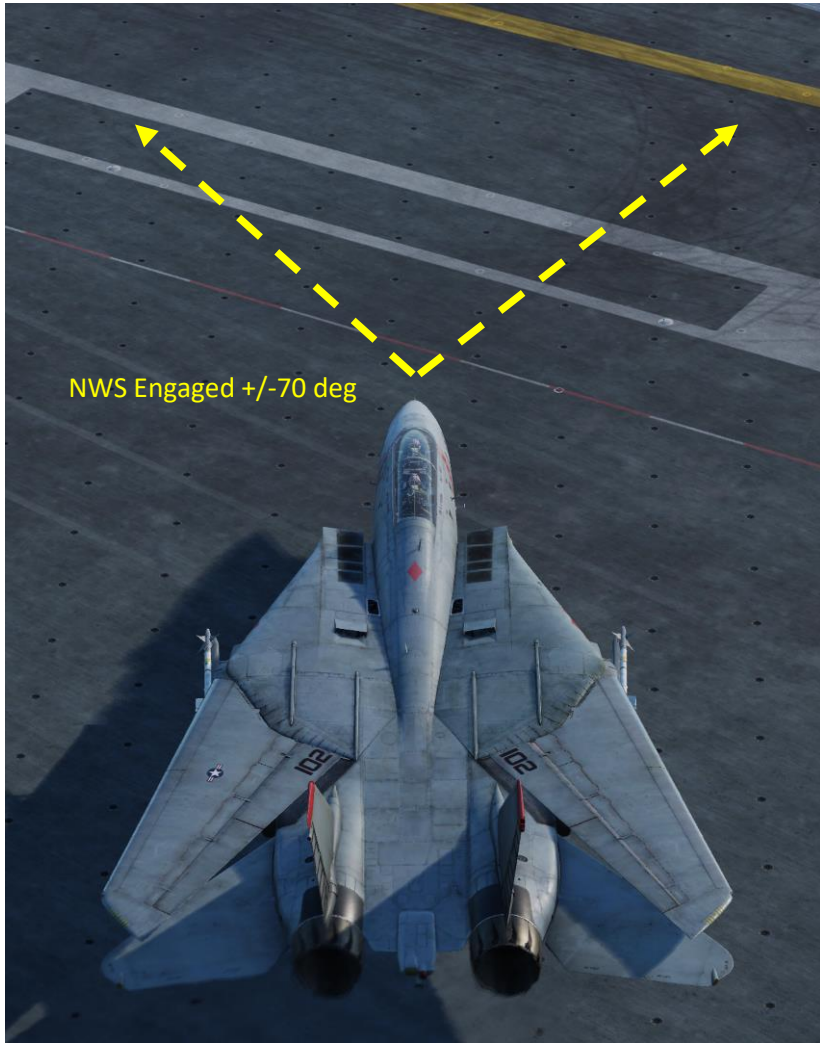
CARRIER TAKEOFF

8. Aircraft is steered using the nosewheel steering (NWS), controlled with rudder pedals.
    - The NWS Mode allows +/- 70 deg steering, which is useful on aircraft carriers or small spaces. You can activate it by pressing the «Nosewheel Steering button» (key binding: « N ») button on your HOTAS.
    - When engaged, the NWS ENGA indication will illuminate.
    - Disengagement of this system occurs automatically with weight off wheels (take-off), electrical supply failure or lowering of the launch bar. It's also possible to deactivate the system by depression of the nosewheel steering button.



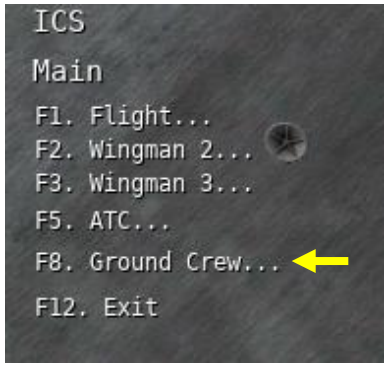


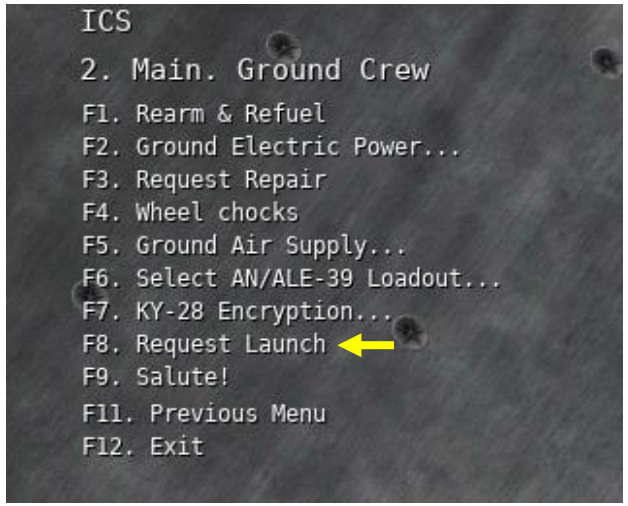




CARRIER TAKEOFF

9. Verify the way is clear to the catapult first. You wouldn't want someone to accidentally land on you while you line up on Catapult 3, eh?
10. Taxi to approach the catapult from directly behind it. If an aircraft is occupying the catapult, wait behind the JBD (Jet Blast Deflector).
11. If the Taxi Director (yellow shirt) is not present on the catapult, you can use the "Ground Crew" menu to request a launch.
    a) Press "\" (Communication Menu) and "F8" to select ground crew
    b) Select "Request Launch" by pressing "F8"







JBD (Jet Blast Deflector)
Deflects engine jet blast in order to not damage any aircraft or injure carrier crew. They also act as heat shields since many carrier-launched aircraft takeoff with afterburners on.

CARRIER TAKEOFF

12. When ready, advance on the retracted JBD (Jet Blast Deflector) and follow the Taxi Director's hand signals to align the aircraft on the catapult track.
13. When the Taxi Director closes his fists, gently stop the aircraft with the wheel brakes.



Turn Left



Taxi Forward



Turn Right



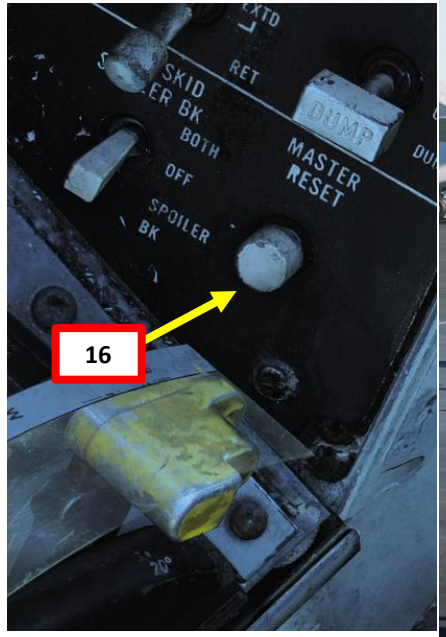






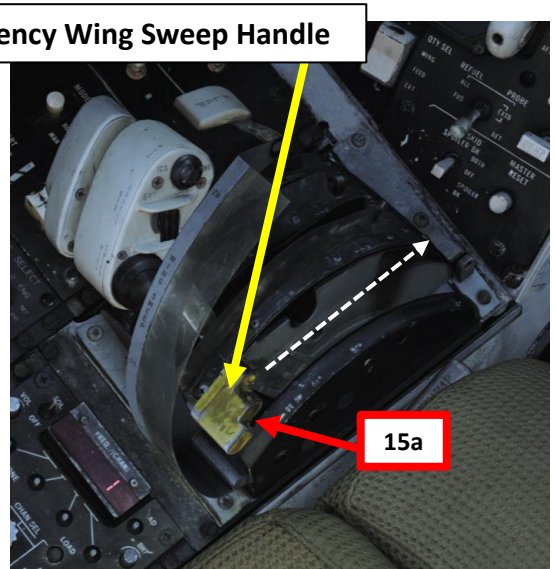
CARRIER TAKEOFF

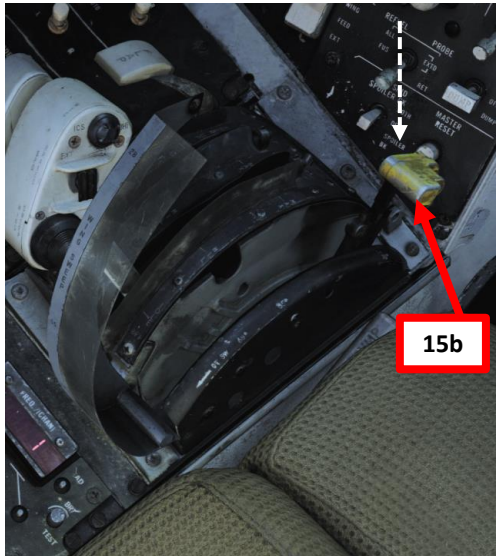
14. When the Taxi Director extends his arms, he directs you to unsweep your wings.
15. Set the Emergency Wing Sweep Handle all the way forward to 20 degrees (scroll mousewheel or left click & drag), then push the lever down with a right click and flip the handle cover over it.
16. Press the MASTER RESET button (very important or the Wing Sweep AUTO mode will not work properly).

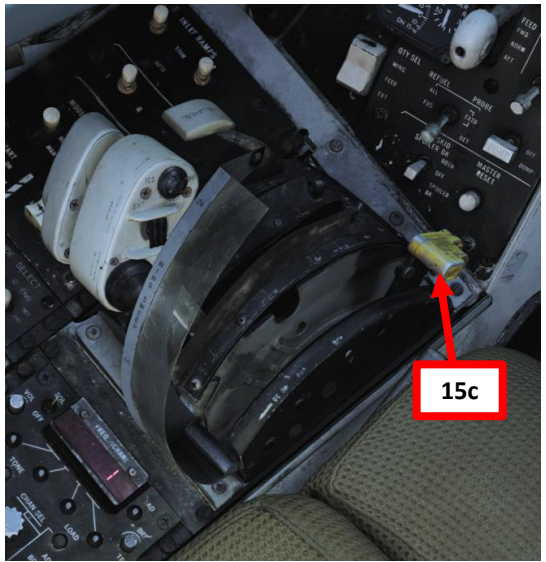


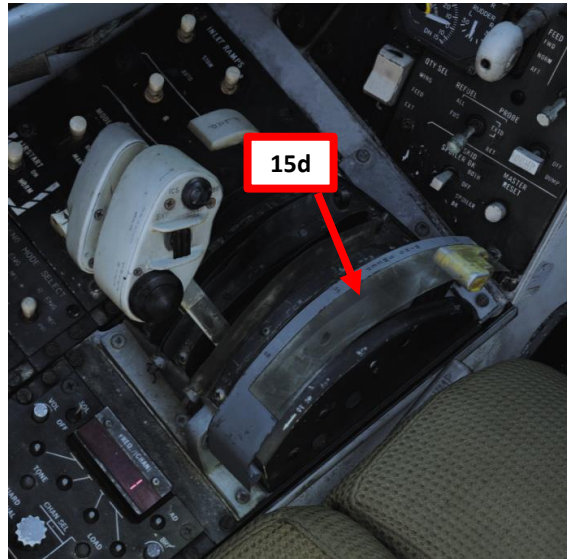


Emergency Wing Sweep Handle



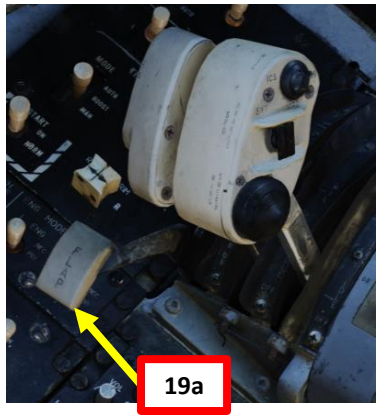


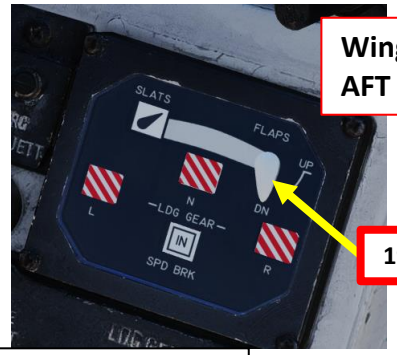


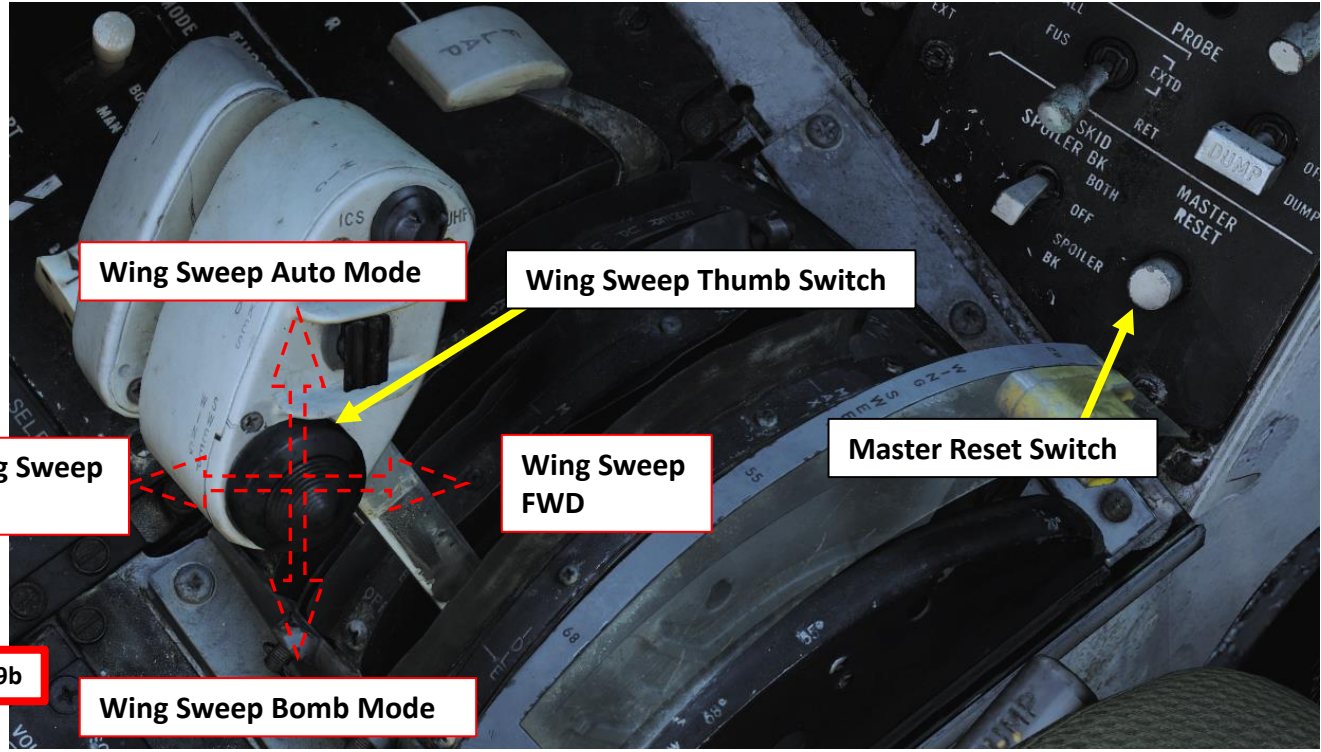


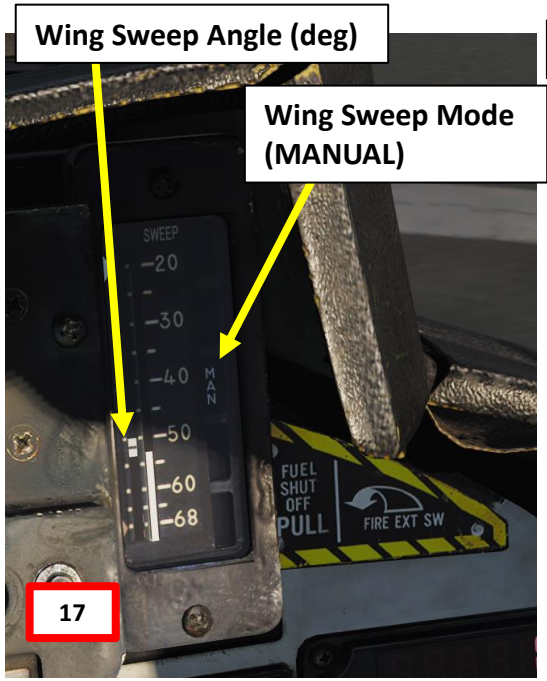
CARRIER TAKEOFF

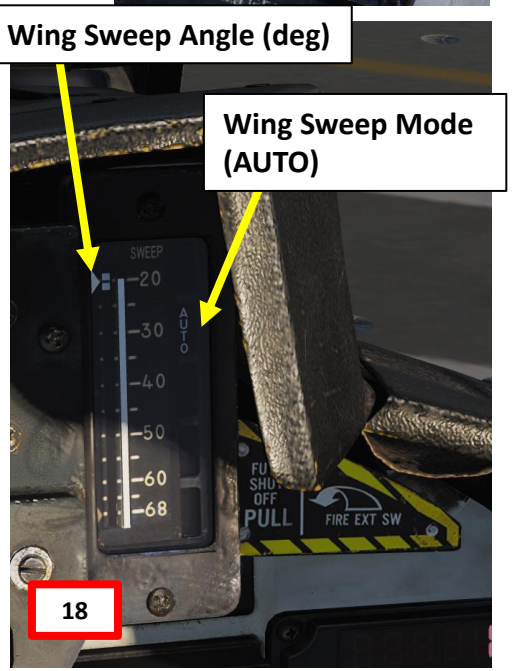
17. Use the Wing Sweep AFT & FWD (Manual) buttons on your Wing Sweep Thumb switch (throttle) to exercise the wings through their whole range of motion. Don't forget to press the Master Reset switch before using the Wing Sweep Thumb switch.
18. Set the Wing Sweep Thumb Switch UP to AUTO mode. The Wing Sweep Angle indicator should show that the wings automatically set themselves to 20 deg.
19. Deploy Flaps (Flaps Lever Fully AFT)
20. While all of this is going on, the flight crew raises the jet blast deflector (JBD) behind the aircraft.













CARRIER TAKEOFF

21. When the Taxi Director unfolds his arm, he directs you to extend your launch bar (“kneel” the aircraft).
22. Set Nose Strut switch to KNEEL to deploy the launch bar and lower the aircraft nose. Once launch bar is deployed, Nosewheel Steering will automatically disconnect.
23. The Catapult crew (Green Shirt) will install the holdback bar, which is used to maintain the aircraft in place until the steam catapult is fired.



Extend Launch Bar



22



21a – Extend Launch Bar



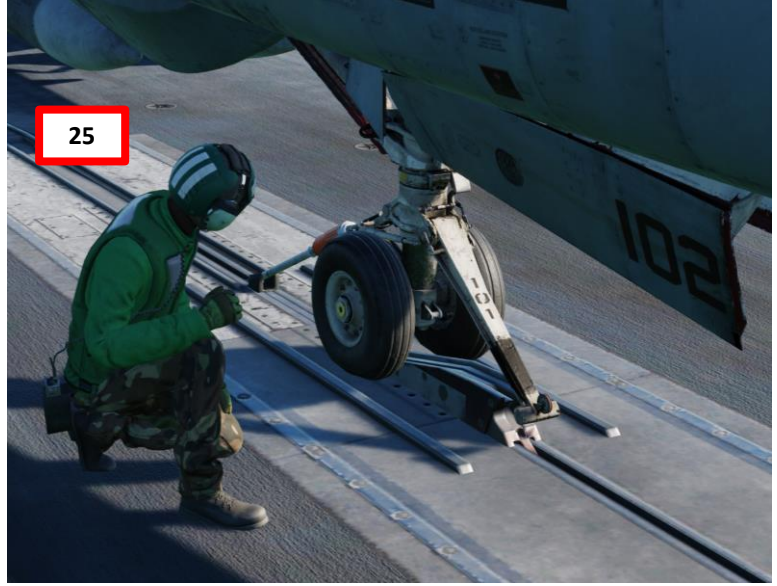
23



21b – Extend Launch Bar

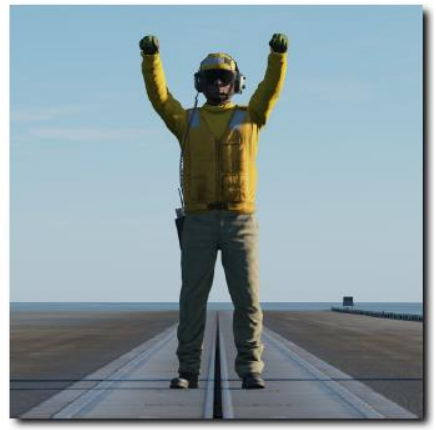
CARRIER TAKEOFF

24. When the Taxi Director moves his arms back and forth, he directs you to throttle up and move forward to hook the launch bar into the catapult shuttle. Significant power may be required.
    - **Note: If you do not own the Supercarrier, press "U" ("Catapult Hook Up" binding) to hook Launch Bar into the Catapult Shuttle.**
25. The catapult crew (green shirt) will monitor the catapult shuttle and tell the Taxi Director when you are hooked up.
26. When the launch bar drops over the shuttle, the aircraft will be stopped as the holdback engages the catapult buffer. Reduce power to idle.





Taxi Forward



Stop

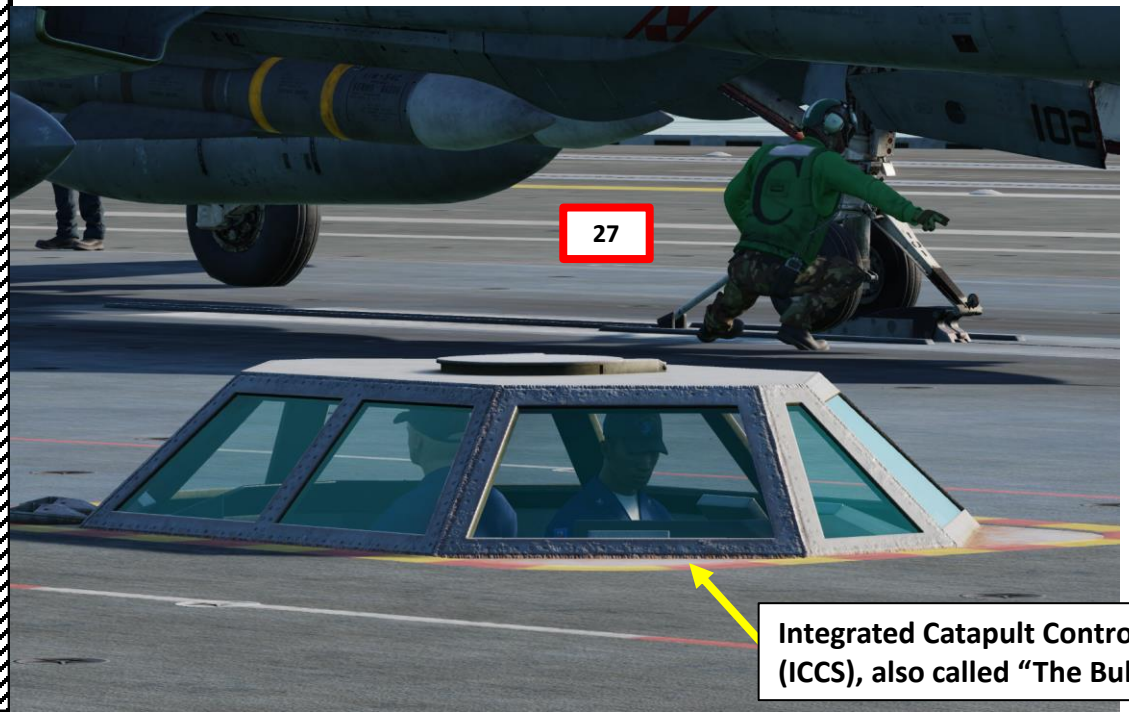




CARRIER TAKEOFF

27. The Catapult crew will verify that the aircraft launch bar is hooked into the catapult shuttle and that the holdback bar is installed properly.
28. When checks are complete, the crew located in the ICCS (Integrated Catapult Control Station), also called the “Bubble”, will apply tension to the catapult. You will see steam emanating from the catapult rail.
29. The Final Checkers (White Shirts) will inspect your aircraft for any last-minute problems.





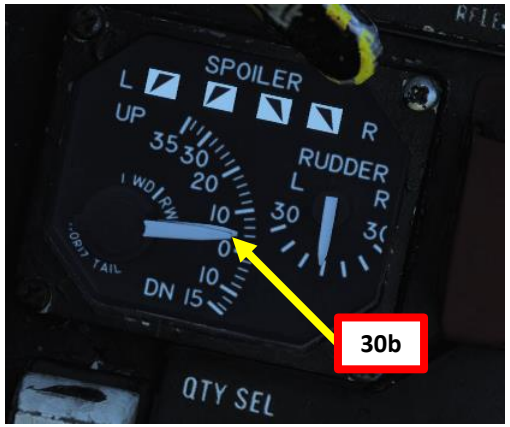
Integrated Catapult Control Station (ICCS), also called “The Bubble”.



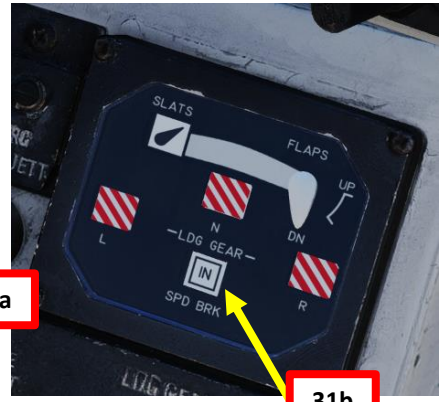
CARRIER TAKEOFF

30. Set Takeoff Elevator Trim to 2 to 3 deg Nose Up using the Trim Hat switch. There is a Catapult Launch Trim Requirements chart in the F-14 NATOPS, but since we don't have the longitudinal CG location… this chart is more or less useless for the purposes of DCS.
31. Verify Speed Brakes are retracted (IN).
32. When the Shooter gives you the « Engine Run Up » hand signal, throttle up to MIL Power (90 % RPM N2).

***Note**: Full afterburner takeoff is prohibited with the GE F110 engines of the F-14B. This limitation is based on controllability concerns in the event of an engine failure during takeoff.*









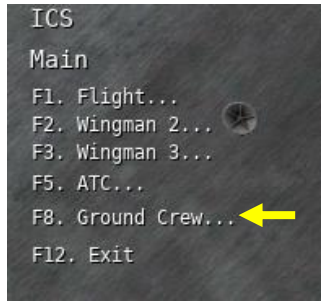


CARRIER TAKEOFF

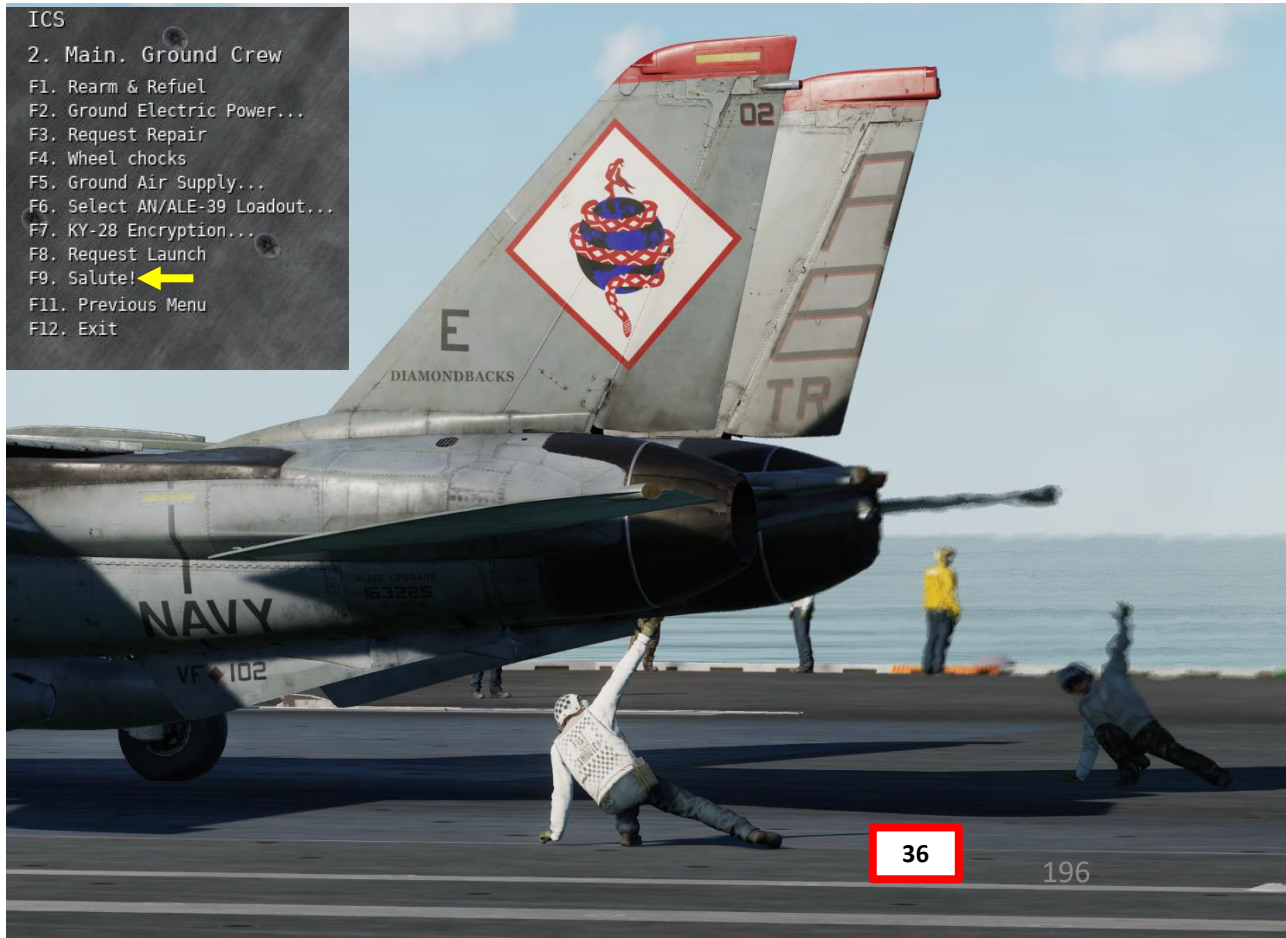
33. Perform a control wipeout to check flight controls
    - Stick Full Forward
    - Stick Full Aft
    - Stick Full Left
    - Stick Full Right
    - Rudder Full Left
    - Rudder Full Right
34. Check the engine instruments and monitor the caution and warning lights.
35. Press “LSHIFT+U” to salute the Shooter. Alternatively, you can also do this through the ground crew menu.
    a) Press “\” (Communication Menu) and “F8” to select ground crew
    b) Select “Salute!” by pressing “F9”
36. All Final Checkers and crew will do a quick last check, then give a thumbs up.











CARRIER TAKEOFF

37. The Catapult Officer (Shooter) will make final checks, looking fore and aft, and then touch the deck.
38. The Shooter will then extend his arm, giving the signal to fire the catapult.
39. The aircraft will accelerate, reaching end speed in about two seconds.
40. Set Landing Gear lever – UP (before reaching 250 kts)
41. Set Flaps lever – UP (before reaching 225 kts)
42. After take off, perform Clearing Turn, which is 20 degree left and heading BRC (Base Recovery Course). Maintain 500 ft and 300 kts.
43. After away from carrier about 7 nm, you are cleared to climb more than 500 ft.







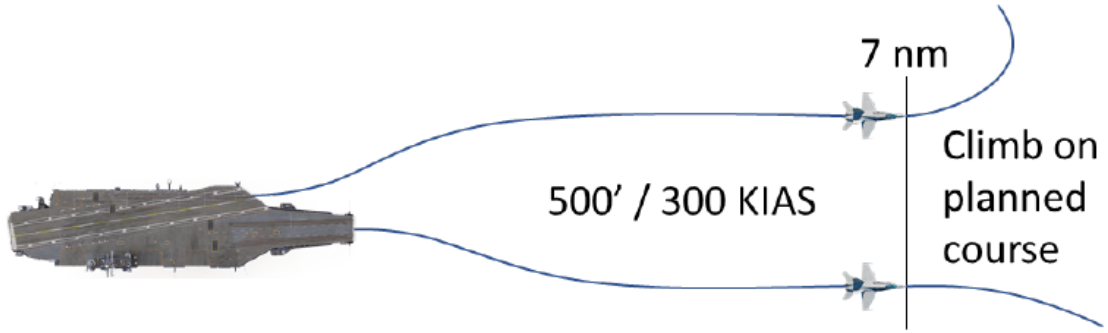


CARRIER TAKEOFF

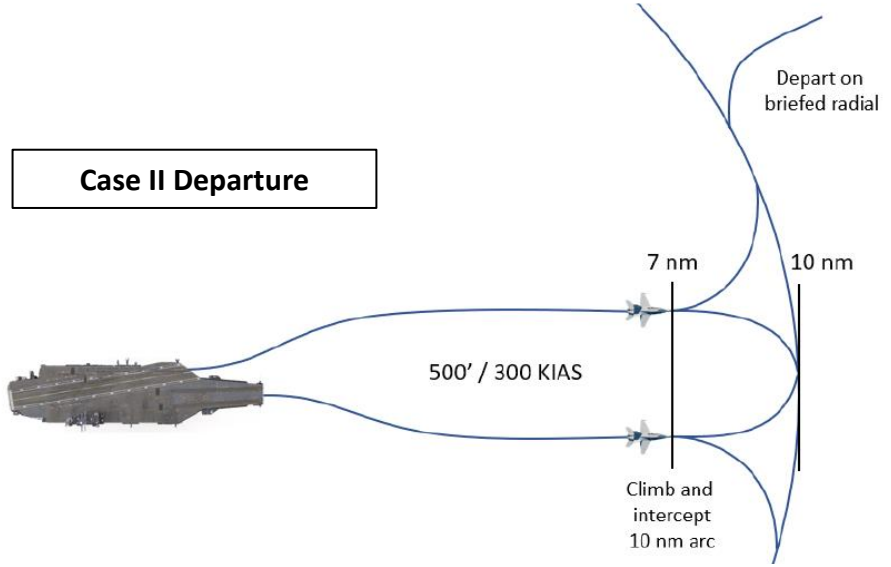


CARRIER TAKEOFF

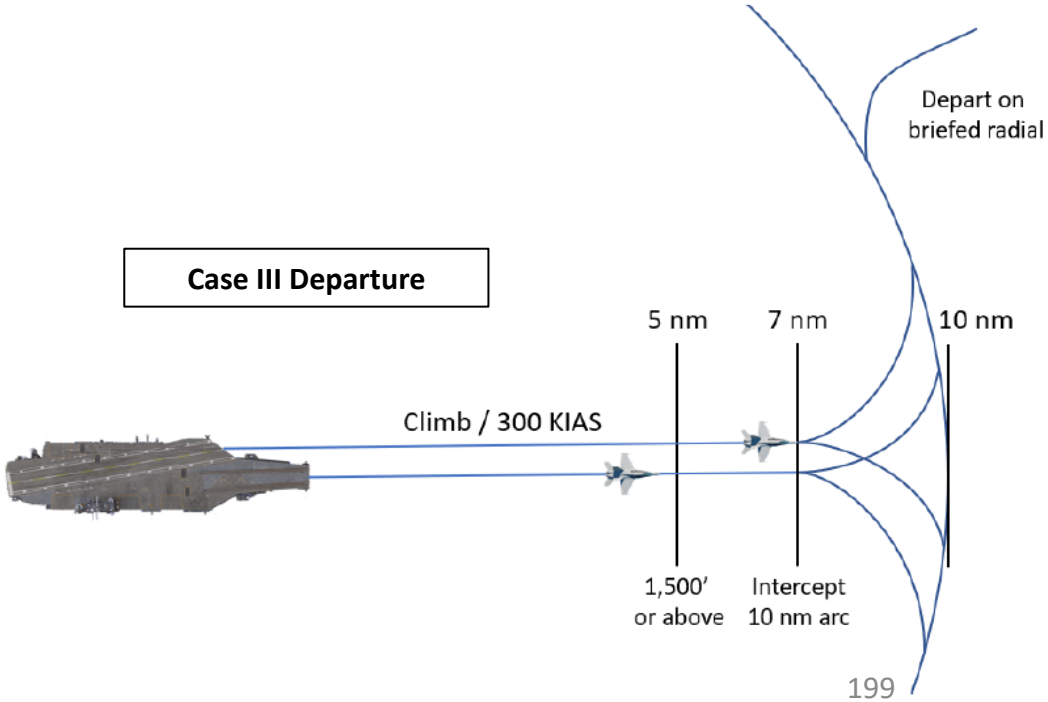
Case I Departure



Case II Departure

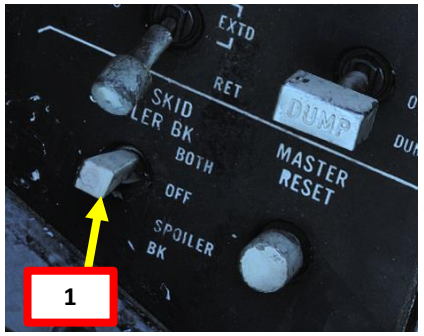


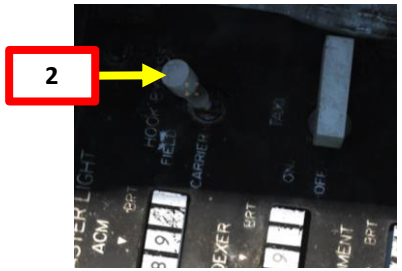
Case III Departure



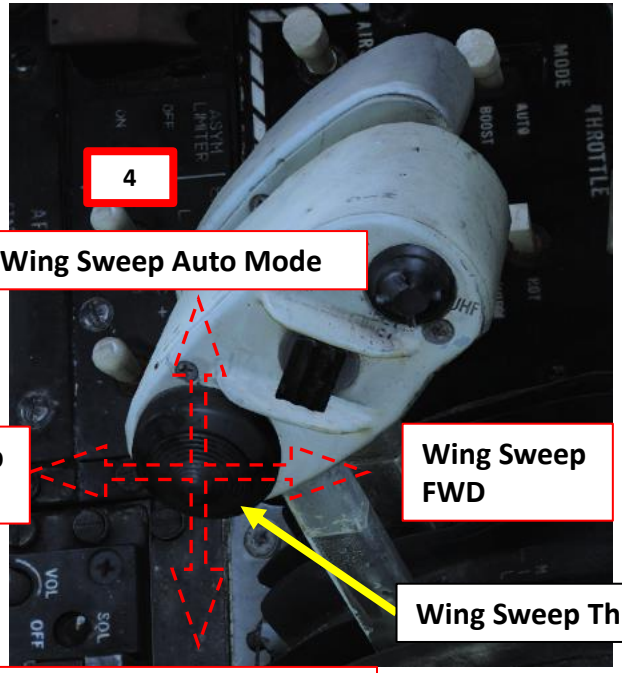
SHORE LANDING
VFR

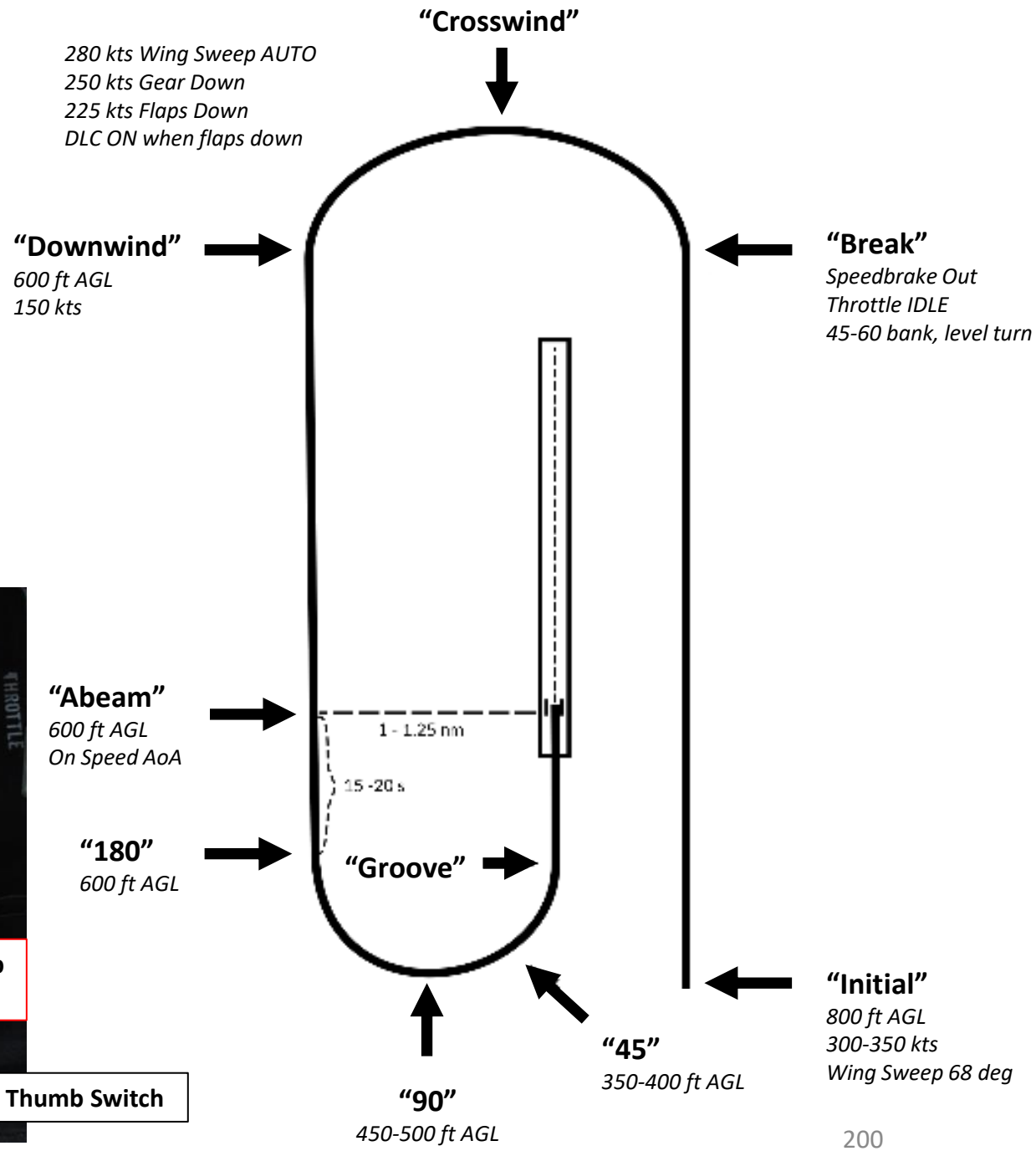
1. Set ANTI-SKID SPOILER BK switch BOTH (UP) & Landing Lights ON
2. Set HOOK BYPASS switch to FIELD (FWD)
3. Enter **Initial Point** at approx. 300-350 kts at about 800 ft altitude
4. Set Wing Sweep Mode to MANUAL and use the Wing Sweep Thumb Switch to adjust Wing Sweep to 68 deg
5. Trim the aircraft to compensate for the loss of lift





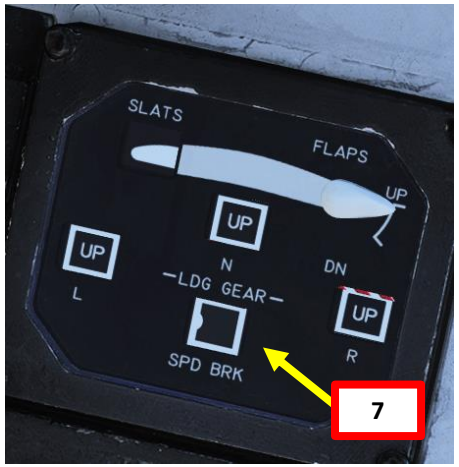


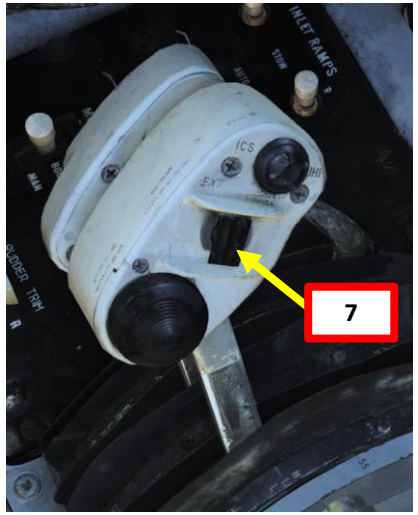




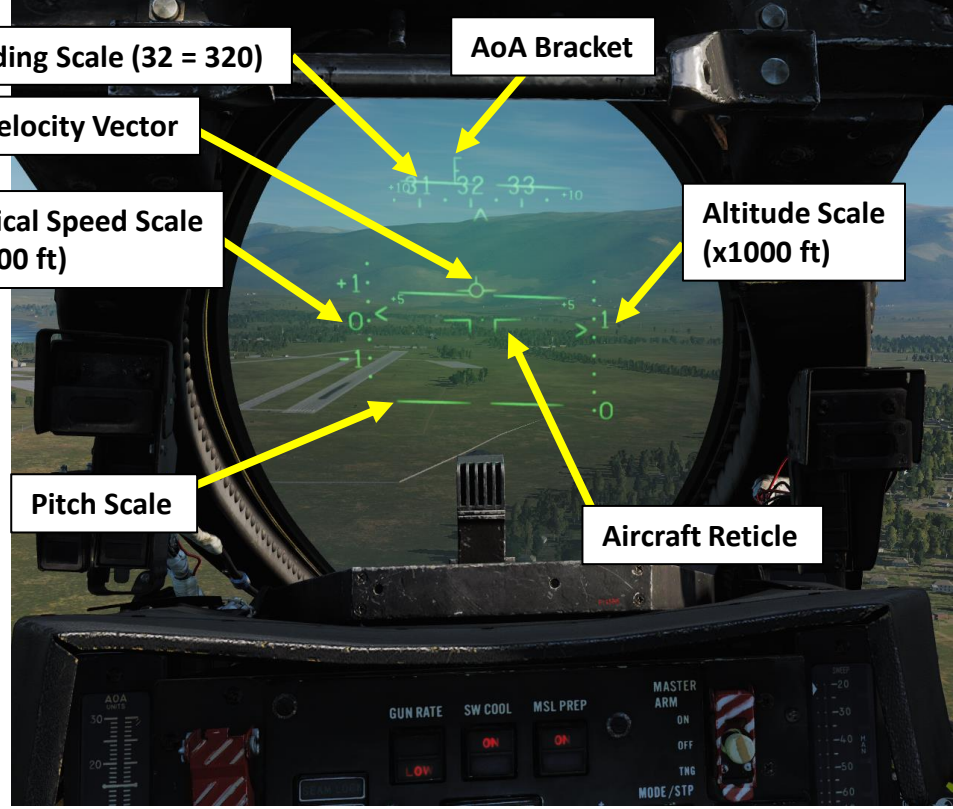
SHORE LANDING
VFR

6. Select HUD LDG (Landing) Mode
7. At the **break interval**, extend Speed Brake, set throttle to IDLE and perform a 45-60 deg bank level turn.







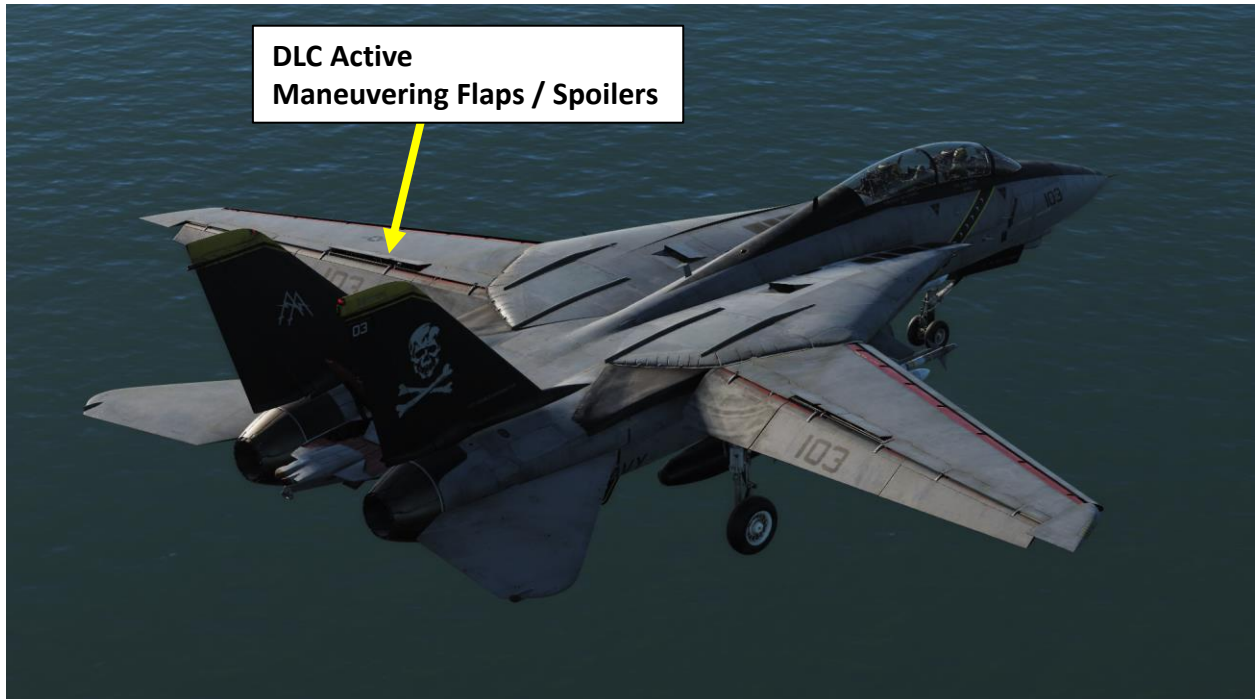


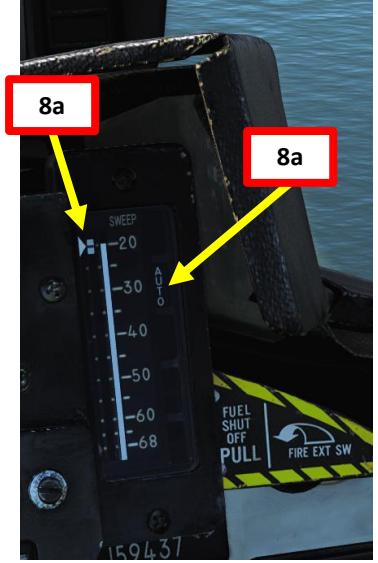


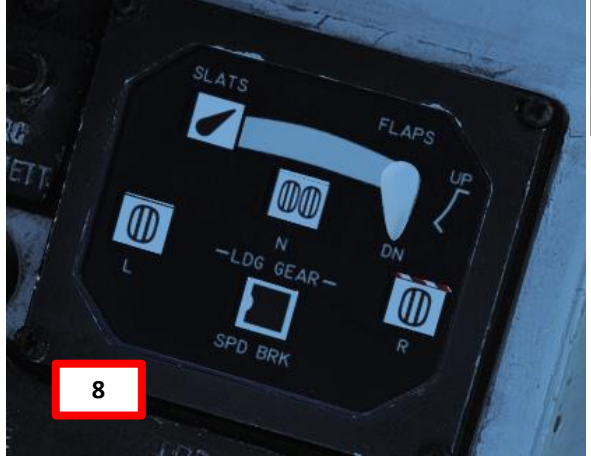


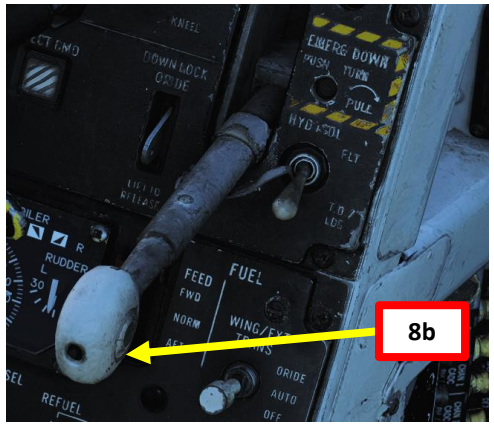
SHORE LANDING
VFR

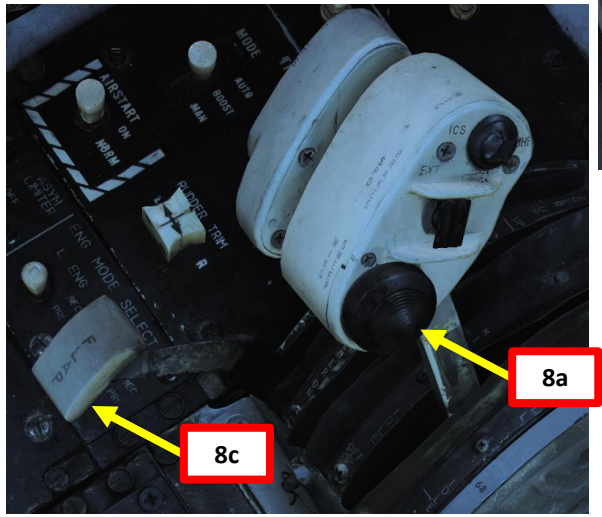
8. When turning from the Crosswind leg to the Downwind leg:
   a) At 280 kts, set Wing Sweep Mode to AUTO and confirm that Wing Sweep is set to Wing Sweep to 20 deg
   b) At 250 kts, set Landing Gear Lever – DOWN
   c) At 225 kts, set Flaps Lever – DOWN
9. When flaps are down, press the DLC Toggle button. Confirm DLC (Direct Lift Control) is on by checking if the Maneuvering Flaps/Spoilers are deployed
10. Speedbrake extension causes a mild pitch down, gear extension a moderate pitch down, flaps a moderate pitch down and finally DLC extension causes a mild pitch down. All require nose up trim.
11. When entering Downwind leg, slow down to 150 kts and fly at 600 ft



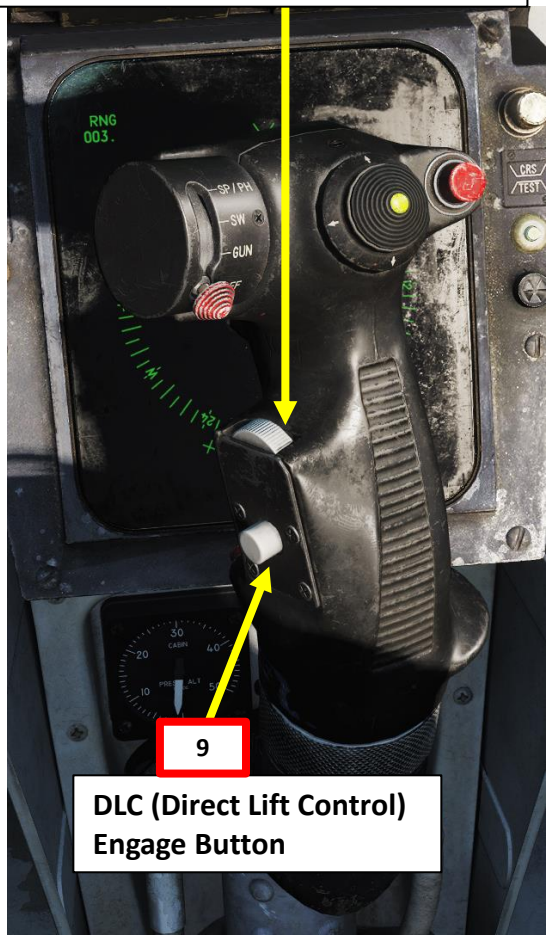








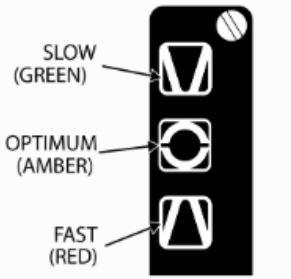
DLC (Direct Lift Control) Thumbwheel
Controls maneuvering flaps extension/retraction



SHORE LANDING VFR

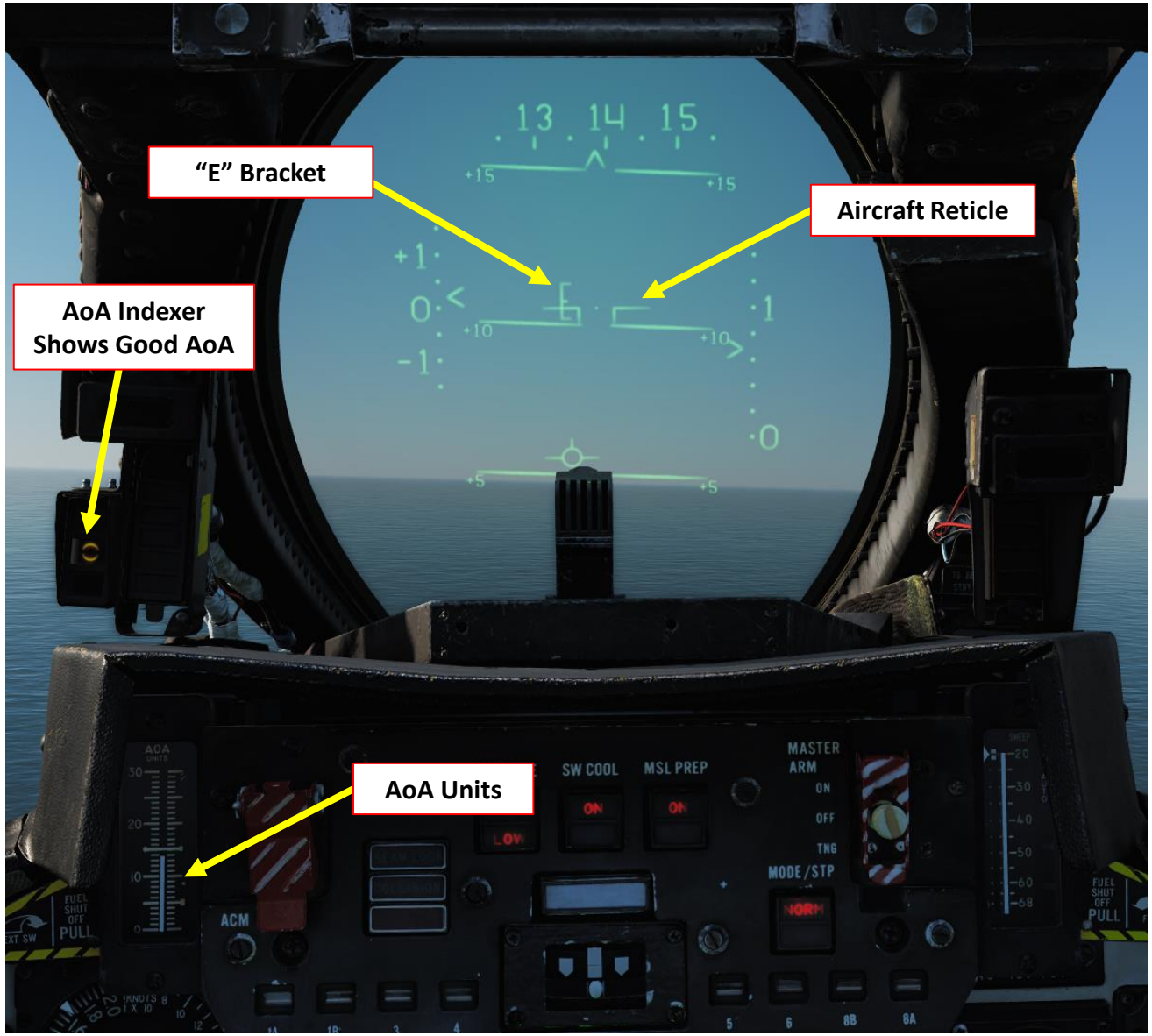
12. As you enter downwind leg, slow down to ON SPEED AOA by setting the aircraft reticle in the middle of the "E" AoA (Angle of Attack) bracket on the HUD using elevator trim and throttle input (in theory). ***In practice***, forget using the pitch on the HUD or the E Bracket. Both are not very accurate in the Tomcat and update too slowly to be of use. **Use the AoA Indexer instead**.
13. You should reach an airspeed of about 140-150 kts for an AoA (Angle of Attack) to 15 Units approx. Make sure to maintain your 600 ft altitude. The AoA Indexer will also give you a good reference if you have the correct Angle of Attack or not.
14. When you are 1 to 1.25 nm abeam the runway, you should be ON SPEED (yellow AoA).
15. Turn left towards to 90-deg heading point (altitude should drop down to 450-500 ft AGL), then to the 45-deg heading point (350-400 ft AGL)

Approach Indexer



APPROACH LIGHT	INDEXER	ANGLE -OF-ATTACK UNITS	AIRSPEED
GREEN		16 TO 30	SLOW
AMBER		15.5 TO 16	SLIGHTLY SLOW
AMBER		14.5 TO 15.5	OPTIMUM ON SPEED
AMBER		14.0 TO 14.5	SLIGHTLY FAST
RED		0 TO 14	FAST

Reference: Heatblur F-14 Wiki



SHORE LANDING
VFR

16. Using coordinated rudder and lateral stick ONLY (do **not** use longitudinal stick input), smoothly roll into a 25 degree angle of bank. You are looking for a slight rate of descent, about 150 fpm in order to arrive at the 90 heading at 450 ft AGL. This requires a very slight addition of power. Simply trying to stay level can result in the correct descent rate. Pitch attitude should be about a degree or less than level.
17. When lined up with the runway, control your glide slope and angle of attack with slight throttle adjustments. That's called flying "pitch for speed, power for altitude".
18. You can check your speed to see if you are too slow, but keep in mind that if you have a good AoA, you'll be on speed.
19. Once AoA Indexer shows that you are ON SPEED (orange donut), just let yourself touchdown on the runway. It will feel like a controlled crash into the ground; that's normal.





SHORE LANDING
VFR



CARRIER LANDING
CASE I RECOVERY

A “case 1 recovery” is simply a fancy term to qualify what kind of landing you perform.

CASE I: occurs when flights are anticipated to not encounter instrument conditions during daytime departure/recovery, and the ceiling and visibility around the carrier are no lower than 3000 ft and 5 nm.

CASE II: occurs when flights may encounter instrument conditions during day time departure/recovery, and the ceiling and visibility in the carrier control zone are no lower than 1000 ft and 5 nm.

CASE III: occurs when flights are expected to encounter instrument conditions during a departure/recovery because the ceiling or visibility around the carrier is lower than 1000 ft and 5 nm, or for night departures/recoveries.

The procedure to land on a carrier is in fact quite similar to the procedure shown in the SHORE LANDING tutorial. The only things that change is that the runway is moving, may pitch up and down and is much smaller. Here is a video I recommend you watch before attempting a carrier landing:

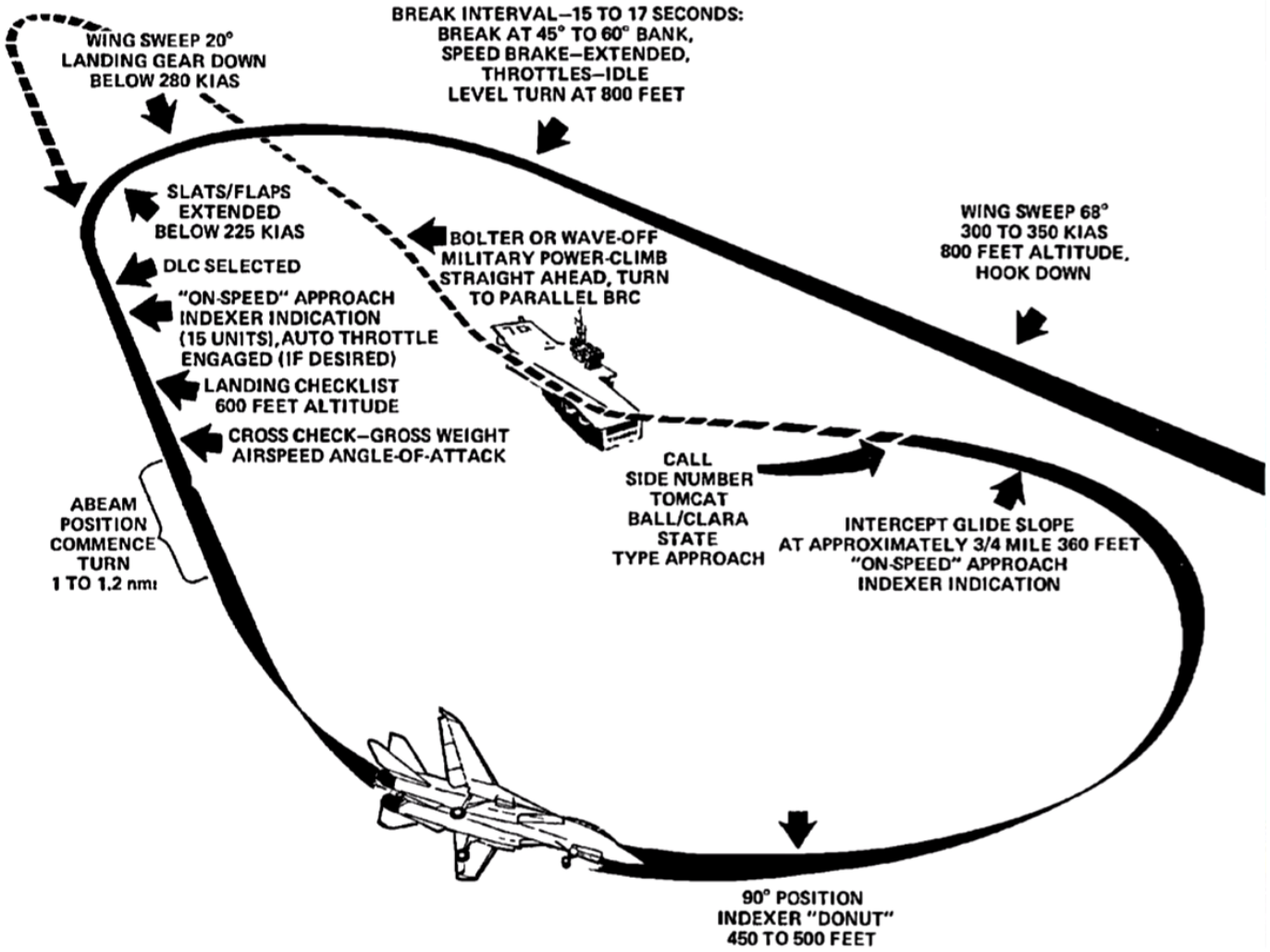
- **Carrier Landing Tutorial by 104th_Maverick:** https://youtu.be/NMDuXrtHWno

Note: The maximum weight allowable for a carrier landing is 54,000 lbs. If you are too heavy, you can either fly around to burn fuel, jettison fuel or jettison your ordnance.



CARRIER LANDING
CASE I RECOVERY

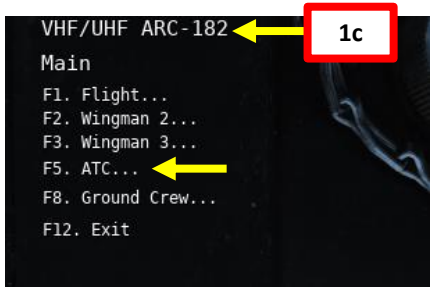
TOMCAT CASE I



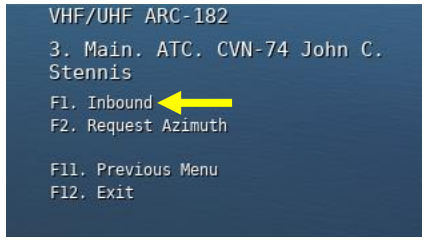
Reference: 104th_Maverick Case I Carrier Landing Tutorial
https://youtu.be/NMDuXrtHWno

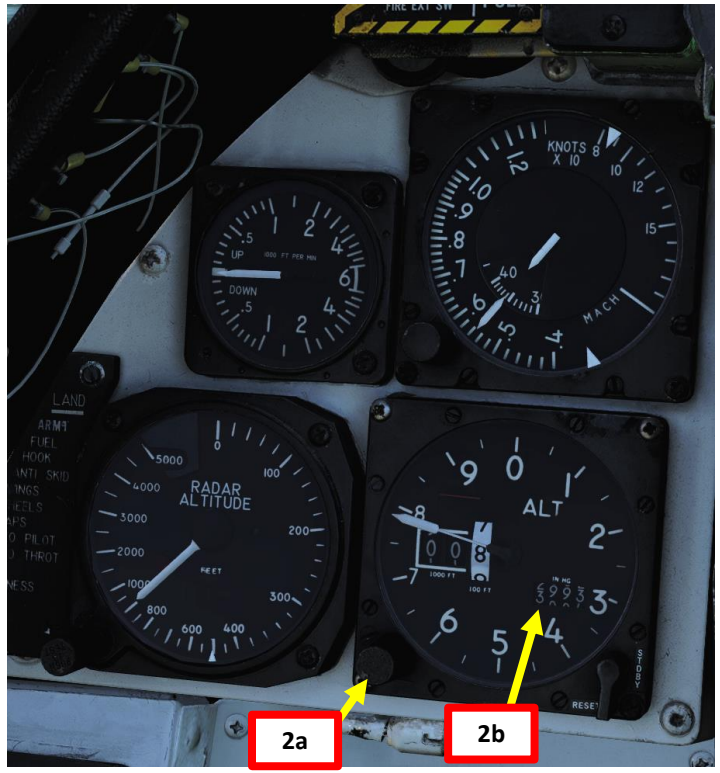
CARRIER LANDING
CASE I RECOVERY

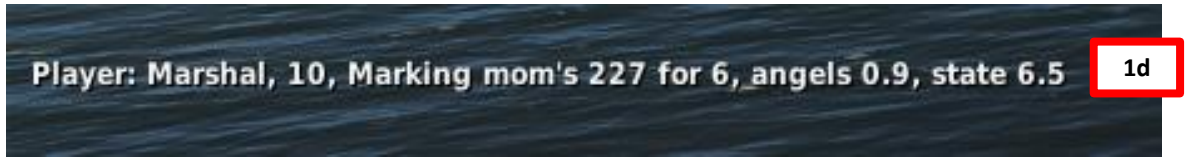
1. Contact Carrier on the carrier's frequency to turn on the lights.
    a. Set either ARC-182 V/UHF 2 or ARC-159 UHF 1 radio frequency to the carrier's radio frequency. This can be done with:
        i. JESTER
        ii. From the pilot's seat with UHF 1 (if carrier frequency is within UHF1 range). Frequencies range from 225.000 MHz to 399.975 MHz.
        iii. From the RIO's seat with V/UHF 2. Frequencies range from:
            - VHF 30-88 MHz FM close air support
            - VHF 108-118 MHz AM navigation, receive only
            - VHF 118-156 MHz AM air traffic control
            - VHF 156-174 MHz FM maritime
            - UHF 225-400 MHz AM/FM military/NATO
    b. Press the MIC BUTTON UHF 2 (RCTRL+\) switch or the MIC BUTTON UHF 1 (RALT+\) switch on your throttle to contact the carrier. If the RIO is in charge of the radio, use the pedal in the appropriate ICS mode to communicate.
    c. Go in F5 – AT5 menu, then to the CVN-74 menu, then to the F1 – Inbound menu.
    d. The carrier will give you a QFE (Barometric Pressure Setting), a pattern altitude and other relevant information.
    e. And that's it, the carrier is now illuminated.
2. Set Barometric Pressure (QFE) stated by the carrier controller (29.93 in Hg)

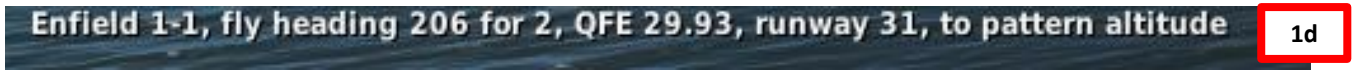












CARRIER LANDING
CASE I RECOVERY

Note: Radio communications will be further explained in the RADIO section.

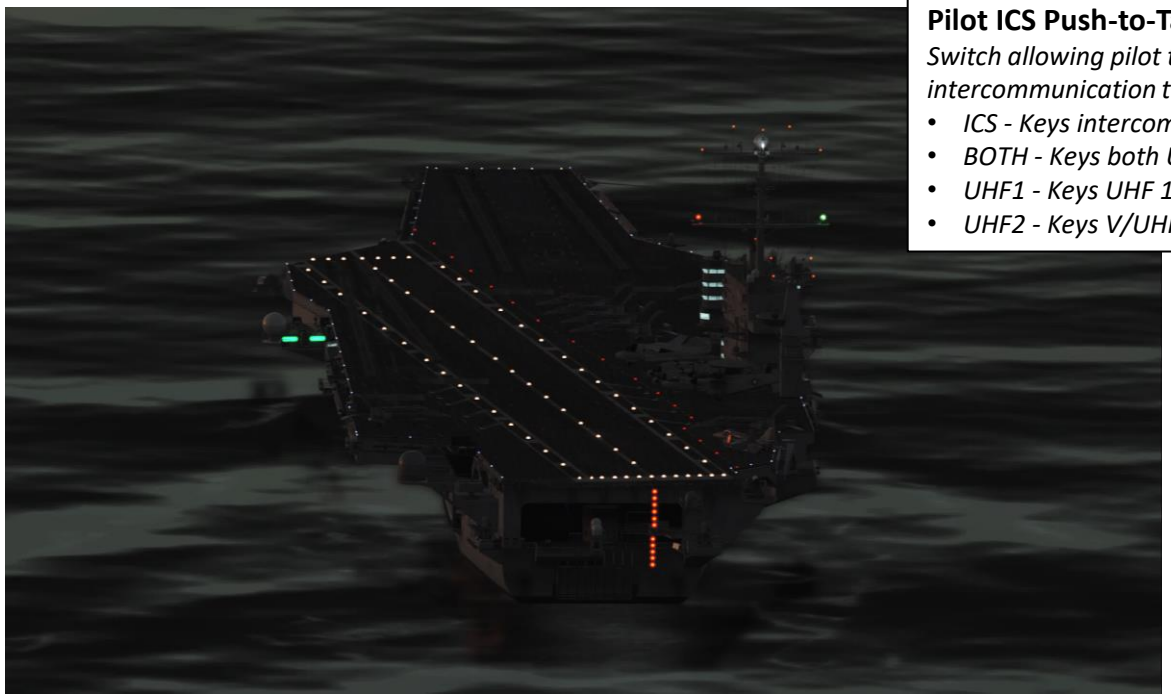








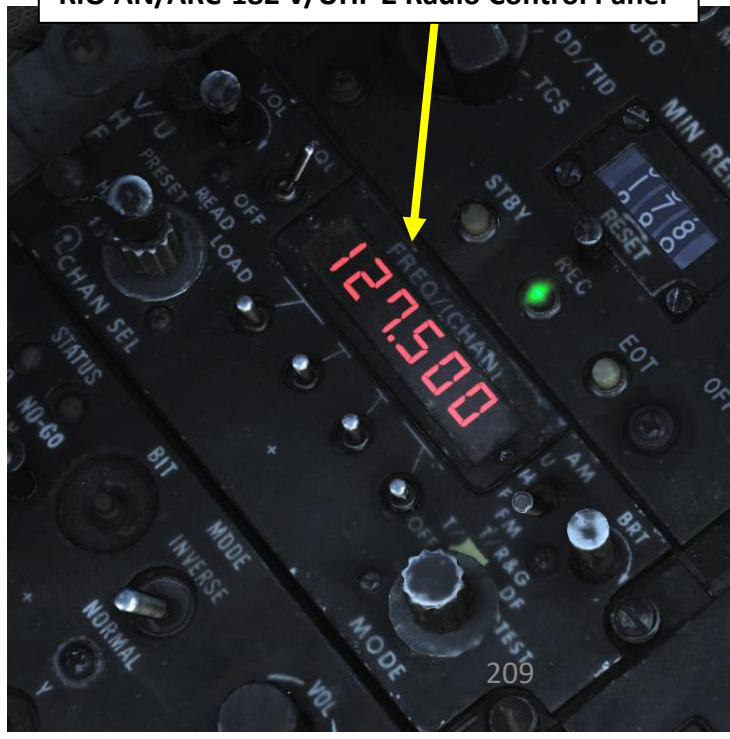
RIO Microphone Foot Button
Right footrest containing PTT (Push-to-Talk) for transmission on UHF 1, V/UHF 2 or both depending on ICS (Intercom System) setting.



Pilot ICS Push-to-Talk Switch
Switch allowing pilot to key one or both radios and intercommunication to RIO.
- *ICS - Keys intercommunication to RIO.*
- *BOTH - Keys both UHF 1 and V/UHF 2 for transmission.*
- *UHF1 - Keys UHF 1 for transmission.*
- *UHF2 - Keys V/UHF 2 for transmission.*



RIO AN/ARC-182 V/UHF 2 Radio Control Panel

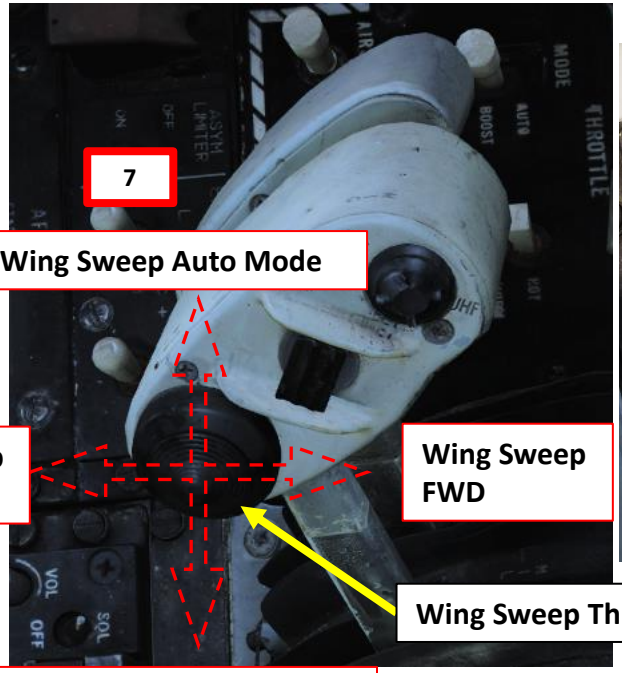


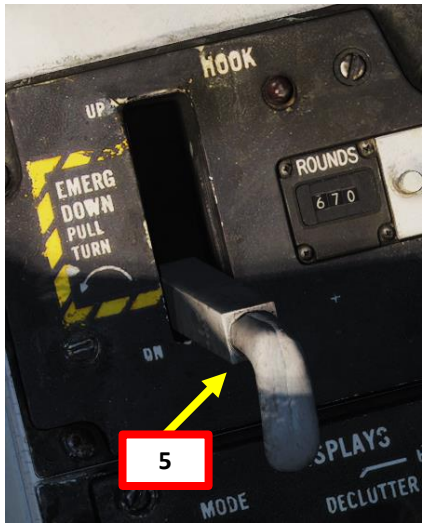
CARRIER LANDING
CASE I RECOVERY

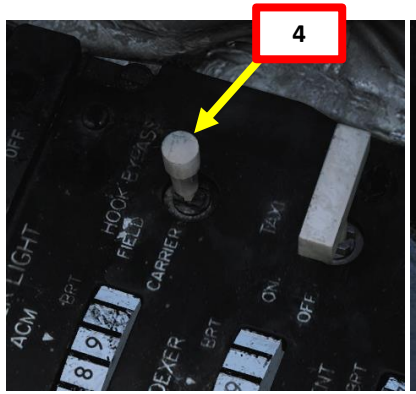
3. Set ANTI-SKID SPOILER BK switch OFF (MIDDLE) & Landing Lights ON
4. Set HOOK BYPASS switch to CARRIER (AFT)
5. Set Hook Lever DOWN
6. Enter pattern (Initial Point) at approx. 300-350 kts at about 800 ft altitude
7. Set Wing Sweep Mode to MANUAL and use the Wing Sweep Thumb Switch to adjust Wing Sweep to 68 deg
8. Trim the aircraft to compensate for the loss of lift







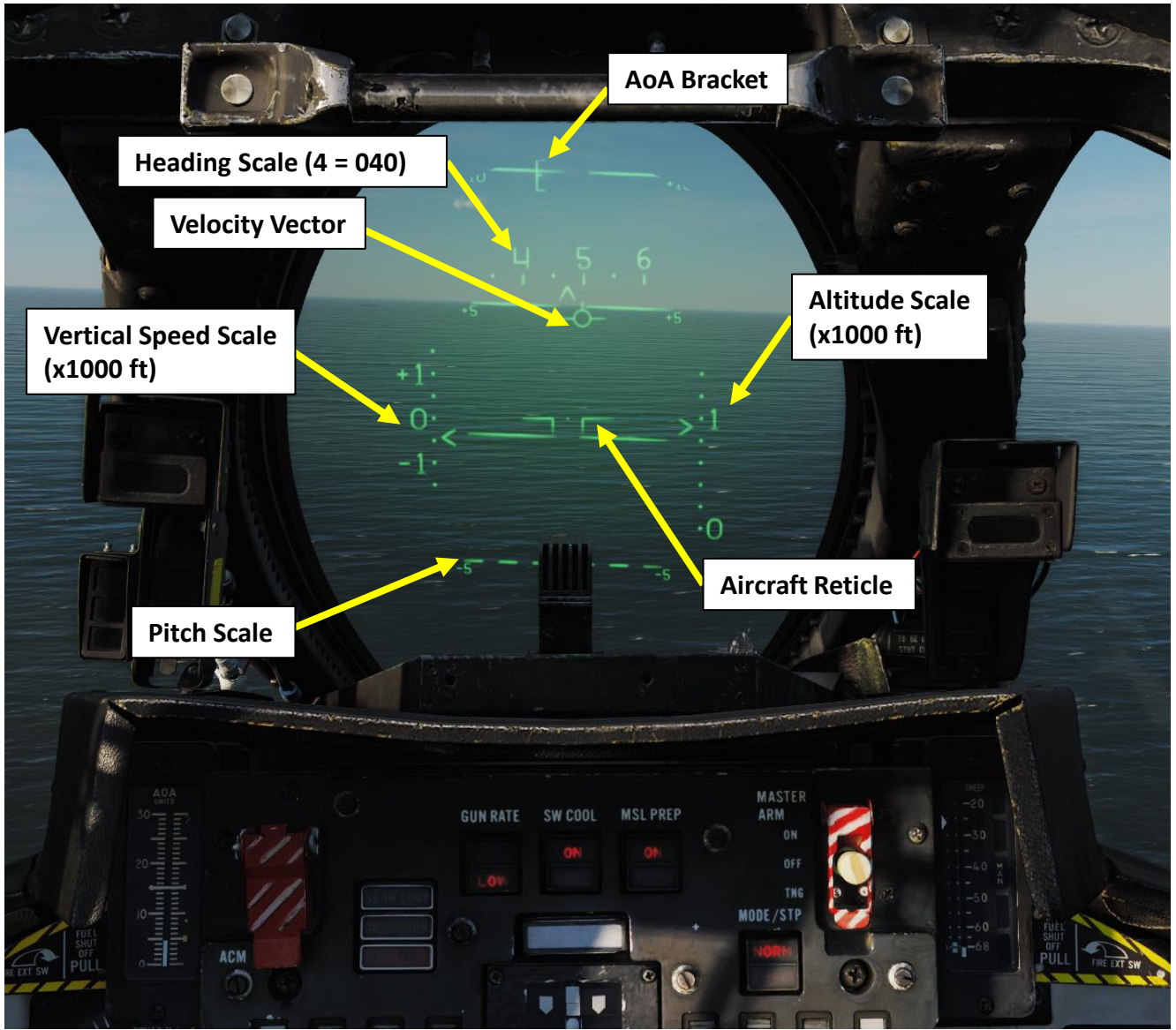






CARRIER LANDING
CASE I RECOVERY

9. Select HUD LDG (Landing) Mode



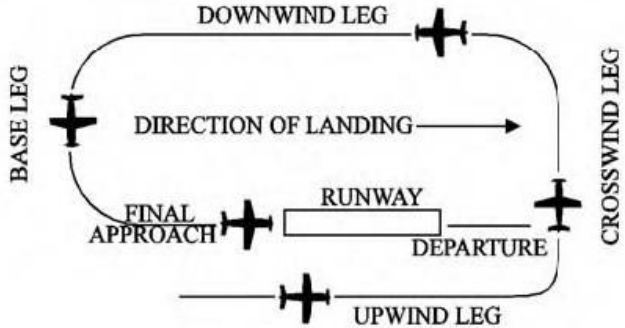


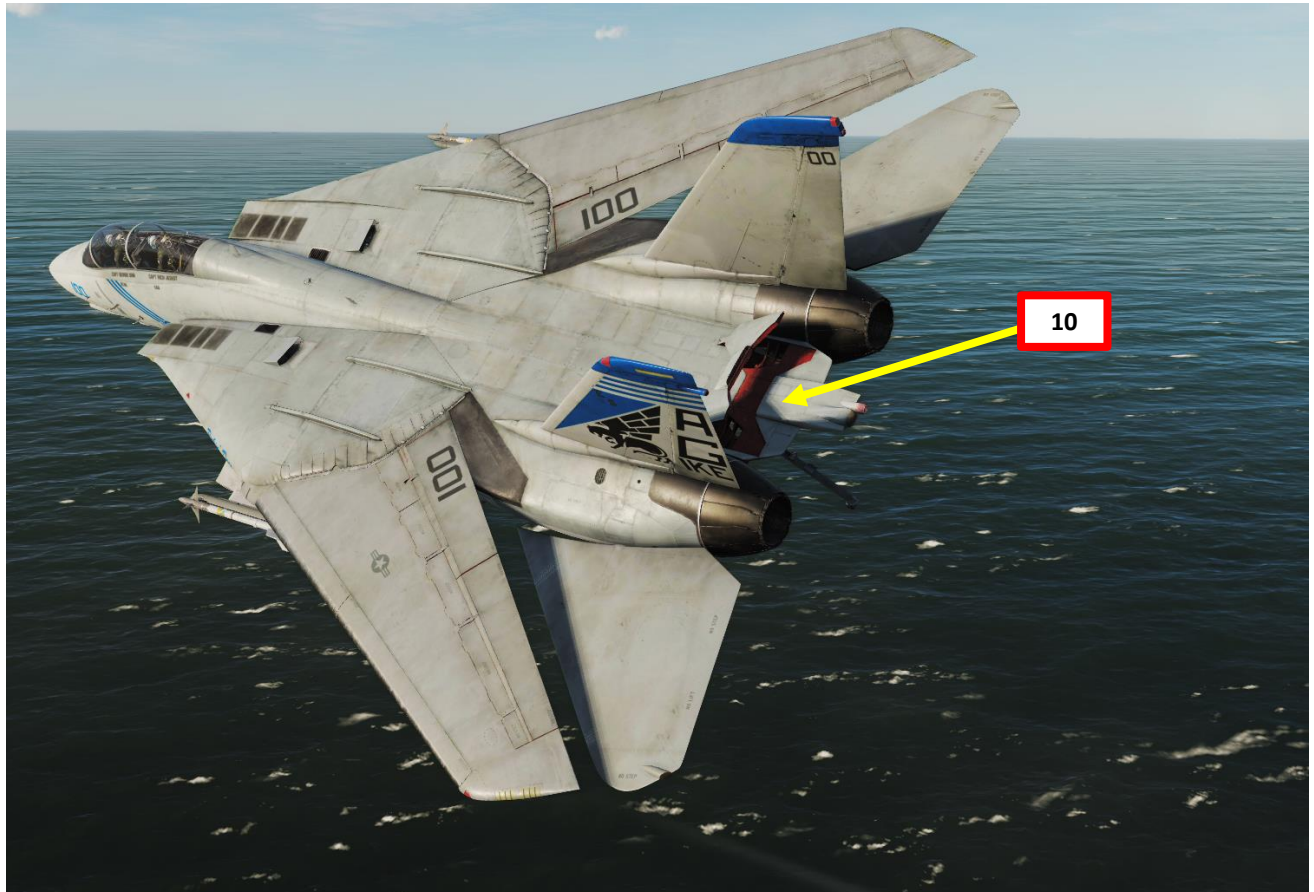
CARRIER LANDING
CASE I RECOVERY



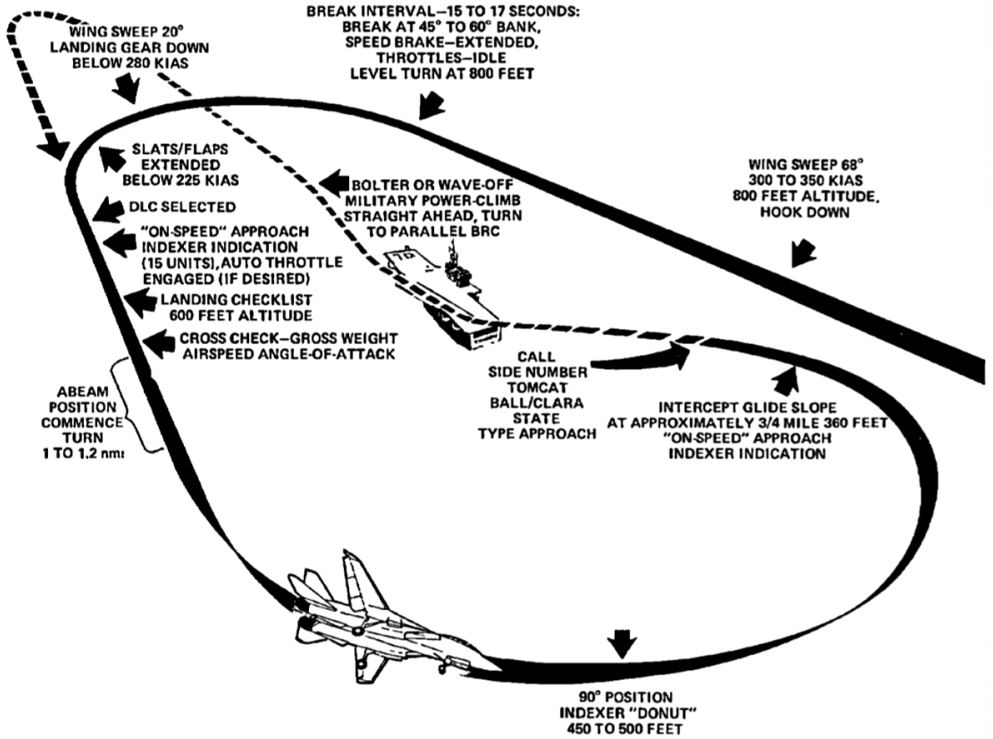
CARRIER LANDING
CASE I RECOVERY

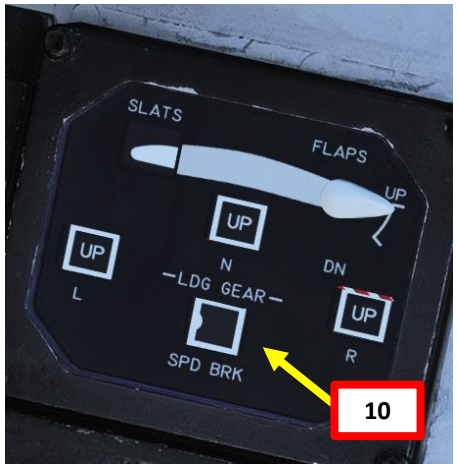
10. At the **break interval**, extend Speed Brake, set throttle to IDLE and perform a 45-60 deg bank level turn.

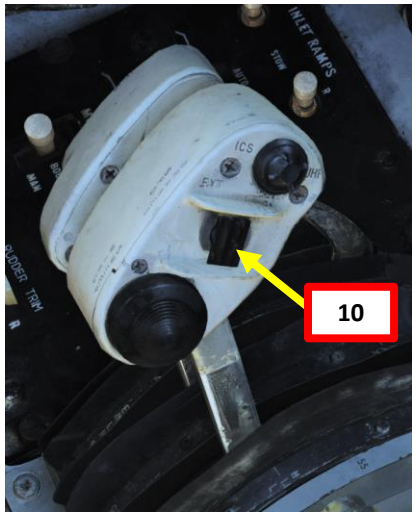




TOMCAT CASE I

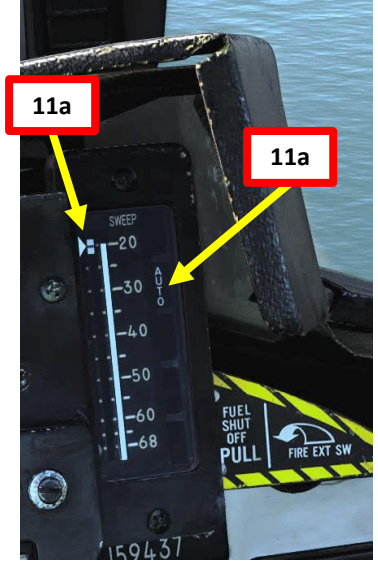


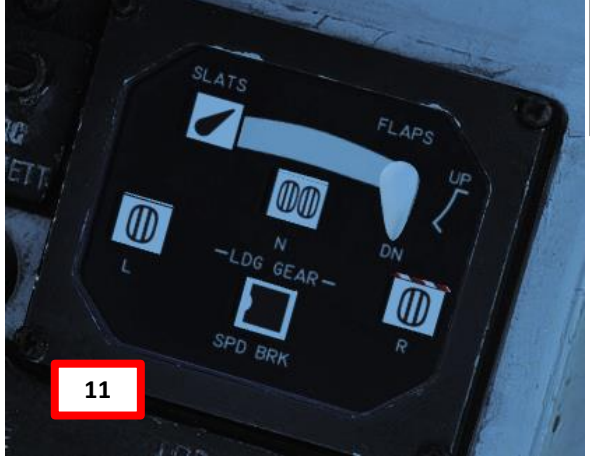




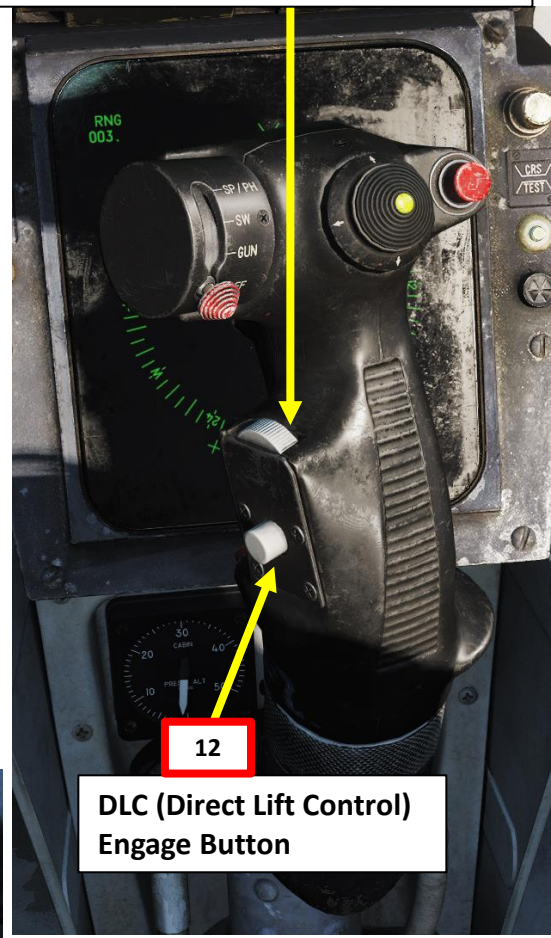
CARRIER LANDING
CASE I RECOVERY

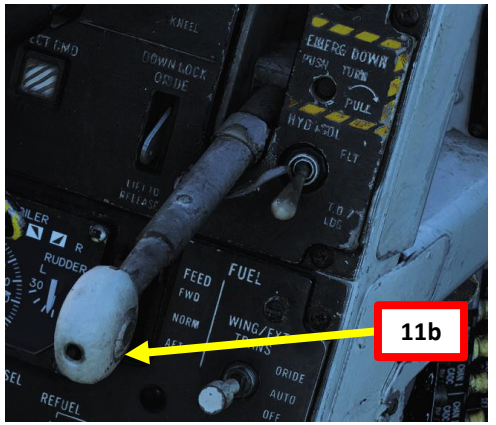
11. When turning from the Crosswind leg to the Downwind leg:
    a) At 280 kts, set Wing Sweep Mode to AUTO and confirm that Wing Sweep is set to Wing Sweep to 20 deg
    b) At 250 kts, set Landing Gear Lever – DOWN
    c) At 225 kts, set Flaps Lever – DOWN
12. When flaps are down, press the DLC Toggle button. Confirm DLC (Direct Lift Control) is on by checking if the Maneuvering Flaps/Spoilers are deployed
13. Speedbrake extension causes a mild pitch down, gear extension a moderate pitch down, flaps a moderate pitch down and finally DLC extension causes a mild pitch down. All require nose up trim.
14. When entering Downwind leg, slow down to 150 kts and fly at 600 ft

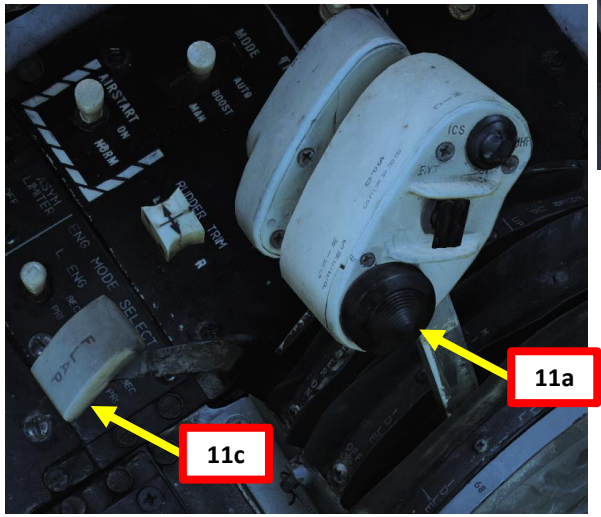




DLC (Direct Lift Control) Thumbwheel
Controls maneuvering flaps extension/retraction





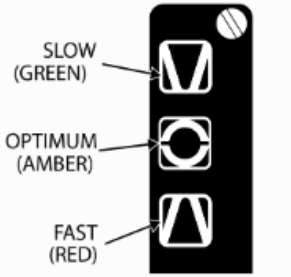




CARRIER LANDING
CASE I RECOVERY

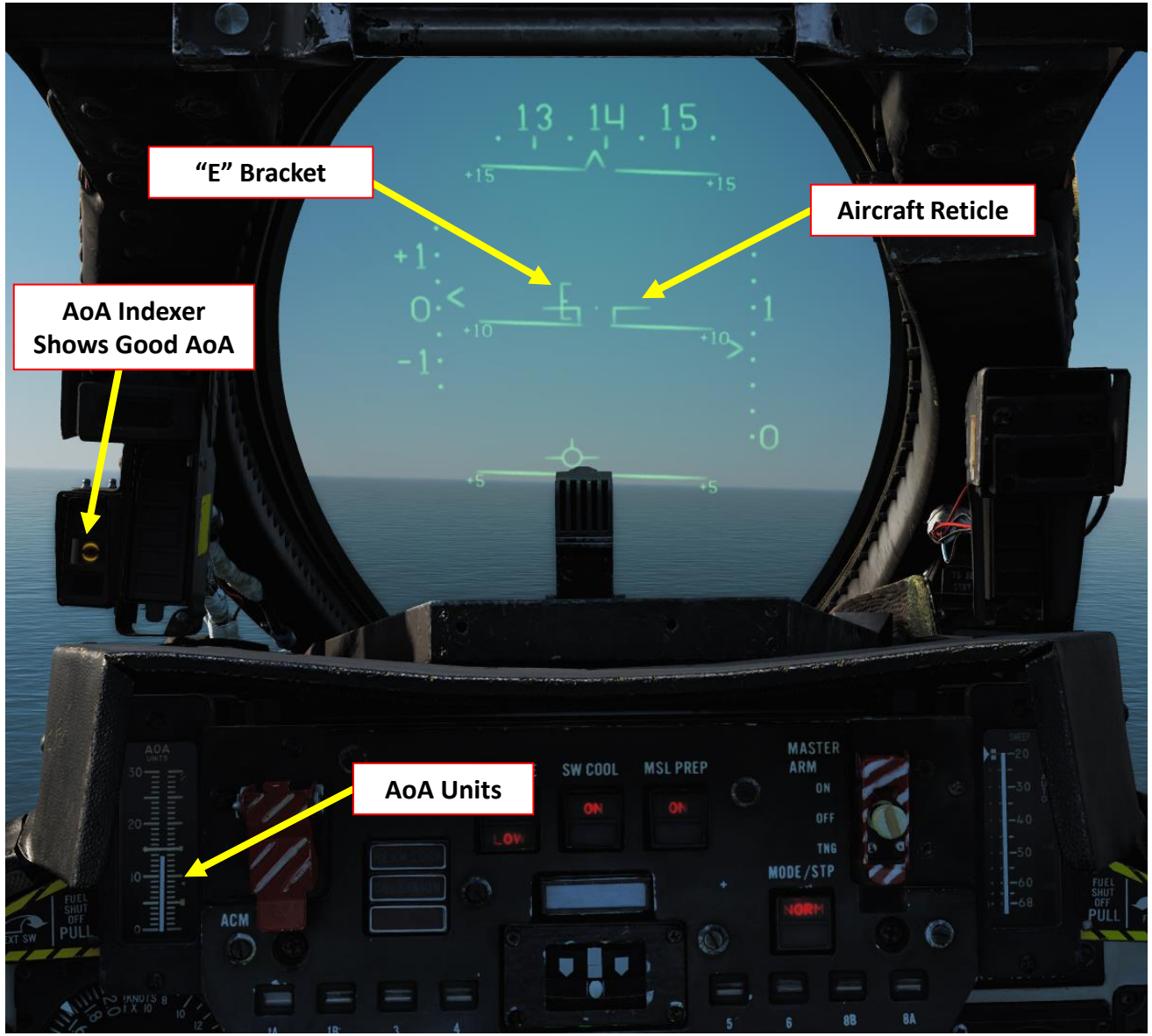
15. As you enter downwind leg, slow down to ON SPEED AOA by setting the aircraft reticle in the middle of the "E" AoA (Angle of Attack) bracket on the HUD using elevator trim and throttle input (in theory). ***In practice***, forget using the pitch on the HUD or the E Bracket. Both are not very accurate in the Tomcat and update too slowly to be of use. **Use the AoA Indexer instead**.
16. You should reach an airspeed of about 140-150 kts for an AoA (Angle of Attack) to 15 Units approx. Make sure to maintain your 600 ft altitude. The AoA Indexer will also give you a good reference if you have the correct Angle of Attack or not.
17. When you are 1 to 1.25 nm abeam the boat, you should be ON SPEED (yellow AoA).
18. Turn left towards to 90-deg heading point (altitude should drop down to 450-500 ft AGL), then to the 45-deg heading point (350-400 ft AGL)

Approach Indexer



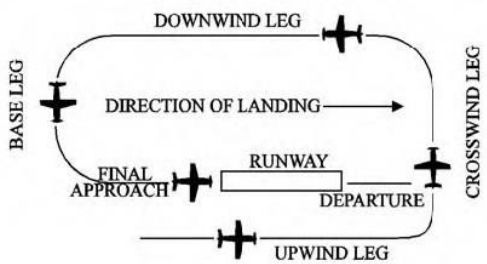
APPROACH LIGHT	INDEXER	ANGLE -OF-ATTACK UNITS	AIRSPEED
GREEN		16 TO 30	SLOW
AMBER		15.5 TO 16	SLIGHTLY SLOW
AMBER		14.5 TO 15.5	OPTIMUM ON SPEED
AMBER		14.0 TO 14.5	SLIGHTLY FAST
RED		0 TO 14	FAST

Reference: Heatblur F-14 Wiki

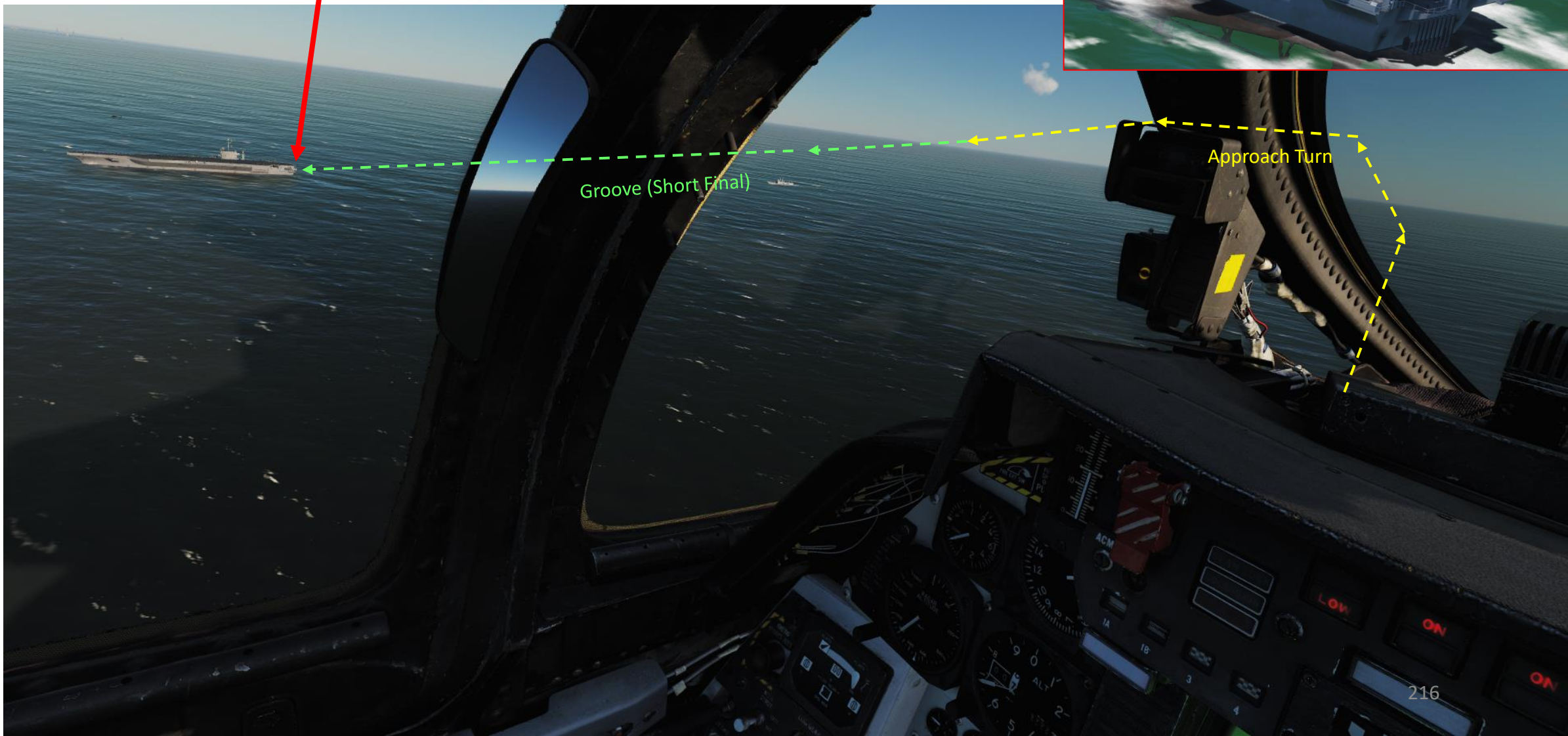


CARRIER LANDING
CASE I RECOVERY

Once flying abeam the ship on the downwind leg, start your approach turn when your wing meets the ship's Round Down.







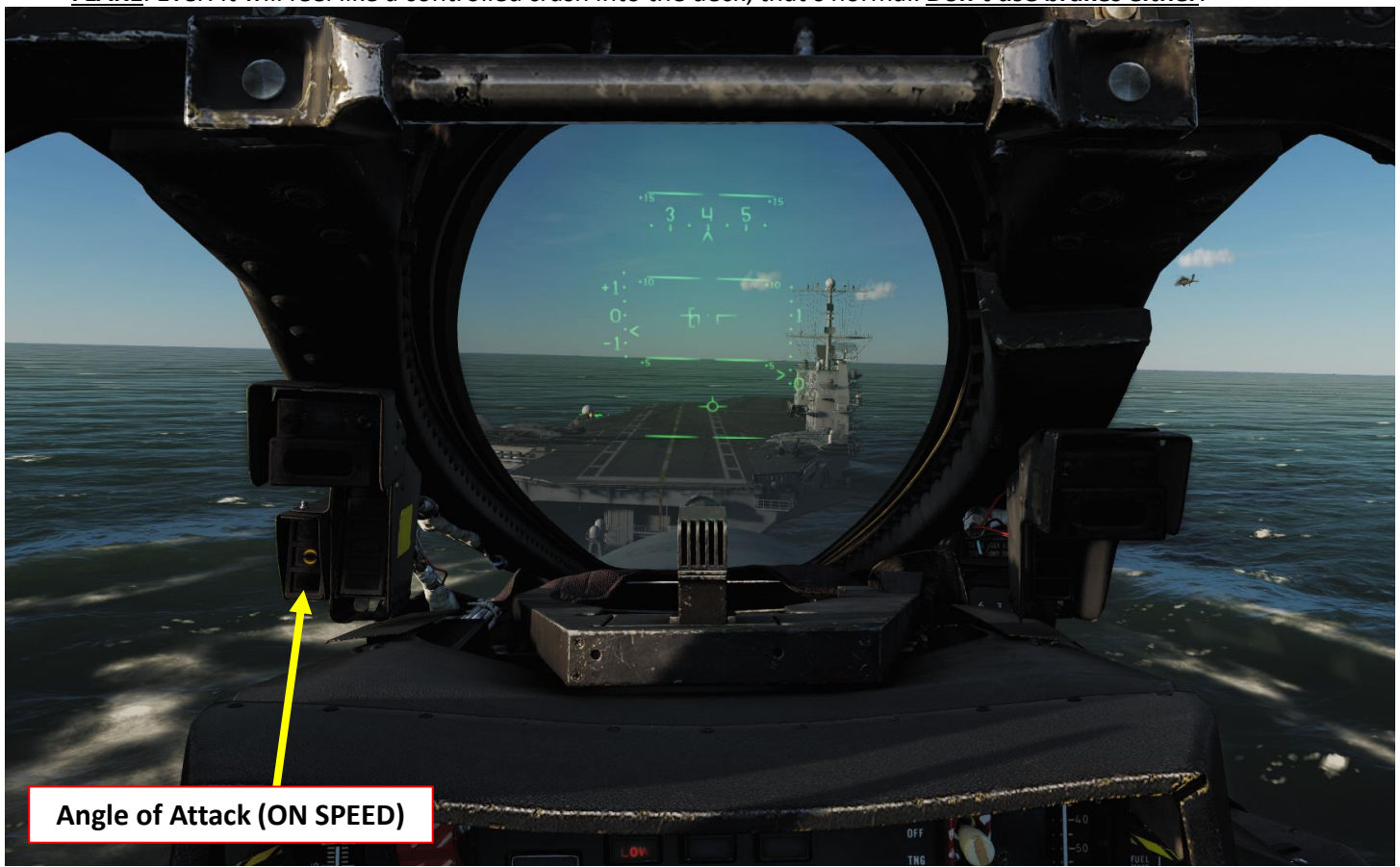
CARRIER LANDING
CASE I RECOVERY



CARRIER LANDING
CASE I RECOVERY

Note: Don't use the radar altimeter for your altitude source when doing a carrier landing. The radar altimeter measures off of the seafloor, which was apparently an issue in real life.

19. Using coordinated rudder and lateral stick ONLY (do **not** use longitudinal stick input), smoothly roll into a 25 degree angle of bank. You are looking for a slight rate of descent, about 150 fpm in order to arrive at the 90 heading at 450 ft AGL. This requires a very slight addition of power. Simply trying to stay level can result in the correct descent rate. Pitch attitude should be about a degree or less than level.
20. When lined up with the boat, control your glide slope and angle of attack with slight throttle adjustments. That's called flying "pitch for speed, power for altitude".
21. You can check your speed to see if you are too slow, but keep in mind that if you have a good AoA, you'll be on speed.
22. When lined up with the ship, you will be entering the "groove" (short final).
23. Once wings are level, you would normally "call the ball". Example: "403, Tomcat Ball, 3.0". (Side number of your Tomcat, Aircraft Type, "Ball", Fuel State/Remaining in thousands of pounds). The LSO (Landing Signal Officer) would then respond with "Roger Ball" and then give you corrections to land properly. Think of the fuel state as basically the time on station available you have.
24. Once AoA Indexer shows that you are ON SPEED (orange donut) and that your velocity vector is sort of lined up with the boat's crotch, just let yourself touchdown on the carrier. **DO NOT FLARE**. Ever. It will feel like a controlled crash into the deck; that's normal. **Don't use brakes either**.





CARRIER LANDING
CASE I RECOVERY



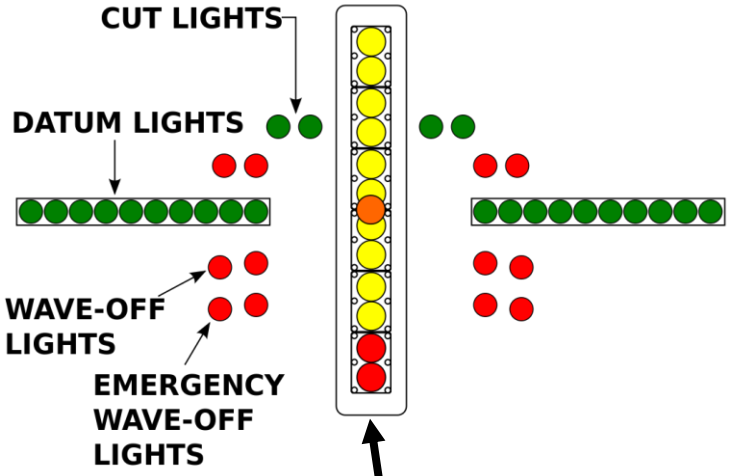
CARRIER LANDING
CASE I RECOVERY



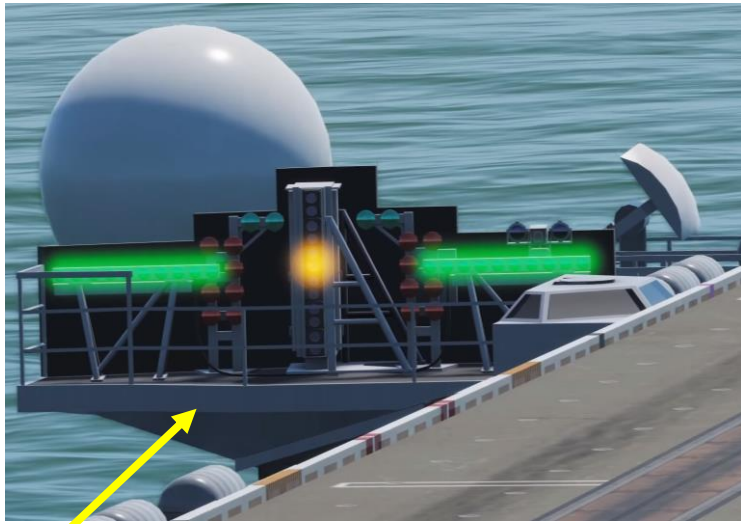
CARRIER LANDING
CASE I RECOVERY

But what is "**the ball**" (or "meatball"), exactly? In fact, it's the IFLOLS (Improved Fresnel Lens Optical Landing System), which acts a bit like PAPI lights but for aircraft carriers. The color of the lights you see will depend on what your angle with the lights and will tell you your glide slope, or in other words "if you need to add or reduce power". The lights that will matter the most are the vertical center lights.

- If you see the bottom red lights ("Atomic Sunrise"), you're about to hit the back of the ship. Throttle up and go around!
- If you see a centered orange light, you're on the ball and should catch a wire.
- If the ball is high, this means you should reduce power very slightly.
- If the ball is low, you need to add power
- Avoid making large power corrections and stay lined up as much as possible.
- Overall, keep your eyes glued to your AoA Indexer and the "ball". It will tell you what to do.



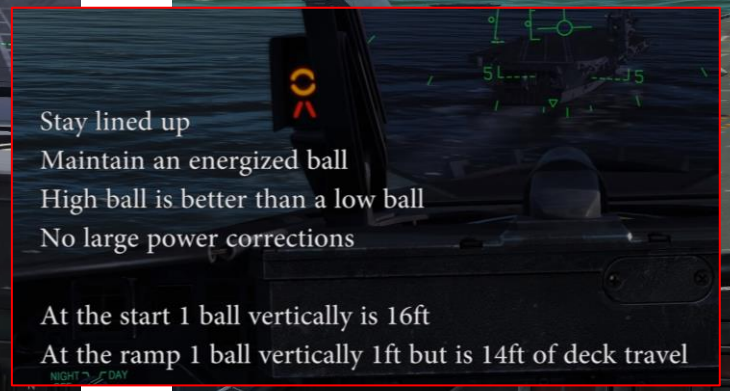
Vertical scale: This is what you should monitor throughout the whole landing.



IFLOLS (Improved Fresnel Lens Optical Landing System)
Also called as "the ball" or "meatball", the IFLOLS is used as visual aid to land on the carrier.



AoA Indexer: provides a similar function to the IFLOS.



That picture shows the AoA Indexer telling me that I am too fast and the meatball telling me I am too low. It will not tell me that I am too far left of lineup though.

CARRIER LANDING
CASE I RECOVERY

25. You should aim for the third arrestor wire. First and second wires indicate a short landing, while the fourth wire indicates a long landing.
26. When crossing the back of the deck, throttle up to MIL power (just before afterburner detent). This will make sure that you have enough power to go around if your hook misses an arrestor wire (this is what we call a “bolter”) or you catch a wire and it snaps. Throttling up to MIL will also automatically retract the speed brake and disengage DLC.

Note: Be very careful to NOT touch the brakes.



CARRIER LANDING
CASE I RECOVERY

27. Once the aircraft has come to a full stop:
    a) Throttle down
    b) Raise arrestor hook
    c) Set flaps UP
    d) Set Wing Sweep Mode to MANUAL and use the Wing Sweep Thumb Switch to adjust Wing Sweep to 68 deg. Alternatively, set it to BOMB mode (55 deg) with a quick Wing Sweep Thumb Switch click.
    e) Verify that Speed Brake is IN (Retracted)
28. Set Nosewheel Steering Switch ON (NWS ENGA caution should illuminate), then taxi to the nearest parking area.

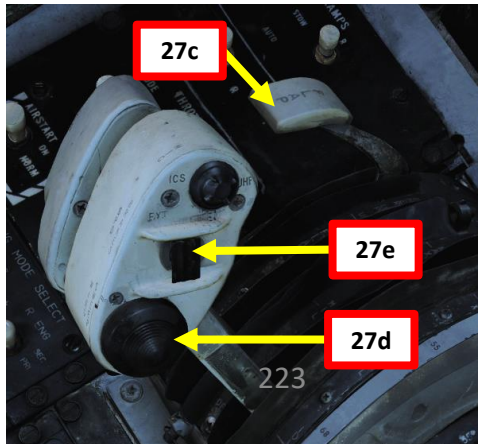












CARRIER LANDING
CASE I RECOVERY





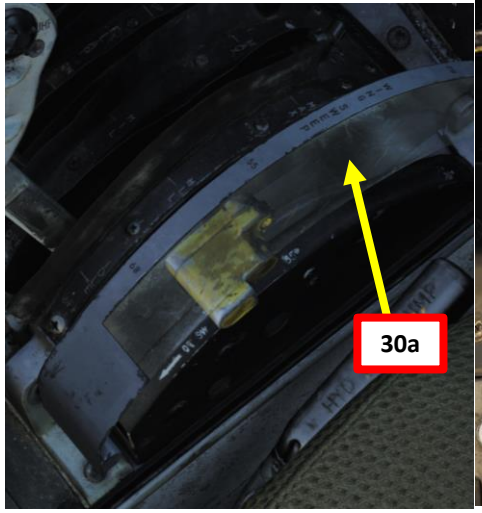




CARRIER LANDING
CASE I RECOVERY

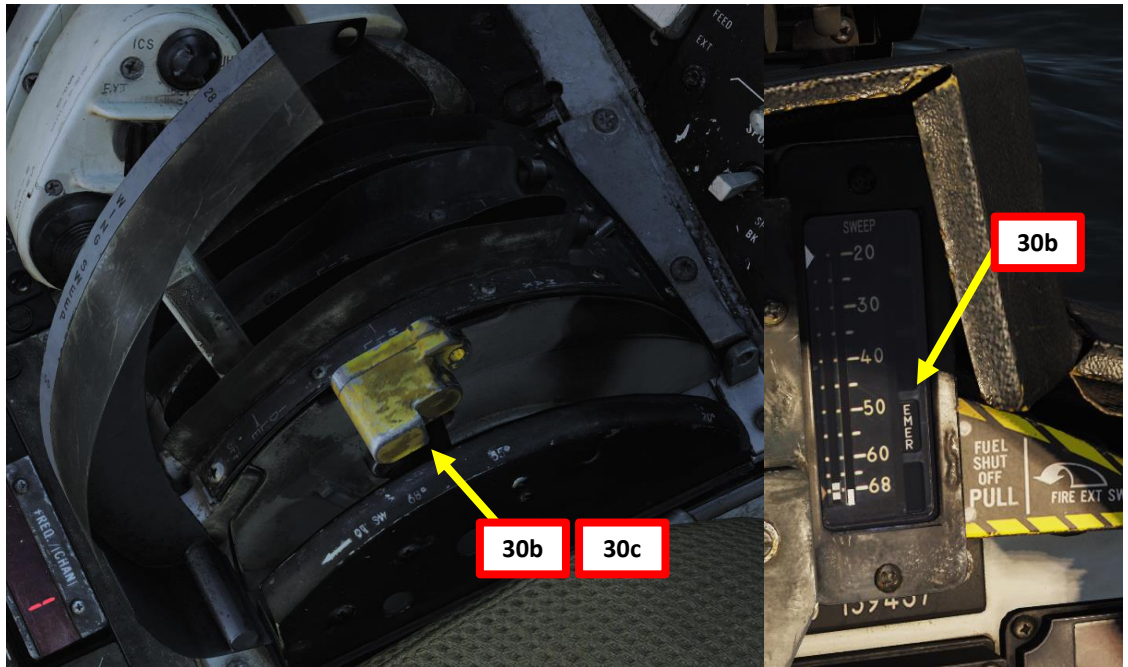
29. Once the aircraft is parked into parking spot, set parking brake ON (Pulled)
30. To take less space on the carrier deck, set wings in full Oversweep Mode (75 deg). *The wing will sweep over the stabilizers on the tail and the horizontal tail authority system is enabled to prevent the wings and stabilizers from damaging each other by restricting movement of the stabilizer.*
    a) Flip the Emergency Wing Sweep Cover Up
    b) Pull on the Emergency Wing Sweep Handle (UP). The EMER flag on the wing-sweep indicator will appear.
    c) Set Emergency Wing Sweep Handle to 68 deg. This will deflate the wing-seal airbags and activate the horizontal tail authority system (HZ TAIL AUTH caution appears). The handle will remain locked to 68 deg for as long as the wing-seal airbags are not completely deflated (takes approx. 15 sec).
    d) When OVER flag on the wing-sweep indicator appears and the HZ TAIL AUTH caution disappears, the oversweep interlocks are free. Set the Emergency Wing Sweep Handle to the 75° position. This will stow the wings.















CARRIER LANDING
CASE I RECOVERY





LANDING TIPS
DLC

DLC (Direct Lift Control) Thumbwheel
Controls maneuvering flaps extension/retraction.
Forward rotation extends spoilers and aft rotation retracts spoilers.

On the control stick, there is a small spring-loaded thumbwheel for the DLC (Direct Lift Control) system. DLC is primarily a function of spoilers to maintain a correct glide slope without power or attitude adjustment. Since power or pitch adjustments screw up your precious "On Speed AoA", DLC comes in really handy when you are flying with a good AoA but you are a bit too high or too low on the glide slope.





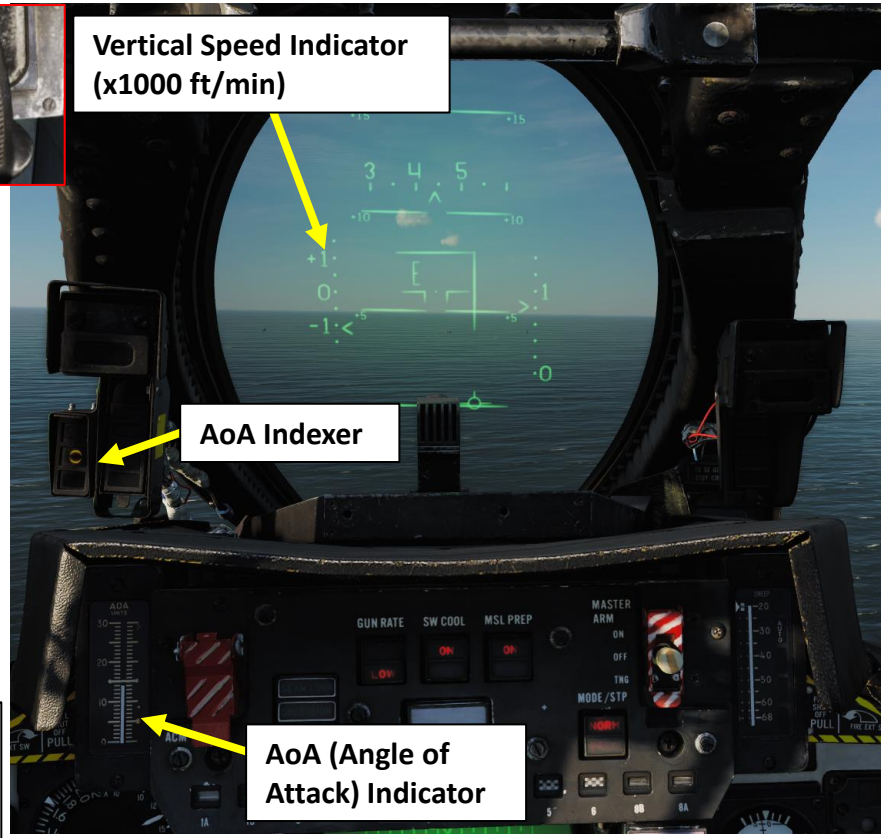
LANDING TIPS
DLC

DLC (Direct Lift Control) Thumbwheel
Controls maneuvering flaps extension/retraction

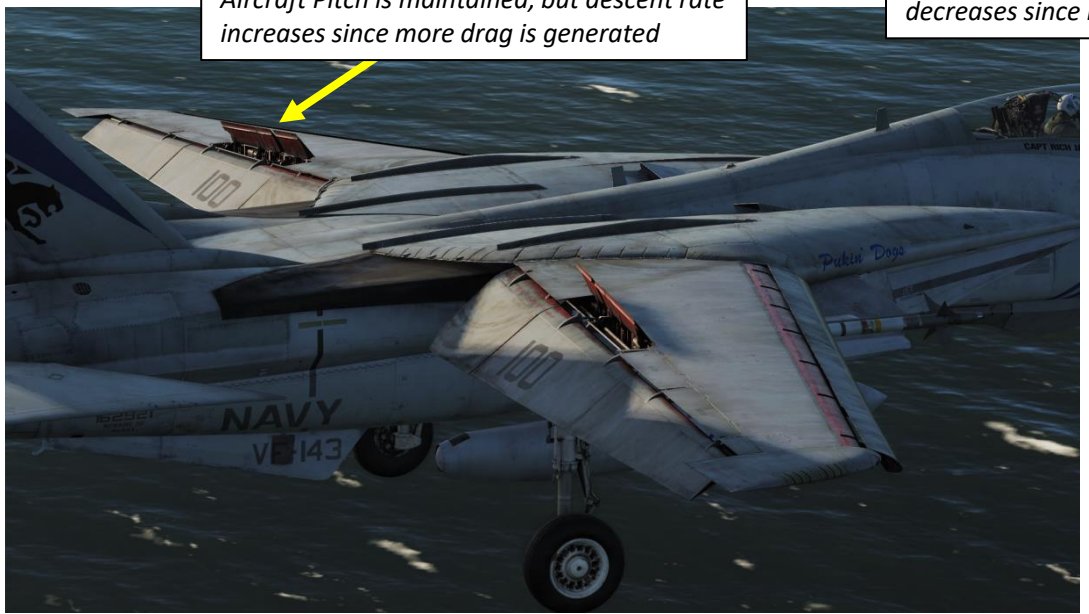


Rotating the thumbwheel aft causes the DLC spoilers to go flush with the wing, thereby increasing lift. This causes the aircraft to climb a little without ever having to adjust either engine power or pitch attitude. However if we are a little above glide slope, rotating the thumbwheel forward causes the spoilers to increase their deflection, thus causing even more drag, making the aircraft descend slightly, again without any needed power or attitude adjustments. There is no DLC indicator in the cockpit, but you can check if the DLC is engaged by looking over your shoulder and checking if the Maneuvering Flaps/Spoilers are deployed.

Don't hold the button down, but don't be timid, hit it twice to keep the ball from rising while easing the power a smidge and get it back on when you see the ball stop going up. You may need a burst of throttle if you hold the button and come down like a ton of proverbial bricks, but usually not. If you need more DLC than what I described, you're probably out of parameters.



DLC Active
Spoilers Deployed (Thumbwheel Forward)
Aircraft Pitch is maintained, but descent rate increases since more drag is generated



DLC Active
Spoilers Retracted (Thumbwheel Aft)
Aircraft Pitch is maintained, but descent rate decreases since less drag is generated



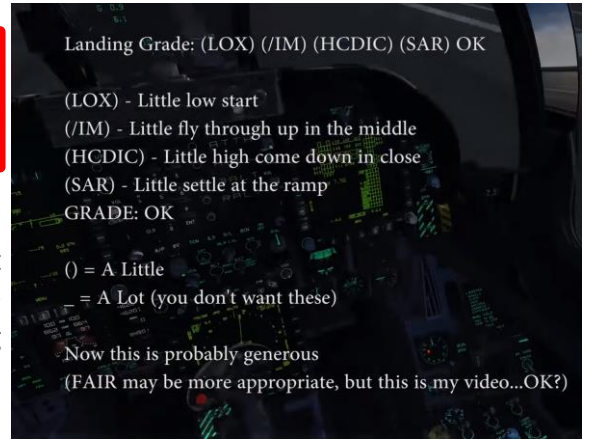
LANDING TIPS
STICK AND RUDDER

As with all inputs in the F-14, you have to know about them before doing them, and then perform them smoothly and precisely. Erratic stick and rudder movements are a recipe for disaster. The Tomcat has many aerodynamic peculiarities and the majority of them are deadly (I'm looking at you, roll reversal!). Adverse yaw (natural tendency for an aircraft to yaw in the opposite direction of a roll, caused by the difference in lift and drag of each wing) can be quite dangerous if you don't pay attention to it.

When trimming the aircraft in a "On Speed AoA" attitude, you will have about 13 AoA units, which means that you need to avoid combining lateral stick, longitudinal stick and rudder input all at once. I recommend using coordinated lateral stick and rudder input when performing a roll in the pattern. Aircraft pitch attitude should only be controlled with trim and throttle input. When increasing the angle of bank in a roll, you need to increase power. When decreasing the angle of bank in a roll, you need to decrease power. This will help you maintain your altitude during turns.



CARRIER LANDING
LSO (LANDING SIGNAL OFFICER)

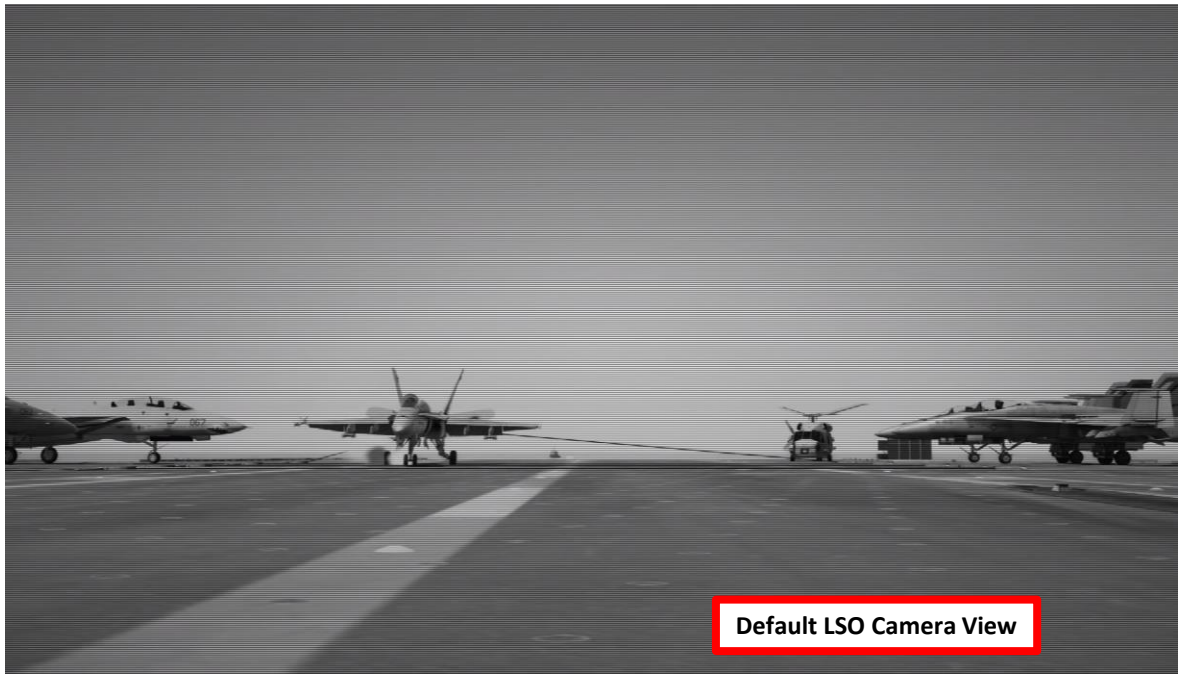


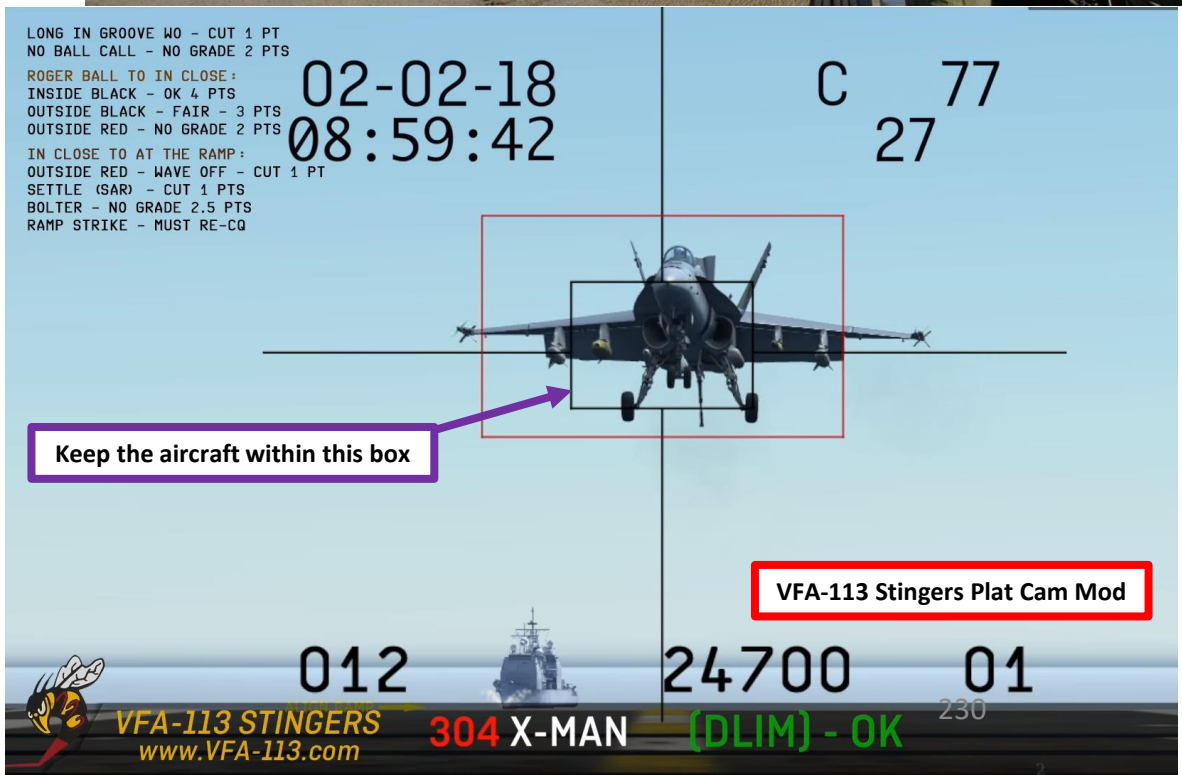
You can also roleplay in multiplayer as the "**LSO**" (Landing Signal Officer), you can! You can select the LSO camera by pressing "LALT+F9". The camera can be moved and zoomed in or out using LCTRL+[Numpad *] or LCTRL+[Numpad /]

You can help the pilot line up properly for landing by giving him corrective commands like "Come right for lineup, Come Left, You're high, (Add) Power". Once the pilot has landed, you can also give him a "grading" based on how he landed.



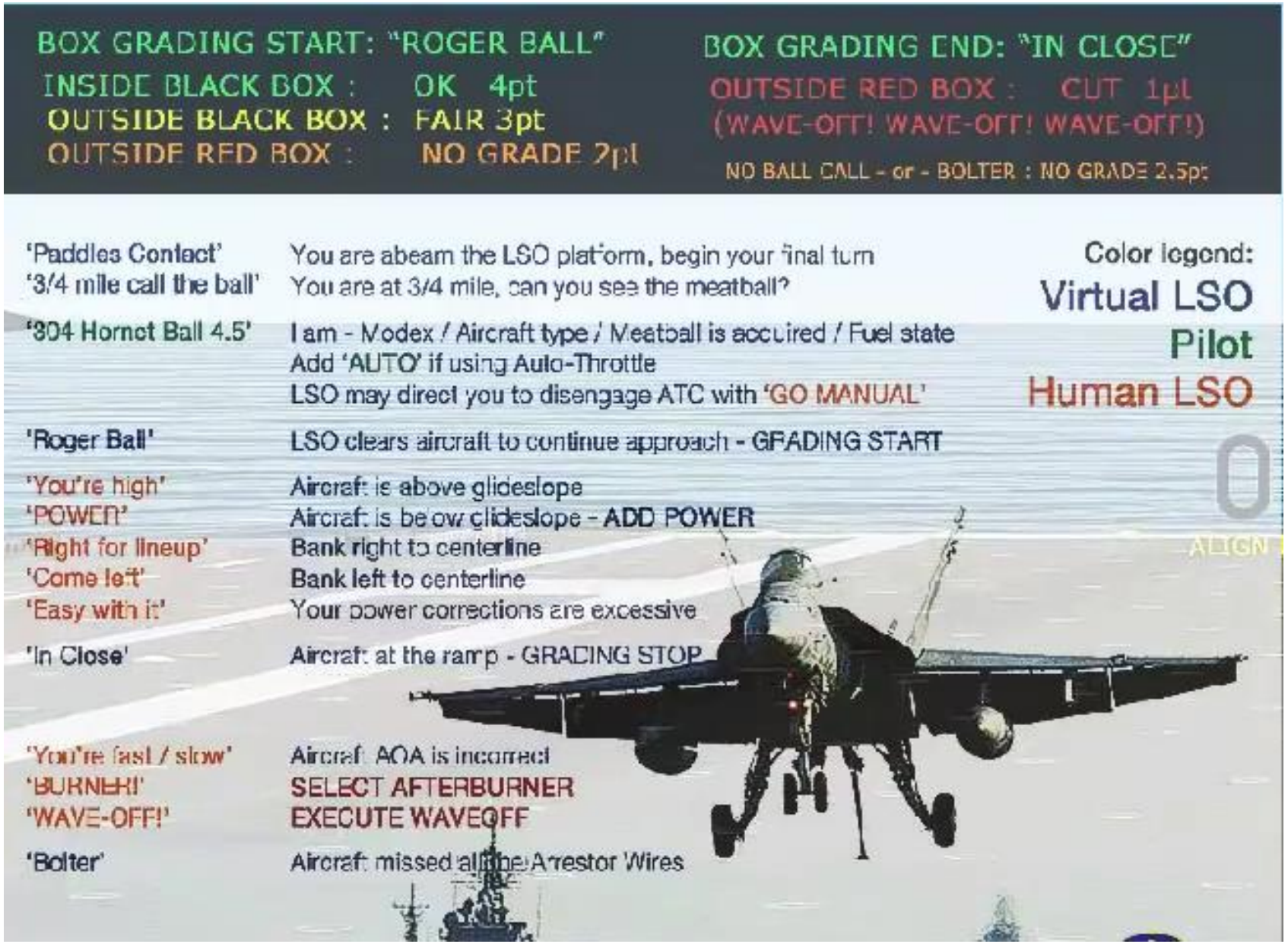
There is a cool LSO mod by the VFA-113 Stingers that gives you a slick overlay:
LSO Mod Link: www.VFA-113.com
LSO Mod Video: https://www.youtube.com/watch?v=vDG1_v1CJVI





CARRIER LANDING
LSO COMMUNICATIONS & GRADING

The VFA-113 Stingers have a short course on LSO & Carrier Landing Grading
LSO Training Course Link: https://youtu.be/BbMw4PcvMyY



GENERAL ELECTRIC **F110**-GE-400 ENGINE

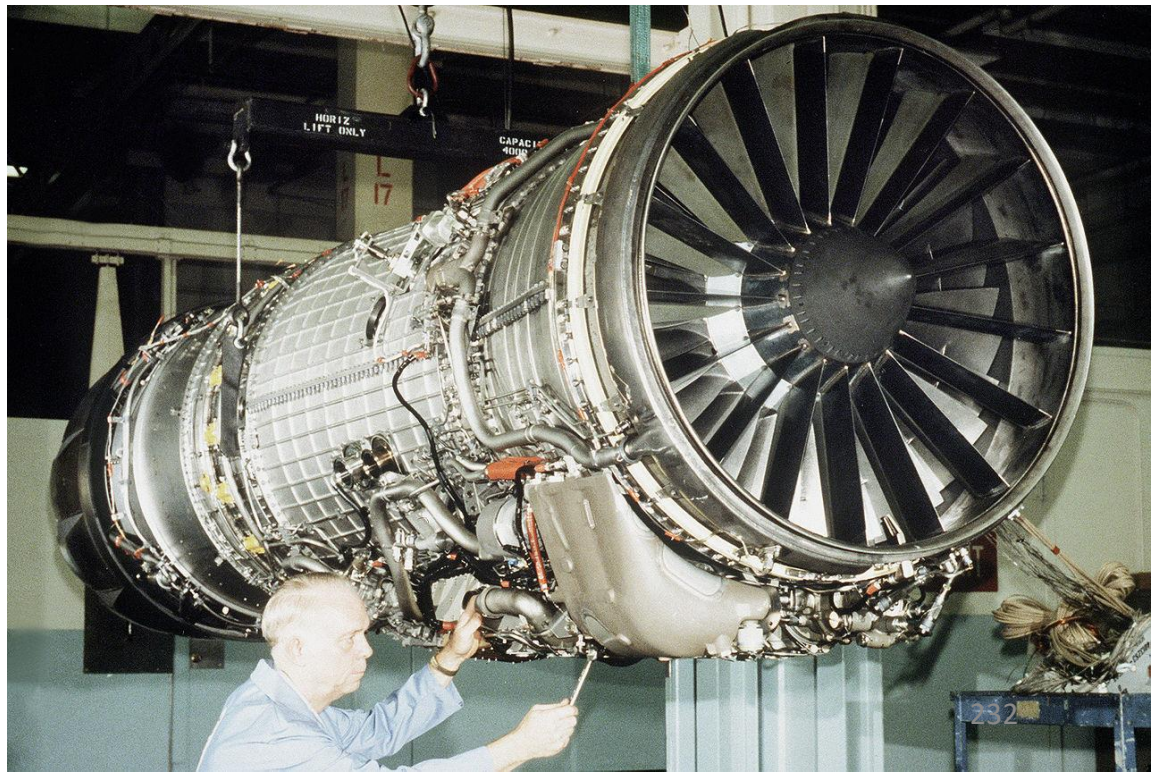
The F-14A entered service with the United States Navy in 1973 powered by Pratt & Whitney TF30s. By the end of the decade, following numerous problems with the original engine (and similar problems with the Pratt & Whitney F100 on the F-15 and F-16), the DoD began procuring the upgraded TF30-P-414As. While these engines solved the serviceability problems, the fuel consumption and thrust was comparable to the initial model– considerably less than what the F-14 had been designed for. In 1979, a derivative of the GE F101 turbofan called the F101-X was selected to power the F-14 and was later designated the F110-GE-400.

The F-14B Tomcat was fitted with these improved engines: two General Electric F110-GE-400 afterburning turbofan engines, which were able to provide 23,400 lbf (104 kN) of thrust with afterburner at sea level, which rose to 30,200 lbf (134 kN) at Mach 0.9. This provided a significant increase over the F-14A's TF30's maximum thrust of 20,900 lbf (93 kN). While the early TF30s required afterburners on takeoff, the increase in thrust with the F110s was so significant that takeoff with afterburners was prohibited; catapult launches with F110 afterburners were considered too dangerous because the yaw moment would be too great if one of the burners failed during or after launch. That's how powerful they were!

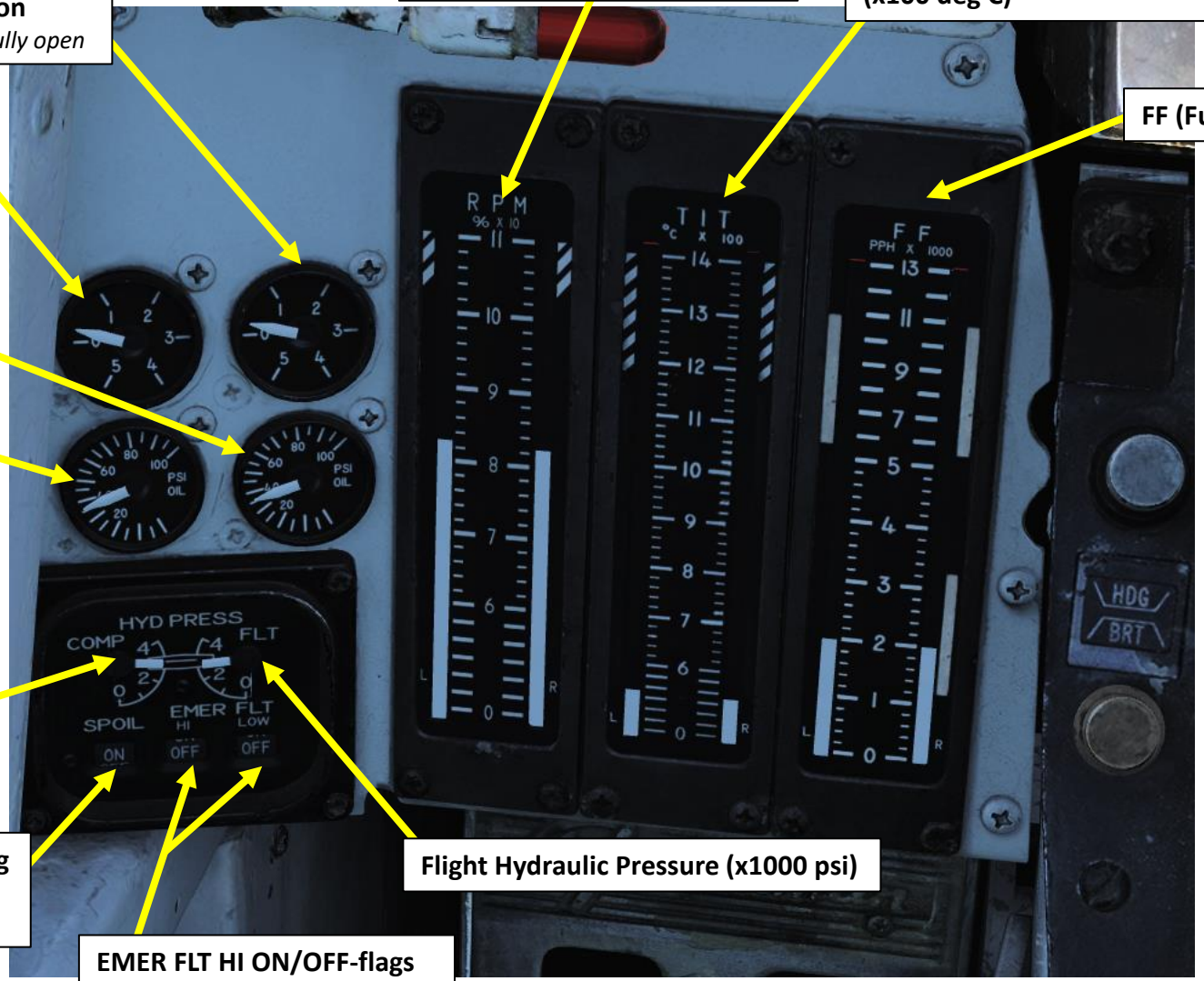
The Augmenter Fan Temperature Controller/Main Engine Control (**AFTC/MEC**) provides limiting functions to prevent engine damage and reduce risk of compressor stalls. Engine RPM, TIT (Turbine Inlet Temperature), and acceleration/deceleration scheduling are all limited by the AFTC to ensure safe engine operation. In civil aviation terms, the AFTC/MEC basically accomplishes the functions of a FADEC (Full Authority Digital Engine Controller), sort of the controller/brain of the engine.

There is also an **APC** (Approach Power Compensator) system that works basically like an auto-throttle system during approaches.





ENGINE INDICATIONS



Engine N2 (High-Pressure Compressor Speed, % RPM)

TIT (Turbine Inlet Temperature) (x100 deg C)

Right Nozzle Position
From 0 to 5, 5 being fully open

Left Nozzle Position
From 0 to 5, 5 being fully open

FF (Fuel Flow) (x1000 lbs/hour)

Right Engine Oil Pressure (psi)

Left Engine Oil Pressure (psi)

Combined Hydraulic Pressure (x1000 psi)

SPOIL (Spoiler) ON/OFF-flag
Indicates pressurization of outboard spoiler module

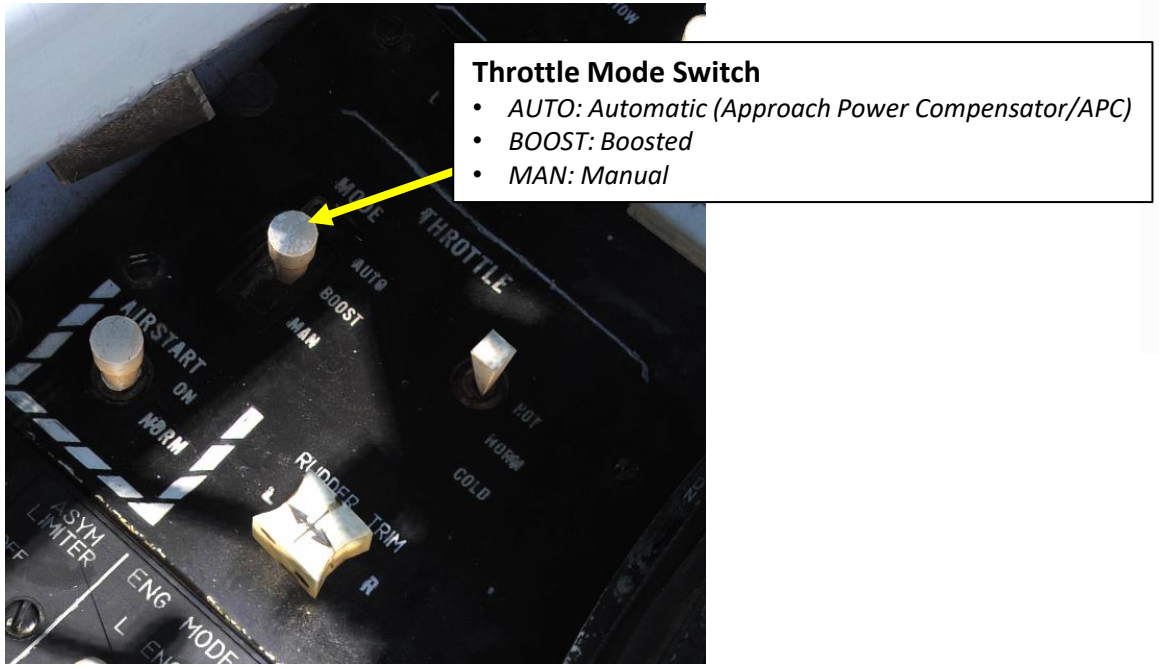
Flight Hydraulic Pressure (x1000 psi)

EMER FLT HI ON/OFF-flags
Indicates backup flight hydraulic system pressures when HI or LOW is selected respectively

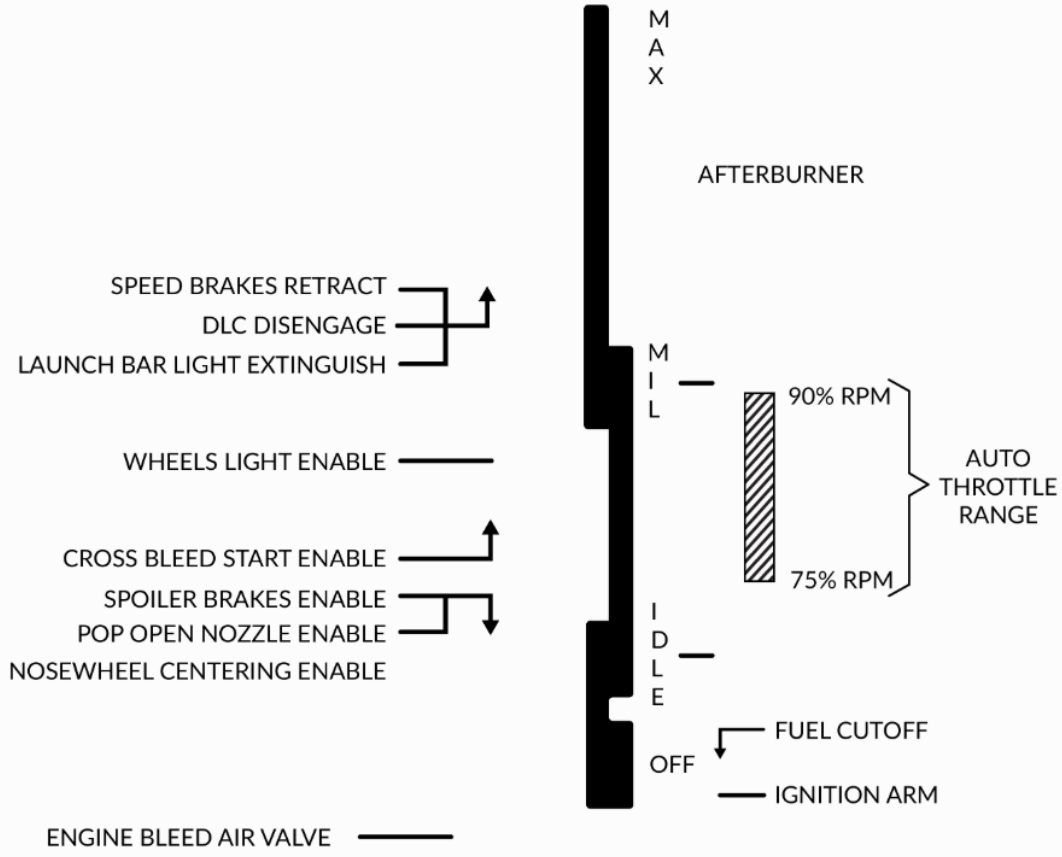
THROTTLE CONTROL

There are three main throttle operation modes:

- The **Manual** mode is a mechanical mode in which the engines are controlled by mechanical linkages directly from the throttles to the engines. The manual mode is designed as a backup mode and may be inexact because of the mechanical nature of the controls.
- **Boost** mode is the normal mode of operation in which electrical paths control actuators moving the same engine controls as the mechanical linkages but more exactly and with lesser force required.
- The third mode is the **approach power compensator** mode or the **Auto Throttle** mode which is a system which allows for automatic throttle control for optimal angle-of-attack during approaches. We will further explain auto-throttle in the AUTOPILOT section.



Throttle Mode Switch
- *AUTO: Automatic (Approach Power Compensator/APC)*
- *BOOST: Boosted*
- *MAN: Manual*



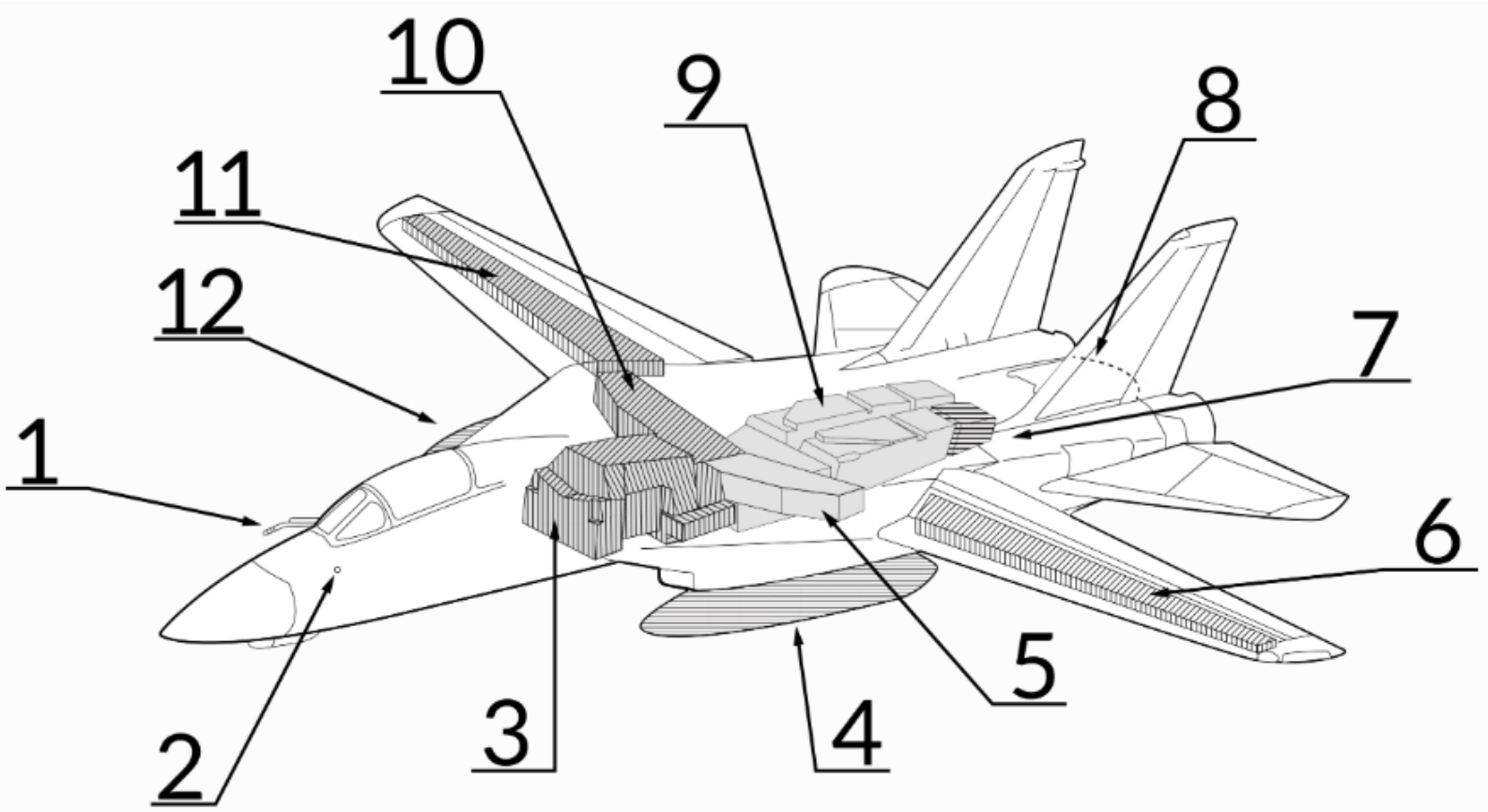
Throttle Detents (Reference: Heatblur F-14B Wiki)

FUEL SYSTEM OVERVIEW

The main fuel storage in the F-14 consists of two feed systems, one for each engine. The right engine feed system consists of the right wing and right box cells and the front fuselage cells while the left engine feed system consists of the left wing and left box cells in addition to the aft fuselage cells. This fact needs to be kept in mind when reading the fuel gauges.

The total useable fuel quantity is roughly 20,000 pounds distributed as in the table below.

Tank group	Fuel Quantity (lbs)
Forward Fuselage	4,700
Aft Fuselage	4,400
Right Feed Group	1,600
Left Feed Group	1,500
Internal Wings	4,000
External Tanks	3,600



1 - Refueling Probe, 2 - Ground refueling Port (Right Side) , 3 - Forward Fuselage Tank, 4 - Left External Drop Tank, 5 - Left Box Beam Tank, 6 - Left Wing Tank, 7 - Vent Tank, 8 - Fuel Dump Mast, 9 - Aft Fuselage Tank, 10 - Right Box Beam Tank, 11 - Right Wing Tank, 12 - Right External Drop Tank.

Fuel System Overview (Reference: Heatblur F-14B Wiki)

FUEL SYSTEM OVERVIEW

The fuel quantity indicator on the pilot right knee panel displays internal and external fuel carried.

- The **TOTAL** indicator displays total carried fuel.
- The **L** and **R** indicator normally shows fuel carried in left and right fuel feeds respectively. A rocker switch on the fuel management panel enables selection of the wing internal tanks (WING) or external fuel tanks (EXT) for display but is springloaded to return to showing the feed tanks (FEED) automatically. When displaying wing internal tanks or external fuel tanks, the left wing or left external tank is shown on the L counter and the right wing or right external tank on the R counter.
- The **FUS & FEED** tapes (fuselage and feed) shows the AFT & L (aft fuselage and left feed) and FWD & R (forward fuselage and right feed) in thousands of pounds.

Additionally the RIO has a total fuel quantity display on the right instrument panel. This display counter can only show total fuel quantity.

RIO Total Fuel Quantity Indicator (lbs)



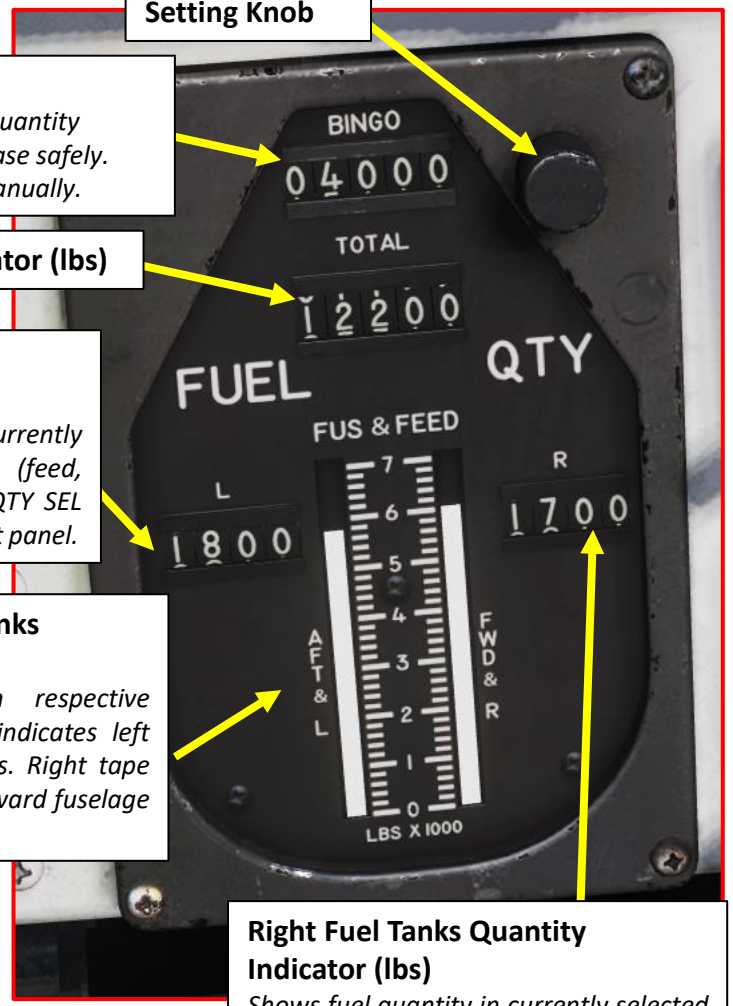
Bingo Fuel Setting Knob

Bingo Fuel Setting
"Bingo Fuel" is the fuel quantity required to go back to base safely. This is set by the pilot manually.

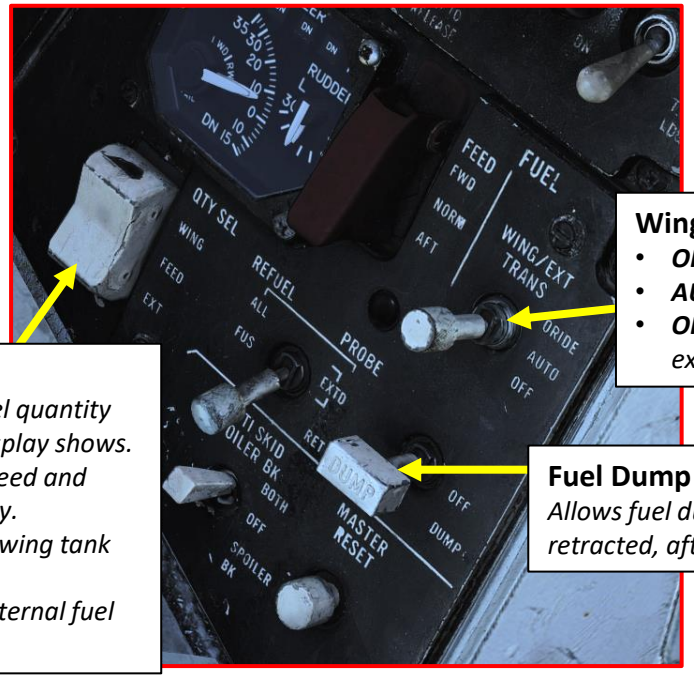
Total Fuel Quantity Indicator (lbs)

Left Fuel Tanks Quantity Indicator (lbs)
Shows fuel quantity in currently selected respective (L) tanks (feed, wing or external) set by the QTY SEL switch on the fuel management panel.

Fuselage & Feed Fuel Tanks Quantity Indicator (lbs)
Shows fuel quantity in respective fuselage tanks. Left tape indicates left feed and aft fuselage tanks. Right tape indicates right feed and forward fuselage tanks.



Right Fuel Tanks Quantity Indicator (lbs)
Shows fuel quantity in currently selected respective (R) tanks (feed, wing or external) set by the QTY SEL switch on the fuel management panel.



Wing/External Transfer Switch
- ***ORIDE*** *- Override.*
- ***AUTO*** *- Normal position.*
- ***OFF*** *- Turns off fuel feed from the wing and external tanks.*

Fuel Dump Switch
Allows fuel dump when speed brakes are retracted, afterburner off and weight off wheels.

Fuel QTY SEL Switch
Switch selecting what the fuel quantity tapes on the fuel quantity display shows.
- ***FEED*** *- Shows respective feed and fuselage tank fuel quantity.*
- ***WING*** *- Shows respective wing tank fuel quantity.*
- ***EXT*** *- Shows respective external fuel tank quantity.*

FUEL SYSTEM OVERVIEW

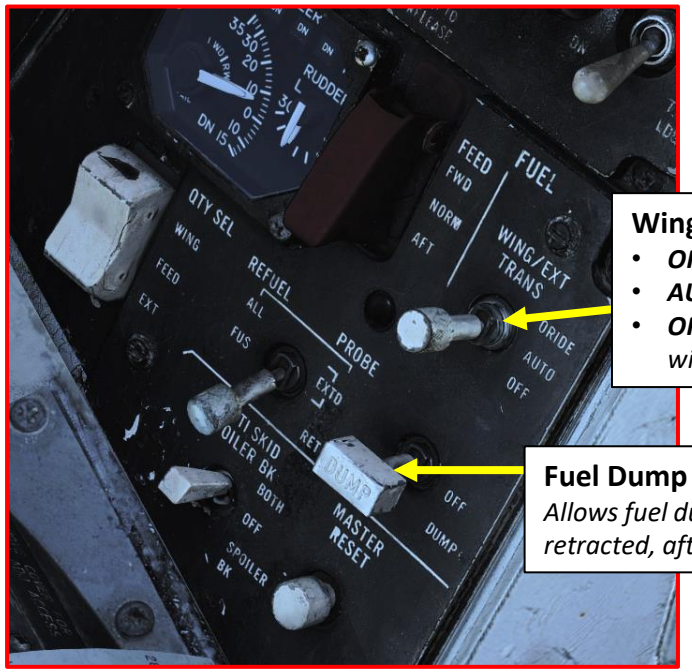
The **FEED** switch allows the pilot to correct fuel imbalances caused by single engine operation or feed failures by selecting both engines to feed from either the FWD (forward and right tanks) or AFT (aft and left tanks) instead of from one feed system each as normal NORM. The switch guard locks the switch to the NORM position when down.

The **WING/EXT TRANS** switch controls fuel transfer from the wing and external tanks into the fuselage feed systems. The normal AUTO position enables this transfer as soon the landing gear is retracted.

The **ORIDE** position enables this transfer regardless of landing gear position, enabling transfer when on the ground or during a malfunction in the electrical system inhibiting landing gear retraction detection. Additionally the OFF position disables this transfer but can be overridden automatically to AUTO when the INST test is performed on the MTS panel, the refuel probe is set to ALL EXTD or when dumping fuel.

The **DUMP** switch enables fuel dump through the beaver tail fuel dump mast, it also enables all fuel transfer systems, enabling dump of fuel in wings and external tanks in addition to the fuselage. If there's weight on the wheels or the speed brake is not fully retracted the fuel dump is inhibited.

Reference: Heatblur F-14B Wiki



Wing/External Transfer Switch

- ***ORIDE*** *- Override.*
- ***AUTO*** *- Normal position.*
- ***OFF*** *- Turns off fuel feed from the wing and external tanks.*

Fuel Dump Switch

Allows fuel dump when speed brakes are retracted, afterburner off and weight off wheels.



ENGINE RELIGHT PROCEDURE

Cross-Bleed Airstart

A cross-bleed airstart can be attempted with one engine running if the spooldown airstart was not successfull or the engine is already at or near windmill rpm.

Cross-Bleed Airstart Checklist

1. Non-running engine throttle	**OFF**
2. **FUEL SHUT OFF** handle	Check handle in in position
3. Running engine throttle	Minimum 80% RPM
4. **BACK UP IGNITION** switch	**ON**
5. **ENG CRANK** switch	Set to non-running engine
6. Non-running engine throttle	**IDLE** immediately after **ENG CRANK** on
If no start occurs:	
7. Non-running engine throttle	**OFF** then **IDLE**
If still no start:	
8. **ENG MODE** select switch	**SEC**
9. Non-running engine throttle	**OFF** then **IDLE**
After successfull airstart:	
10. **BACK UP** ignition switch	**OFF**
11. **ENG MODE SELECT** switch	**PRI** if possible

Windmill Airstart

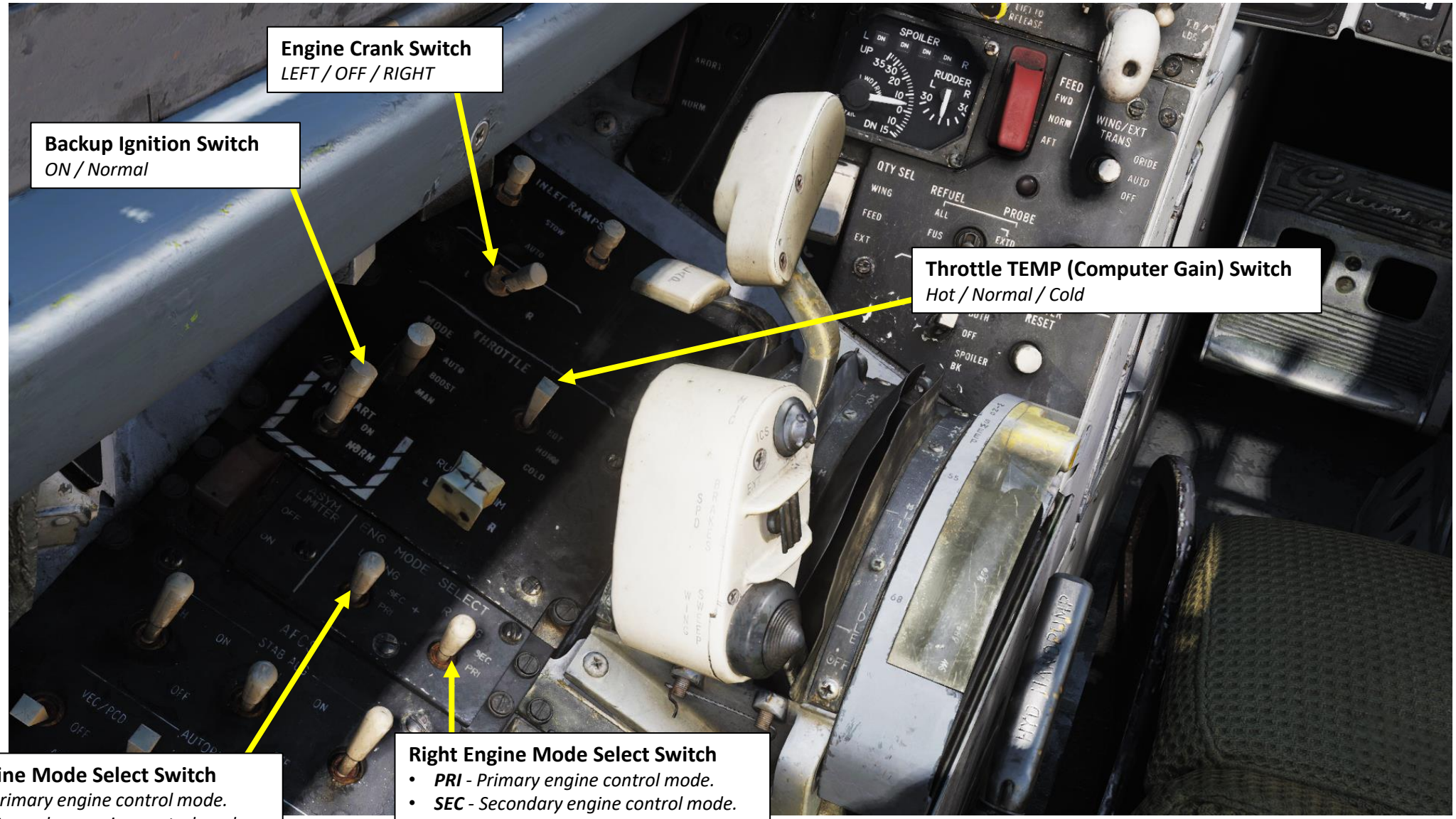
The windmill airstart uses aircraft airspeed to turn the engine turbines using wind speed. Required airspeed is at or above 450 knots indicated airspeed and should only be attempted if airspeed and altitude allows it.

Windmill Airstart Checklist

1. Airspeed	At or above 450 KIAS
2. Throttle	**IDLE** or above
3. **BACK UP IGNITION** switch	**ON**
If no relight occurs:	
4. Throttle	**OFF** then **IDLE**
If still no relight:	
5. **ENG MODE SELECT** switch	**SEC**
6. Throttle	If no start after mode switch, **OFF** then **IDLE**
After successful airstart:	
7. **BACK UP IGNITION** switch	**OFF**
8. **ENG MODE SELECT** switch	**PRI** if possible

Reference: Heatblur F-14B Wiki

ENGINE RELIGHT PROCEDURE



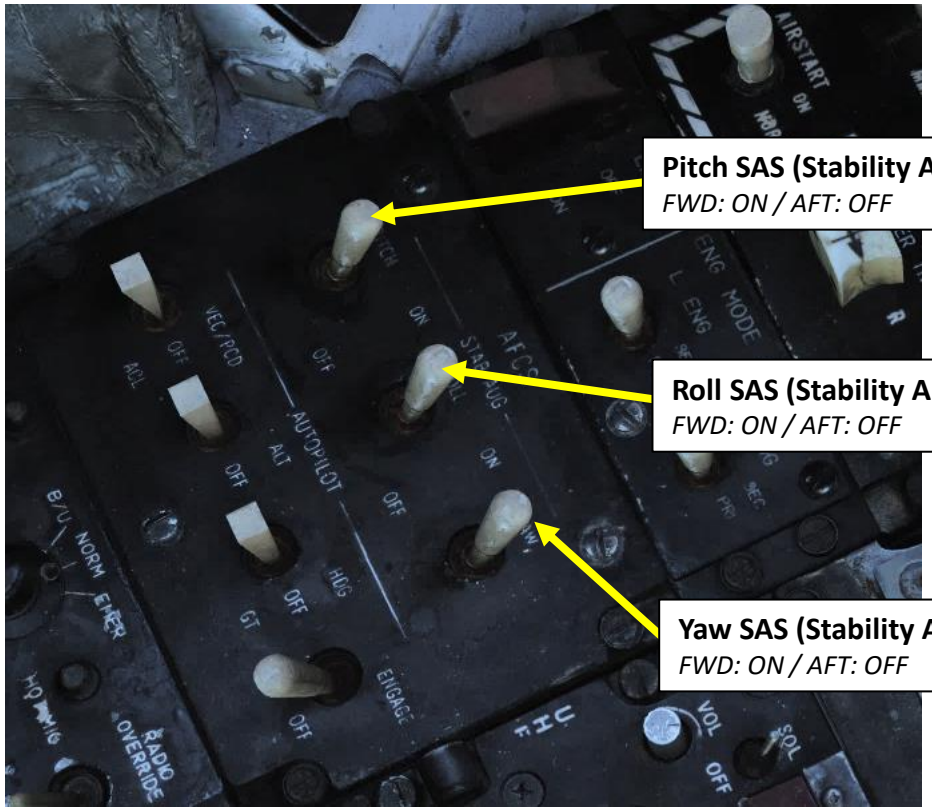
AFCS: Automatic Flight Control System

The flight control system on the F-14 Tomcat is driven by the two main hydraulic circuits, powered by pumps connected to each engine.

For longitudinal (pitch) control both tail stabilizers are deflected in unison, acting in the same way as traditional elevators. Lateral (roll) control is produced by both the tail stabilizers (tailerons) and the spoilers working in unison. To produce roll the stabilizers are deflected opposite each other to act as ailerons in combination with the spoilers on the side to which roll is commanded. The rudders on the F-14 is a standard rudder configuration albeit in a two tail, two rudder configuration.

The **AFCS or Automatic Flight Control System** provides additional aircraft stability (SAS or Stability Augmentation System) via automatic control surface commands generated from AFCS sensors. The AFCS is controlled by switches on the AFCS Control Panel and pitch, roll and yaw can each be set individually. The pitch and roll switches are springloaded to off but normally held to on by solenoids meaning that if the system is turned off or inoperable the switches return to off. The yaw switch is purely mechanical. Roll SAS should not be used for situations involving flight at AOA above 15 units and should therefore be set to off for combat maneuvers.

If the **Autopilot Emergency Disengage Paddle** on the control stick is held down the pitch and roll channels will be set to off.



Pitch SAS (Stability Augmentation System) Switch
FWD: ON / AFT: OFF

Roll SAS (Stability Augmentation System) Switch
FWD: ON / AFT: OFF

Yaw SAS (Stability Augmentation System) Switch
FWD: ON / AFT: OFF



Autopilot Emergency Disengage Paddle

CADC & Variable Wing Sweep

The wing-sweep system controls the geometry of the F-14's wings, allowing the wings to move from a 20° to a 68° position in the air. While on the deck an oversweep of 75° is also possible reducing the F-14's wing span to 33 feet (about 10 meters). The wings are moved by hydromechanical screwjack actuators which are interconnected mechanically, making sure they're synchronized. As long as both main hydraulic systems are functioning the maximum wing-sweep change rate is about 15°/s. This can be affected negatively by negative g or large amounts of positive g.

AUTO, BOMB & MANUAL MODES

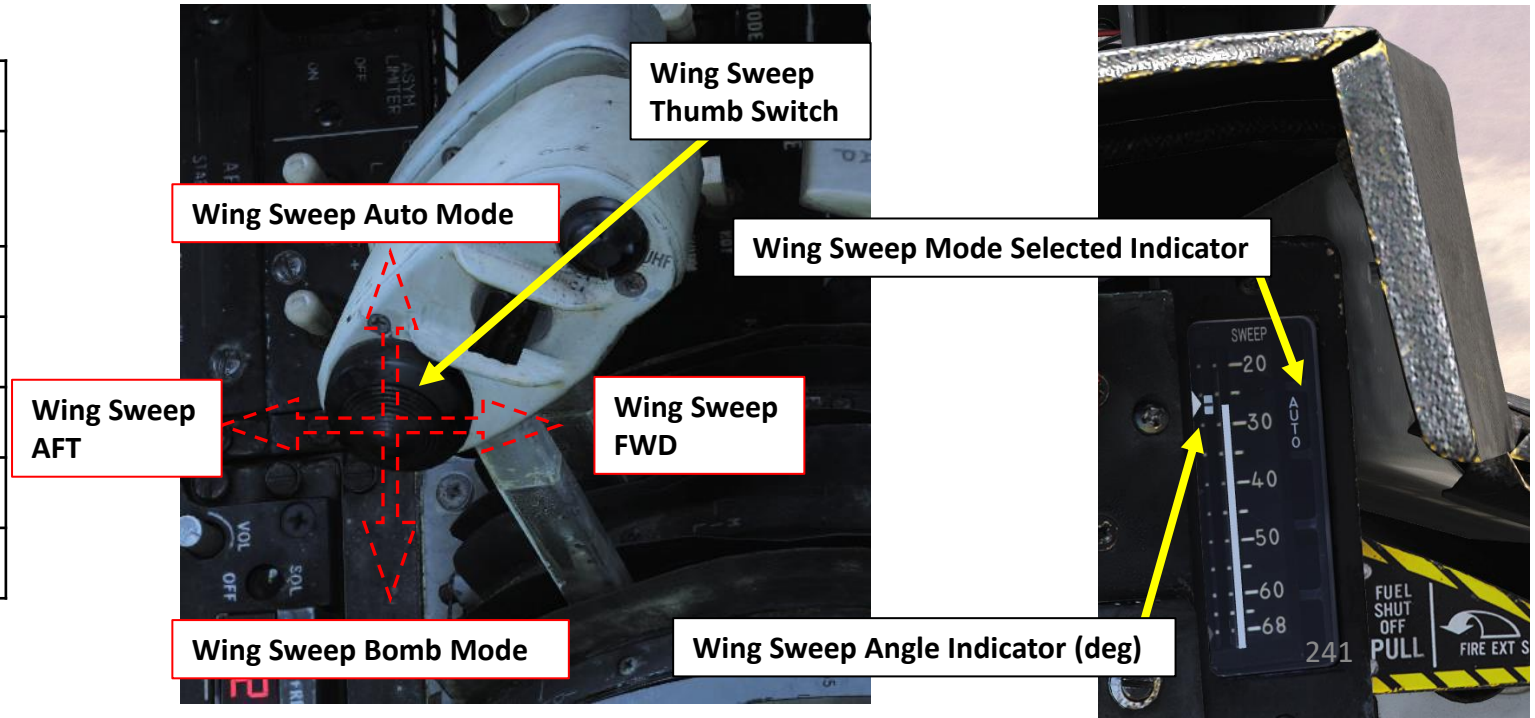
In normal operation the CADC, Central Air Data Computer, controls the wing position as a function of current Mach via the wing-sweep program, this is known as the **AUTO** mode. You can also set a specific wing sweep position **manually** using the thumb switch AFT/FWD on the throttle.

The pilot can also select a wing position aft of the wing-sweep program manually or choose the **BOMB** mode that sets the wings to 55° or further aft depending on the program.

Simply put, the CADC wing-sweep program determines the max forward position of the wings. All this is done electrically via two independent channels (for redundancy) to the wing-sweep actuators. Currently commanded wing position, CADC program wing position and actual wing position can be seen on the wing-sweep indicator next to the ACM panel.

CADC Wing Sweep Schedule	
Speed (Indicated Mach)	Max Forward Wing Position (deg)
0.4	20°
0.7	25°
0.8	50°
0.9	60°
1.0	68°

Reference: Heatblur F-14B Wiki



CADC & Variable Wing Sweep



Wing Sweep 20 deg



Wing Sweep 68 deg



Wing Sweep 55 deg (Bomb Mode)

Wing Sweep Mode Selected Indicator
AUTO: *Automatically set by CADC (Central Air Data Computer)*
MAN: *Manually set by Wing-sweep switch*
BOMB: *Sets wing-sweep to 55° if forwards of that. When the CADC position is aft of 55° it will follow that setting instead*
EMER: *Wings set with the emergency wing-sweep handle (75°)*



Wing Sweep Angle Indicator (deg)



Wing Sweep – 75 deg (Oversweep)

CADC & Variable Wing Sweep

EMERGENCY MODE

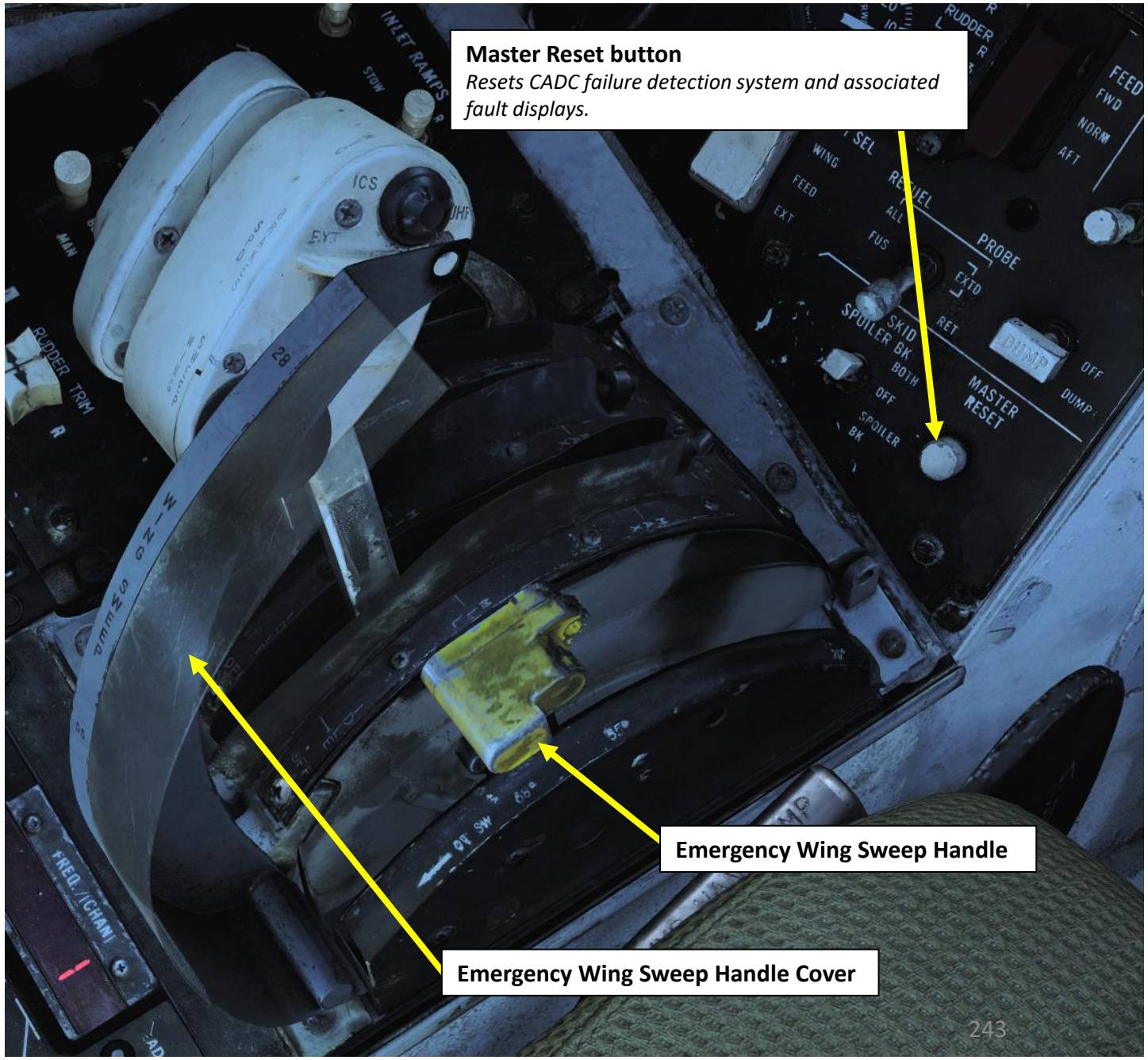
While the normal mode controls the wing-sweep electrically, to supplement this it's also possible to control the wing-sweep mechanically via the emergency mode. This is done via the emergency wing-sweep handle on the right side of the throttle. That handle is connected mechanically to the hydraulic valves in the wing-sweep system, providing a physical back-up control.

To return to the normal mode of operation, the handle should be pushed into the desired position and pressed down and the guard closed. The **MASTER RESET** button should then be depressed and the wing-sweep system set to the same position as the handle. The servo will then drive to the commanded position and re-engage the handle to the spider detent, resuming normal operation.

WING OVERSWEEP MODE

The emergency wing-sweep handle is also used to select the oversweep position of the wings. The oversweep is only used while on the ground to reduce the wing span to make it easier to spot the aircraft on the carrier deck. As the wing will sweep over the stabilizers on the tail the horizontal tail authority system is enabled to prevent the wings and stabilizers from damaging each other by restricting movement of the stabilizer.

Reference: Heatblur F-14B Wiki



SPOILERS & DLC (DIRECT LIFT CONTROL)

SPOILERS

Reference: Heatblur F-14B Wiki

The spoilers are only used forwards of 62° wing-sweep as further aft these conflict with the fuselage. This means that at higher speeds, the wing sweep system in AUTO mode sweeps back the wings and roll control is managed by the tail stabilizers only. When wing sweep is 62° or less, both spoilers and tail stabilizers will function to produce roll motion.

Spoilers are also used for braking when the throttle is set to IDLE, wheels are on the ground and **ANTI-SKID SPOILER BK** switch is set to either SPOILER BK or BOTH. OFF disables the system, BOTH enables antiskid and the spoiler brake system and SPOILER BK enables only the spoiler brake system. Keep in mind that for carrier operations, anti-skid and spoiler brakes must be disabled.

DLC – DIRECT LIFT CONTROL

The DLC or Direct Lift Control is used to control vertical glideslope position without pitch control inputs or engine throttle commands. The DLC uses the two inboard spoiler sections in conjunction with small corrections on the tail stabilizers to control lift.

The DLC is engaged by depression of the DLC switch on the control stick with flaps and gear down. This causes the inboard spoilers to extend to half and enables the DLC & maneuver flap command thumbwheel on the control stick to control them.

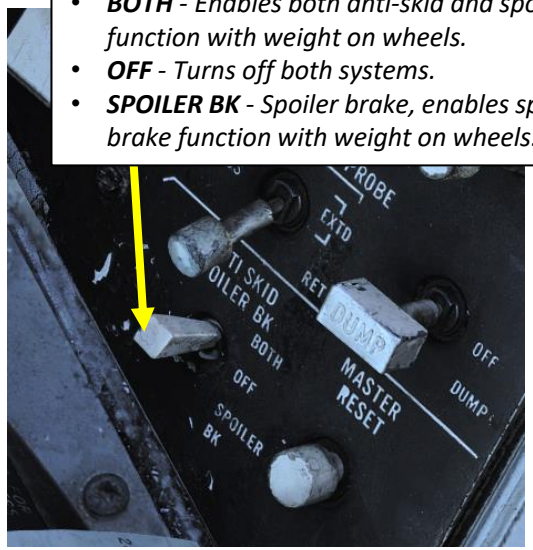
Rotation of the thumbwheel forwards extends the spoilers towards the max up position, decreasing lift and adjusting glideslope position downward. Rotation of the thumbwheel aft retracts the spoilers towards the flush position, increasing lift and adjusting glideslope position upward.

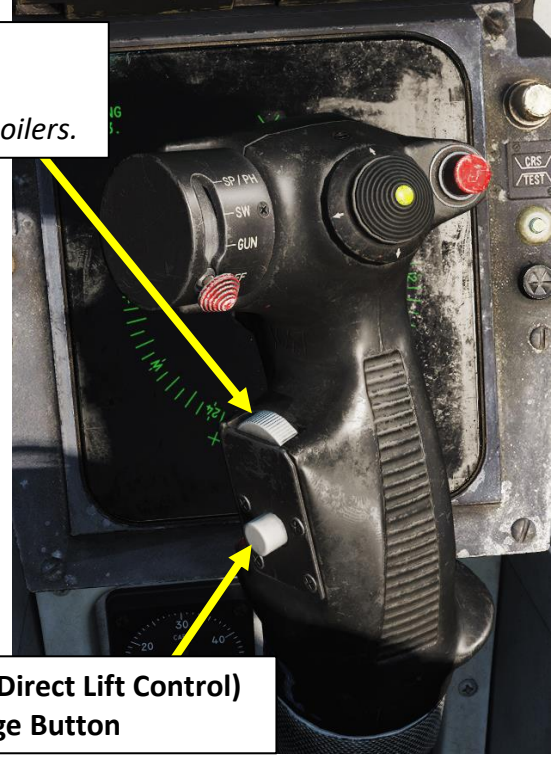
Another depression of the DLC switch disengages the system.

DLC (Direct Lift Control) Thumbwheel
Controls maneuvering flaps extension/retraction.
Forward rotation extends spoilers and aft rotation retracts spoilers.

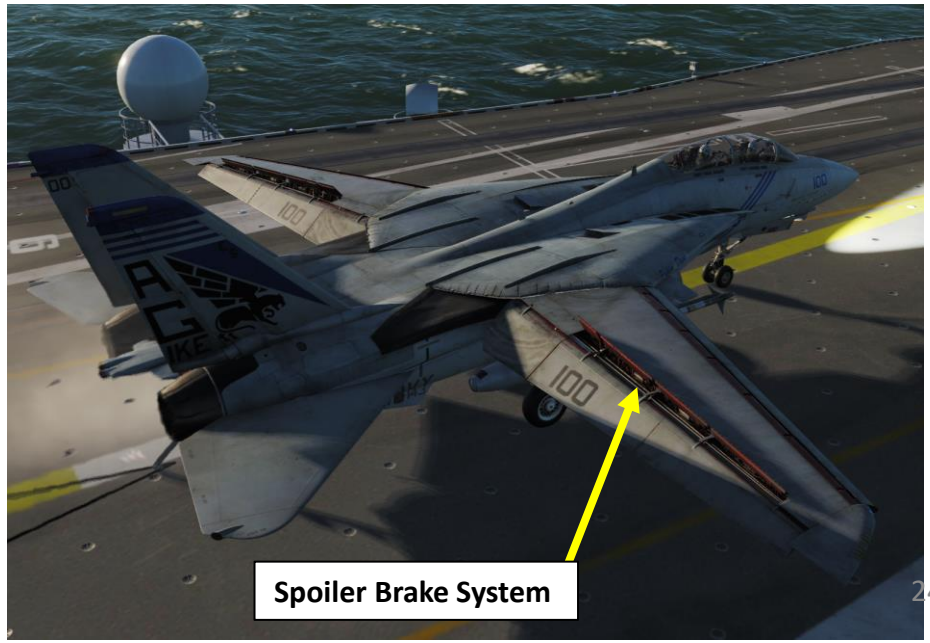
Anti-Skid Spoiler Brakes switch

- ***BOTH*** *- Enables both anti-skid and spoiler brake function with weight on wheels.*
- ***OFF*** *- Turns off both systems.*
- ***SPOILER BK*** *- Spoiler brake, enables spoiler brake function with weight on wheels.*





DLC (Direct Lift Control) Engage Button



Spoiler Brake System

SPOILERS & DLC (DIRECT LIFT CONTROL)

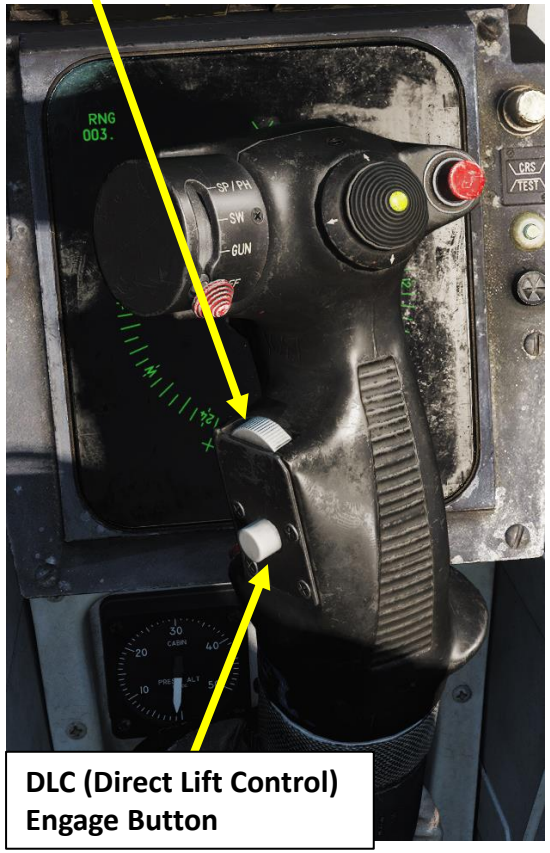


DLC Active
Spoilers Deployed (Thumbwheel Forward)
Aircraft Pitch is maintained, but descent rate increases since more drag is generated



DLC Active
Spoilers Retracted (Thumbwheel Aft)
Aircraft Pitch is maintained, but descent rate decreases since less drag is generated

DLC (Direct Lift Control) Thumbwheel
Controls maneuvering flaps extension/retraction.
Forward rotation extends spoilers and aft rotation retracts spoilers.



DLC (Direct Lift Control) Engage Button

AERODYNAMICS

The Tomcat does not have any fancy FBW (Fly-By-Wire) system. This means that you have much more control on how you fly the plane. As with all inputs in the F-14, you have to know about them before doing them, and then perform them smoothly and precisely. Erratic stick and rudder movements are a recipe for disaster. As an example, one should not try an all-rudder constant slow roll turn all the way through a barrel roll; use the rudder to turn in increments with controlled inputs instead.

When flying a low angle of attack (AoA) high-speed roll, you should roll the aircraft with the stick and progressively add rudder. The higher your angle of attack, the more your rudders should replace your lateral stick inputs, especially when turning in BFM (Basic Fighter Maneuvers). If you find yourself in a nose up high AoA near stall, gently release pressure from the stick, nudge some left or right rudder into the turn and the Tomcat's nose will glide back down, then you can feed throttle back in during the recovery.

The Tomcat has many aerodynamic peculiarities and the majority of them are deadly (I'm looking at you, roll reversal!). Proverse yaw can be quite dangerous if you don't pay attention to it. Combining roll and rudder input while pulling on the stick is the last thing I would recommend. It's a bit like the "Good-Fast-Cheap" quality triangle, but with control input. Out of roll, yaw, and pitch input…you should try to only pick two at once at any time in a high AoA fight. Above 16 "AoA units" (nope, the AoA is not calculated in degrees in the Tomcat but in its own arbitrary units), forget about using roll – use rudder instead.

Manoeuvering and Flight Characteristics Video by Jabbers:
https://youtu.be/b5opjCygZug



SECTION STRUCTURE

- 1 - Sensors
  - Introduction to Sensors
  - My Sensors Control Setup (HCU)
  - My Sensors Control Setup (LANTIRN)

- 2 - AN/AWG-9 WCS (Weapon Control System) Radar
  - Radar Interface & Controls
  - Radar Main Modes
  - Radar Pulse Mode
    - Pulse Search Sub-Mode
    - Pulse STT Lock Sub-Mode
  - Radar Pulse Doppler Modes
    - Pulse-Doppler (PD) Search Sub-Mode
    - RWS Sub-Mode
    - TWS Sub-Mode
    - Pulse Doppler STT Lock Sub-Mode
  - Radar ACM Modes
    - PLM Sub-Mode
    - VSL Sub-Mode
    - PAL Sub-Mode
    - MRL Sub-Mode
  - JESTER
  - Radar Lingo and Terminology
  - RIO BRA Call

- 3 – TCS/ALQ-100 (Television Camera Set)

- 4 - LANTIRN Targeting Pod

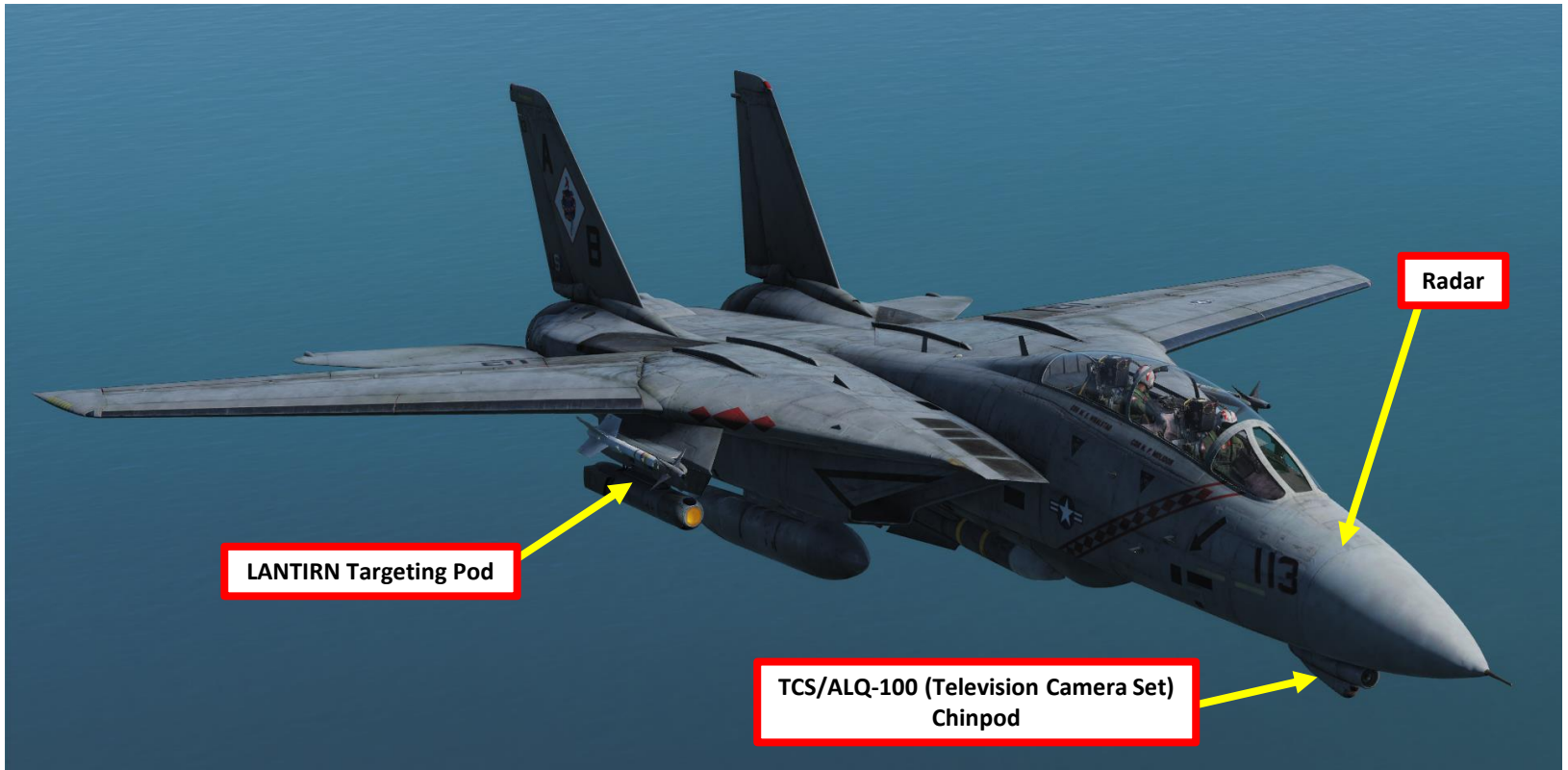
1 - INTRODUCTION TO SENSORS

Here is an overview of how the Tomcat can “see” the outside world. All of these tools are controlled by the RIO (Radar Intercept Officer).

- **AN/AWG-9 Weapon Control System (WCS) / Radar**: Integrated system containing the F-14’s main sensors and computer providing detection, tracking and engagement of targets in the air-to-air and air-to-ground roles.
    - Modes currently available are PD Search (Pulse Doppler), Pulse, TWS (Track While Scan), RWS (Range While Search), STT (Single Target Track) and ACM (Air Combat Maneuvering).

- **LANTIRN (Low Altitude Navigation and Targeting Infrared for Night) Targeting Pod**: Targeting system developed to provide precision strike capability. Target designation is achieved by using a laser designator/range finder or an infrared laser marker, which can be created by the pod itself. It is also capable of displaying a FLIR (Forward-Looking Infrared) thermal imagery.

- **TCS/ALQ-100 (Television Camera Set)** : Contains an aircraft stabilized high resolution closed circuit television camera. The TCS is capable of independent contrast lock or being slaved to the AN/AWG-9 radar.



1 - INTRODUCTION TO SENSORS

PILOT SEAT

HSD (Horizontal Situation Indicator) used as a TID (Tactical Information Display) Repeater in the front cockpit.





HSD (Horizontal Situation Display) Mode:

- ***TID*** *(Tactical Information Display): Display repeating the RIO TID information. If RIO has TID set to TV the screen will be blank*

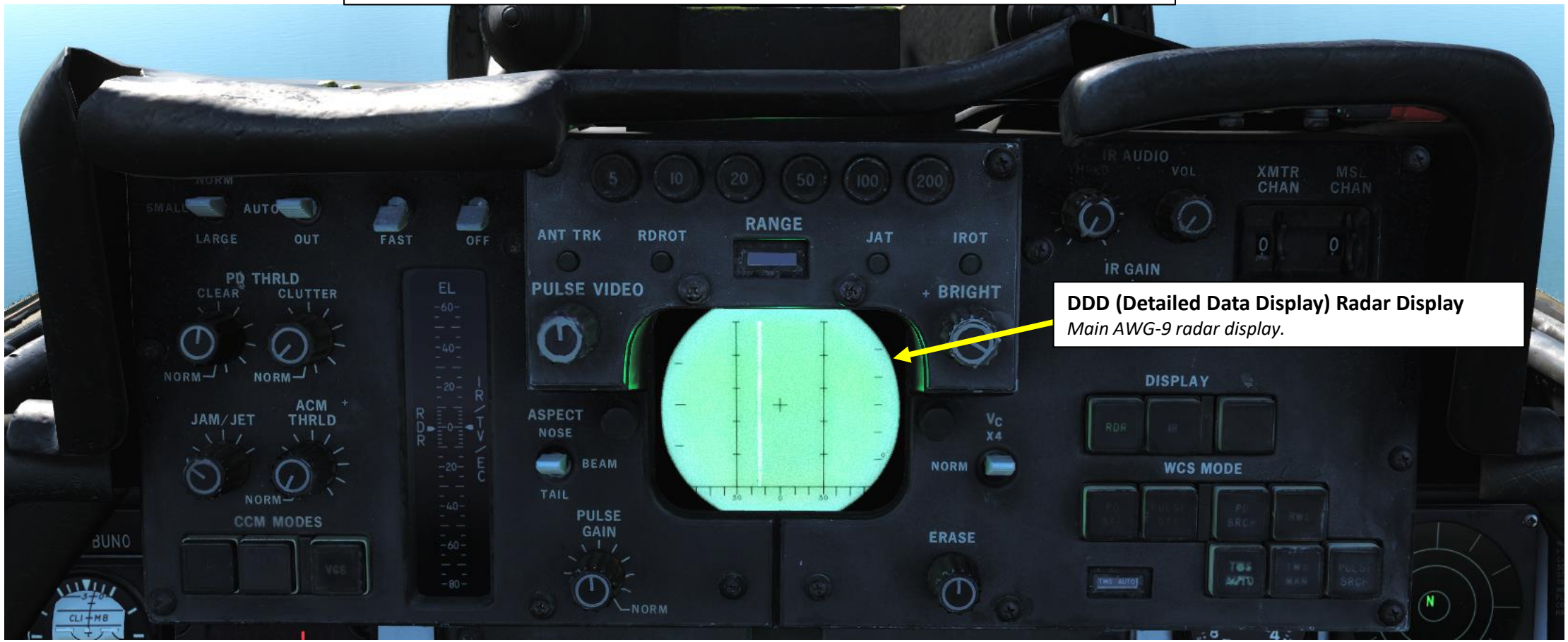
Target Designate Switch



1 - INTRODUCTION TO SENSORS

RIO SEAT

WCS (Weapon Control System) / Radar Control Panel
Allows you to control radar (WCS) mode, IFF interrogation and consult the DDD (Detail Data Display)



1 - INTRODUCTION TO SENSORS

RIO SEAT

TID (Tactical Information Display)

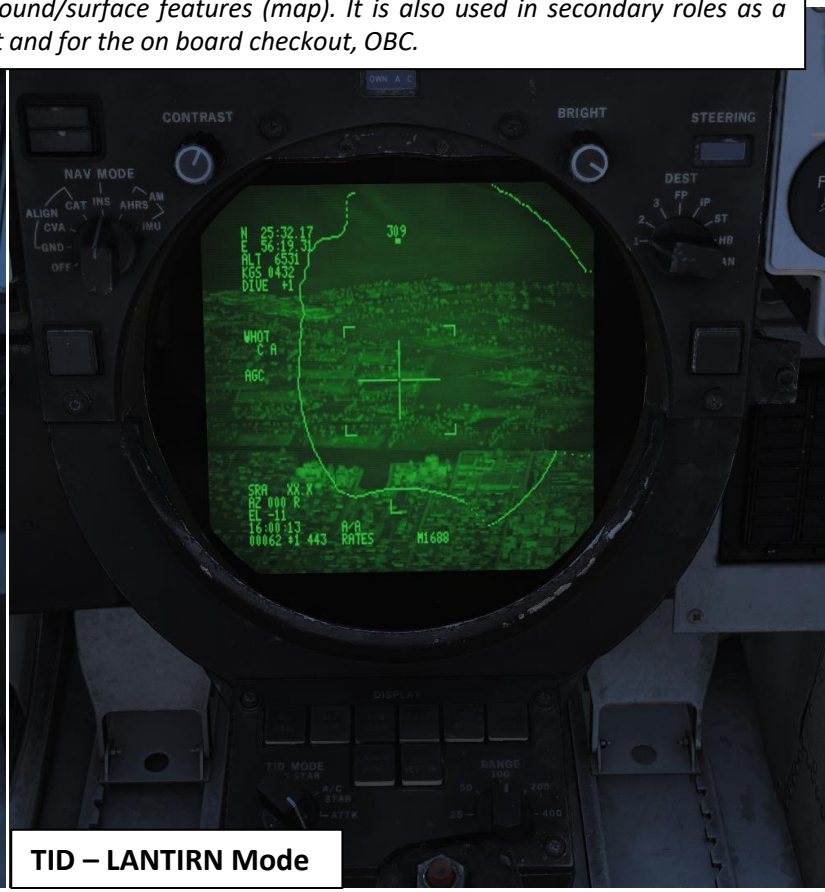
The TID is the main data display for the WCS (Weapon Control System). It displays a tactical picture to the RIO which is used to identify and select targets for the long range weapons on the F-14 Tomcat. Think of it as a top down map showing the relative coordinates of all presented tracks and symbols, but without a representation of the ground/surface features (map). It is also used in secondary roles as a display for entering data into the WCS, for navigation, for INS alignment and for the on board checkout, OBC.



TID – Radar Display Mode



TID – TCS (TV) Mode



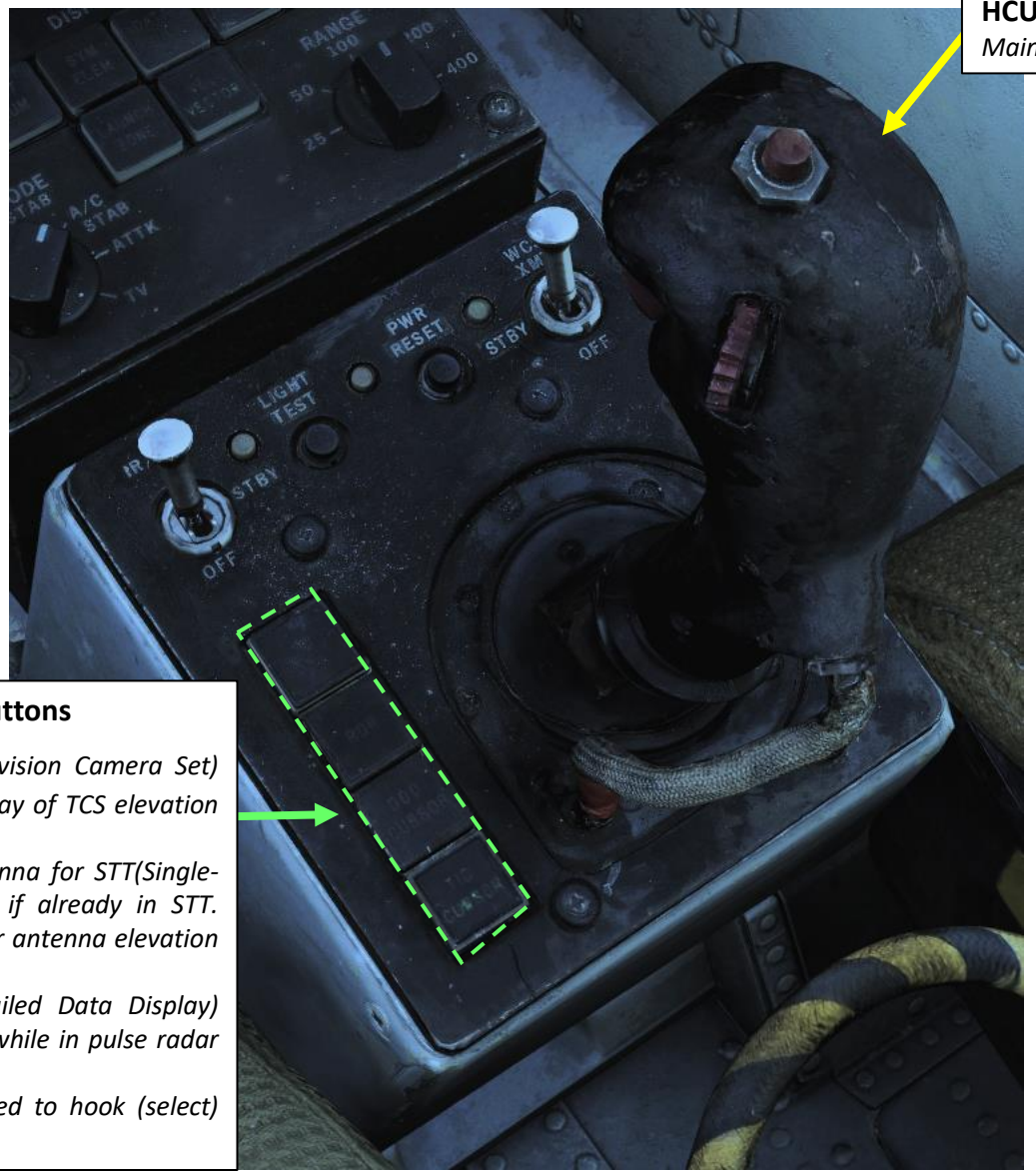
TID – LANTIRN Mode

TID Display Settings Panel



1 - INTRODUCTION TO SENSORS

RIO SEAT



HCU (Hand Control Unit)
Main Radar & TCS (Television Camera Set) Control Stick

HCU (Hand Control Unit) Mode Selector Buttons

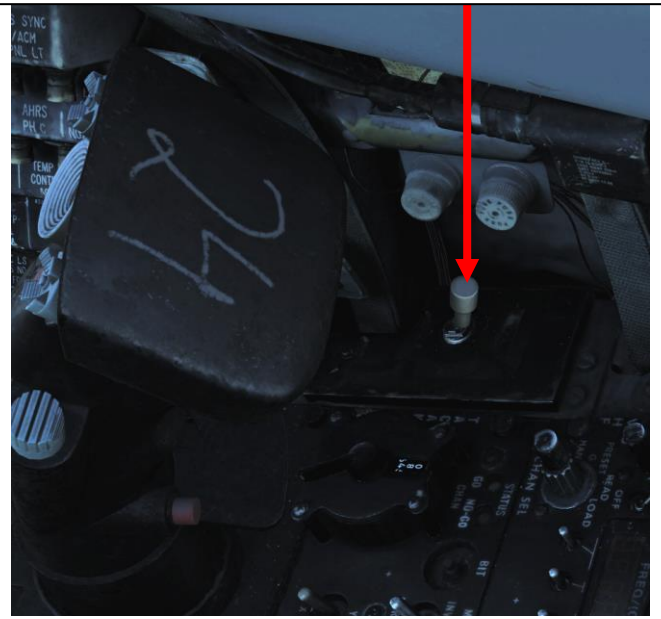
- ***IR/TV Mode*** - *Selects control of TCS (Television Camera Set) azimuth, elevation and tracking. Enables display of TCS elevation on right elevation indicator on DDD.*
- ***RADAR Mode*** - *Selects control of radar antenna for STT(Single-Target Track) lock-on and return to search if already in STT. Enables display of currently commanded radar antenna elevation on right elevation indicator on DDD.*
- ***DDD Mode*** - *Selects control of DDD (Detailed Data Display) cursor used to mark a geographical position while in pulse radar mode.*
- ***TID Mode*** - *Selects control of TID cursor used to hook (select) symbols on the Tactical Information Display.*

1 - INTRODUCTION TO SENSORS

RIO SEAT

Sensor Control Panel
Control panel for AWG-9 scan settings, the TCS and the airborne video tape recorder.

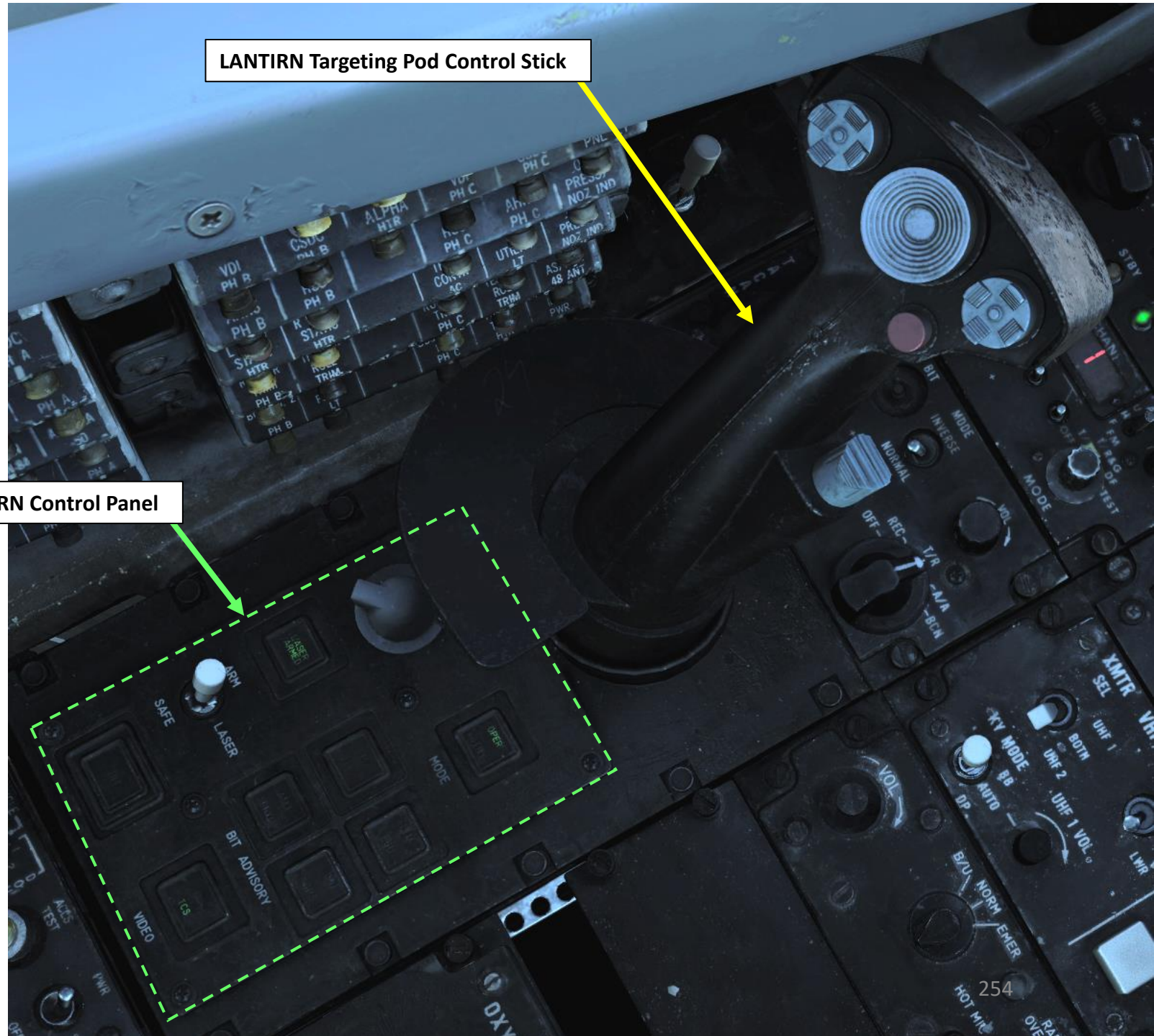
Liquid Cooling Switch
Controls the liquid cooling system for the AWG-9 and AIM-54. The AWG-9 circuit can be enabled independently of the AIM-54. This switch need to be enabled for the respective system before AWG-9 operation or AIM-54 missile preparation.



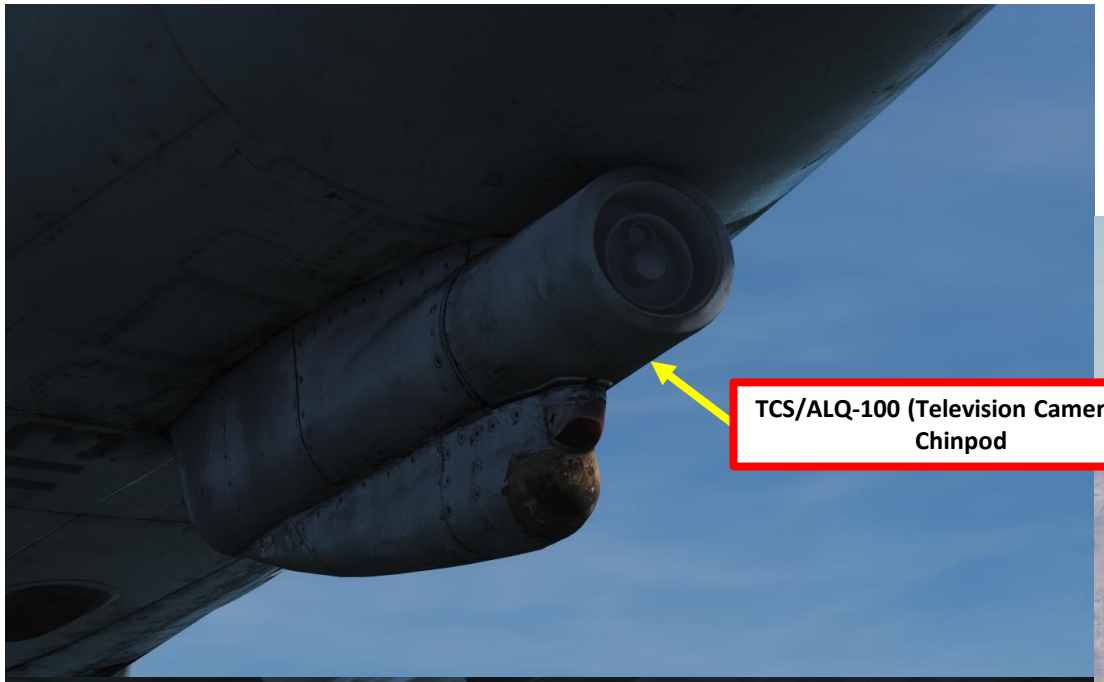
CAP (Computer Address Panel)
The CAP is used to enter data into the WCS. The MESSAGE indicator drum and buttons works similarly to the buttons on MFDs on newer aircraft. The TGT DATA (Target Data) CAP Category contains message button functionality used to modify hooked track symbols.

1 - INTRODUCTION TO SENSORS

RIO SEAT



1 - INTRODUCTION TO SENSORS

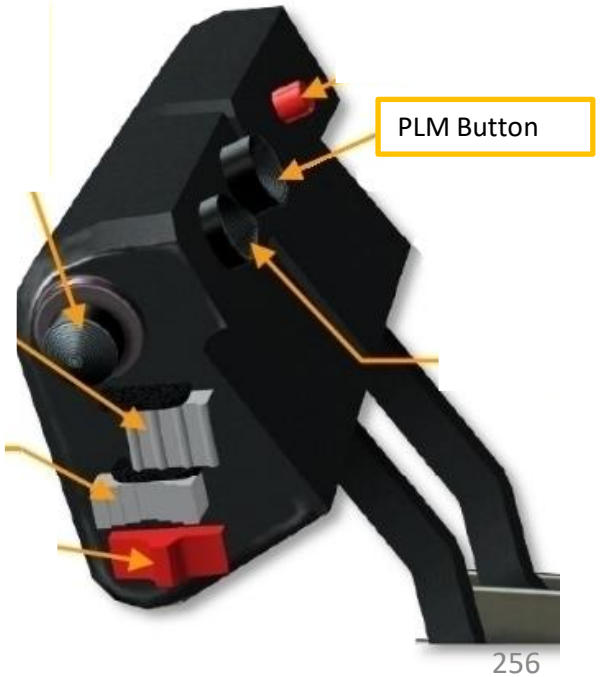






1 – MY SENSORS CONTROL SETUP
PILOT STICK





1 – MY SENSORS CONTROL SETUP
HCU STICK (RIO)



HCU MRL
(Grey button on RHS)

↑ Radar Elevation Up
→ Radar Azimuth Right
↓ Radar Elevation Down
← Radar Azimuth Left

↑ Radar Elevation Bars Increase
→ Radar Azimuth Scan Narrower
↓ Radar Elevation Bars Decrease
← Radar Azimuth Scan Wider

HCU Offset

HCU Half-Action (First Detent)
HCU Full-Action (Second Detent)

↑ HCU Thumb Up
→
↓ HCU Thumb Down
←
P HCU Thumb Re-center

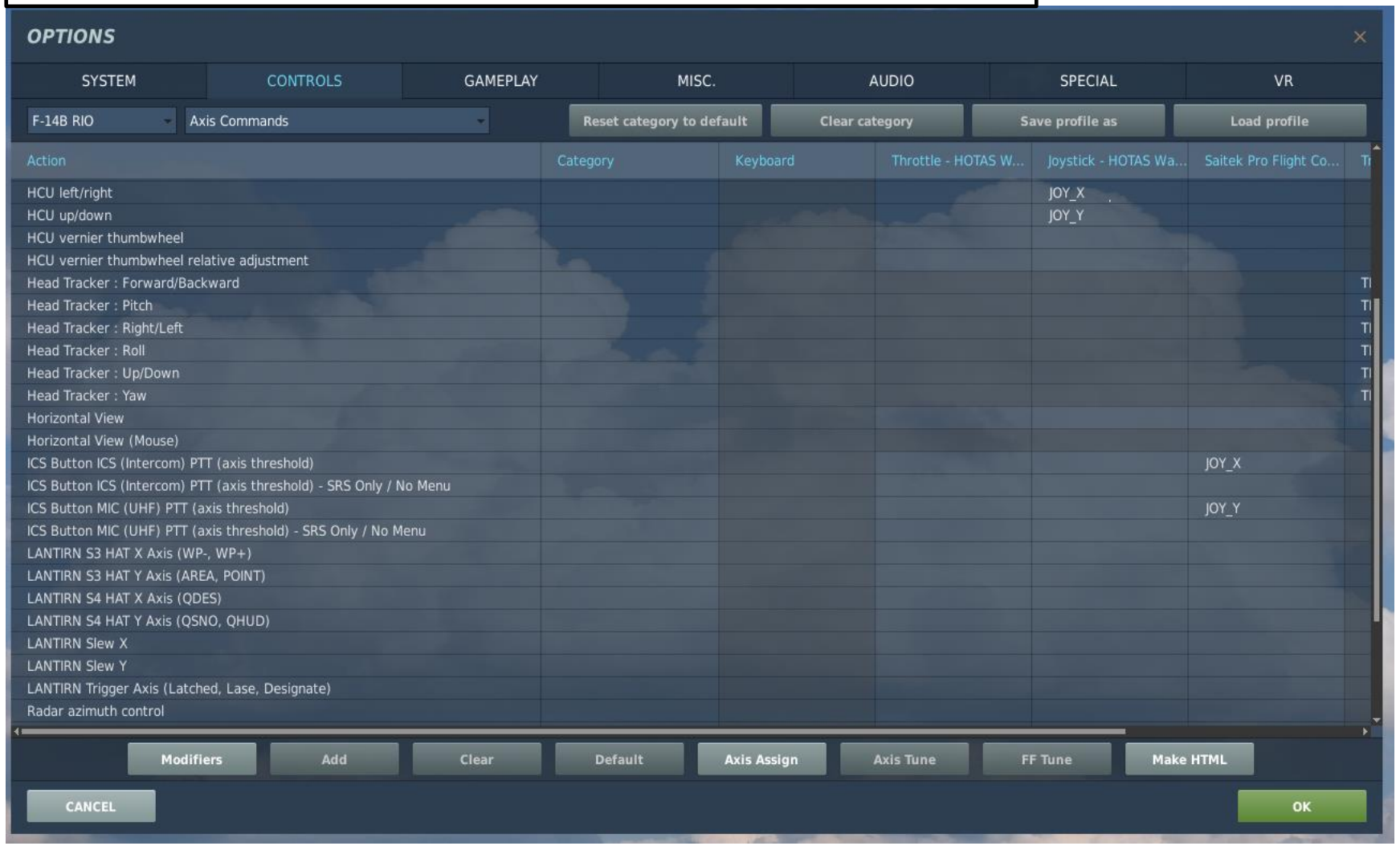
DDD Interrogate Friend or Foe

Paddle used as a modifier to toggle from HCU controls to LANTIRN stick controls

Left Toe Brake (mapped on pedals): ICS Foot Button
Right Toe Brake (mapped on pedals): Microphone Foot Button

1 – MY SENSORS CONTROL SETUP
HCU STICK AXES (RIO)

X axis of the stick is mapped to the HCU left/right axis.
Y axis of the stick is mapped ot the HCU up/down axis.



1 – MY SENSORS CONTROL SETUP
LANTIRN STICK (RIO)

LANTIRN Laser Latched
(Grey button on RHS)

↑ LANTIRN Area Track
→ LANTIRN QWP +
↓ LANTIRN Point Track
← LANTIRN QWP -

↑ LANTIRN S4 Hat Up
→ LANTIRN S4 Hat Right
↓ LANTIRN S4 Hat Down
← LANTIRN S4 Hat Left

LANTIRN Toggle FOV

LANTIRN Trigger Half-Action (First Detent)
LANTIRN Trigger Full-Action (Second Detent)

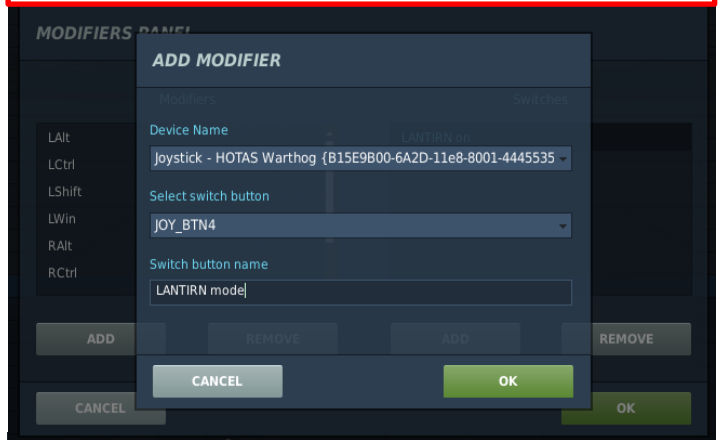
↑ LANTIRN Toggle WHOT/BHOT
→ LANTIRN Slider AGC/MGC
↓ LANTIRN S4 Hat Press Declutter
← LANTIRN Slider laser/focus
P LANTIRN Mode Toggle

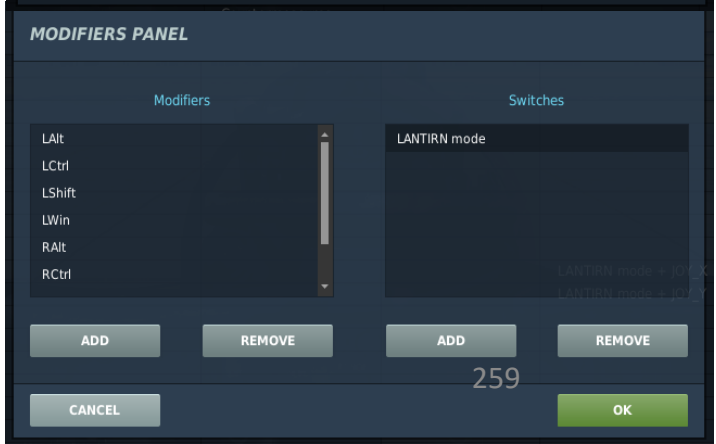
LANTIRN Undesignate



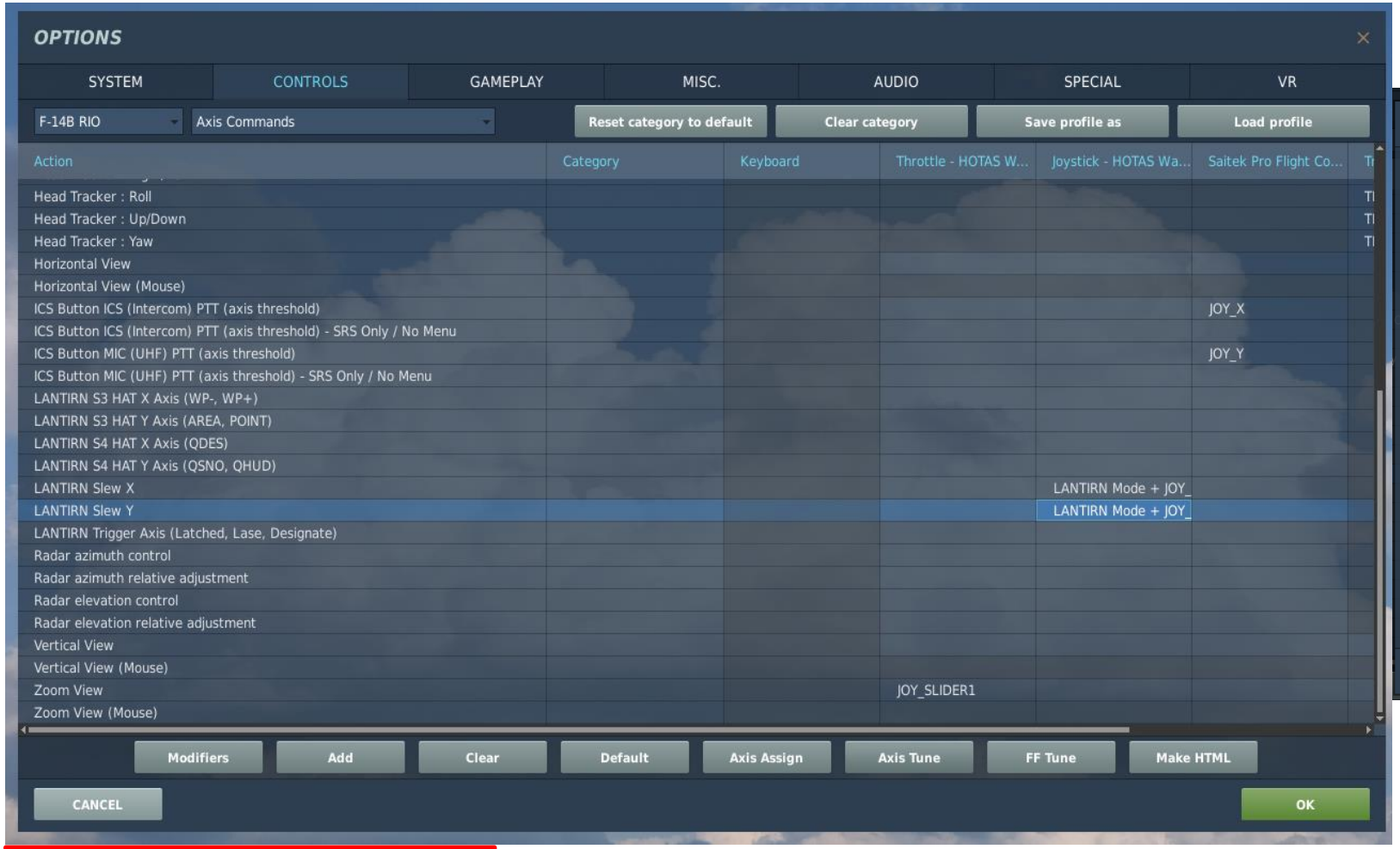
Paddle used as a modifier to toggle from HCU controls to LANTIRN stick controls

IMPORTANT NOTE: Every control in this page uses the "Paddle Lever" modifier.



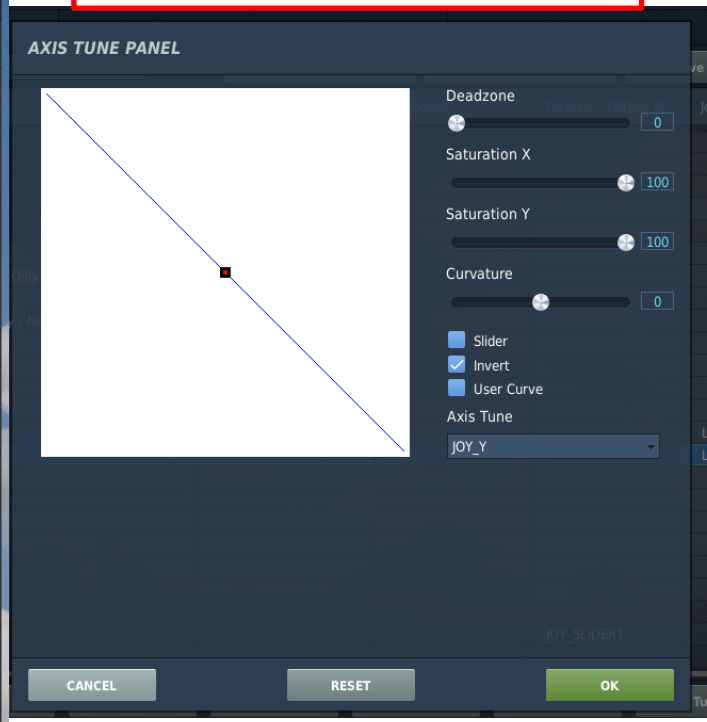


1 – MY SENSORS CONTROL SETUP LANTIRN STICK AXES (RIO)



IMPORTANT NOTE: Every control in this page uses the “Paddle Lever” modifier.

For the LANTIRN Slew Y axis, click on AXIS TUNE and tick the “Invert” box.



2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS



The AWG-9 radar was one of the most revolutionary technological advances back in the days of the Tomcat. While most of you may be familiar with the way the radar display works in a single-seat fighter, a two-seat fighter requires tasks to be separated.

The pilot is mainly responsible for weapons launch, flying the aircraft, finding targets visually or using information forwarded by the RIO. The pilot's situational awareness extends from what he sees to what the TID repeater mode of the HSD can tell him. The pilot can operate in a very limited fashion certain radar close-range ACM (Air Combat Maneuver) modes, but he cannot control the radar by himself.

This is where the RIO comes in. He controls the radar (scanning pattern, azimuth/elevation, mode, etc.) and locks targets for the pilot, which can then be engaged by the pilot once a lock is acquired.





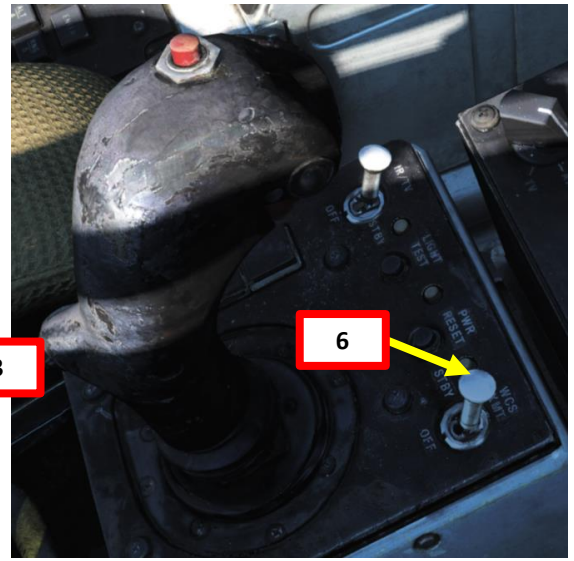
2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

How to power up the radar?

Note: these steps are typically performed while on the ground.

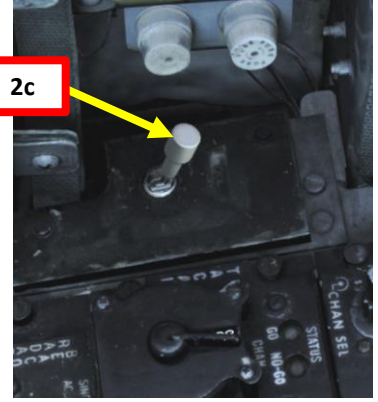
1. Verify that electrical power is available (ground power or engine generators)
2. Communicate with the pilot to know when engines are started and engine bleed air is available. Why? The WCS requires cooling air from the ECS (Environment Control System), which in turn means:
    a) Both engines need to be running (started by the pilot)
    b) The AIR SOURCE selector needs to be set to BOTH ENG in the pilot's cockpit.
    c) The LIQUID COOLING switch needs to be set to FWD in the RIO's cockpit
3. Set WCS (Weapon Control System) Switch – STBY.
4. Wait approx. 40 seconds for the TID (Tactical Awareness Display) and DDD (Detail Data Display) to power on
5. Set Liquid Cooling Switch – ON (FWD). This will start the AWG-9 radar cooling process.
6. Once the three-minute warm-up period for the radar is done, set WCS (Weapon Control System) Switch – WCS XMT (Transmit)

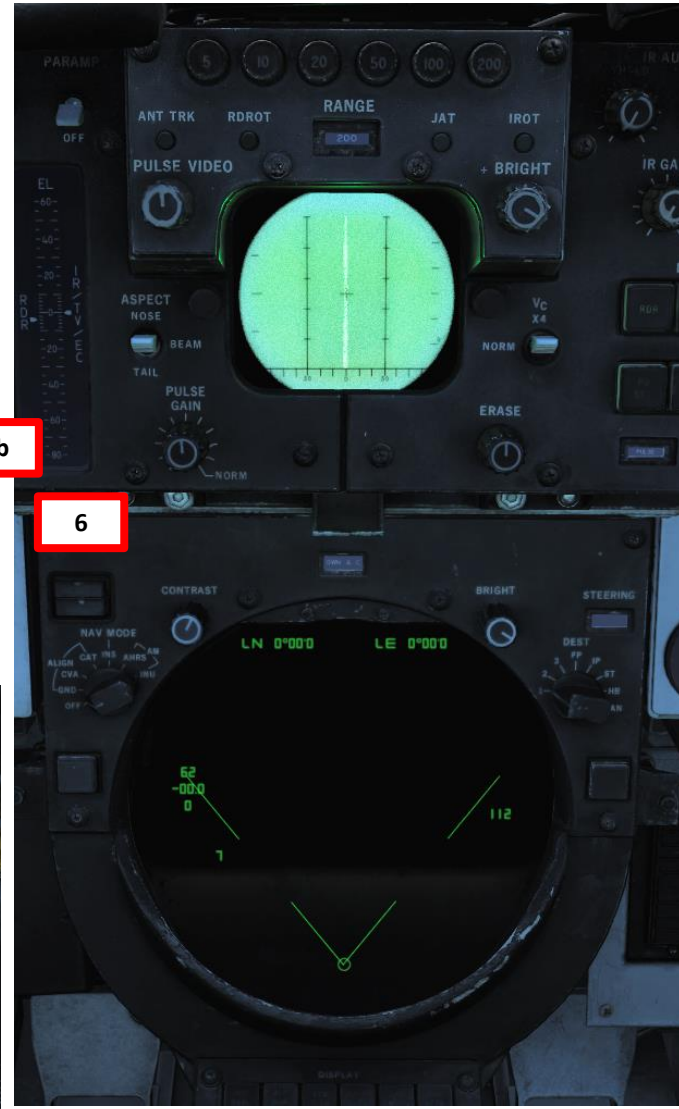








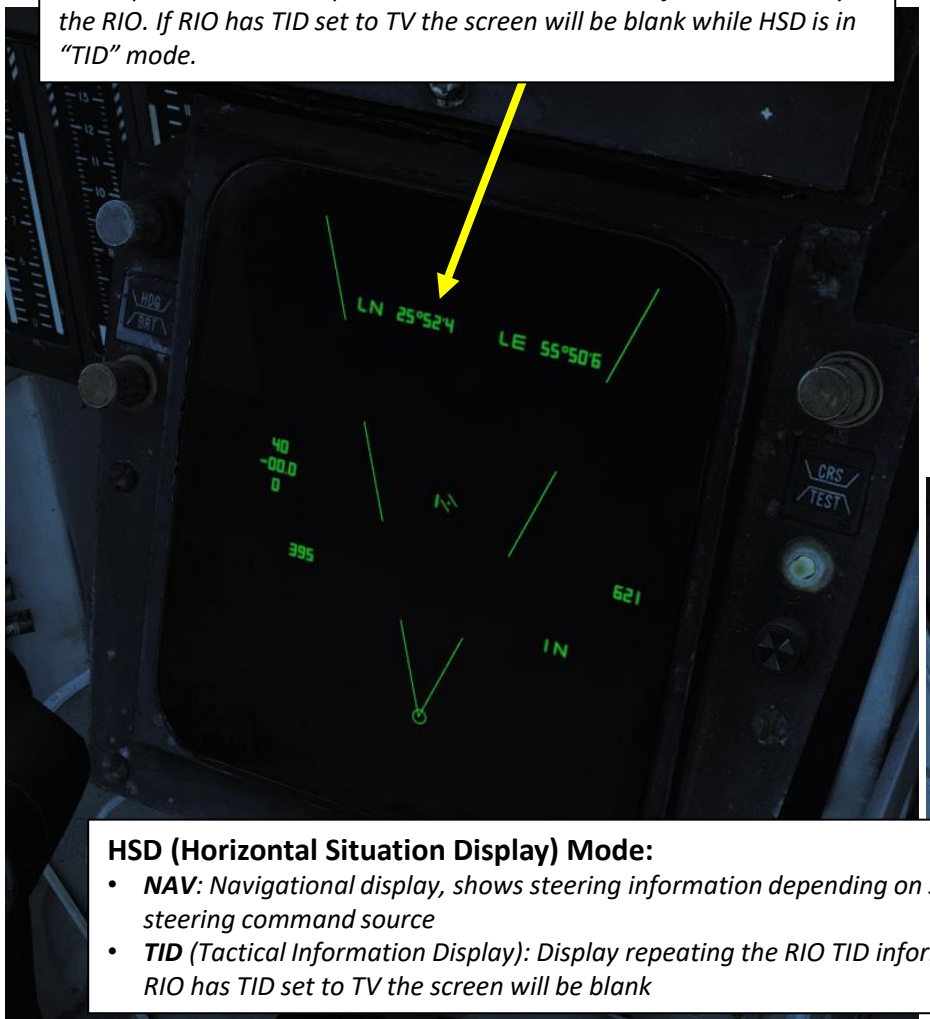




2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

PILOT SEAT

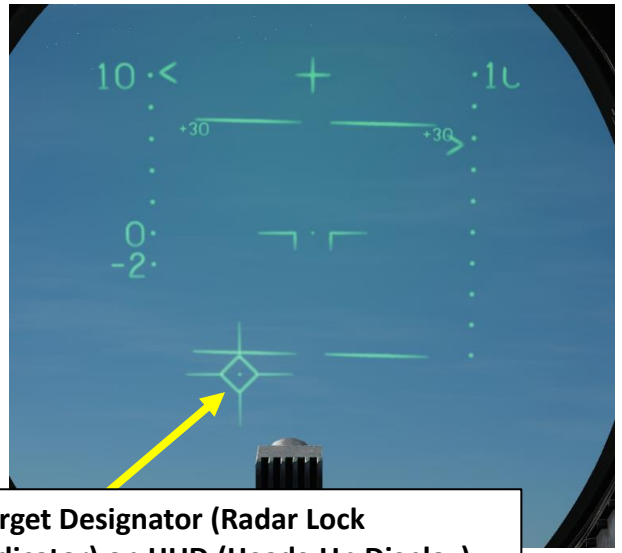
HSD (Horizontal Situation Indicator) used as a TID (Tactical Information Display) Repeater in the front cockpit.
This repeater shows the pilot the TID, but the TID itself is controlled by the RIO. If RIO has TID set to TV the screen will be blank while HSD is in "TID" mode.



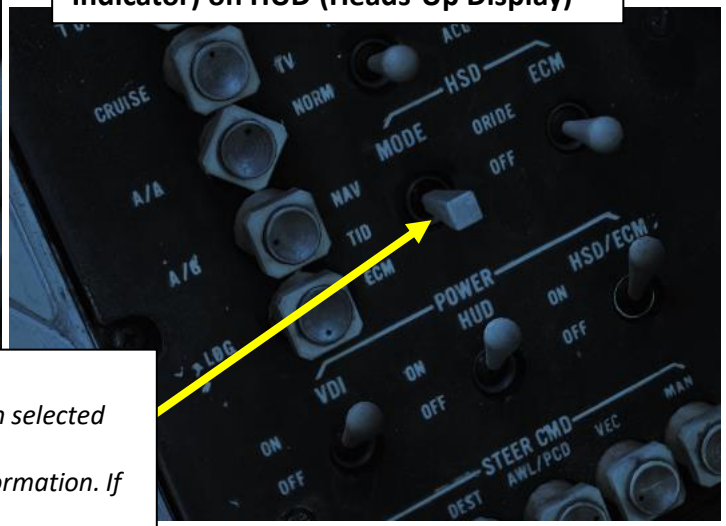
HSD (Horizontal Situation Display) Mode:
- ***NAV****: Navigational display, shows steering information depending on selected steering command source*
- ***TID*** *(Tactical Information Display): Display repeating the RIO TID information. If RIO has TID set to TV the screen will be blank*

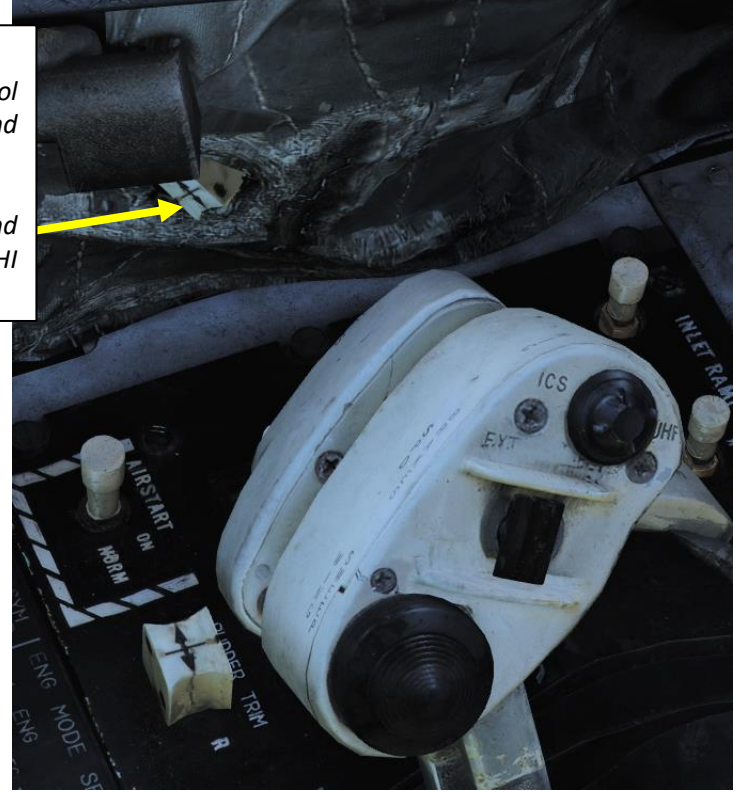
Target Designate Switch
Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

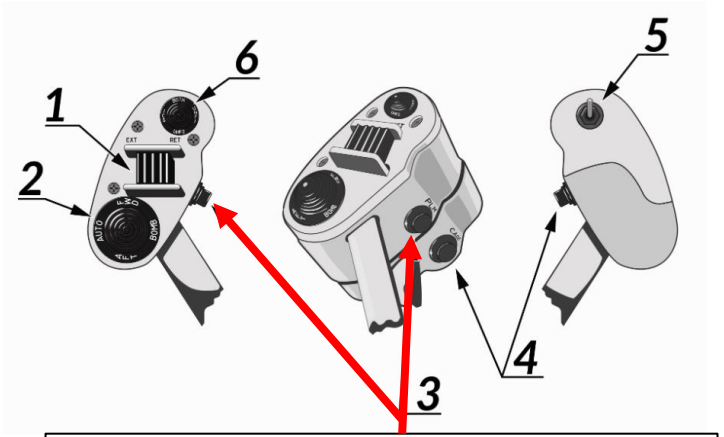
In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.



Target Designator (Radar Lock Indicator) on HUD (Heads-Up Display)





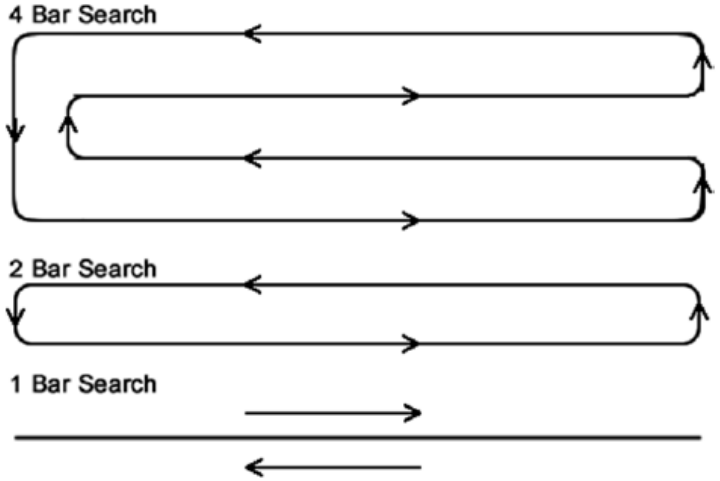


PLM Button
Button used to command pilot lockon mode of AWG-9. Also used to disengage autopilot while ACL.

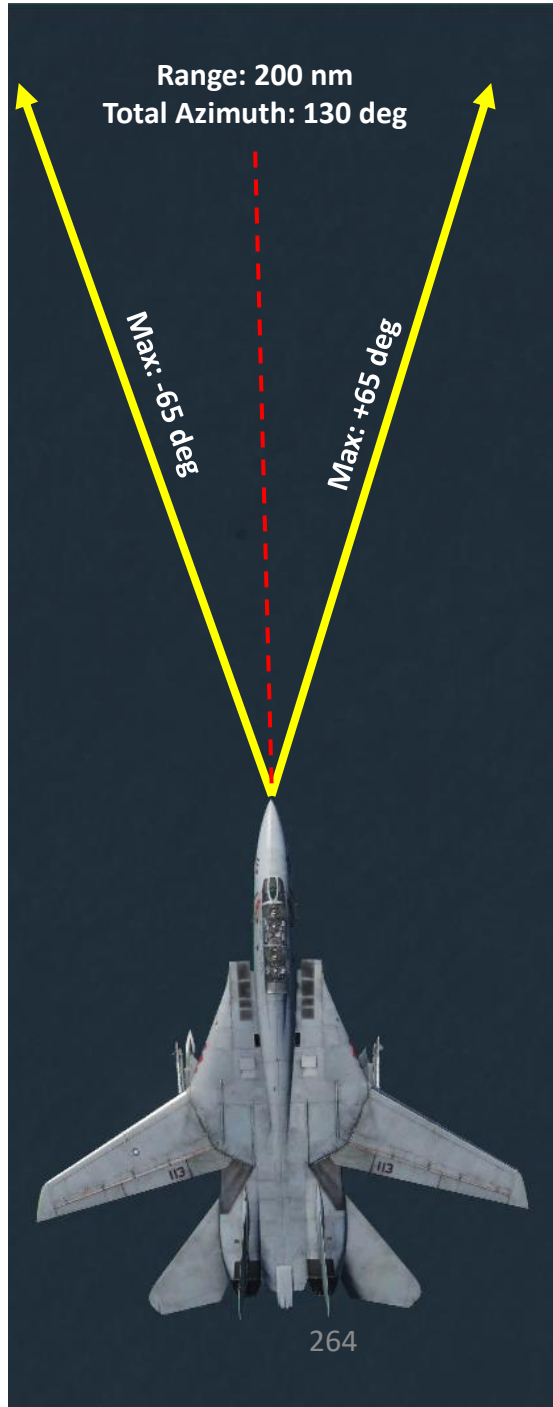
2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

The F-14's radar has a range of 200 nautical miles, a horizontal arc of 130 degrees and a variable vertical arc. You can control the radar scan pattern (1, 2, 4 or 8 bars), which will give you a narrower or wider scanning area.





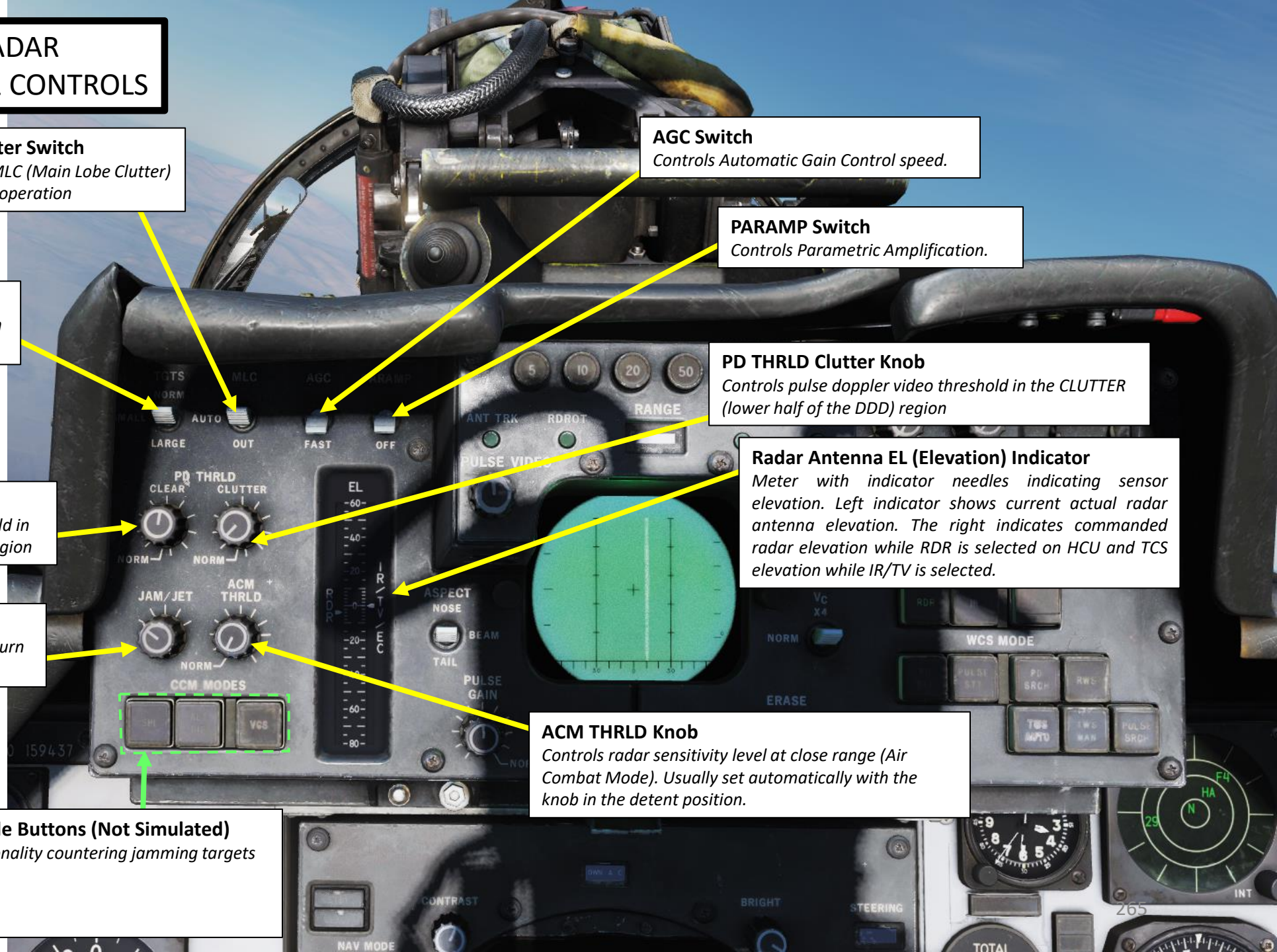






2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT



MLC Filter Switch
Selects MLC (Main Lobe Clutter) mode of operation

AGC Switch
Controls Automatic Gain Control speed.

PARAMP Switch
Controls Parametric Amplification.

TGTS Switch
Selects target size for missile launch zones and WCS track calculations

PD THRLD Clutter Knob
Controls pulse doppler video threshold in the CLUTTER (lower half of the DDD) region

Radar Antenna EL (Elevation) Indicator
Meter with indicator needles indicating sensor elevation. Left indicator shows current actual radar antenna elevation. The right indicates commanded radar elevation while RDR is selected on HCU and TCS elevation while IR/TV is selected.

PD THRLD Clear Knob
Controls pulse doppler video threshold in the CLEAR (upper half of the DDD) region

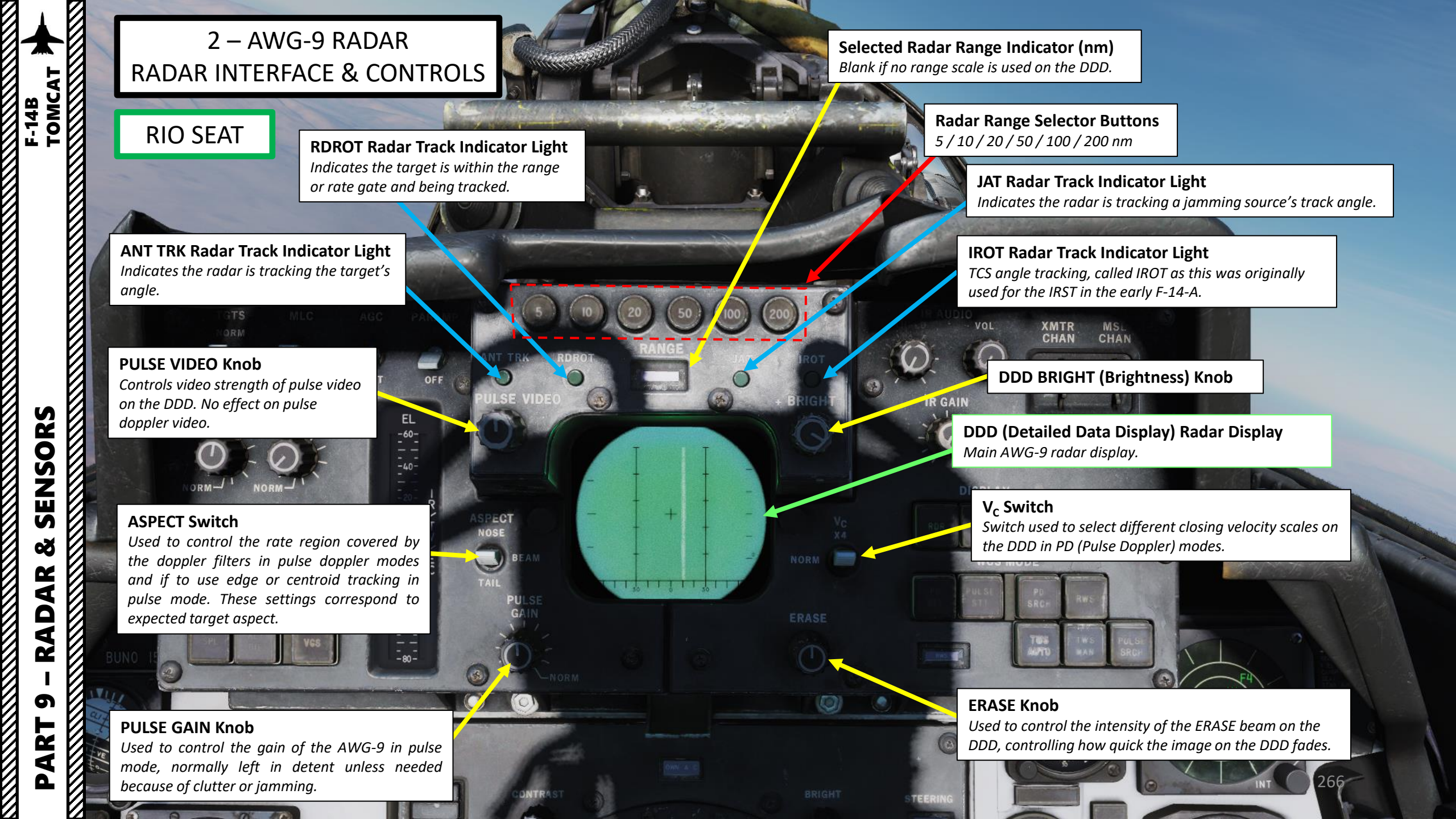
JAM/JET Knob
Sets threshold at which a radar return is considered a jamming target.

ACM THRLD Knob
Controls radar sensitivity level at close range (Air Combat Mode). Usually set automatically with the knob in the detent position.

CCM (Countermeasures) Mode Buttons (Not Simulated)
Buttons used to set AWG-9 functionality countering jamming targets
- ***SPL***
- ***ALT DIFF***
- ***VGS***

2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT



Selected Radar Range Indicator (nm)
Blank if no range scale is used on the DDD.

Radar Range Selector Buttons
5 / 10 / 20 / 50 / 100 / 200 nm

RDROT Radar Track Indicator Light
Indicates the target is within the range or rate gate and being tracked.

JAT Radar Track Indicator Light
Indicates the radar is tracking a jamming source's track angle.

ANT TRK Radar Track Indicator Light
Indicates the radar is tracking the target's angle.

IROT Radar Track Indicator Light
TCS angle tracking, called IROT as this was originally used for the IRST in the early F-14-A.

PULSE VIDEO Knob
Controls video strength of pulse video on the DDD. No effect on pulse doppler video.

DDD BRIGHT (Brightness) Knob

DDD (Detailed Data Display) Radar Display
Main AWG-9 radar display.

V_C Switch
Switch used to select different closing velocity scales on the DDD in PD (Pulse Doppler) modes.

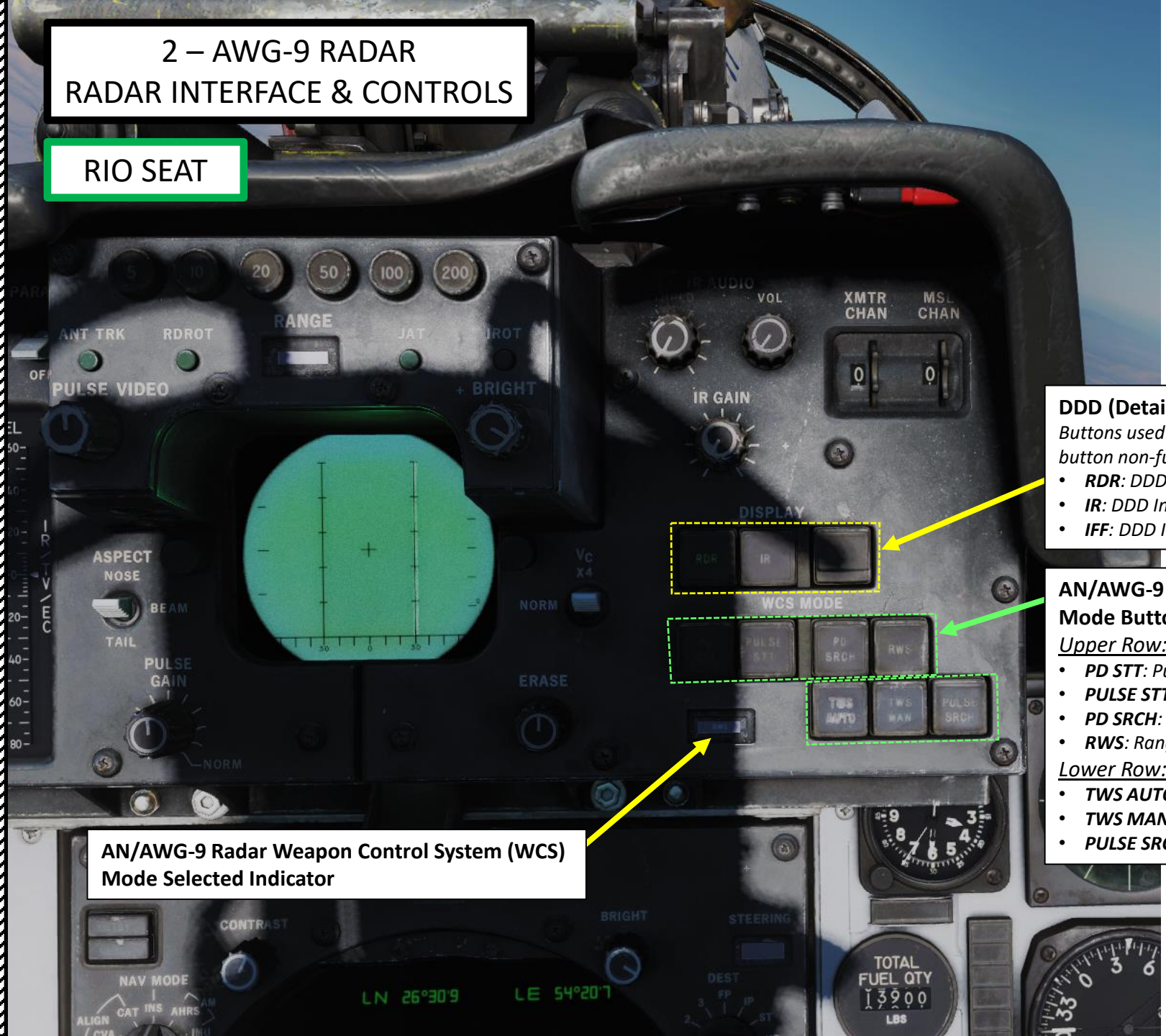
ASPECT Switch
Used to control the rate region covered by the doppler filters in pulse doppler modes and if to use edge or centroid tracking in pulse mode. These settings correspond to expected target aspect.

ERASE Knob
Used to control the intensity of the ERASE beam on the DDD, controlling how quick the image on the DDD fades.

PULSE GAIN Knob
Used to control the gain of the AWG-9 in pulse mode, normally left in detent unless needed because of clutter or jamming.

2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT



DDD (Detail Data Display) Display Mode Buttons
Buttons used to control what to display on the DDD. IR button non-functional with TCS (Television Camera Set).
- ***RDR**: DDD Radar Mode Button*
- ***IR**: DDD Infrared Mode Button*
- ***IFF**: DDD Interrogate Friend-or-Foe Button*

AN/AWG-9 Radar Weapon Control System (WCS) Mode Buttons
Upper Row:
- ***PD STT**: Pulse Doppler Single Target Track*
- ***PULSE STT**: Pulse Single Target Track*
- ***PD SRCH**: Pulse Doppler Search*
- ***RWS**: Range While Scan*

Lower Row:
- ***TWS AUTO**: Track While Scan (Automatic)*
- ***TWS MAN**: Track While Scan (Manual)*
- ***PULSE SRCH**: Pulse Search*

AN/AWG-9 Radar Weapon Control System (WCS) Mode Selected Indicator

2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT

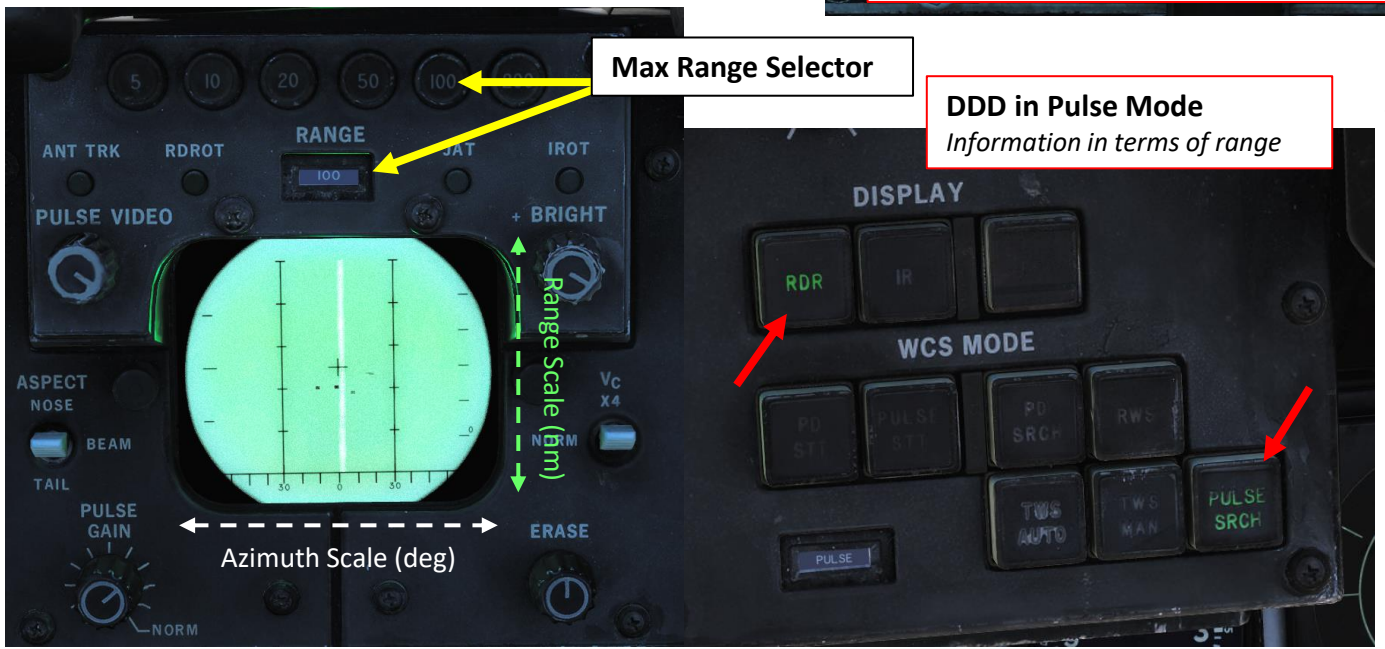
The F-14's radar displays contact data on the **"DDD" (Detail Data Display).** While modern radars often display information in a top-down view, the DDD will display information differently based on what radar mode is selected.

If using a **"Pulse Doppler" operation mode (RWS, TWS, PD Search), DDD information will be displayed in terms of contact closure speed**, not in terms of range. Pulse Doppler modes have two blind spots: the "Zero Doppler Filter Line" (small speed differential between the target and you) and the "Notch Filter Line" (target is flanking or notching you, which is flying perpendicular to you).



DDD in Pulse Doppler (PD) Search Mode
Information in terms of closure speed

Zero Doppler Filter Line
This imaginary line is a blind spot (+/- 100 kts around your own speed moving away from you). Targets that are matching your speed will not be displayed.



DDD in Pulse Mode
Information in terms of range

If using a **"Pulse" operation mode (with no Doppler filter applied), DDD information will be displayed in terms of contact range**.

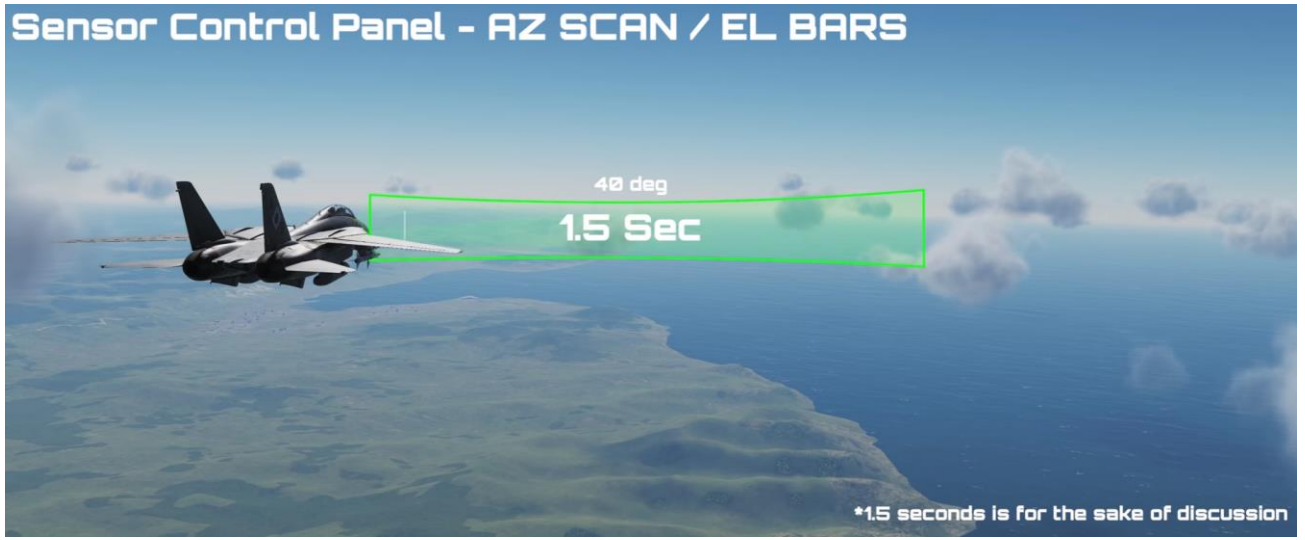
2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT

The Sensor Control Panel allows you to control radar elevation scan bars and azimuth. Keep in mind using more bars and a greater azimuth range means a better coverage, but also a much longer scanning refresh time.



Radar Antenna EL (Elevation) Indicator
Meter with indicator needles indicating sensor elevation. Left indicator shows current actual radar antenna elevation. The right indicates commanded radar elevation while RDR is selected on HCU and TCS elevation while IR/TV is selected.

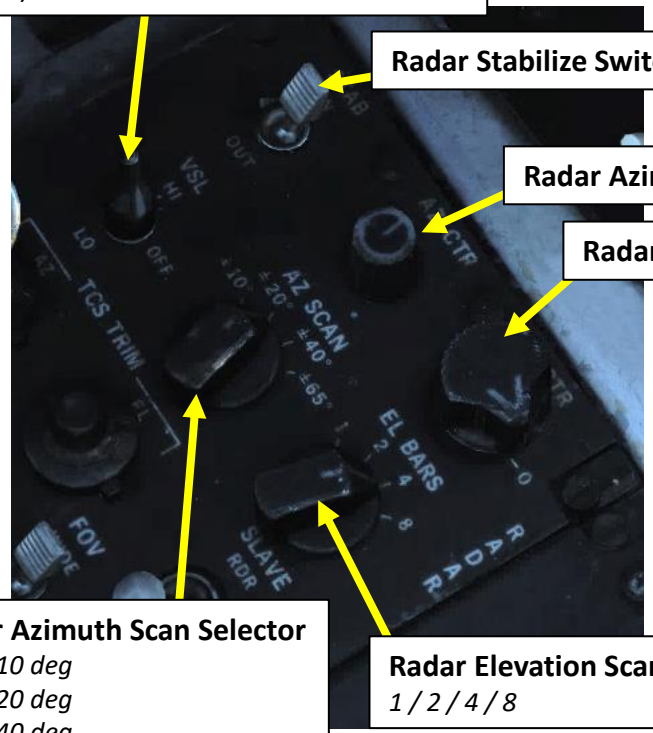


Radar VSL (Vertical Scan Lockon) Switch
HI / OFF / LOW

Radar Stabilize Switch

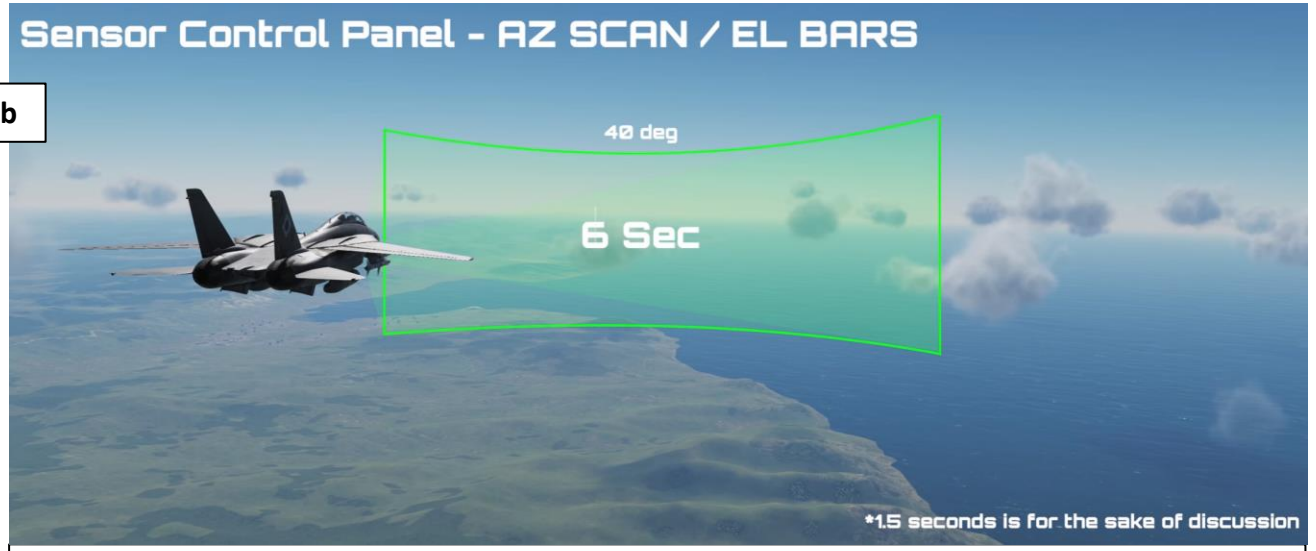
Radar Azimuth Center Knob

Radar Elevation Center Knob



Radar Azimuth Scan Selector
- *+/-10 deg*
- *+/-20 deg*
- *+/-40 deg*
- *+/-65 deg*

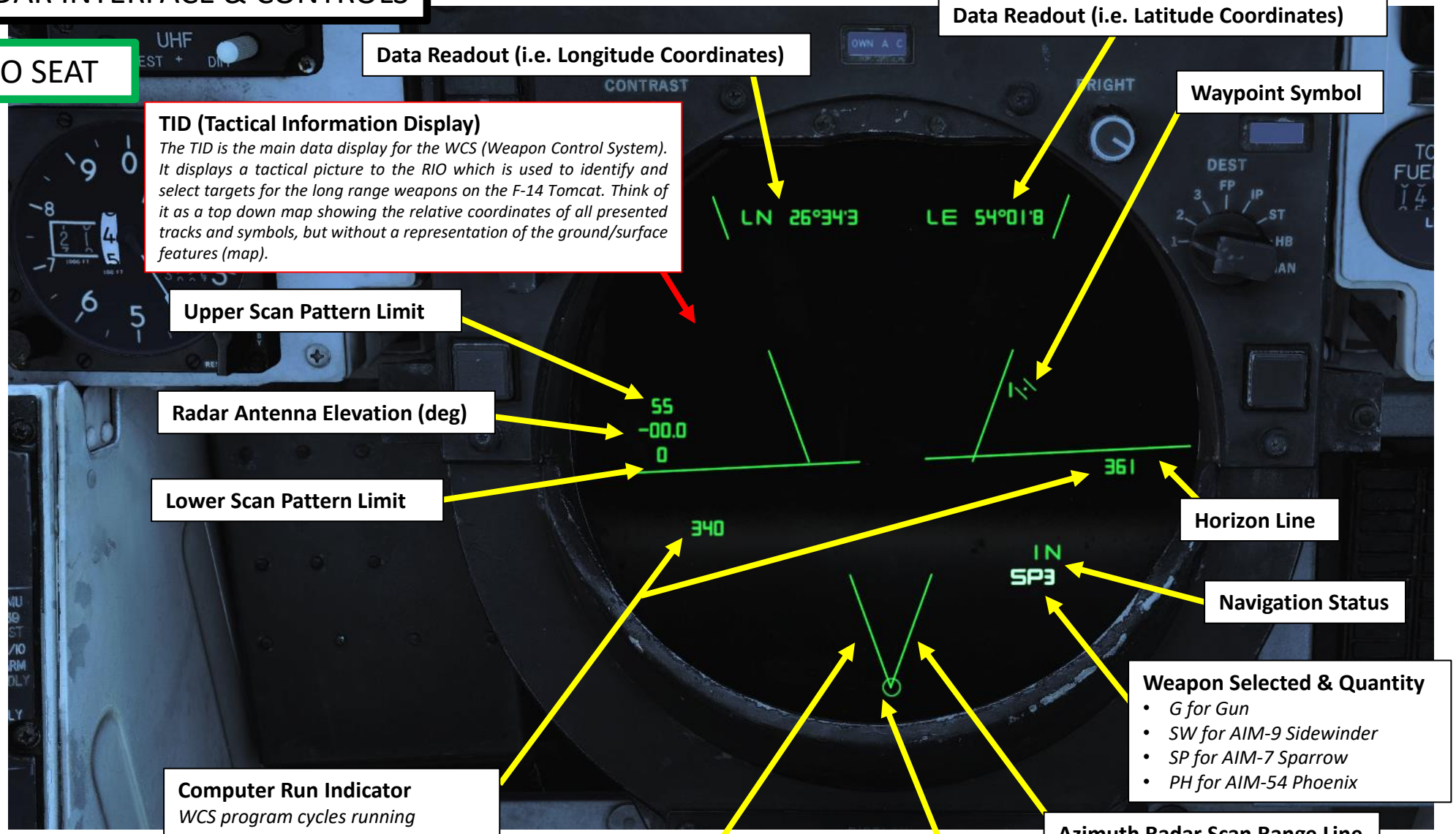
Radar Elevation Scan Bars Selector
1 / 2 / 4 / 8



Effect of elevation bars on scanning time (timings are hypothetical and not based on actual measured timings). Reference: https://youtu.be/r4-Dd4ss2Rc (Jabbers)

2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT



TID (Tactical Information Display)
The TID is the main data display for the WCS (Weapon Control System). It displays a tactical picture to the RIO which is used to identify and select targets for the long range weapons on the F-14 Tomcat. Think of it as a top down map showing the relative coordinates of all presented tracks and symbols, but without a representation of the ground/surface features (map).

Data Readout (i.e. Longitude Coordinates)

Data Readout (i.e. Latitude Coordinates)

Waypoint Symbol

Upper Scan Pattern Limit

Radar Antenna Elevation (deg)

Lower Scan Pattern Limit

Horizon Line

Navigation Status

Weapon Selected & Quantity
- *G for Gun*
- *SW for AIM-9 Sidewinder*
- *SP for AIM-7 Sparrow*
- *PH for AIM-54 Phoenix*

Computer Run Indicator
WCS program cycles running

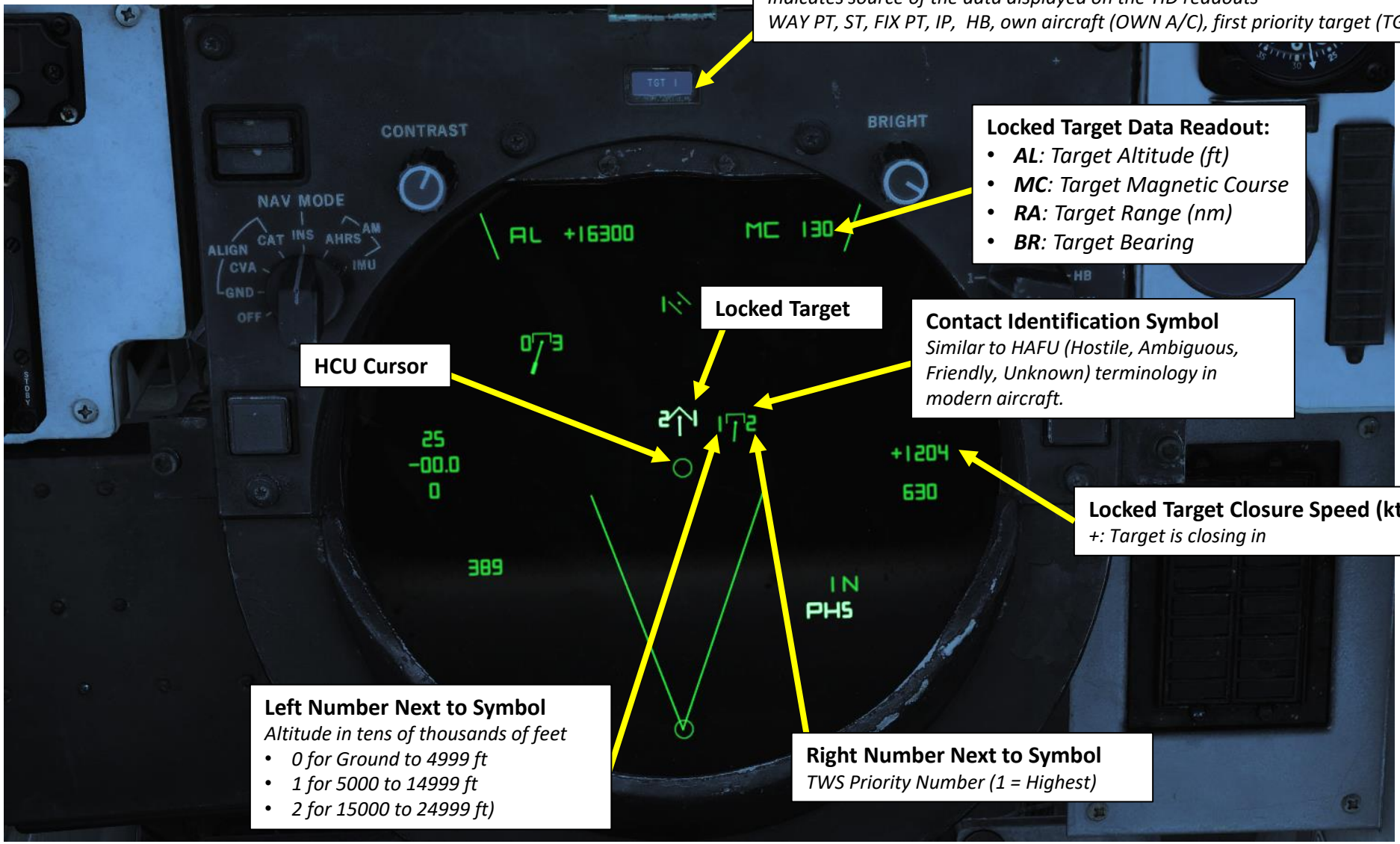
Azimuth Radar Scan Range Line

Azimuth Radar Scan Range Line

Aircraft Position

2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT



Data Readout Indicator
Indicates source of the data displayed on the TID readouts
WAY PT, ST, FIX PT, IP, HB, own aircraft (OWN A/C), first priority target (TGT 1) and SYMBOL

Locked Target Data Readout:
- ***AL**: Target Altitude (ft)*
- ***MC**: Target Magnetic Course*
- ***RA**: Target Range (nm)*
- ***BR**: Target Bearing*

Locked Target

Contact Identification Symbol
Similar to HAFU (Hostile, Ambiguous, Friendly, Unknown) terminology in modern aircraft.

HCU Cursor

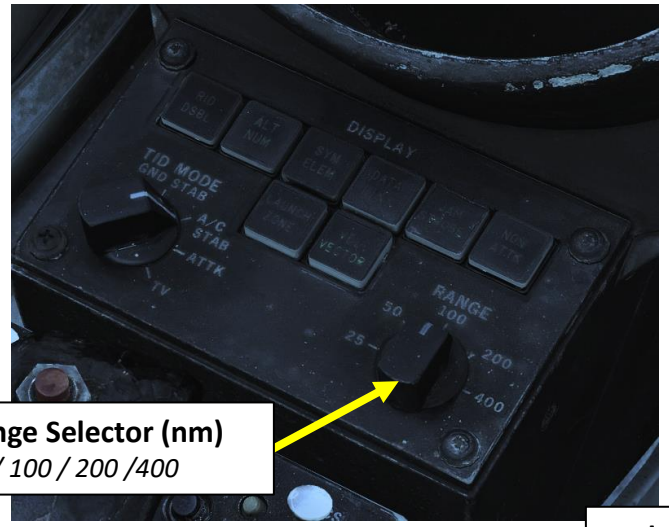
Locked Target Closure Speed (kts)
+: Target is closing in

Left Number Next to Symbol
Altitude in tens of thousands of feet
- *0 for Ground to 4999 ft*
- *1 for 5000 to 14999 ft*
- *2 for 15000 to 24999 ft)*

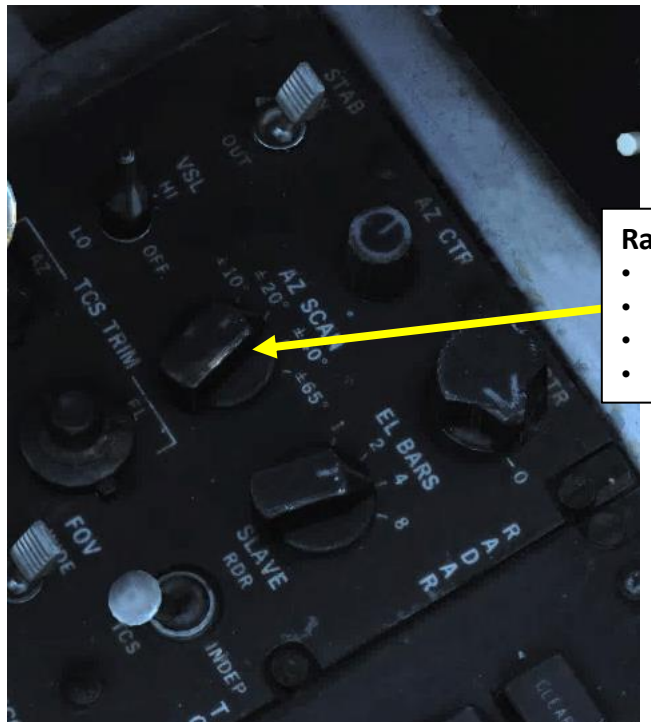
Right Number Next to Symbol
TWS Priority Number (1 = Highest)

2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

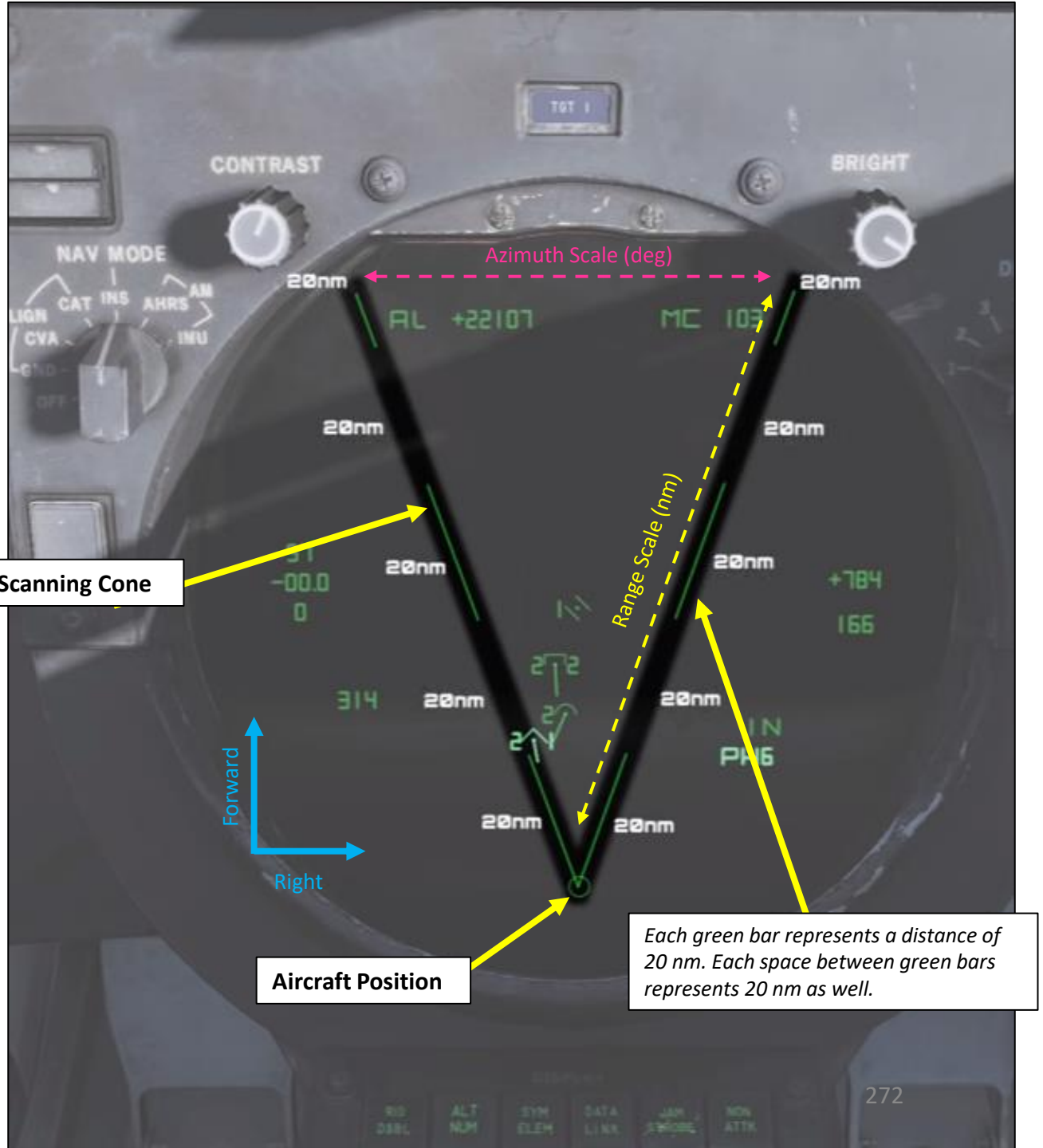
RIO SEAT



TID Range Selector (nm)
25 / 50 / 100 / 200 /400



Radar Azimuth Scan Selector
- *+/-10 deg*
- *+/-20 deg*
- *+/-40 deg*
- *+/-65 deg*



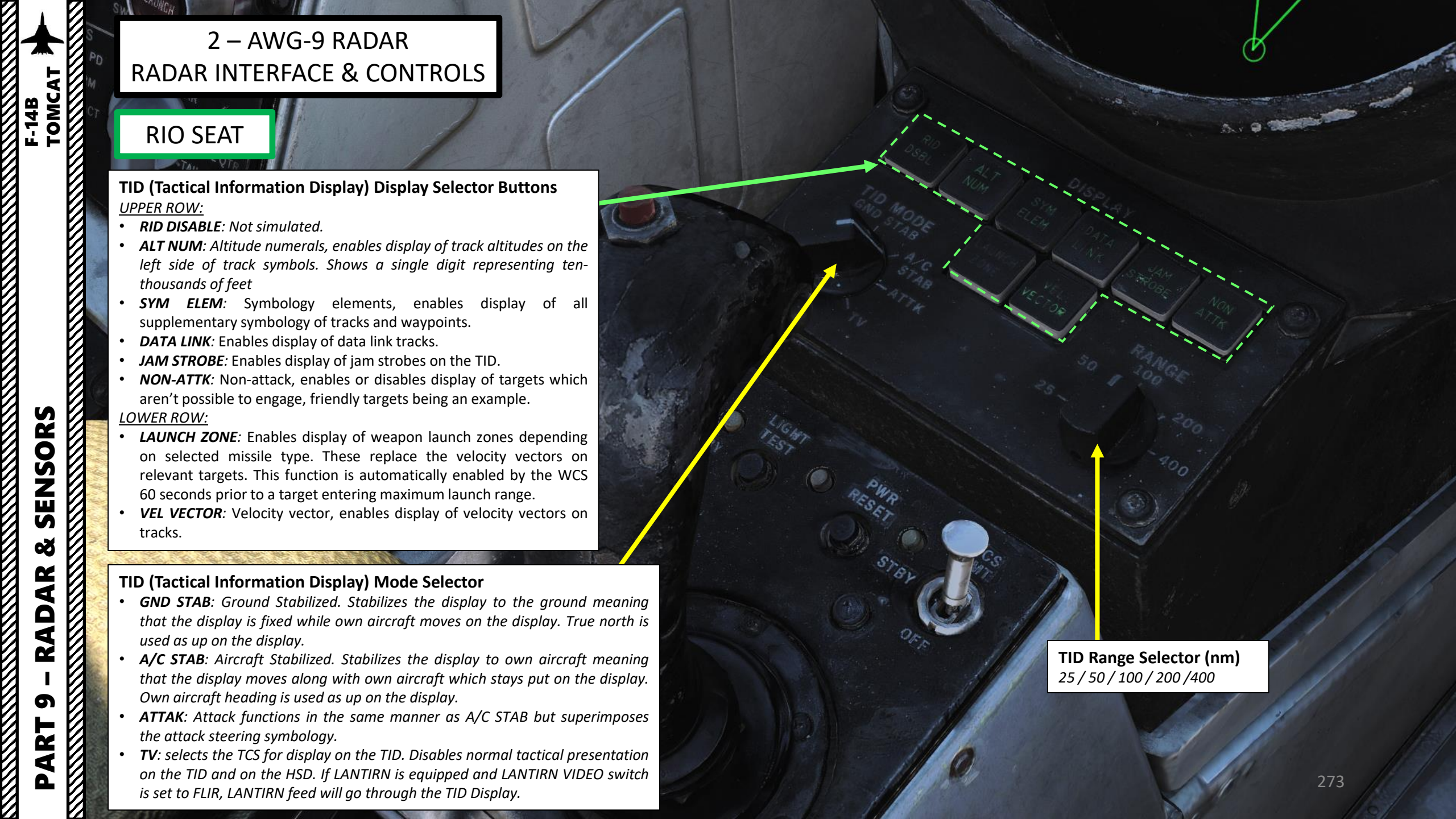
Radar Scanning Cone

Aircraft Position

Each green bar represents a distance of 20 nm. Each space between green bars represents 20 nm as well.

2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT



TID (Tactical Information Display) Display Selector Buttons

UPPER ROW:

- ***RID DISABLE**: Not simulated.*
- ***ALT NUM**: Altitude numerals, enables display of track altitudes on the left side of track symbols. Shows a single digit representing ten-thousands of feet*
- ***SYM ELEM**:* Symbology elements, enables display of all supplementary symbology of tracks and waypoints.
- ***DATA LINK**:* Enables display of data link tracks.
- ***JAM STROBE**:* Enables display of jam strobes on the TID.
- ***NON-ATTK**:* Non-attack, enables or disables display of targets which aren't possible to engage, friendly targets being an example.

LOWER ROW:

- ***LAUNCH ZONE**:* Enables display of weapon launch zones depending on selected missile type. These replace the velocity vectors on relevant targets. This function is automatically enabled by the WCS 60 seconds prior to a target entering maximum launch range.
- ***VEL VECTOR**:* Velocity vector, enables display of velocity vectors on tracks.

TID (Tactical Information Display) Mode Selector

- ***GND STAB**: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.*
- ***A/C STAB**: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.*
- ***ATTAK**: Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.*
- ***TV**: selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD. If LANTIRN is equipped and LANTIRN VIDEO switch is set to FLIR, LANTIRN feed will go through the TID Display.*

TID Range Selector (nm)
25 / 50 / 100 / 200 /400

2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT

WCS (Weapon Control System) Switch
- ***STBY*** *- turns on power to the WCS and begins radar warmup without transmission.*
- ***XMT*** *- enables radar transmission if radar is ready. Display warmup time is 30 seconds, radar warmup is 3 minutes.*
- ***OFF***

HCU (Hand Control Unit)
Main Radar & TCS (Television Camera Set) Control Stick

HCU Trigger

HCU Power Reset Button

HCU Light Test Button

HCU OFFSET Button
Used to offset TID to hooked location on the display

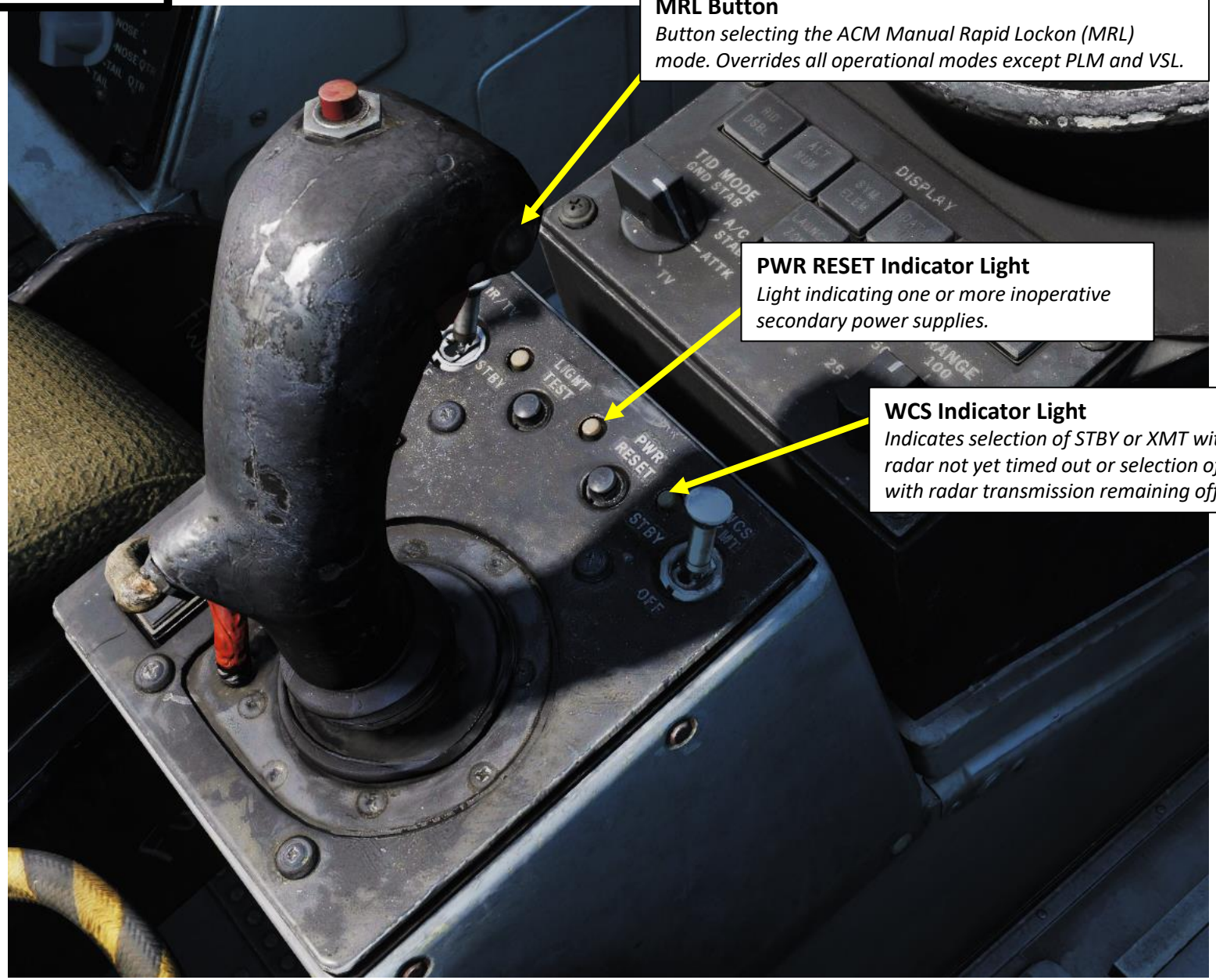
Radar Antenna Elevation Thumbwheel

HCU (Hand Control Unit) Mode Selector Buttons

- ***IR/TV Mode*** *- Selects control of TCS (Television Camera Set) azimuth, elevation and tracking. Enables display of TCS elevation on right elevation indicator on DDD.*
- ***RADAR Mode*** *- Selects control of radar antenna for STT(Single-Target Track) lock-on and return to search if already in STT. Enables display of currently commanded radar antenna elevation on right elevation indicator on DDD.*
- ***DDD Mode*** *- Selects control of DDD (Detailed Data Display) cursor used to mark a geographical position while in pulse radar mode.*
- ***TID Mode*** *- Selects control of TID cursor used to hook (select) symbols on the Tactical Information Display.*

2 – AWG-9 RADAR
RADAR INTERFACE & CONTROLS

RIO SEAT



MRL Button
Button selecting the ACM Manual Rapid Lockon (MRL) mode. Overrides all operational modes except PLM and VSL.

PWR RESET Indicator Light
Light indicating one or more inoperative secondary power supplies.

WCS Indicator Light
Indicates selection of STBY or XMT with the radar not yet timed out or selection of XMT with radar transmission remaining off.

2 – AWG-9 RADAR
RADAR MAIN MODES

Radar Operation Mode (Red: Pilot-Controlled / Green: RIO-Controlled)			Function	Weapons capability	Detection-range
BVR (Beyond Visual Range) (more than 10 nm)	Pulse	**Pulse Search**	Medium range search and detection, secondary air-to-ground.	Boresight missiles.	60 nm
		Pulse STT (Single Target Track)	Short to medium range single target track and missile launch.	Gun and missiles, AIM-7 in CW and AIM-54 in active launch.	50 nm
	Pulse Doppler	**Pulse Doppler Search**	Long range search and detection.	Boresight missiles.	110 nm
		RWS (Range While Search)	Long range search, detection and ranging.		90 nm
		TWS (Track While Search)	Long range search, detection, multiple target track and missile guidance.	AIM-54, multiple target capability.	90 nm
		Pulse Doppler STT (Single Target Track)	Long range single target track and missile guidance.	Gun and all missiles. AIM-7 in PD and CW and AIM-54 in PD and active.	90 nm
WVR (Within Visual Range) (less than 10 nm)	ACM (Air Combat Mode)	**PLM (Pilot Lockon Mode)**	Short range search and detection.	Gun and all missiles	5 nm
		VSL High/Low (Vertical Scan Lockon)	Short range search and detection.	Gun and all missiles. VSL High or VSL Low mode is set by the RIO, but lock is performed by the pilot.	5 nm
		PAL (Pilot Automatic Lockon)	Short range search and detection.	Gun and all missiles	15 nm
		MRL (Manual Rapid Lockon)	Short range search and detection.	Gun and all missiles. Rarely used since difficult to relate what you are seeing on the DDD to what is actually outside the canopy.	5 nm

2 – AWG-9 RADAR
RADAR MAIN MODES

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

Pulse modes:

- In the pulse mode of operation the AN/AWG-9 does not use pulse doppler filtering which means that it can be used to detect targets at all aspects and also be used for rudimentary ground mapping. On the pro side this means that the radar in this mode cannot be notched as it does not need to have a relative speed to register the target. The downside however is that the radar does not have an easy way of differentiate between unwanted ground reflections and real targets meaning that aircraft can hide in the ground clutter near the ground. Because of this and the increased difficulty from trying to differentiate real targets from the general background noise without doppler filtering means that the range in the pulse modes are less than in the pulse doppler modes.
- The radar has two pulse modes, pulse search and pulse single target track (P STT).
- Pulse mode does not show anything on the TID, only on the DDD. TID only shows datalink contacts and waypoints.

Pulse Doppler modes**:**

- In pulse doppler mode the AN/AWG-9 uses doppler filters to filter out unwanted returns, enhancing target detection and thus increasing detection range. The pros of this mode being that, as said, targets can be detected at greater ranges, ground returns mostly eliminated and missile guidance commands be sent to AIM-7 and AIM-54 missiles. The AIM-54 both in TWS and STT and the AIM-7 in STT only. The biggest con of this mode being that it is susceptible to notching as a target returning zero relative speed will be filtered out.
- The pulse doppler modes of the AN/AWG-9 are, pulse doppler search, range while scan, track while scan and pulse doppler STT. The three search modes have a common DDD display, the main difference being that pulse doppler search has a slightly better range as the other two modes need to process FM-ranging to enable range indication of tracked targets.

ACM modes**:**

- The AN/AWG-9 has three distinct ACM acquisition modes. Pilot lockon mode (PLM), vertical scan lockon (VSL) and manual rapid lockon (MRL).
- The ACM modes are listed in priority order, the different modes overriding other modes lower in the prioritization. This means that PLM always overrides VSL and lower modes and VSL overrides PAL and lower modes but not PLM and so on.
- All of the modes can be exited by the RIO selecting half-action and release on the HCU except PLM which will be in effect until the pilot releases the PLM button.

2 – AWG-9 RADAR
PULSE MODE – PULSE SEARCH

In the pulse mode of operation, the AN/AWG-9 does not use pulse doppler filtering which means that it can be used to detect targets at all aspects and also be used for rudimentary ground mapping. On the pro side this means that the radar in this mode cannot be notched as it does not need to have a relative speed to register the target.

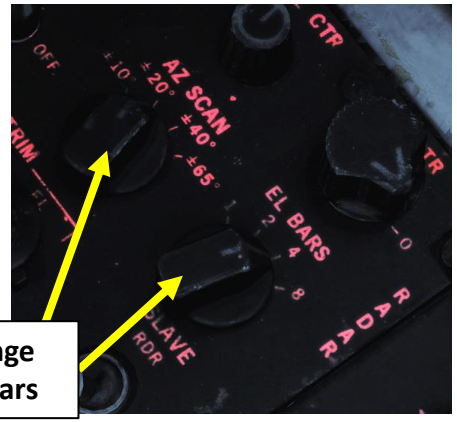
The downside however is that the radar does not have an easy way of differentiate between unwanted ground reflections and real targets meaning that aircraft can hide in the ground clutter near the ground. Because of this and the increased difficulty from trying to differentiate real targets from the general background noise without doppler filtering means that the range in the pulse modes are less than in the pulse doppler modes.

In the pulse search mode, the display shows only radar returns and a visual representation of the radar sweep and erase sweep. The screen shows range vs azimuth in this mode. This mode cannot guide the AIM-54 (limited to 20 nm). It also does not show information on TID. Pulse can be useful if the target is notching us and we want to keep track of it.

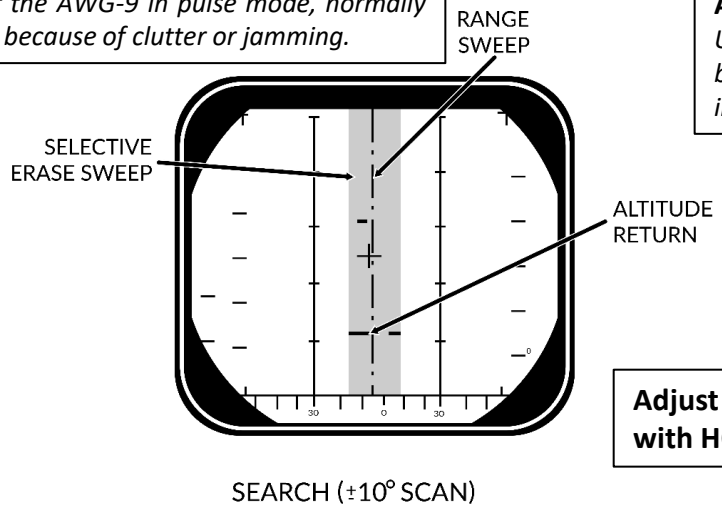


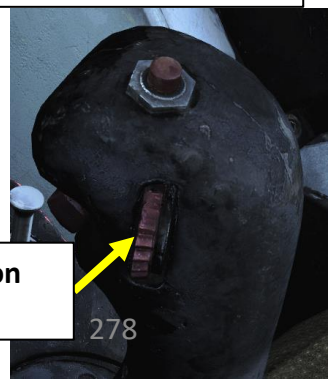
Adjust PULSE GAIN Knob
Used to control the gain of the AWG-9 in pulse mode, normally left in detent unless needed because of clutter or jamming.

Adjust ERASE Knob
Used to control the intensity of the ERASE beam on the DDD, controlling how quick the image on the DDD fades.



Set Azimuth Scan Range (deg) and Elevation Bars





Adjust antenna elevation with HCU thumbwheel

2 – AWG-9 RADAR
PULSE MODE – PULSE STT LOCK

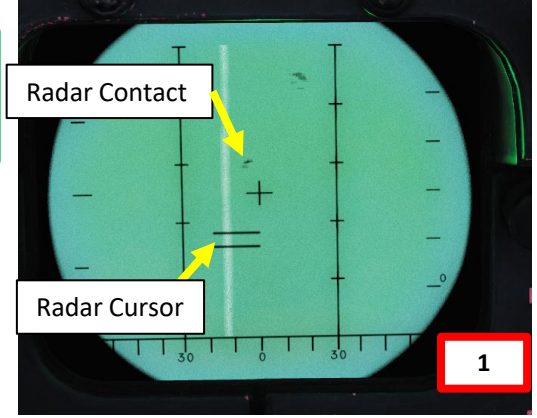
Pulse STT is used to track a single target, like pulse search mode it is not susceptible to notching but it is to ground clutter. The fact that the STT modes use gates to track the target, in this case range gates, means that it is less susceptible to ground clutter but a target close enough to the ground that the ground return enters the range gates would be likely to shake the lock.

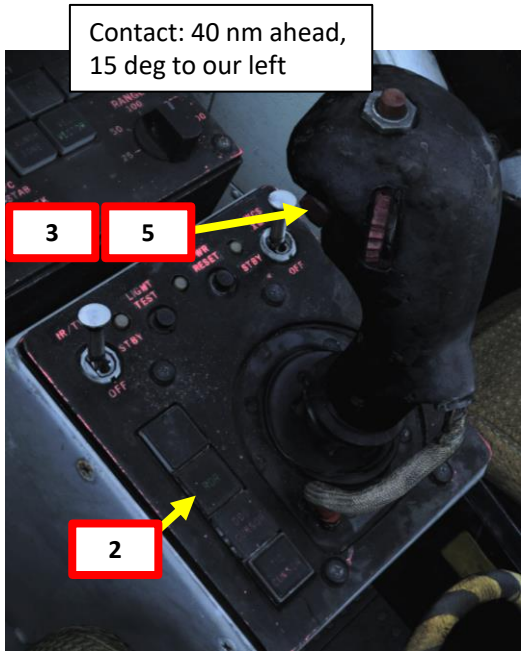
To get a radar lock from Pulse Mode to Pulse STT:

1. Make sure you are in Pulse Search Mode
2. Select RDR HCU Mode
3. Press and hold the first HCU trigger (Half-Action), The radar cursor will appear on the DDD
4. Use the HCU stick to slew the cursor over the desired target.
5. Once cursor is over desired contact, press the second HCU trigger (Full-Action) to lock the target.
6. Once contact is locked, DDD will go in Pulse STT mode automatically.
7. To unlock target, press the first HCU trigger (Half-Action).

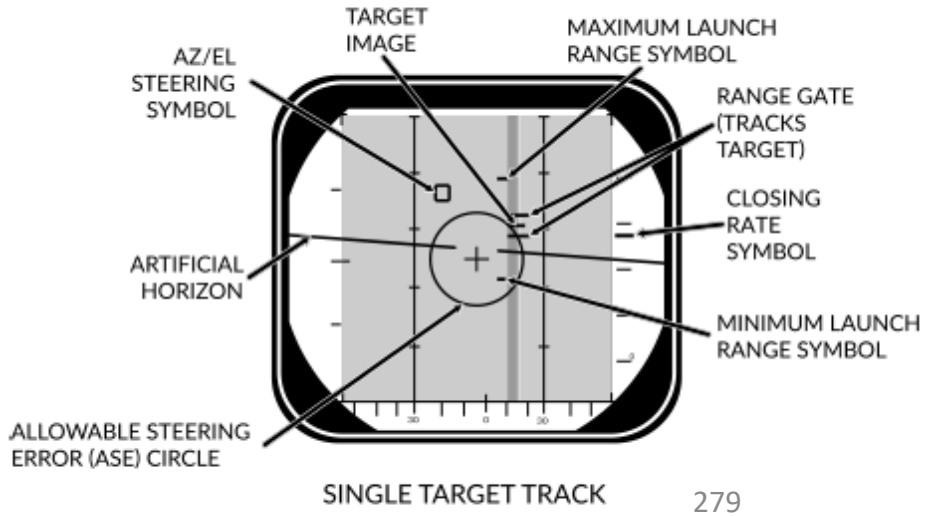
- A successful track is indicated by the ANT TRK and RDROT indicator lights on the DDD, meaning that the antenna is tracking the target and that the target is within the range gates.

- The target the display shows, in addition to the return from the target, the tracking gates (either range or range rate gate), a closing rate indication on the right side and the attack symbology if in air-to-air mode and a missile is selected. is displayed at the correct azimuth and range



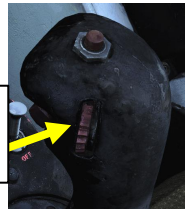






SINGLE TARGET TRACK

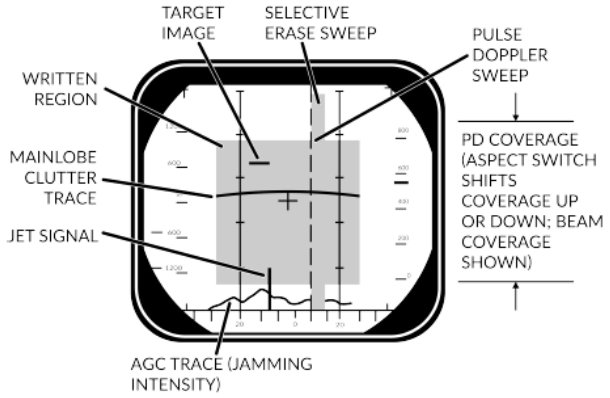
2 – AWG-9 RADAR
PULSE DOPPLER – PD SEARCH MODE



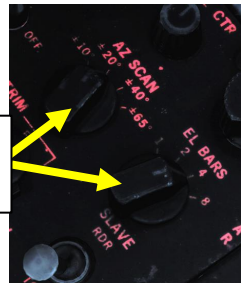
Adjust antenna elevation with HCU thumbwheel

The pulse doppler search mode is used mainly as a kind of early warning mode. It is the search mode with the greatest detection range but it can display no range to the RIO, only closure rate. For this reason the TID can display no track information. The scale displays contact azimuth and closure speed only.

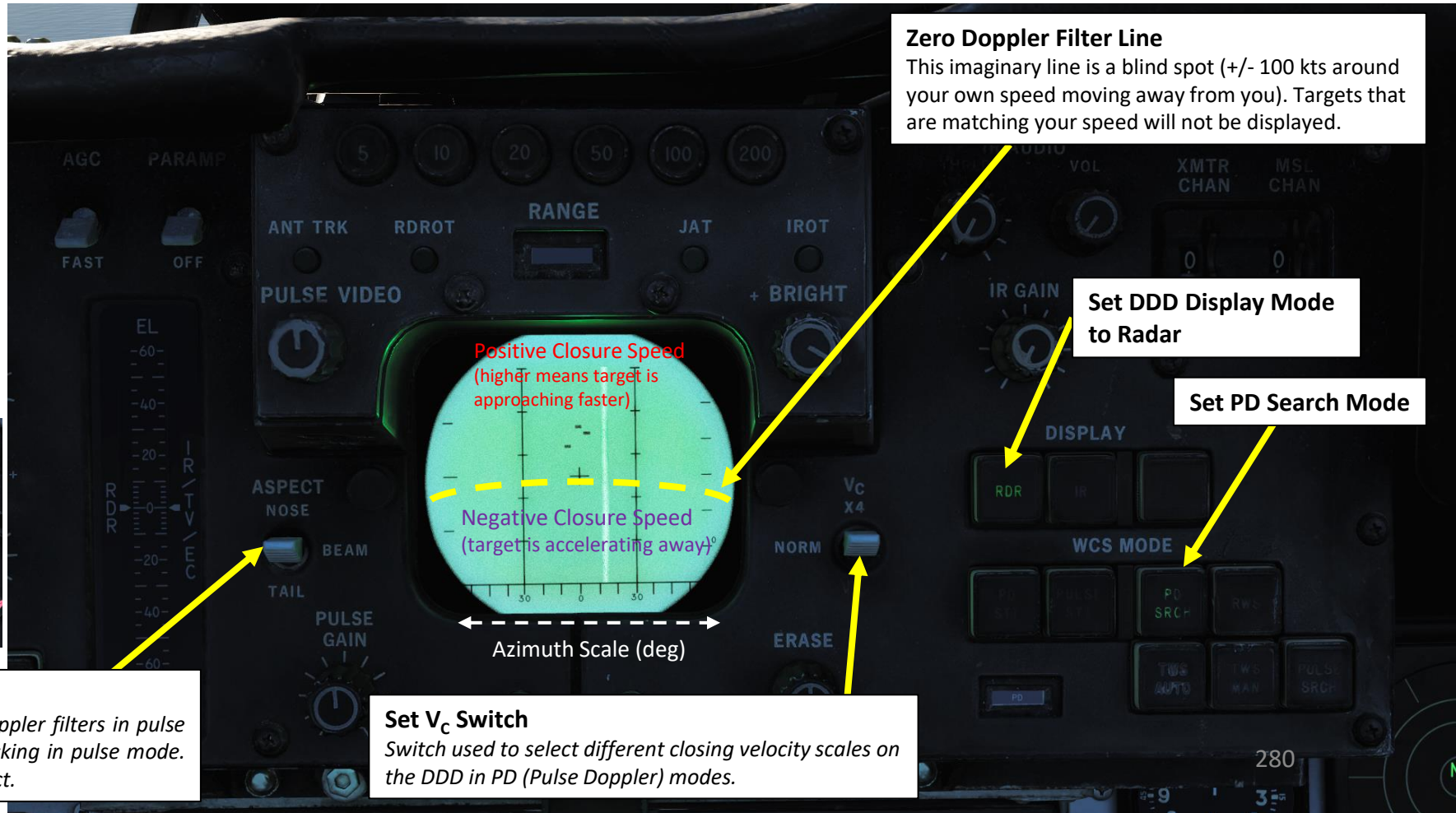
The scale shown on the DDD (what rate region is shown) can be set by the Vc switch on the DDD panel. X-4 sets the scale to 800 knots opening to 4 000 knots closing, NORM sets the scale to 200 knots opening to 1 000 knots closing and VID sets the scale to 50 knots opening to 250 knots closing. The operating range of the doppler filters can also be configured by the ASPECT switch on the same panel, NOSE sets 600 knots opening to 1 800 knots closing, BEAM sets 1200 knots closing to 1200 knots opening and TAIL sets 1 800 knots opening to 600 knots closing. This allows the RIO to optimize the doppler filters for a known target closing speed and this affects the whole radar processing unlike the Vc switch which only affects the DDD.



SEARCH (±40° SCAN)



Set Azimuth Scan Range (deg) and Elevation Bars



Zero Doppler Filter Line
This imaginary line is a blind spot (+/- 100 kts around your own speed moving away from you). Targets that are matching your speed will not be displayed.

Set DDD Display Mode to Radar

Set PD Search Mode

Set ASPECT Switch
Used to control the rate region covered by the doppler filters in pulse doppler modes and if to use edge or centroid tracking in pulse mode. These settings correspond to expected target aspect.

Set V_C Switch
Switch used to select different closing velocity scales on the DDD in PD (Pulse Doppler) modes.

2 – AWG-9 RADAR
PULSE DOPPLER – PD SEARCH MODE

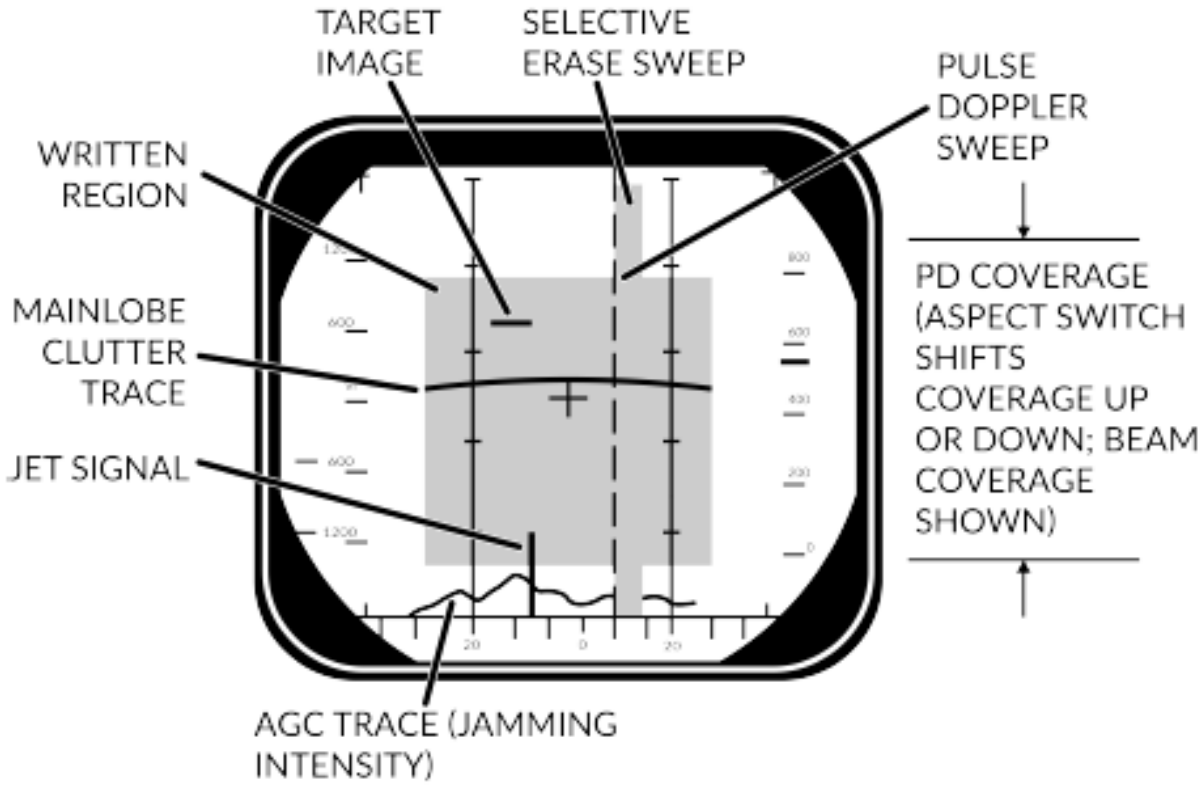
The DDD in the pulse doppler search modes displays returns at azimuth versus rate (closing speed) meaning that by reading only the DDD the RIO can only discern target closing speed and azimuth. The display shows closure rate vs the ground (as if own aircraft was stationary) as opposed to relative closure rate. At the bottom edge of the DDD the AGC-trace is displayed indicating radar return intensity enabling the RIO to discern jamming targets by their return strength. The jamming targets are shown as jamming strobes on the TID if they exceed the set jamming threshold (set by the JAM/JET knob on the DDD).

Because of the way the radar operates the doppler filters it will have **two blind ranges:**

The **mainlobe clutter (MLC)** region which contains most of the ground returns, those returning with zero groundspeed is one of them and is 266 knots wide, centered around own aircraft groundspeed (133 knots slower and 133 knots faster). This is the reason that the radar can be notched as a target with the same relative groundspeed as the ground will also be filtered out.

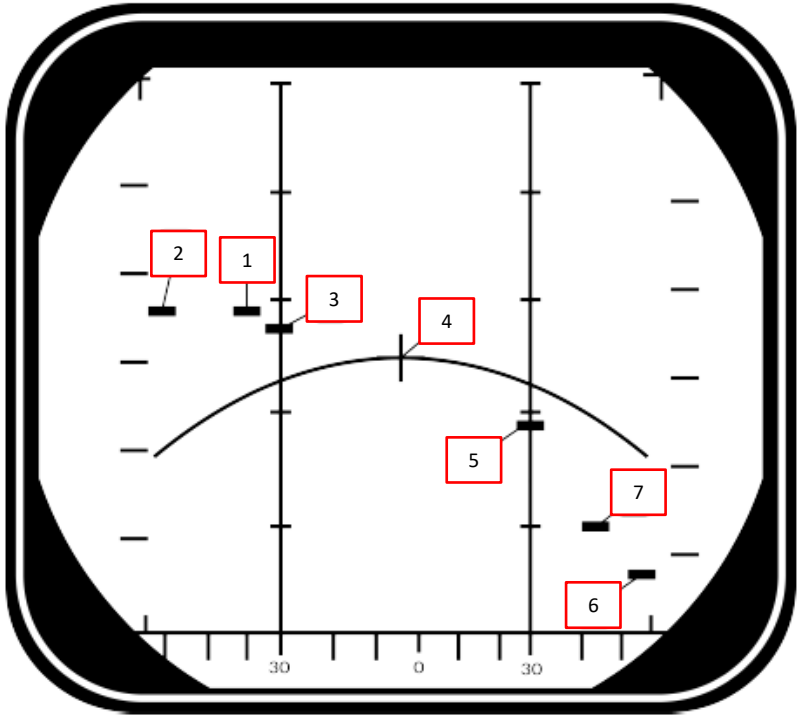
The second filter, and second blind spot, of the radar is the **zero doppler filter**. This blind area is centered around a closure rate of negative own groundspeed, meaning a target moving away from own aircraft at the same speed as own aircraft. This blind area is a hardware limitation as it is a doppler radar mode it cannot detect targets without a doppler shift. The resulting blind area is 200 knots wide, meaning that a chased target moving at a speed of within 100 knots (+/-) of own groundspeed will be invisible to the radar. This means that when chasing a fleeing target it may very well be necessary to use the pulse modes instead.

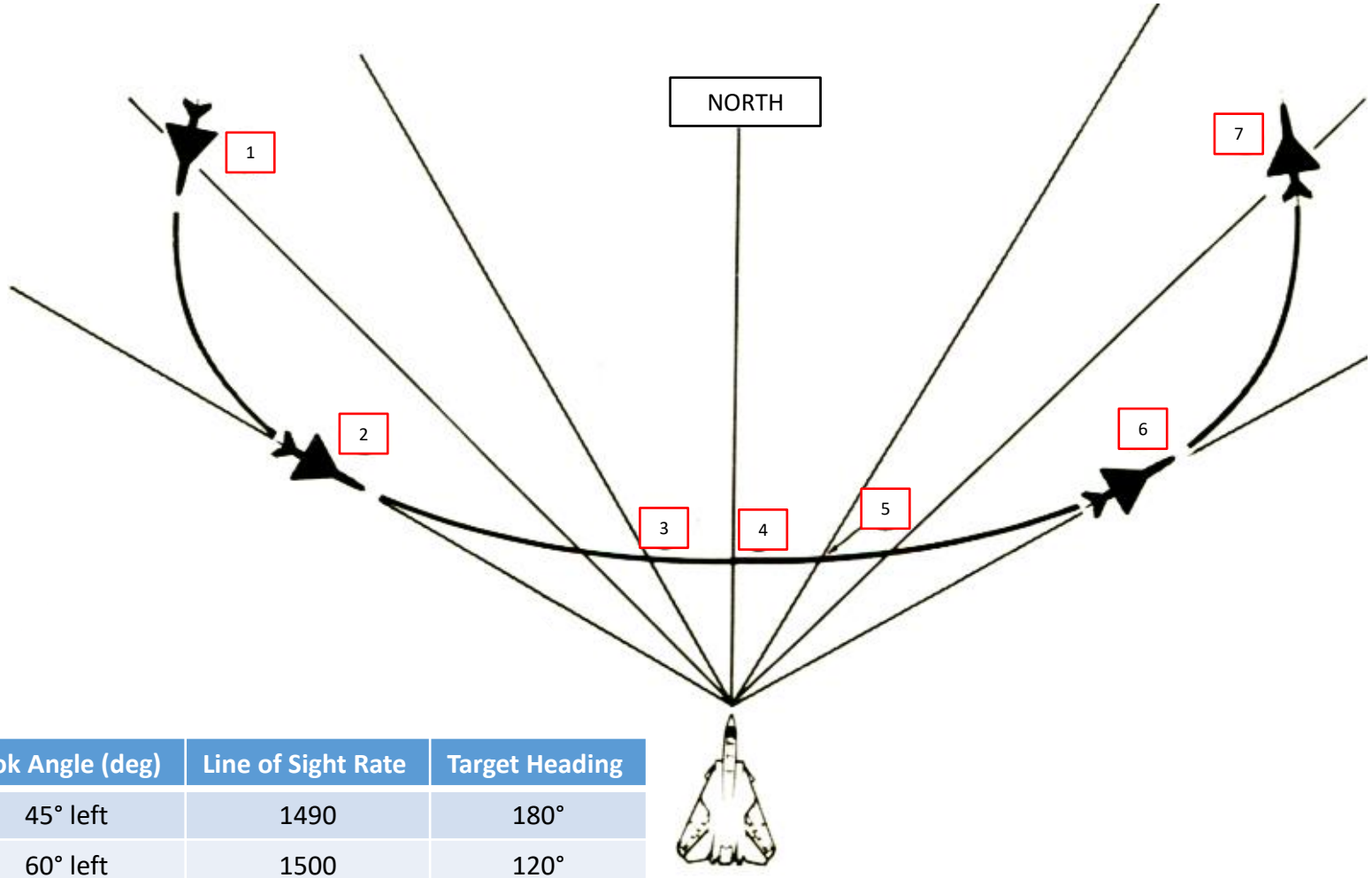
Your own airspeed relative to target varies with aspect. Relative airspeed from a target at 45° will be less than a target at 0° as own speed vector will be pointing away from it slightly. This is the reason for the mainlobe clutter trace presenting a curve on the DDD as the observed speed of the returning ground returns will vary with azimuth.



SEARCH (±40° SCAN)

2 – AWG-9 RADAR
PULSE DOPPLER – PD SEARCH MODE





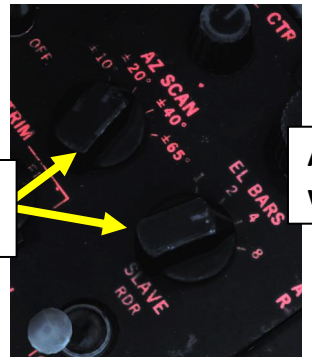
Target ground speed 900 knots, own airspeed 1200 knots. See table for details, line of sight rate is the sum of target and own aircraft relative rate.

	Look Angle (deg)	Line of Sight Rate	Target Heading
1	45° left	1490	180°
2	60° left	1500	120°
3	30° left	1428	100°
4	0°	1200	90°
5	30° right	672	80°
6	60° right	-300	60°
7	45° right	210	0°

2 – AWG-9 RADAR
PULSE DOPPLER – RWS (RANGE WHILE SEARCH) MODE

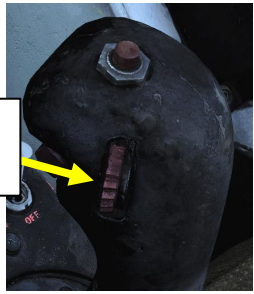
In Range While Search (RWS), a frequency measuring ranging mode is added (FM ranging) to allow the radar to measure range of tracked targets in addition to closure rate. This additional processing does however mean that the effective range of the radar is somewhat lesser. This mode is used to get a good air picture before switching to TWS (Track While Scan).

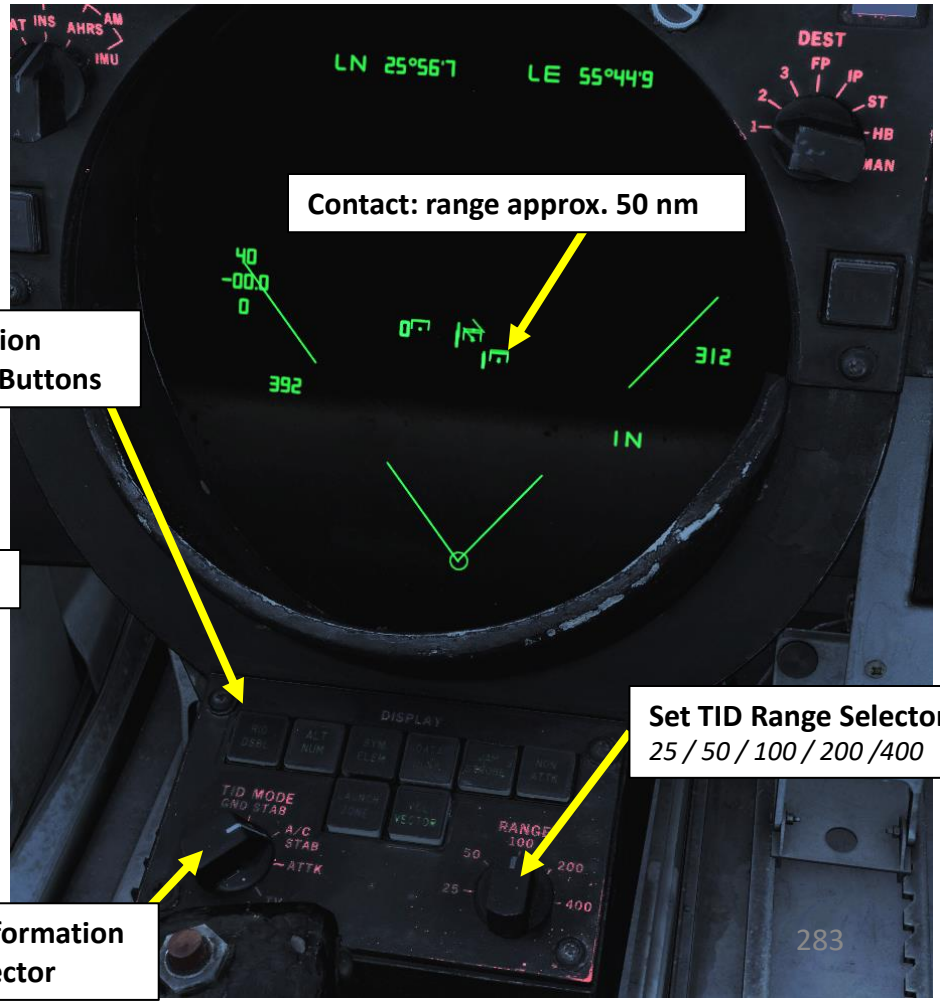
- The display on the DDD is the same as in pulse doppler search.
- The TID also shows tracks in this mode showing the targets as tracks momentarily as they're scanned and displaying their position and altitude.
- Maximum number of concurrently shown tracks are 48 on the TID.
- **You cannot radar lock targets on the TID, only on the DDD (see Pulse Doppler STT lock).**



Set Azimuth Scan Range (deg) and Elevation Bars

Adjust antenna elevation with HCU thumbwheel





Set TID (Tactical Information Display) Display Selector Buttons

Set DDD Display Mode to Radar

Set RWS Mode

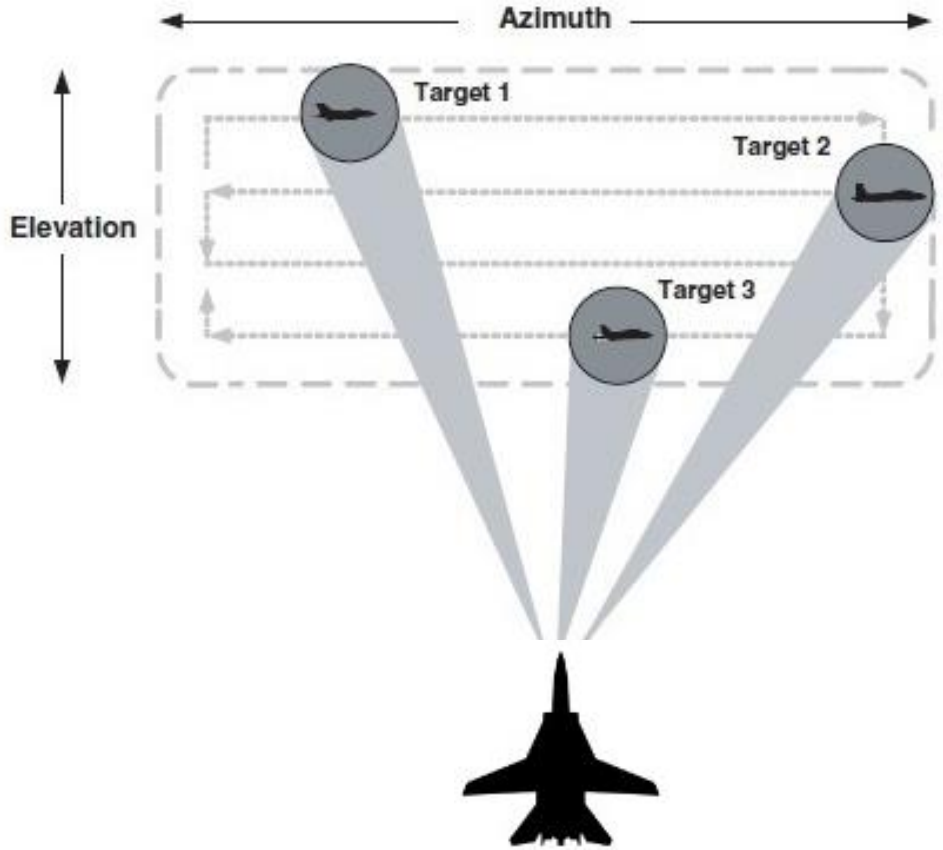


Set TID Range Selector (nm)
25 / 50 / 100 / 200 /400

Set TID (Tactical Information Display) Mode Selector

2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) MODE

The Track While Scan (TWS) mode uses the same FM ranging as RWS with the same reduction in range compared to pulse doppler search and the DDD display is also the same. The main difference that the computer establishes track files and tracks up to 24 targets concurrently of which 18 can be shown on the TID at any given time.



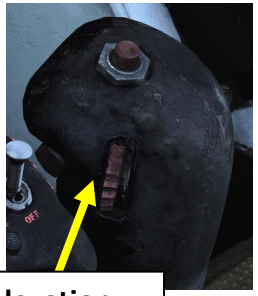


2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) MODE

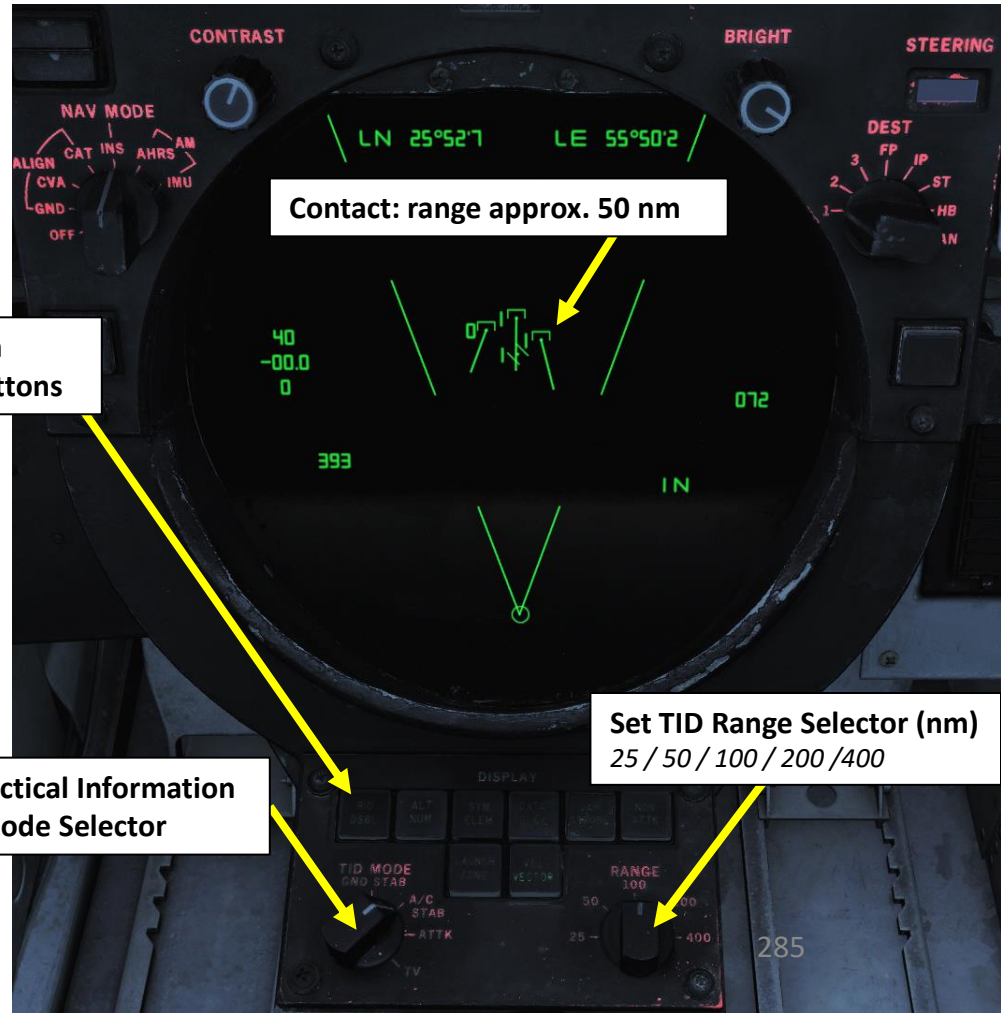
- The display on the DDD is the same as in pulse doppler search
- The TID also shows tracks in this mode showing the targets as tracks momentarily as they're scanned and displaying their position and altitude.
- **You can radar lock targets on the TID or on the DDD.**
- You can **only use 20 deg 4 bar search or 40 deg 2 bar search** (automatically set if any other **azimuth/elevation bar combination is selected)**
- The F-14 has two **TWS modes, MANUAL and AUTO**.
  - TWS MAN leaves radar operation to the RIO.
  - TWS AUTO will automatically prioritize contacts based off their range, aspect and closure.
- You can tell Jester to select either the first or a specific contact from the TWS list.



Set Azimuth Scan Range (deg) and Elevation Bars



Adjust antenna elevation with HCU thumbwheel





Set TID (Tactical Information Display) Display Selector Buttons

Set DDD Display Mode to Radar

Set TWS Mode (AUTO or MAN)

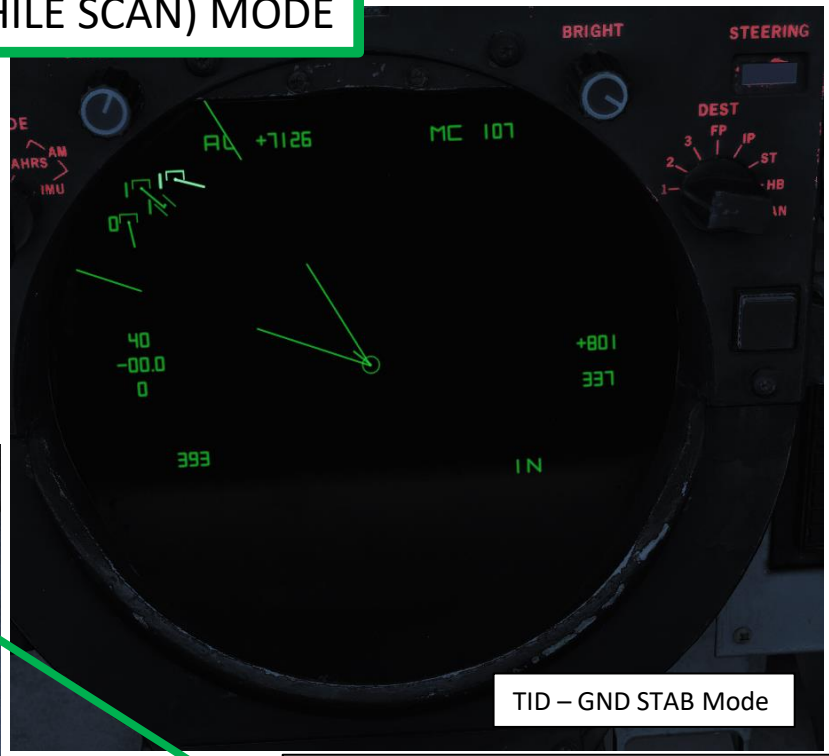
Set TID (Tactical Information Display) Mode Selector

2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) MODE

What differs between the TWS Auto and Manual mode is that in TWS auto the computer takes control of used scan volume and scan pattern azimuth and elevation as soon as target tracks are present.

The TWS mode is also the only mode enabling guidance of the AIM-54 at multiple targets (up to six), and as soon as engageable targets are detected the computer starts assigning them a missile priority number according to optimal missile firing sequence.





TID – GND STAB Mode



TID – A/C STAB Mode

TID (Tactical Information Display) Mode Selector

- ***GND STAB****: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.*
- ***A/C STAB****: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.*
- ***ATTAK****: Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.*
- ***TV****: selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD. If LANTIRN is equipped and LANTIRN VIDEO switch is set to FLIR, LANTIRN feed will go through the TID Display.*

TID (Tactical Information Display) Display Selector Buttons

UPPER ROW:

- ***RID DISABLE****: Not simulated.*
- ***ALT NUM****: Altitude numerals, enables display of track altitudes on the left side of track symbols. Shows a single digit representing ten-thousands of feet*
- ***SYM ELEM****:* Symbology elements, enables display of all supplementary symbology of tracks and waypoints.
- ***DATA LINK****:* Enables display of data link tracks.
- ***JAM STROBE****:* Enables display of jam strobes on the TID.
- ***NON-ATTK****:* Non-attack, enables or disables display of targets which aren't possible to engage, friendly targets being an example.

LOWER ROW:

- ***LAUNCH ZONE****:* Enables display of weapon launch zones depending on selected missile type. These replace the velocity vectors on relevant targets. This function is automatically enabled by the WCS 60 seconds prior to a target entering maximum launch range.
- ***VEL VECTOR****:* Velocity vector, enables display of velocity vectors on tracks.

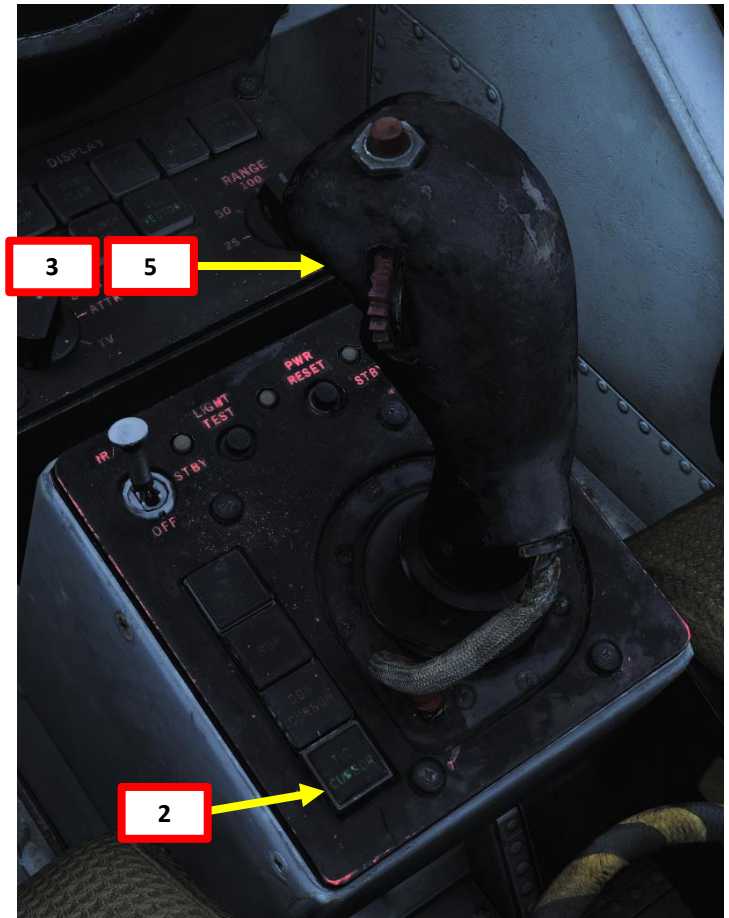
2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) MANUAL MODE

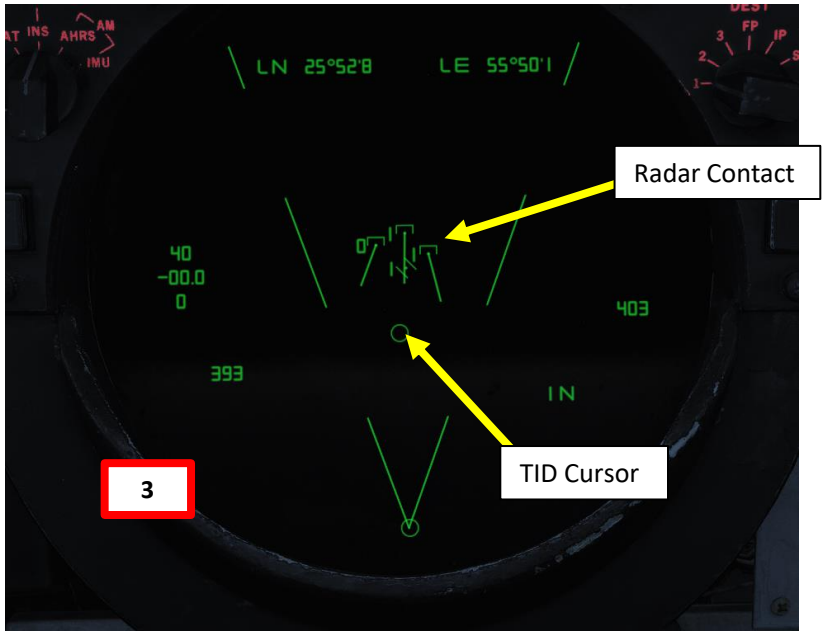
If you want to gather more information from a target without doing a proper radar lock, you can hook a target with the TID cursor only. You can think of it as a "soft lock" that simply gives you ranging (RA), bearing (BR), altitude (AL) and magnetic course (MC) information.

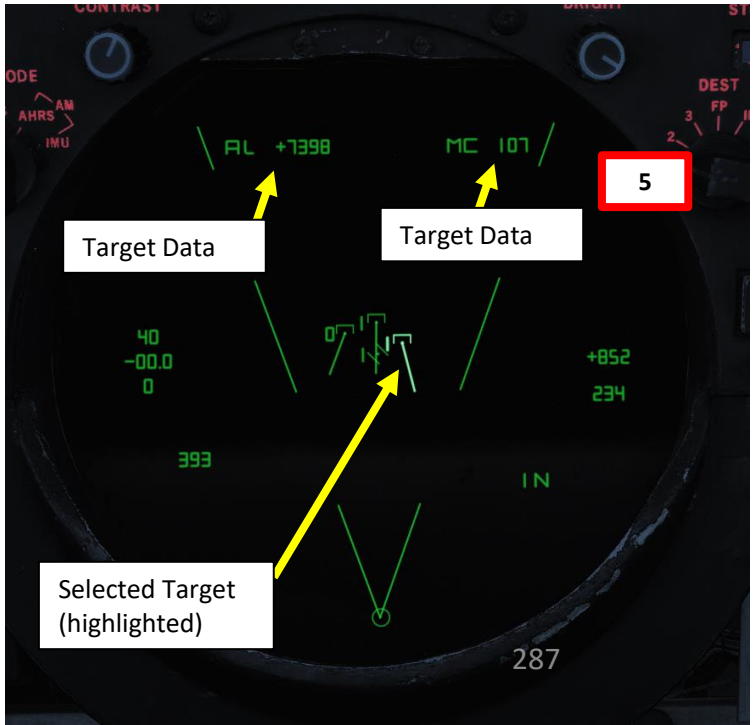
1. Select TWS MAN Mode
2. Select "TID CURSOR" TID Mode
3. Press and hold the first HCU trigger (Half-Action); the TID cursor will appear on the TID (Tactical Information Display).
4. Use the HCU stick to slew the TID cursor over the desired target.
5. Once the cursor is over desired contact, press the second HCU trigger (Full-Action) to select the target.



TWS MAN Mode

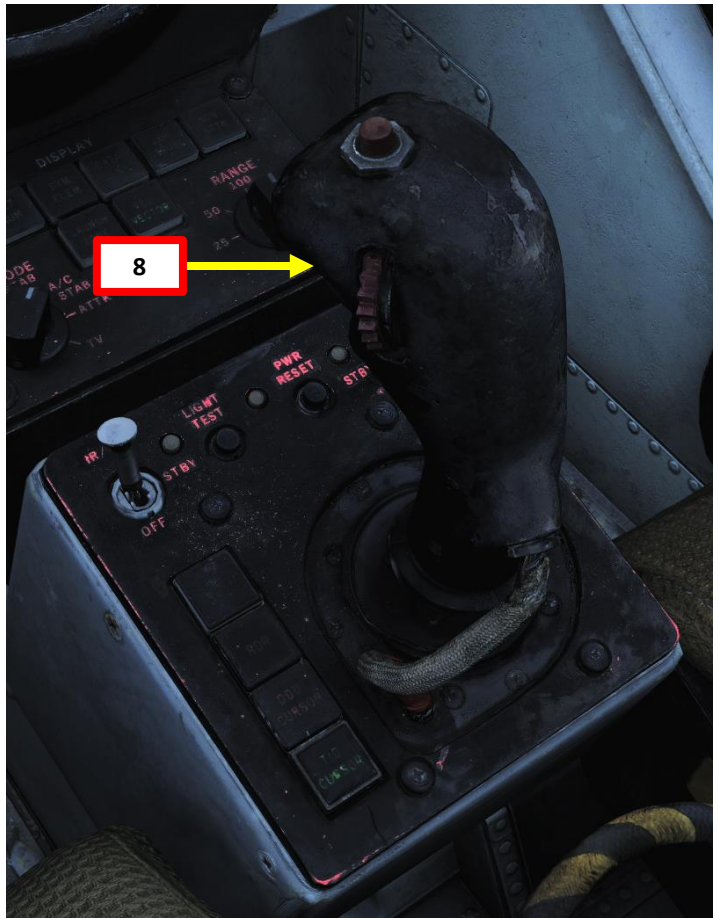


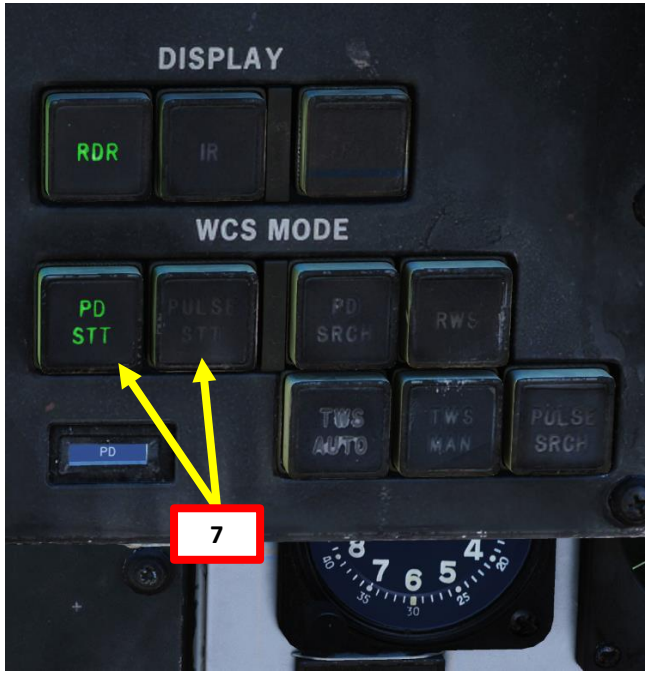




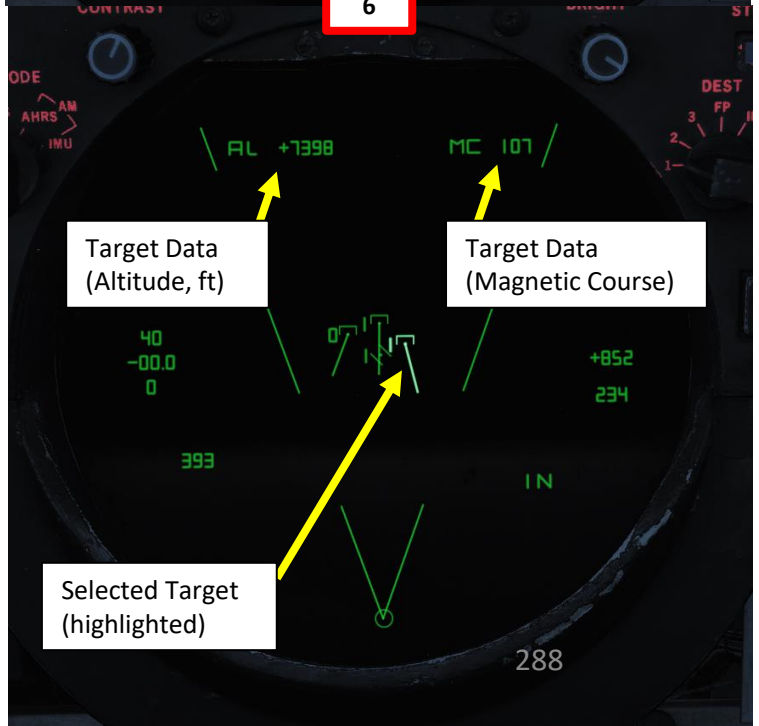
2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) MANUAL MODE

6. Once target is selected, ranging (RA), bearing (BR), altitude (AL) and magnetic course (MC) information will be displayed on the TID. Keep in mind that this is NOT a radar lock and you will not be able to use weapons with this function.
7. If you want to lock the target with the radar (hard lock), you can press the PD STT or the Pulse STT button.
8. To deselect target, press the first HCU trigger (Half-Action).









2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

TWS-Auto Tutorial by Jabbers
https://youtu.be/k0rwtapUmmY

Introduction

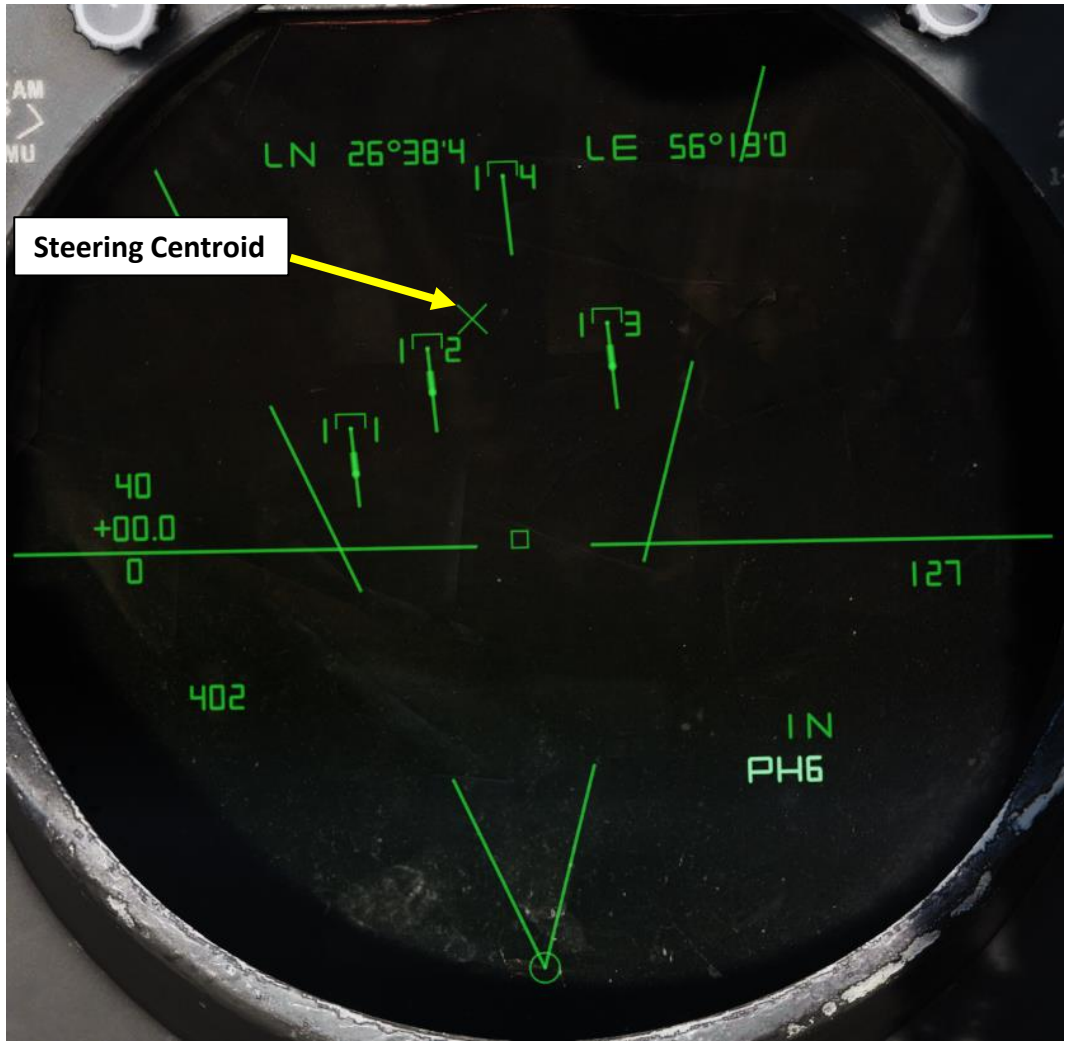
TWS AUTO mode works almost just like TWS MAN. The difference is that a number of radar parameters are automatized like scan cone azimuth and elevation angle. Steering cues are also computed to help guide the pilot for the best firing solution. Radar target selection (soft lock) and STT lock (hard lock) is obtained in the same manner as in TWS MAN.

Simply put, TWS-Auto attempts to keep the TWS pattern pointing where it is most useful in azimuth and elevation, while also controlling the optimum scan volume.

The azimuth and elevation angles are determined by a computed **weighted centroid (geometric center)** of targets in the scan volume. Target weights are a function of a number of parameters we will explore later in this section. This is the **steering centroid symbol**, which is visible on the RIO's Tactical Information Display. Think of this as a "X symbol that shows where should my radar be looking".



TWS AUTO Mode Selector



2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

Pilot Steering Cues

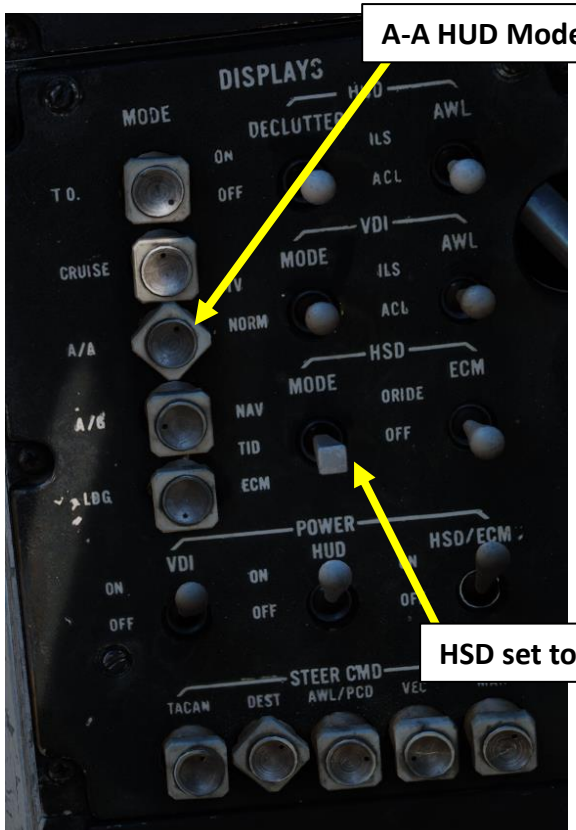
TWS-Auto computes steering cues available for the pilot. These will direct the pilot horizontally only, based on the steering centroid computed.

The steering cues are only visible if:

- A-A (Air-to-Air) HUD Mode is selected
- Master Arm is ON (UP)
- Phoenix (AIM-54) or Sparrow (AIM-7) missile is selected
- TWS-Auto is selected from the RIO seat

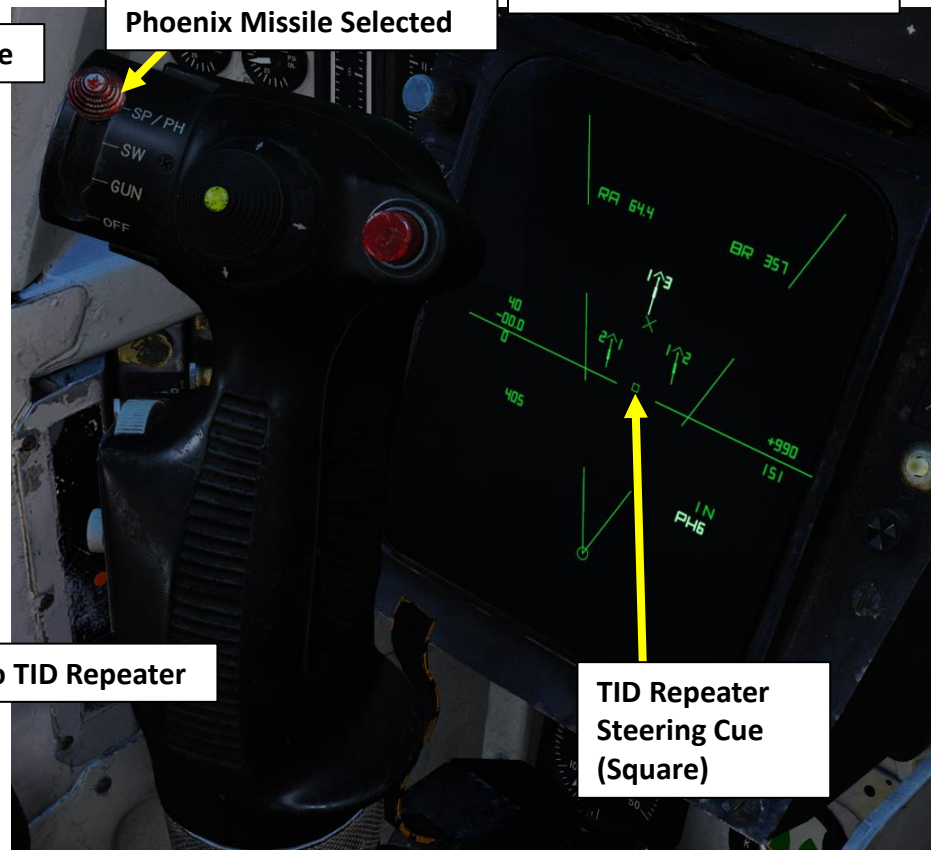


TWS AUTO Mode Selector



A-A HUD Mode

HSD set to TID Repeater



Phoenix Missile Selected

TID Repeater Steering Cue (Square)



HUD Steering Cue (Inverted T)

Master Arm ON

VDI Steering Cue (Inverted T)

2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

RIO Steering Cues & Centroids

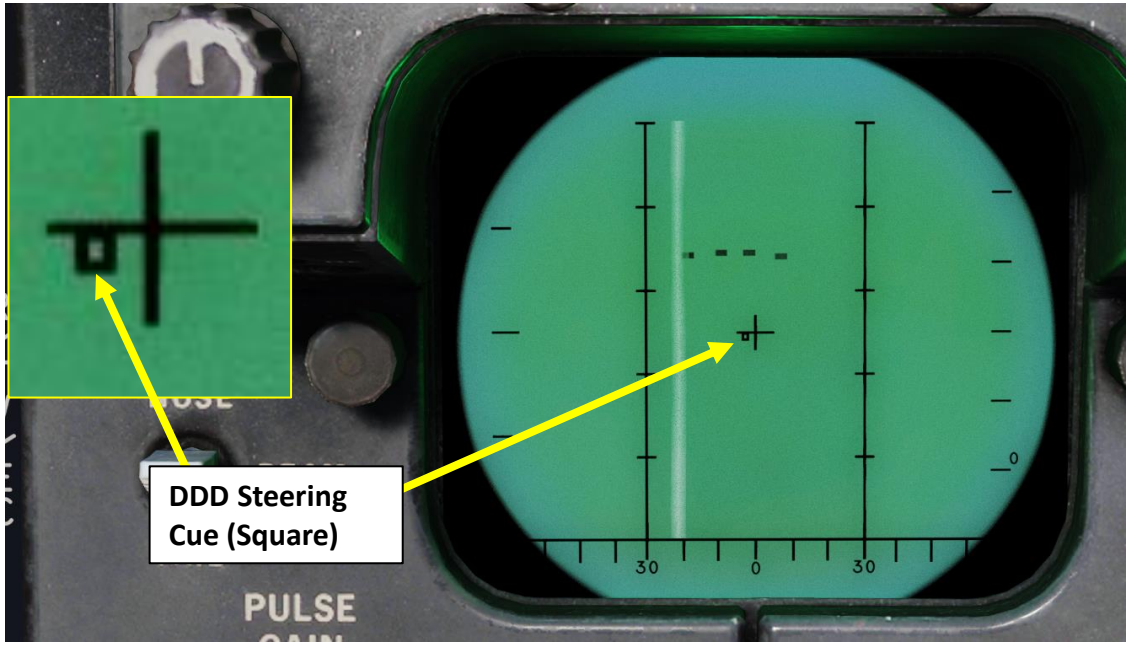
TWS-Auto computes steering cues available for the RIO as well on the DDD (Detail Data Display) and TID (Tactical Information Display).

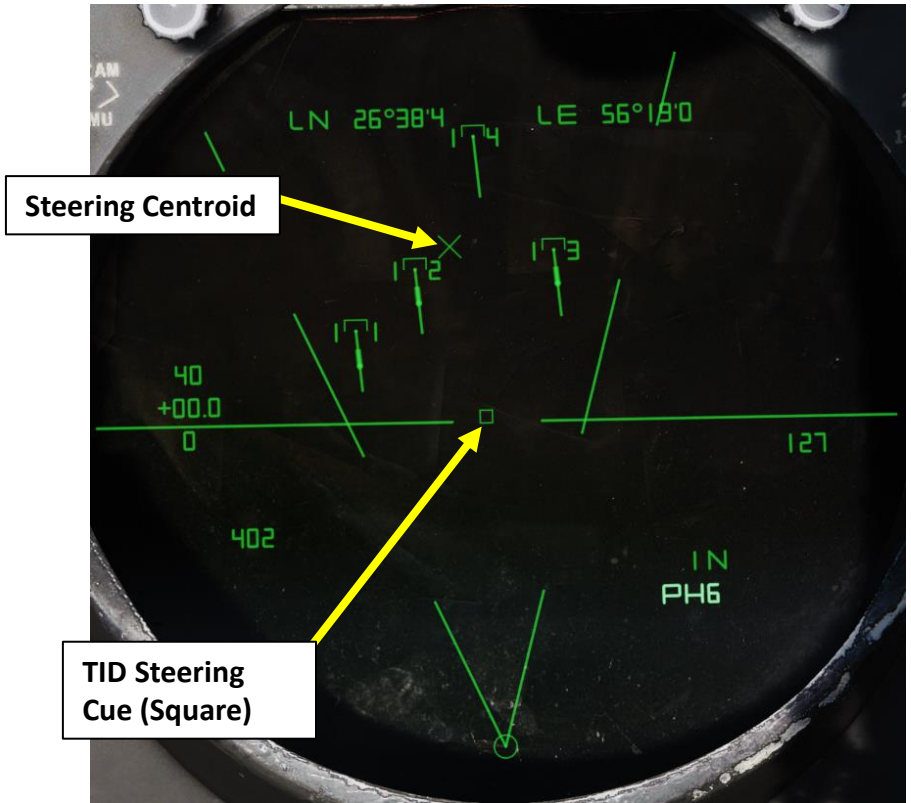
Two separate centroids are calculated as part of the TWS-Auto update procedure: a steering centroid, and an illumination centroid.

- The **steering centroid** facilitates steering cues (on HUD, VDI, TID, DDD) to help the pilot maintain optimum target coverage, and also displays a small X on the TID indicating the steering centroid. position. The radar gimbal limits (maximum extents, basically ±65° in both azimuth and elevation) are considered when computing this centroid.

- The **illumination centroid** (not visible) controls the azimuth and elevation of the scan pattern center by using the angles from the aircraft to the computed illumination centroid. The current scan volume limits are considered (i.e. either 2-bar ±40° or 4-bar ±20°) when computing this centroid.

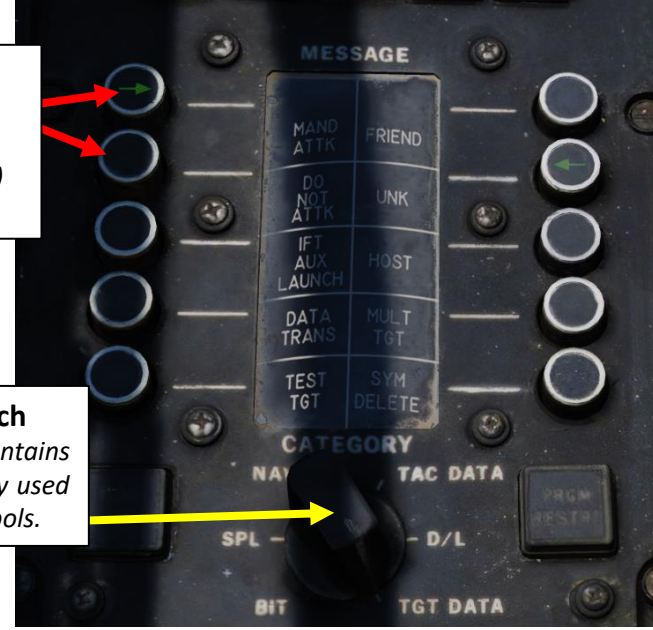
- The velocities (change in position over time) of both steering and illumination centroids are also calculated, used to calculate steering cues for a short period when all targets are lost (in an attempt to re-acquire them at their expected positions).





2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

CAP Message Selector Buttons
are used by the RIO to modify the status of a target
- *Mandatory Attack (MAND ATTK)*
- *Do Not Attack (DO NOT ATTK)*

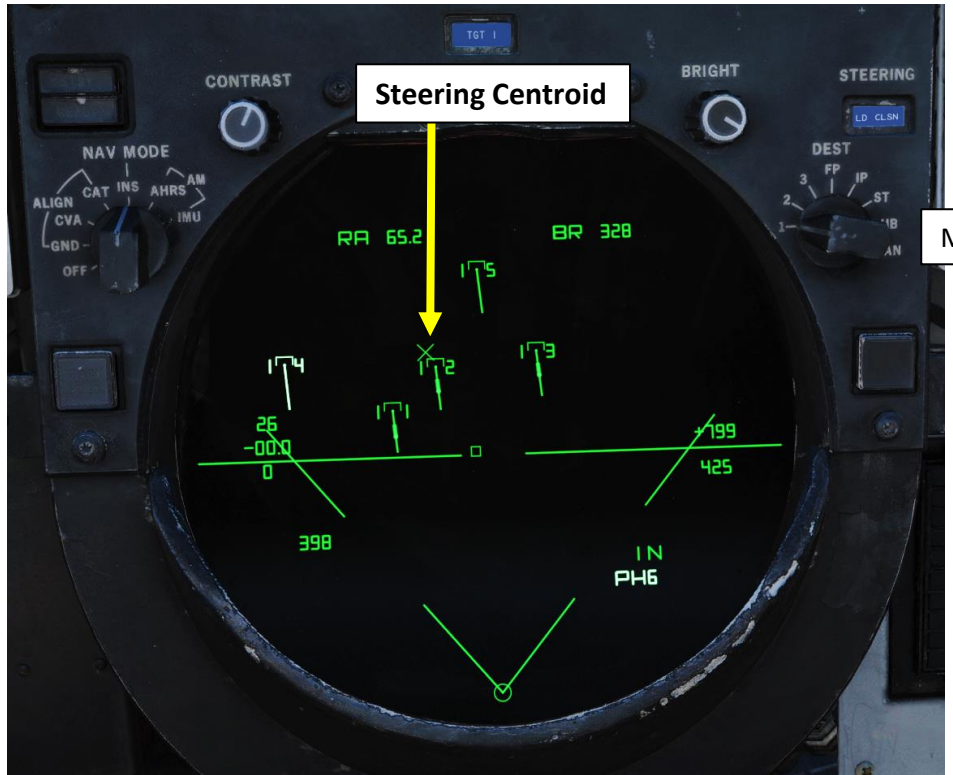


CAP Category Selector Switch
- ***TGT DATA**: Target Data, contains message button functionality used to modify hooked track symbols.*

Target Weights

The **steering centroid** is determined by a weighted centroid of targets in the scan volume. Some targets contribute more to the steering centroid than others, depending on their respective "weight". The position of each target is multiplied by its weight factor divided by the total weight of all targets, and these weighted positions are added together to give a centroid. Only sensor targets (i.e. own radar) are considered, not datalink targets.

The weight of a target impacts the emplacement of the steering centroid, and is a function of many parameters, the most important being:
- Presence of a launch zone (targets marked as friendly by RIO will never get a launch zone)
- Whether a missile is already underway to a target
- RIO selections on targets such as DO NOT ATTK (Do Not Attack) and MAND ATTK (Mandatory Attack), which can be set from the CAP (Computer Address Panel) buttons of the TGT DATA (Target Data) menu.





2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) AUTO MODE

Operation

- TWS-Auto is engaged by pressing the TWS AUTO Mode selector button.
- When TWS-Auto is first engaged, there is a period of 8 seconds where the manual controls for azimuth, elevation and the scan volume pattern are still in effect and can still be controlled by the RIO.
- After this period, the TWS-Auto computer takes over.
- The scan volume pattern (2-bar vs 4-bar) is re-evaluated every 4 seconds, while the steering centroid and illumination centroid are re-evaluated multiple times per second. The weights are updated at the end of each 2 second scan frame.
- The scan volume algorithm considers the future positions of all targets, and selects between which of the two options would give a greater total illumination weight. If they are equal, 4-bar ±20° is selected.

Take note that firing an AIM-54 Phoenix while in TWS-Manual will result in automatic selection of TWS-Auto. When any AIM-54 missiles are deemed to still be in flight (up to 16 seconds beyond their expected time to impact), TWS-Manual mode cannot be entered. Target tracks that have a missile launched at them will also behave as if Track Hold (the button to the left of the TID fishbowl, see next page) has been selected. In other words, these tracks will continue to be extrapolated for up to 2 minutes if their radar contact is lost.



TWS AUTO Mode Selector



2 – AWG-9 RADAR
PULSE DOPPLER – TWS (TRACK WHILE SCAN) MODE

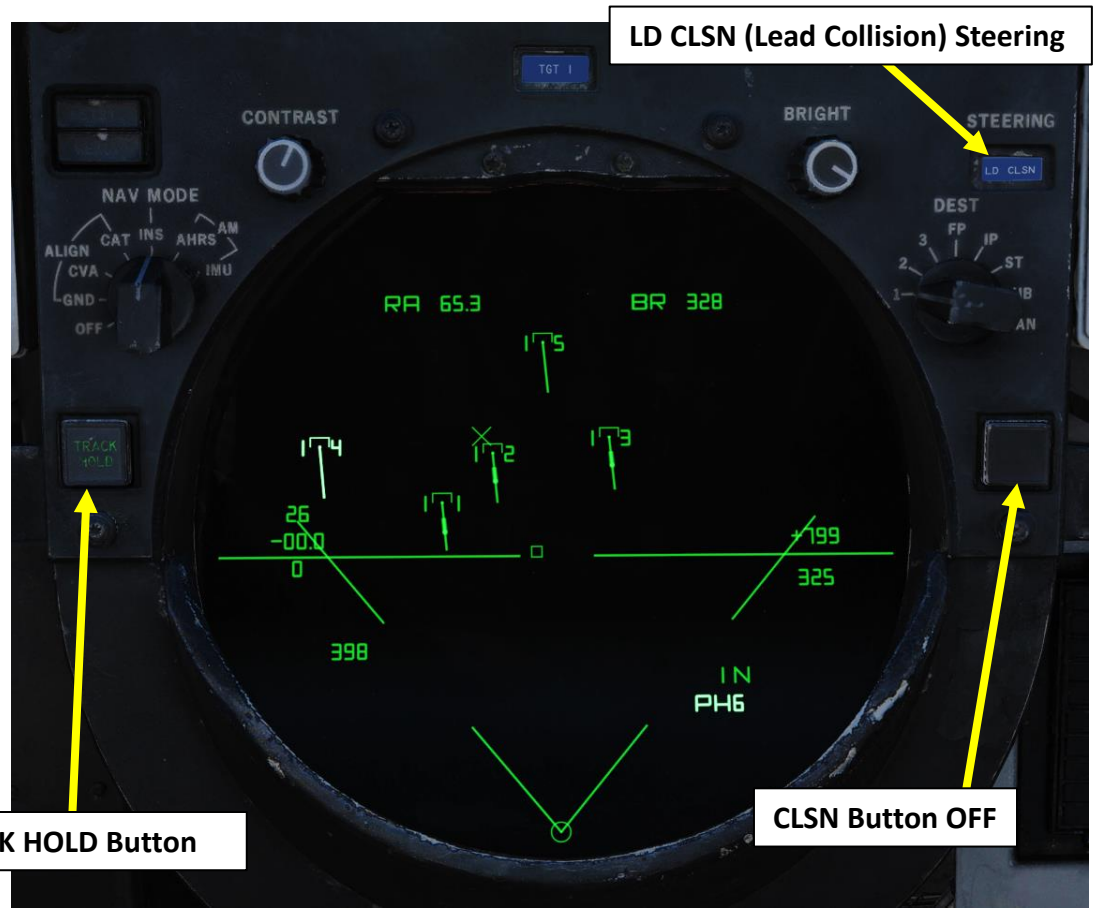
Track Hold & Collision Steering

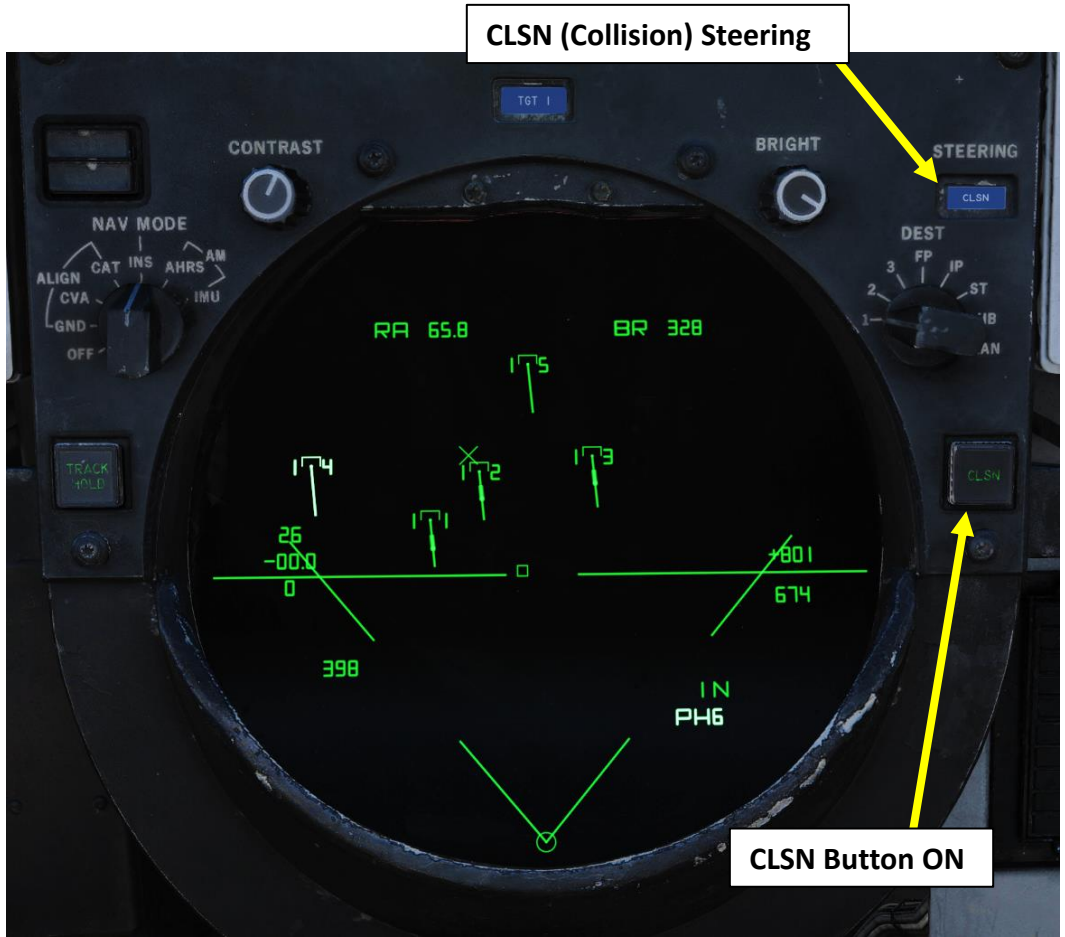


Collision Steering Light (Pilot Seat)

- The **TRACK HOLD** button enables the TWS Track Hold function. Normally, targets on the TID in TWS mode are retained for 14 seconds after the last observation. When enabled, the Track Hold function extends this to 2 minutes for all tracks. This is useful if you want to keep an eye on some radar contacts that may slip out of your view momentarily.

- The **CLSN button** enables collision steering to currently tracked target (or steering centroid if in TWS). This selection overrides the current steering information presented to the pilot with the collision steering, only exception being if the pilot selects the ACM (Air Combat Manoeuver) mode. LD CLSN (Lead Collision Steering) presents azimuth steering information only, while CLSN (Collision Steering) presents both azimuth and elevation steering information.





2 – AWG-9 RADAR
PULSE DOPPLER – PULSE DOPPLER STT LOCK

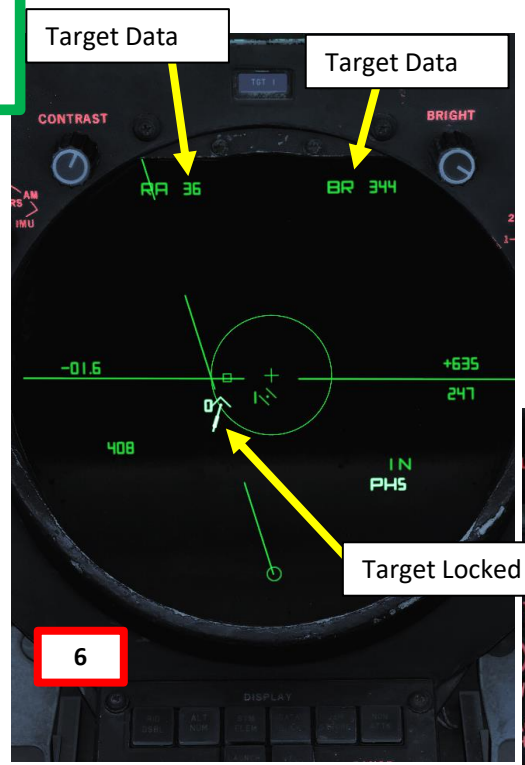
The pulse doppler STT (Single Target Track) works and looks much like the pulse STT mode. It does however have the same advantages and disadvantages compared to pulse STT as the other pulse doppler modes compared to the pulse modes. This means that while much better at tracking a target close to the ground it is however vulnerable to notching.

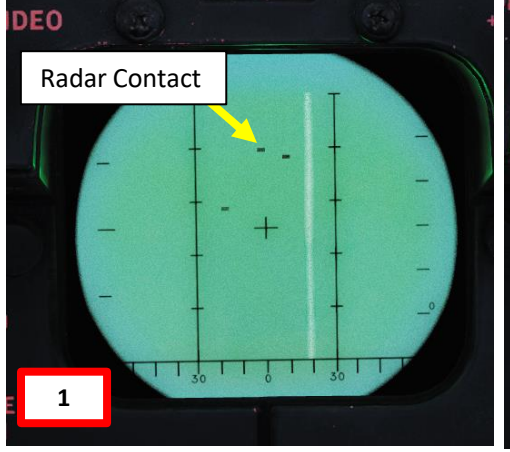
To get a radar lock from Pulse Doppler Mode to Pulse Doppler STT:

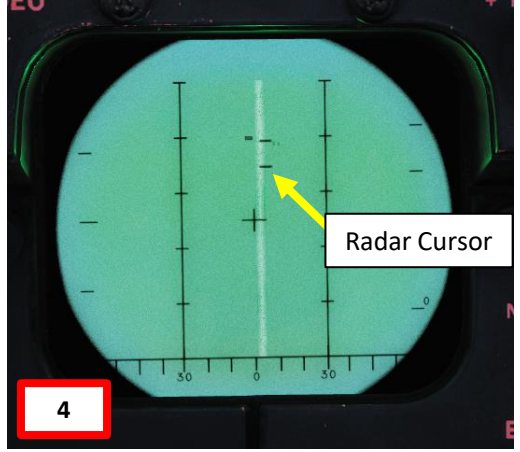
1. Make sure you are in a Pulse Doppler Mode (PD Search, TWS, RWS)
2. Select RDR HCU Mode
3. Press and hold the first HCU trigger (Half-Action), the radar cursor will appear on the DDD
4. Use the HCU stick to slew the cursor over the desired target.
5. Once cursor is over desired contact, press the second HCU trigger (Full-Action) to lock the target.
6. Once contact is locked, DDD and TID will go in Pulse Doppler (PD) STT mode automatically. Ranging (RA), bearing (BR), altitude (AL) and magnetic course (MC) information will be displayed on the TID.
7. To unlock target, press the first HCU trigger (Half-Action).

- A successful track is indicated by the ANT TRK and RDROT indicator lights on the DDD, meaning that the antenna is tracking the target and that the target is within the range gates.

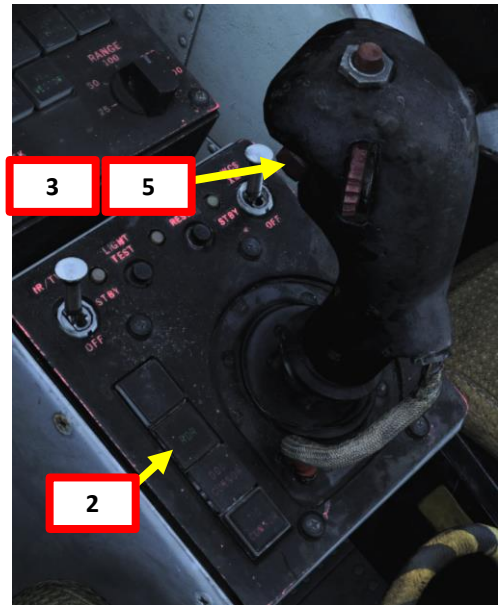
- The target the display shows, in addition to the return from the target, the tracking gates (either range or range rate gate), a closing rate indication on the right side and the attack symbology if in air-to-air mode and a missile is selected. The target return and antenna azimuth display is moved to the left side of the screen and a generated synthetic target marker is displayed at the correct azimuth. This is so that the targets range can be displayed by the synthetic target unlike the other pulse doppler modes which only shows closure rate.

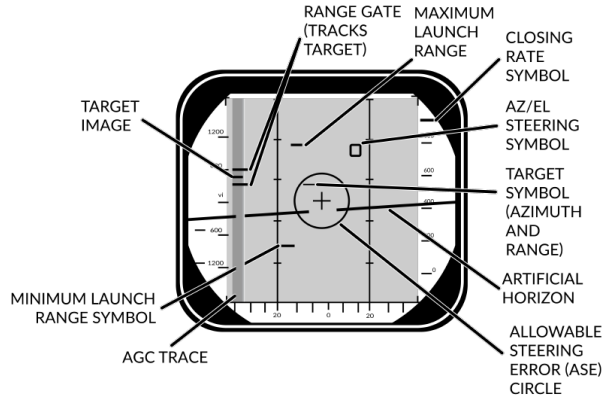










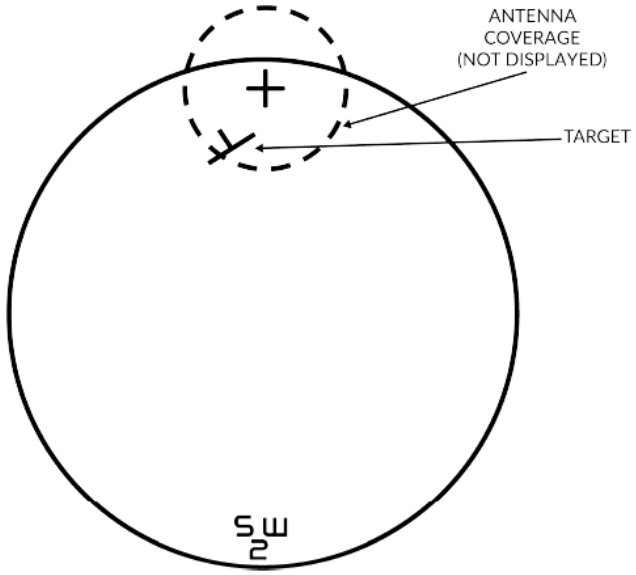


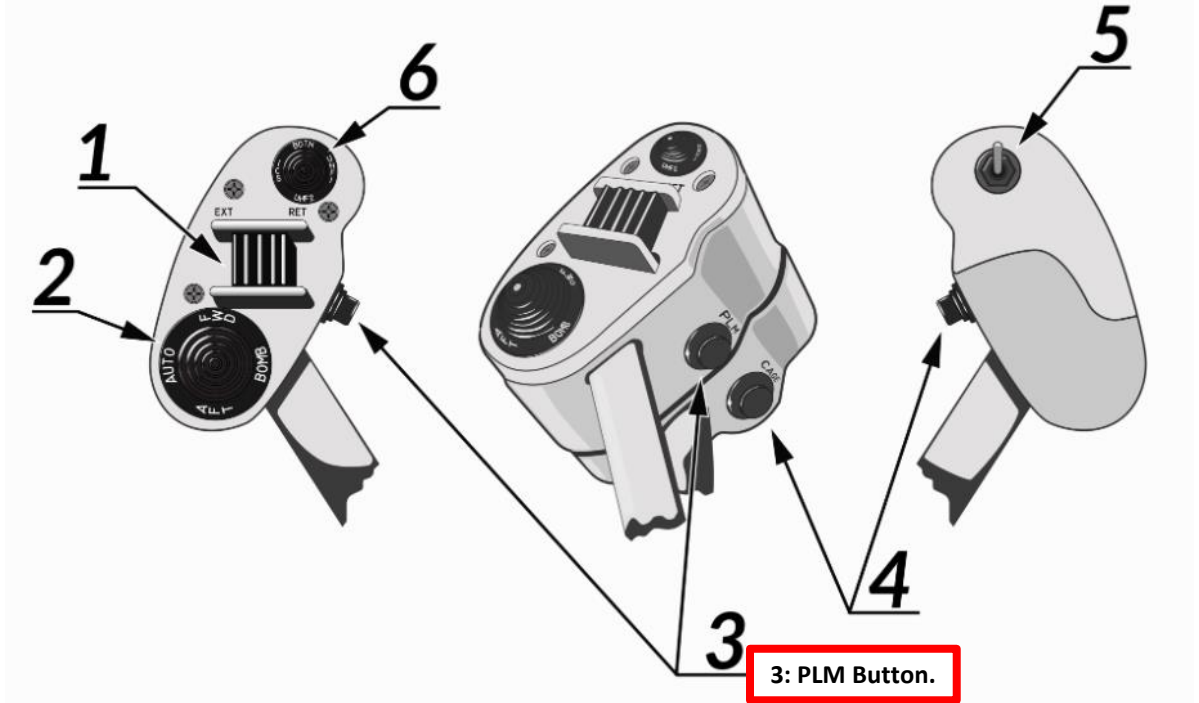
SINGLE TARGET TRACK

2 – AWG-9 RADAR
ACM – PLM MODE

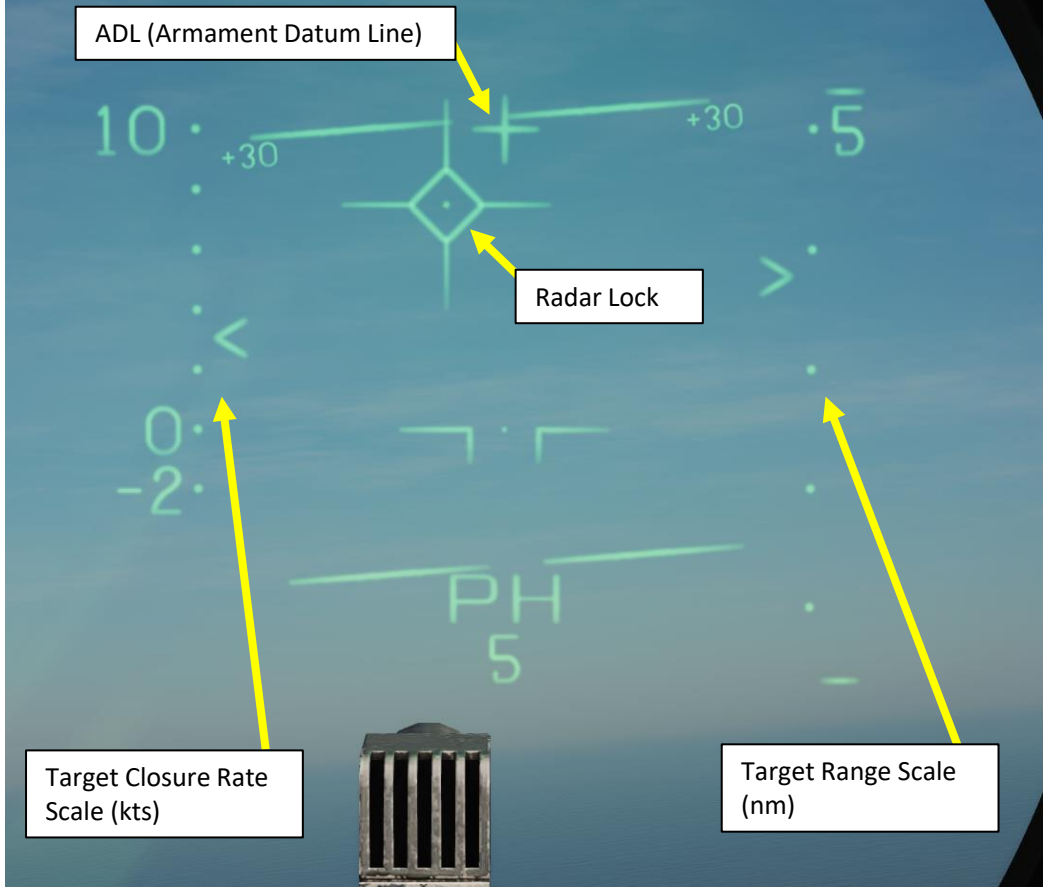
The PLM (Pilot Lockon Mode) is the ACM mode with the highest priority, it always overrides any other radar mode and is enabled when the pilot presses the PLM button on the front of the right throttle. Depression of that button commands the antenna to the armament datum line (ADL) and causes it to lock onto the first target seen out to 5 NM.

The procedure to use PLM is for the pilot to fly the ADL marker on the HUD over the target and then press and hold the PLM button until lockon occurs. The PLM continues until a target is detected and transition to pulse STT occurs or the PLM button is released making the radar transition to pulse search instead.





3: PLM Button.





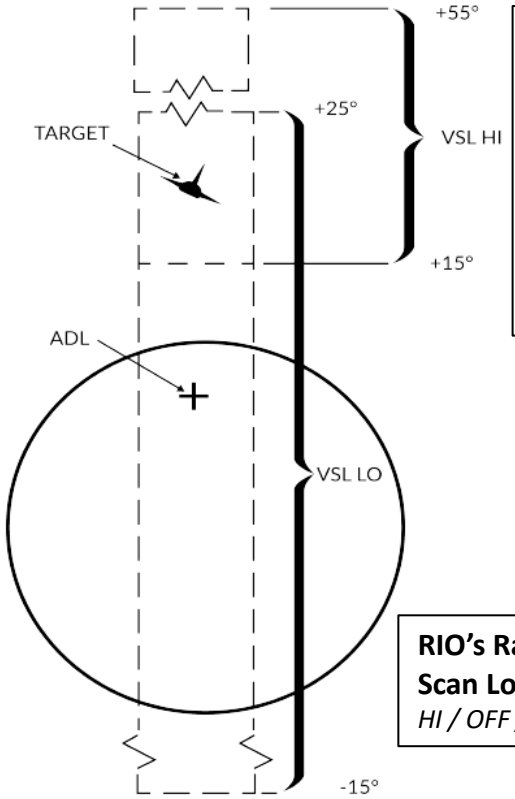
2 – AWG-9 RADAR ACM – VSL MODE

The VSL (Vertical Scan Lockon) mode is enabled by the pilot or the RIO and is used to acquire a target at own aircrafts current heading from an elevation of -15° to +55°. The RIO can use the VSL switch on the sensor control panel in the RIO cockpit.

Two submodes are available by placing the switch into either VSL HI (high) or VSL LO (low) and releasing it back to center. The pilot can enable VSL HI or LO by selecting UP or DN respectively on the target designate switch when not in A/G mode.

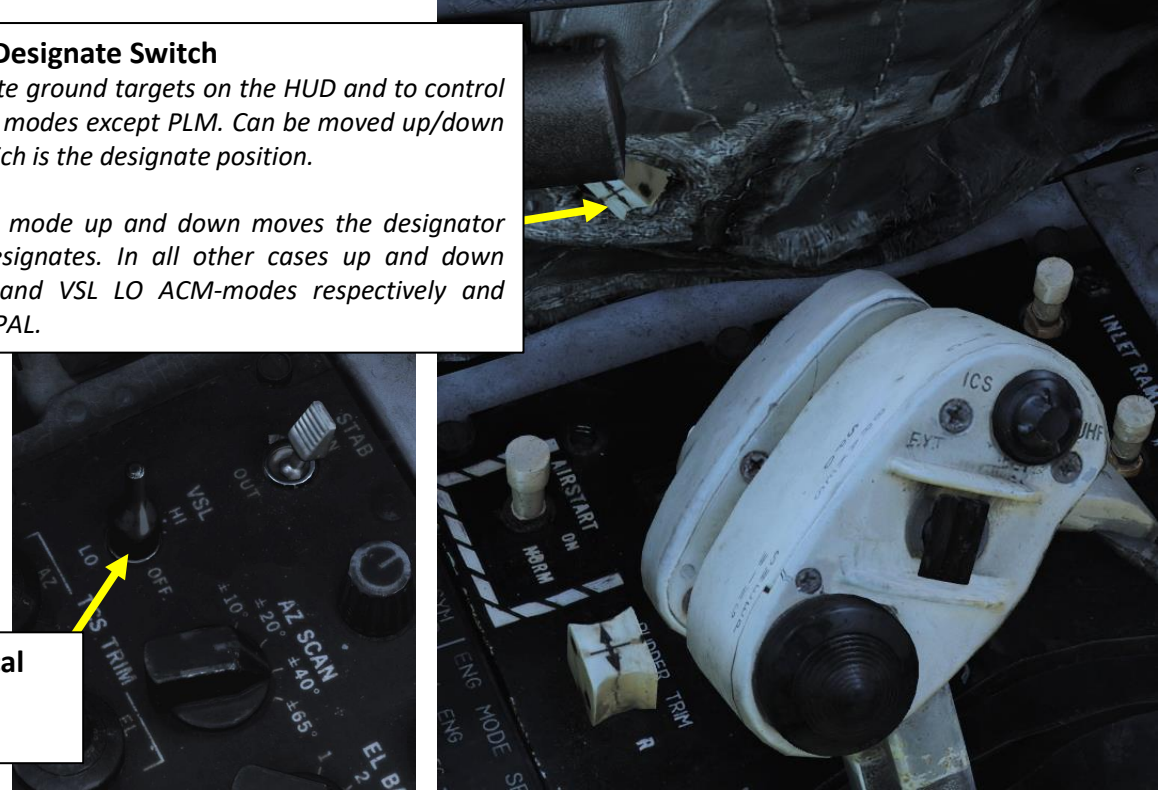
This commands the antenna to start a volume 5° wide in a circular fashion. If VSL HI is commanded the vertical area covered is from +15° to +55° and if VSL LO is commanded the area covered is from -15° to +25°. VSL is indicated on the HUD by the diamond moving with antenna line of sight indicating its current position.

When a target is detected within 5 NM the radar transitions into pulse STT, otherwise it continues in VSL until another mode is selected.

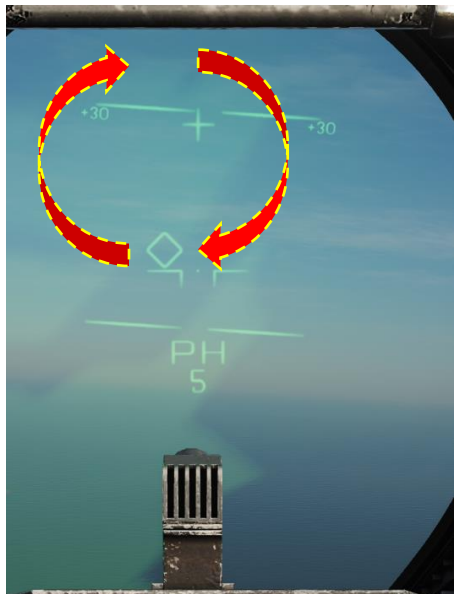


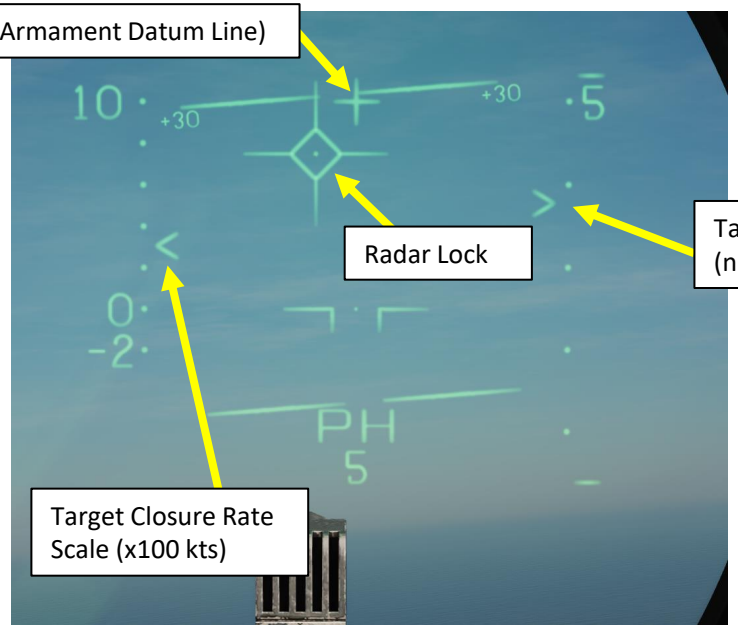
Pilot's Target Designate Switch
Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.



RIO's Radar VSL (Vertical Scan Lockon) Switch
HI / OFF / LOW





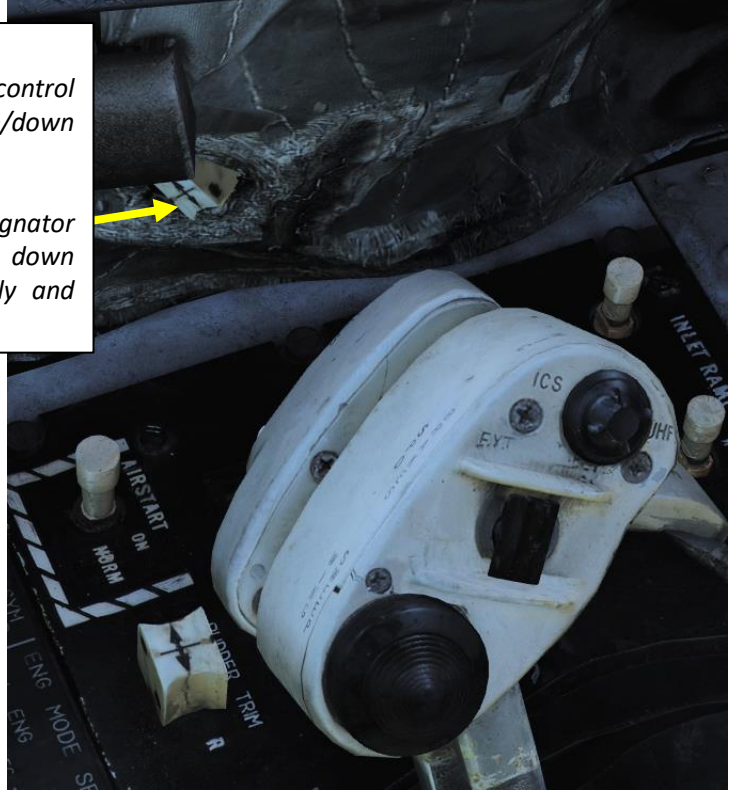
2 – AWG-9 RADAR ACM – PAL MODE

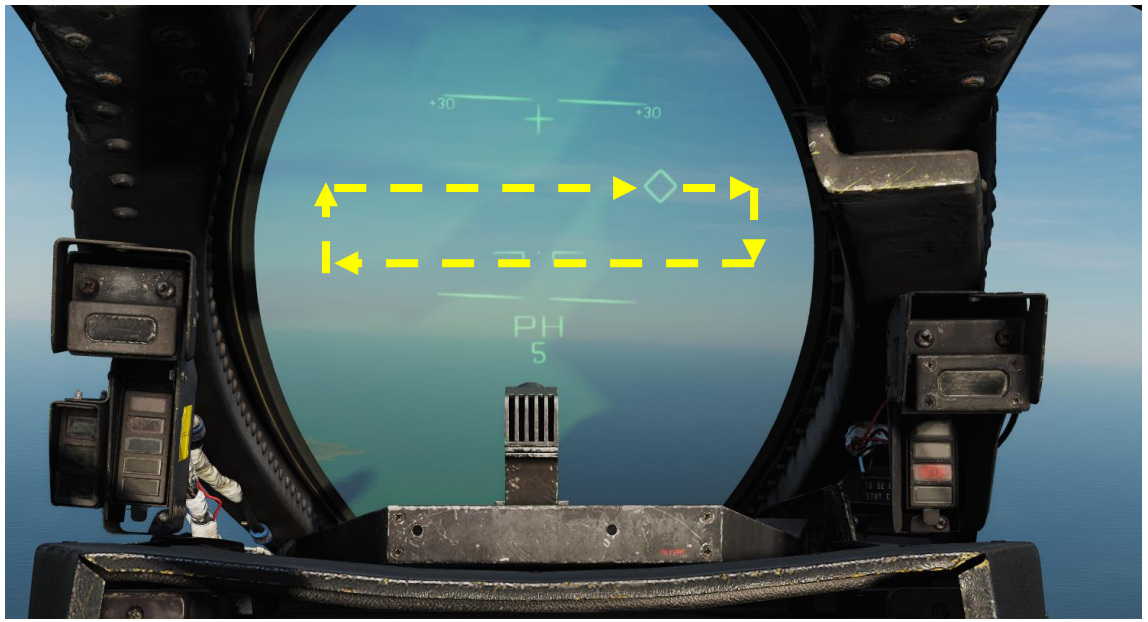
The PAL (Pilot Automatic Lockon) mode is enabled by the pilot selecting DES (pressing switch forward) on the target designate switch when not in A/G mode.

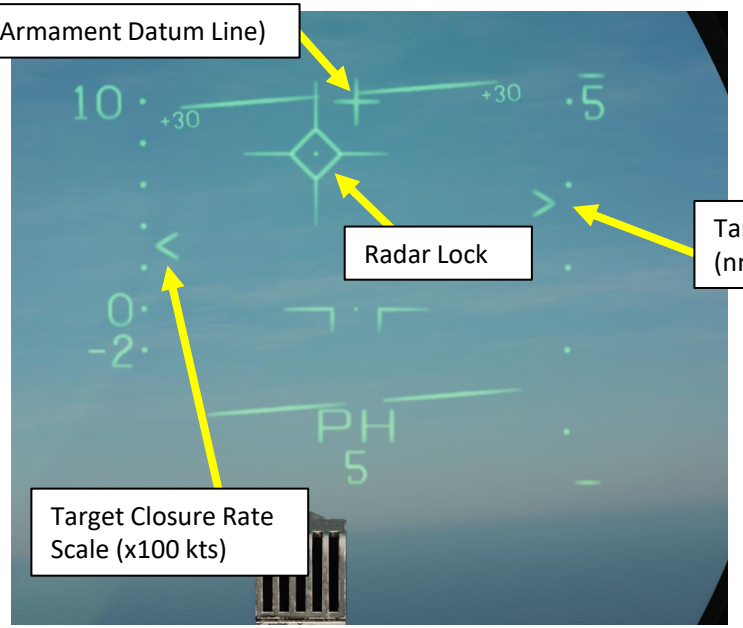
PAL commands the antenna to a 8-bar +/- 20° scan pattern locking onto the first target detected out to 15 NM. This mode is indicated by the diamond on the HUD following current antenna line of sight.

Pilot's Target Designate Switch
Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.





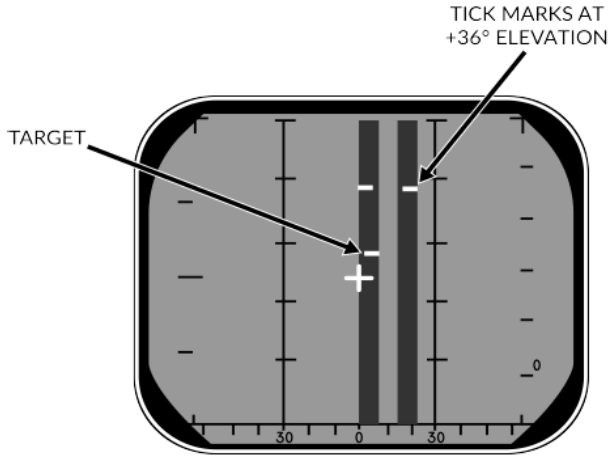


2 – AWG-9 RADAR
ACM – MRL MODE

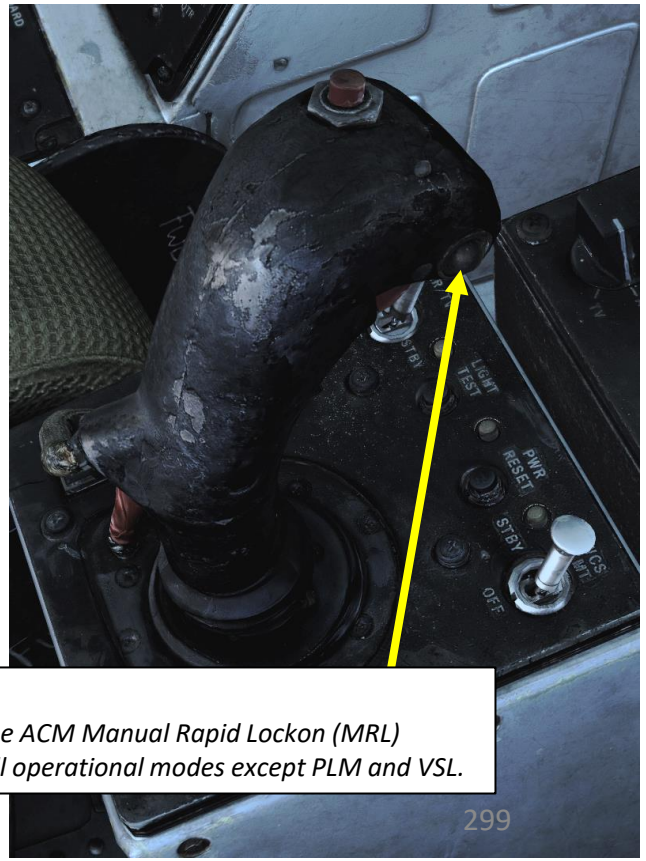
The manual rapid lockon (MRL) mode allows the RIO to quickly acquire a target within the antenna limits out to 5 NM. When the MRL button on the right side of the HCU stick is depressed it commands the radar to start a one-bar supersearch pattern out to 5 NM.

The HCU stick controls the supersearch pattern in azimuth and elevation (left/right controlling azimuth and up/down controlling elevation). The DDD displays a normal supersearch pattern in 5 NM scale and additionally two tick marks are shown at the edge of the scan pattern indicating current elevation. When the target is visible the RIO commands full-action to acquire the target and transfer to pulse STT.

If only half-action is commanded after entering into MRL and then released the radar transfers back to pulse search.







MRL Button
Button selecting the ACM Manual Rapid Lockon (MRL) mode. Overrides all operational modes except PLM and VSL.

2 – AWG-9 RADAR JESTER

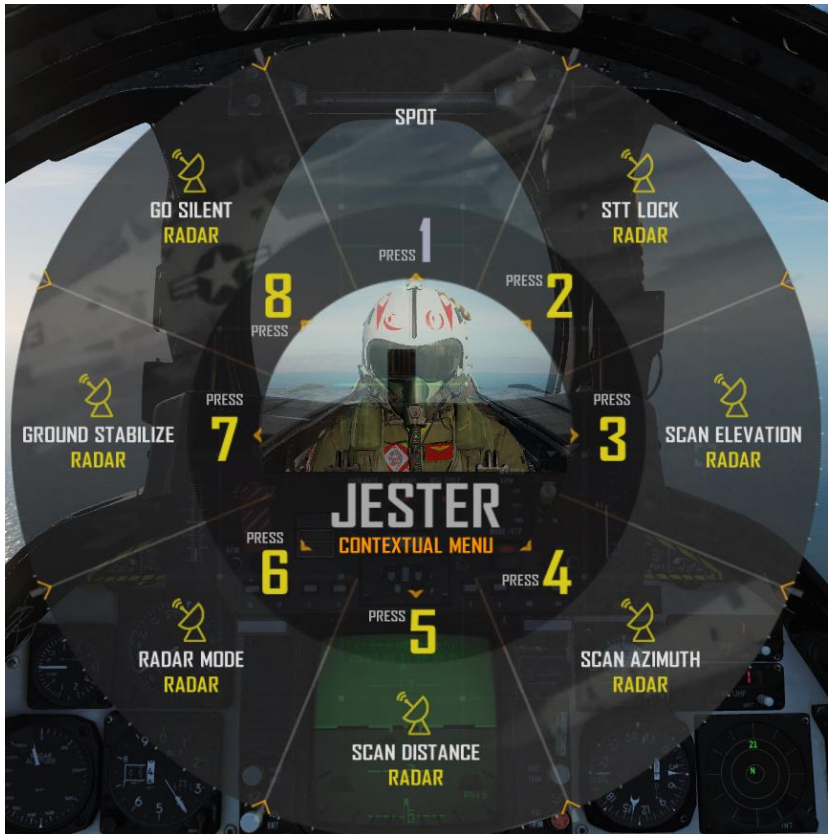
You can ask JESTER to choose what radar mode to use, what scanning parameters to use and who to lock. Simply press “A” and select either the “Beyond Visual Range Radar” menu or the “Within Visual Range Radar” menu.

JESTER will dynamically tell you what contacts he found, where they are and what is their identification and direction in relationship to you.













2 – AWG-9 RADAR
RADAR LINGO & TERMINOLOGY

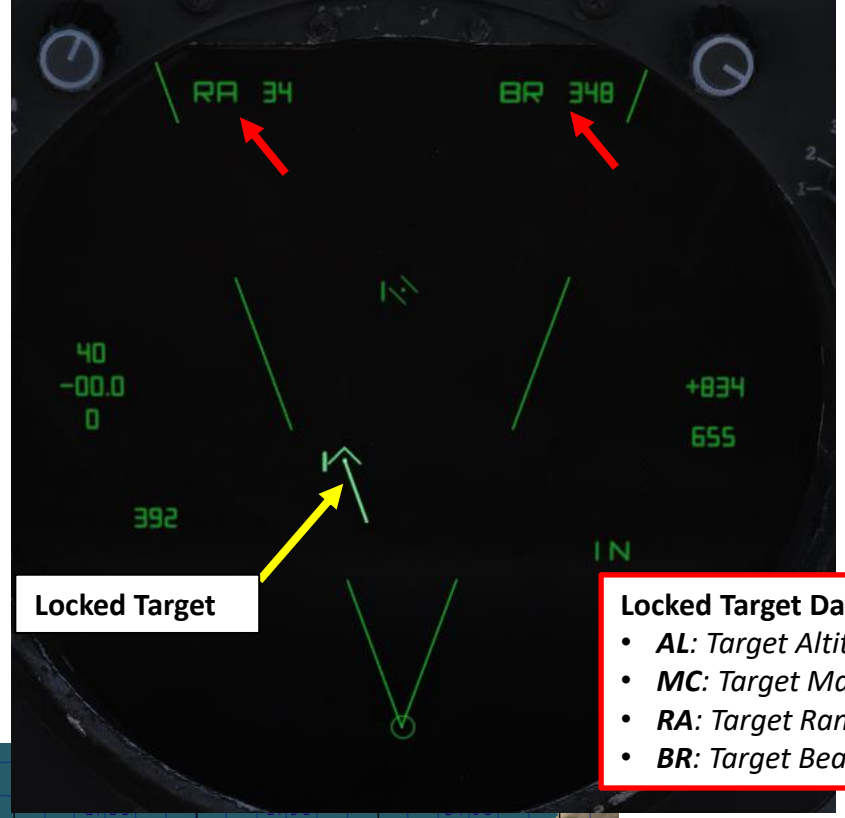
- BANDIT: Identified Enemy Aircraft
- BOGEY: Unidentified Aircraft
- SPIKE: Air-to-Air radar is locked on you
- BUDDY SPIKE: Friendly radar is locked on you
- NAILS: RWR contact, which emits radar waves but does not have a radar lock on you
- FOX 1: semi-active radar missile (27R/ER + AIM-7)
- FOX 2: heat-seeking infrared missile (27T/ET + AIM-9 + R-73/60)
- 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-54/R-77)
- 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

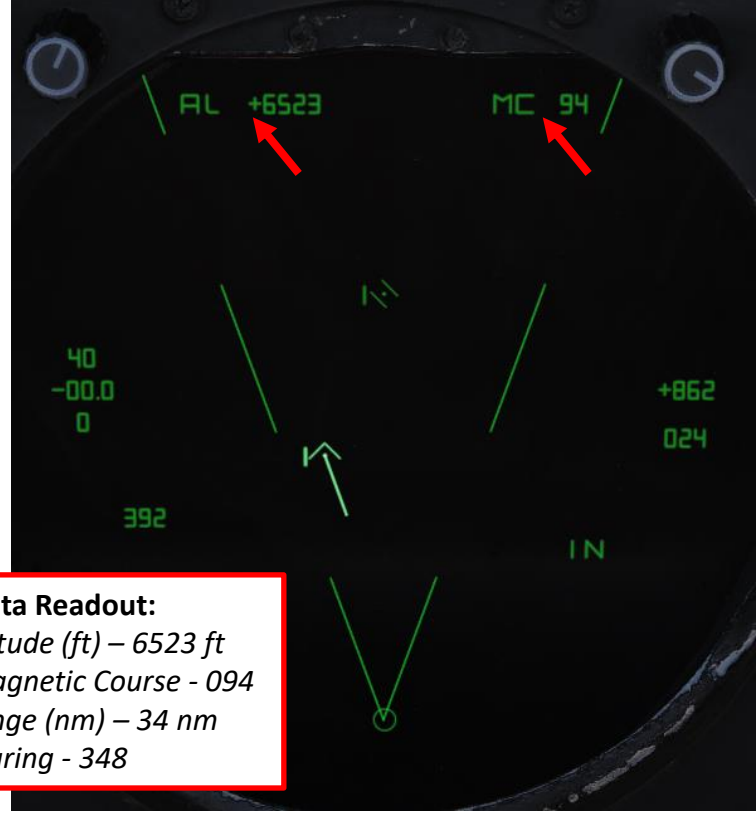


2 – AWG-9 RADAR
RIO BRA CALL

It is important for the RIO to communicate to the pilot what he sees on radar. In order to do it efficiently, the RIO can perform a "BRA" call (Bearing-Range-Altitude) for friendly, unknown or hostile targets spotted on the radar.

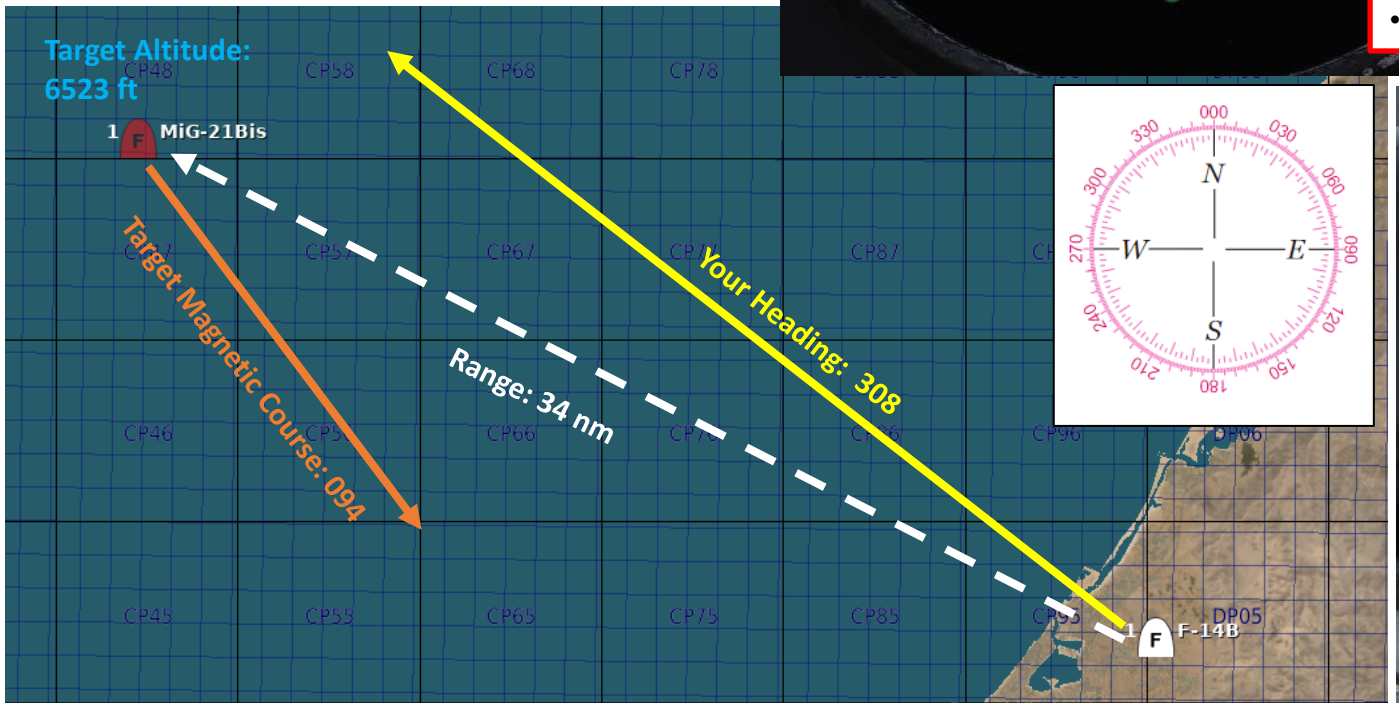
If the RIO hooks up a target on the TID, Target Data readouts will cycle between AL (Altitude), MC (Magnetic Course), RA (Range) and BR (Bearing) information.





Locked Target Data Readout:

- ***AL**: Target Altitude (ft) – 6523 ft*
- ***MC**: Target Magnetic Course - 094*
- ***RA**: Target Range (nm) – 34 nm*
- ***BR**: Target Bearing - 348*





2 – AWG-9 RADAR RIO BRA CALL

The BR (Bearing) given by the radar is actually a bearing **relative to the aircraft's nose** (0 / 360 bearing). As an example, BR 348 means that the target has a bearing of 348 relative to the aircraft's nose. In simpler terms, the target is 12 degrees off to your left. To get the Target Absolute Bearing, take your absolute heading (308) and add or substract the offset off your nose (12 deg). In our case, target absolute bearing is at 308 – 12 = 296.

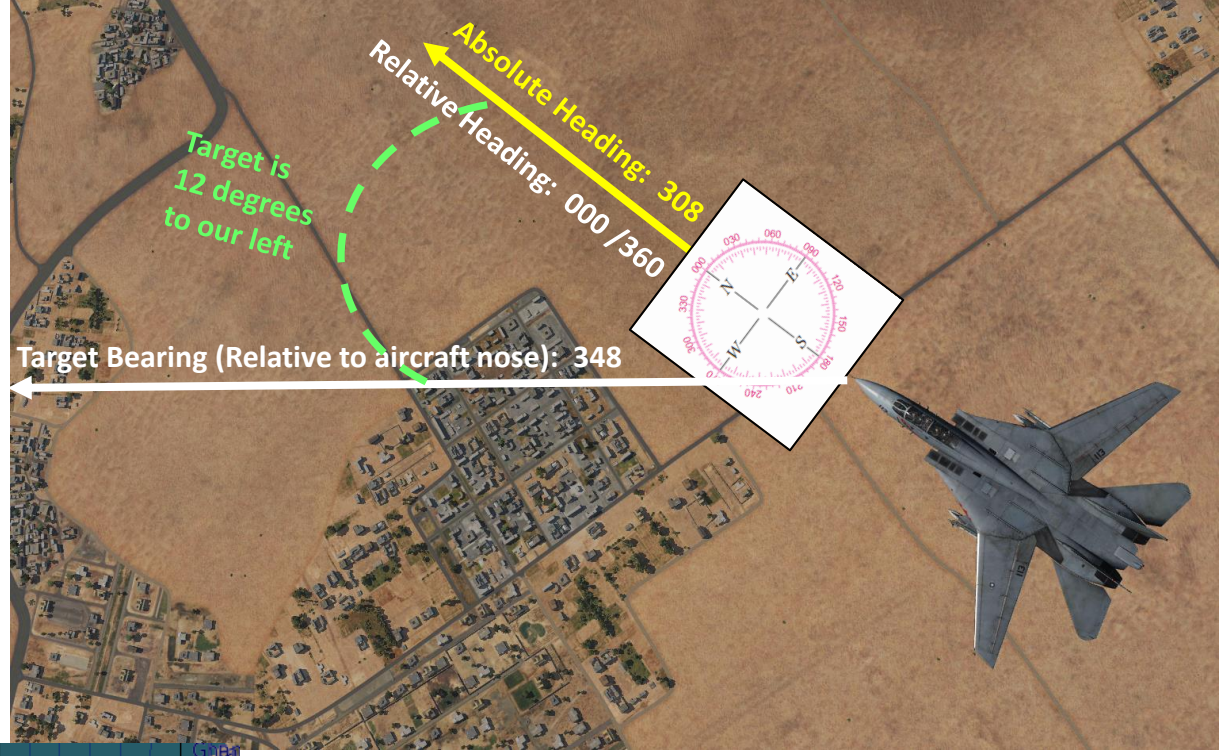
A **BRA** (Target Bearing Range Altitude) call from the RIO to the pilot would sound something like:

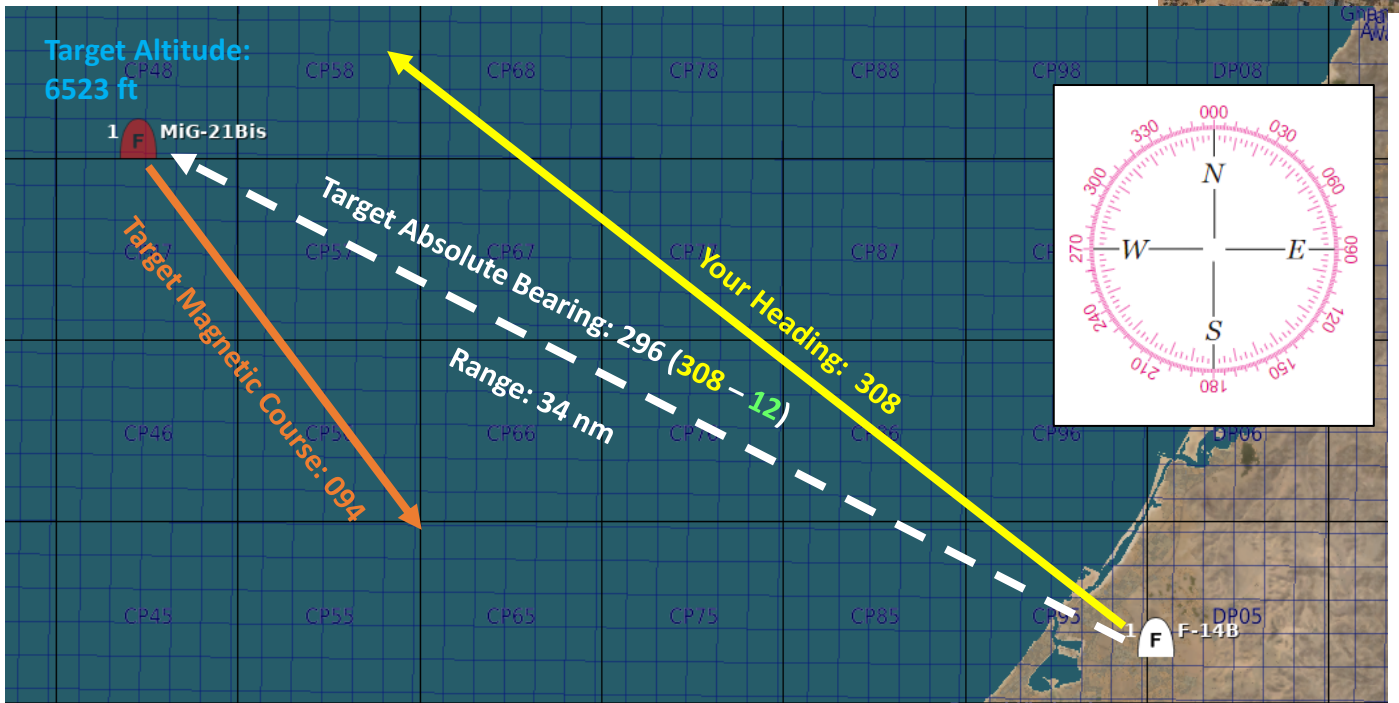
- **"-Bandit, BRA, 296, 34 miles, angels 6.5."**

You could also refer to a target in relationship to the aircraft nose (Bandit, 12 degrees left).

A **BRA(A)** (Bearing Range Altitude Aspect) includes the target aspect (Hot if target goes towards you, Cold if target goes away from you. Can be deduced from Target Magnetic Course). A BRA(A) call would sound something like:

- **"-Bandit, BRA(A), 296, 34 miles, angels 6.5, hot."**







3 – TCS/ALQ-100 (TELEVISION CAMERA SET)

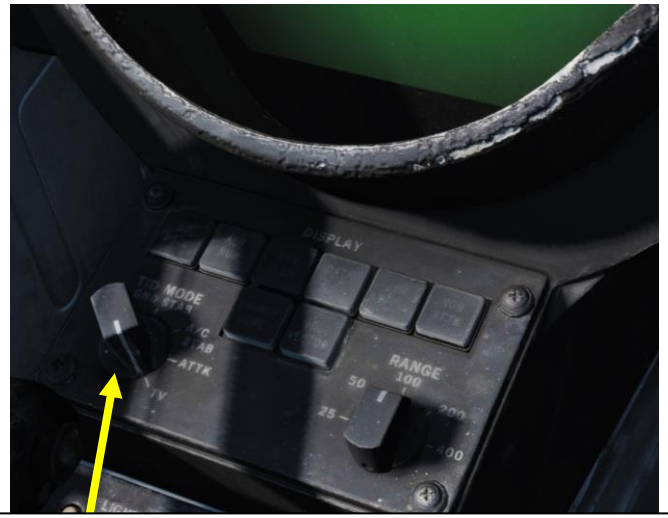


3 – TCS/ALQ-100 (TELEVISION CAMERA SET)

The TCS is located underneath and behind the radar radome, just in front of the nose gear well. It contains an aircraft stabilized high resolution (for it's time) closed circuit television camera mainly used for reconnaissance and visual identification of an aircraft.

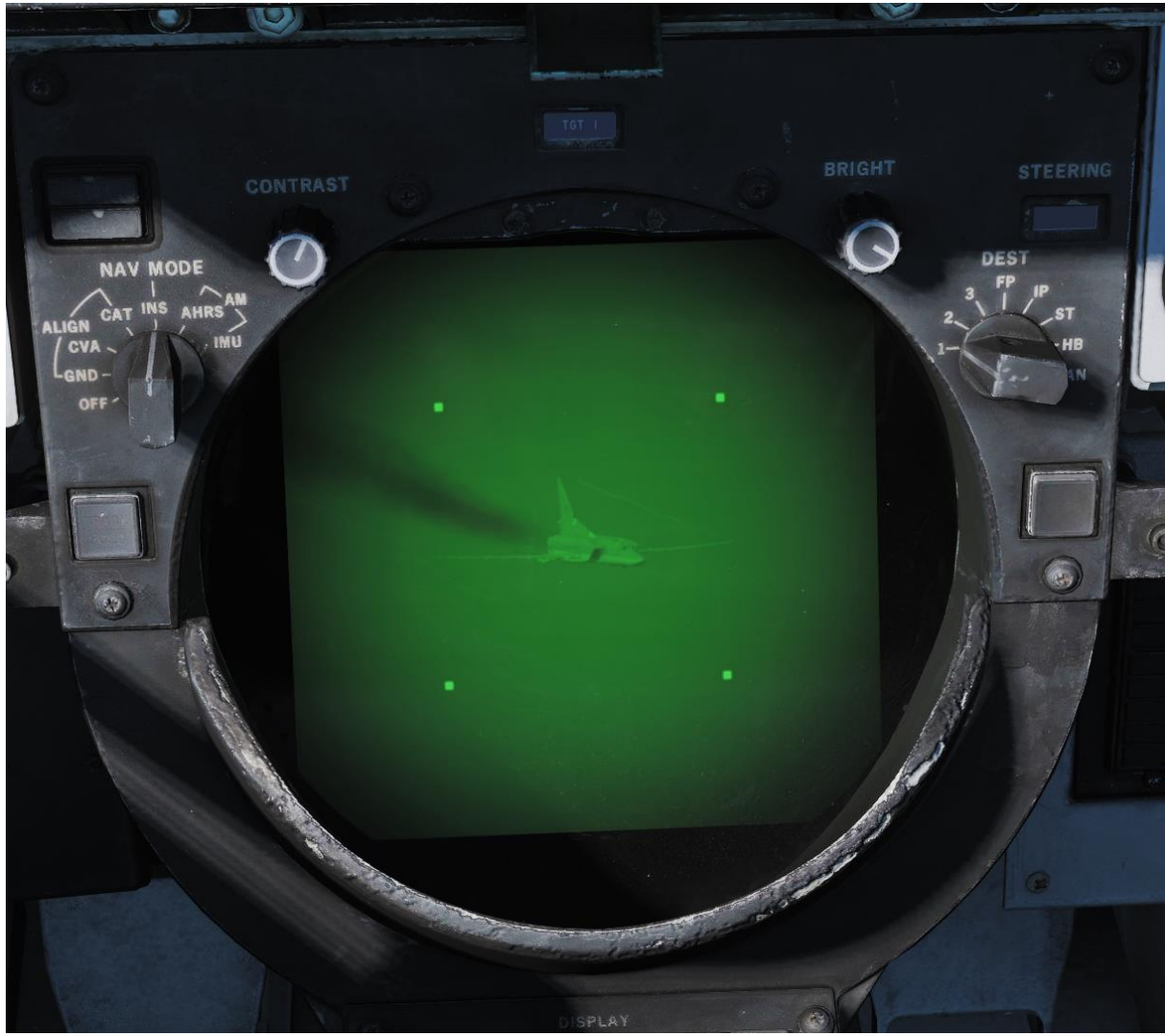
The sensor has two fields of view (FOV), narrow (NFOV) which is 0.44° or 10X magnification and wide (WFOV) which is 1.42° or 4X magnification. The gimbal limits are +/- 15° except upwards which is limited to +11° and the TCS is capable of independent contrast lock or being slaved to the AN/AWG-9 radar.

Therefore, an easy way to use the TCS is to set the IR/TV Power switch ON (**allow 2 minutes of warm-up time at STBY**), lock a target using the radar, then set the TID Mode selector to TV.

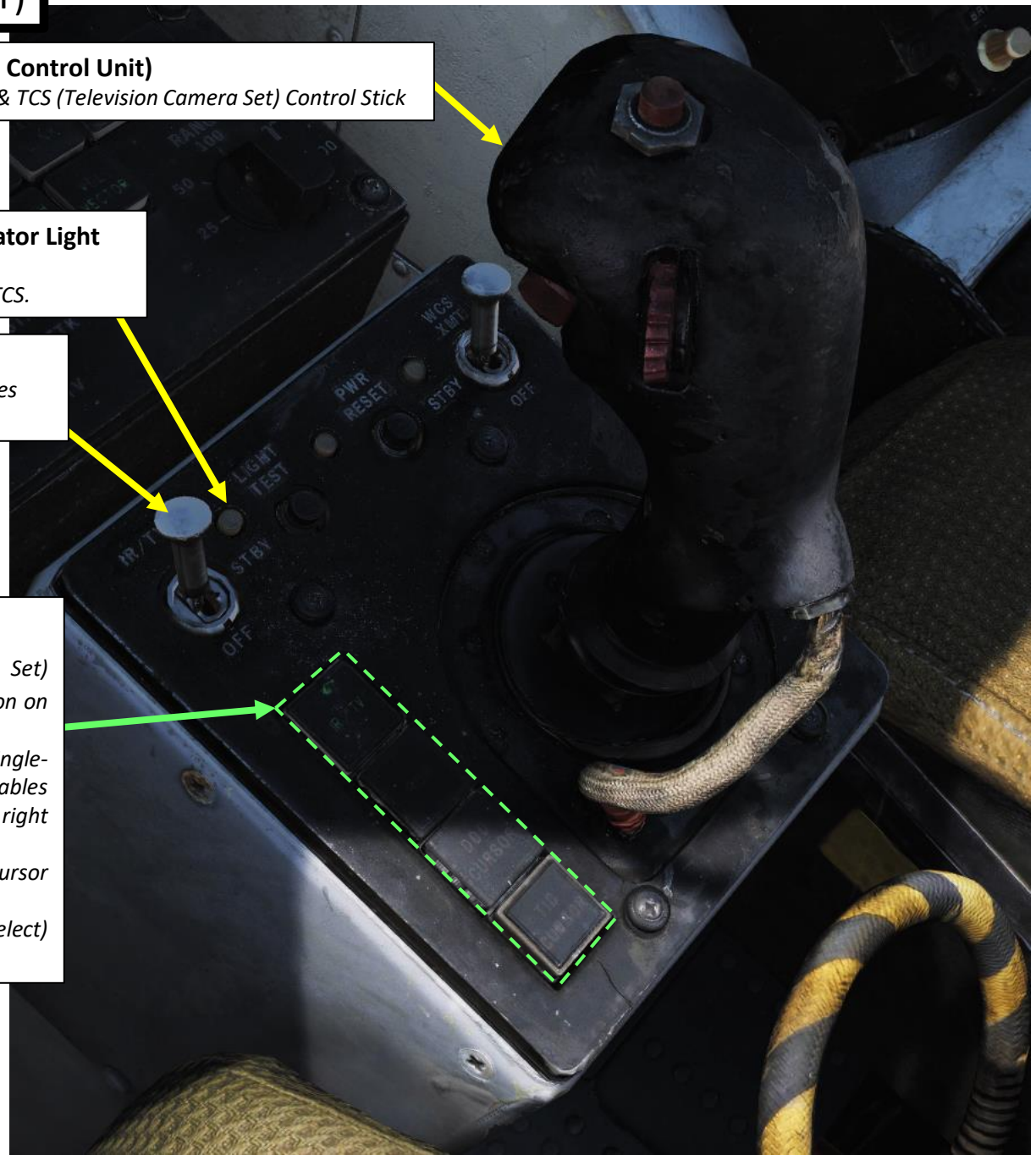


TID (Tactical Information Display) Mode Selector

- ***GND STAB****: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.*
- ***A/C STAB****: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.*
- ***ATTAK****: Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.*
- ***TV****: selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD.*



3 – TCS/ALQ-100 (TELEVISION CAMERA SET)



HCU (Hand Control Unit)
Main Radar & TCS (Television Camera Set) Control Stick

IR/TV Overtemperature Indicator Light
Light indicating the presence of an overtemperature condition in the TCS.

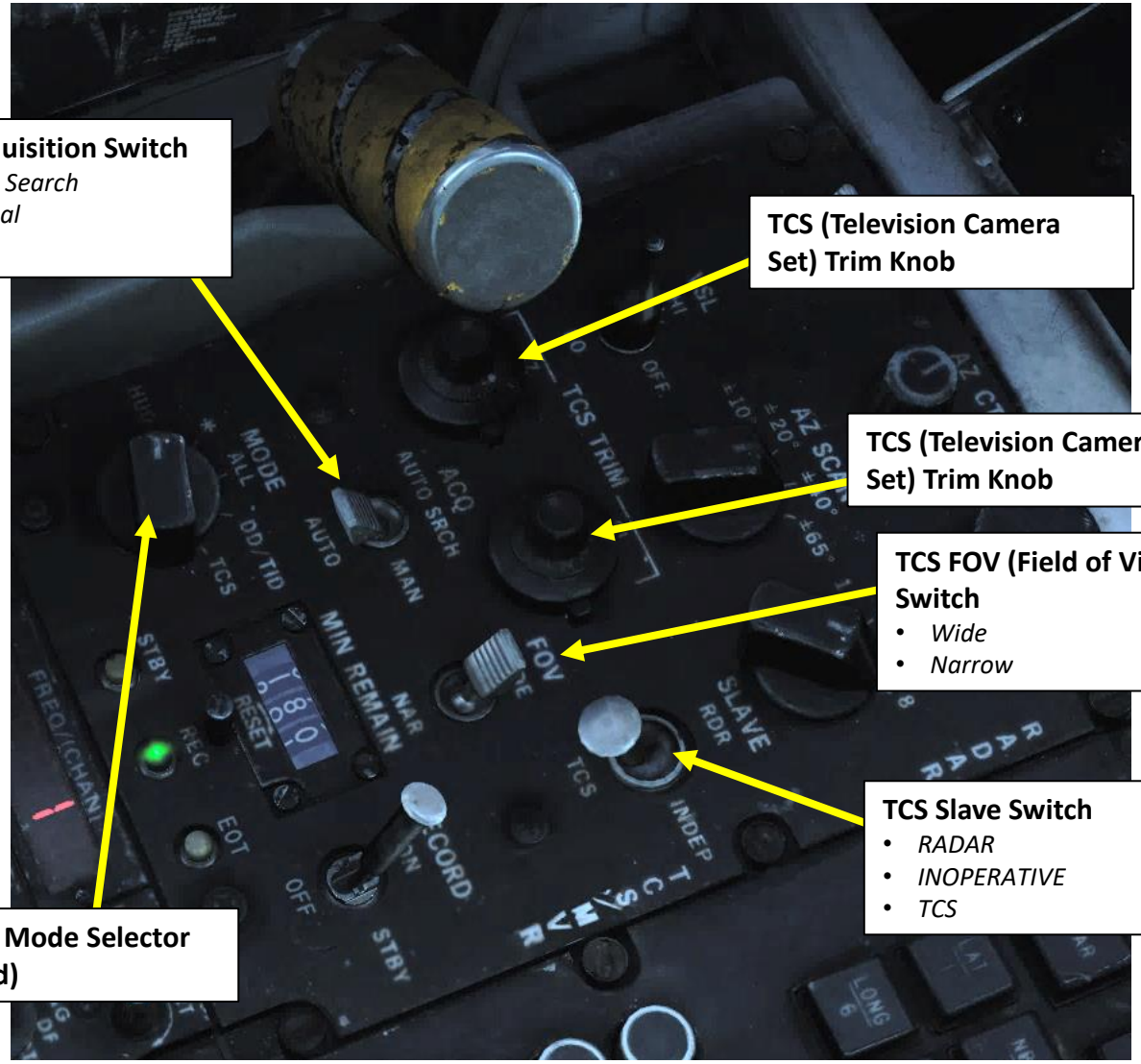
IR/TV Switch
Switch controlling TCS power. Enables selection of OFF/STBY and ON.

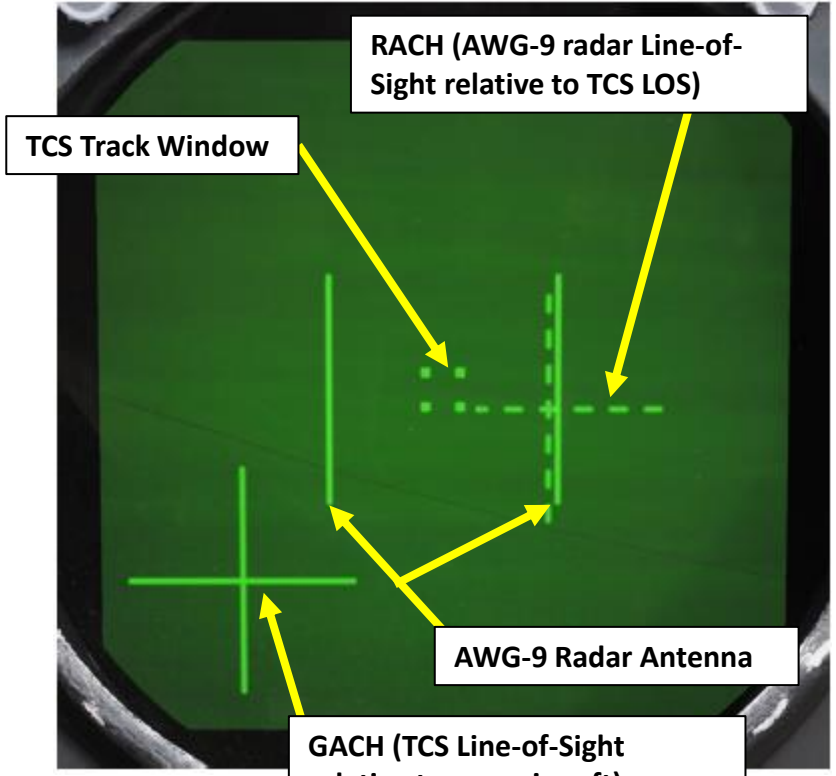
HCU (Hand Control Unit) Mode Selector Buttons

- ***IR/TV Mode*** - *Selects control of TCS (Television Camera Set) azimuth, elevation and tracking. Enables display of TCS elevation on right elevation indicator on DDD.*
- ***RADAR Mode*** - *Selects control of radar antenna for STT(Single-Target Track) lock-on and return to search if already in STT. Enables display of currently commanded radar antenna elevation on right elevation indicator on DDD.*
- ***DDD Mode*** - *Selects control of DDD (Detailed Data Display) cursor used to mark a geographical position while in pulse radar mode.*
- ***TID Mode*** - *Selects control of TID cursor used to hook (select) symbols on the Tactical Information Display.*

3 – TCS/ALQ-100 (TELEVISION CAMERA SET)

The FLIR sensor itself has three different zoom levels or fields of view (FoV): wide, narrow and Expanded. Limits and maximum slew rates are listed in the Heatblur F-14 wiki.



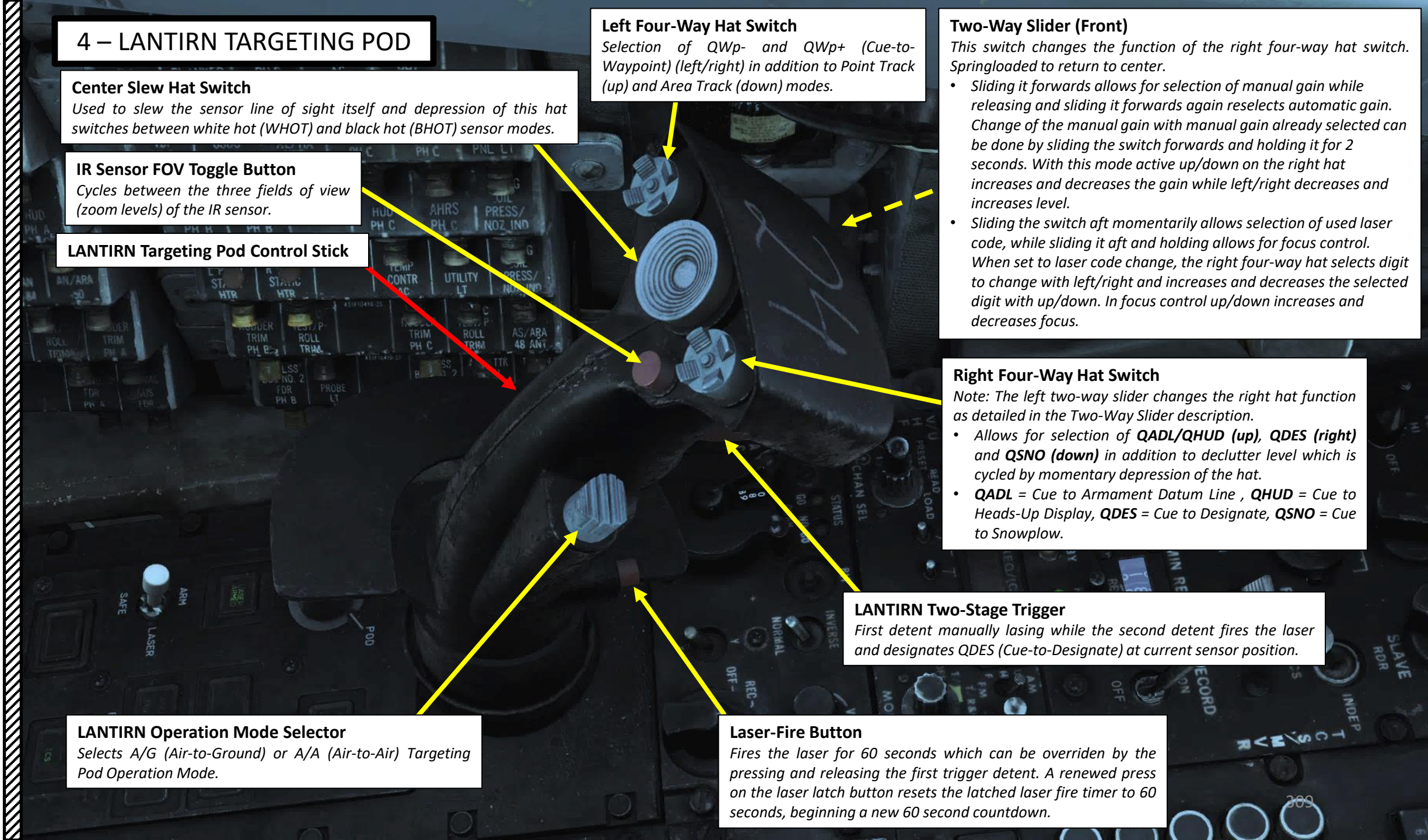




4 – LANTIRN TARGETING POD



4 – LANTIRN TARGETING POD



Center Slew Hat Switch
Used to slew the sensor line of sight itself and depression of this hat switches between white hot (WHOT) and black hot (BHOT) sensor modes.

IR Sensor FOV Toggle Button
Cycles between the three fields of view (zoom levels) of the IR sensor.

LANTIRN Targeting Pod Control Stick

Left Four-Way Hat Switch
Selection of QWp- and QWp+ (Cue-to-Waypoint) (left/right) in addition to Point Track (up) and Area Track (down) modes.

Two-Way Slider (Front)
This switch changes the function of the right four-way hat switch. Springloaded to return to center.

- *Sliding it forwards allows for selection of manual gain while releasing and sliding it forwards again reselects automatic gain. Change of the manual gain with manual gain already selected can be done by sliding the switch forwards and holding it for 2 seconds. With this mode active up/down on the right hat increases and decreases the gain while left/right decreases and increases level.*
- *Sliding the switch aft momentarily allows selection of used laser code, while sliding it aft and holding allows for focus control. When set to laser code change, the right four-way hat selects digit to change with left/right and increases and decreases the selected digit with up/down. In focus control up/down increases and decreases focus.*

Right Four-Way Hat Switch
Note: The left two-way slider changes the right hat function as detailed in the Two-Way Slider description.

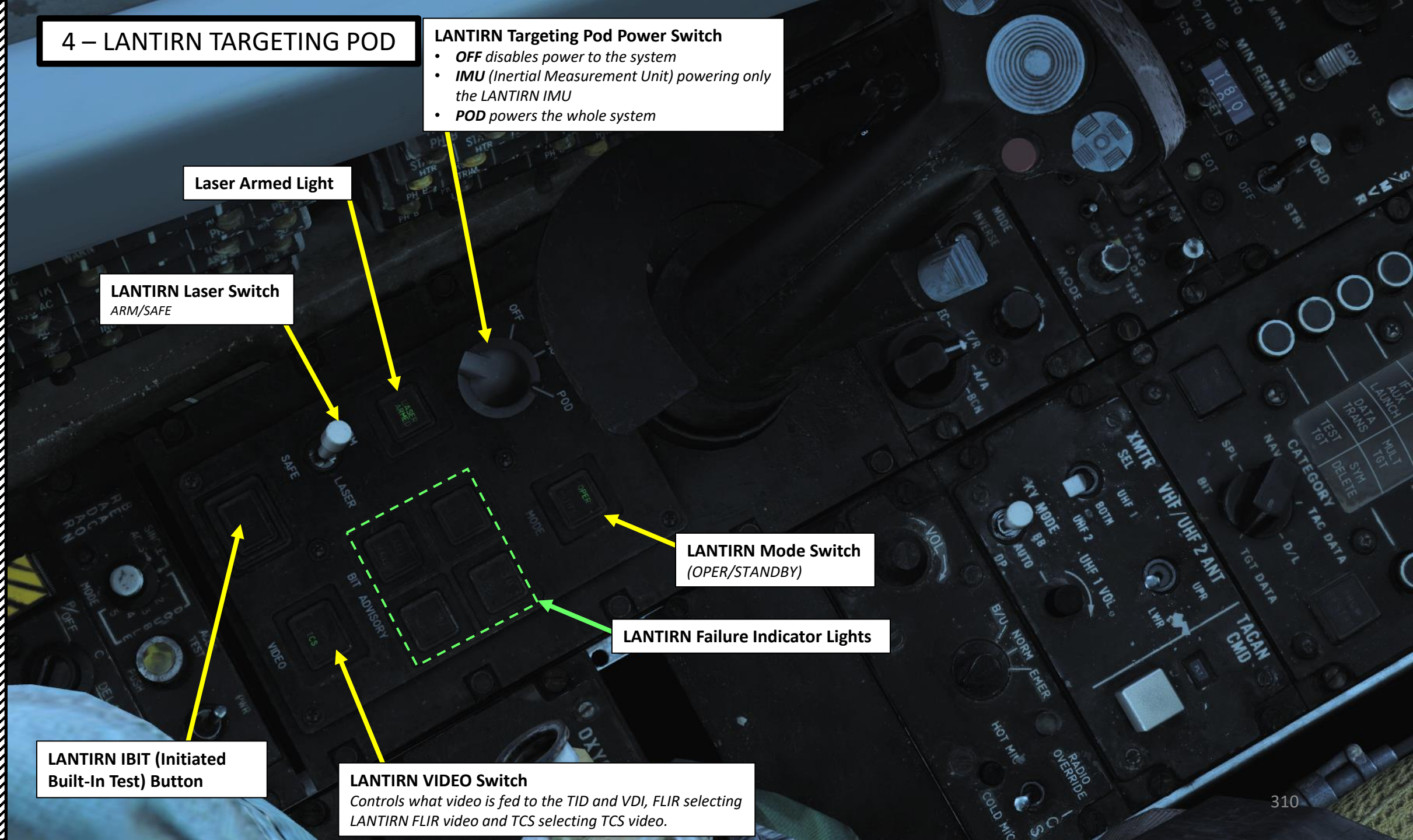
- *Allows for selection of **QADL/QHUD (up)**, **QDES (right)** and **QSNO (down)** in addition to declutter level which is cycled by momentary depression of the hat.*
- ***QADL** = Cue to Armament Datum Line , **QHUD** = Cue to Heads-Up Display, **QDES** = Cue to Designate, **QSNO** = Cue to Snowplow.*

LANTIRN Two-Stage Trigger
First detent manually lasing while the second detent fires the laser and designates QDES (Cue-to-Designate) at current sensor position.

LANTIRN Operation Mode Selector
Selects A/G (Air-to-Ground) or A/A (Air-to-Air) Targeting Pod Operation Mode.

Laser-Fire Button
Fires the laser for 60 seconds which can be overriden by the pressing and releasing the first trigger detent. A renewed press on the laser latch button resets the latched laser fire timer to 60 seconds, beginning a new 60 second countdown.

4 – LANTIRN TARGETING POD



LANTIRN Targeting Pod Power Switch
- ***OFF*** *disables power to the system*
- ***IMU*** *(Inertial Measurement Unit) powering only the LANTIRN IMU*
- ***POD*** *powers the whole system*

Laser Armed Light

LANTIRN Laser Switch
ARM/SAFE

LANTIRN Mode Switch
(OPER/STANDBY)

LANTIRN Failure Indicator Lights

LANTIRN IBIT (Initiated Built-In Test) Button

LANTIRN VIDEO Switch
Controls what video is fed to the TID and VDI, FLIR selecting LANTIRN FLIR video and TCS selecting TCS video.

4 – LANTIRN TARGETING POD

LANTIRN VIDEO Switch
Controls what video is fed to the TID and VDI, FLIR selecting LANTIRN FLIR video and TCS selecting TCS video.

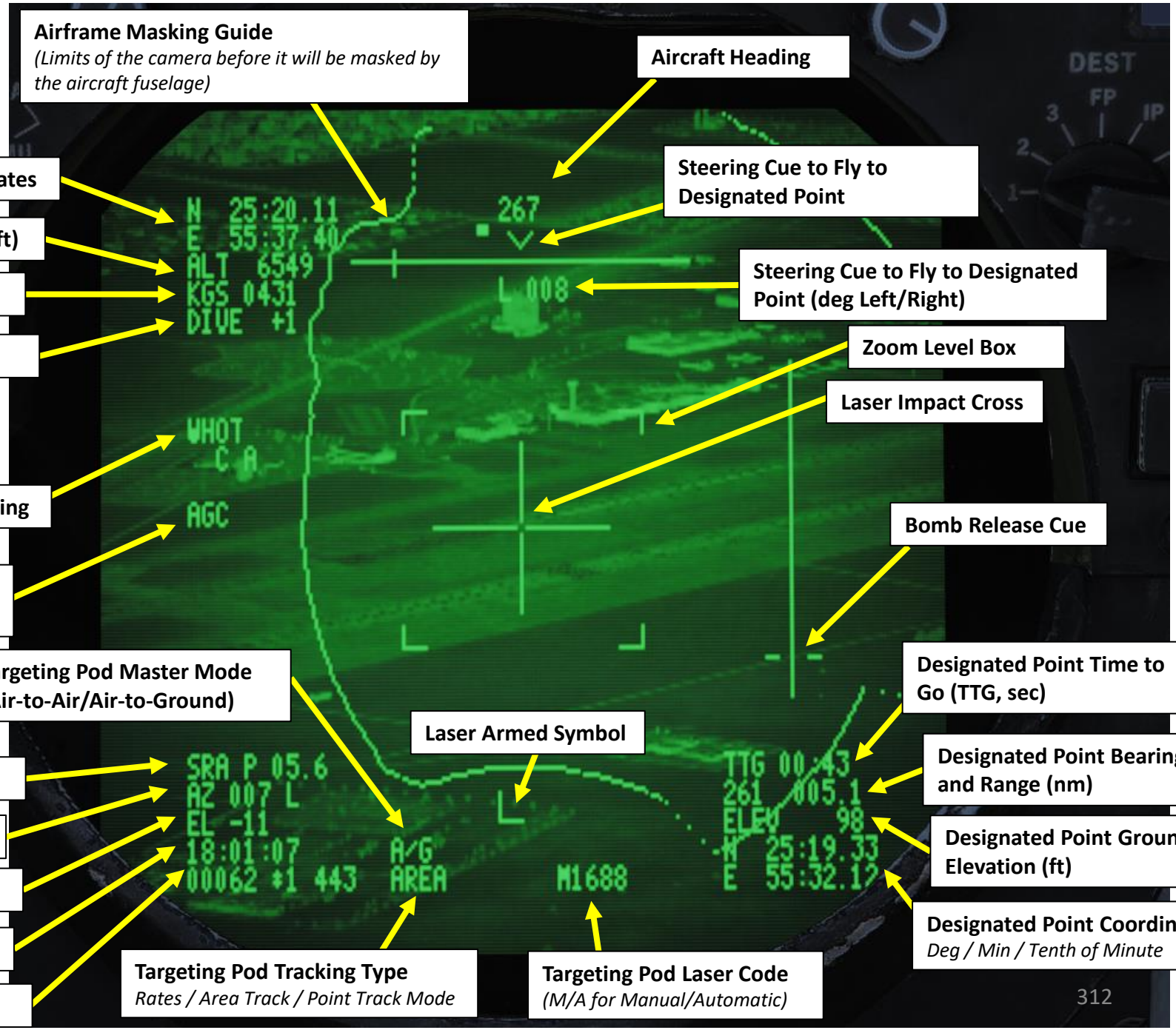


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- ***ATTAK***: *Attack functions in the same manner as A/C STAB but superimposes the attack steering symbology.*
- ***TV***: *selects the TCS for display on the TID. Disables normal tactical presentation on the TID and on the HSD.* ***If LANTIRN is equipped and LANTIRN VIDEO switch is set to FLIR, LANTIRN feed will go through the TID Display.***



4 – LANTIRN TARGETING POD



Airframe Masking Guide
(Limits of the camera before it will be masked by the aircraft fuselage)

Aircraft Heading

Aircraft Coordinates

Steering Cue to Fly to Designated Point

Aircraft Altitude (ft)

Steering Cue to Fly to Designated Point (deg Left/Right)

Ground Speed (kts)

Zoom Level Box

Dive Angle (deg)

Laser Impact Cross

FLIR WHOT (White Hot) / BHOT (Black Hot) Setting

Bomb Release Cue

Gain Control (AGC/MGC, Automatic/Manual Gain Control)

Targeting Pod Master Mode (Air-to-Air/Air-to-Ground)

Designated Point Time to Go (TTG, sec)

Laser Armed Symbol

Targeting Pod SRA (Slant Range to a Target)

Designated Point Bearing and Range (nm)

Targeting Pod Camera Azimuth (deg Left/Right)

Designated Point Ground Elevation (ft)

Targeting Pod Camera Elevation (deg)

Local Time

Designated Point Coordinates
Deg / Min / Tenth of Minute

Targeting Pod SRA (Slant Range to a Point)

Targeting Pod Tracking Type
Rates / Area Track / Point Track Mode

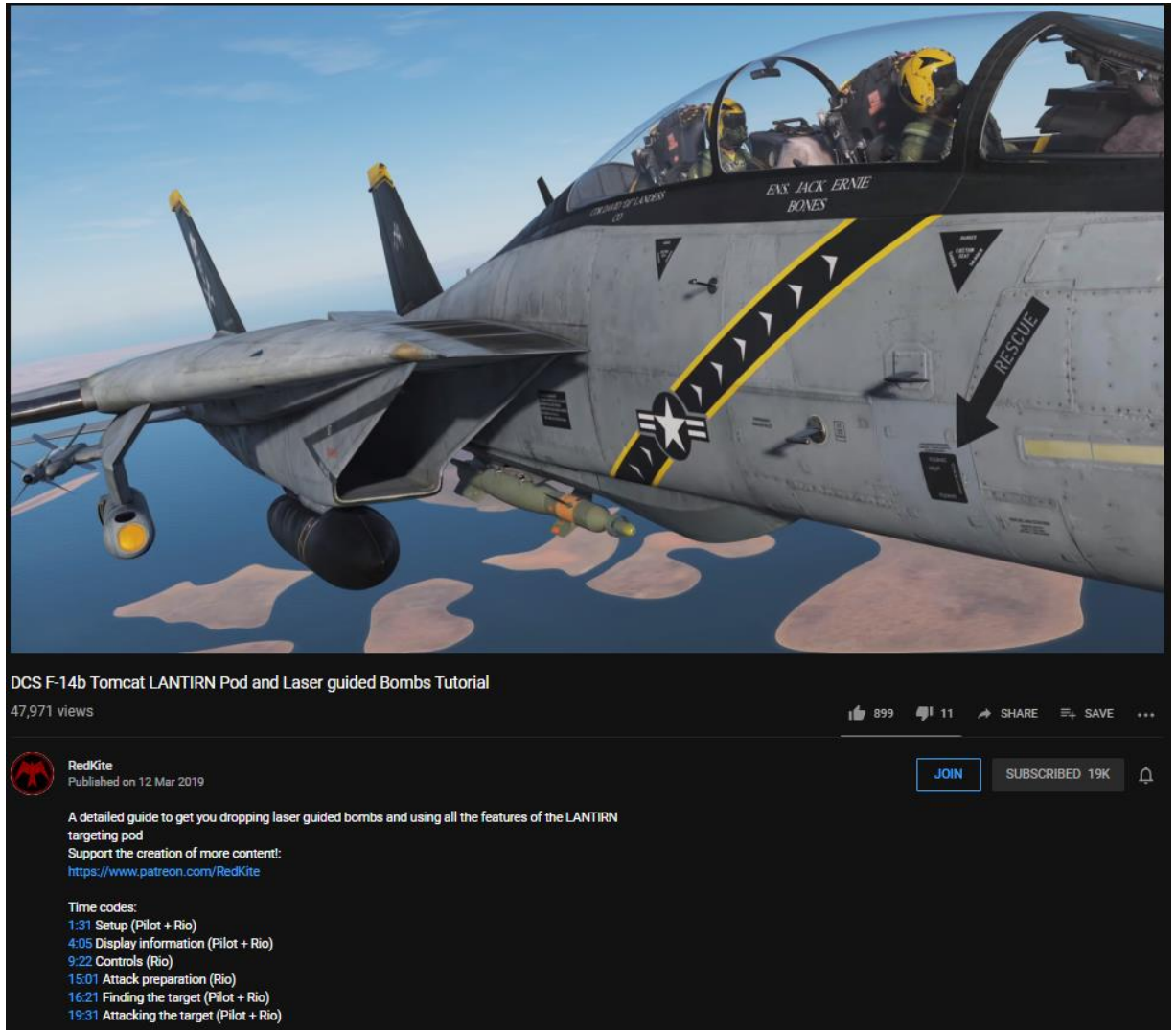
Targeting Pod Laser Code
(M/A for Manual/Automatic)

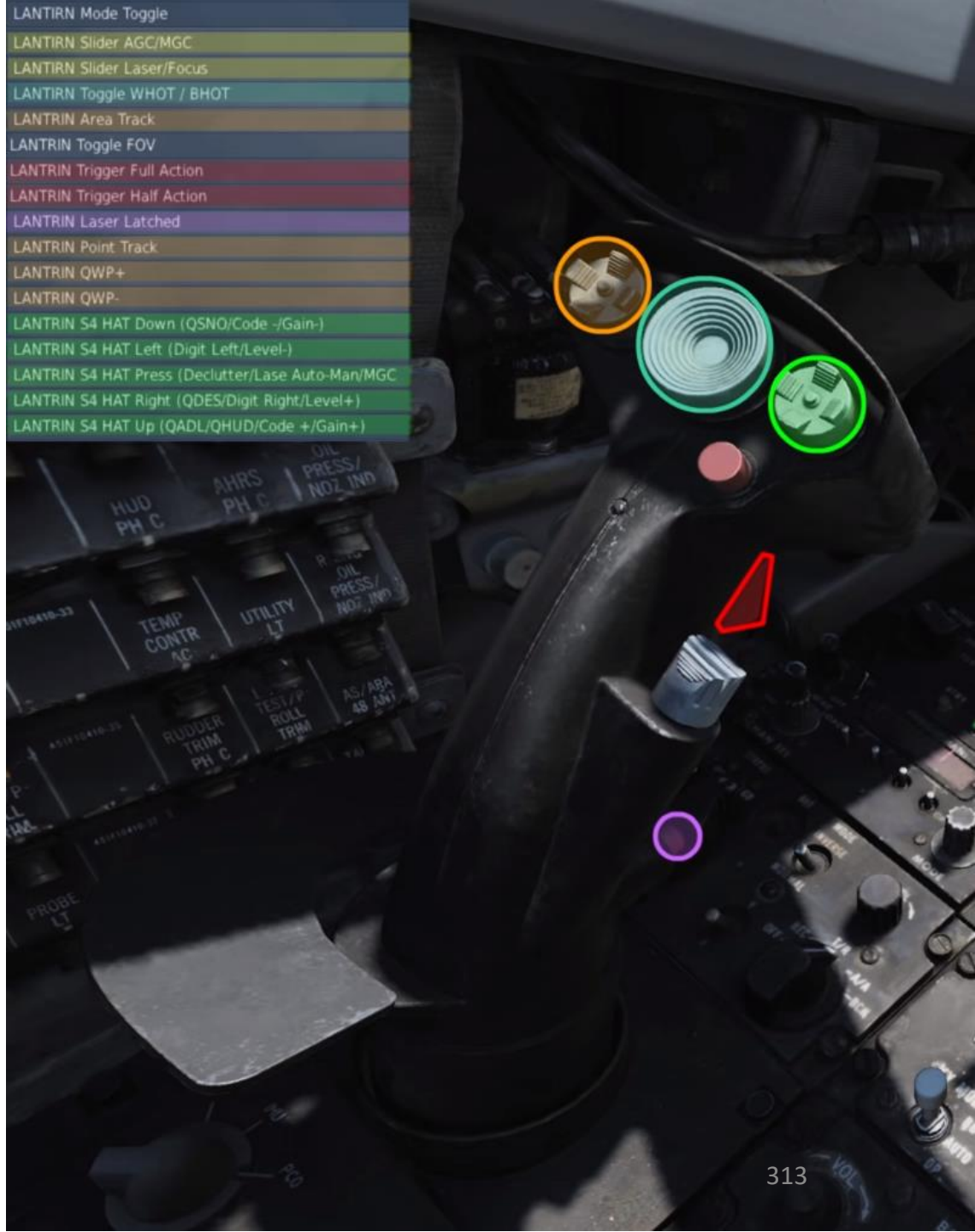
4 – LANTIRN TARGETING POD

An excellent LANTIRN pod tutorial by Redkite is available on youtube. Feel free to consult the video below.

Link: https://youtu.be/R9-8UCj66Ds

A targeting pod demonstration will be available in the WEAPONS section for guided bomb units.





SECTION STRUCTURE

- **1 - Introduction**
  - Introduction to Weapons
  - My Weapons Control Setup
  - Armament Stations
  - Weapons Setup
  - Bomb Delivery Modes

- **2 – Air-to-Ground Weapons**
  - 2.1 – Unguided Bomb (MK-82 – Computer Pilot/CCIP)
  - 2.2 – Unguided Bomb (MK-82 – Computer Target/CCRP)
  - 2.3 – ZUNI Rockets
  - 2.4 – M61 Guns (Air-to-Ground)
  - 2.5 – Using TCS (Television Camera Set)
  - 2.6 – GBU-12 Paveway II (Laser-Guided)
  - 2.7 – TALD Decoys

- **3 – Air-to-Air Weapons**
  - 3.1 – M61 Guns (Manual/No Radar Tracking)
  - 3.2 – M61 Guns (RTGS/No Radar Tracking)
  - 3.3 – M61 Guns (RTGS/Radar Tracking)
  - 3.4 – AIM-9M Sidewinder (No Radar)
  - 3.5 – AIM-9M Sidewinder (Radar)
  - 3.6 – AIM-7M Sparrow (Radar)
  - 3.7 – AIM-54 Phoenix (Single Target)
  - 3.8 – AIM-54 Phoenix (RIO Six Shooter)

- **4 – Selective Ordnance Jettison**

- **5 – Videos**

BOMBS

WEAPON	TYPE	WEAPON	TYPE
MK-81	250 lbs low-drag unguided bomb Fuze: Nose	MK-82AIR MK-82SE (Snake Eyes)	500 lbs high-drag unguided bomb Fuze: Nose for free-fall drop, Nose/Tail for retarded drop
MK-82	500 lbs low-drag unguided bomb Fuze: Nose	GBU-10/12/16/24 PAVEWAY II	2000/500/1000/2000 lbs laser-guided bomb unit (GBU) Fuze: Nose
MK-83	1000 lbs low-drag unguided bomb Fuze: Nose	MK-20 Rockeye	Unguided cluster bomb Fuze: Nose
MK-84	2000 lbs low-drag unguided bomb Fuze: Nose	BDU-33	25 lbs unguided training bomb Fuze: Nose

GUN POD

WEAPON	TYPE
M61 Vulcan	Six-barrel 20 mm Gatling-type rotary cannon (676 rounds)

ROCKETS

WEAPON	TYPE
ZUNI MK-71	130 mm (5 inches) unguided rockets Fuze: Nose

AIR-TO-AIR MISSILES

WEAPON	TYPE
AIM-9L/M Sidewinder	Infrared guided air-to-air missile
AIM-7M Sparrow	Semi-active radar-guided air-to-air missile
AIM-54A Mk 60 Phoenix	Active radar homing air-to-air missile. Higher speed and range than AIM-54C.
AIM-54C Phoenix	Active radar homing air-to-air missile. Smokeless and equipped with better, digital electronics than AIM-54A.

SPECIALIZED MUNITIONS

WEAPON	TYPE
ADM-141 TALD	Air-to-Ground tactical air-launched decoy (TALD)

1 - MY WEAPONS CONTROLS SETUP
PILOT STICK



Store Release

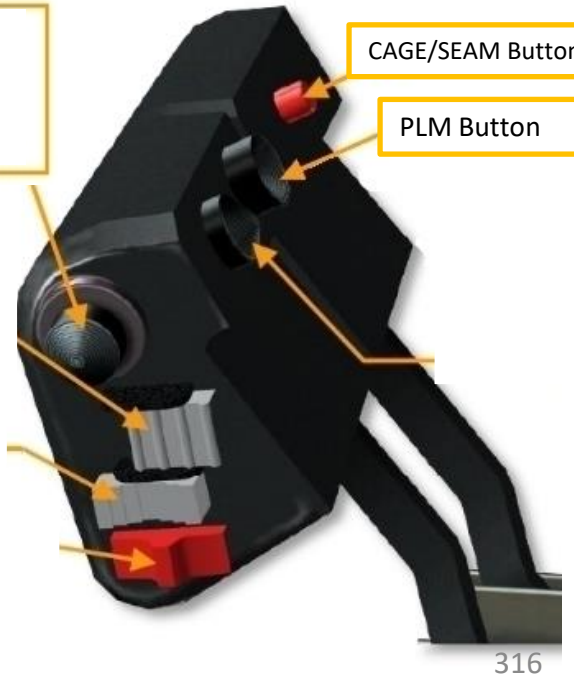
Trigger (First Detent)
Trigger (Second Detent)

↑ DLC Thumbwheel FWD
→
↓ DLC Thumbwheel AFT
←
P DLC Toggle / Countermeasure Dispense

↑ Target Designate UP / VSL HI
→ Target Designate Forward / PAL
↓ Target Designate DOWN / VSL LO
←

↑ ZOOM IN SLOW / Weapon Selector UP (LSHIFT Modifier)
→ Weapon Selector Press
↓ ZOOM OUT SLOW / Weapon Selector DOWN (LSHIFT Modifier)
←

↑ Wing Sweep Auto Mode
→ Wing Sweep Forward
↓ Wing Sweep Bomb Mode
← Wing Sweep Aft



CAGE/SEAM Button

PLM Button

1 - MY WEAPONS CONTROL SETUP
HCU STICK (RIO)



HCU MRL
(Grey button on RHS)

↑ Radar Elevation Up
→ Radar Azimuth Right
↓ Radar Elevation Down
← Radar Azimuth Left

↑ Radar Elevation Bars Increase
→ Radar Azimuth Scan Narrower
↓ Radar Elevation Bars Decrease
← Radar Azimuth Scan Wider

HCU Offset

↑ ZOOM IN SLOW
→
↓ ZOOM OUT SLOW
←

HCU Half-Action (First Detent)
HCU Full-Action (Second Detent)

↑ HCU Thumb Up
→ AN/ALE-39 Chaff SGL
↓ HCU Thumb Down
← AN/ALE-39 Flare SGL
P HCU Thumb Re-center

DDD Interrogate Friend or Foe

Paddle used as a modifier to toggle from HCU controls to LANTIRN stick controls

Left Toe Brake (mapped on pedals): ICS Foot Button
Right Toe Brake (mapped on pedals): Microphone Foot Button

1 - MY WEAPONS CONTROL SETUP
LANTIRN STICK (RIO)



LANTIRN Laser Latched
(Grey button on RHS)

↑ LANTIRN Area Track
→ LANTIRN QWP +
↓ LANTIRN Point Track
← LANTIRN QWP -

↑ LANTIRN S4 Hat Up
→ LANTIRN S4 Hat Right
↓ LANTIRN S4 Hat Down
← LANTIRN S4 Hat Left

LANTIRN Toggle FOV

↑ ZOOM IN SLOW
→
↓ ZOOM OUT SLOW
←

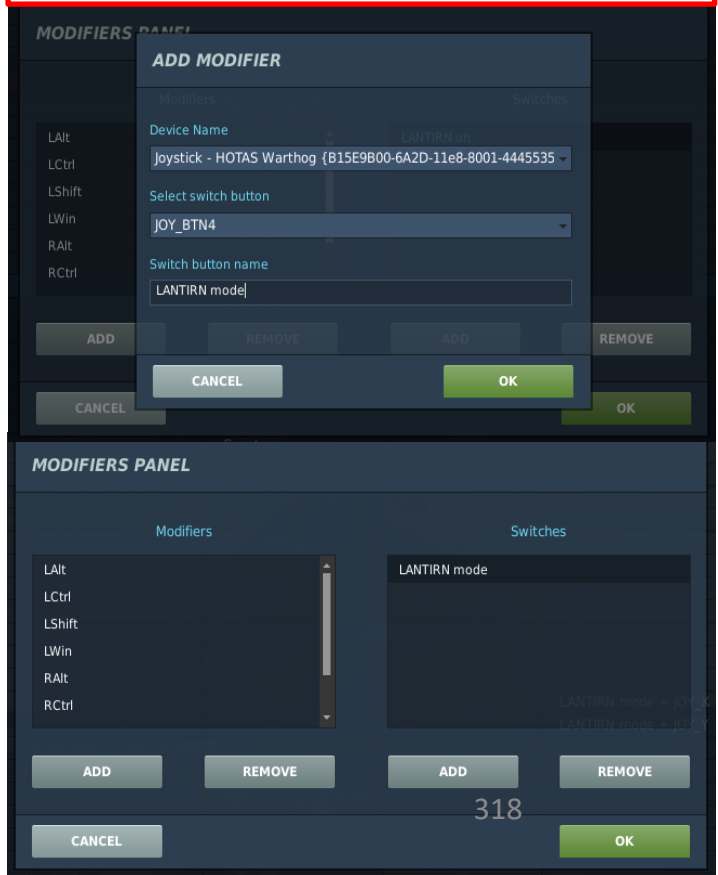
LANTIRN Trigger Half-Action (First Detent)
LANTIRN Trigger Full-Action (Second Detent)

↑ LANTIRN Toggle WHOT/BHOT
→ LANTIRN Slider AGC/MGC
↓ LANTIRN S4 Hat Press Declutter
← LANTIRN Slider laser/focus
P LANTIRN Mode Toggle

LANTIRN Undesignate

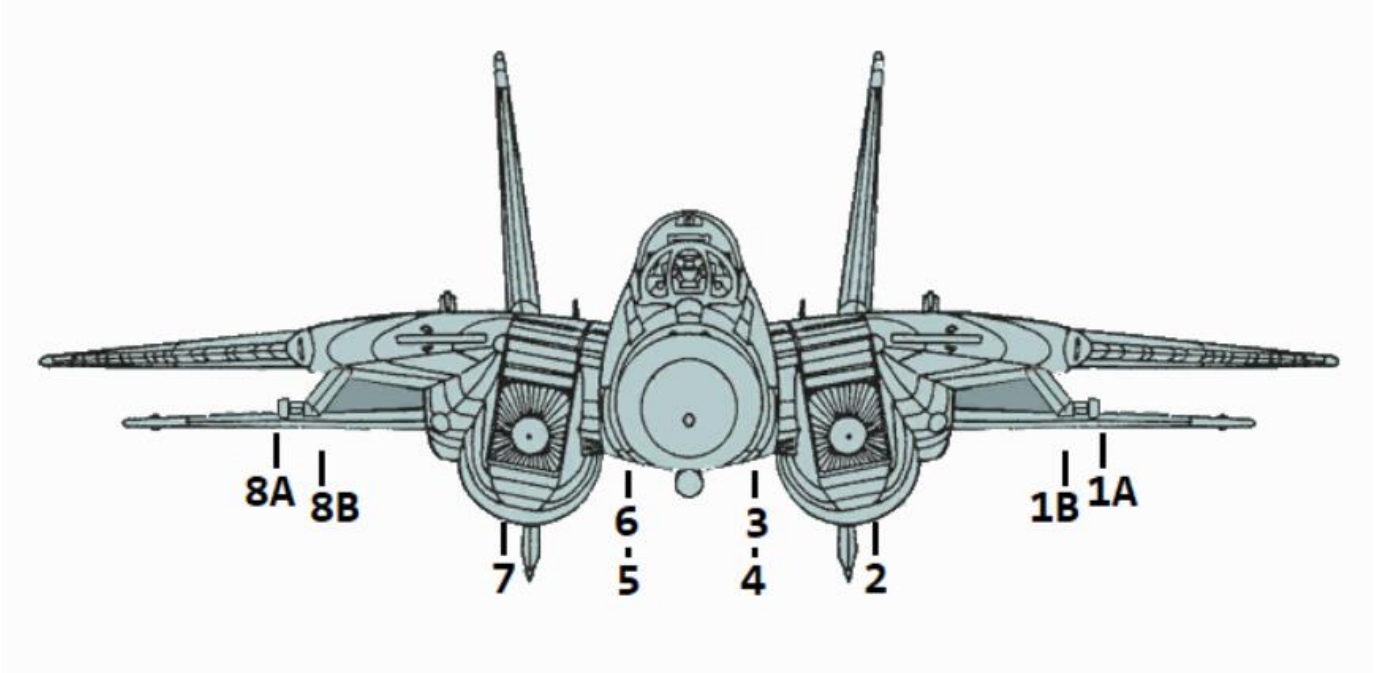
Paddle used as a modifier to toggle from HCU controls to LANTIRN stick controls

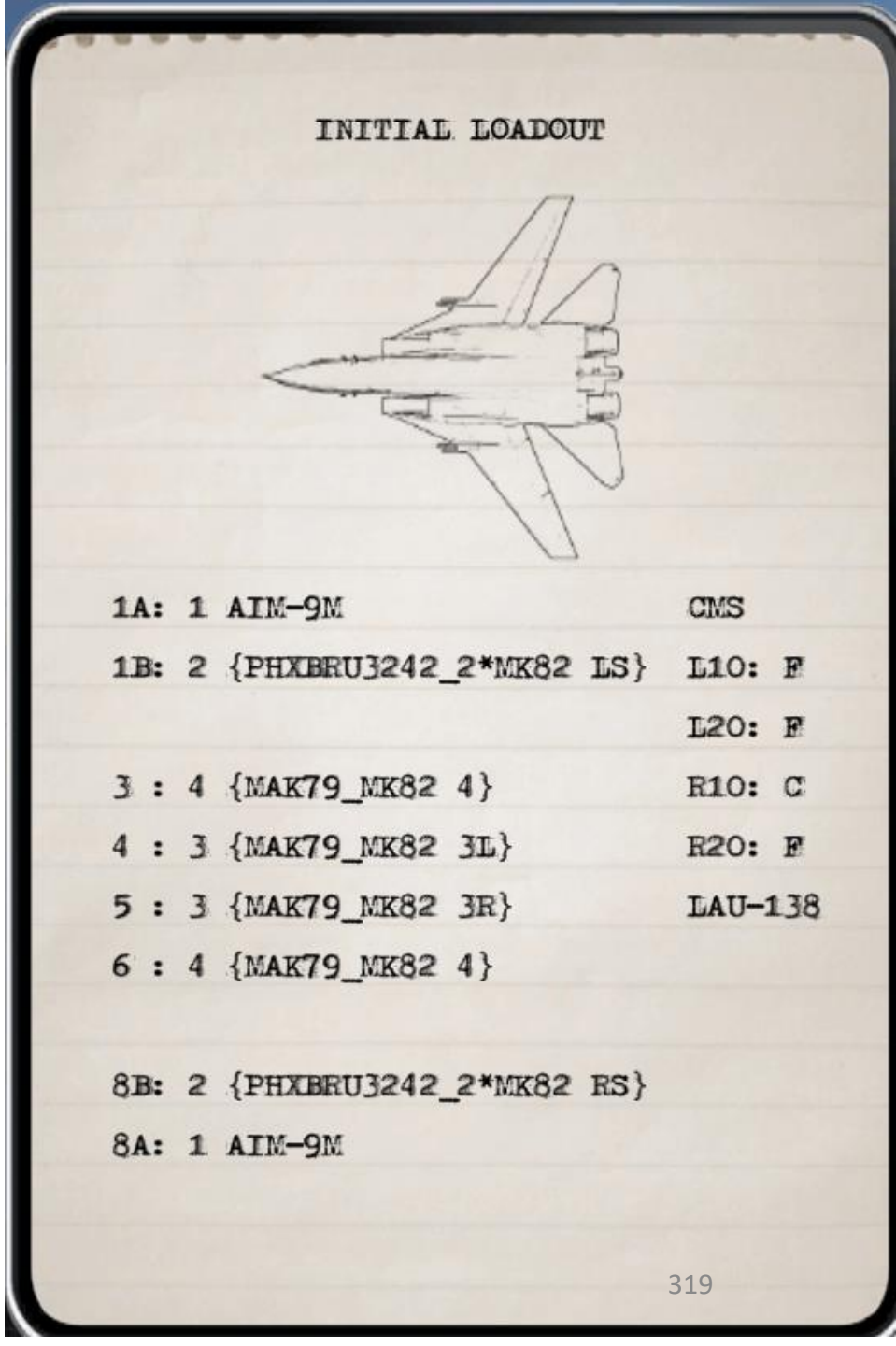
IMPORTANT NOTE: Every control in this page uses the "Paddle Lever" modifier.



1 – ARMAMENT STATIONS

To see your weapon loadout, press “RSHIFT+K” and use “[“ and “]” to cycle through pages until you reach the INITIAL LOADOUT page. This allows you to see what weapon you have mounted on what station.

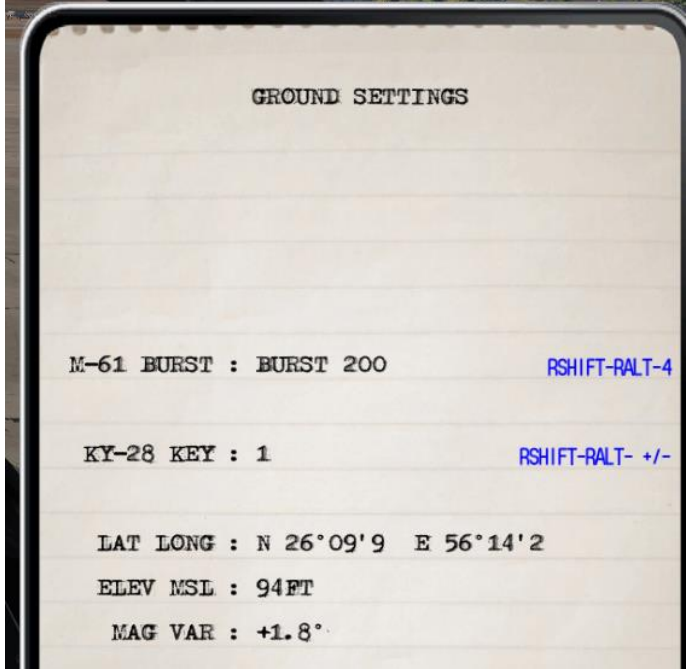


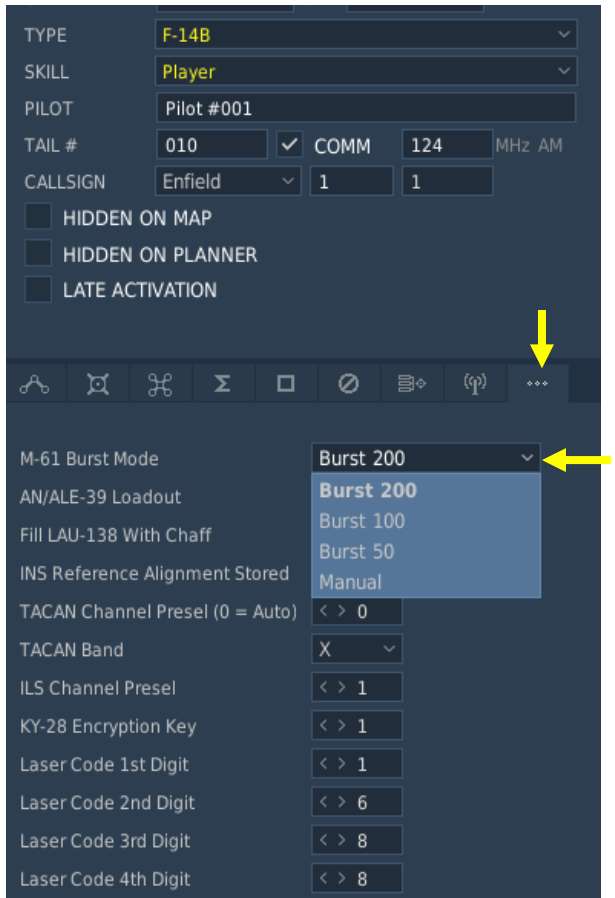


1 - WEAPONS SETUP

The M-61 Vulcan is a six-barreled hydraulically driven 20 mm automatic cannon capable of firing over 6,000 rpm (rounds per minute), or 100 rounds per second. This crazy firing rate means that you can go through your 676 rounds in roughly 6 seconds. An ingenious way to help pilots conserve ammunition was to ask the ground crews to space rounds in the ammunition belt to force the gun to fire in bursts. Bursts can be set in the mission editor to 200 rounds per trigger squeeze, 100 rounds, or 50 rounds. This way, pilots do not have to worry about holding the trigger for too long. A “manual” option is also available for those who want to have full authority over the burst length of their gun.

To see your gun burst setting, press “RSHIFT+K” while on the ground. Use “[“ and “]” to cycle through pages until you reach the GROUND SETTINGS page. You can also change the burst length by pressing “RSHIFT+RALT+4”.







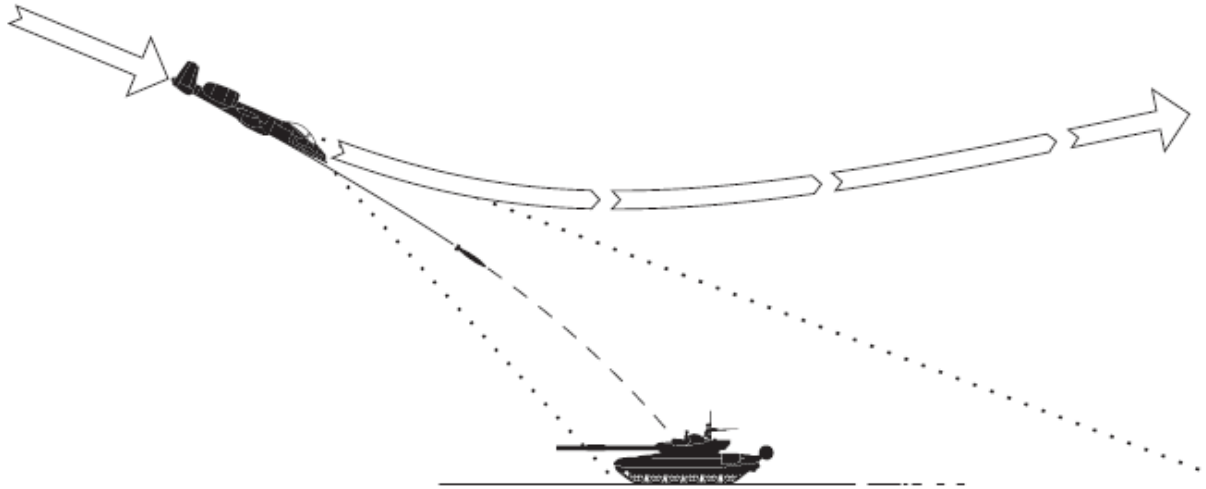
1 - BOMB DELIVERY MODES CCIP & CCRP

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

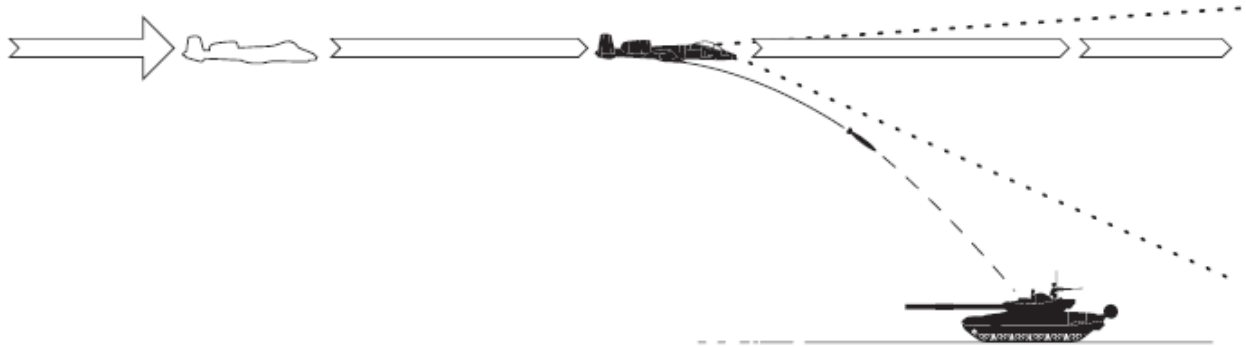
CCIP mode is the traditional dive bombing approach: you dive on target and the reticle will tell you where the bomb will impact. In the Tomcat, **CCIP** mode is referred as "**Computer Pilot**" mode.

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. In the Tomcat, **CCRP** mode is referred as "**Computer Target**" mode.

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.



CCIP: Continuously Computed Impact Point

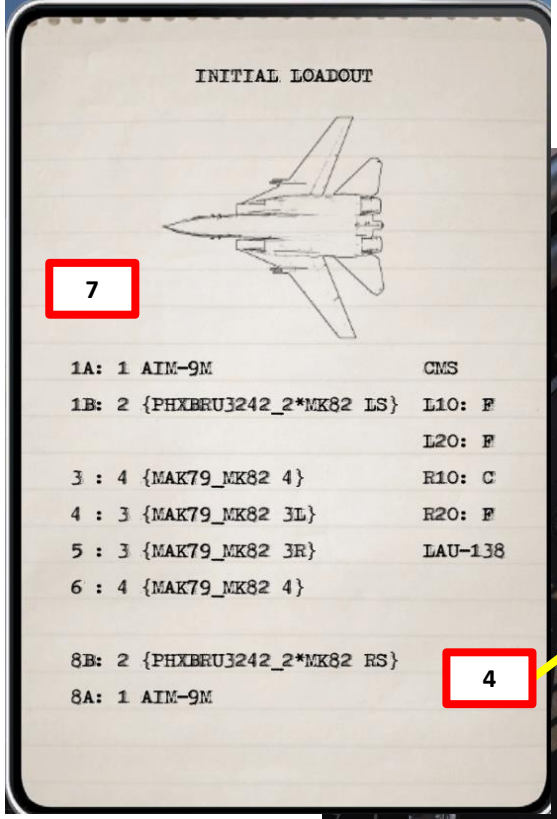


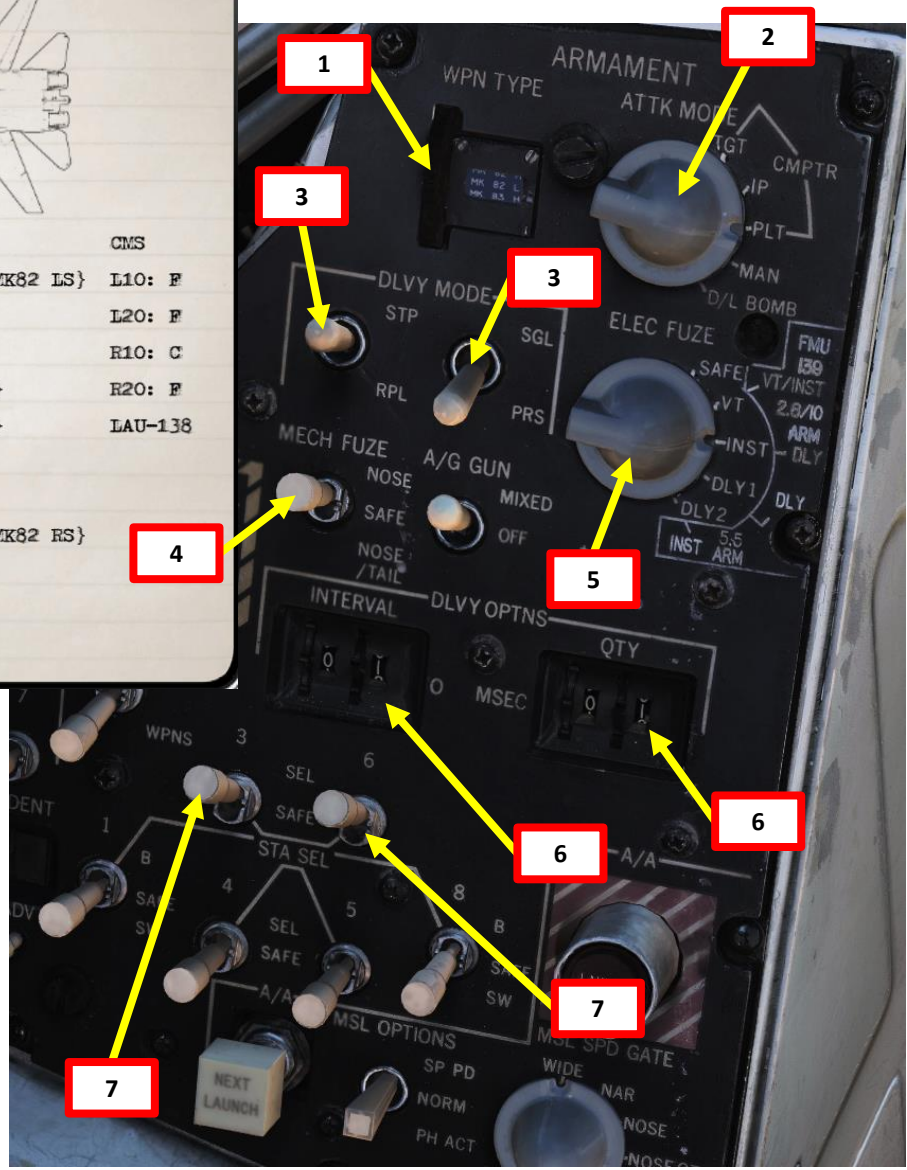
CCRP: Continuously Computed Release Point

2.1 - UNGUIDED BOMB (MK-82) COMPUTER PILOT/CCIP RELEASE MODE

From the RIO Seat (or using JESTER):

1. Select MK-82 Bombs WPN TYPE
2. Select Computer Pilot Attack Mode
3. Select desired Delivery Mode (we will use STP and PRS, Step and Pairs).
   - STP (Step) releases a single bomb per bomb release button press.
   - RPL (Ripple) releases multiple bombs per bomb release button press.
   - SGL (Single) releases a single bomb per release button press.
   - PRS (Pairs) releases a pair of bombs per bomb release button press.
4. Select Mechanical Fuze to NOSE
5. Select Electronic Fuze to INST (Instantaneous)
6. Select Delivery options (we will use Interval 010 msec and Quantity 01)
7. Arm Stations that you want to use (press “RSHIFT+K” and use “[“ and “]” to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3 and 6.







2.1 - UNGUIDED BOMB (MK-82) COMPUTER PILOT/CCIP RELEASE MODE

If using JESTER, use the same procedure but with the JESTER menus.





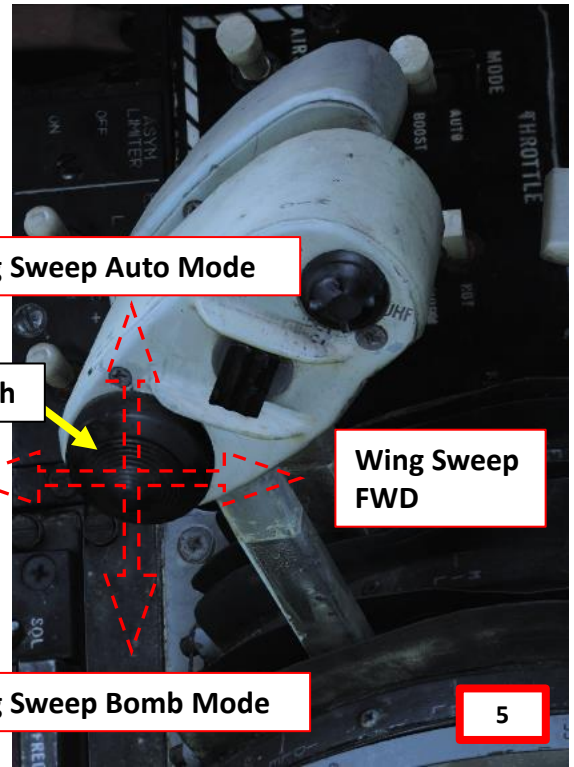
2.1 - UNGUIDED BOMB (MK-82) COMPUTER PILOT/CCIP RELEASE MODE

From the Pilot Seat:

1. Master Arm switch – ON (UP)
2. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
3. HUD Display Mode – A/G
4. Verify that stations 3 and 6 are selected
5. Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.







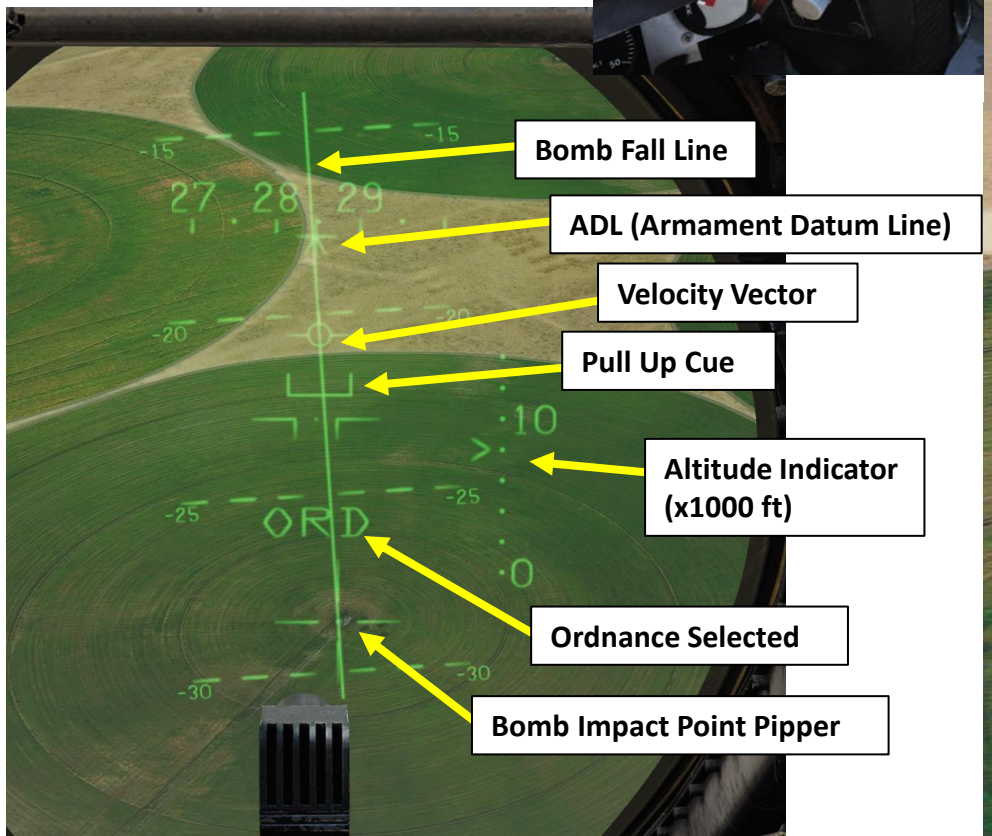


2.1 - UNGUIDED BOMB (MK-82) COMPUTER PILOT/CCIP RELEASE MODE

From the Pilot Seat:

6. Perform a 40-deg dive to the target. You can set throttle to IDLE and deploy speed brake for better controllability
7. Align the impact point pipper on the HUD over the target. It will appear from the bottom when you are sufficiently low.
8. Press the STORE RELEASE (RALT+SPACE) button on the stick to release bombs, then throttle up and pull up.



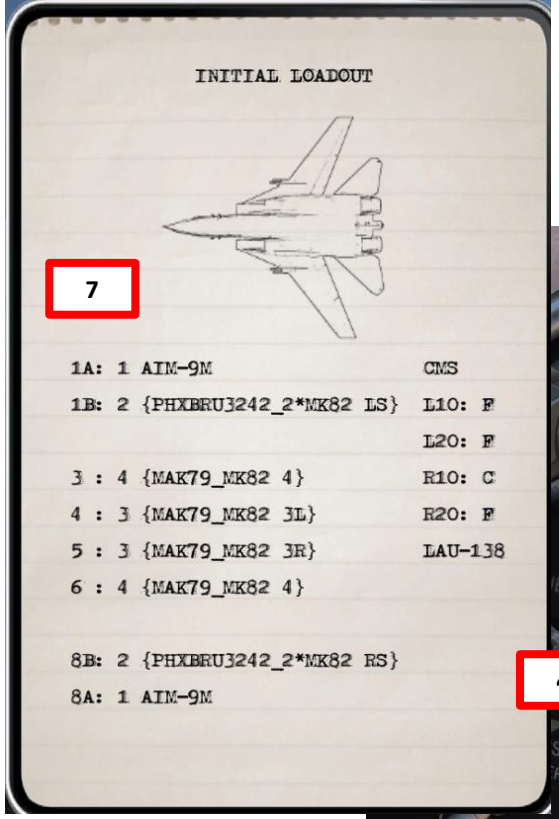


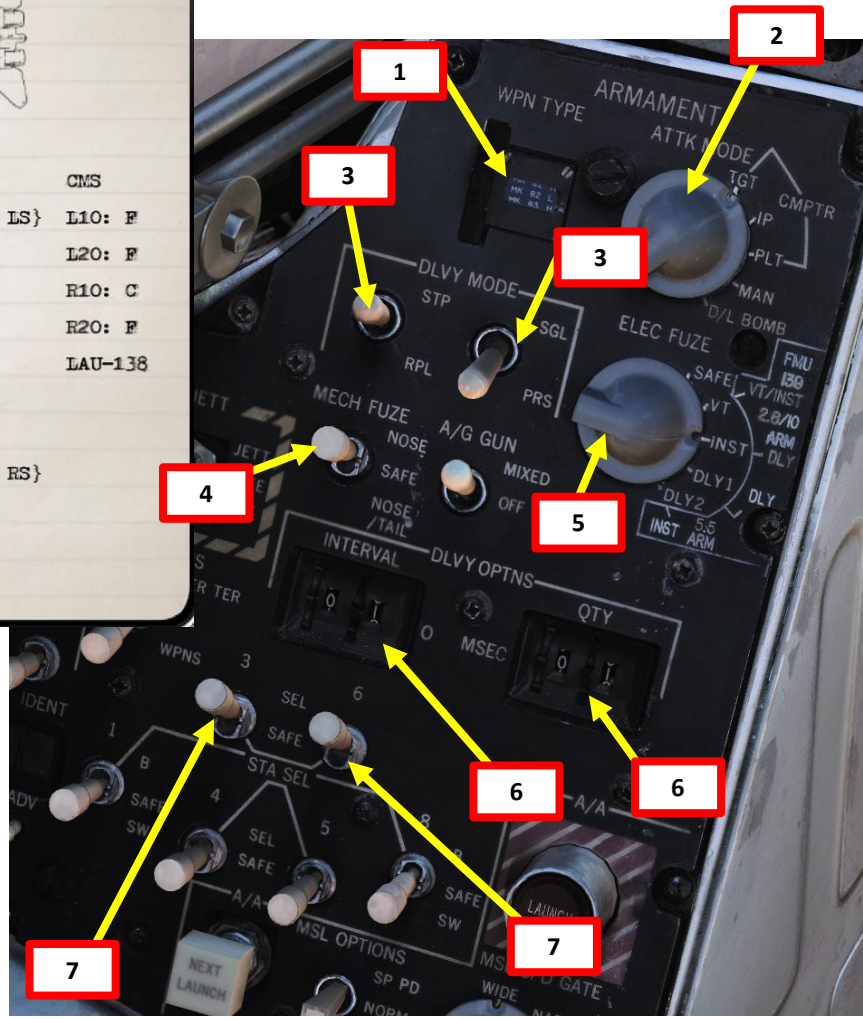


2.2 - UNGUIDED BOMB (MK-82) COMPUTER TARGET/CCRP RELEASE MODE

From the RIO Seat (or using JESTER):

1. Select MK-82 Bombs WPN TYPE
2. Select Computer Target Attack Mode
3. Select desired Delivery Mode (we will use STP and PRS, Step and Pairs).
   - STP (Step) releases a single bomb per bomb release button press.
   - RPL (Ripple) releases multiple bombs per bomb release button press.
   - SGL (Single) releases a single bomb per bomb release button press.
   - PRS (Pairs) releases a pair of bombs per bomb release button press.
4. Select Mechanical Fuze to NOSE
5. Select Electronic Fuze to INST (Instantaneous)
6. Select Delivery options (we will use Interval 010 msec and Quantity 01)
7. Arm Stations that you want to use (press “RSHIFT+K” and use “[“ and “]” to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3 and 6.







2.2 - UNGUIDED BOMB (MK-82) COMPUTER TARGET/CCRP RELEASE MODE

If using JESTER, use the same procedure but with the JESTER menus.





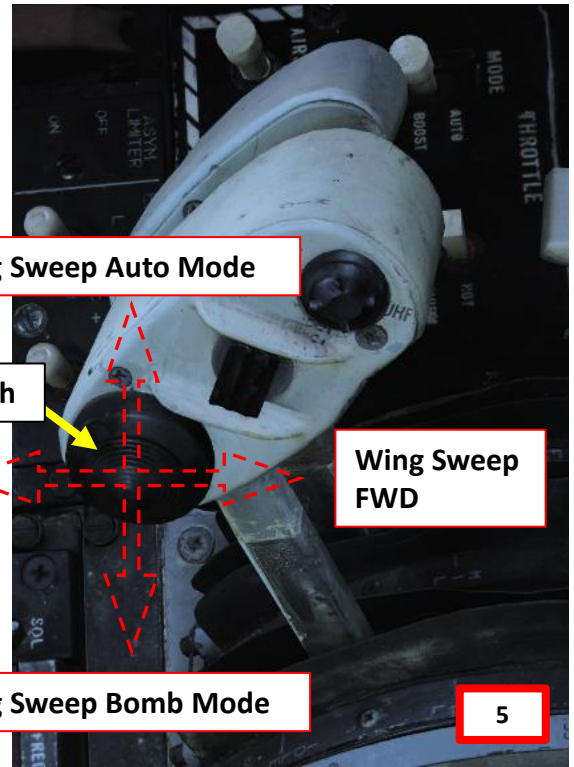
2.2 - UNGUIDED BOMB (MK-82) COMPUTER TARGET/CCRP RELEASE MODE

From the Pilot Seat:

1. Master Arm switch – ON (UP)
2. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
3. HUD Display Mode – A/G
4. Verify that stations 3 and 6 are selected
5. Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.









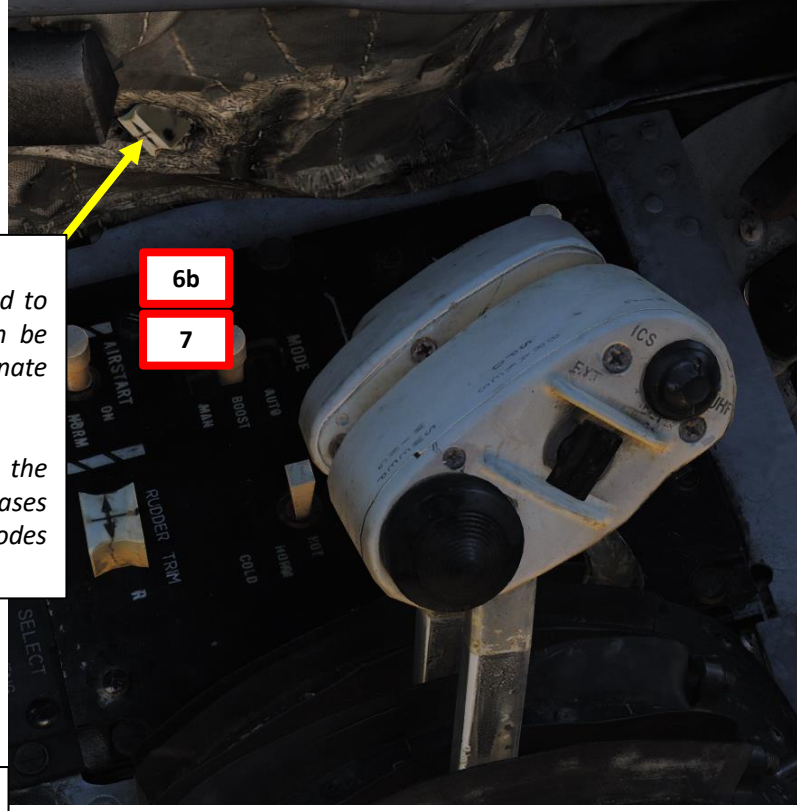
2.2 - UNGUIDED BOMB (MK-82) COMPUTER TARGET/CCRP RELEASE MODE

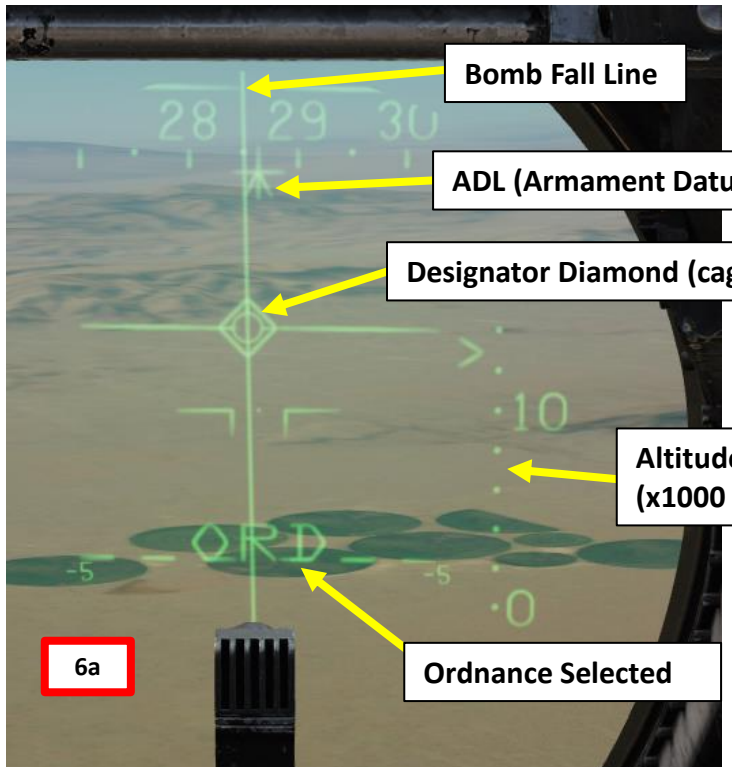
From the Pilot Seat:

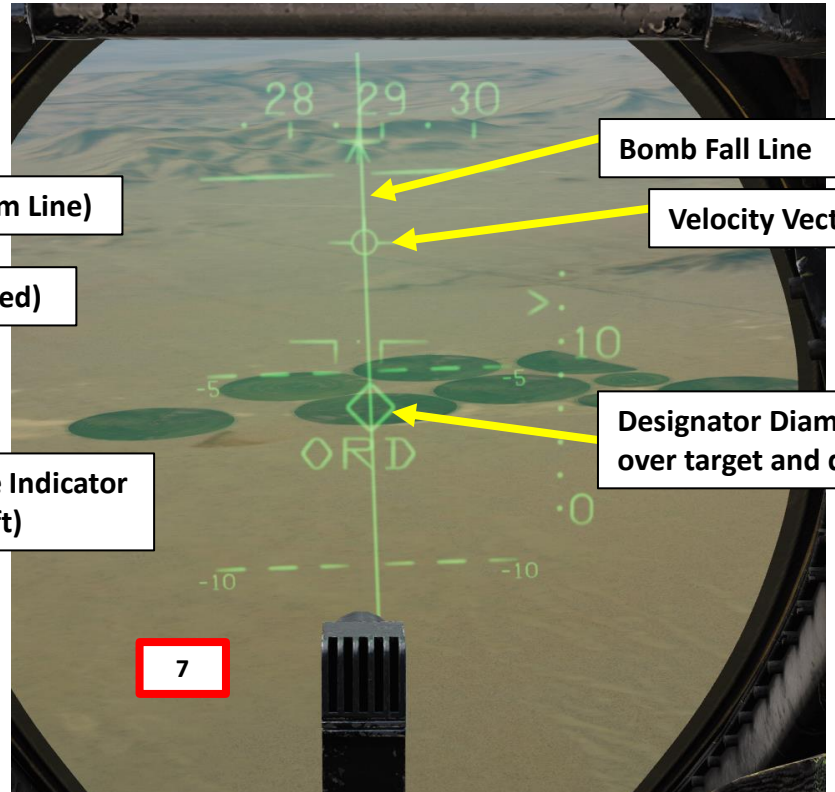
6. Press the TD (Target Designate) switch UP (VSL HI) or DOWN (VSL LO) to slew the Designator Diamond over the desired impact point.
7. Once Designator Diamond is over impact point, press the TD (Target Designate) PAL mode (Forward) to lock the Designator Diamond.
8. Fly straight and level towards the target and align velocity vector with the Bomb Fall Line

Target Designate Switch
Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.







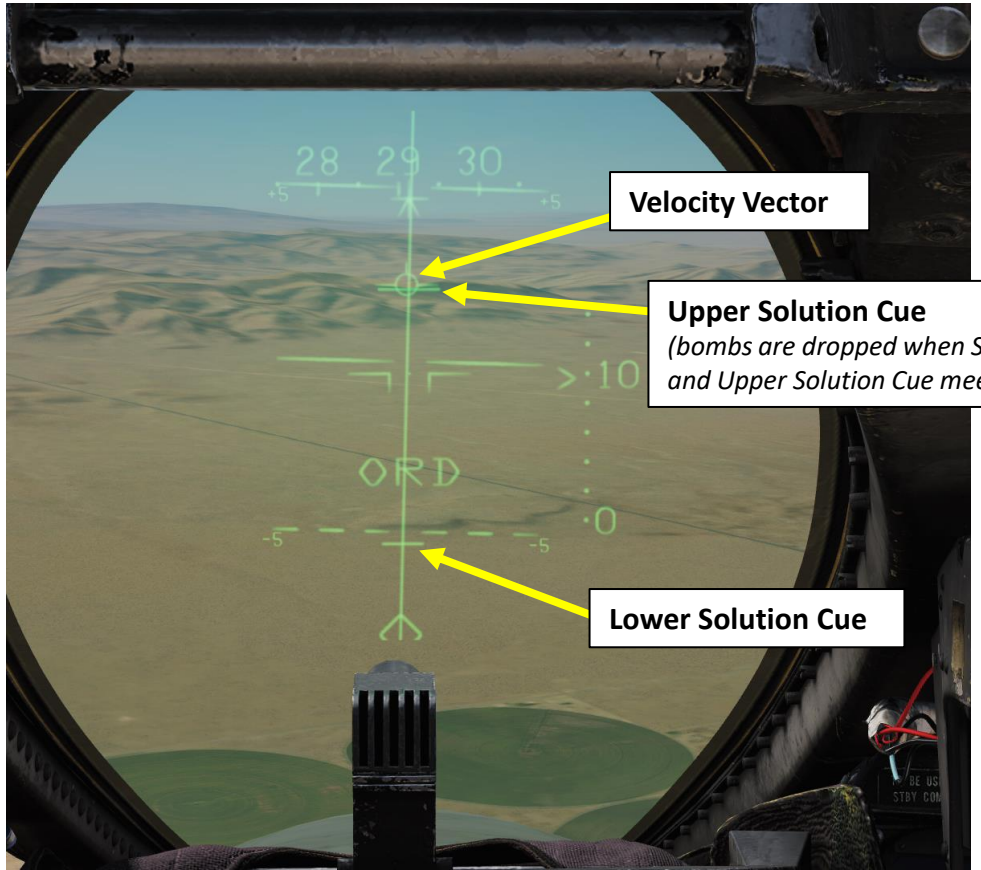
2.2 - UNGUIDED BOMB (MK-82) COMPUTER TARGET/CCRP RELEASE MODE

From the Pilot Seat:

9. Wait until the Lower Solution Cue appears from the top of the Bomb Fall Line, then press and hold the STORE RELEASE (RALT+SPACE) button.
10. When the Upper Solution Cue appears from the top of the Bomb Fall Line and meets the velocity vector, bombs will automatically drop. You can now release the STORE RELEASE button.





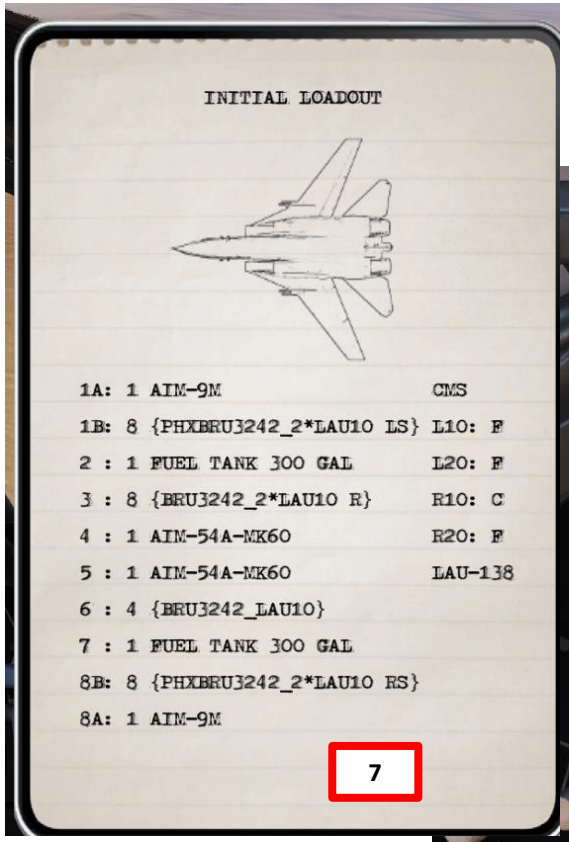




2.3 – ZUNI ROCKETS

From the RIO Seat (or using JESTER):

1. Select LAU-10 (Zuni Rocket) WPN TYPE
2. Select Computer Pilot Attack Mode
3. Select desired Delivery Mode (we will use RPL and SGL, Ripple and Single).
   - STP (Step) releases a single rocket per trigger press.
   - RPL (Ripple) releases multiple rockets per trigger press.
   - SGL (Single) releases a single rocket per trigger press.
   - PRS (Pairs) releases a pair of bombs per trigger press.
4. Select Mechanical Fuze to NOSE
5. Select Electronic Fuze to INST (Instantaneous)
6. Select Delivery options (we will use Interval 050 msec and Quantity 04)
7. Arm Stations that you want to use (press “RSHIFT+K” and use “[“ and “]” to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3, 6, 1B and 8B.



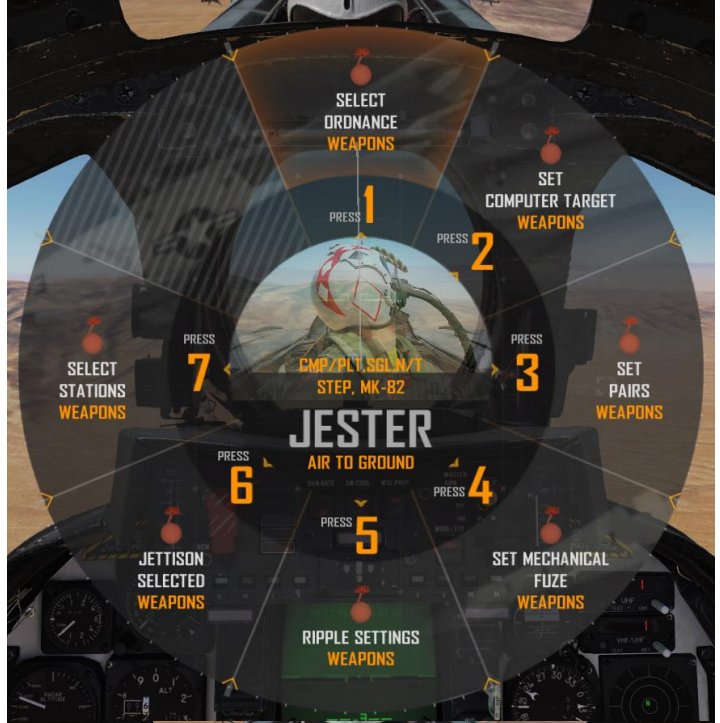


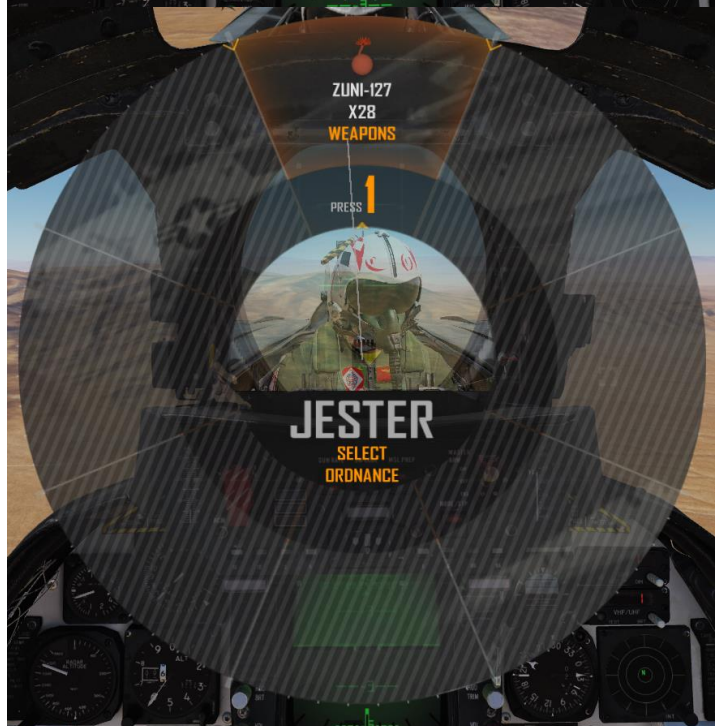


2.3 – ZUNI ROCKETS

If using JESTER, use the same procedure but with the JESTER menus.







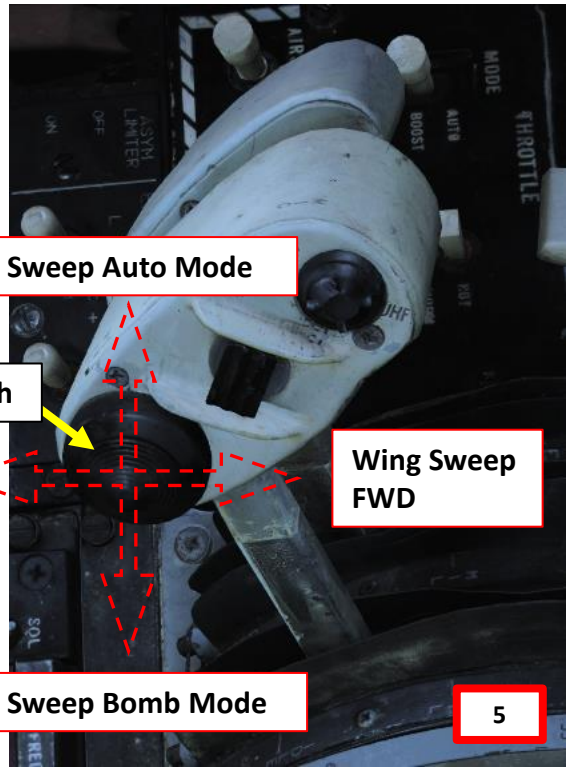
2.3 – ZUNI ROCKETS

From the Pilot Seat:

1. Master Arm switch – ON (UP)
2. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
3. HUD Display Mode – A/G
4. Verify that stations 3, 6, 1B and 8B are selected
5. Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.







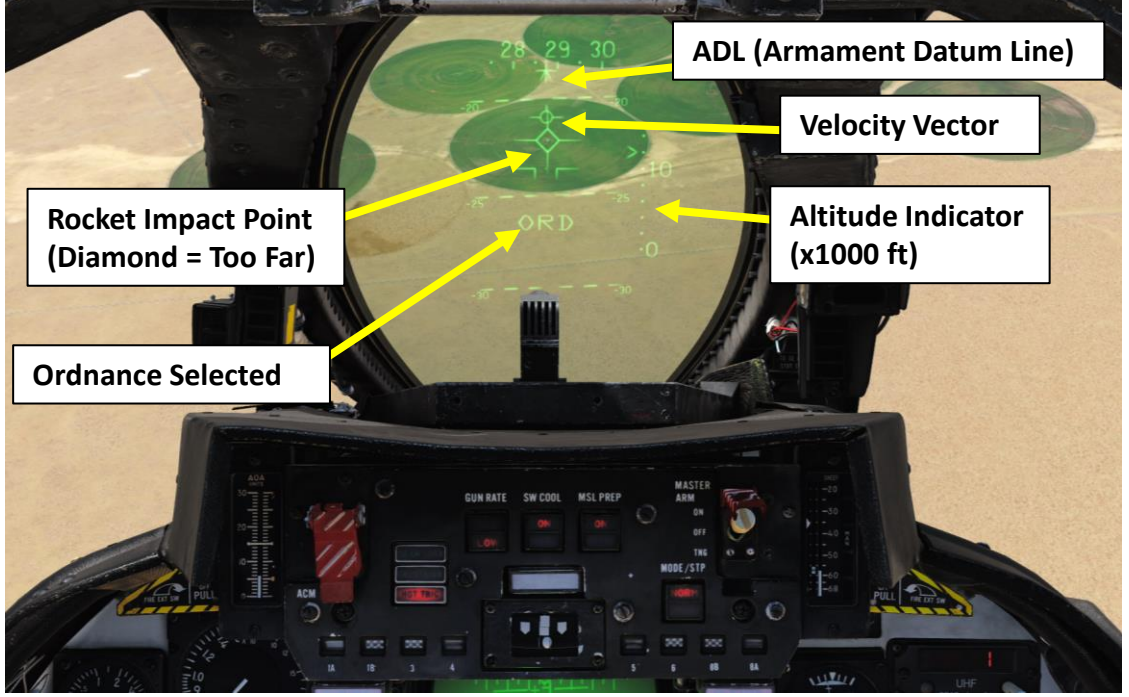


2.3 – ZUNI ROCKETS

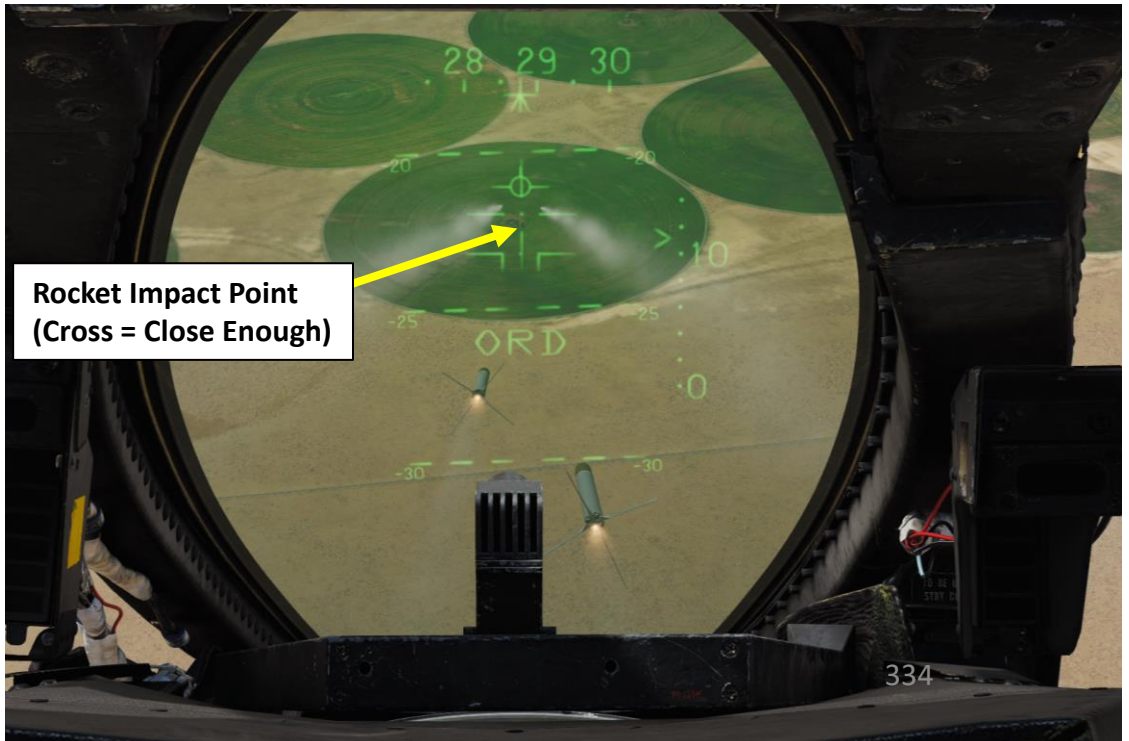
From the Pilot Seat:

6. Perform a 20-30-deg dive to the target. You can set throttle to IDLE and deploy speed brake for better controllability
7. Align the impact point pipper on the HUD over the target. When you are too far, the impact point is a diamond. When you are close/low enough, the diamond turns into a cross.
8. Press the TRIGGER SECOND STAGE (SPACE) on the stick to launch rockets, then throttle up and pull up.









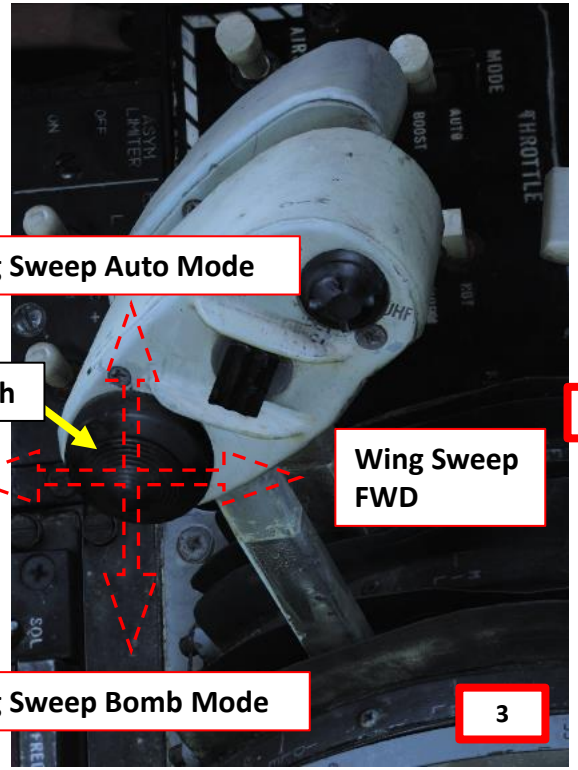
2.4 – M61 GUNS (AIR-TO-GROUND)

From the Pilot Seat:

1. Master Arm switch – ON (UP)
2. HUD Display Mode – A/G
3. Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.
4. Select Gun Rate (LOW/HIGH) as required. For ground strikes, I recommend LOW rate of fire.
5. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to GUNS.





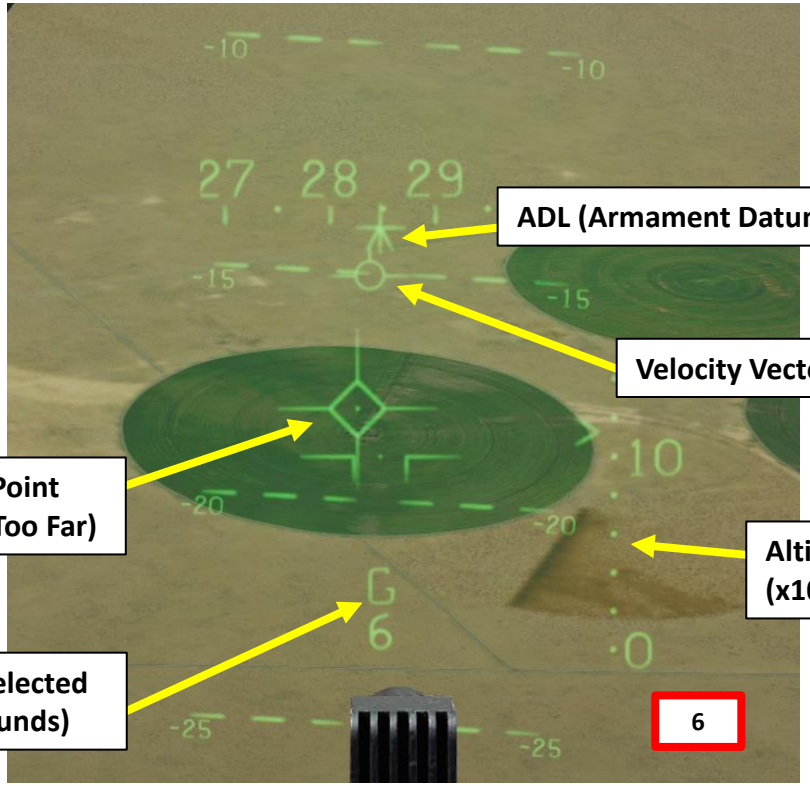


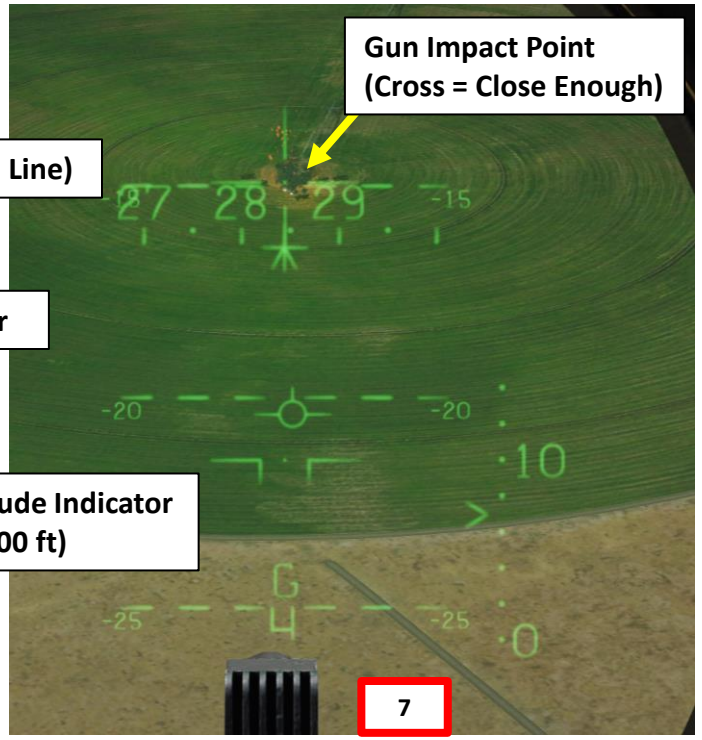


2.4 – M61 GUNS (AIR-TO-GROUND)

From the Pilot Seat:

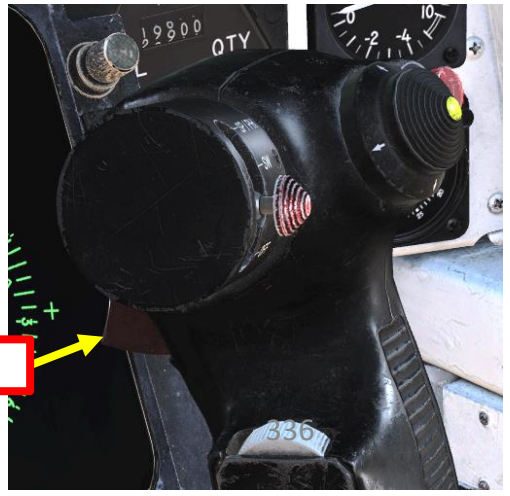
6. Perform a 20-30-deg dive to the target. You can set throttle to IDLE and deploy speed brake for better controllability
7. Align the impact point pipper on the HUD over the target. When you are too far, the impact point is a diamond. When you are close/low enough, the diamond turns into a cross.
8. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire guns, then throttle up and pull up.





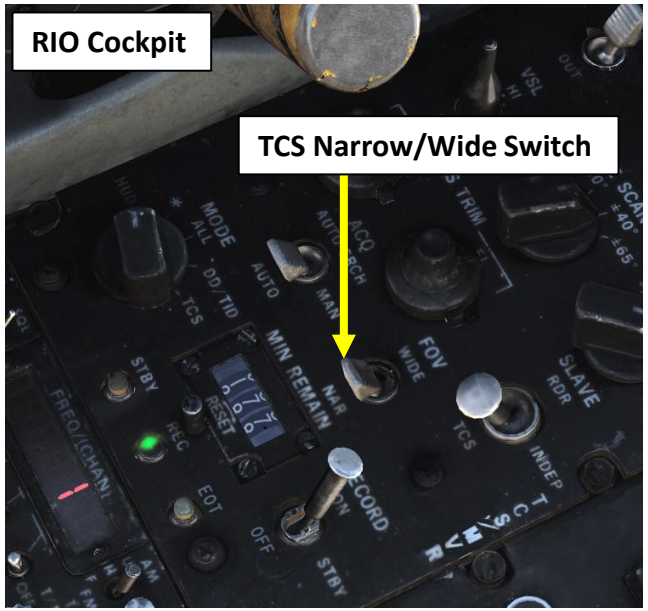


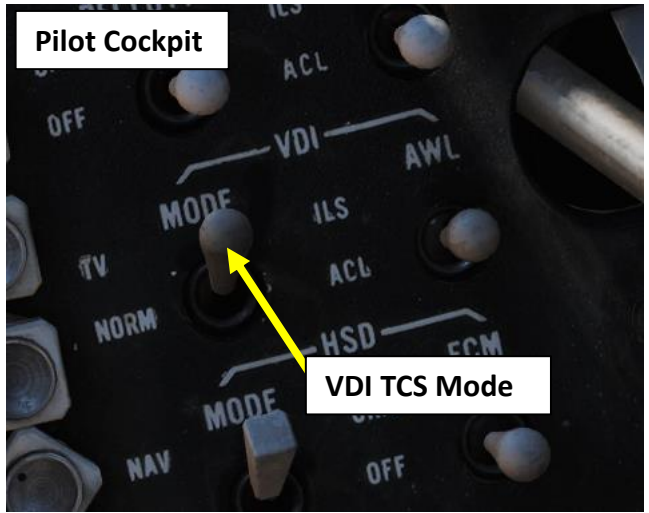


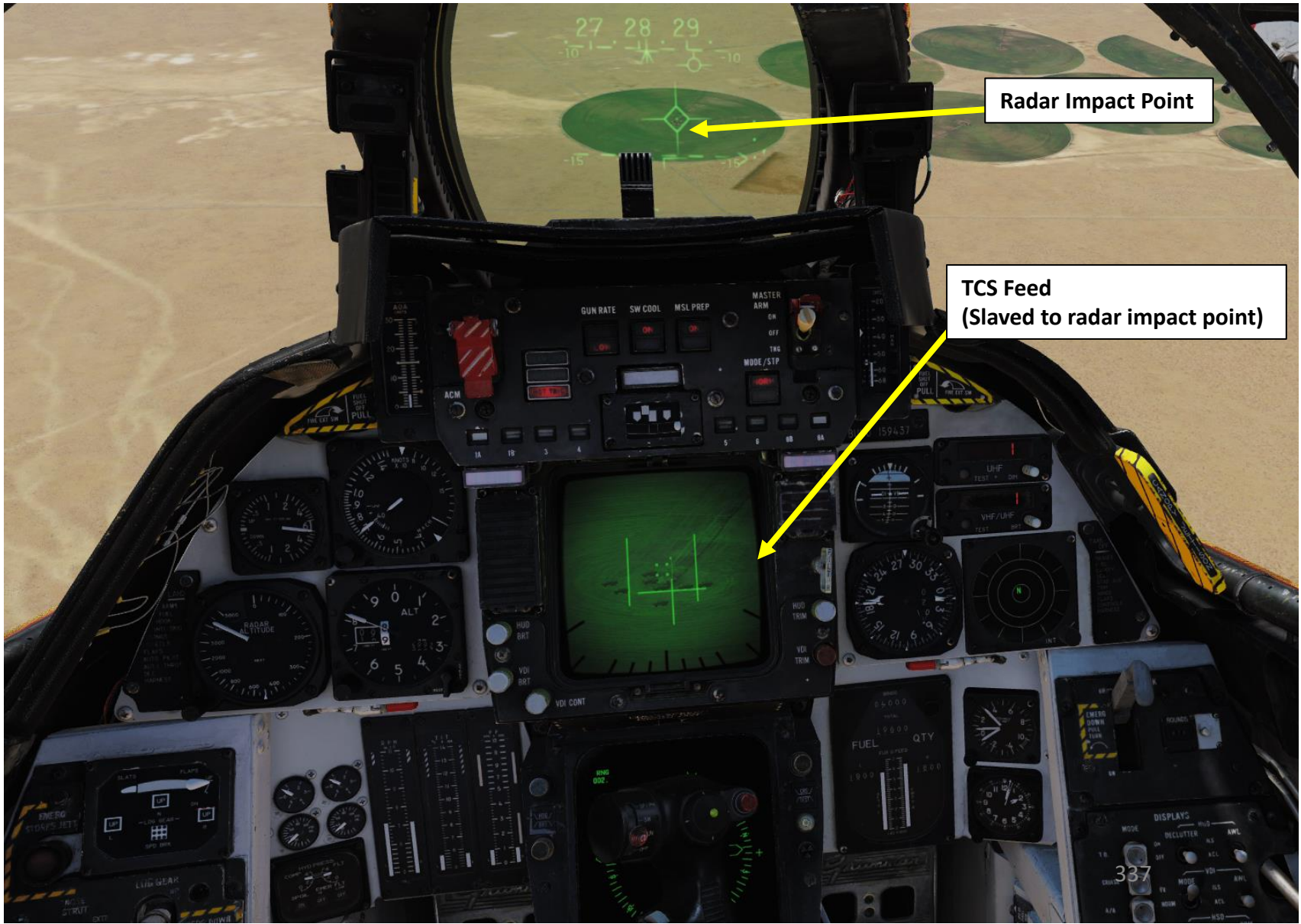


2.5 – USING TCS

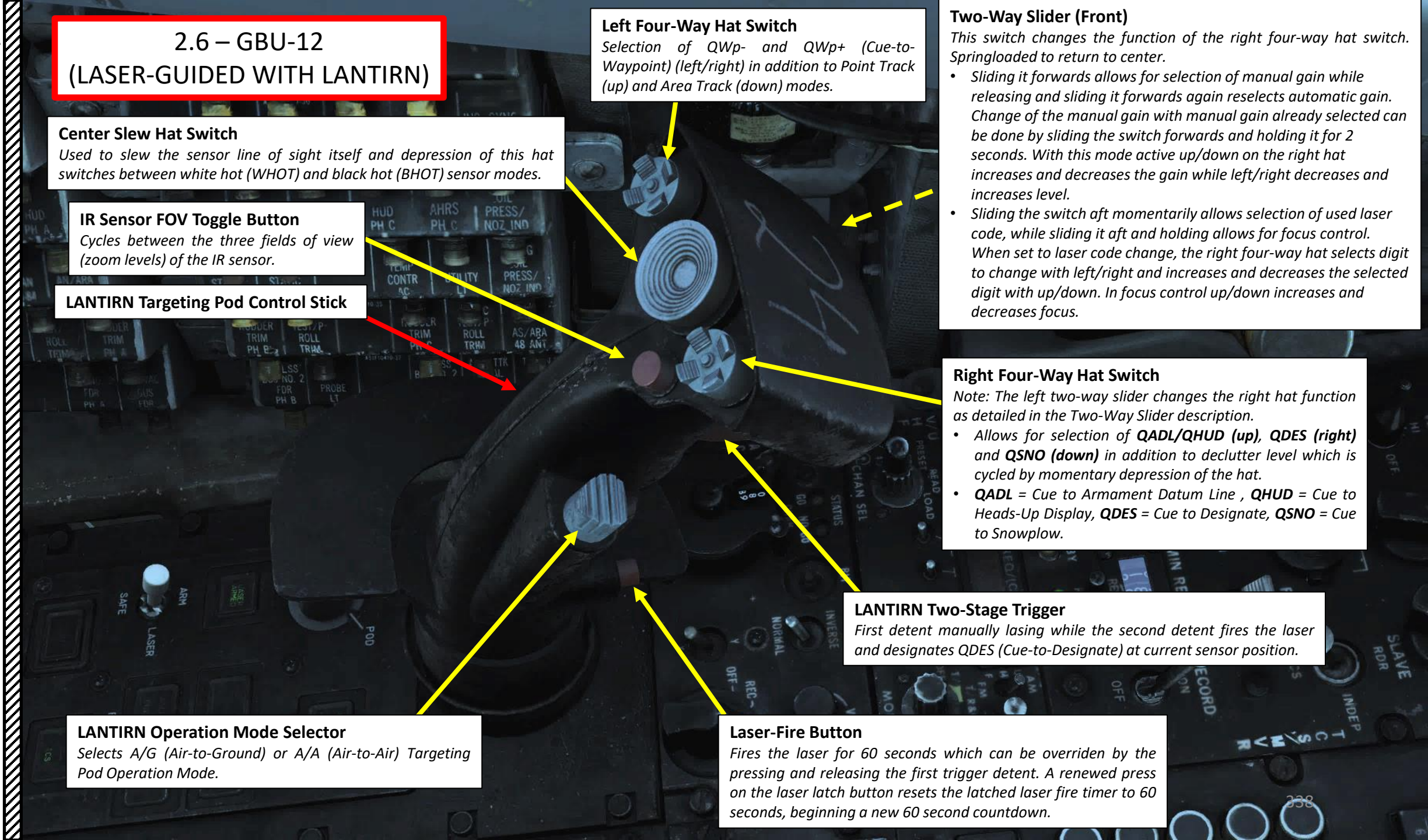
Take note that air-to-ground strikes can use the TCS (Television Camera System) feed to see better. The RIO can also set TCS settings like Narrow or Wide field-of-view.







2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)



Left Four-Way Hat Switch
Selection of QWp- and QWp+ (Cue-to-Waypoint) (left/right) in addition to Point Track (up) and Area Track (down) modes.

Two-Way Slider (Front)
This switch changes the function of the right four-way hat switch. Springloaded to return to center.

- *Sliding it forwards allows for selection of manual gain while releasing and sliding it forwards again reselects automatic gain. Change of the manual gain with manual gain already selected can be done by sliding the switch forwards and holding it for 2 seconds. With this mode active up/down on the right hat increases and decreases the gain while left/right decreases and increases level.*
- *Sliding the switch aft momentarily allows selection of used laser code, while sliding it aft and holding allows for focus control. When set to laser code change, the right four-way hat selects digit to change with left/right and increases and decreases the selected digit with up/down. In focus control up/down increases and decreases focus.*

Center Slew Hat Switch
Used to slew the sensor line of sight itself and depression of this hat switches between white hot (WHOT) and black hot (BHOT) sensor modes.

IR Sensor FOV Toggle Button
Cycles between the three fields of view (zoom levels) of the IR sensor.

LANTIRN Targeting Pod Control Stick

Right Four-Way Hat Switch
Note: The left two-way slider changes the right hat function as detailed in the Two-Way Slider description.

- *Allows for selection of **QADL/QHUD (up)**, **QDES (right)** and **QSNO (down)** in addition to declutter level which is cycled by momentary depression of the hat.*
- ***QADL** = Cue to Armament Datum Line , **QHUD** = Cue to Heads-Up Display, **QDES** = Cue to Designate, **QSNO** = Cue to Snowplow.*

LANTIRN Two-Stage Trigger
First detent manually lasing while the second detent fires the laser and designates QDES (Cue-to-Designate) at current sensor position.

LANTIRN Operation Mode Selector
Selects A/G (Air-to-Ground) or A/A (Air-to-Air) Targeting Pod Operation Mode.

Laser-Fire Button
Fires the laser for 60 seconds which can be overriden by the pressing and releasing the first trigger detent. A renewed press on the laser latch button resets the latched laser fire timer to 60 seconds, beginning a new 60 second countdown.

2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)



LANTIRN Laser Latched
(Grey button on RHS)

- ↑ LANTIRN Area Track
- → LANTIRN QWP +
- ↓ LANTIRN Point Track
- ← LANTIRN QWP -

LANTIRN Toggle FOV

- ↑ LANTIRN S4 Hat Up
- → LANTIRN S4 Hat Right
- ↓ LANTIRN S4 Hat Down
- ← LANTIRN S4 Hat Left

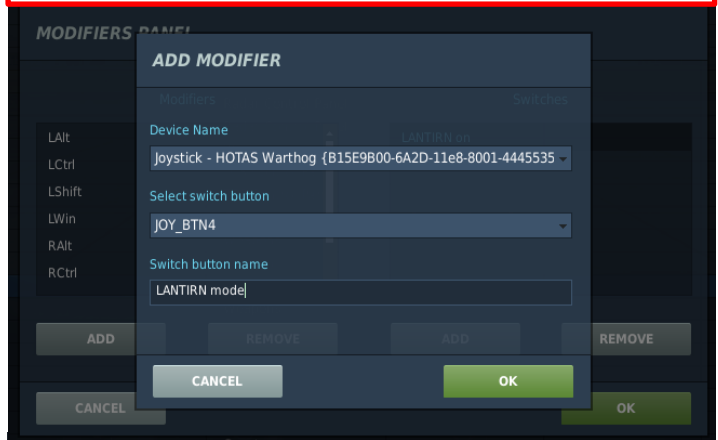
LANTIRN Trigger Half-Action (First Detent)
LANTIRN Trigger Full-Action (Second Detent)

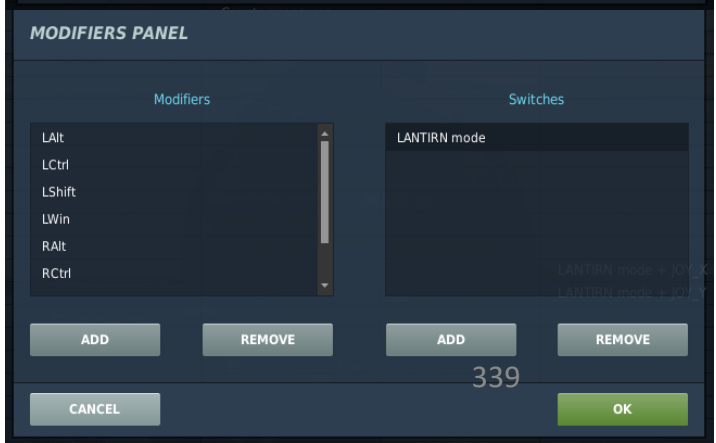
- ↑ LANTIRN Toggle WHOT/BHOT
- → LANTIRN Slider AGC/MGC
- ↓ LANTIRN S4 Hat Press Declutter
- ← LANTIRN Slider laser/focus
- P LANTIRN Mode Toggle

LANTIRN Undesignate

Paddle used as a modifier to toggle from HCU controls to LANTIRN stick controls

IMPORTANT NOTE: Every control in this page uses the "Paddle Lever" modifier.

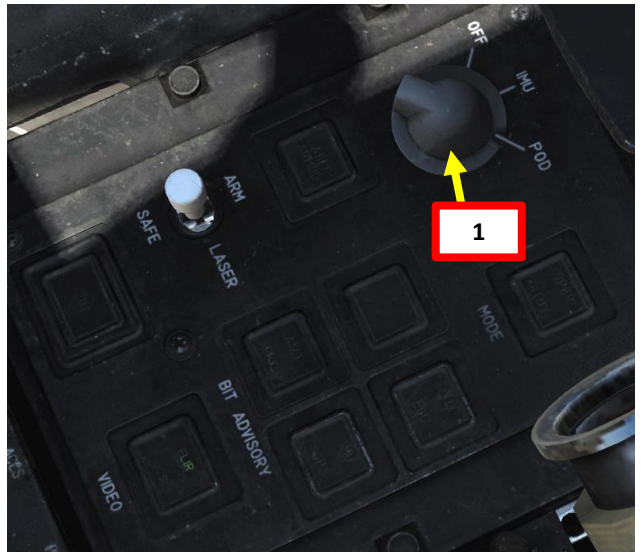




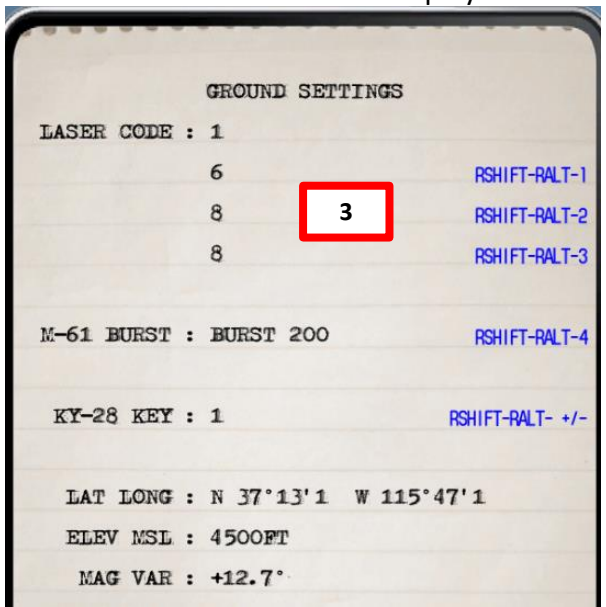
2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

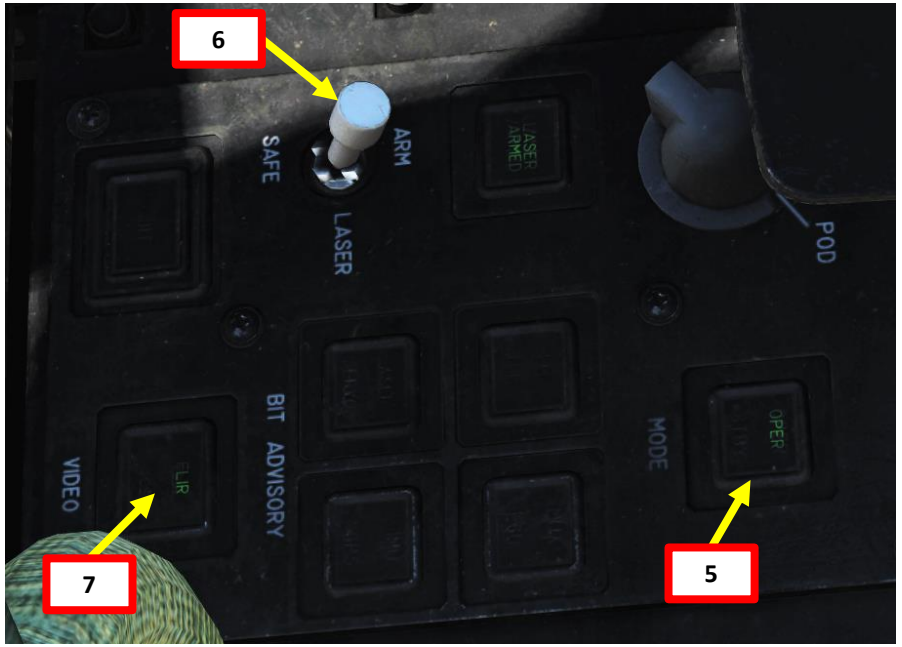
From the RIO Seat:

1. When on the ground, set Targeting Pod Power Switch to POD.
2. LANTIRN pod will warm up during 8 minutes.
3. While we wait, check if your laser code is set to the desired code (1688 by default). Press “RSHIFT+K” to show the GROUND SETTINGS page. You can ask the ground crew to modify the laser code by using “RSHIFT+RALT+1”, “RSHIFT+RALT+2” and “RSHIFT+RALT+3”.
4. When warm-up is complete, the LANTIRN Mode switch will automatically switch to STANDBY mode.
5. Press LANTIRN Mode switch to set it to OPERATE. STANDBY caution will flash for 30 seconds, then will switch to OPER.
6. Set Laser Arm switch to ARM. LASER ARMED indication will illuminate.
7. Set VIDEO switch to FLIR to select LANTIRN video feed in lieu of TCS feed for the TID.
8. Set TID Mode to TV to display LANTIRN feed.









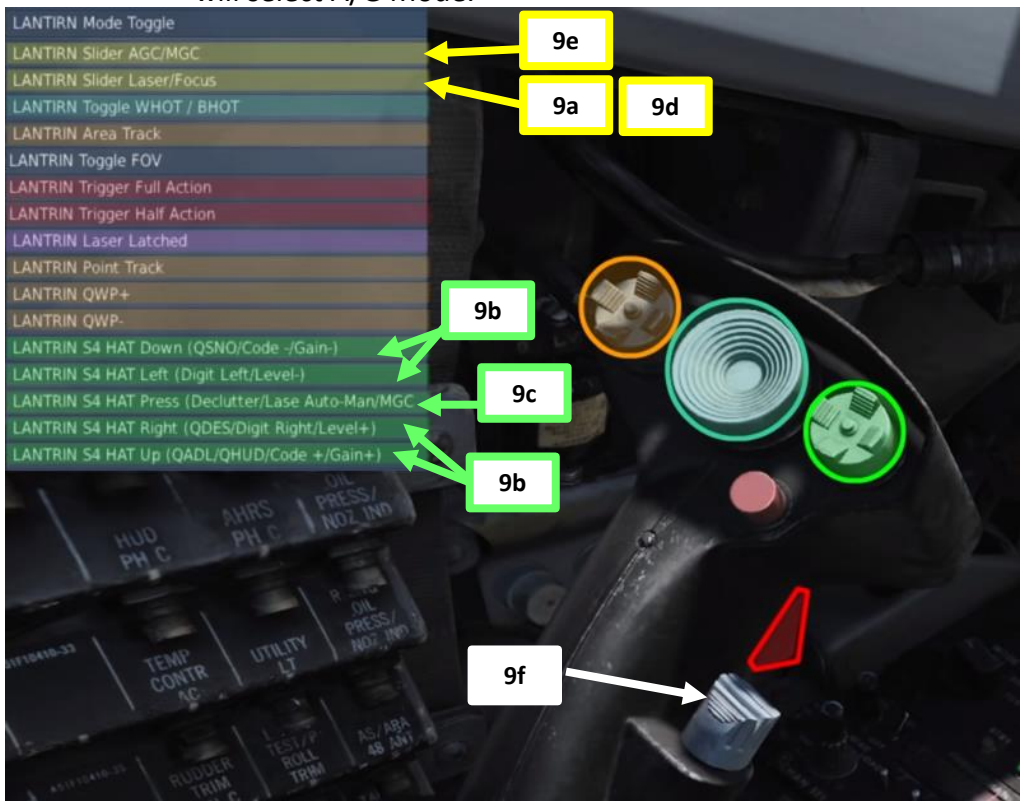


2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

From the RIO Seat:

9. Set LANTIRN laser code setting to the laser code set by the ground crew (in our case, 1688). To modify LANTIRN laser code option:
   a) Press the LANTIRN Slider laser/focus
   b) Modify the laser code using the **Right S4 Left/Right** switch to select **what digit to edit** and the **Right S4 Hat Up/Down** switch to **increment/decrement a digit**.
   c) Press the **Right S4 Press** switch to switch between **Auto and Manual mode**. We will select manual mode since the RIO will manually lase the target.
   d) Press the LANTIRN **Slider laser/focus** button again to deselect laser code.
   e) Press the LANTIRN **Slider AGC/MGC** to set Automatic or Manual Gain Control. We will set Automatic.
   f) Press the LANTIRN **Mode Toggle** to select between A/A (Air-to-Air) and A/G (Air-to-Ground) Mode. We will select A/G Mode.



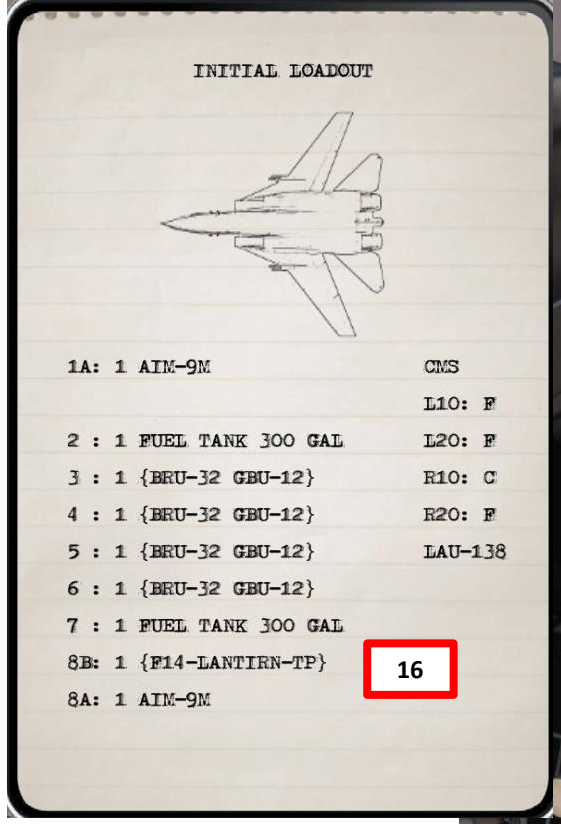


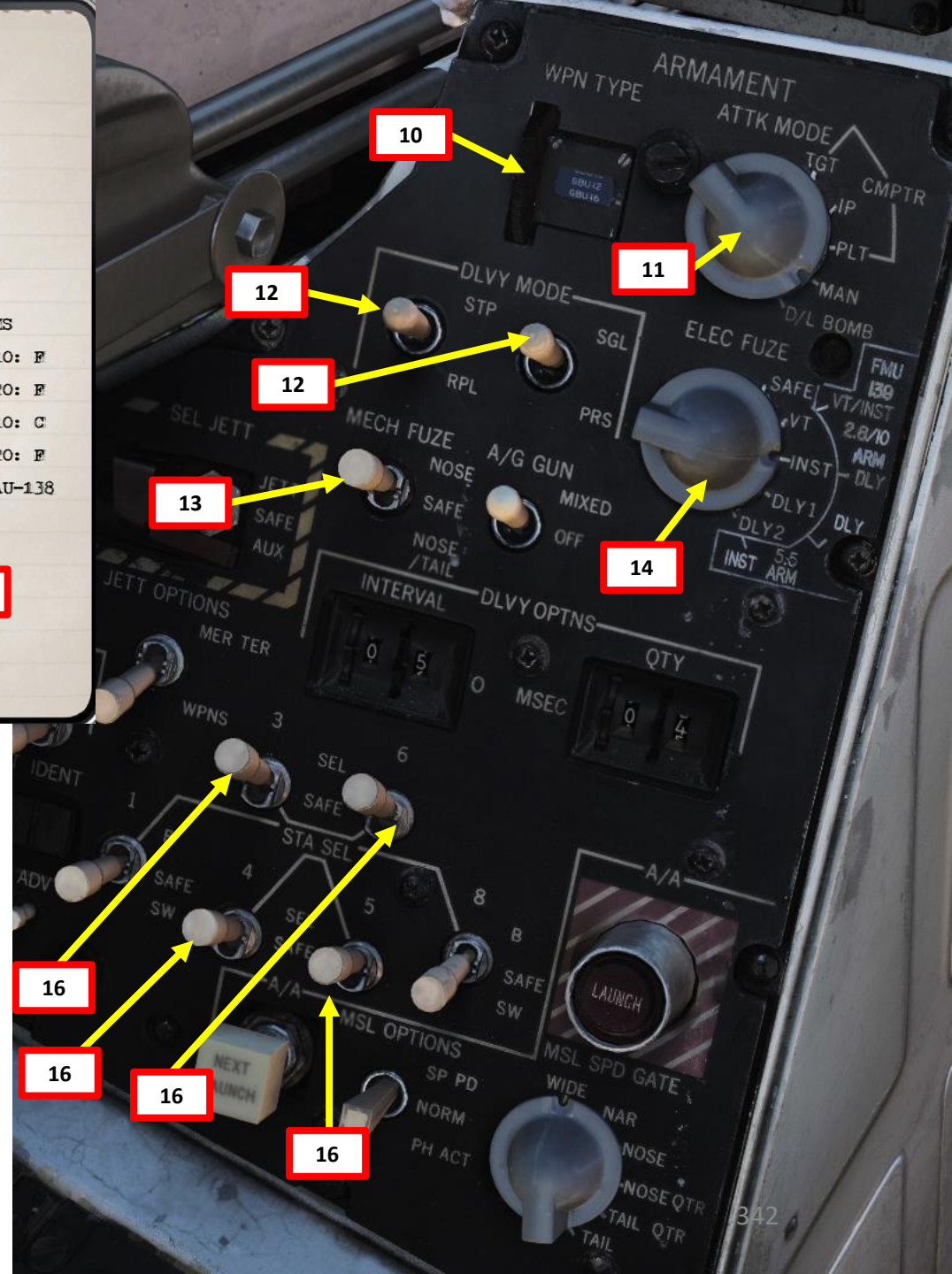


2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

From the RIO Seat (or using JESTER):

10. Select GBU-12 WPN TYPE
11. Select Manual Attack Mode
12. Select desired Delivery Mode (we will use STP and SGL, Step and Single).
    - STP (Step) releases a single bomb per bomb release button press.
    - RPL (Ripple) releases multiple bombs per bomb release button press.
    - SGL (Single) releases a single bomb per bomb release button press.
    - PRS (Pairs) releases a pair of bombs per bomb release button press.
13. Select Mechanical Fuze to NOSE
14. Select Electronic Fuze to INST (Instantaneous)
15. Select Delivery options if necessary (we will not use any since we use STP-SGL)
16. Arm Stations that you want to use (press “RSHIFT+K” and use “[“ and “]” to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3, 4, 5 and 6.





2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

If using JESTER, use the same procedure but with the JESTER menus.



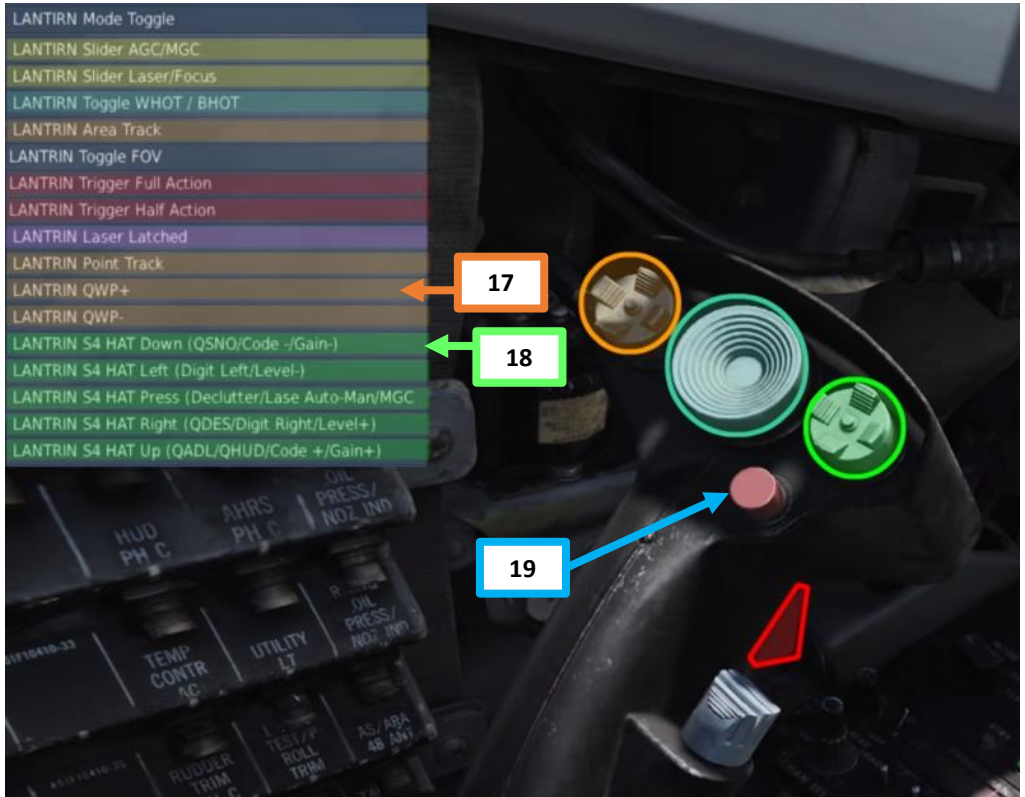




2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

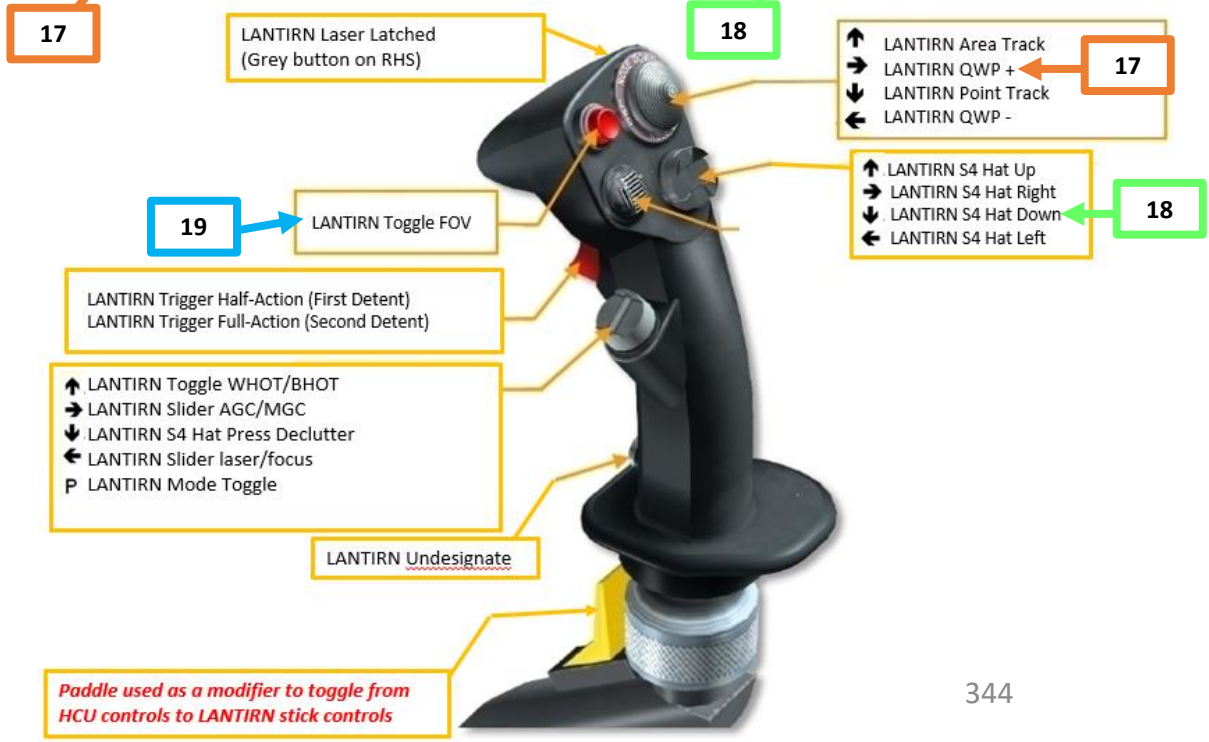
From the RIO Seat:

17. If a waypoint is close to the target, you can slew the LANTIRN pod to this waypoint by using the **Left Four-Way Hat switch Right (QWP+) to select the desired waypoint.** This will use an existing waypoint as a cue for the targeting pod.
18. If no waypoint is available, you can use the **Right S4 Down switch** to use QSNO (Cue-Snowplow) Mode. This will slew the pod to the direction the aircraft nose is pointing. You can coordinate with the pilot to point the aircraft in an approximate location of the target and let you slew the pod manually from there.
19. Use the LANTIRN Toggle FOV button to zoom in or out as required.









2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

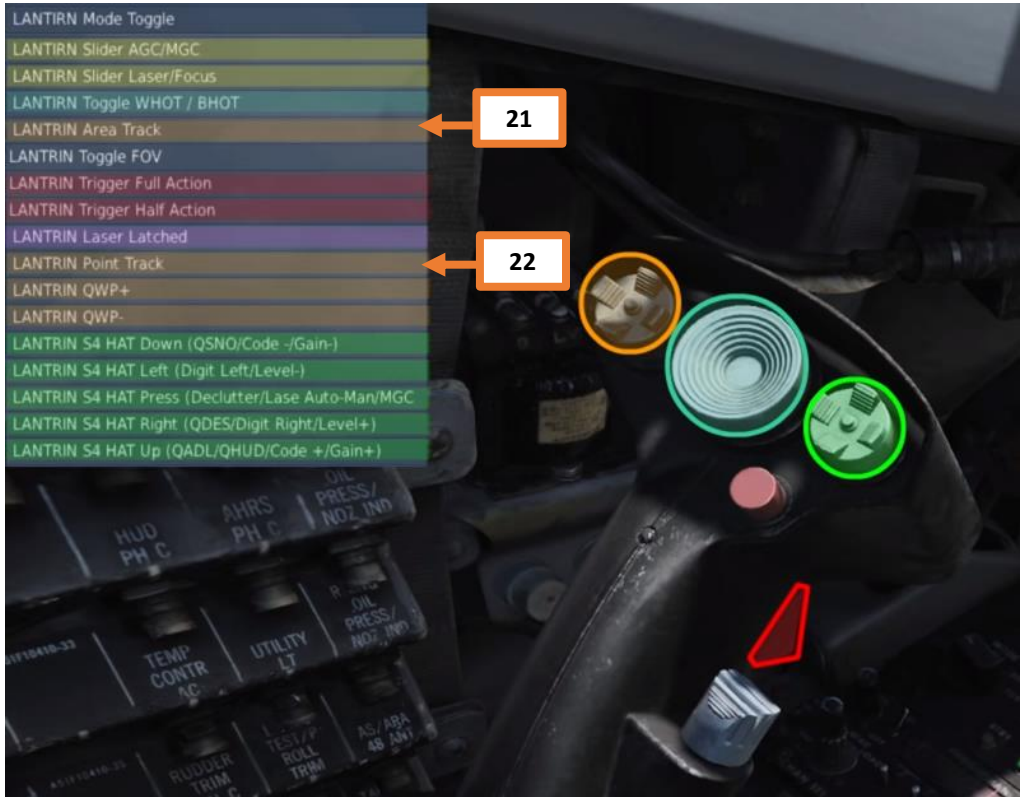
From the RIO Seat:

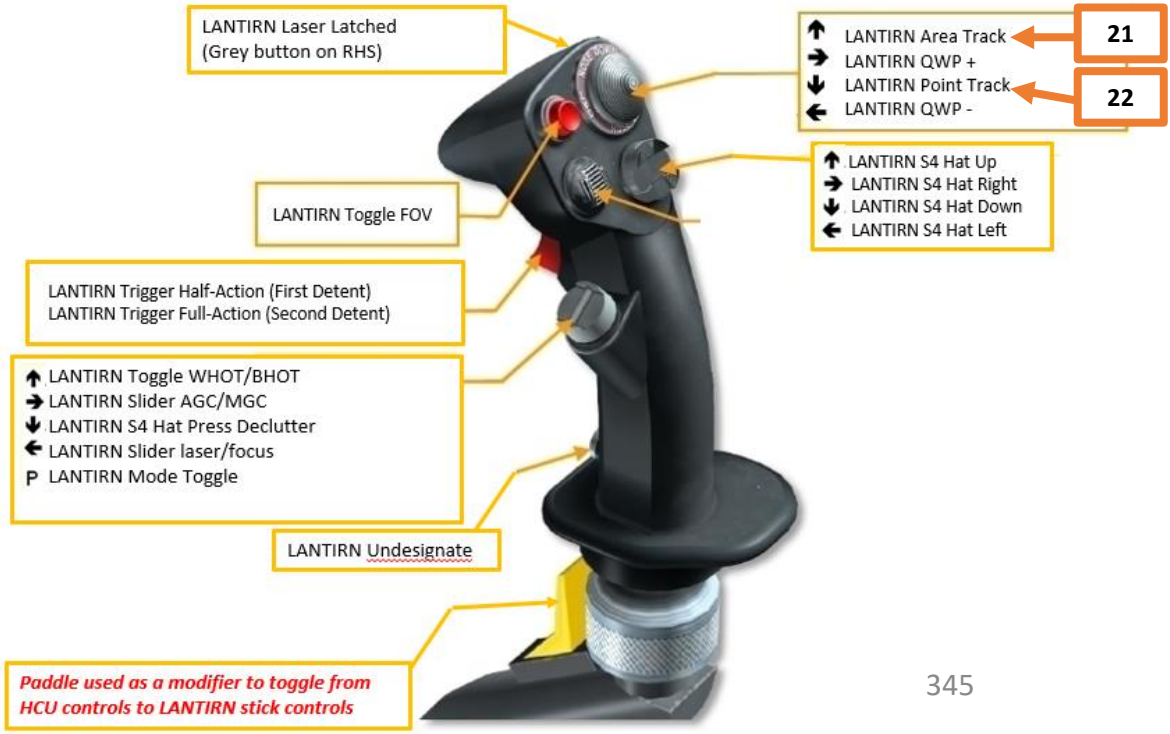
20. Move the LANTIRN stick lever to move the cursor manually on the target.
21. Once cursor is on the target, press the **Left Four-Way Hat switch Up (Area Track)** to stop the cursor from drifting.
22. If desired, press the **Left Four Way Hat switch Down (Point Track)** to track an object like a high-contrast vehicle.

Note: Keep in mind that you can undesignate using the LANTIRN Undesignate button.







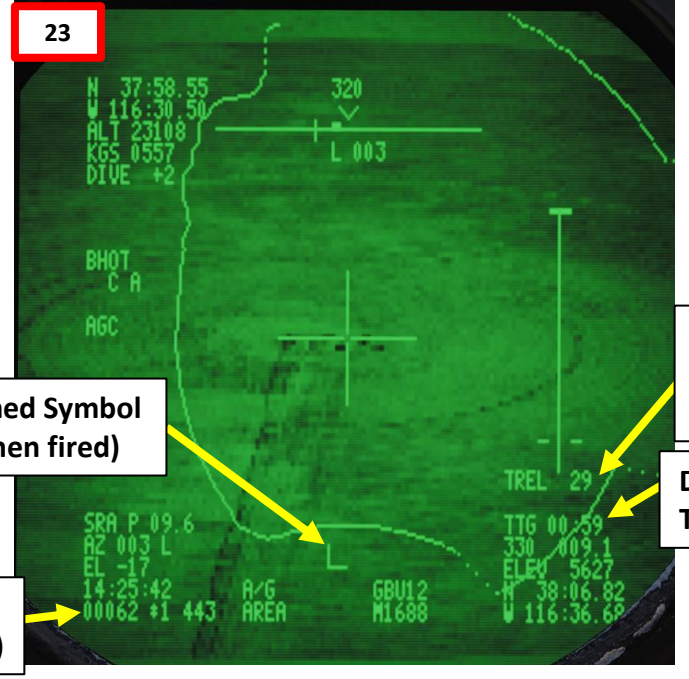


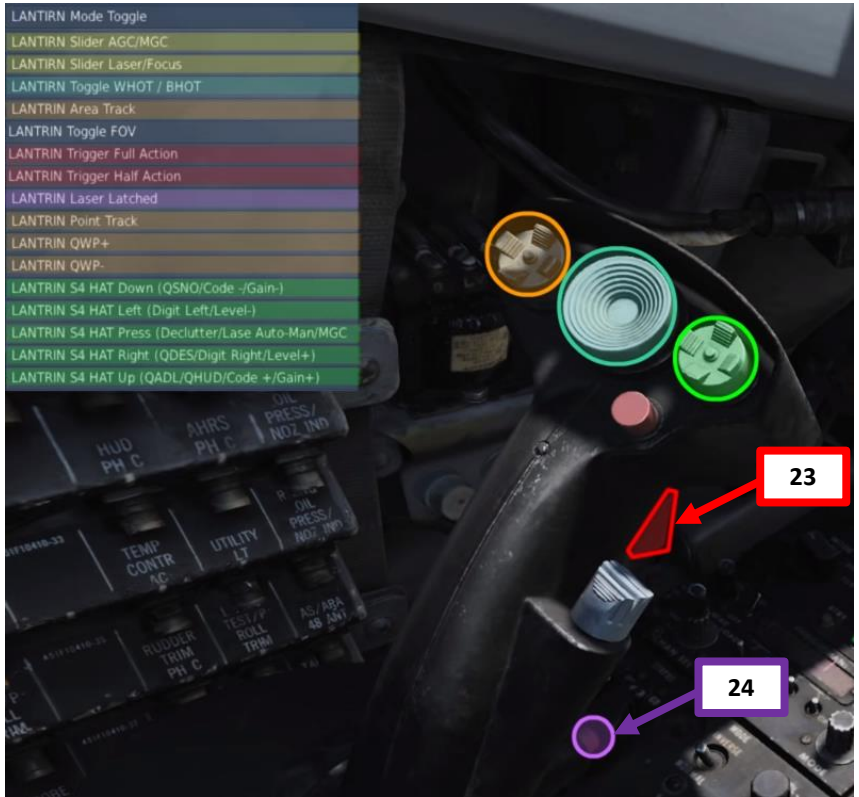
2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

From the RIO Seat:

23. A) Press the **LANTIRN Trigger Full-Action (second Detent)** to designate the target. Once designated, the TTG (Time-to-Go) value and slant range values will be calculated properly.
    B) When TREL (time to release) counter reaches 0, press and hold the **LANTIRN Trigger Full-Action (second Detent)** to lase the target. The « L » will blink as the laser is being fired. If the autolase mode is activated, the laser will begin firing at 10 seconds TIMP (Time-to-Impact) until TIMP zero +4 seconds.

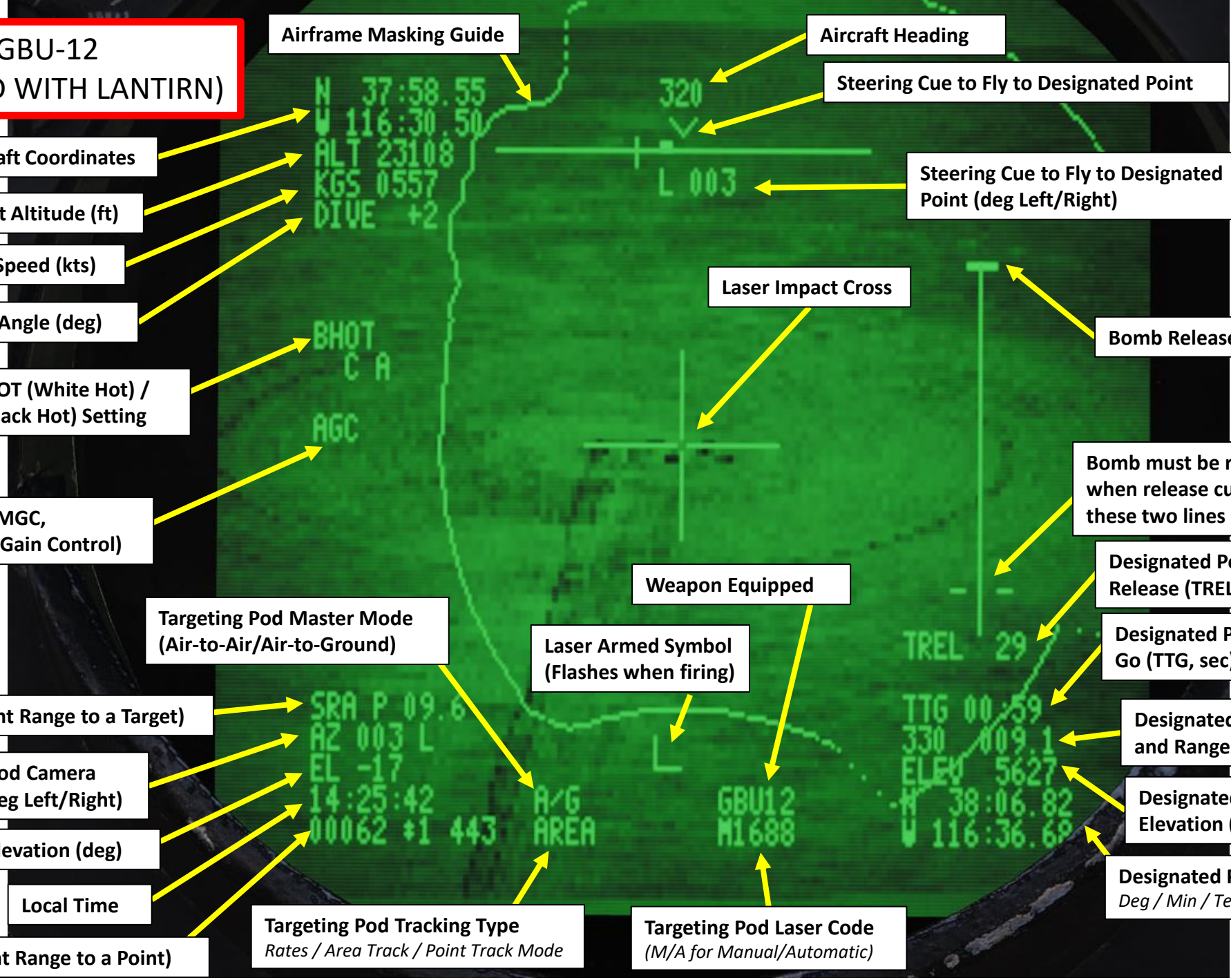
24. You can also use the **Laser Latched** button to fire the laser. Selecting it fires the laser for 60 seconds which can be overriden by the pressing and releasing the first trigger detent.







2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

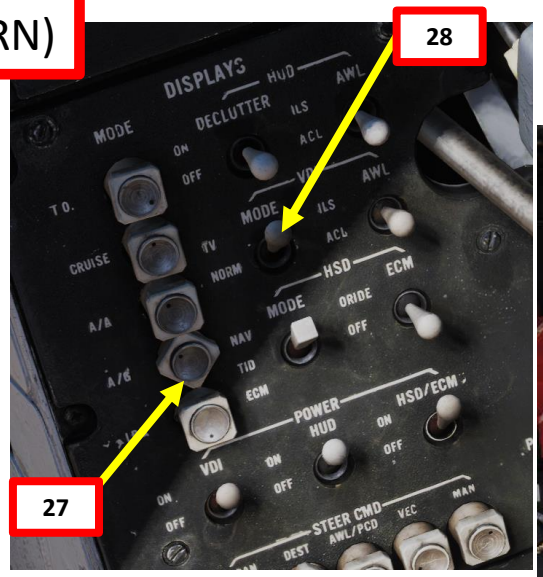


- Airframe Masking Guide
- Aircraft Heading
- Steering Cue to Fly to Designated Point
- Aircraft Coordinates
- Steering Cue to Fly to Designated Point (deg Left/Right)
- Aircraft Altitude (ft)
- Ground Speed (kts)
- Laser Impact Cross
- Dive Angle (deg)
- Bomb Release Cue
- FLIR WHOT (White Hot) / BHOT (Black Hot) Setting
- Bomb must be released when release cue reaches these two lines
- Gain Control (AGC/MGC, Automatic/Manual Gain Control)
- Designated Point Time to Release (TREL, sec)
- Weapon Equipped
- Targeting Pod Master Mode (Air-to-Air/Air-to-Ground)
- Laser Armed Symbol (Flashes when firing)
- Designated Point Time to Go (TTG, sec)
- Targeting Pod SRA (Slant Range to a Target)
- Designated Point Bearing and Range (nm)
- Targeting Pod Camera Azimuth (deg Left/Right)
- Designated Point Ground Elevation (ft)
- Targeting Pod Camera Elevation (deg)
- Local Time
- Designated Point Coordinates *Deg / Min / Tenth of Minute*
- Targeting Pod SRA (Slant Range to a Point)
- Targeting Pod Tracking Type *Rates / Area Track / Point Track Mode*
- Targeting Pod Laser Code *(M/A for Manual/Automatic)*

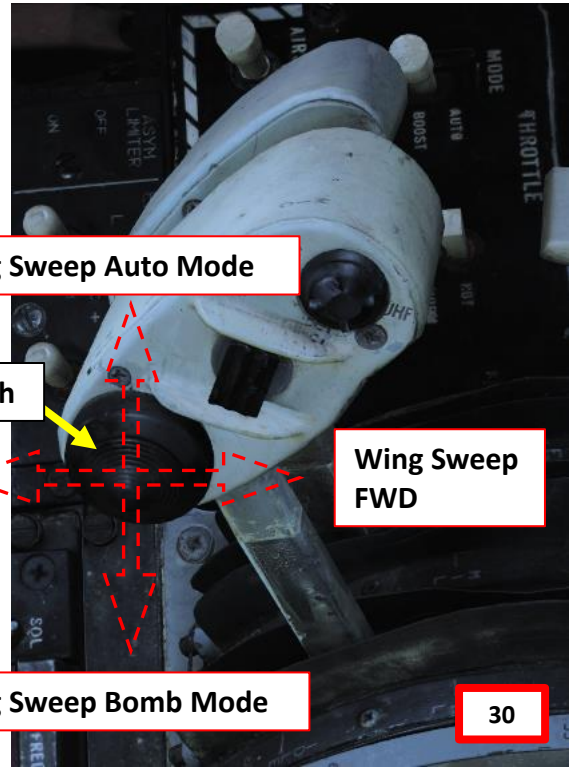
2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

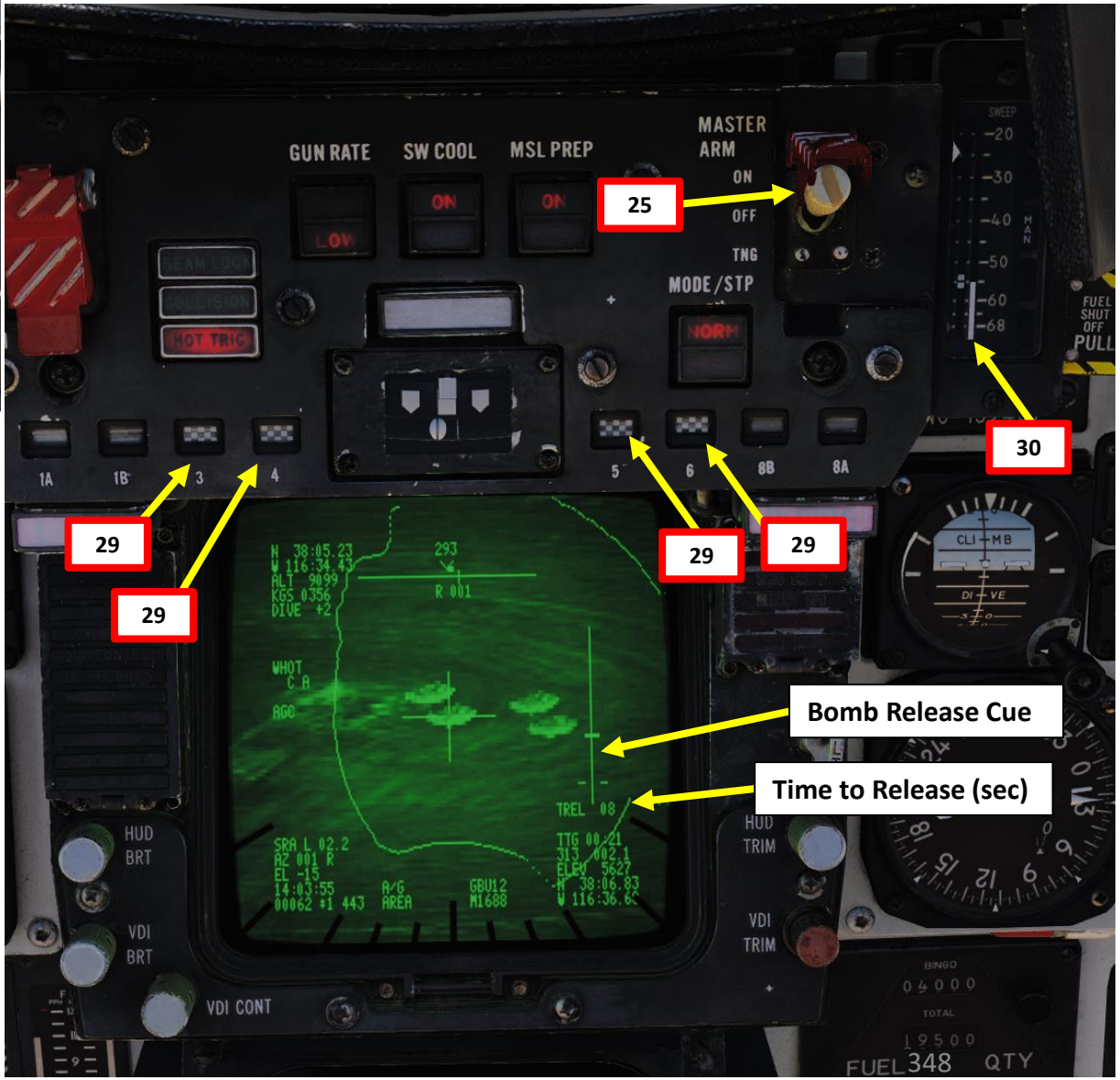
From the Pilot Seat:

25. Master Arm switch – ON (UP)
26. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
27. HUD Display Mode – A/G
28. Set VDI Mode - TV
29. Verify that stations 3, 4, 5 and 6 are selected
30. Set Wing Sweep Thumb switch DOWN to BOMB mode. Wing sweep will automatically go to 55 deg.









2.6 – GBU-12 (LASER-GUIDED WITH LANTIRN)

From the Pilot Seat:

31. Once the Time to Release reaches 0 and the Bomb Release Cue crosses the two lines, press the STORE RELEASE button to drop the bomb.
32. As the pilot, take extreme care to fly in a gentle right-hand turn over the target to provide the least disturbance to the camera limits, maintaining the targeting pod laser tracking. If the targeting pod gets masked by the aircraft fuselage, the laser link will be broken and the guided bombs will go dumb and miss their mark.







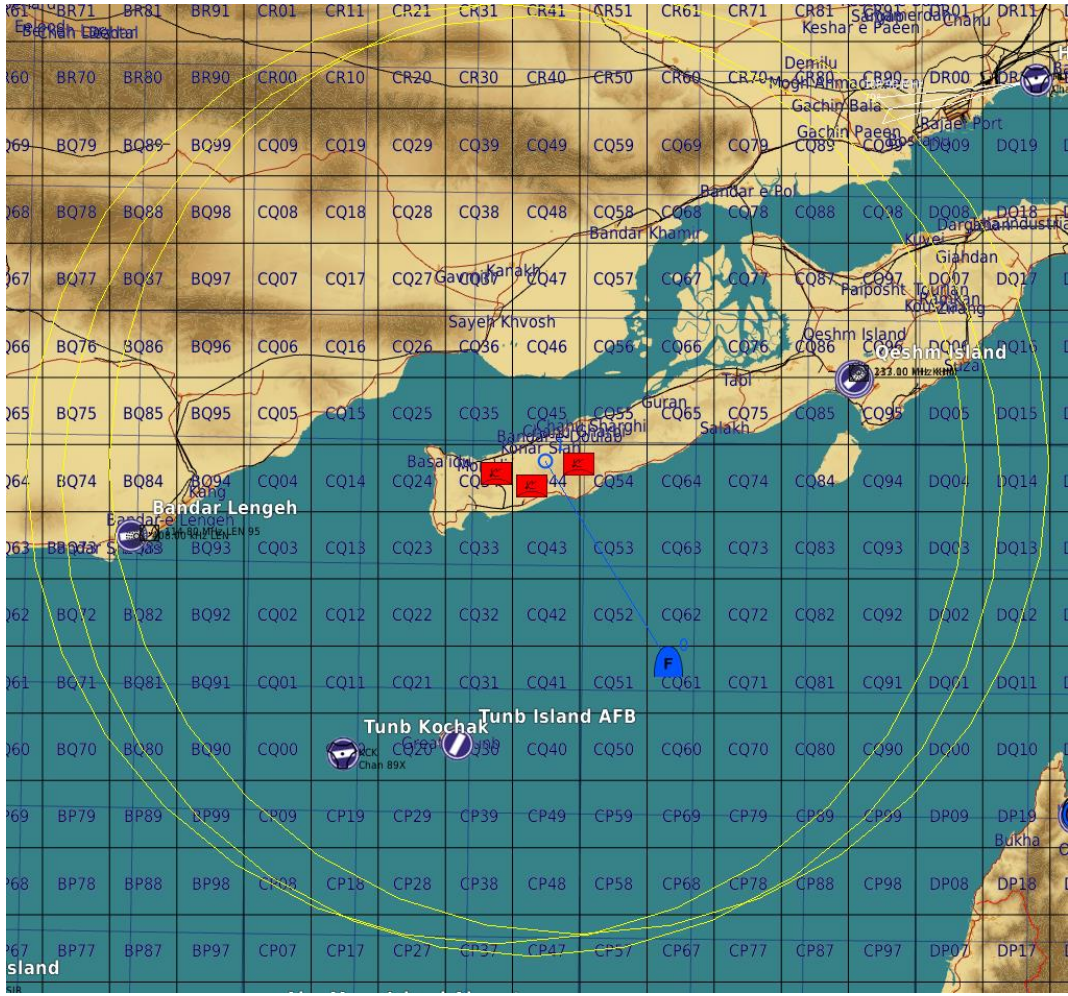


2.7 – TALD DECOYS

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 ADM-141A **TALD** (Tactical Air-Launched Decoy) was intended to confuse and saturate enemy air defenses, as part of an overall SEAD strategy, thus allowing attacking aircraft and weapons a higher probability of penetrating to the target. The TALD was an expendable glide vehicle with a square fuselage, flip-out wings, and three tail control surfaces. A digital flight control system could be programmed to conduct various speed or manoeuvering changes during flight. The missile could be launched from 12,200 metres (40,000 ft), at which height it had a range of up to 126 kilometres (78 mi); a low-altitude range reduced this to 26 kilometres (16 mi).


SA6 SAM Site

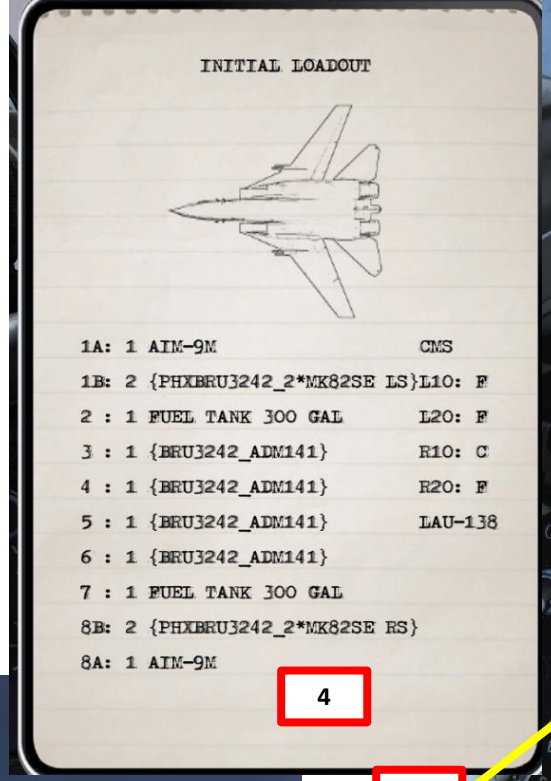


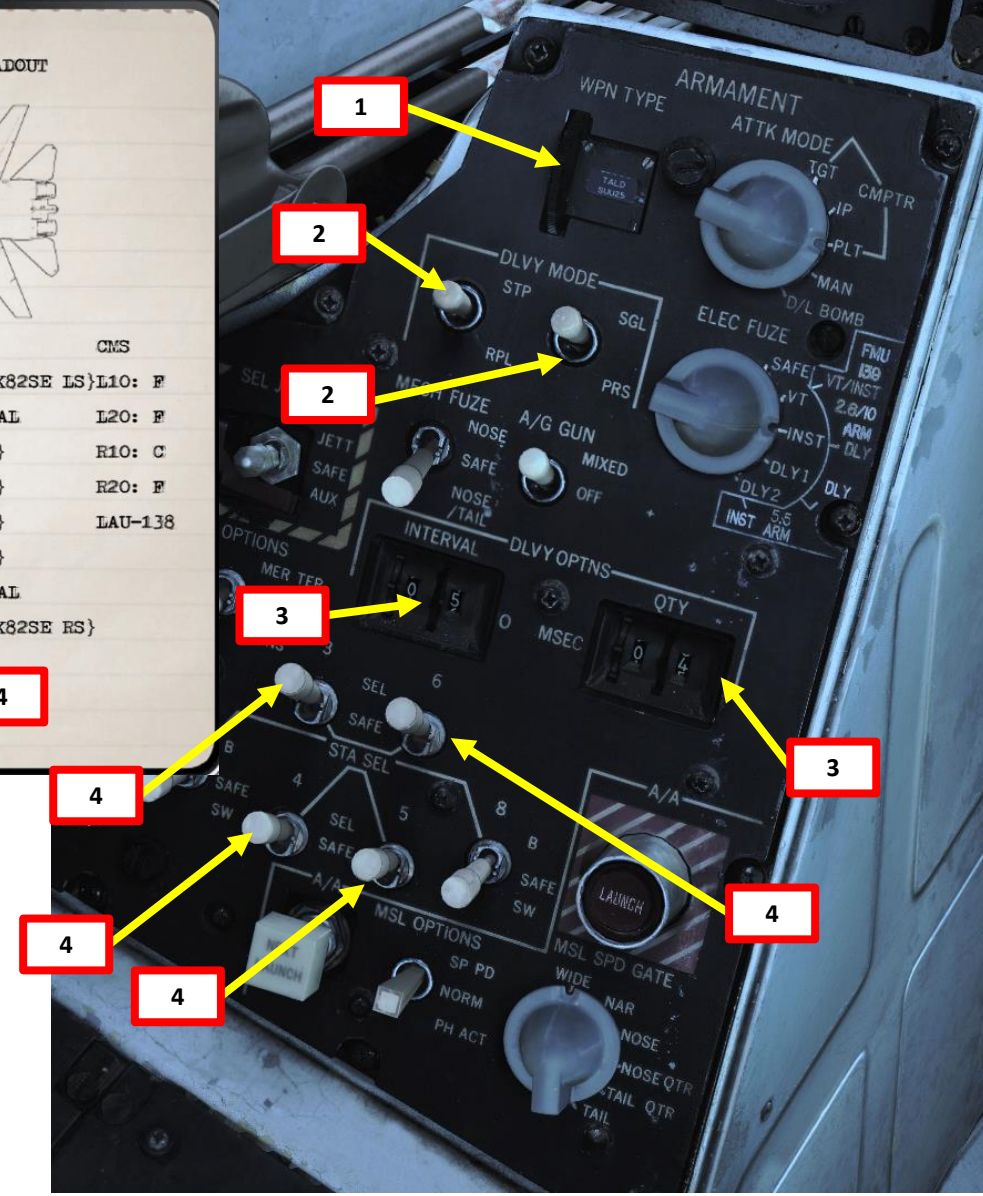
2.7 – TALD DECOYS

From the RIO Seat (or using JESTER):

1. Select TALD Bombs WPN TYPE
2. Select desired Delivery Mode (we will use STP and SGL, Step and Single).
   - STP (Step) releases a single TALD per bomb release button press.
   - RPL (Ripple) releases multiple TALDs per bomb release button press.
   - SGL (Single) releases a single TALD per bomb release button press.
   - PRS (Pairs) releases a pair of TALD per bomb release button press.
3. Select Delivery options if required (we will not use them for Step-Single).
4. Arm Stations that you want to use (press “RSHIFT+K” and use “[“ and “]” to cycle through pages until you reach the INITIAL LOADOUT page to know what station to use). We will use stations 3, 4, 5 and 6.







2.7 – TALD DECOYS

If using JESTER, use the same procedure but with the JESTER menus.



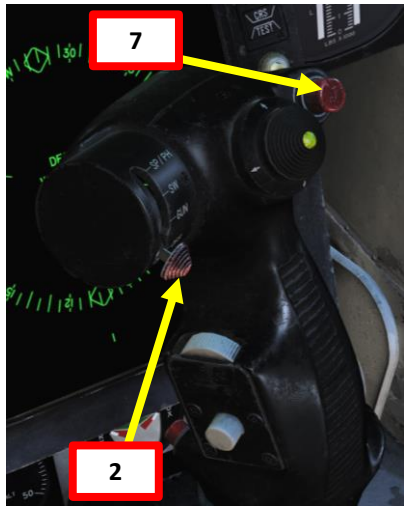


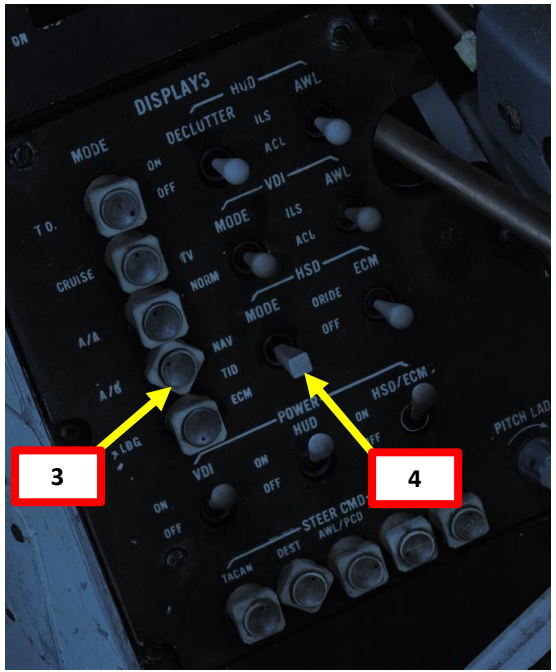


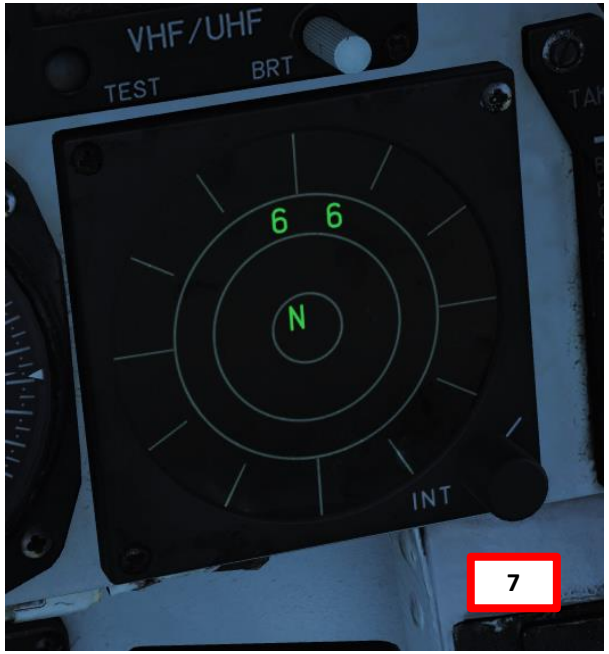
2.7 – TALD DECOYS

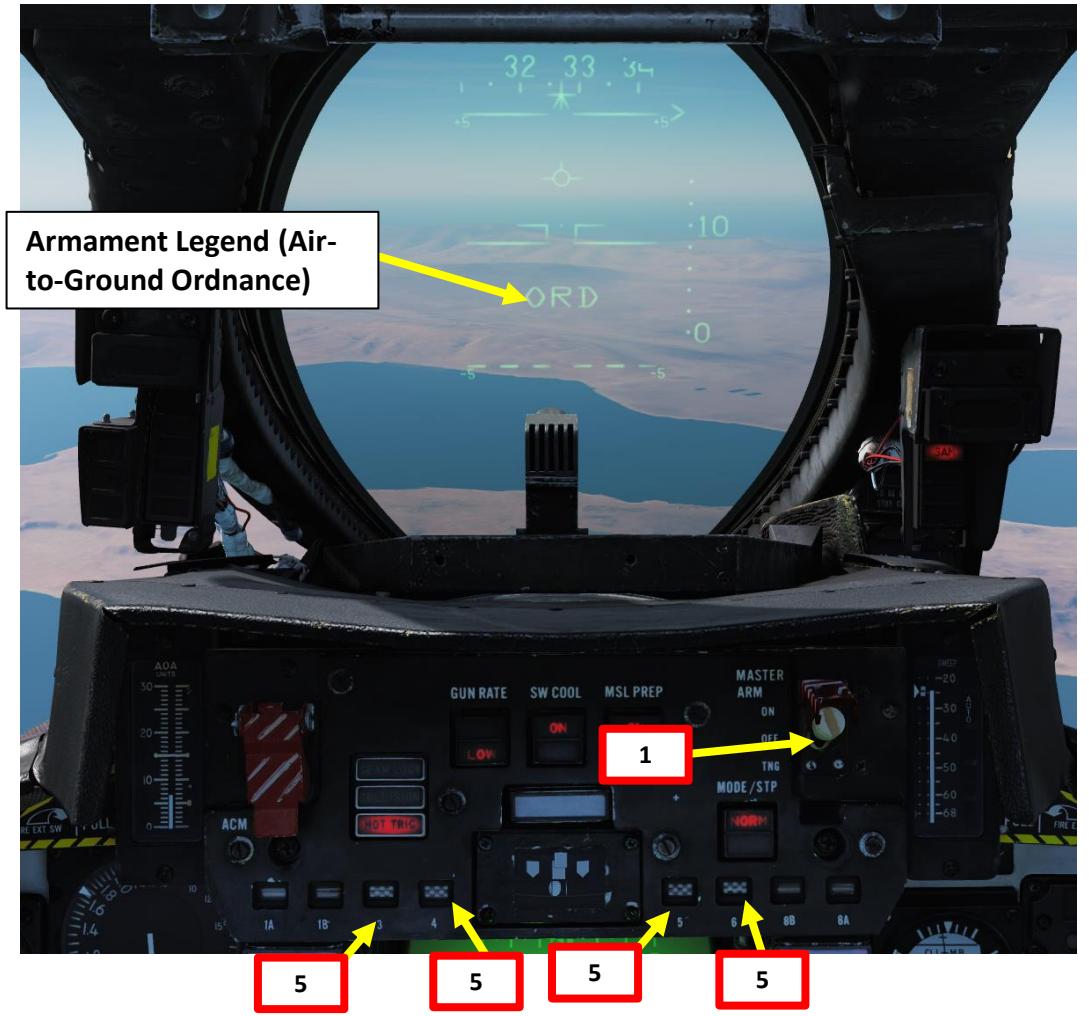
From the Pilot Seat:

1. Master Arm switch – ON (UP)
2. Set the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector DOWN to OFF.
3. HUD Display Mode – A/G
4. HSD Display Mode – TID. If a datalink host is available (AWACS), tune in to its frequency and you may have more information on your TID.
5. Verify that stations 3, 4, 5 and 6 are selected
6. Fly at a cruising altitude and speed (more altitude and speed means more range for the TALD)
7. Consult your RWR (Radar Warning Receiver) to know where to find radar emitters. Align the aircraft nose with the direction of these emitters.
8. When ready, press and hold the STORE RELEASE (RALT+SPACE) button to launch the TALD.









2.7 – TALD DECOYS

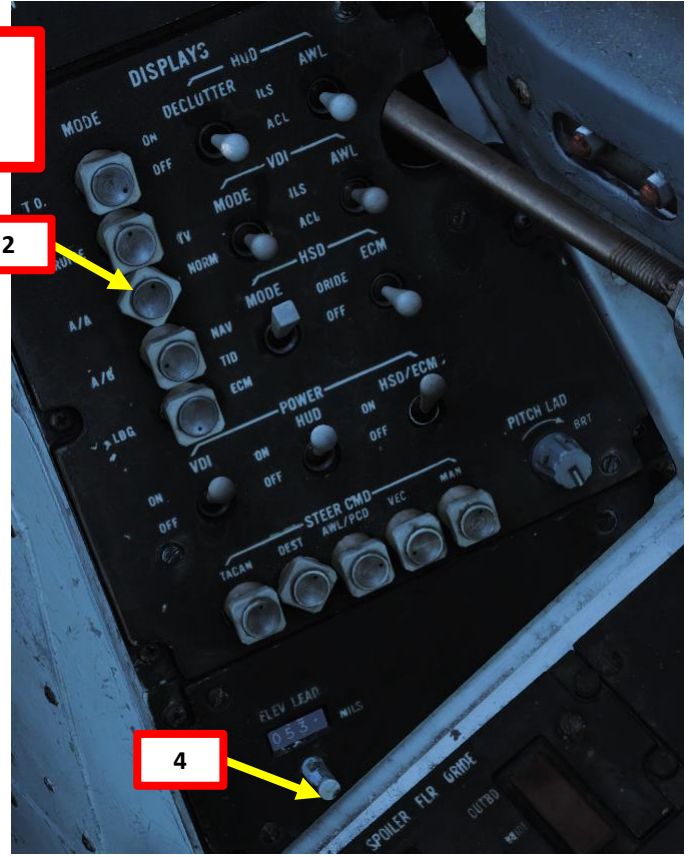
Once launched, the TALD will deploy its wings and glide for as long as it can. Radar emitters should start launching ground-to-air missiles at the decoy once they detect it.

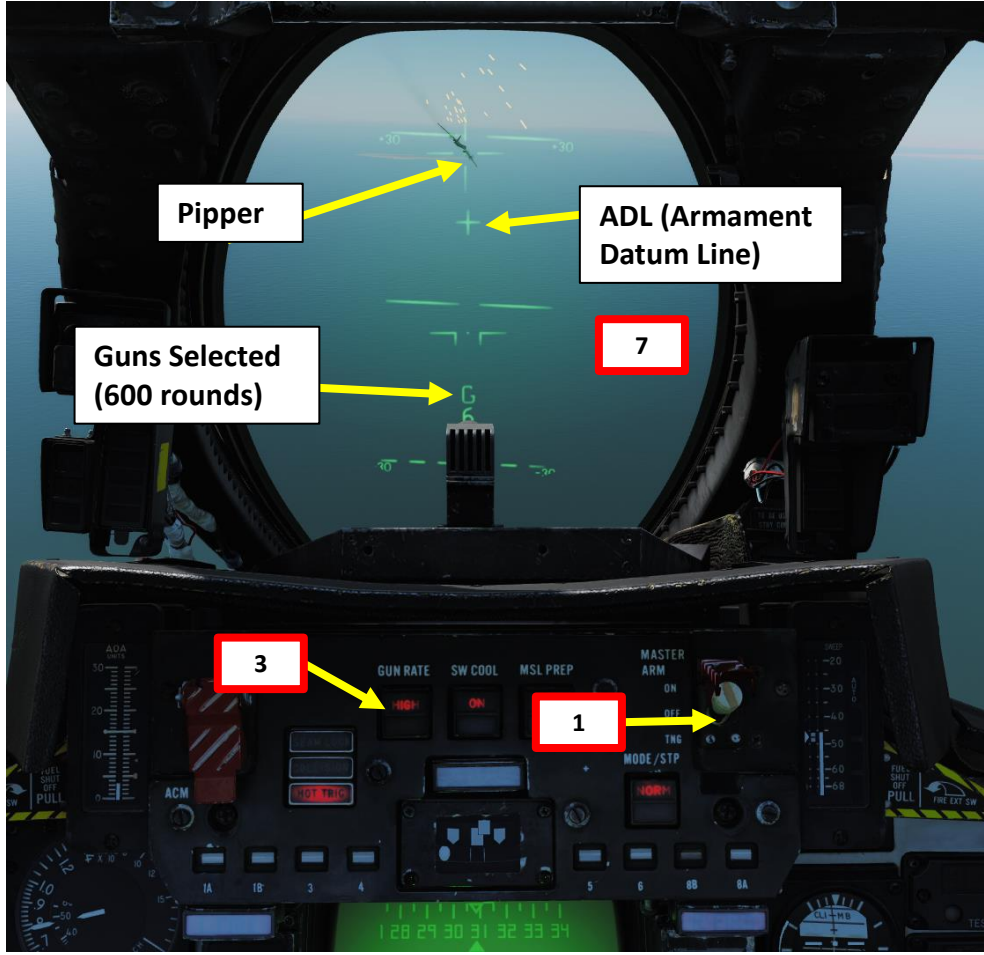


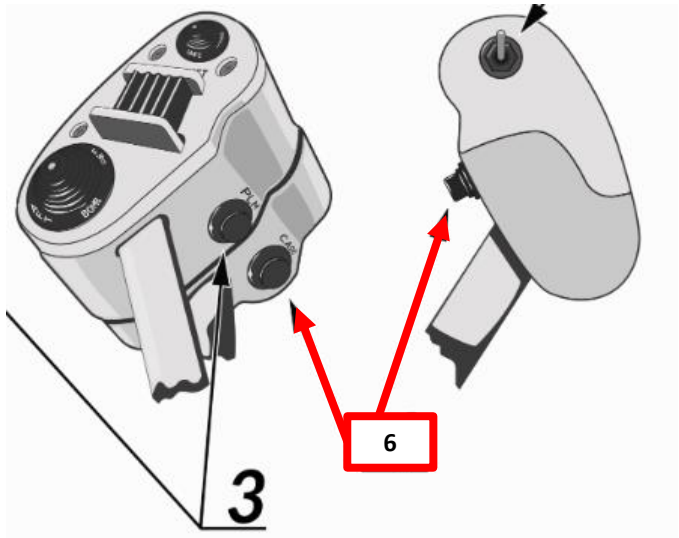


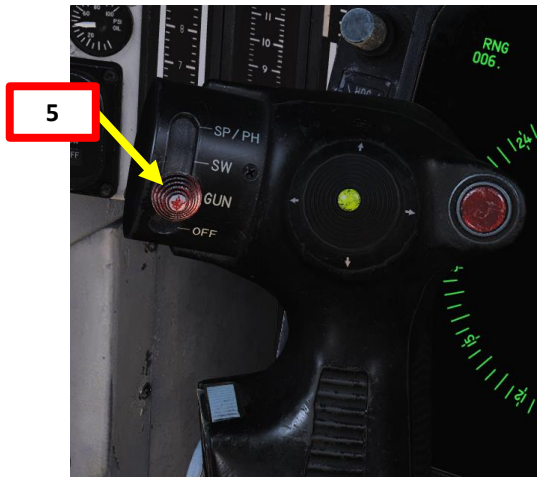
3.1 – M61 GUNS (MANUAL/NO RADAR TRACKING)

1. Master Arm switch – ON (UP)
2. HUD Display Mode – A/A
3. Select Gun Rate (LOW/HIGH) as required. For air-to-air, I recommend HIGH rate of fire.
4. Set Gunsight Elevation Lead – As Required (we will use 53 mils, which is roughly 3 degrees above the ADL, Armament Datum Line).
5. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to GUNS.
6. Press the CAGE/SEAM button on the throttle to go in Manual Air-to-Air Gun Mode.
7. Place Pipper on target. Keep in mind that in Manual Mode, you have no ranging or target lead information.



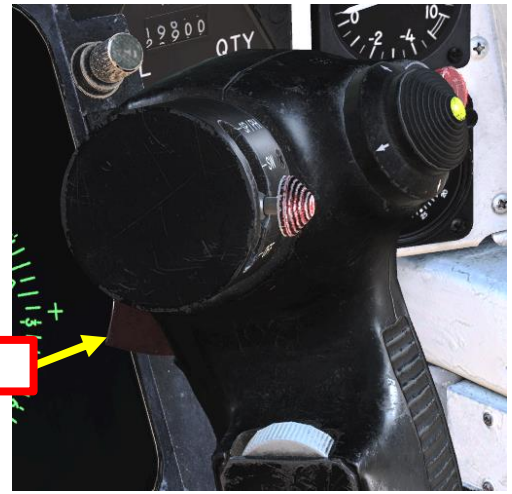


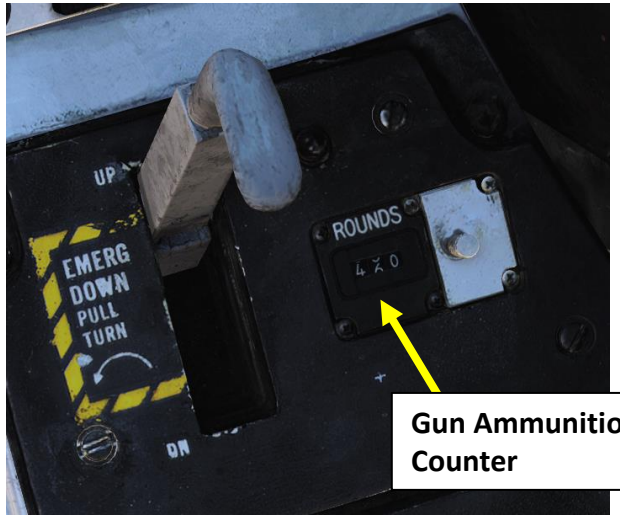




3.1 – M61 GUNS (MANUAL/NO RADAR TRACKING)

8. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire guns.



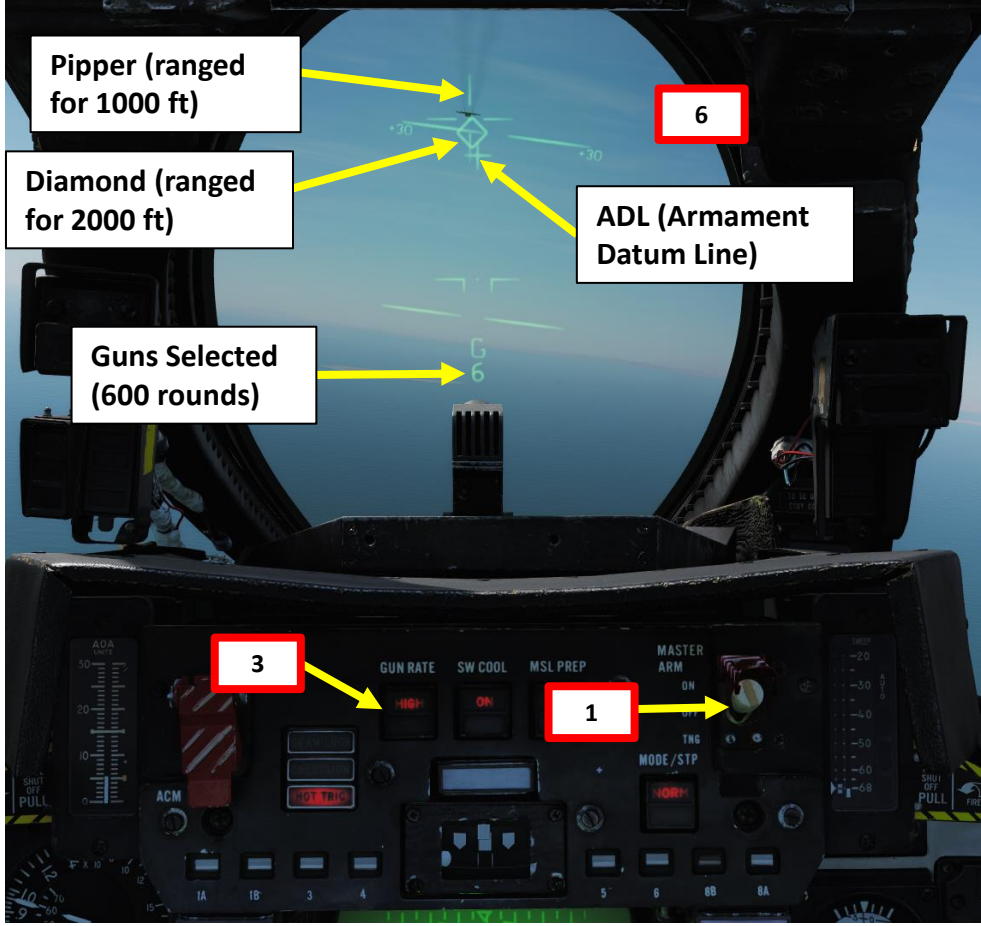




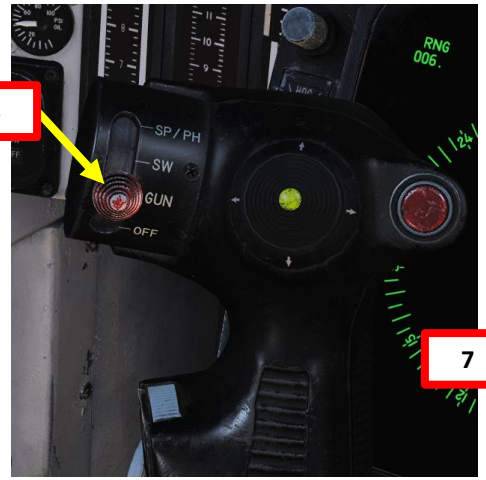
3.2 – M61 GUNS (RTGS/NO RADAR TRACKING)

1. Master Arm switch – ON (UP)
2. HUD Display Mode – A/A
3. Select Gun Rate (LOW/HIGH) as required. For air-to-air, I recommend HIGH rate of fire.
4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to GUNS.
5. The RTGS (Real-Time Gunsight Mode) will automatically be activated.
6. Place either the Diamond (ranged for 2000 ft) or the Pipper (ranged for 1000 ft) on target. Keep in mind that in RTGS Mode, you have no ranging information but lead computing information.
7. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire guns.









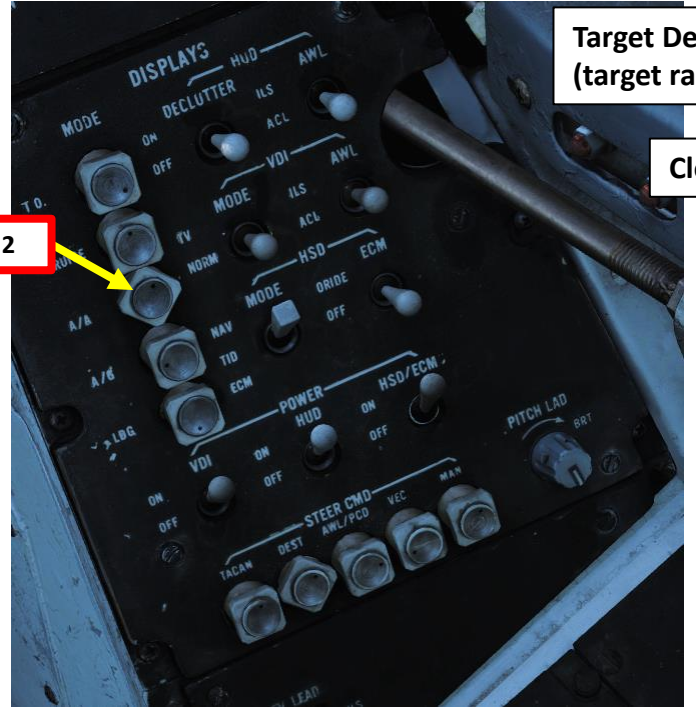


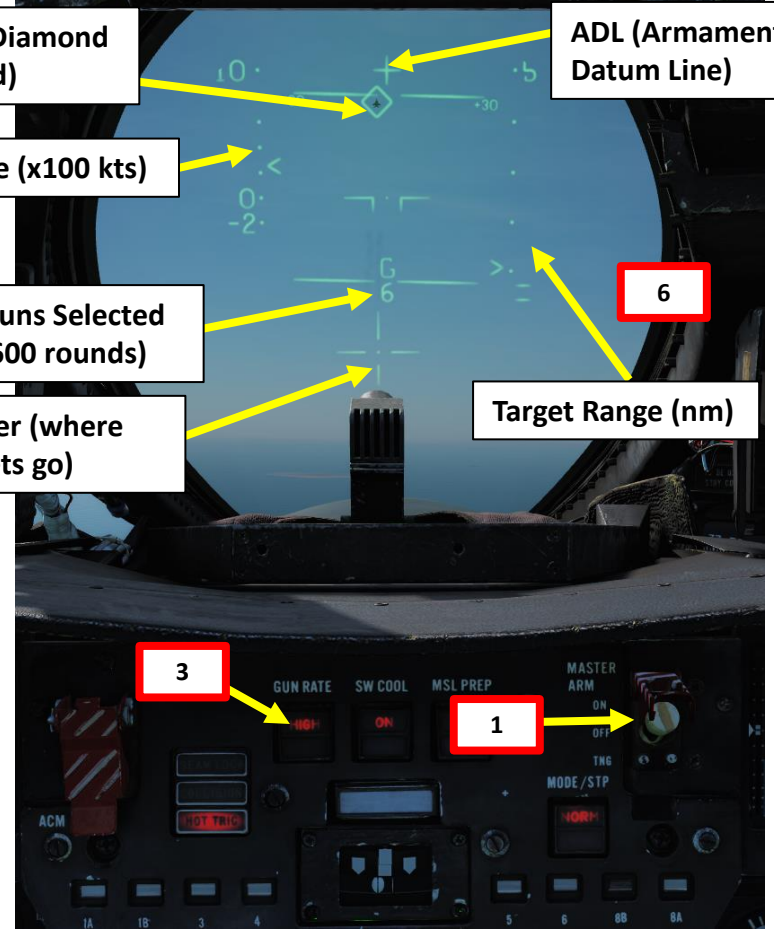
3.3 – M61 GUNS (RTGS/RADAR TRACKING)

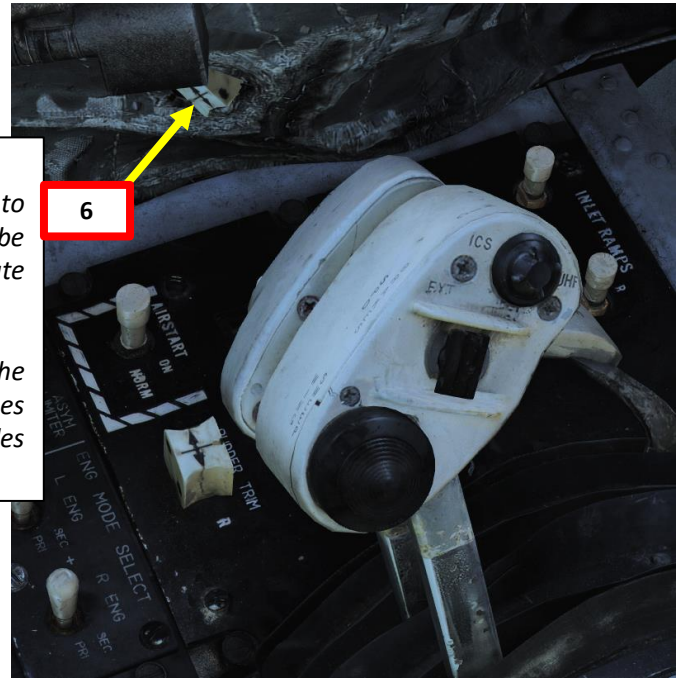
1. Master Arm switch – ON (UP)
2. HUD Display Mode – A/A
3. Select Gun Rate (LOW/HIGH) as required. For air-to-air, I recommend HIGH rate of fire.
4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to GUNS.
5. The RTGS (Real-Time Gunsight Mode) will automatically be activated.
6. Press the Target Designate Switch Forward, which will engage the PAL (Pilot Automatic Lockon Mode) to radar lock the target. Alternatively, you could also have any other kind of radar STT (Single Target Track) lock. The WCS (Weapon Control System) just needs a radar lock to compute ranging and lead information.

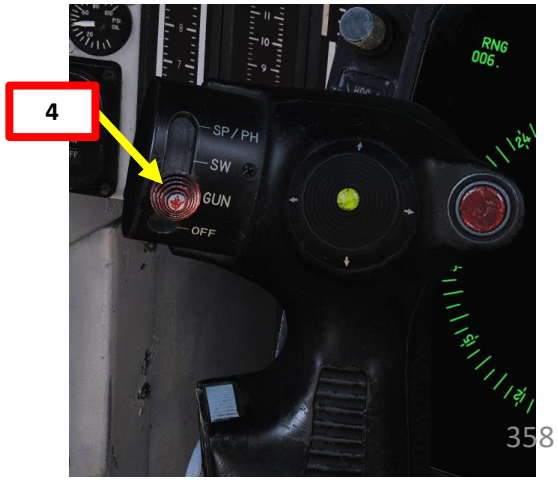
Target Designate Switch
Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.



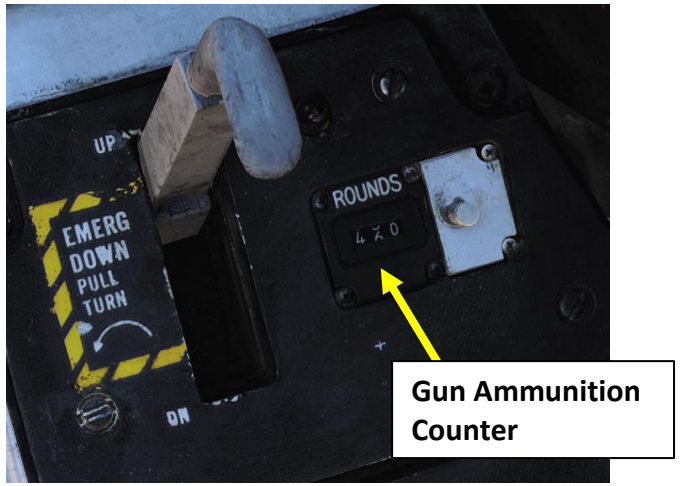


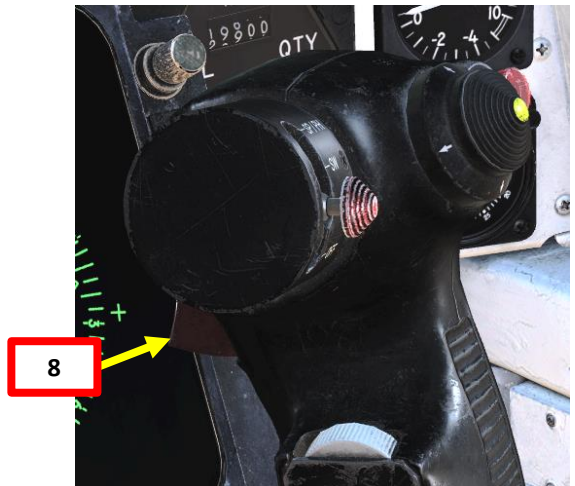


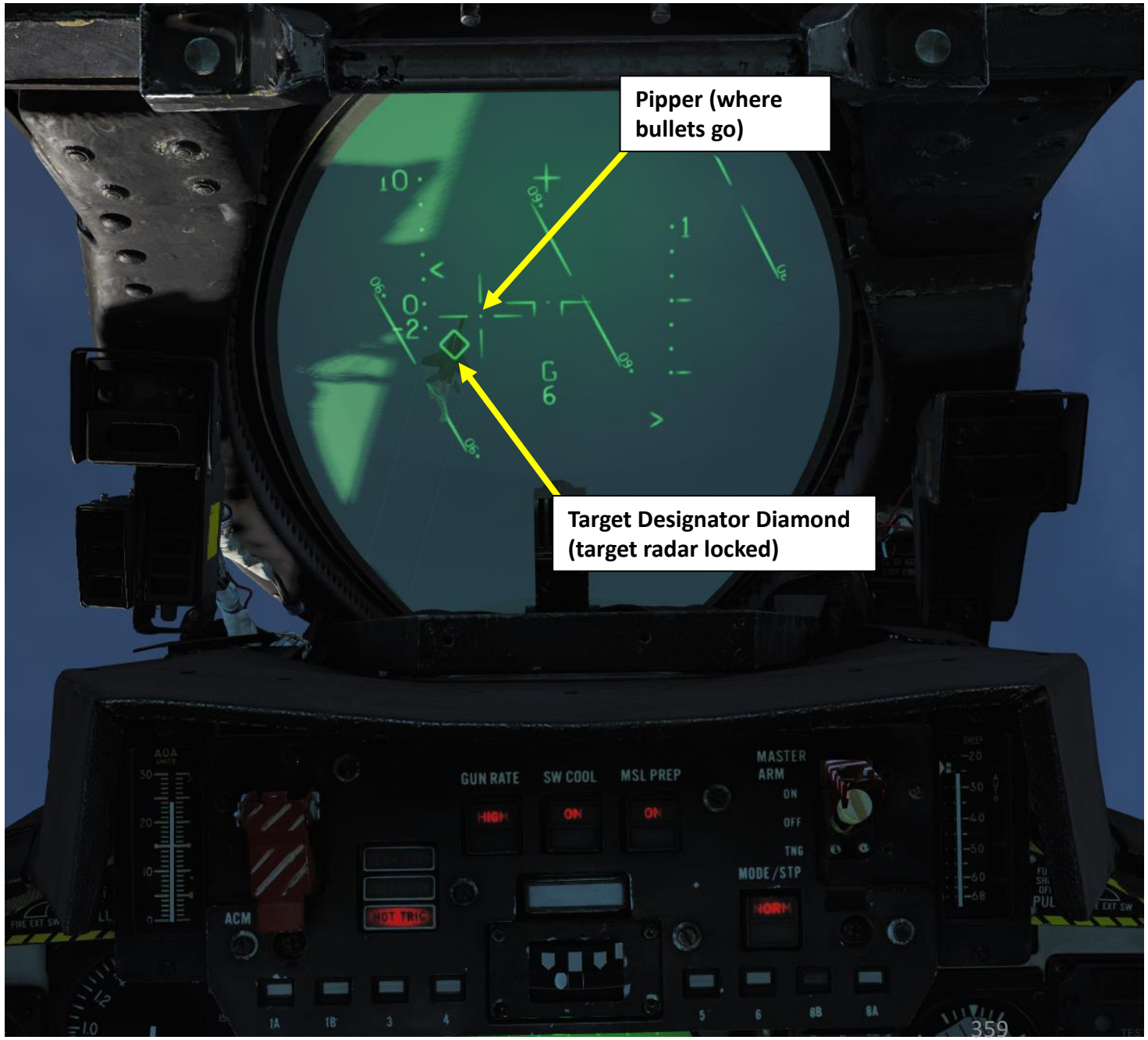


3.3 – M61 GUNS (RTGS/RADAR TRACKING)

7. Place the pipper on the target diamond. If you have a good radar lock, you will have ranging, closure rate and lead information.
8. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire guns.

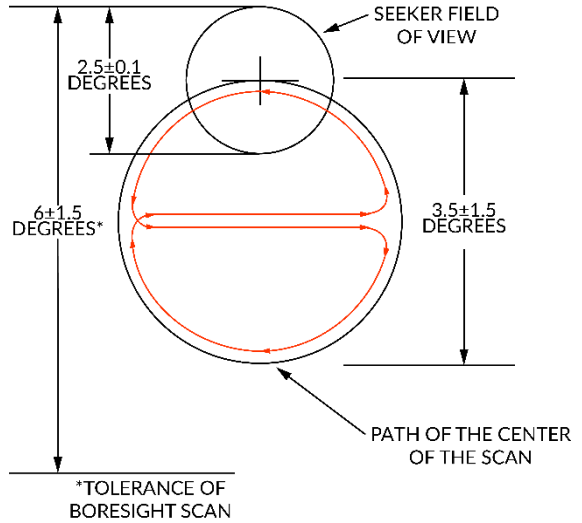


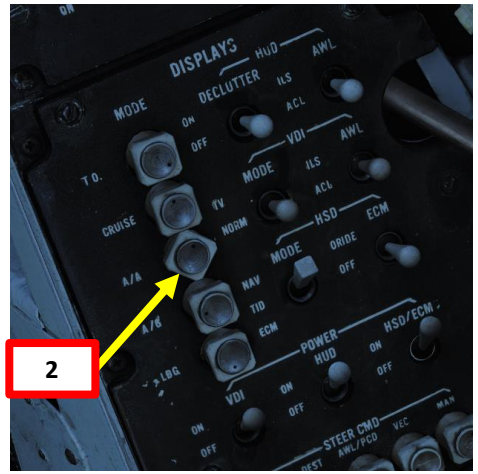




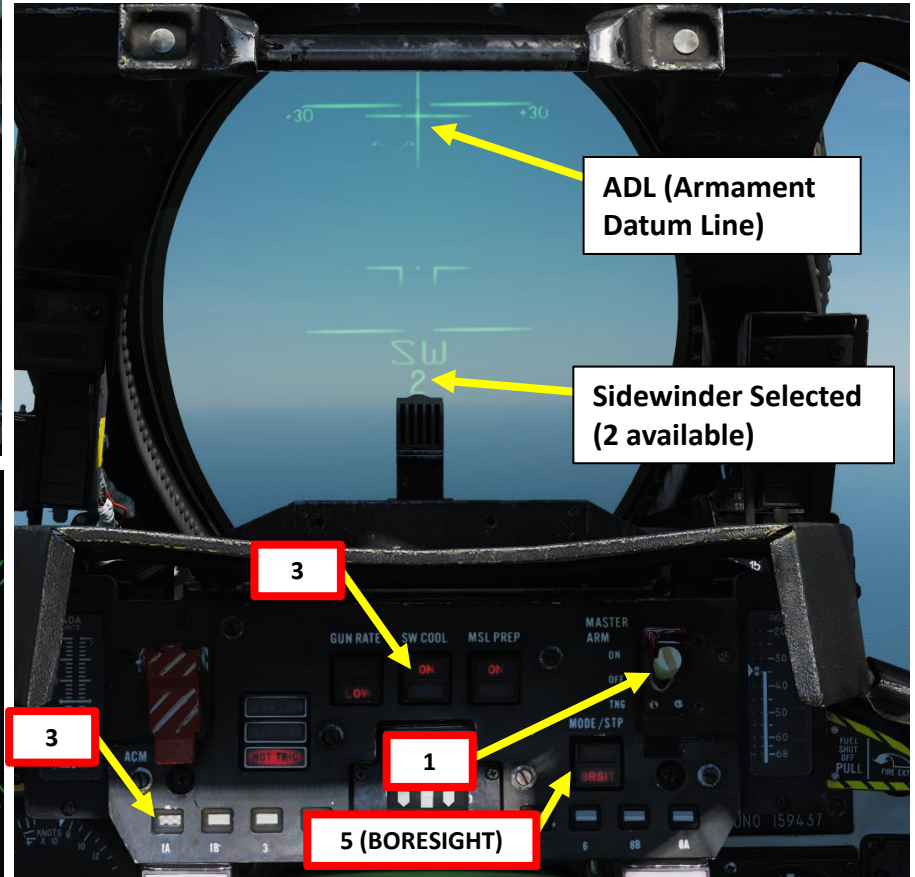
3.4 – AIM-9M SIDEWINDER (NO RADAR TRACKING)

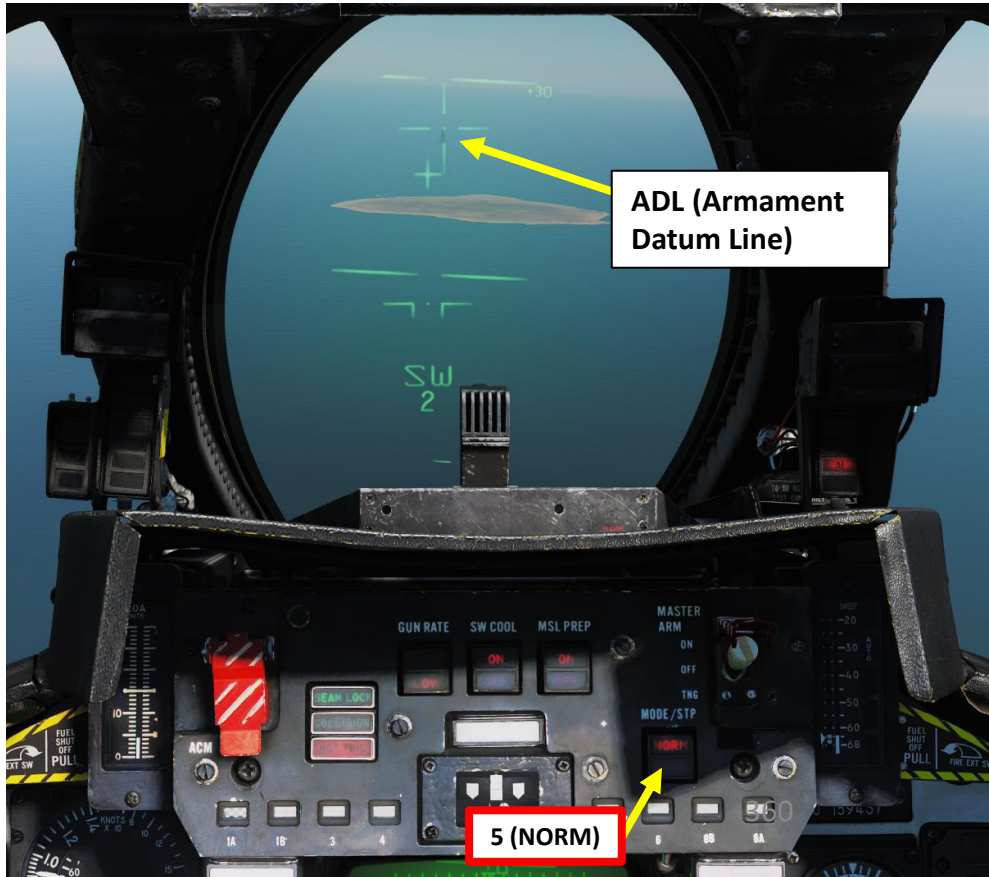
1. Master Arm switch – ON (UP)
2. HUD Display Mode – A/A
3. Set the SW COOL switch to ON. This commands cooling of the Sidewinder missiles seeker head. The missile will immediately show ready but full seeker head performance will take at least 60 seconds. The corresponding missile status windows turns white to indicate a ready missile.
4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SW.
5. Select **NORM** (Sidewinder expanded acquisition mode (SEAM) allows the missile seeker head to be uncaged to track a target within the seeker limits, 40° from ADL) or **BRSIT** (Boresight, seeker head remains slaved to ADL (2.5° field of view) Mode.







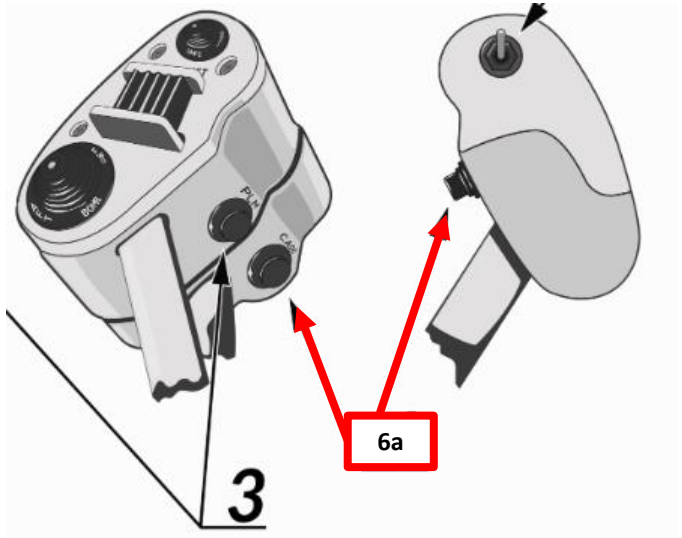


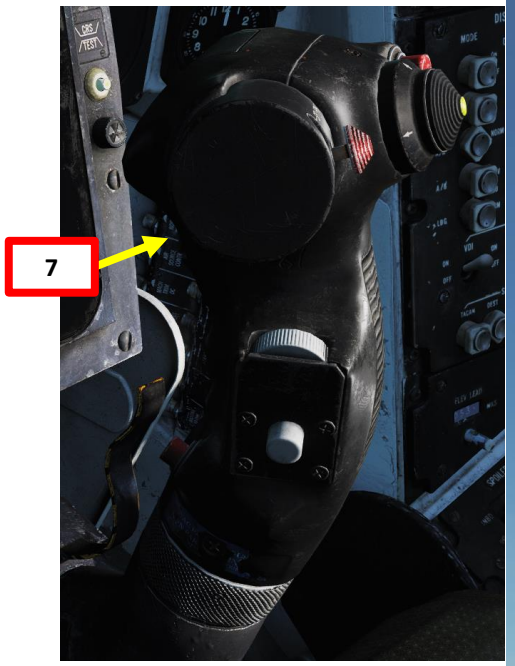


3.4 – AIM-9M SIDEWINDER (NO RADAR TRACKING)

6. Line up target with ADL (within 20 deg) to acquire heat signature
   a) If using NORM mode, press the CAGE/SEAM button on the throttle. This illuminates the SEAM LOCK light on the ACM panel and uncages the seeker for 4.5 seconds and allows it to track a target present in the seeker field of view. If no IR sources is found the missile is again caged and the SEAM LOCK light is deactivated. If lock-on is successful, the aural tone will remain and the SEAM LOCK light stays illuminated A low-pitch growling tone indicates the seeker is searching. A high-pitch screeching sound will indicate the seeker is looking at an IR-source.
   b) If using Boresight mode, low-pitch growling tone increases slightly in intensity when the seeker is looking at an IR-source.
7. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire missile once seeker is tracking a good infrared source.





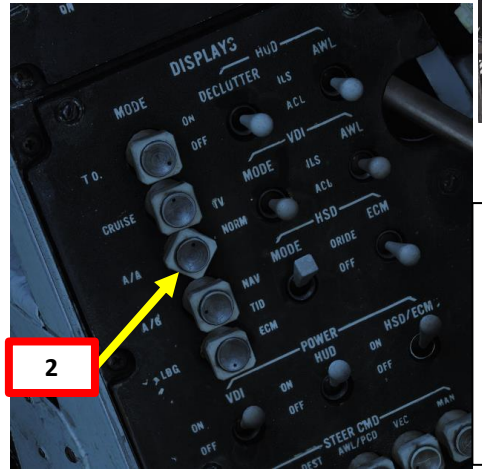


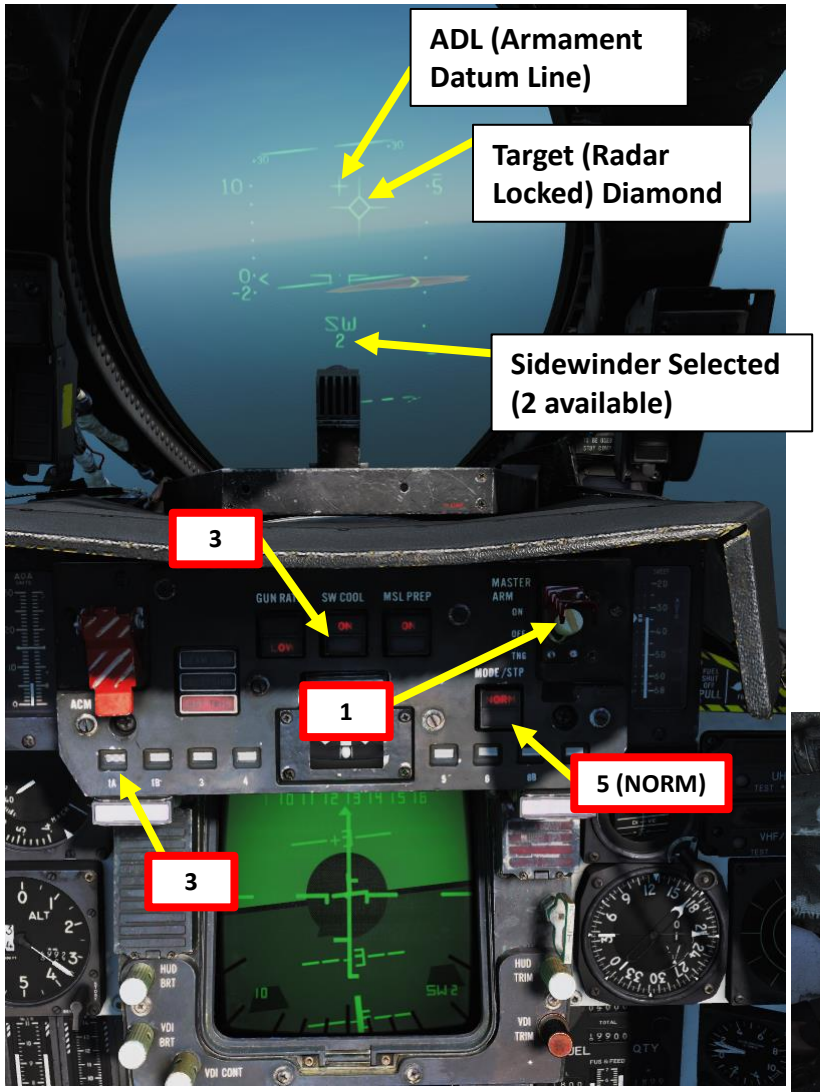


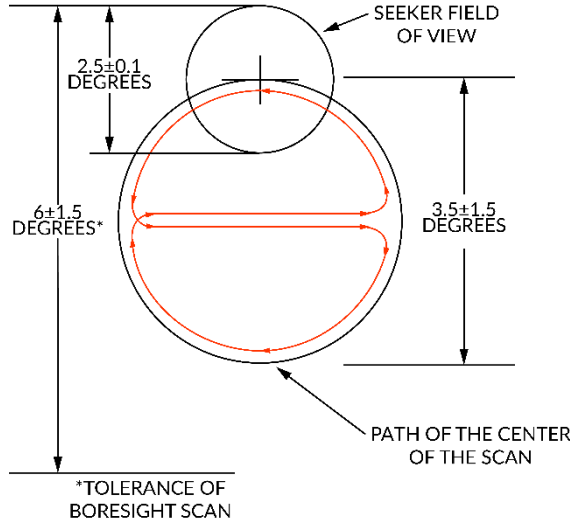
3.5 – AIM-9M SIDEWINDER (RADAR TRACKING)

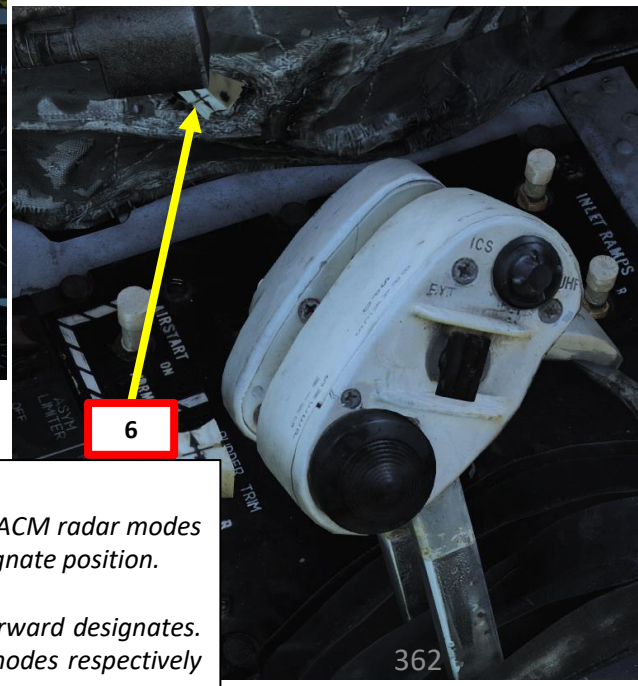
1. Master Arm switch – ON (UP)
2. HUD Display Mode – A/A
3. Set the SW COOL switch to ON. This commands cooling of the Sidewinder missiles seeker head. The missile will immediately show ready but full seeker head performance will take at least 60 seconds. The corresponding missile status windows turns white to indicate a ready missile.
4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SW.
5. Select **NORM** (Sidewinder expanded acquisition mode (SEAM) allows the missile seeker head to be uncaged to track a target within the seeker limits, 40° from ADL) or **BRSIT** (Boresight, seeker head remains slaved to ADL (2.5° field of view) Mode.
6. Press the Target Designate Switch Forward, which will engage the PAL (Pilot Automatic Lockon Mode) to radar lock the target. Alternatively, you could also have any other kind of radar STT (Single Target Track) or ACM lock. The WCS (Weapon Control System) just needs a radar lock to compute ranging and lead information.











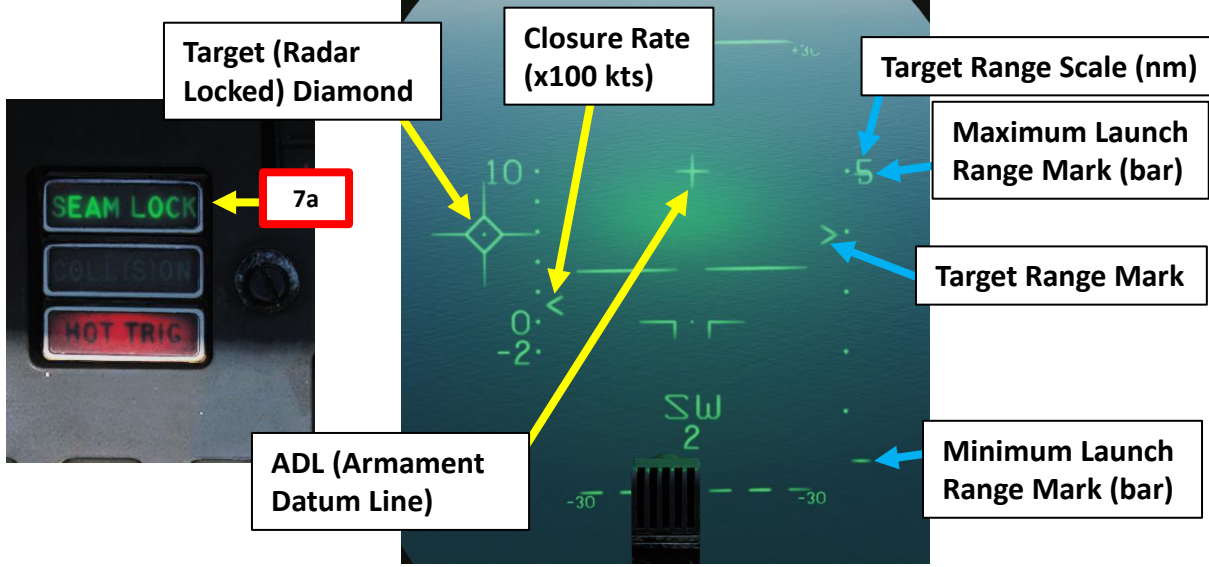
Target Designate Switch

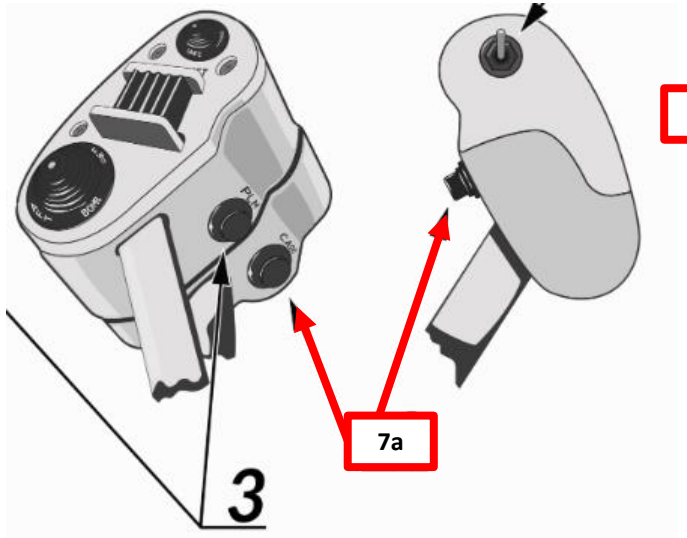
Used to designate ground targets on the HUD and to control pilot ACM radar modes except PLM. Can be moved up/down and forward which is the designate position.

In air-to-ground mode up and down moves the designator and forward designates. In all other cases up and down selects VSL HI and VSL LO ACM-modes respectively and forward selects PAL.

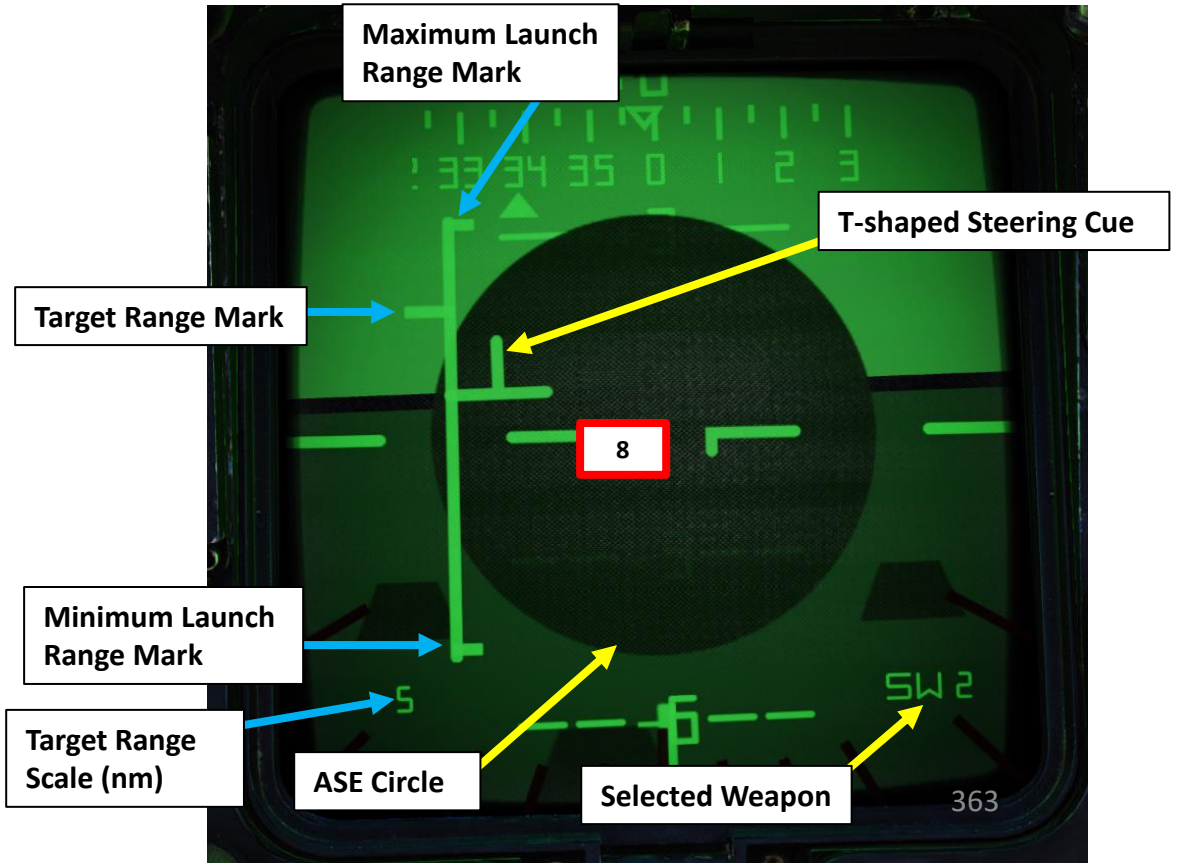
3.5 – AIM-9M SIDEWINDER (RADAR TRACKING)

7. Line up target with ADL (within 20 deg) to acquire heat signature
    a) If using NORM mode, press the CAGE/SEAM button on the throttle. This illuminates the SEAM LOCK light on the ACM panel and uncages the seeker for 4.5 seconds and allows it to track a target present in the seeker field of view. If no IR sources is found the missile is again caged and the SEAM LOCK light is deactivated. If lock-on is successful, the aural tone will remain and the SEAM LOCK light stays illuminated A low-pitch growling tone indicates the seeker is searching. A high-pitch screeching sound will indicate the seeker is looking at an IR-source.
8. Steer the aircraft to line up the T-shaped steering cue with the center of the black circle (ASE, or Allowable Steering Error circle) on the HSD to maximize probability of kill.
9. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire missile once seeker is tracking a good infrared source.



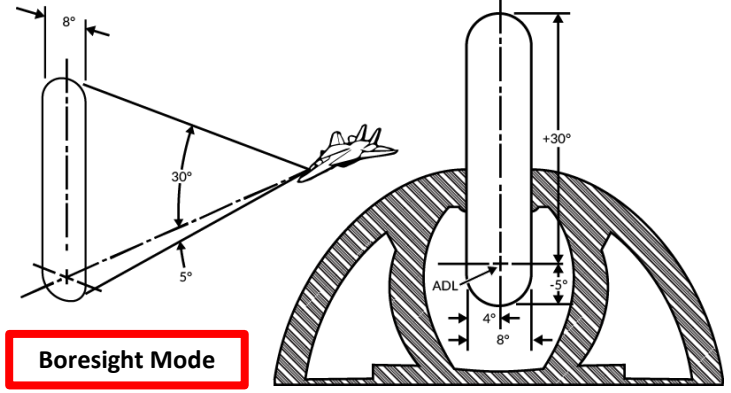




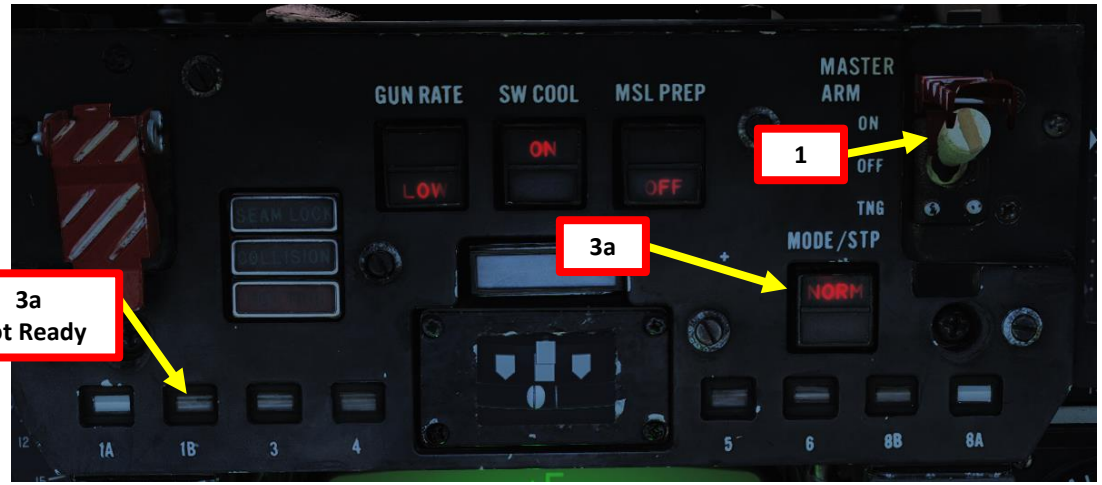


3.6 – AIM-7M SPARROW (RADAR TRACKING)

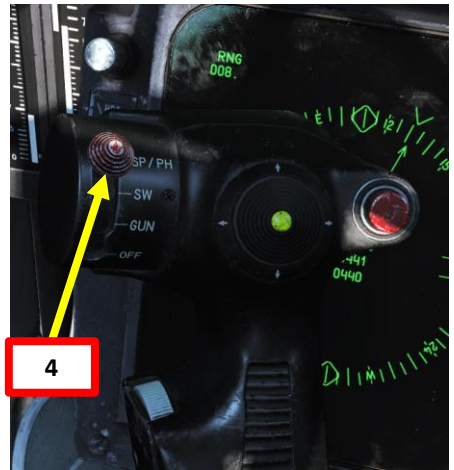
1. Master Arm switch – ON (UP)
2. HUD Display Mode – A/A
3. Set the MSL PREP switch ON. This commands the WCS to start missile preparation for the AIM-7 and AIM-54. When the individual missiles are tuned and ready the corresponding missile status windows turns white to indicate a ready missile. This should take approx. 2 minutes.
4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SP/PH.
5. Select **NORM** (used to engage a target tracked in STT; WCS is capable of using both CW and pulse doppler for guidance) or **BRSIT** (Boresight, tracks the strongest target return within the boresighted flood area) Mode. We will chose NORM mode.
6. You need a radar STT (Single Target Track) lock to the target. This can be done through JESTER, through the RIO cockpit or through one of the pilot ACM modes with the Target Designate Switch (Forward engages the PAL (Pilot Automatic Lockon Mode, Up/Down engages VSL HI/LO). The WCS (Weapon Control System) just needs a radar lock to compute ranging and lead information.

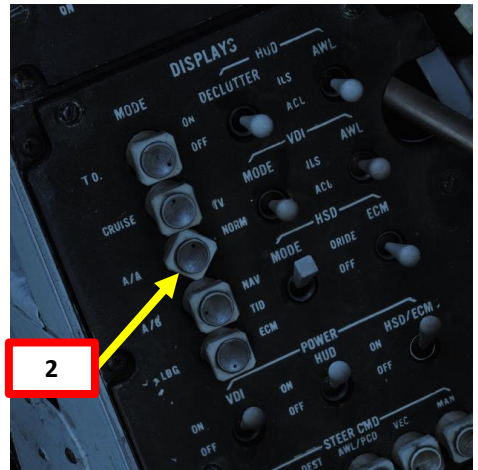


Boresight Mode



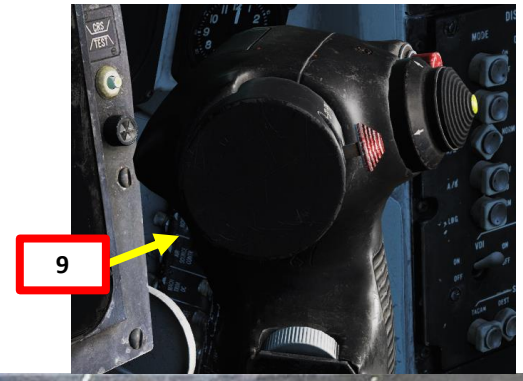


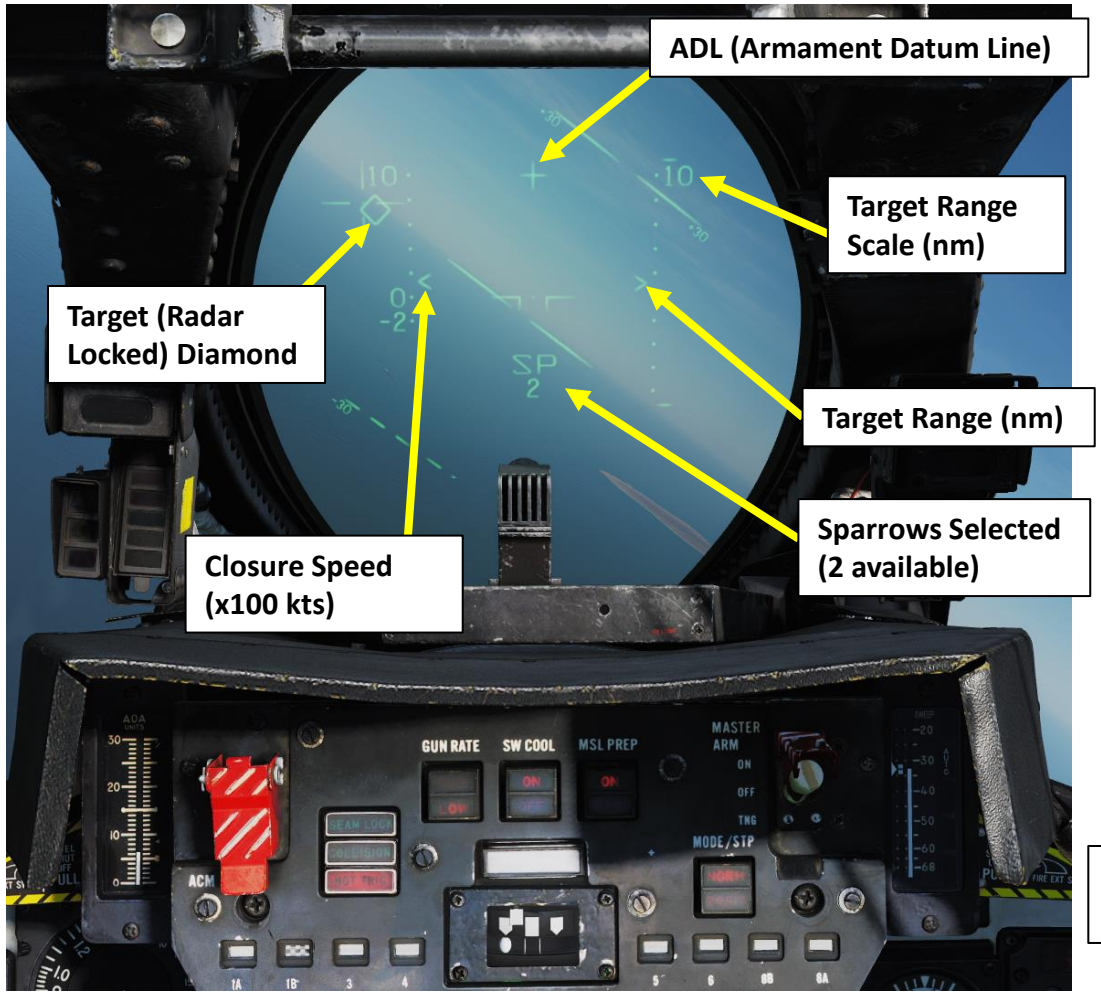




3.6 – AIM-7M SPARROW (RADAR TRACKING)

7. Line up target with ADL (within 20 deg)
8. Steer the aircraft to line up the T-shaped steering cue with the center of the black circle (ASE, or Allowable Steering Error circle) on the HSD to maximize probability of kill.
9. Press the TRIGGER SECOND STAGE (SPACE) on the stick to fire missile when ready.
10. Keep tracking the target to maintain radar lock until missile impact.







3.6 – AIM-7M SPARROW (RADAR TRACKING)

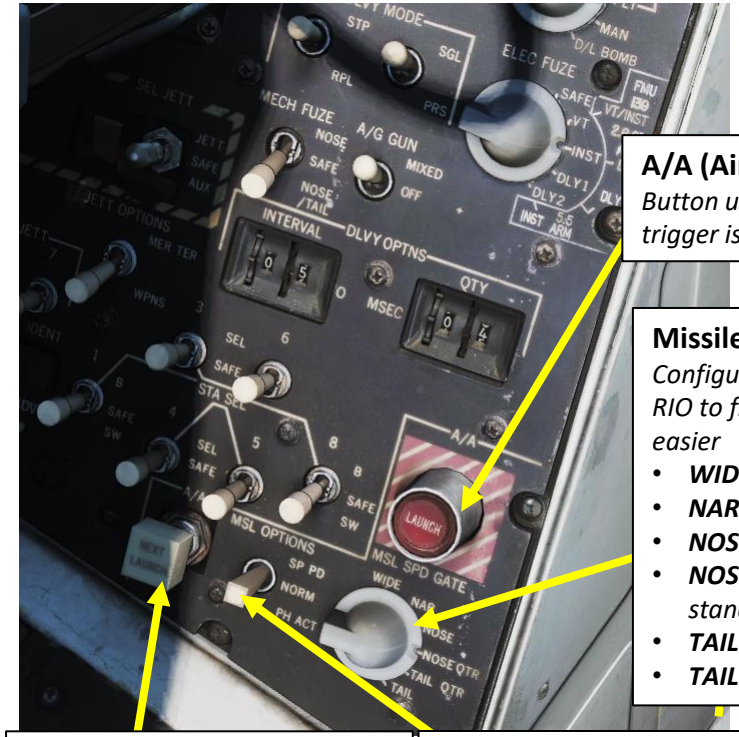




3.6 – AIM-7M SPARROW (RADAR TRACKING)

Note: you can also fire AIM-7 missiles from the RIO seat. Pilot needs to set Master Arm ON, set MSL PREP ON and select Sparrows first. However, I would advise against using Sparrows as the RIO for the following reasons:

- The AIM-7 requires a constant radar lock, which must be maintained by steering the aircraft (that's the pilot's job).
- The RIO A/A Launch mode is useful in BVR (Beyond Visual Range) engagements, but the effective range of the AIM-7 makes it more suited for WVR (Within Visual Range) engagements, which are better managed by the pilot.



A/A (Air-to-Air) Launch Button
Button used for RIO launch of AIM-7 or AIM-54, hot trigger is indicated by button illumination

Missile Speed Gate Selector Switch
Configures the missiles acquisition gate, allowing the RIO to fine-tune the missile to find the correct target easier

- ***WIDE**: Not Simulated*
- ***NARROW** : Not Simulated*
- ***NOSE** : Not Simulated*
- ***NOSE QTR**: In DCS, this position is used for standard missile operation*
- ***TAIL QTR** : Not Simulated*
- ***TAIL** : Not Simulated*

Missile Next Launch Button
Button used by RIO to select a hooked target as the next target to launch at in TWS.

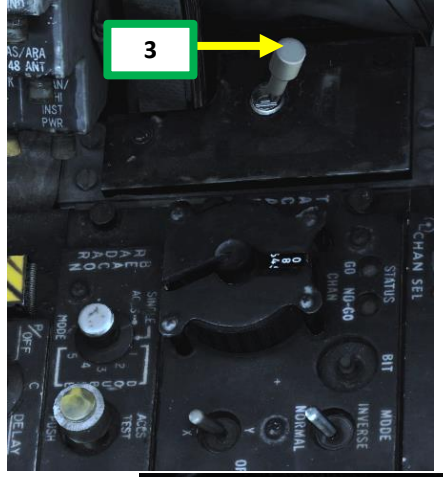
Missile Options Switch

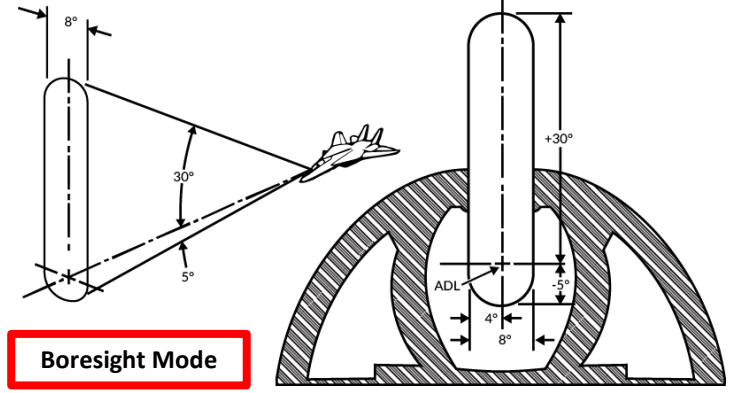
- ***SP PD**: AIM-7 Sparrow Pulse Doppler Launch Mode*
- ***NORM**: Normal*
- ***PH ACT**: AIM-54 Phoenix Active Launch Mode*



3.7 – AIM-54 PHOENIX (SINGLE TARGET)

1. Master Arm switch – ON (UP)
2. HUD Display Mode – A/A. Also set HSD Display Mode to TID.
3. In the **RIO cockpit**, verify that the Liquid Cooling Switch has been set to ON (FWD). This controls the liquid cooling system for the AWG-9 and AIM-54 missile.
4. Set the MSL PREP switch ON. This commands the WCS to start missile preparation for the AIM-7 and AIM-54. When the individual missiles are tuned and ready the corresponding missile status windows turns white to indicate a ready missile. This should take approx. 2 minutes.
5. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SP/PH.
6. Press the WEAPON SELECTOR button again to toggle between Sparrows (SP) and Phoenixes (PH).
7. Select **NORM** (used to engage a target tracked in STT; WCS is capable of using both CW and pulse doppler for guidance) or **BRSIT** (Boresight, tracks the strongest target return within the boresighted flood area) Mode. We will chose NORM mode.
8. You need a radar STT (Single Target Track) lock to the target. This can be done through JESTER, through the RIO cockpit or through one of the pilot ACM modes with the Target Designate Switch (Forward engages the PAL (Pilot Automatic Lockon Mode, Up/Down engages VSL HI/LO). The WCS (Weapon Control System) just needs a radar lock to compute ranging and lead information.

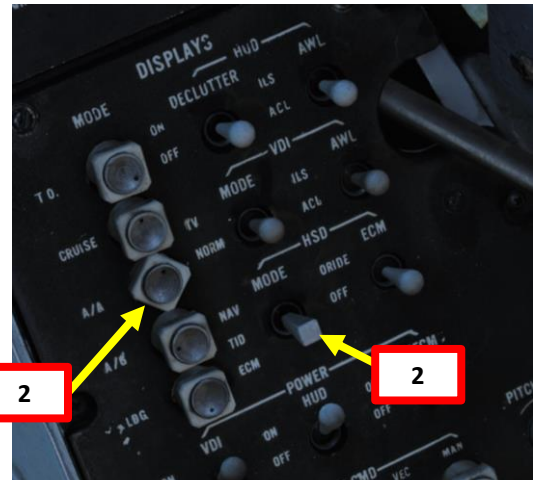




Boresight Mode



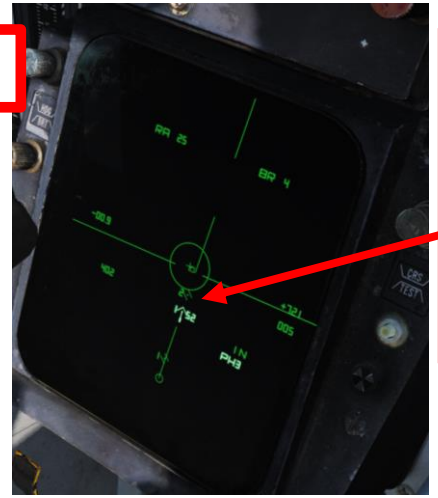


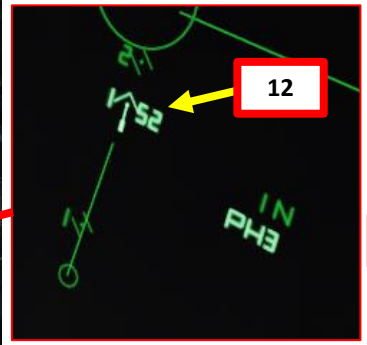


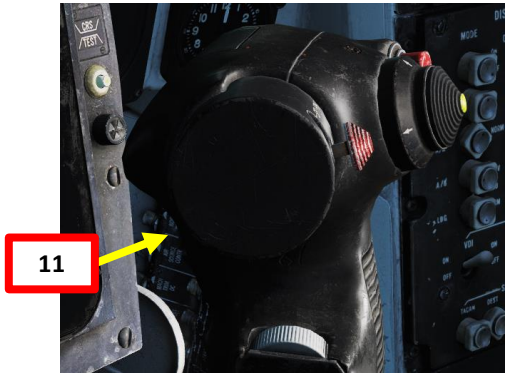


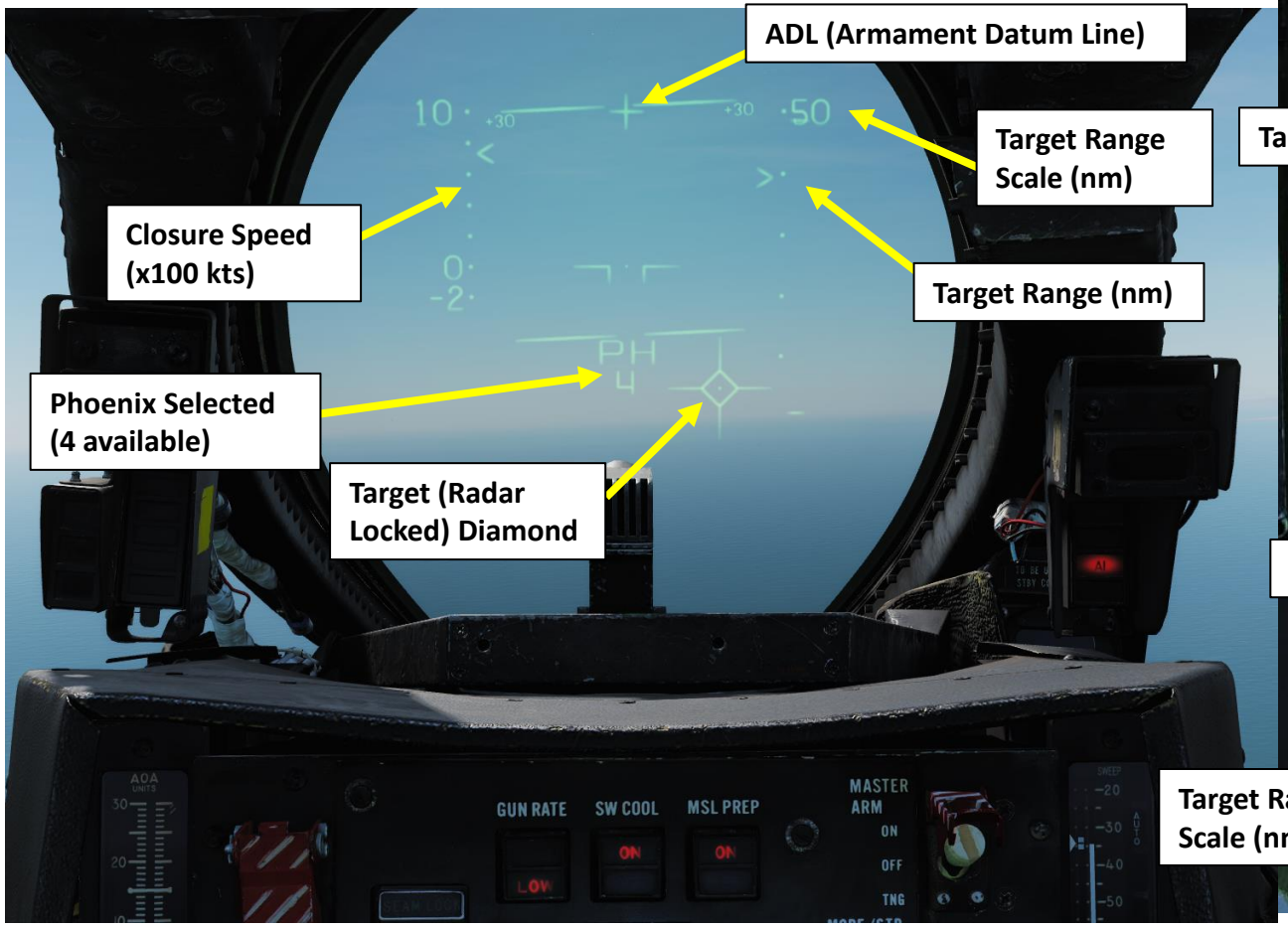
3.7 – AIM-54 PHOENIX (SINGLE TARGET)

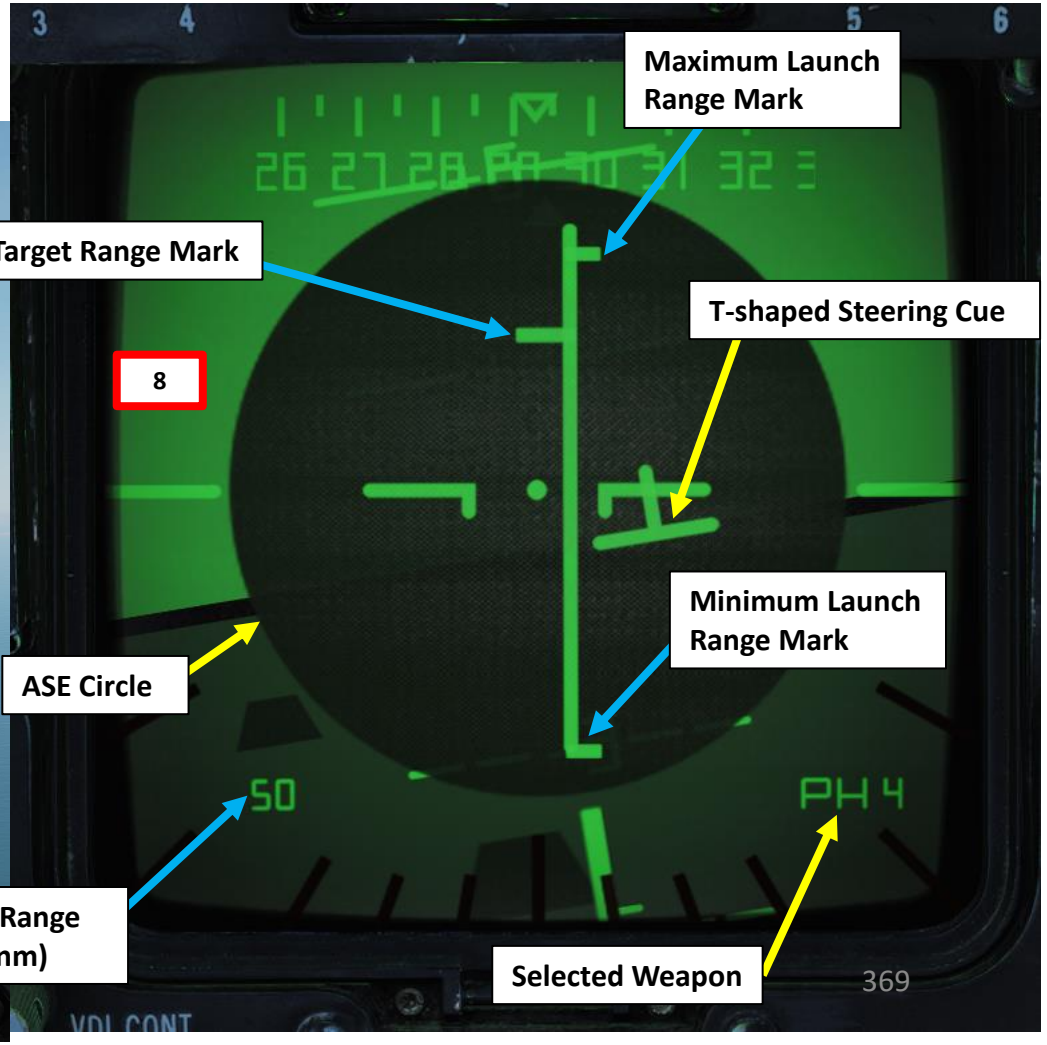
9. Line up target with ADL (within 20 deg)
10. Steer the aircraft to line up the T-shaped steering cue with the center of the black circle (ASE, or Allowable Steering Error circle) on the VDI to maximize probability of kill.
11. Press the TRIGGER SECOND STAGE (SPACE) on the stick for 3 to 4 seconds to fire missile when ready.
12. When fired, the TTI (Time to Impact) in seconds will appear on the TID Repeater next to the engaged target.











3.7 – AIM-54 PHOENIX (SINGLE TARGET)



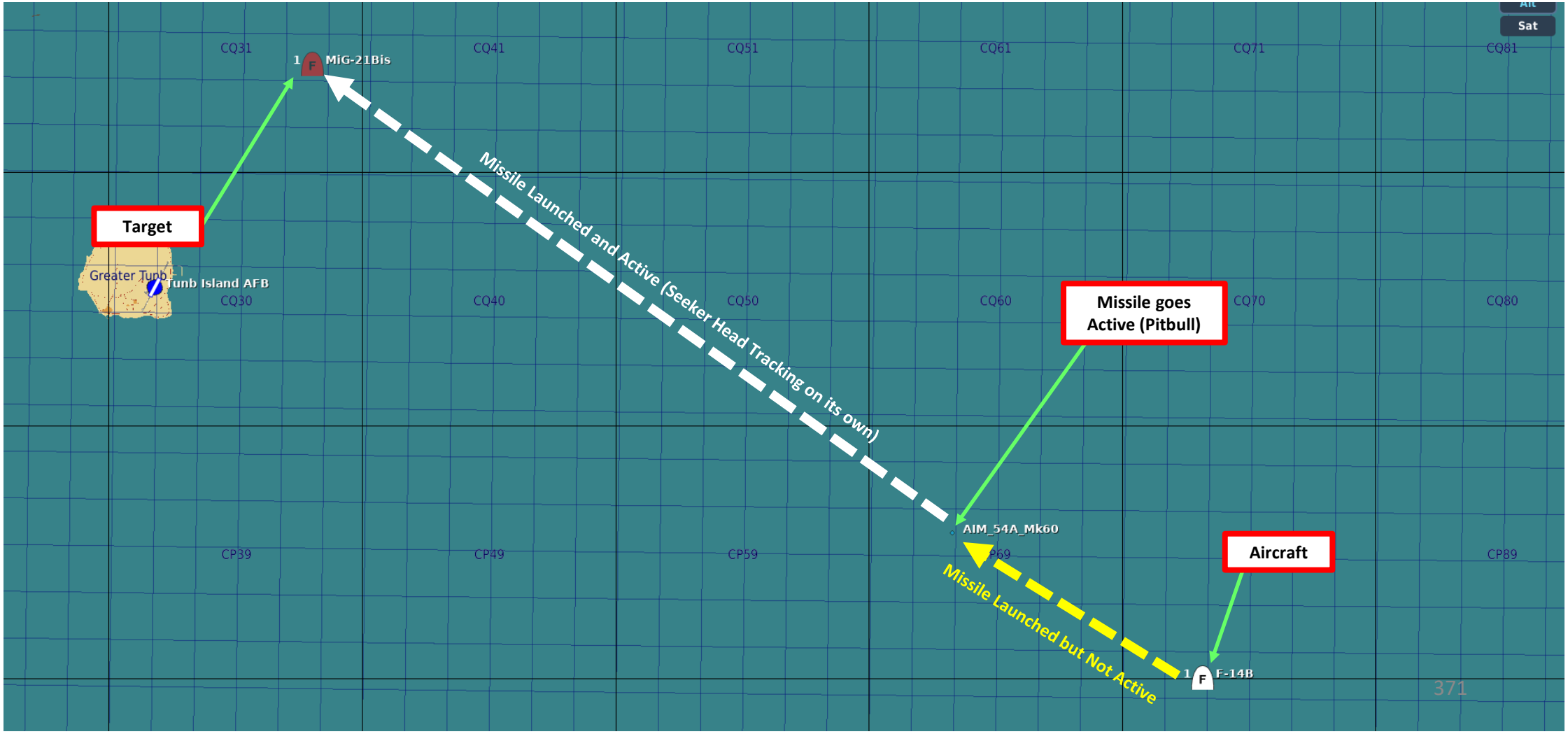
3.7 – AIM-54 PHOENIX (SINGLE TARGET)

Missile Options Switch

- ***NORM****: Normal (Missile goes active after a certain delay)*
- ***PH ACT****: AIM-54 Phoenix Active Launch Mode, missile goes active immediately after launch.*



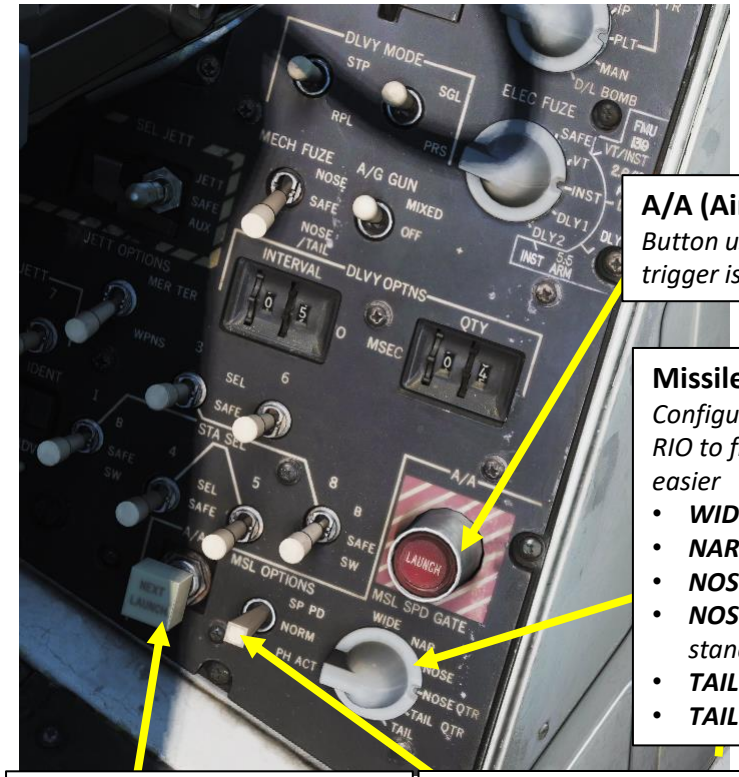
Note: When you first fire a Phoenix missile, the missile is initially guided by your own radar. However, an « active radar homing missile » also has his own radar inside the seeker head. The moment the missile goes « active » (meaning it will start self-homing/tracking targets on his own instead of using 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.



3.7 – AIM-54 PHOENIX (SINGLE TARGET)

Note: you can also fire AIM-54 missiles from the RIO seat.

1. Make sure pilot has set Master Arm ON, set MSL PREP ON and selected Phoenix missiles with the stick.
2. Radar STT lock a target (see SENSORS section).
3. Set Missile Speed Gate to NOSE QTR.
4. Set Missile Option as required (NORM or PH ACT if you want the Phoenix to go active immediately after launch)
5. When ready, fire the Phoenix using the A/A Launch Button (keep pressed for 3-4 seconds).



A/A (Air-to-Air) Launch Button
Button used for RIO launch of AIM-7 or AIM-54, hot trigger is indicated by button illumination

Missile Speed Gate Selector Switch
Configures the missiles acquisition gate, allowing the RIO to fine-tune the missile to find the correct target easier

- ***WIDE**: Not Simulated*
- ***NARROW** : Not Simulated*
- ***NOSE** : Not Simulated*
- ***NOSE QTR**: In DCS, this position is used for standard missile operation*
- ***TAIL QTR** : Not Simulated*
- ***TAIL** : Not Simulated*

Missile Next Launch Button
Button used by RIO to select a hooked target as the next target to launch at in TWS.

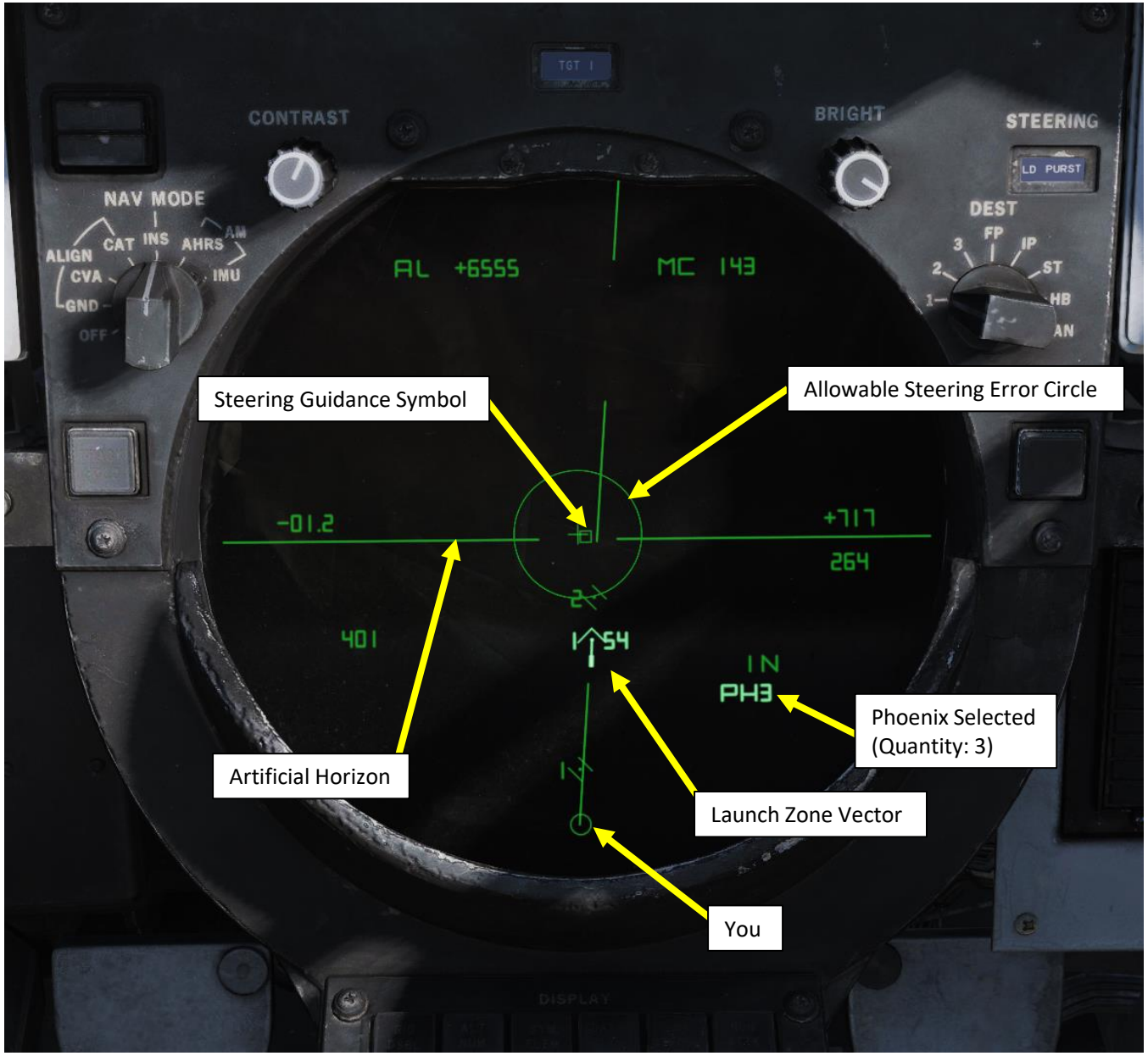
Missile Options Switch

- ***SP PD**: AIM-7 Sparrow Pulse Doppler Launch Mode*
- ***NORM**: Normal*
- ***PH ACT**: AIM-54 Phoenix Active Launch Mode*

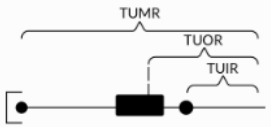


3.7 – AIM-54 PHOENIX (SINGLE TARGET)

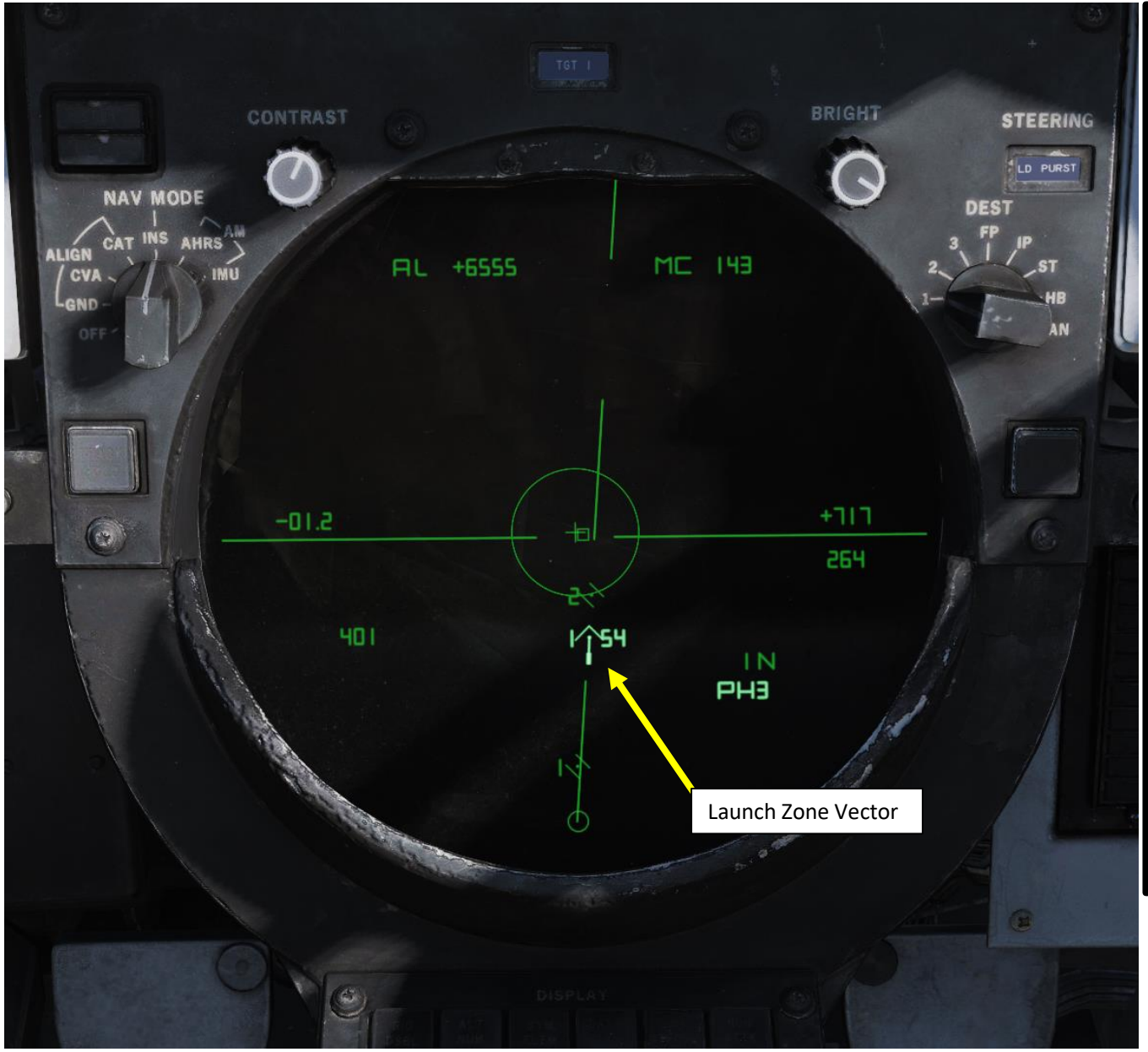
6. On the TID, a timer in seconds (TTI, Time to Impact in seconds) will appear next to the selected target.



	Attack Display Symbols	
Artificial Horizon		Artificial horizon on TID representing aircraft roll and pitch. Angle of the line represents roll and vertical deflection on display represents pitch.
Steering Guidance Symbol		Symbol representing steering error from optimal missile launch direction. Should be placed by the pilot as near as possible to the center of the ASE circle and at launch should be inside of that same circle.
Allowable Steering Error Circle		ASE circle used to indicate the allowable steering error for missile launch. Size varies with attack geometry, mode and selected missile.
Breakaway Indication		Large cross appearing in the center of the TID when target range is less than minimum missile launch range.

Launch Zone Vectors		 *TUMR (Time Until Minimum Range), TUOR (Time Until Optimum Range) and TUIR (Time Until In-Range/Maximum Range)* The launch zone vectors are activated manually by the RIO or when time to maximum launch range is less than 60 seconds and replaces the normal track velocity vectors. The track symbol vector length in this mode represents the time-until-Rmin, with a maximum limit of 180 seconds (shown as a 1.5" long vector). When the time-until-Rmin becomes less than 180 seconds, the vector will start to shorten and move towards the center dot on the target (which represents Rmin). If the vector becomes zero length, you are at AIM-54 Rmin. Along this vector line is also a second dot, with the distance from end of the vector to that dot representing time-until-Rmax (a.k.a. time-until-in-range). That is, when the vector shortens to this dot (end of the vector reaches the dot), it indicates you are at Rmax (maximum range to target). The dot disappears when you are closer than Rmax to the target (i.e. time-until-Rmax, a.k.a. time-until-in-range is now essentially negative). The intensified bar (box) along the launch zone vector represents the optimum missile launch range. When the vector end reaches the bar the time until in optimal range is 8 seconds.

3.7 – AIM-54 PHOENIX (SINGLE TARGET)



Altitude Numerics	4	When altitude numerics are selected for display a number on the left side of the tracks indicate track altitude to nearest ten thousands of feet. The number four as an examples indicate an altitude between 35,000 and 45,000 feet. Available on radar and data link tracks.
Firing Order Numerics	4	Indicates AIM-54 phoenix target prioritization (1 to 6) in WCS when in the TWS mode. Next missile launch will target track with number 1 and remove the number from that track to advance the other 5 track numbers one step to prepare for next launch. Mandatory attack selection on a target forces the WCS to always include that target in the prioritization. Next launch selection automatically sets hooked target as number one in the prioritization queue.
Time-to-Impact (TTI)	16	After AIM-54 launch the firing order number on a track is replaced with the TTI or time-to-impact indication, showing WCS calculated time until missile intercepts the target track. When the AIM-54 active command is sent the TTI numbers flash to indicate this.
Velocity Vector		Velocity vector emanating from center dot of tracks when velocity vector display is selected. Vector direction represents track heading and length represents track speed so that the max indicated speed (1 800 knots) is 1.5 inches on the TID. In TID ground stabilized mode the vector direction represents track true heading and the vector length represents track ground speed.

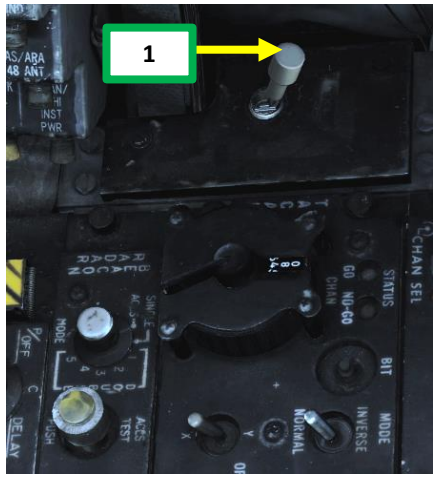
3.8 – AIM-54 PHOENIX (RIO SIX SHOOTER)

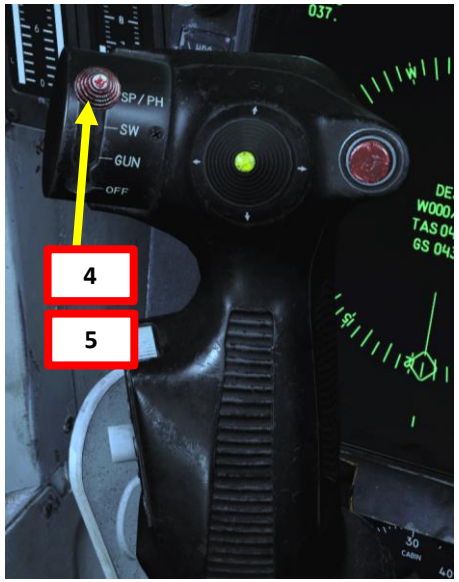
In the **RIO cockpit:**

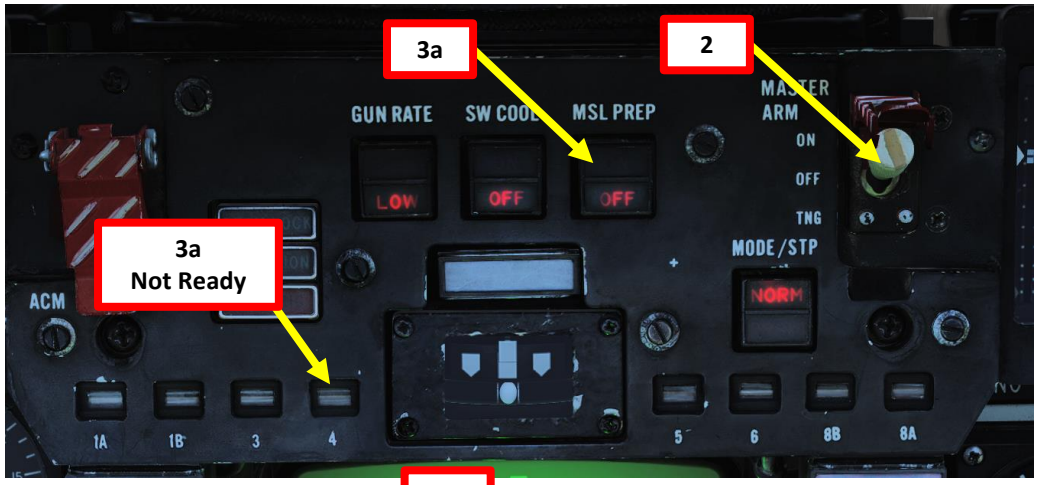
1. Verify that the Liquid Cooling Switch has been set to ON (FWD). This controls the liquid cooling system for the AWG-9 and AIM-54 missile

In the **Pilot cockpit:**

2. Set Master Arm switch – ON (UP)
3. Set the MSL PREP switch ON. This commands the WCS to start missile preparation for the AIM-7 and AIM-54. When the individual missiles are tuned and ready the corresponding missile status windows turns white to indicate a ready missile. This should take approx. 2 minutes.
4. Press the WEAPON SELECTOR button in, hold it in and cycle the Weapon Selector UP to SP/PH.
5. Press the WEAPON SELECTOR button again to toggle between Sparrows (SP) and Phoenixes (PH).
6. Select **NORM** Missile Mode





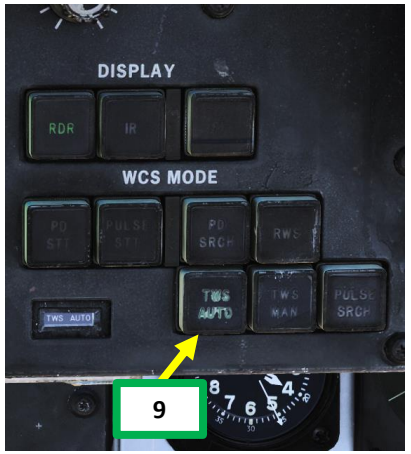


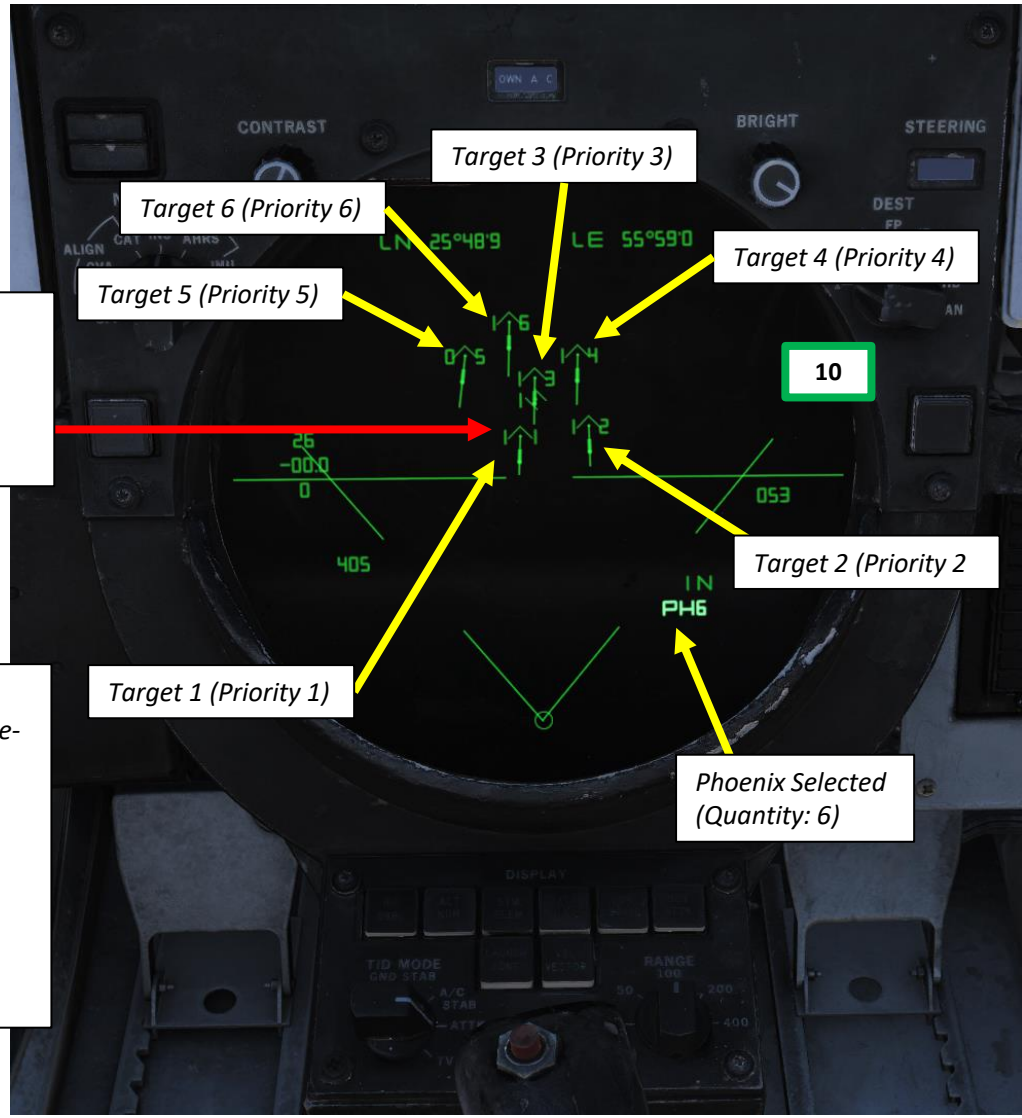


3.8 – AIM-54 PHOENIX (RIO SIX SHOOTER)

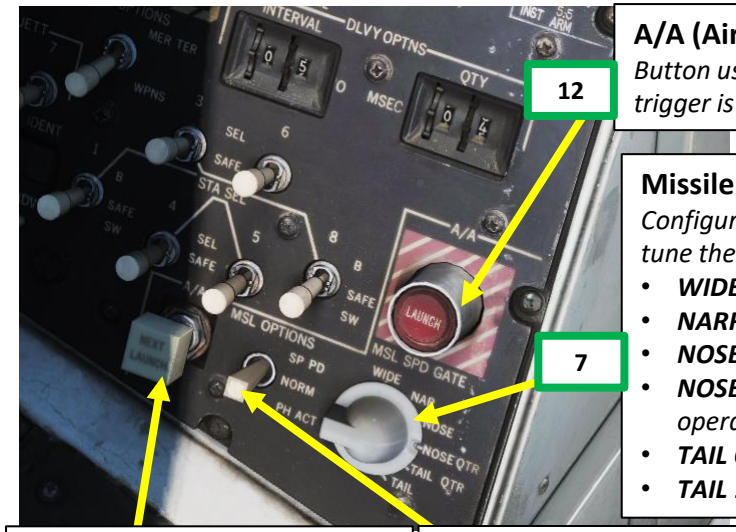
In the **RIO cockpit:**

7. Set Missile Speed Gate to NOSE QTR.
8. Set Missile Option as required (NORM or PH ACT if you want the Phoenix to go active immediately after launch)
9. Set Radar WCS Mode to TWS AUTO (Track While Scan)
10. As targets are scanned they will automatically be numbered in terms of priority (1 = highest priority).
11. **You do not need to radar lock a target**; you just have to launch weapons and the TWS mode will automatically pick which target is the highest priority for you and launch a Phoenix at it.
12. When ready, fire the Phoenix using the A/A Launch Button (keep pressed for 3-4 seconds). Missile will track by itself the target with the highest priority (1). TWS priority numbers are to the right of contact symbols, while target altitude is displayed to the left in tens of thousands of feet.





Left Number Next to Symbol
Altitude in tens of thousands of feet
- *0 for Ground to 4999 ft*
- *1 for 5000 to 14999 ft*
- *2 for 15000 to 24999 ft)*



A/A (Air-to-Air) Launch Button
Button used for RIO launch of AIM-7 or AIM-54, hot trigger is indicated by button illumination

Missile Speed Gate Selector Switch
Configures the missiles acquisition gate, allowing the RIO to fine-tune the missile to find the correct target easier
- ***WIDE**: Not Simulated*
- ***NARROW** : Not Simulated*
- ***NOSE** : Not Simulated*
- ***NOSE QTR**: In DCS, this position is used for standard missile operation*
- ***TAIL QTR** : Not Simulated*
- ***TAIL** : Not Simulated*

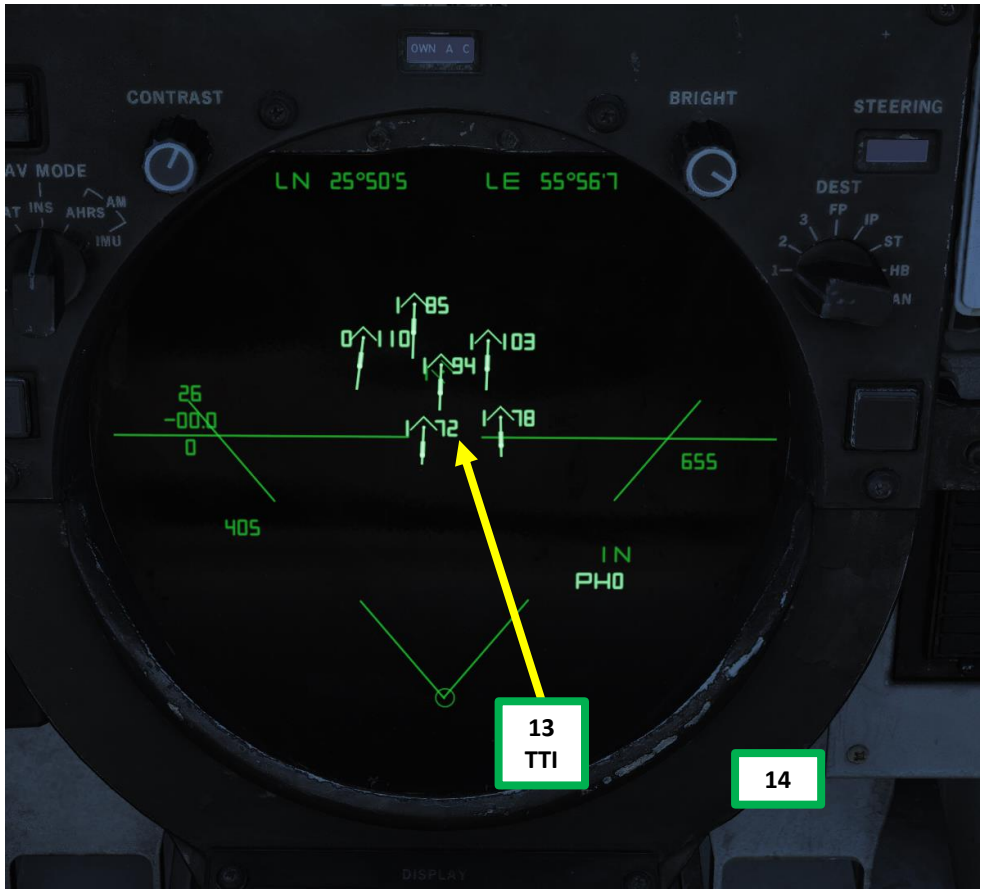
Missile Next Launch Button
Button used by RIO to select a hooked target as the next target to launch at in TWS.

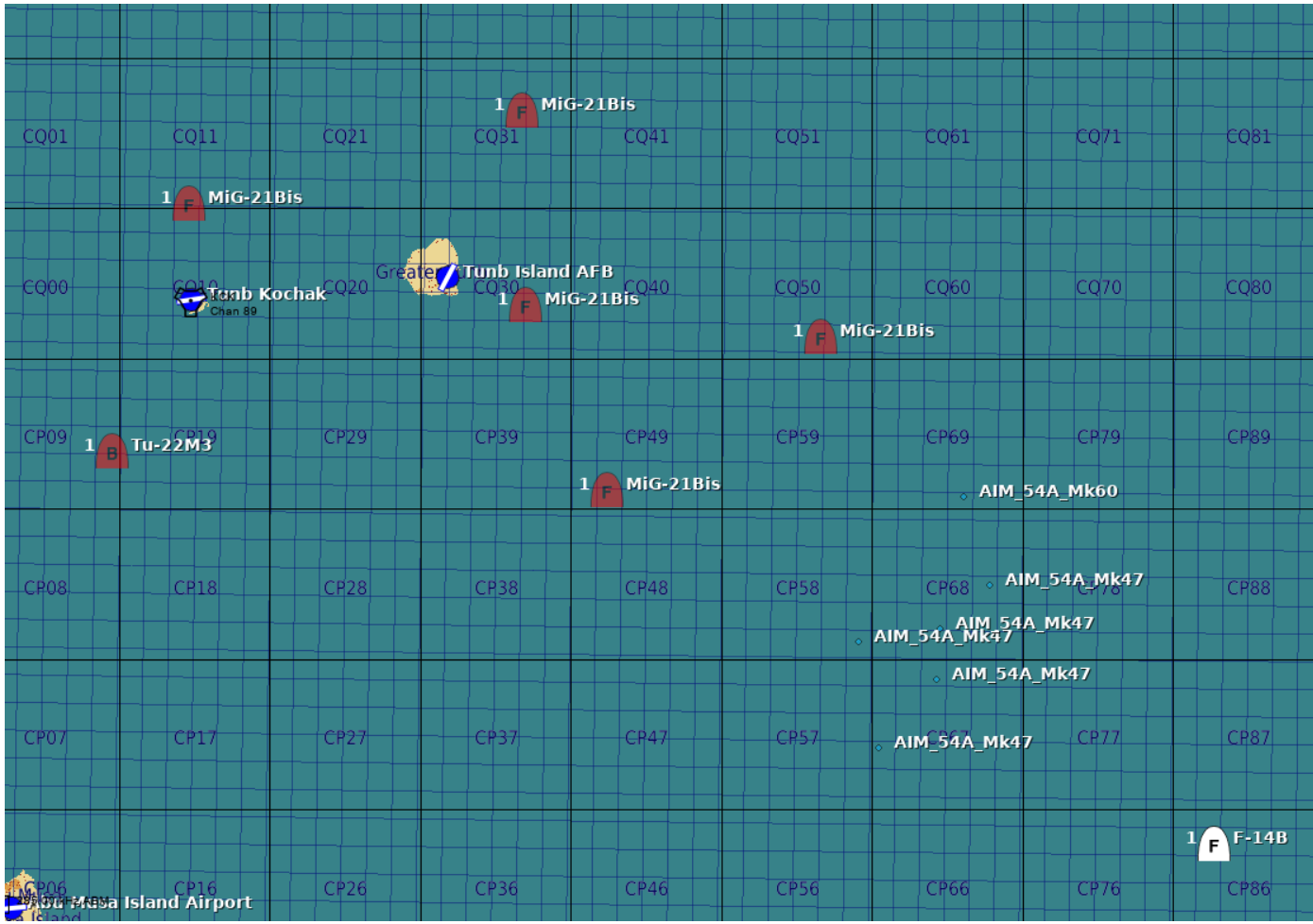
Missile Options Switch
- ***SP PD**: AIM-7 Sparrow Pulse Doppler Launch Mode*
- ***NORM**: Normal*
- ***PH ACT**: AIM-54 Phoenix Active Launch Mode*

8

3.8 – AIM-54 PHOENIX (RIO SIX SHOOTER)

13. On the TID, a timer in seconds (TTI, Time to Impact in seconds) will appear next to the selected target.
14. If you use the A/A Launch Button again, TWS will automatically switch to the target with the next highest priority (2). And fire the missile on this target. Keep using the A/A Launch Button until all missiles are launched.
15. And that's it! You have now performed a "Six Shooter" (engaged six targets almost simultaneously).





3.8 – AIM-54 PHOENIX (RIO SIX SHOOTER)



4 – SELECTIVE ORDNANCE JETTISON

METHOD #1: Emergency Jettison

Pilot Seat:
Use the Emergency Stores Jettison Button to jettison all stores except sidewinder missiles.

****

METHOD #2: ACM Jettison

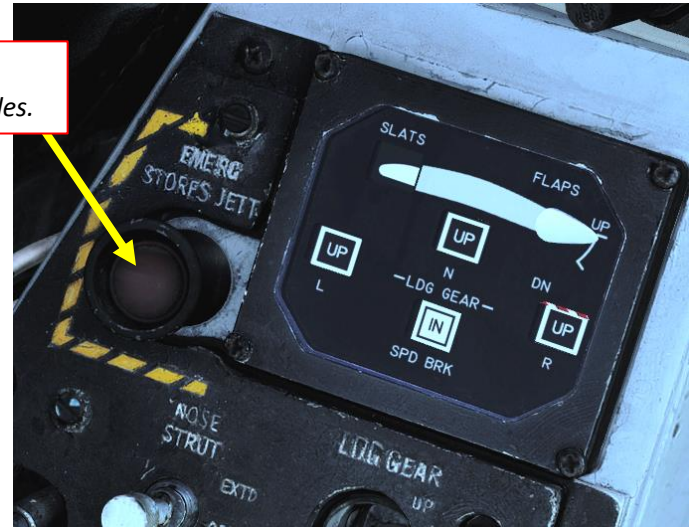
RIO Seat:
1. Select desired stations using the SELECT switches (UP).

Pilot Seat:
2. Flip the ACM Jettison cover UP, then press the white button under it to jettison your selected stations.

ACM (Air Combat Maneuver) Switch/Cover
- *Lifting the ACM cover activates the ACM mode and allows access to the ACM jettison button.*
- *Button under the ACM cover that enables jettison of stores selected on the RIO's ARMAMENT panel. Will not jettison Sidewinders regardless if selected.*



Emergency Stores Jettison Button
Jettisons every store except sidewinder missiles.





1 **Station 3 and Station 4 Selected (UP)**



4 – SELECTIVE ORDNANCE JETTISON

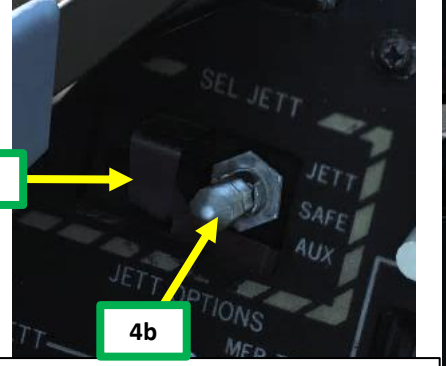
METHOD #3: Selective Jettison

Pilot Seat:

1. Set Master Arm ON (UP)

RIO Seat:

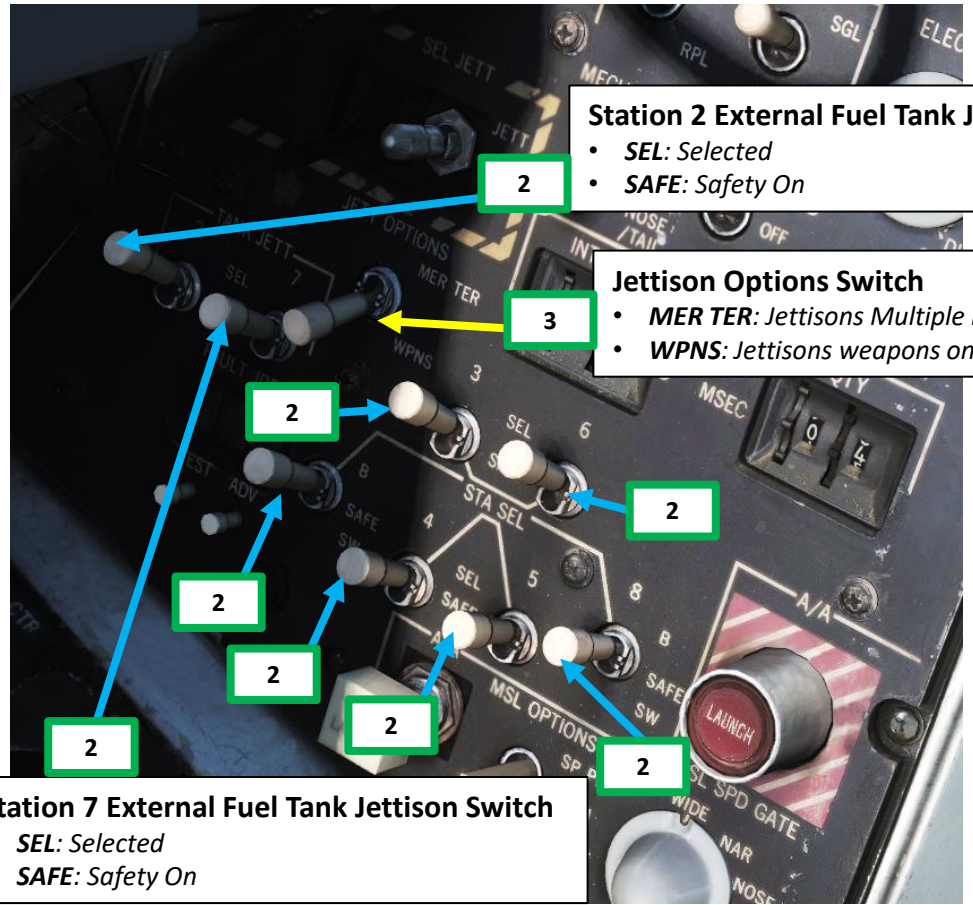
2. Select desired stations using the SELECT switches (UP).
3. Set Jettison Options as required
4. Flip the Selective Jettison Switch guard, then right click on the Selective Jettison Switch (JETT) to jettison selected ordnance



Selective Jettison Switch Guard

Selective Jettison Switch
- ***JETT**: Selective Jettison*
- ***SAFE**: Safety On*
- ***AUX**: Auxiliary (Backup) Mode*

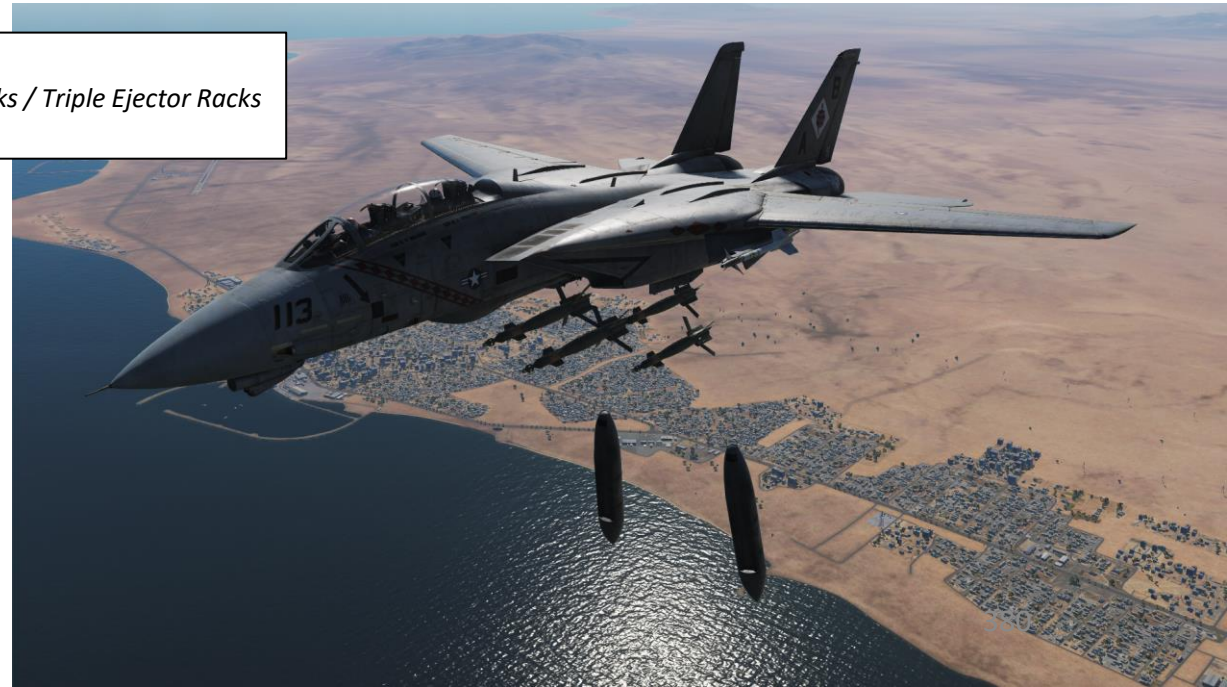




Station 2 External Fuel Tank Jettison Switch
- ***SEL**: Selected*
- ***SAFE**: Safety On*

Jettison Options Switch
- ***MER TER**: Jettisons Multiple Ejector Racks / Triple Ejector Racks*
- ***WPNS**: Jettisons weapons only*

Station 7 External Fuel Tank Jettison Switch
- ***SEL**: Selected*
- ***SAFE**: Safety On*



5 – VIDEOS

- **2 – Air-to-Ground Weapons**
  - 2.1 – Unguided Bomb (MK-82 – Computer Pilot/CCIP)
    https://youtu.be/Is3AtOX-abw
  - 2.2 – Unguided Bomb (MK-82 – Computer Target/CCRP)
    https://youtu.be/Is3AtOX-abw
  - 2.3 – ZUNI Rockets
    https://youtu.be/wftck0C3fJ8
  - 2.4 – M61 Guns (Air-to-Ground)
    https://youtu.be/EEeyH-MUVf8
  - 2.5 – Using TCS (Television Camera Set)
    https://youtu.be/gYEAdqKTN_M
  - 2.6 – GBU-12 Paveway II (Laser-Guided)
    https://youtu.be/R9-8UCj66Ds
  - 2.7 – TALD Decoys
    https://youtu.be/Ub8xtfmJHYg

- **3 – Air-to-Air Weapons**
  - 3.1 – M61 Guns (Manual/No Radar Tracking)
    https://youtu.be/B-qsw06hBco
  - 3.2 – M61 Guns (RTGS/No Radar Tracking)
    https://youtu.be/B-qsw06hBco
  - 3.3 – M61 Guns (RTGS/Radar Tracking)
    https://youtu.be/B-qsw06hBco
  - 3.4 – AIM-9M Sidewinder (No Radar)
    https://youtu.be/4m-Q02gxFEA
  - 3.5 – AIM-9M Sidewinder (Radar)
    https://youtu.be/4m-Q02gxFEA
  - 3.6 – AIM-7M Sparrow (Radar)
    https://youtu.be/BlJO8HduYak
  - 3.7 – AIM-54 Phoenix
    https://youtu.be/4groy-_Bxfk

- **4 – Selective Ordnance Jettison**
  https://youtu.be/VQ7ufmx2pVI

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.

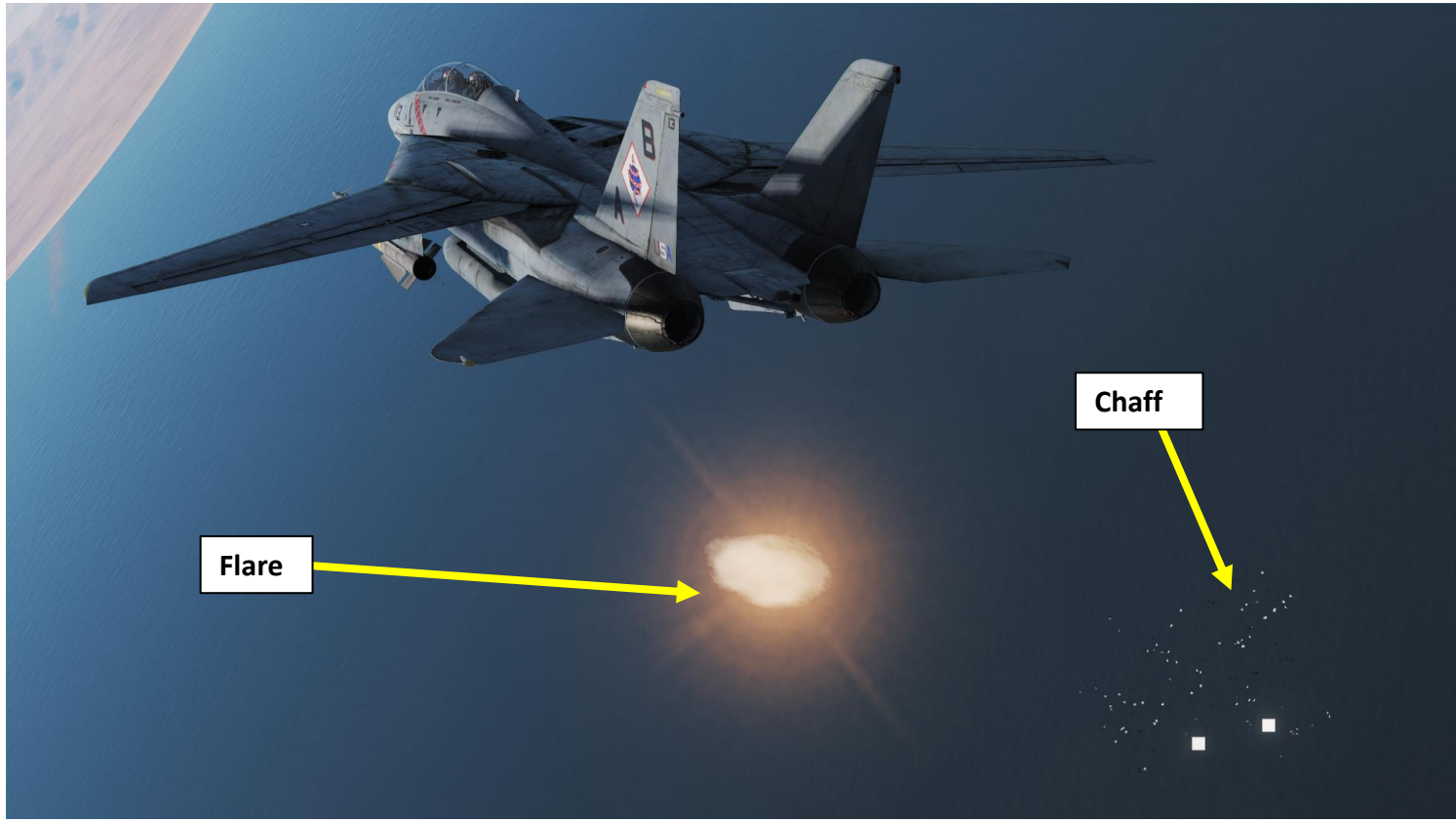
Missiles can generally track you using 2 things: radar signature (radar waves are sent on you and you reflect them, which is called a “radar signature”) and heat signature (like the exhaust of your engines). Countermeasures will only be effective against the kind of weapon it was meant to counter; a 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.

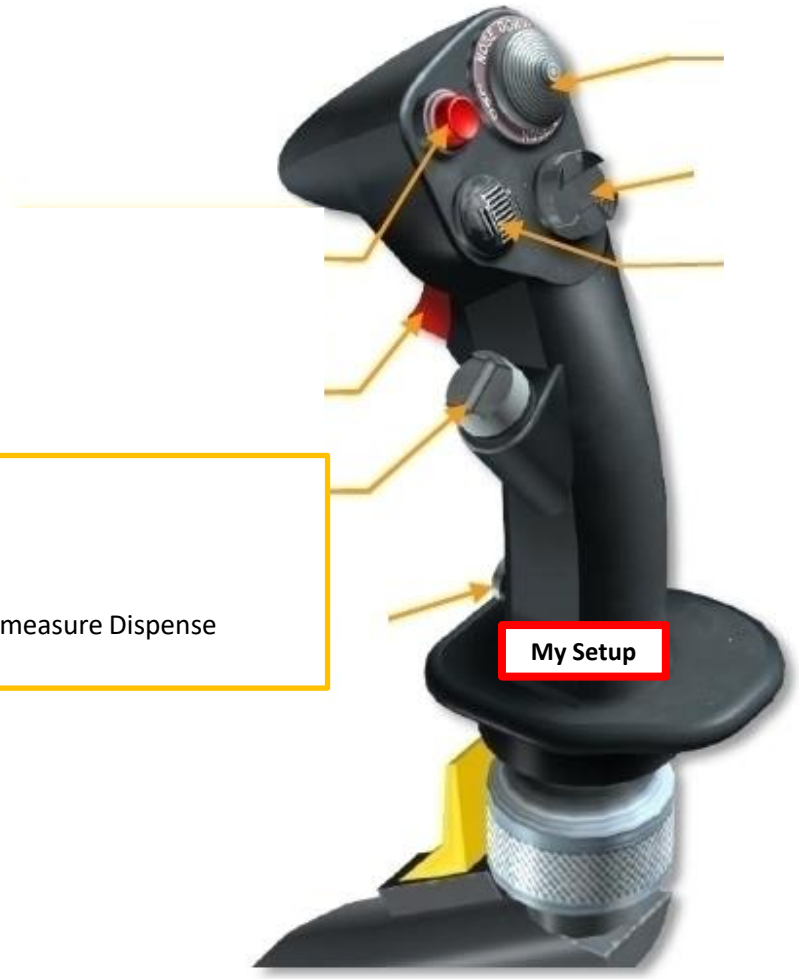
Chaff is a form of “passive” jamming. Passive (reflected) jamming is when a deceptive object or device reflects radar waves. Chaff is simply a bundle of small pieces of metal foil with reflective coating, which creates clusters of radar signatures that prevent a radar to get a solid lock on the aircraft itself.

The **AN/ALQ-126 Deception Jammer** is the onboard Defensive Electronic Countermeasure (**DECM**) 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.

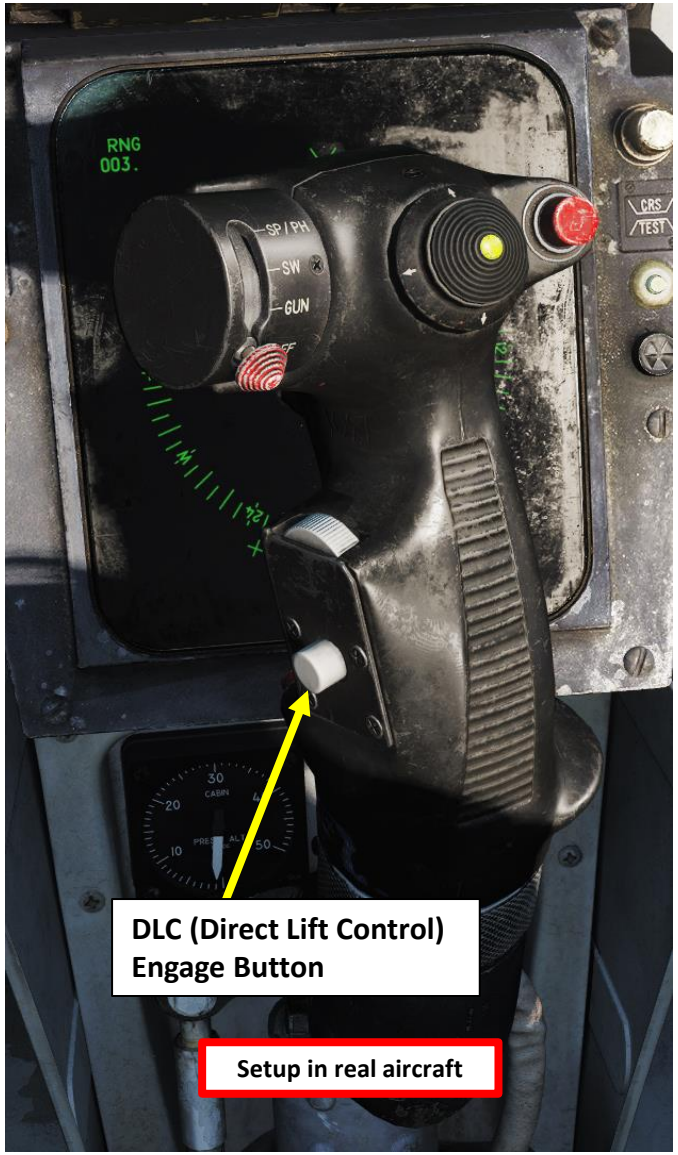
In order to use these three forms of countermeasures, you can use “countermeasure programs”, routines that will deploy a number of flares/chaff for a number of cycles at a given interval.



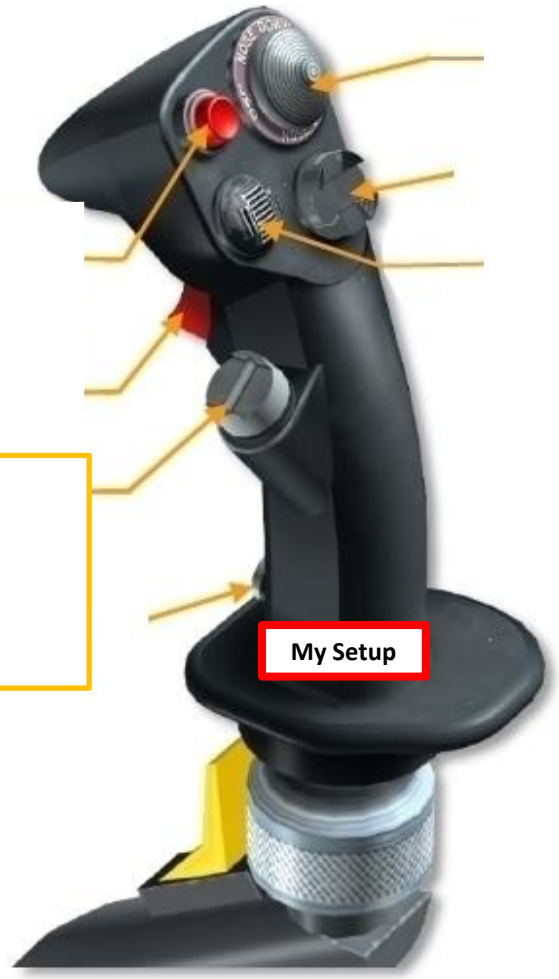
COUNTERMEASURES CONTROL SETUP (PILOT)



↑
→
↓
←
P DLC Toggle / Countermeasure Dispense



COUNTERMEASURES CONTROL SETUP (RIO)



↑
→ AN/ALE-39 Chaff SGL
↓
← AN/ALE-39 Flare SGL
P

AN/ALR-67 RWR (RADAR WARNING RECEIVER)

The RWR (Radar Warning Receiver) will tell if you are being searched or locked by radar. The annunciator threat lights will tell you which type of threat is locking you. CW is for continuous wave emissions, AI is for Air Intercept, SAM is for surface-to-air-missiles, and AAA is for anti-aircraft artillery radar.

The **RWR** 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 outer band (critical) is generally missiles in flight. The middle band (lethal) is for radars actively tracking you. The inner band is classified as non-lethal since these are radars searching for you, not actively tracking you. Keep in mind that the definition of these bands has changed throughout the life of the Tomcat. Some versions may have the Critical and Non-Lethal bands reversed depending on the software version of RWR installed on the plane.

If a **Threat Advisory Indication** is illuminated, it means the radar emitter has a solid lock on you. Tones also indicate what's happening (new contact, radar lock warning, missile launch, etc.) The faster the tone frequency, the greater the danger.



Pilot ECM (Electronic Countermeasures) / ALR-67 RWR Warning Lights / Threat Advisory Indicator

- ***SAM****: steady illumination when detecting lock on from a SAM tracking radar. Flashes when missile launch is detected.*
- ***AAA****: steady illumination when detecting lock on from an Anti-Aircraft Artillery tracking radar. Flashes when AAA firing is detected.*
- ***AI****: steady illumination when detecting lock on from an Airborne Interceptor radar.*



RWR (Radar Warning Receiver)



Threat Advisory Indicator (RIO Panel)

IFF: Received mode 4 interrogation without own system generating reply
RCV: ALQ-126 is receiving a threat identification signal
XMIT: ALQ-126 is transmitting
SAM: Warning light, steady illumination when detecting lockon from a SAM tracking radar. Flashes when missile launch is detected.
AAA: Warning light, steady illumination when detecting lockon from a AAA tracking radar. Flashes when AAA engagement is detected.
CW: Detection of a continuous wave (CW) emitter
AI: Warning light, steady illumination when detecting lockon from an airborne interceptor radar.

AN/ALR-67 RWR (RADAR WARNING RECEIVER)

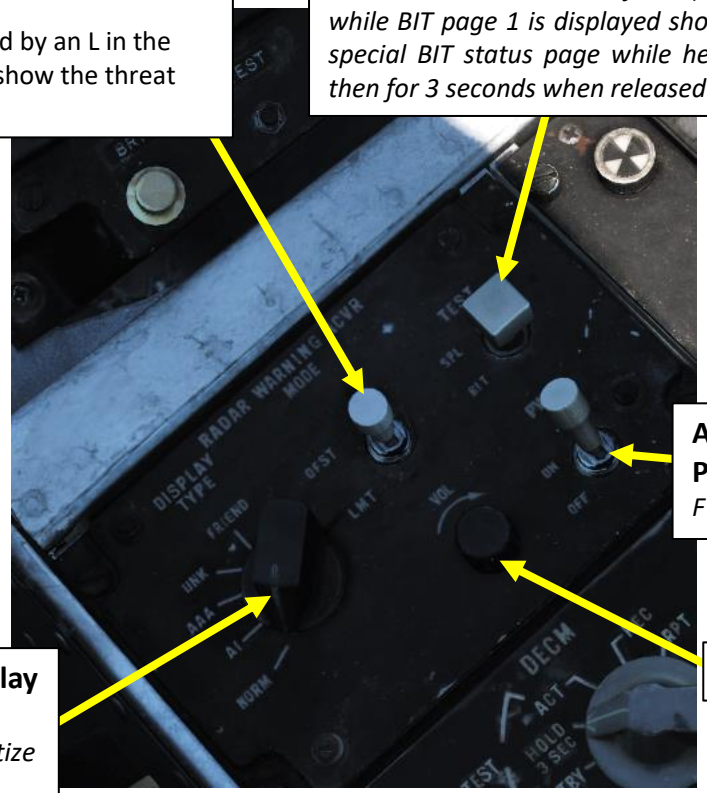
The RIO has a RWR control panel, which allows him to choose what display mode to use.

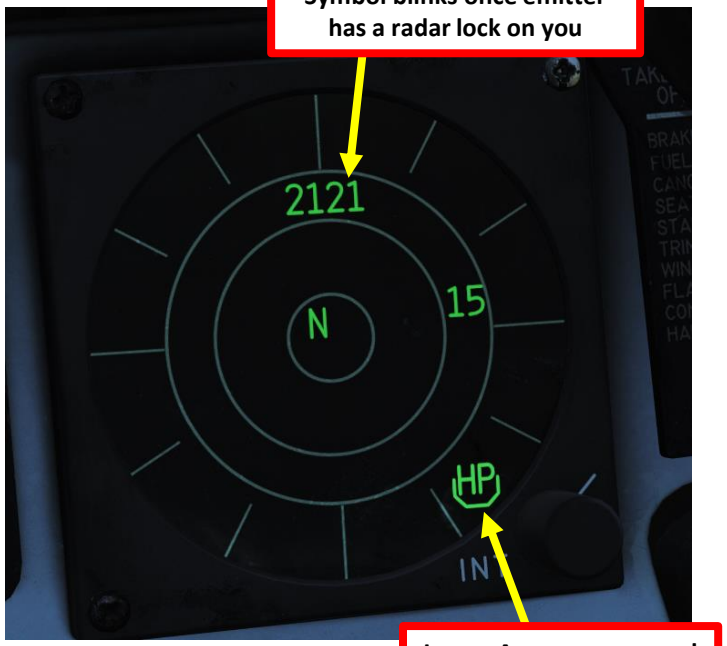
RWR Mode Selector
Switch springloaded to center (OFF) position. Can be held to OFST (offset) and LMT (limit) position to enable respective function while held.

- If too many contacts start overlapping each other, you can use the "OFFSET" function, which will spread out enemy contacts. It is indicated by an O in the status ring on the display
- You can also use the "LIMIT" function, which is indicated by an L in the status ring on the display and limits the display to only show the threat symbols of the six highest prioritized threats.

RWR Test Switch
Switch springloaded to center. Momentary selection of BIT indicates BIT in ALR-67. Selection of SPL (special) while BIT page 1 is displayed shows the special BIT status page while held and then for 3 seconds when released.







Symbol blinks once emitter has a radar lock on you

Lower Arc means a naval emitter

AN/ALR-67 RWR (Radar Warning Receiver) Power Switch
FWD: ON / AFT: OFF

RWR Volume Control Knob

AN/ALR-67 RWR (Radar Warning Receiver) Display Mode Selector
Selector switch controlling what type of threats to prioritize and display.

- ***NORM*** *(Normal)*
- ***AI*** *(Airborne Interceptor)*
- ***AAA*** *(Anti-Aircraft Artillery)*
- ***UNK*** *(Unknown)*
- ***FRIEND***

AN/ALR-67 RWR LEGEND



Threat symbol	Platform/Sensor	Special Tone
Ships (Symbology enhanced by being enclosed by an enlarged U symbol.)		
AB	Arleigh Burke	
AK	Admiral Kuznetsov	
GR	Grisha 5 (Albatros)	
GZ	DDG-168 Guangzhou	
HP	Oliver Hazard Perry	
HU	DDG-171 Haikou	
KK	Krivak 3 (Rezky)	
KV	Kirov (Pyotr Velikiy)	
N	Ships only carrying a navigational radar (civilian ships, submarines)	
NE	Neustrashimy	
NZ	Nimitz (Vinson, Stennis)	
SV	Slava (Moscow)	
TC	Ticonderoga	
TT	Tarantul 3 (Molniya)	
TW	Tarawa	
YI	FFG-538 Yantai	
Aircraft		
13	C-130	
17	C-17A	
37	AJS-37	
50	A-50	
52	B-52	
14	F-14A/B	Yes
15	F-15C/E	Yes
16	F-16C	Yes
18	F/A-18C	Yes
19	Mig-19	
21	Mig-21bis	
23	Mig-23MLD	
24	Su-24M/MR	
25	Mig-25PD	
29	Su-27, Su-33, Mig-29A/G/S and J-11A	Yes
30	Su-30	Yes
31	Mig-31	
34	Su-34	Yes
39	Su-25TM (Su-39)	Yes
AN	AN-26B and AN-30M	
AP	AH-64D	
B1	B-1B	
BE	Tu-95 and Tu-142M	
BF	Tu-22M3	
BJ	Tu-160	
E2	E-2D	
E3	E-3C	
F4	F-4E	
F5	F-5E	
HX	Ka-27	
IL	IL-76MD and IL-78M	
KC	KC-135	
KJ	KJ-2000	

Threat symbol	Platform/Sensor	Special Tone
M2	Mirage 2000-C and 2000-5	Yes
S3	S-3B	
SH	SH-60B	
Air Defense		
2	S-75 TR SNR (Fan Song)	
3	S-125 TR SNR-125 (SA-3/Low Blow)	
6	Kub SA-6	
8	OSA (SA-8)	
10	S-300PS 30N6 TR (SA-10)	
11	Buk (SA-11)	
12	S-300V	
15	Tor 9A331 (SA-15)	
19	Tunguska 2C6M (SA-19)	Yes
A	Gepard, M-163 Vulcan and ZSU-23-4 Shilka	
BB	S-300PS 64H6E SR (SA-10/Big Bird)	
CS	S-300PS 5N66M SR (SA-10/Clam Shell)	
DE	Sborka (Dog Ear)	
FF	S-125 P-19 SR (SA-3/Flat Face)	
GR	Roland SR	
HA	Hawk SR	
HK	Hawk TR	
PT	Patriot	
RO	Roland	
S	IL13 and 55G6 EWR	
SD	Buk TR (SA-11/Snow Drift)	
SN	PRW-11 (Side Net)	
Missiles		
M	MICA-EM, R-37, R-77, AIM-54 and AIM-120	
ATC (Air Traffic Control)		
T	Airport ATC Radar	

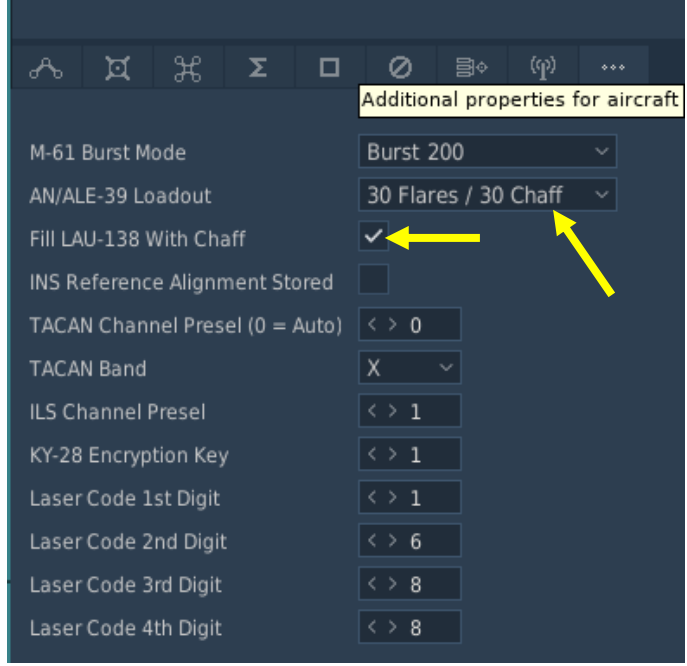
Reference: Grim Reapers F-14 RWR Video
https://youtu.be/-G-9fZ9i0lc

COUNTERMEASURES - CHAFF & FLARES
AN/ALE-39 CMDS (COUNTERMEASURES DISPENSER SYSTEM)

1 - COUNTERMEASURE PROGRAM

Your AN/ALE-39 Loadout is set from the mission editor. You can equip an optional LAU-138 with additional Chaff, which is quite useful in SAM-alley kind of environments.

From the RIO seat, the Countermeasures Program panel allows you to create countermeasures release programs. Rotate the blue thumbwheels to set Chaff parameters, yellow thumbwheels to set Flare parameters, white thumbwheels for Jammer parameters. Parameters include quantity and intervals in seconds.

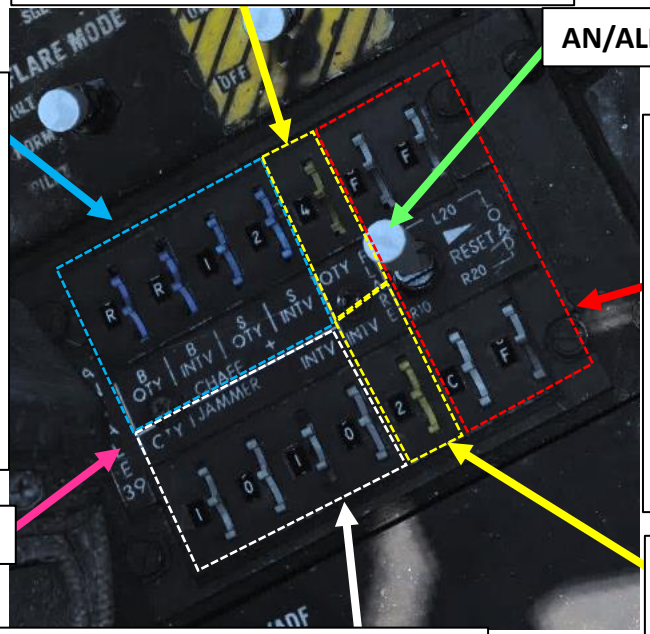


Flare Program - Quantity Thumbwheel
Sets quantity of flares to be released in a program.

AN/ALE-37 Programmer Reset Switch

Chaff Program Thumbwheels

- ***B QTY**: Quantity, sets quantity of chaff to release in one program salvo, can also be set to C (continuous) or R (random).*
- ***B INTV**: Interval (sec), sets interval between chaff burst to release in one program salvo, can also be set to R (random).*
- ***S QTY**: Quantity, selects number of salvoes to release in a program.*
- ***S INTV**: Interval (sec), selects interval between salvoes in a program.*



LOAD Control Thumbwheels
Thumbwheels inputting into AN/ALE-39 what is loaded into each launcher subsection.

- ***L10** - Sets loaded countermeasure in Left 10 subsection.*
- ***L20** - Sets loaded countermeasure in Left 20 subsection.*
- ***R10** - Sets loaded countermeasure in Right 10 subsection.*
- ***R20** - Sets loaded countermeasure in Right 20 subsection.*

AN/ALE-39 Countermeasures Program Panel

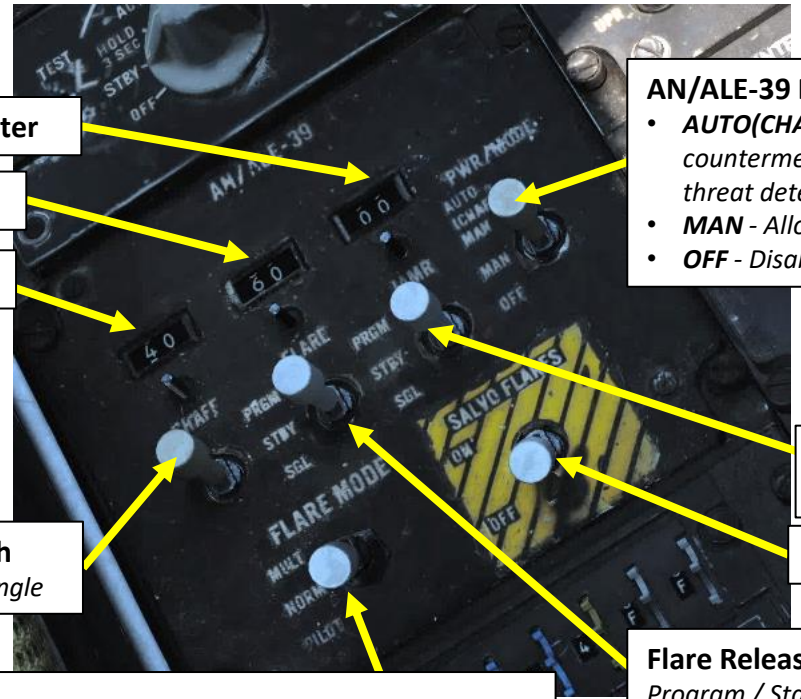
Flare Program - Interval Thumbwheel
Sets interval between flare releases in a program (sec)

Jammer Program Thumbwheels
Quantity / Interval Hundreds (sec) / Interval Tens (sec) / Interval Units (sec)

COUNTERMEASURES - CHAFF & FLARES
AN/ALE-39 CMDS (COUNTERMEASURES DISPENSER SYSTEM)

2 - COUNTERMEASURE CONTROL PANEL

Once your program has been created, the RIO can then set the PWR/MODE switch as desired and use the Chaff Release, Flare Release and Jammer Release switches to dispense countermeasures as necessary, using either a Single dispense (switch AFT) or a Program dispense (switch FWD).



Jammer Inventory Counter

Flare Inventory Counter

Chaff Inventory Counter

AN/ALE-39 PWR/MODE Switch
- ***AUTO(CHAFF)/MAN*** *- Allows manual release of countermeasures and automatic release of chaff by threat detection in the ECM systems.*
- ***MAN*** *- Allows manual release of countermeasures.*
- ***OFF*** *- Disables AN/ALE-39.*

Jammer Release Switch
Program / Standby / Single

Flare Salvo Switch

Chaff Release Switch
Program / Standby / Single

Flare Release Switch
Program / Standby / Single

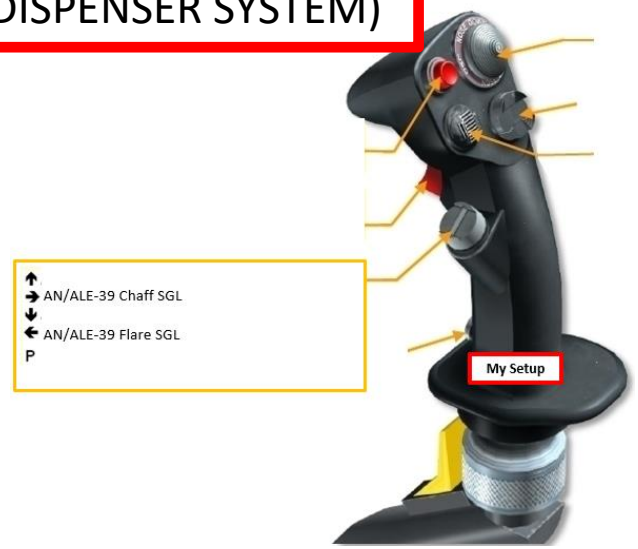
Flare Mode Switch
- ***MULT*** *- Multiple, each flare ejection command will eject one flare from each launcher subsection loaded with flares. Affects both manual and programmed releases.*
- ***NORM*** *- Normal, each flare ejection command will eject one flare in total. Affects both manual and programmed releases.*
- ***PILOT*** *- Enables the pilot to manually release flares with the pilot stick DLC button, the other positions releases chaff with DLC button depression.*

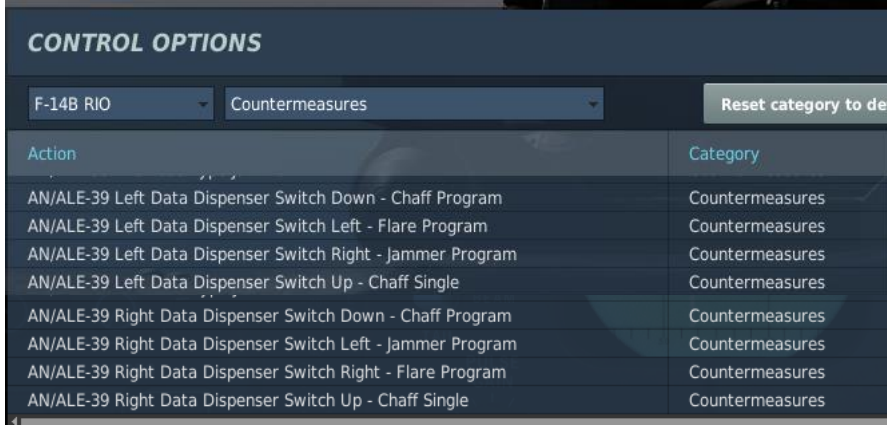
COUNTERMEASURES - CHAFF & FLARES
AN/ALE-39 CMDS (COUNTERMEASURES DISPENSER SYSTEM)

3 - COUNTERMEASURE DISPENSE (RIO)

For quick countermeasure dispensing, there are two mirrored Chaff/Flare Dispense Hat switches. I haven't mapped them since I am a lazy bastard, but you can still map them to four-way switches or bindings if you want.

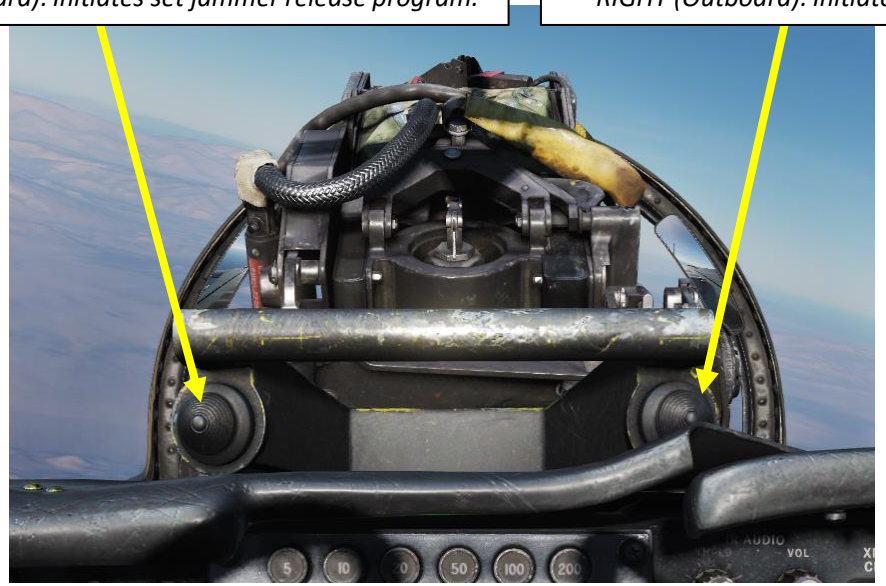
Personally, I simply use bindings linked to the Flare Release, Chaff Release and Jammer Release switches.





Chaff/Flare Dispense Hat Switch
- *DOWN: Initiates set chaff release program.*
- *UP: Initiates a single chaff release.*
- *LEFT (Outboard): Initiates set flare release program.*
- *RIGHT (Inboard): Initiates set jammer release program.*

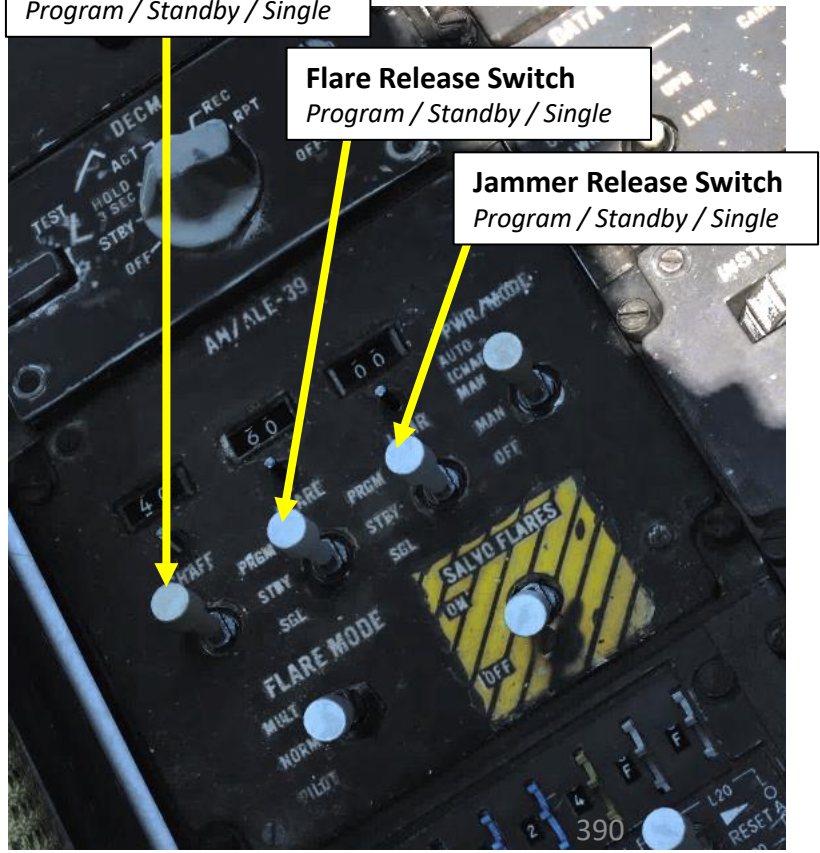
Chaff/Flare Dispense Hat Switch
- *DOWN: Initiates set chaff release program.*
- *UP: Initiates a single chaff release.*
- *LEFT (Inboard): Initiates set jammer release program.*
- *RIGHT (Outboard): Initiates set flare release program.*



Chaff Release Switch
Program / Standby / Single

Flare Release Switch
Program / Standby / Single

Jammer Release Switch
Program / Standby / Single

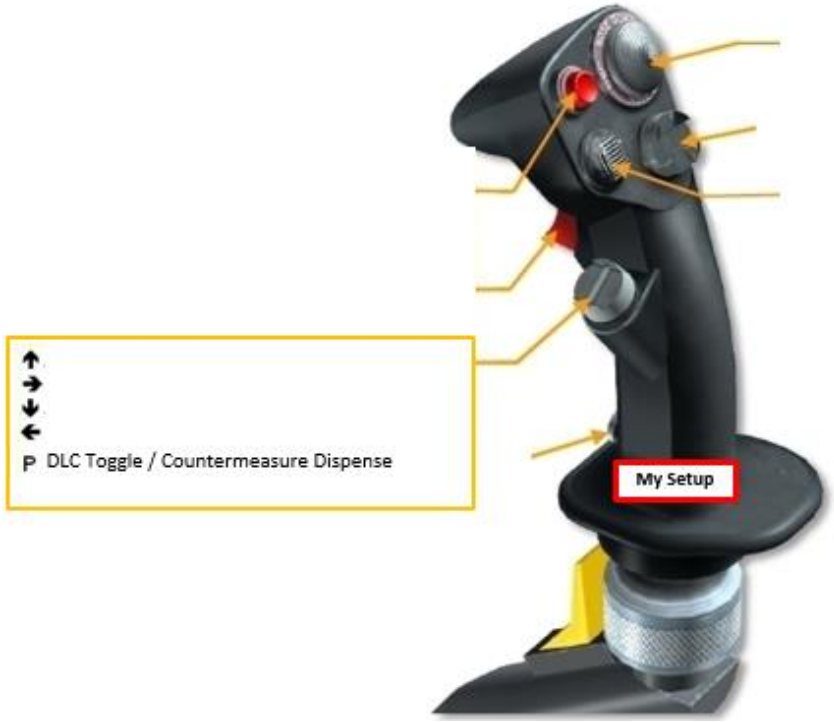


COUNTERMEASURES - CHAFF & FLARES
AN/ALE-39 CMDS (COUNTERMEASURES DISPENSER SYSTEM)

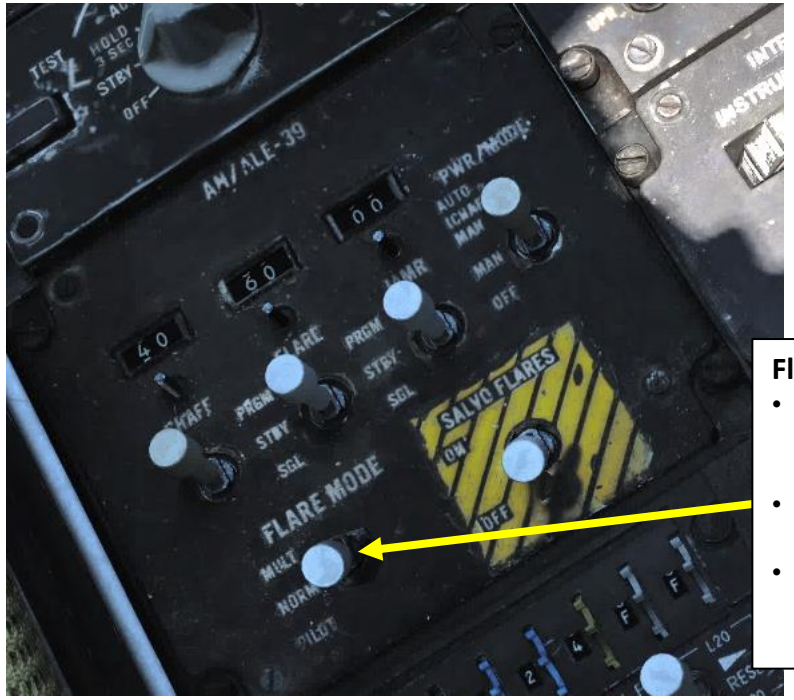
4 - COUNTERMEASURE DISPENSE (PILOT)

The pilot can also dispense countermeasures. **If the flaps lever is in the UP position**, the DLC Engage button will dispense countermeasures.

The Flare Mode switch in the RIO cockpit allows a "PILOT" setting, which enables the pilot to manually release flares with the pilot stick DLC Engage Button. If the Flare Mode switch is set to MULT or NORM, the DLC Engage button will release chaff instead.







Flare Mode Switch

- ***MULT*** *- Multiple, each flare ejection command will eject one flare from each launcher subsection loaded with flares. Affects both manual and programmed releases.*
- ***NORM*** *- Normal, each flare ejection command will eject one flare in total. Affects both manual and programmed releases.*
- ***PILOT*** *- Enables the pilot to manually release flares with the pilot stick DLC button, the other positions releases chaff with DLC button depression.*

COUNTERMEASURES - CHAFF & FLARES
AN/ALE-39 CMDS (COUNTERMEASURES DISPENSER SYSTEM)

5 – JESTER MANAGEMENT







AN/ALQ-126 DECEPTION JAMMER (DECM)

The AN/ALQ-126 deception jammer is designed to detect radar threats, analyze them, select the optimum countermeasure technique available and apply it.

In DCS, the DECM (Defensive Electronic Countermeasures) system is modelled as a simple noise jammer due to engine limitations but controlled by the DECM logic as to when it's on or off.

The two indication lights on the threat advisory are **RCV** (receive) and **XMIT** (transmit). RCV illuminates up when the system detects and analyzes a threat while the XMIT illuminates up when it's actively jamming a threat.

Operate the Jammer using the Jammer Mode Selector.

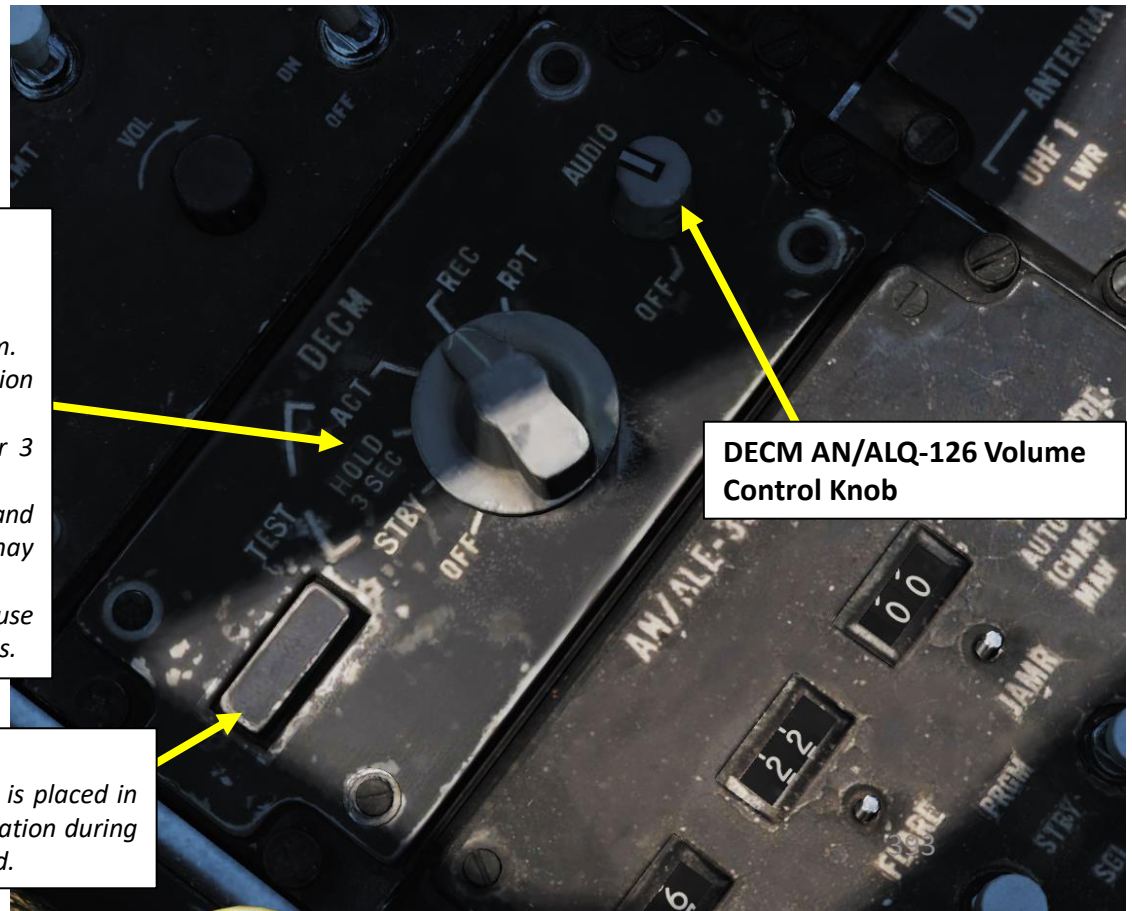


Threat Advisory Indicator (RIO Panel)

IFF: Received mode 4 interrogation without own system generating reply
RCV: ALQ-126 is receiving a threat identification signal
XMIT: ALQ-126 is transmitting
SAM: Warning light, steady illumination when detecting lockon from a SAM tracking radar. Flashes when missile launch is detected.
AAA: Warning light, steady illumination when detecting lockon from a AAA tracking radar. Flashes when AAA engagement is detected.
CW: Detection of a continuous wave (CW) emitter
AI: Warning light, steady illumination when detecting lockon from an airborne interceptor radar.

AN/ALQ-126 DECM (Defensive Electronic Countermeasures) Jammer Mode Selector

- ***OFF*** *- Turns off power to AN/ALQ-126.*
- ***STBY*** *- Standby, applies power to warmup system.*
- ***TEST/HOLD 3 SEC*** *- Should be held in this position for 3 seconds to prepare for system test.*
- ***TEST/ACT*** *- Starts AN/ALQ-126 BIT, used after 3 seconds in TEST/HOLD 3 SEC position.*
- ***REC*** *- Receive, enables AN/ALQ-126 to receive and analyze threat signal. Detected missile launch may force the system into repeat mode.*
- ***RPT*** *- Repeat, enables AN/ALQ-126 to use programmed responses to received threat signals.*



DECM AN/ALQ-126 Volume Control Knob

DECM Standby Light

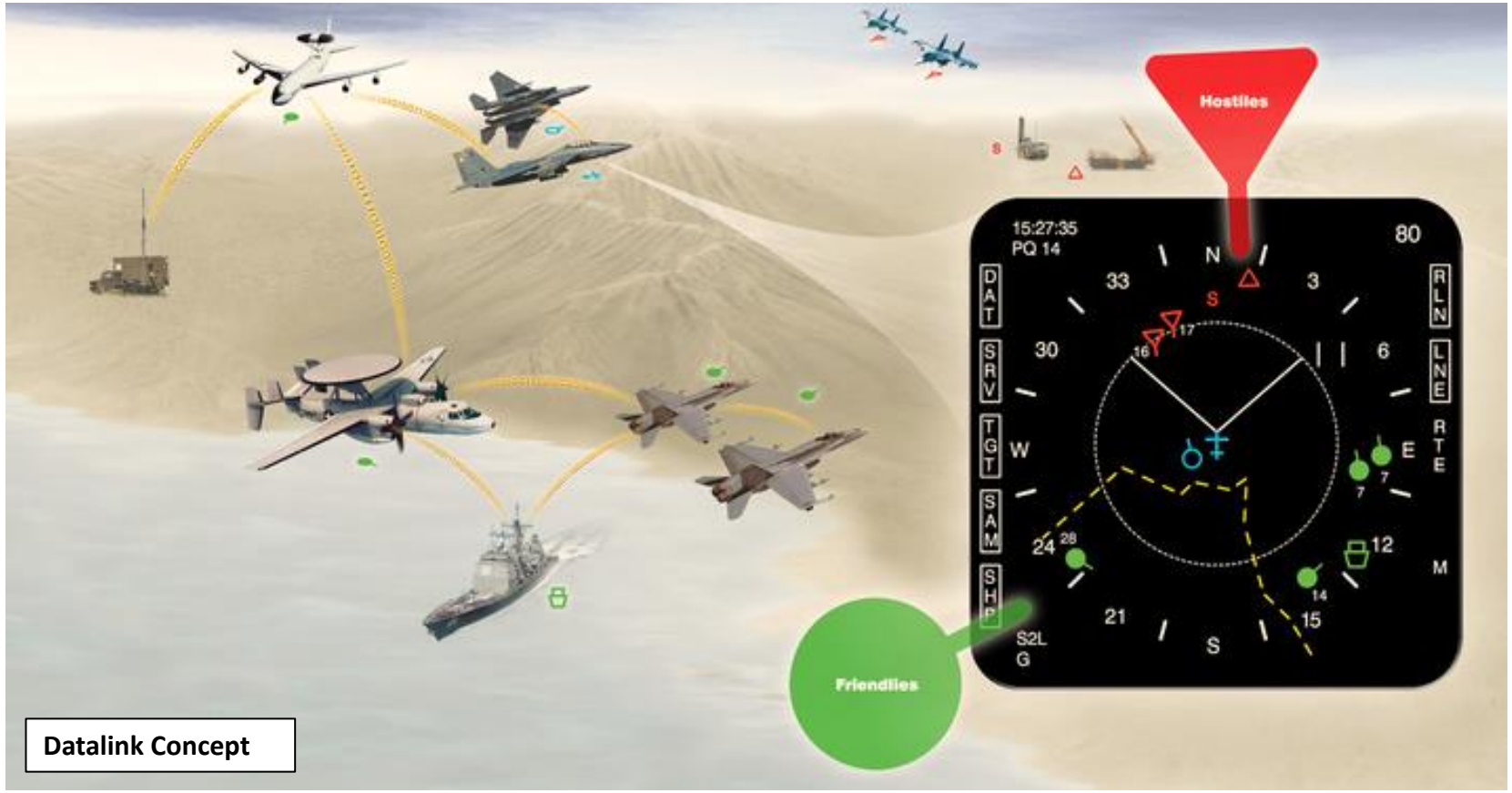
Amber light indicating warmup when system is placed in STBY. Goes out after complete warmup. Indication during test or operation indicates a fault has occurred.

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; the Tomcat can gather information from both **LINK 4A** and **LINK 4C** networks.

Link 4A TADIL C is one of several Tactical Data Links now in operation in the United States Armed Services and forces of the North Atlantic Treaty Organization (NATO). Link-4A plays an important role by providing digital surface-to-air, air-to-surface, and air-to-air tactical communications. Originally designated Link-4, this link was designed to replace voice communications for the control of tactical aircraft. The use of Link-4 has since been expanded to include communication of digital data between surface and airborne platforms. First installed in the late 1950s, Link-4A has achieved a reputation for being reliable. But Link-4A's transmissions are not secure, nor are they jam-resistant. However, Link-4A is easy to operate and maintain without serious or long-term connectivity problems.

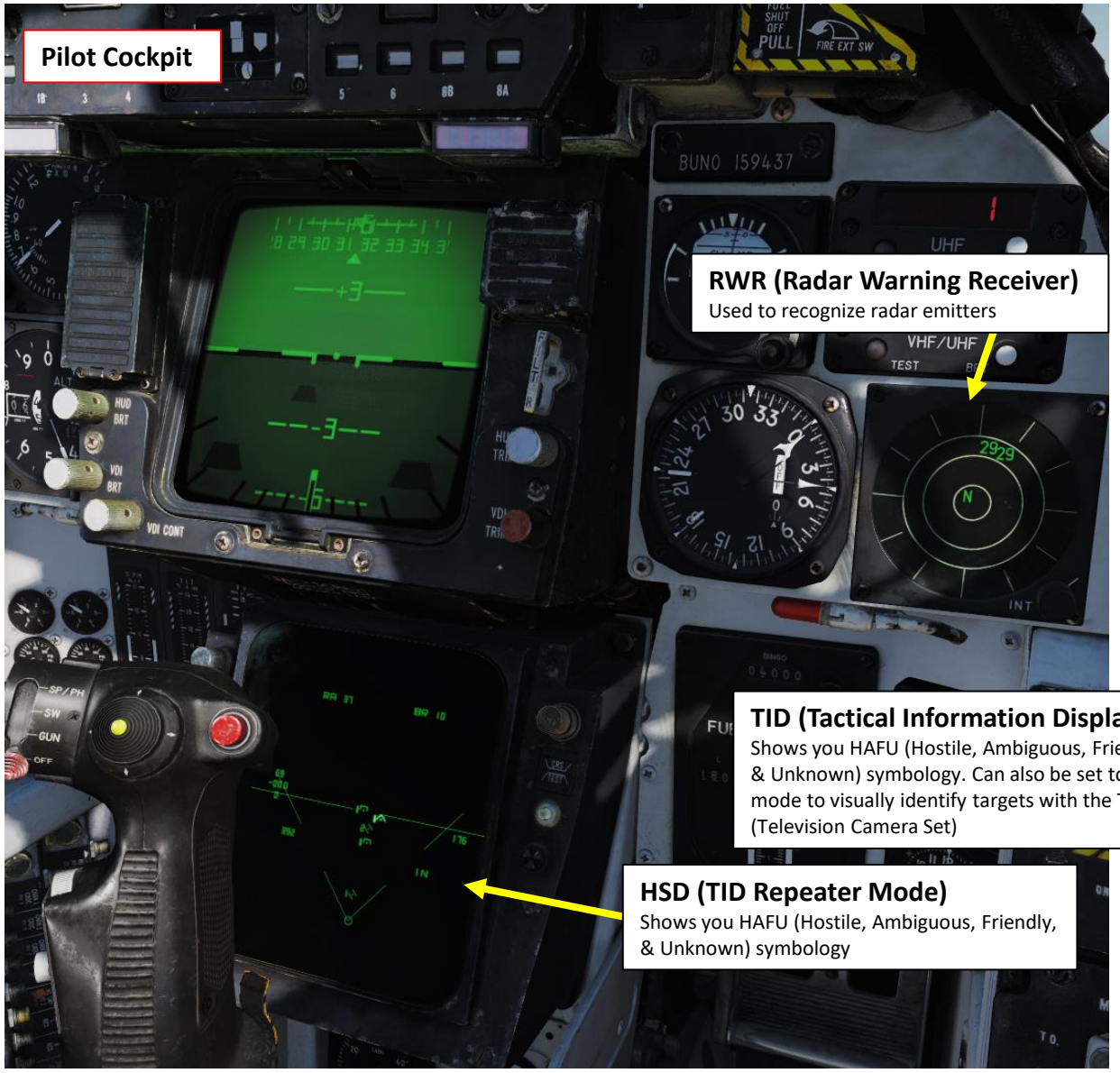
Link 4C is a fighter-to-fighter data link which is intended to complement Link 4A although the two links do not communicate directly with each other. Link 4C uses F-series messages and provides some measure of ECM resistance. Link 4C is fitted to the F-14 only and the F-14 cannot communicate on Link 4A and 4C simultaneously. Up to 4 fighters may participate in a single Link 4C net.

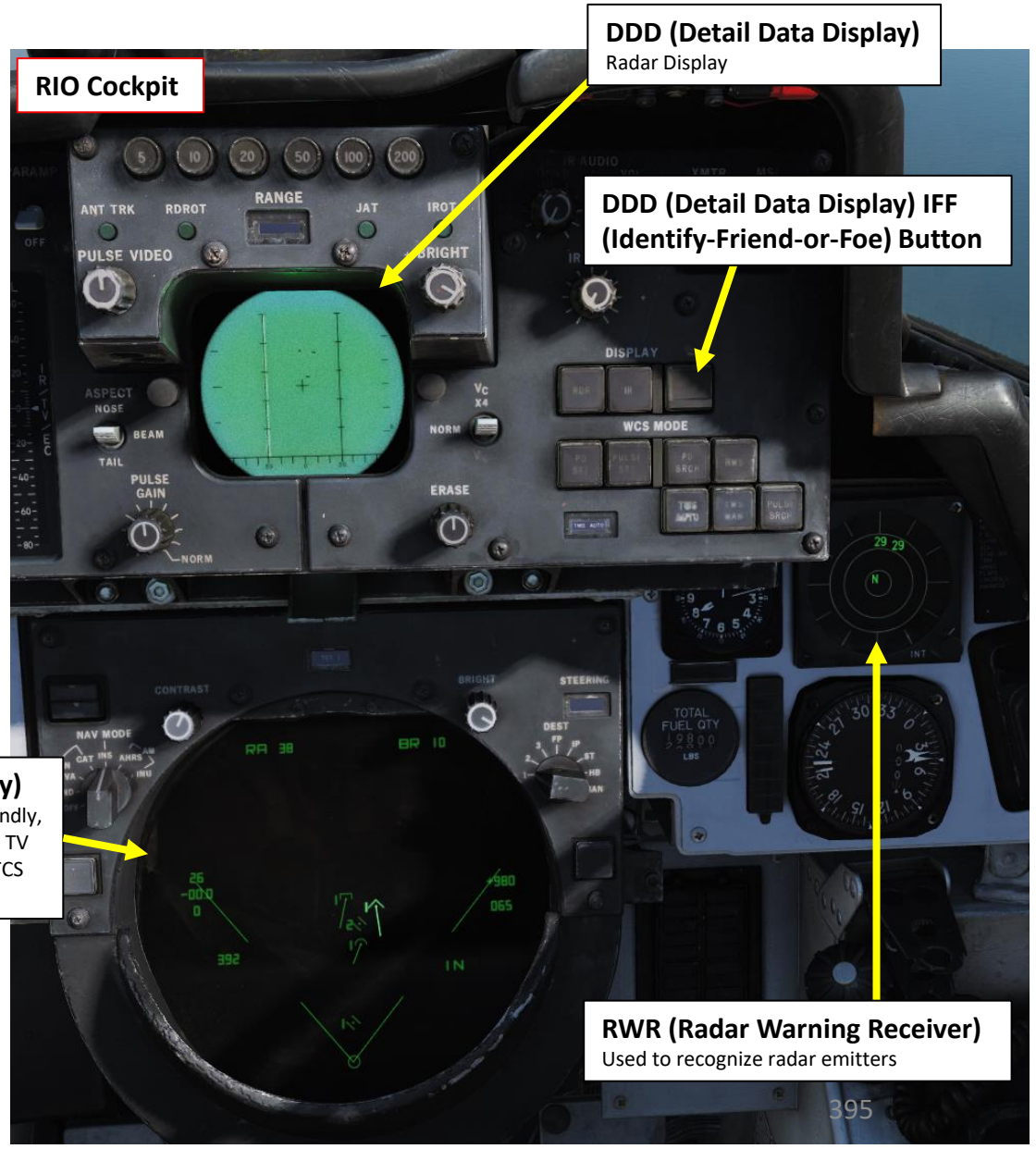


Datalink Concept

SENSORS INTEGRATED VIEW

These are the main displays that you will consult when gathering information on a target.



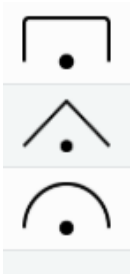


TID HAFU SYMBOLOGY

Hostile, Ambiguous, Friendly or Unknown (HAFU) is a symbology system used by the F/A-18 to represent contact identification. A similar concept is used on the F-14.

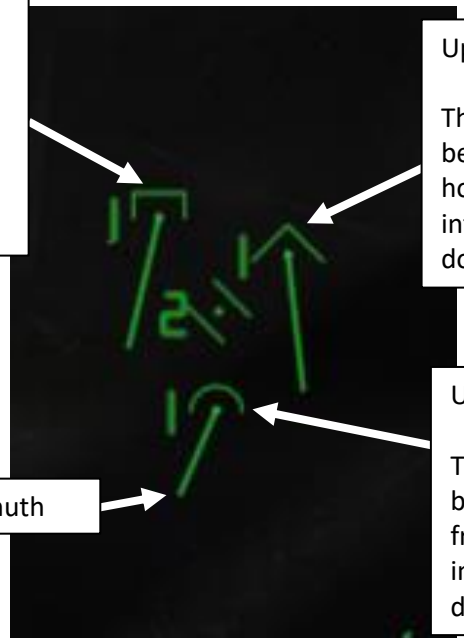
Here are three main HAFU symbols:

- **Staple:** Unknown
- **Triangle:** Hostile
- **Half-Circle:** Friendly



Upper Part: This is what you have identified.

This symbol shows an Unknown Target that has not been interrogated by either yourself or any other information donor (i.e. AWACS).



Upper Part: This is what you have identified.

This symbol shows a hostile Target that has been interrogated by you and identified as hostile. However, you do not have information from any other information donor (i.e. AWACS).

Upper Part: This is what you have identified.

This symbol shows a Friendly Target that has been interrogated by you and identified as friendly. However, you do not have information from any other information donor (i.e. AWACS).

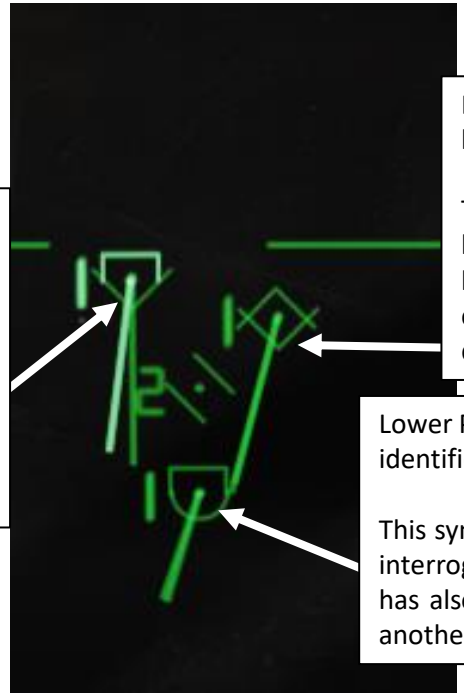
Contact Azimuth

Toggle the TID Data Link button to remove or show information that comes from Datalink if the TID becomes too cluttered.



Lower Part: This is what information donors have identified.

This symbol shows an Unknown Target that you have not interrogated yet, but that has been interrogated and confirmed hostile by another information donor (i.e. AWACS).



Lower Part: This is what information donors have identified.

This symbol shows a Hostile Target that has been interrogated by you and confirmed hostile. It has also been interrogated and confirmed hostile by another information donor (i.e. AWACS).

Lower Part: This is what information donors have identified.

This symbol shows a Friendly Target that has not been interrogated by you, which is unknown. However, it has also been interrogated and confirmed friendly by another information donor (i.e. AWACS).

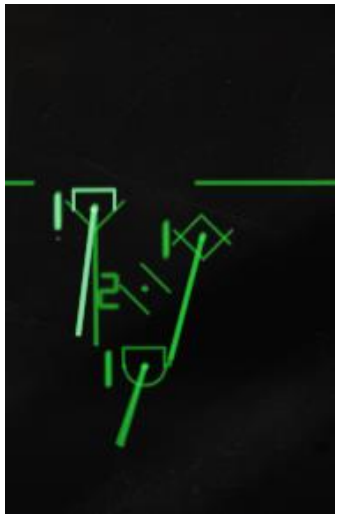
TID HAFU SYMBOLOGY

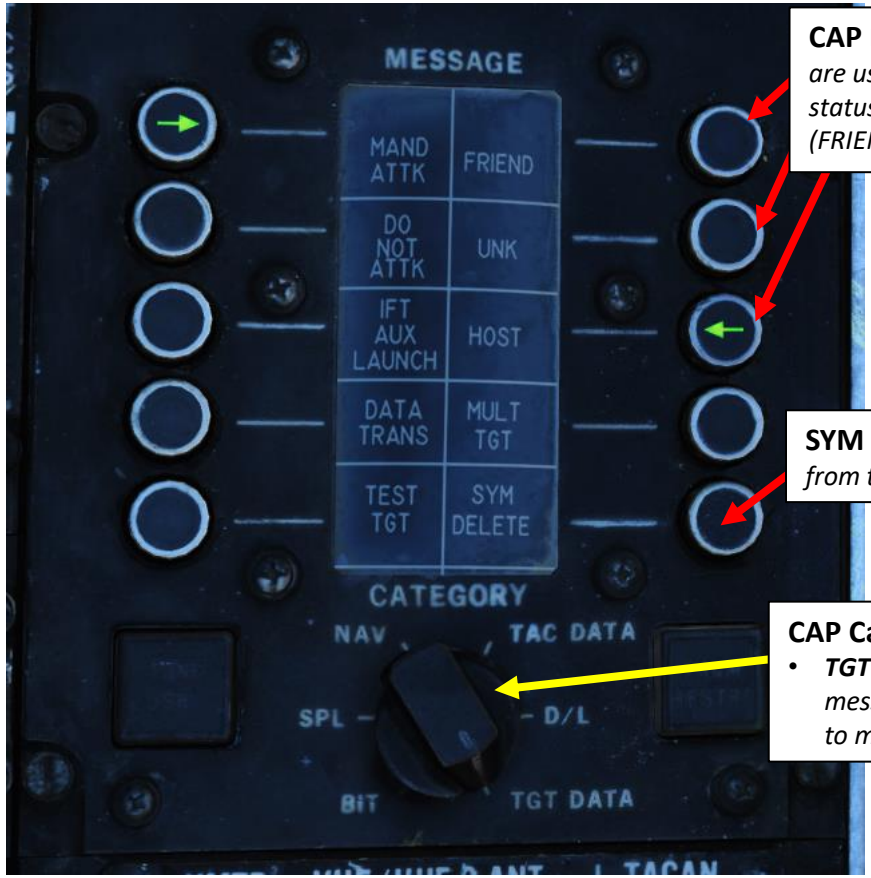
The CAP (Computer Address Panel) selected in the TGT DATA (Target Data) menu allows you to designate the status of a selected target (Friendly, Hostile, Unknown).

	Onboard Sensor Targets	
Unknown		Unknown sensor track in RWS, TWS and STT modes.
Hostile		Track in TWS and STT modes designated as hostile by RIO.
Friend		Track in TWS and STT modes designated as friendly by RIO.
Angle-Tracked Radar Target		Radar target tracked only in angle (jamming target).
Angle-Tracked Radar Target with Altitude Difference Ranging		Radar target being tracked in angle only and range being computed by altitude difference ranging.
TCS-Angle Tracked Target		Target being tracked in angle by TCS.
TCS-Angle Tracked Target with Altitude Difference Ranging		Target being tracked in angle by TCS and range being computed by angle difference ranging.

	Data Link Targets	
Unknown		Data link track identified as unknown by source.
Hostile		Data link track identified as hostile by source.
Friend		Data link track identified as friendly by source.







CAP Message Selector Buttons *are used by the RIO to designate the status of a target (FRIEND/UNKNOWN/HOSTILE)*

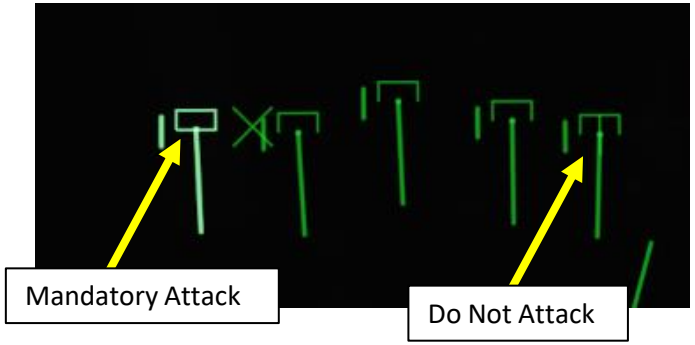
SYM DELETE: *Deletes a symbol from the TID*

CAP Category Selector Switch

- ***TGT DATA****: Target Data, contains message button functionality used to modify hooked track symbols.*

TID HAFU SYMBOLOGY

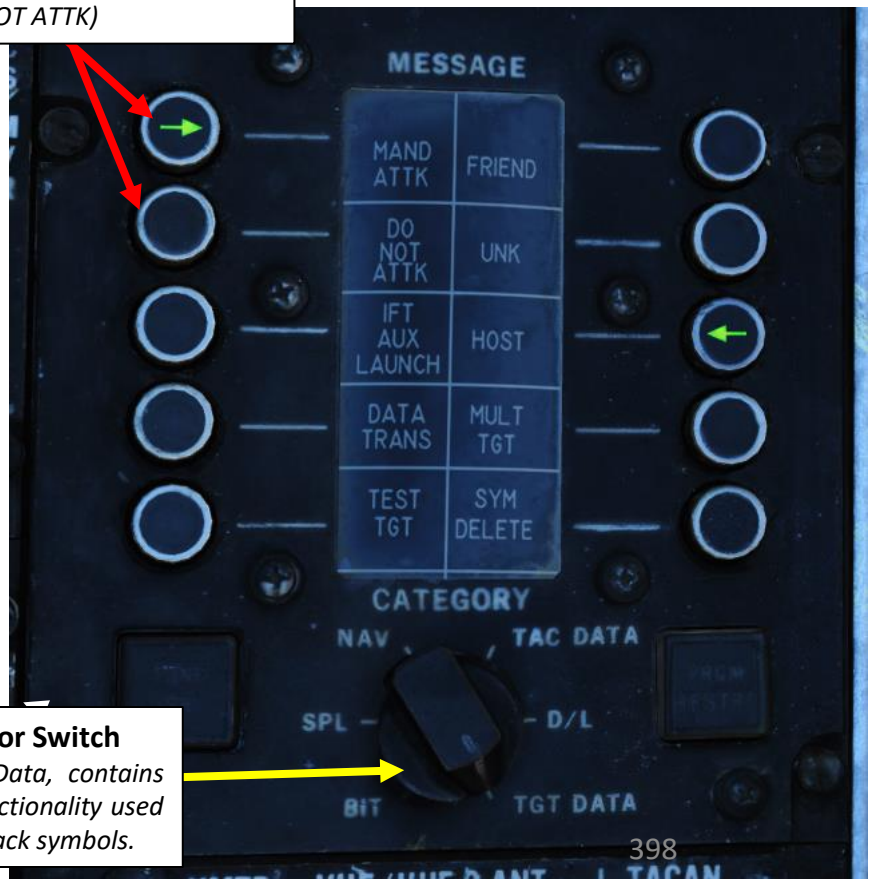
The CAP (Computer Address Panel) selected in the TGT DATA (Target Data) menu also allows you to modify the status of a selected target (Mandatory Attack, Do Not Attack). MAND ATTK and DO NOT ATTK do affect the TWS (Track While Scan) Centroid in TWS AUTO mode.



	Position Symbol Modifiers	
Mandatory Attack		Additional symbology on a TWS track (horizontal bar through center dot) selected as mandatory attack by the RIO. Only one target can be designated thusly and always receives an engagment priority number.
Data link Destroy		Additional symbology on a data link track (horizontal bar through center dot) designated to be destroyed by data link source. Does not affect target prioritization in WCS.
Do Not Attack		Additional symbology on a TWS or data link track (vertical bar through center dot) designated as do not attack (by RIO) or disengage (via data link). If set by RIO removes target from WCS target prioritization.
Multiple Targets		Additional symbology on a TWS or data link track (horizontal bar on left side of symbol) indicating that the track represents multiple targets. Can be set manually by RIO or recieved via data link.
Data Link Challenge		Additional symbology on a data link track (small V with apex at center dot) representing data link command to visually identify target.
Track Extrapolated		Additional symbology on TWS or STT track (small X with center at center dot) indicating that no update to target has occured within 8 seconds. Track will be deleted after 14 seconds or 2 minutes if track hold function is enabled.

CAP Message Selector Buttons *are used by the RIO to modify the status of a target*

- *Mandatory Attack (MAND ATTK)*
- *Do Not Attack (DO NOT ATTK)*

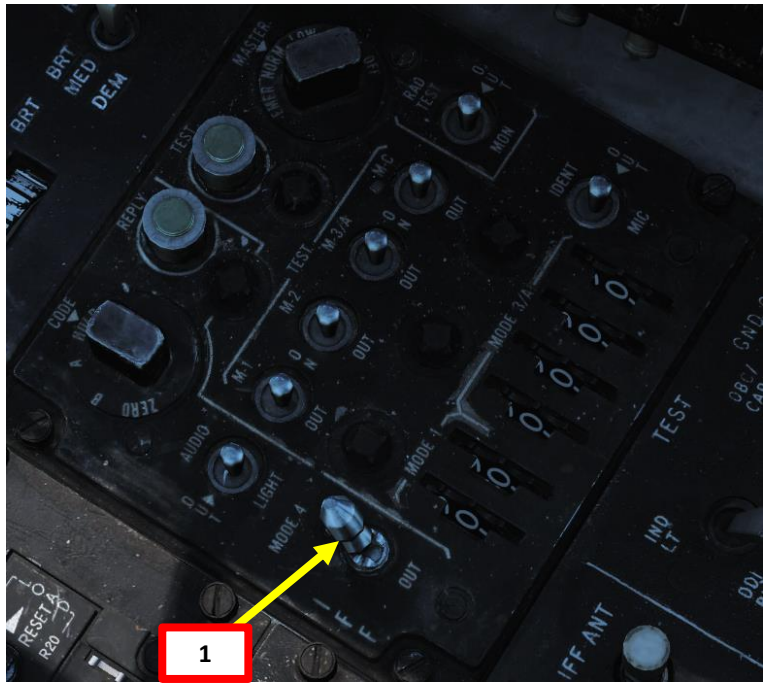


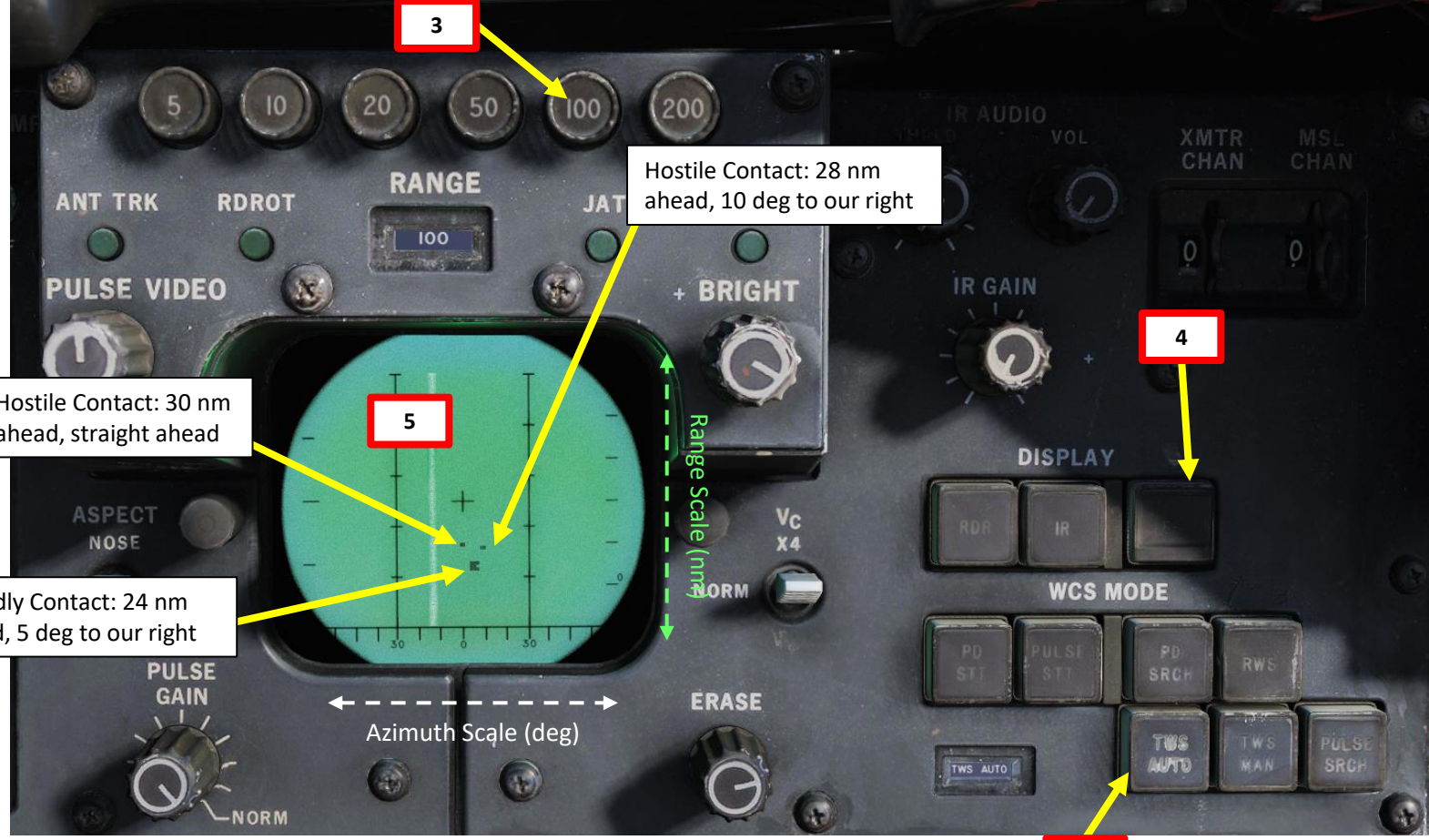
CAP Category Selector Switch

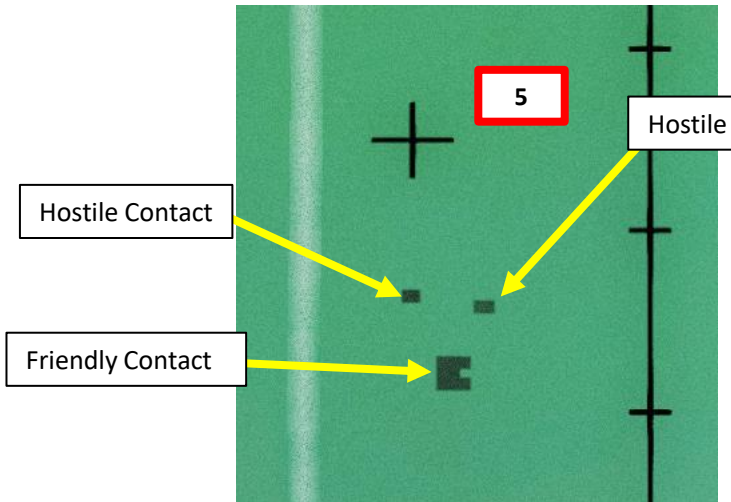
- ***TGT DATA****: Target Data, contains message button functionality used to modify hooked track symbols.*

MANUAL IFF EXAMPLE

1. Set IFF Mode 4 Power Switch – ON (FWD)
2. Select TWS AUTO radar mode
3. Select a DDD range as desired (100 nm).
4. Press and hold the IFF Interrogate button for a few seconds.
5. While the IFF Interrogate button is pressed, the DDD will momentarily switch from the Pulse Doppler Closure Velocity scale to a Range scale.
6. Friendly contacts are identified with a bar above and a bar below them.
7. Hostile contacts are identified as single bars.
8. Release the IFF Interrogate button. The DDD scale will go back in the Pulse Doppler Closure Velocity scale.





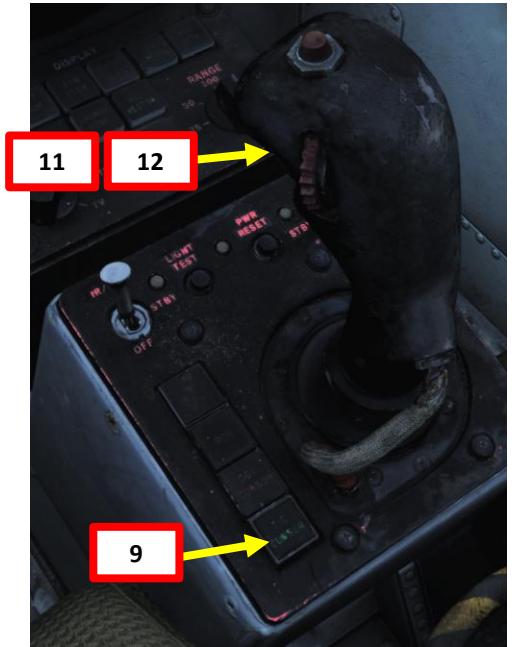


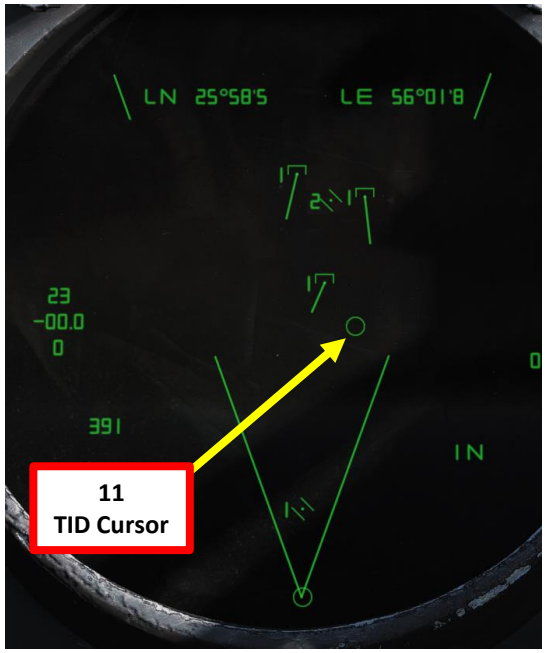
Note: an IFF can be performed when a target is radar locked as well. You simply have to press the IFF button after you have locked the target on the DDD. The friendly/hostile double-bar symbology still applies.

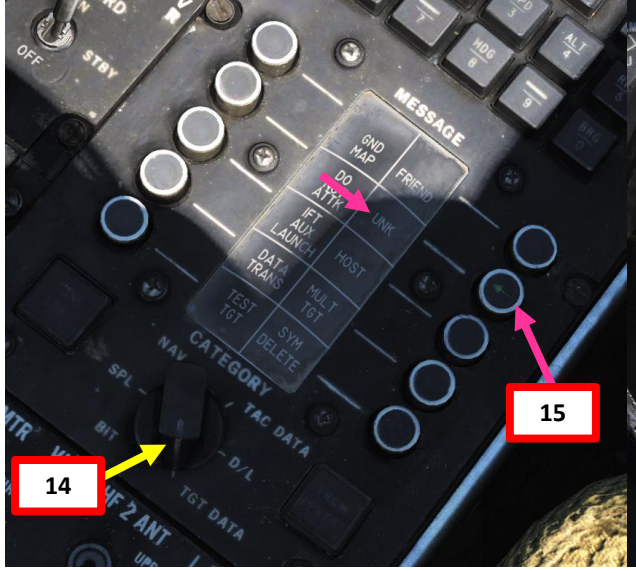
MANUAL IFF EXAMPLE

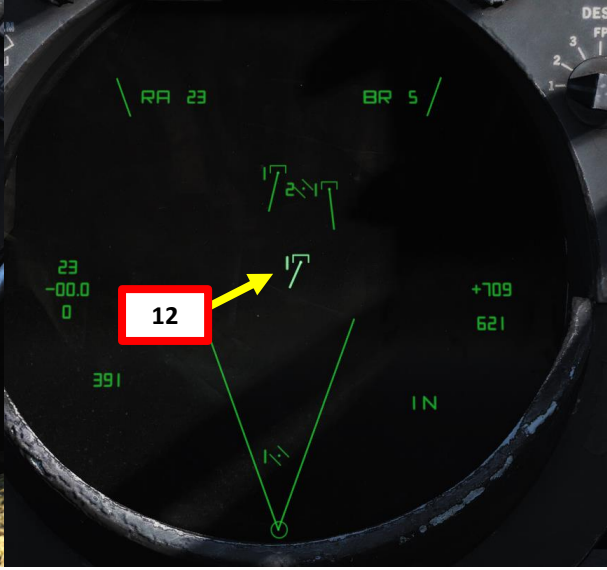
Now that we have identified our targets in the DDD, we need to mark them as friendly, hostile or unknown on the TID. This has to be done manually.

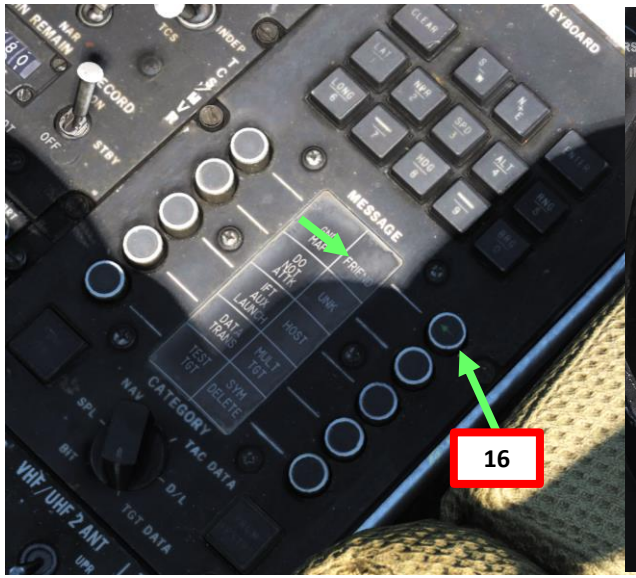
9. Select “TID CURSOR” TID Mode
10. The TID cursor will appear on the TID
11. Press and hold the first HCU trigger (Half-Action), then use the HCU stick to slew the TID cursor over the desired target.
12. Once the cursor is over desired contact, press the second HCU trigger (Full-Action) to select the target.
13. Once target is selected, ranging (RA), bearing (BR), altitude (AL) and magnetic course (MC) information will be displayed on the TID and symbol will brighten. Keep in mind that this is NOT a radar lock and you will not be able to use weapons with this function.
14. Set CAP (Computer Address Panel) Category Selector switch to TGT DATA (Target Data)
15. The green arrow next to UNK message button means that the target is currently set as UNKNOWN on the TID.
16. Press the CAP Message button next to FRIEND to set contact as FRIENDLY on the TID.
17. Contact will go from a Staple (Unknown HAFU) to a Half-Circle (Friendly HAFU)
18. To deselect target, press the first HCU trigger (Half-Action).
19. Repeat the process (steps 10 through 18) for other contacts on the TID and assign them HOST (Hostile) HAFU if they are not marked as friendly on the DDD during IFF interrogation.

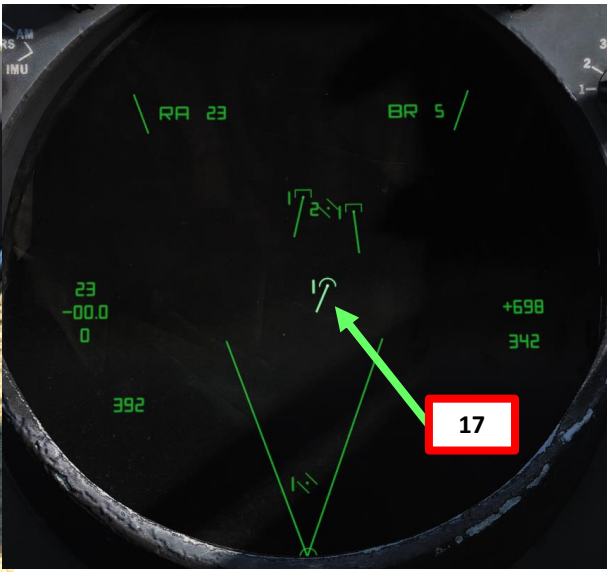












LINK 4A (TAC) VS LINK 4C (FIGHTER-TO-FIGHTER)

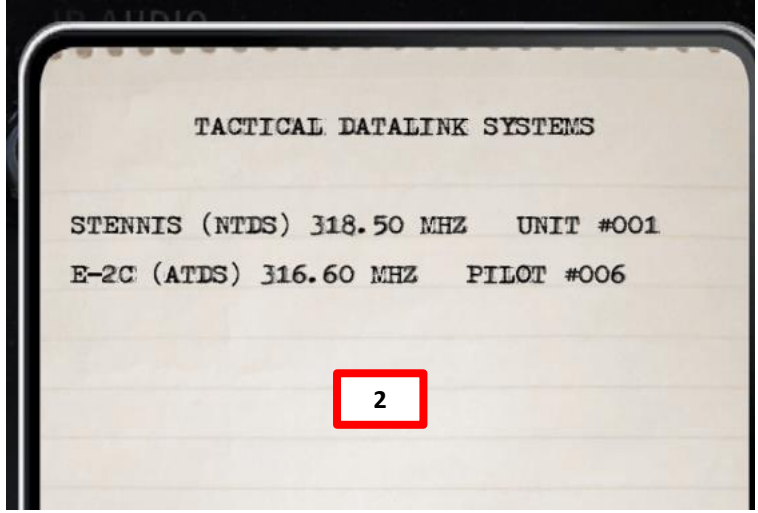
- The **Link-4A** system is a fully automatic, high-speed data transmission system used for aircraft control. The system provides controlling information to the aircraft, using radio transmission between the controlling ship and the controlled aircraft. The Carrier Aircraft Inertial Navigation System (CAINS) is also a part of the Link-4A system.
- **Link 4C**, on the other hand, is a fighter-to-fighter data link which is intended to complement Link 4A although the two links do not communicate directly with each other.

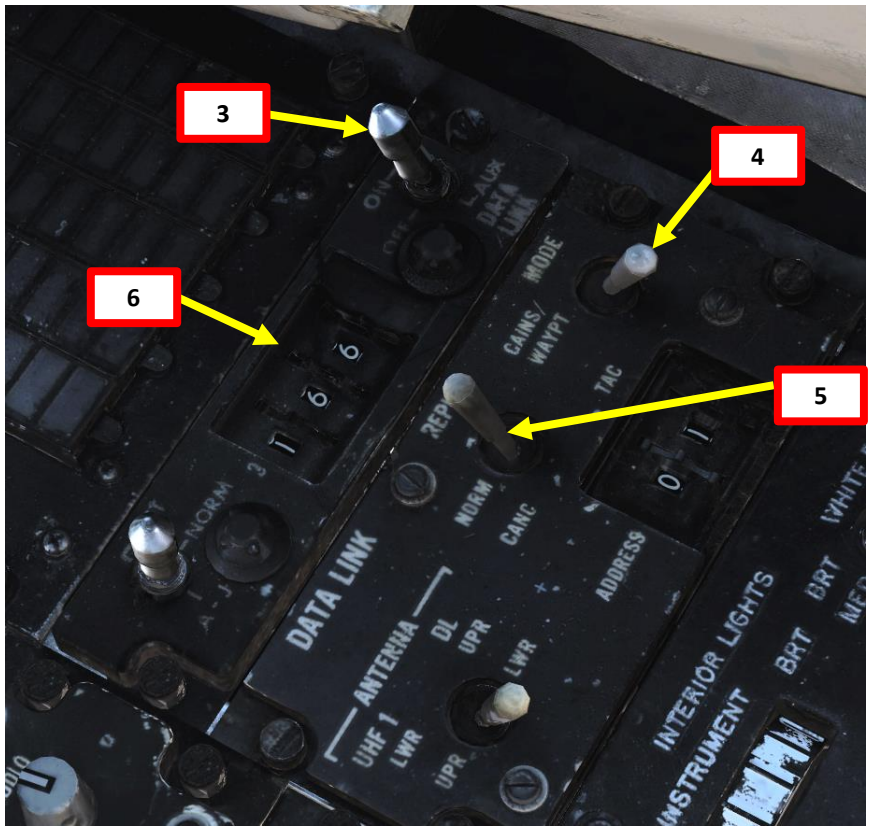


SETTING UP TAC (LINK4A) DATALINK (HUMAN RIO)

You can set up Datalink Mode and Host with JESTER, or a human RIO can also do this for you. Here is how to do it with a human RIO.

1. Open up your kneeboard using “RSHIFT+K”. This will bring you to the GROUND SETTINGS page.
2. Cycle through pages using the “[“ and “]” (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
3. Set Datalink Power Switch – ON (FWD). Datalink Forward position sets datalink in LINK 4A (Tactical) Mode.
4. Set Datalink Mode to TAC (CAINS/WPT is used for INS alignment on the carrier).
5. Set Datalink Reply Switch to NORM to allow the aircraft to both receive and transmit information.
6. Set Datalink Frequency to the desired network (in our case the E-2C AWACS). Our desired frequency is listed on the kneeboard TACTICAL DATALINK SYSTEMS as 316.60 MHz. Rotate the Datalink Frequency Select wheels to 16.6 as shown (the 3 is preset and cannot be modified).
7. Close your kneeboard using “RSHIFT+K”.

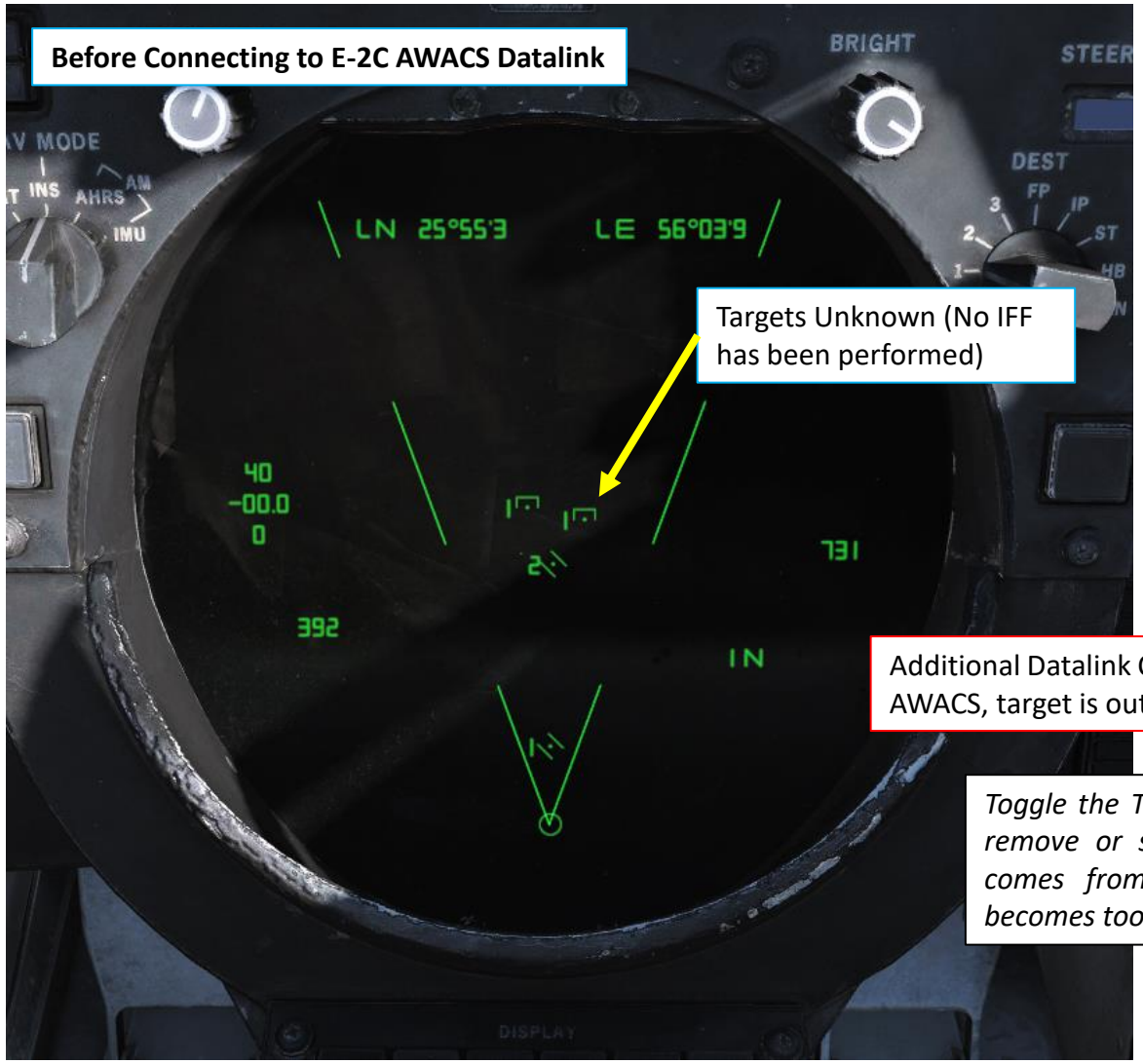


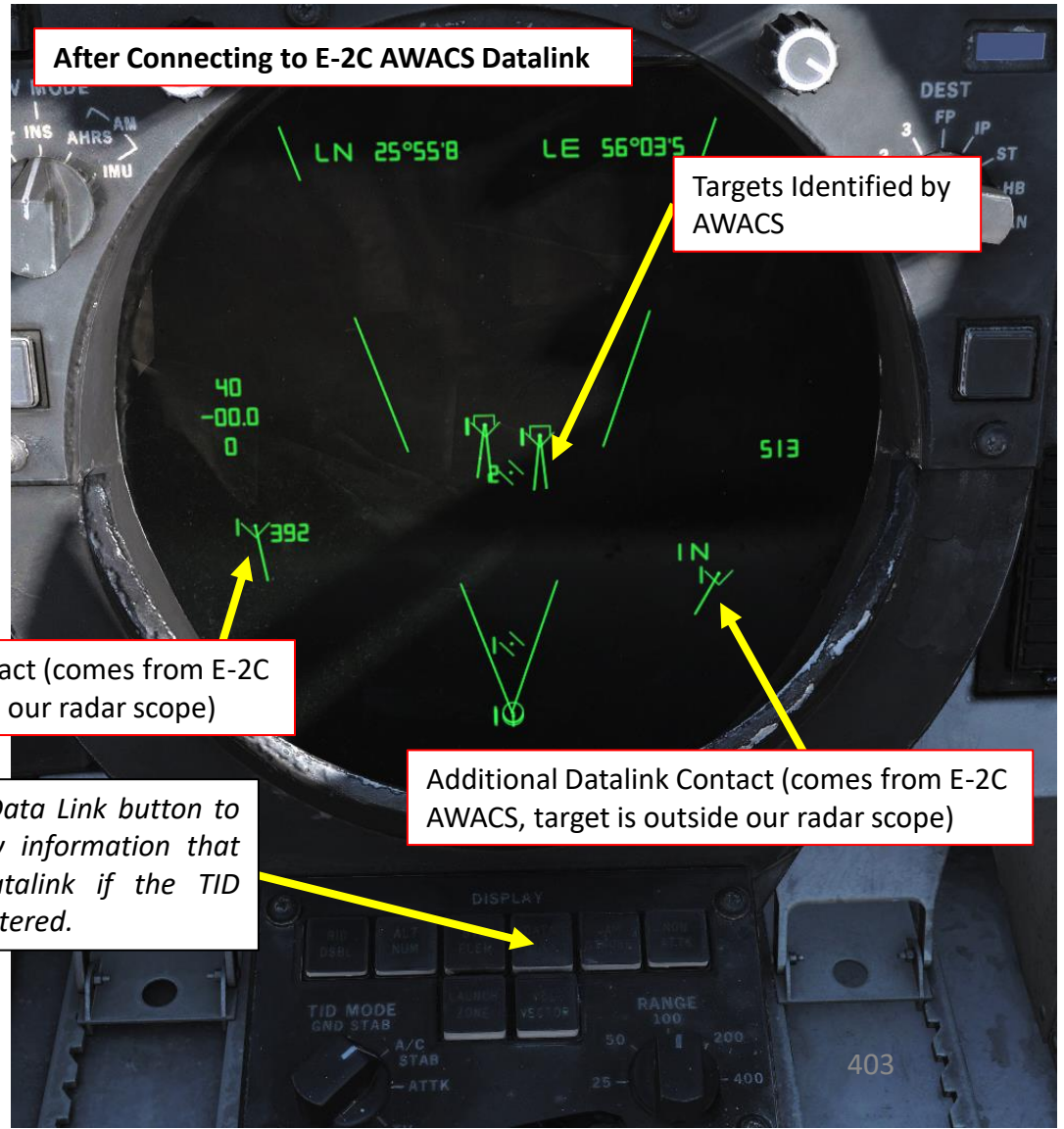




SETTING UP TAC (LINK4A) DATALINK (HUMAN RIO)

7. And that's it! You will now receive and transmit information to the E-2C AWACS on this network. Data on targets identified by the E-2C Hawkeye will automatically be displayed on your TID (provided the TID DATA LINK button is pressed in).

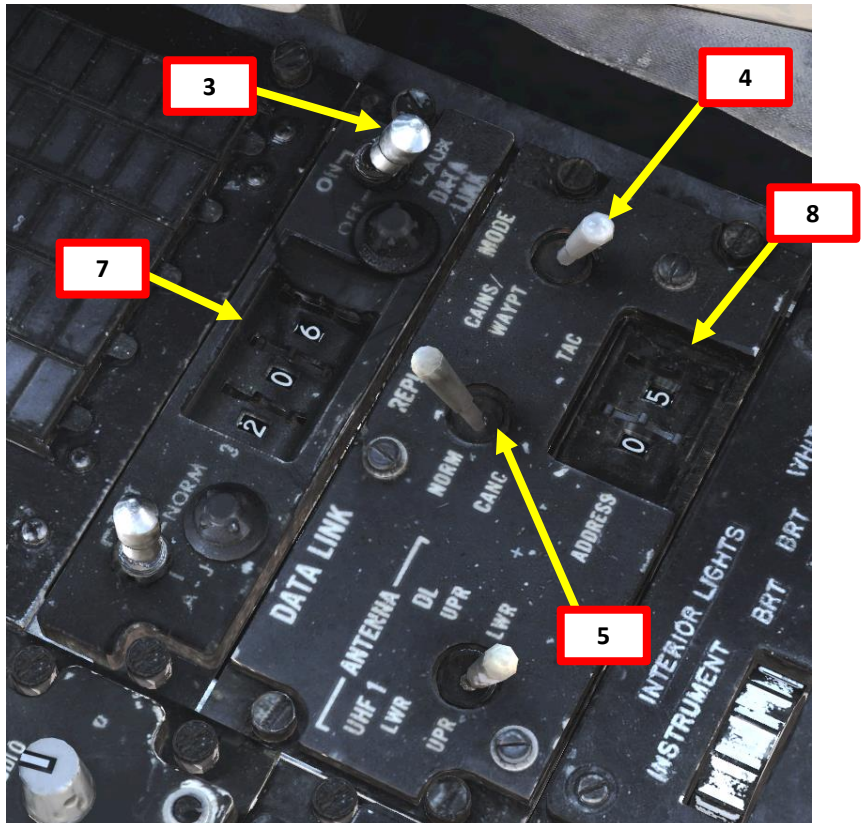




SETTING UP AUX (LINK4C) DATALINK (HUMAN RIO)

You can set up Datalink Mode and Host with JESTER, or a human RIO can also do this for you. Here is how to do it with a human RIO.

1. Open up your kneeboard using “RSHIFT+K”. This will bring you to the GROUND SETTINGS page.
2. Cycle through pages using the “[“ and “]” (kneeboard previous/next page bindings) to find the TACTICAL DATALINK SYSTEMS page. You will see available datalink hosts.
3. Set Datalink Power Switch – AUXILIARY (AFT). Datalink Aft position sets datalink in AUXILIARY LINK 4C (Fighter-to-Fighter) Mode.
4. Set Datalink Mode to TAC (CAINS/WPT is used for INS alignment on the carrier).
5. Set Datalink Reply Switch to NORM to allow the aircraft to both receive and transmit information.
6. If flying on multiplayer, coordinate with other players to find a **common Datalink Frequency**. However, **each player must have his own unique Datalink Address** in order for the datalink to know who sends what and to whom it sends the information. In our case, we will use 320.60 with an address of 05. Another player could use 320.60 as well, but with his own address (like 02 for example).
7. Set Datalink Frequency to the desired network. Our desired frequency is 320.60 MHz. Rotate the Datalink Frequency Select wheels to 20.6 as shown (the 3 is preset and cannot be modified).
8. Set Datalink Address to the desired address. Our desired address is 05. Rotate the Datalink Address thumbwheels to 05 as shown.

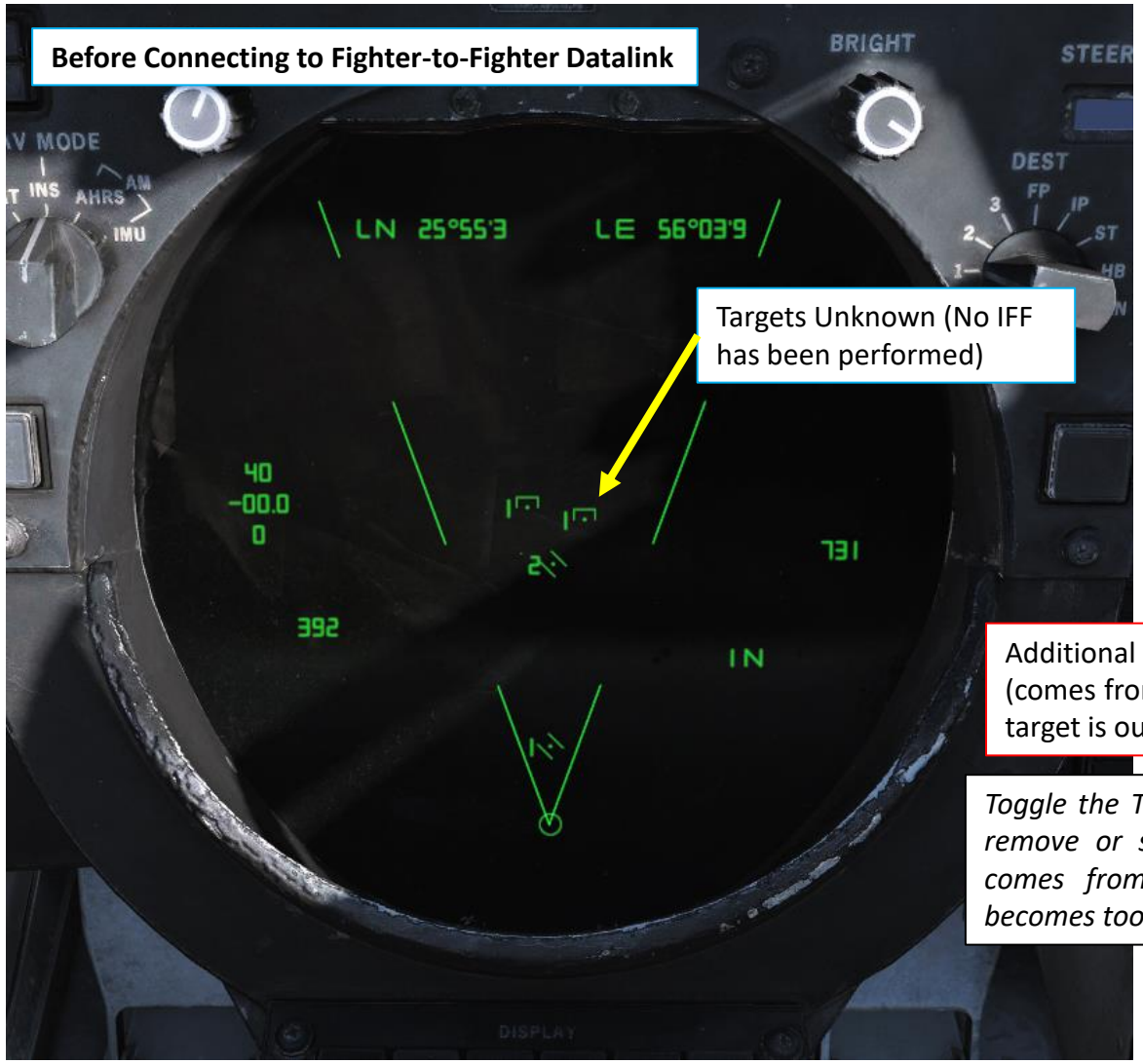




SETTING UP AUX (LINK4C) DATALINK (HUMAN RIO)

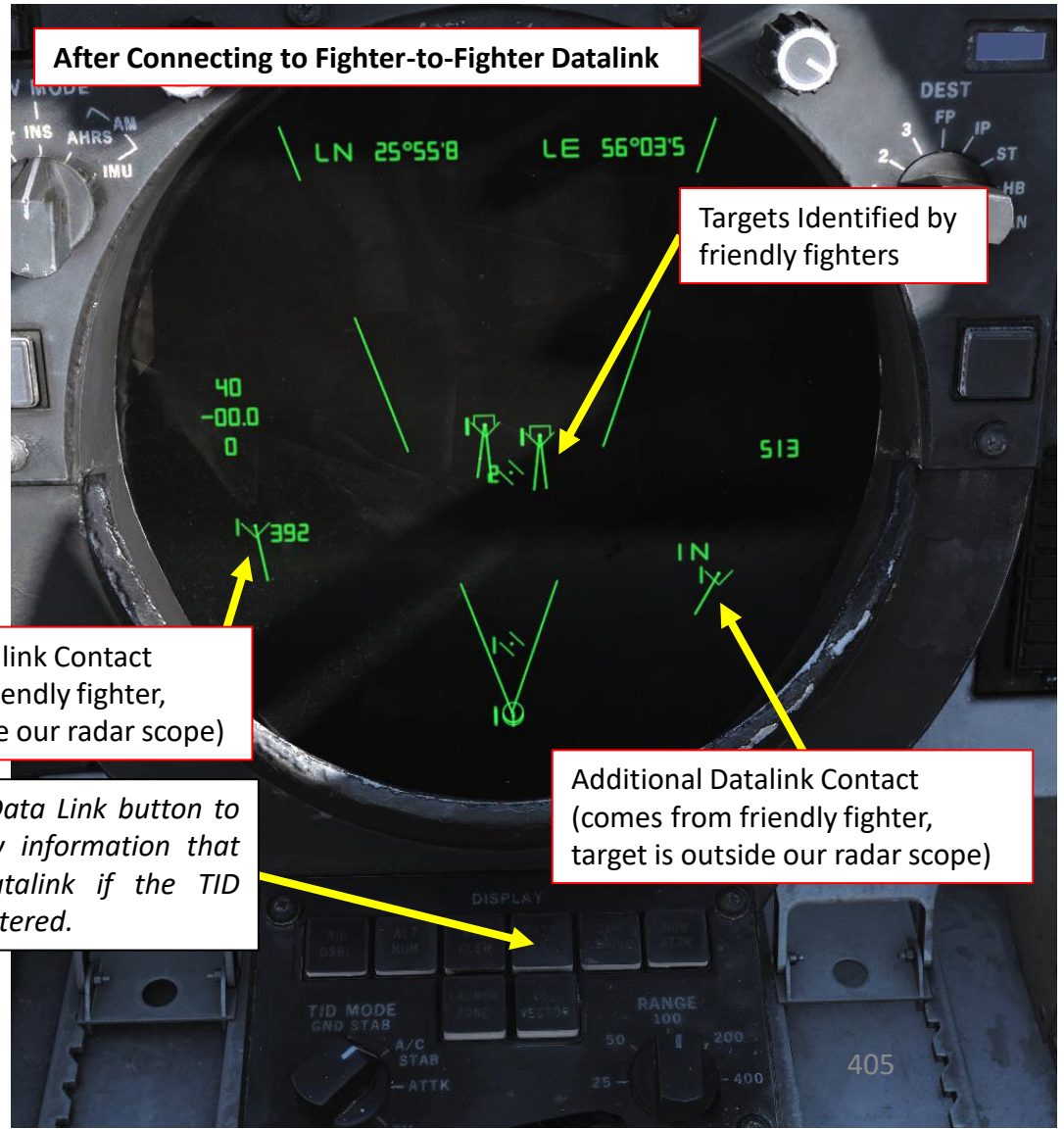
8. And that's it! You will now transmit and receive information to all fighters on this datalink network (Frequency 320.60 Address 05). Data on targets identified by friendly fighters will automatically be displayed on your TID (provided the TID DATA LINK button is pressed in).

Before Connecting to Fighter-to-Fighter Datalink



Targets Unknown (No IFF has been performed)

After Connecting to Fighter-to-Fighter Datalink



Targets Identified by friendly fighters

Additional Datalink Contact (comes from friendly fighter, target is outside our radar scope)

Additional Datalink Contact (comes from friendly fighter, target is outside our radar scope)

Toggle the TID Data Link button to remove or show information that comes from Datalink if the TID becomes too cluttered.

SETTING UP DATALINK (JESTER)

You can set up Datalink Mode and Host with JESTER, or a human RIO can also do this for you. Here is how to do it with JESTER:

1. Set Datalink Mode to the Tactical Datalink System. Use the JESTER Contextual Menu by pressing “A” twice and selecting “DATA LINK RADIO” (LCTRL+7). Then, select “SET MODE” (LCTRL+1) and select “TACTICAL DATALINK SYSTEM” (LCTRL+1) for LINK4A Mode (AWACS, Carrier). You can also select “FIGHTER-TO-FIGHTER” for LINK4C Mode (datalink between a flight of four fighters on the same network).
2. Set Datalink Frequency to the desired network. Use the JESTER Contextual Menu by pressing “A” twice and selecting “DATA LINK RADIO” (LCTRL+7). Then, select “SET HOST” (LCTRL+1) and select desired datalink host (E-2C AWACS, CVN74 Stennis Carrier, etc.).









NOTES ON LINK4 DATALINK

1. At the moment, LINK-4 Datalink is not compatible with the more modern LINK-16 datalink used in the F/A-18C Hornet. This means that information can only be transferred between LINK-4-compatible assets like the F-14 and the E-2 Hawkeye or E-3 Sentry AWACS.

2. Datalink must also be set to the correct frequency for Automatic Carrier Landings and Carrier INS Alignment.

3. When set to TAC the data link will then receive the 8 target tracks with the highest priority from the TDS controller.

4. In Link 4C (AUX), up to four aircraft can participate within a flight and all four aircraft should have different addresses set.





RADIOS - INTRODUCTION

The Tomcat comes equipped with two radio sets: the AN/ARC-159 UHF 1 Radio (controlled by the pilot) and the AN/ARC-182 V/UHF 2 Radio (controlled by the RIO). Interestingly, while the pilot used a standard push-to-talk button on his throttle, the RIO had to press his foot on push-to-talk pedals to communicate.

While the pilot can communicate on the radio on his own, the role of managing communications was typically handled mainly by the RIO. The RIO's radio also had a greater range of available frequencies, which means the RIO could also have additional responsibilities such as acting as a FAC(A), which is a Forward Air Controller (Airborne).



AN/ARC-159 UHF 1 RADIO (PILOT)

UHF 1 Frequencies range from:
- 225.000 MHz to 399.975 MHz.

UHF 1 SQL (Squelch) Switch

UHF 1 Volume Control Knob

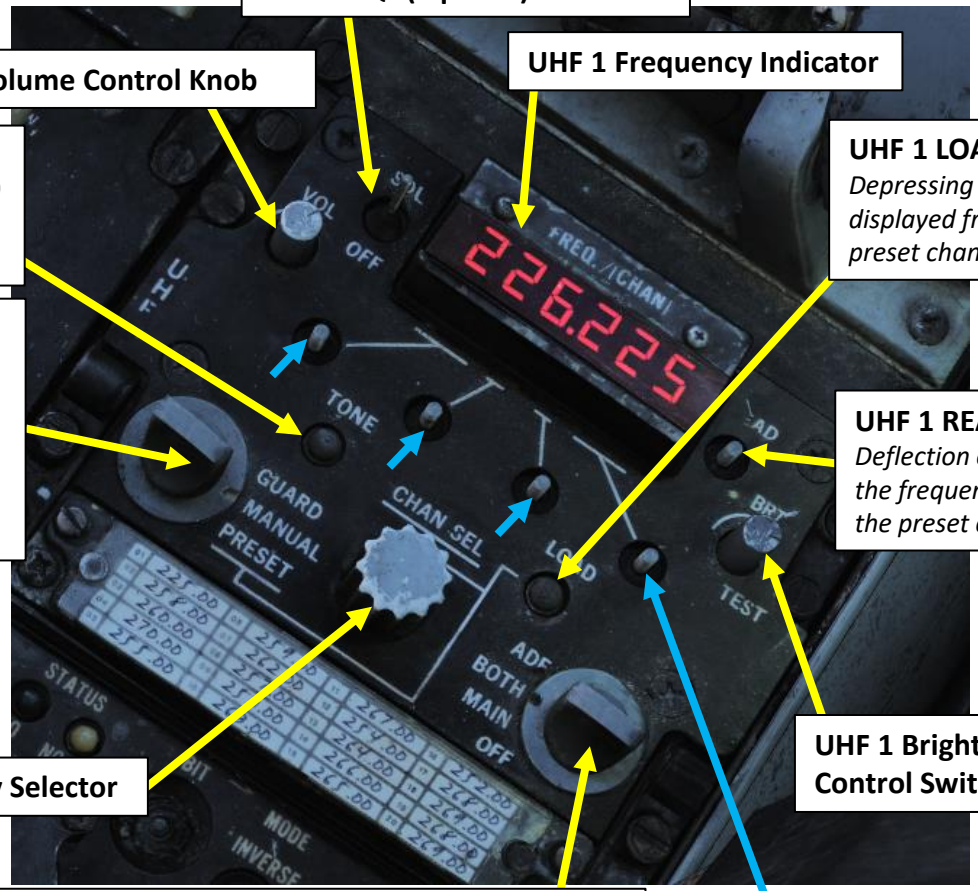
UHF 1 Frequency Indicator

UHF 1 TONE Button
Depressing button causes a steady tone (1020 Hz) to be transmitted on the frequency or channel selected.

UHF 1 LOAD Button
Depressing button saves displayed frequency to selected preset channel

UHF 1 Frequency Mode Selector Switch
- ***GUARD*** *– Guard frequency (243.000 MHz). Permits transmission and reception. In this position, both preset and manual frequency selections are not available.*
- ***MANUAL*** *- Manual frequency selection*
- ***PRESET*** *- Preset frequency selection*

UHF 1 READ Switch
Deflection of the switch causes the frequency display to show the preset channel frequency.

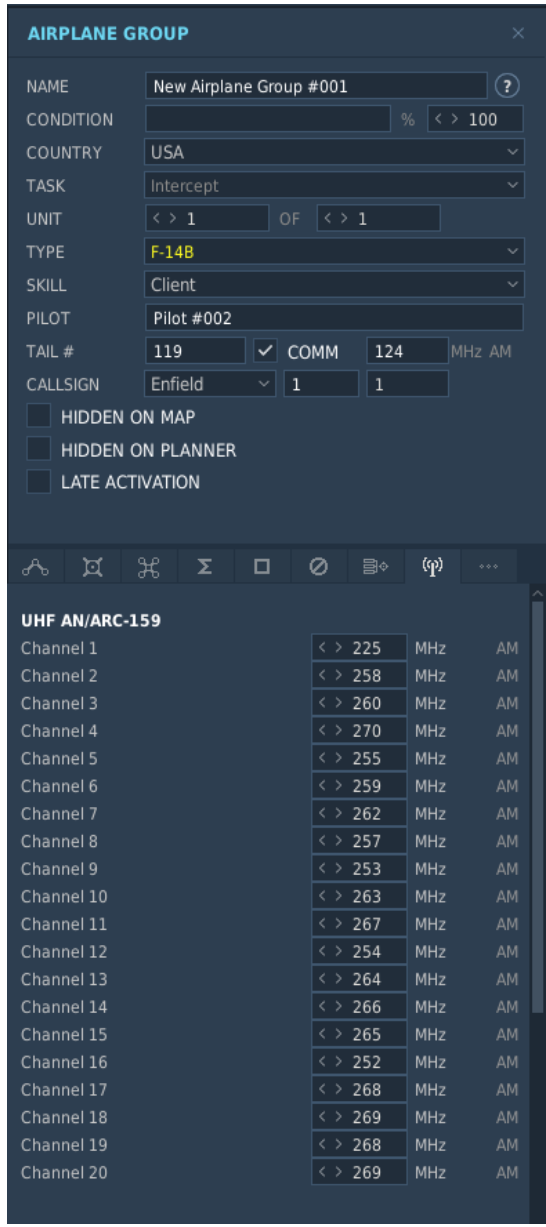


UHF 1 Preset Frequency Selector

UHF 1 Brightness Control Switch

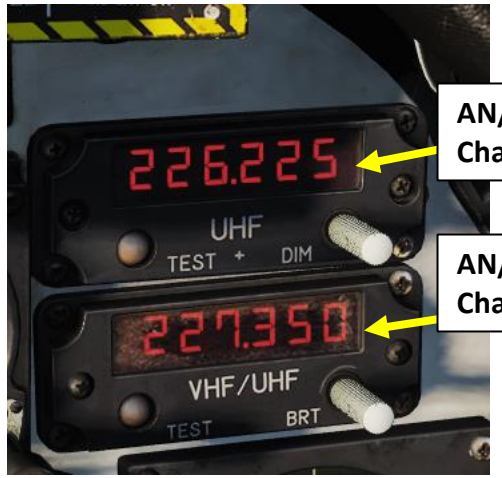
UHF 1 Radio Mode Selector Switch
- ***ADF*** *- UHF 1 ARC-159 ADF (Automatic Direction Finding) function is not functional; use the DF mode of the V/UHF 2 ARC-182*
- ***BOTH*** *- Energizes both the main transceiver and the guard receiver.*
- ***MAIN*** *- Main transceiver is energized permitting normal transmission and reception. Receive or transmit function is selected by the microphone push-to-talk switch.*
- ***OFF***

UHF 1 Frequency Select Switches



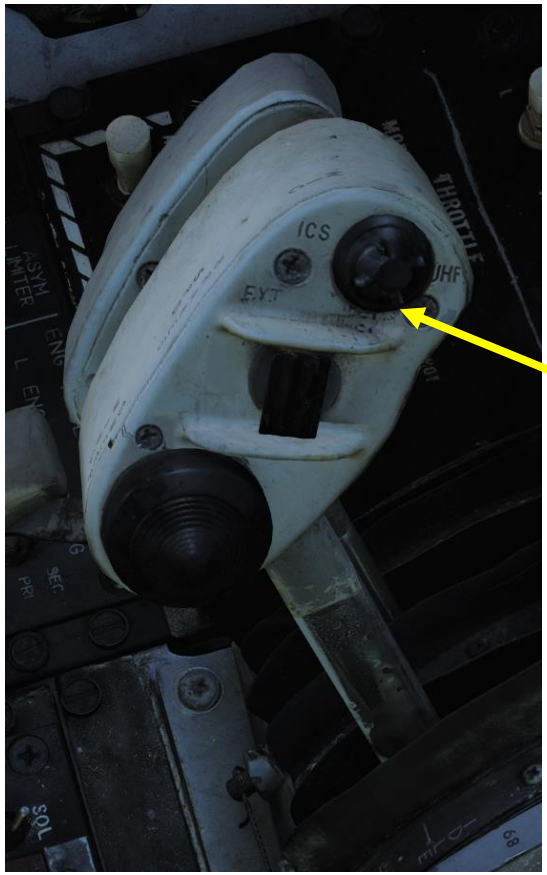
AN/ARC-159 UHF 1 RADIO (PILOT)





AN/ARC-159 UHF 1 Radio Remote Channel/Frequency Indicator

AN/ARC-182 V/UHF 2 Radio Remote Channel/Frequency Indicator

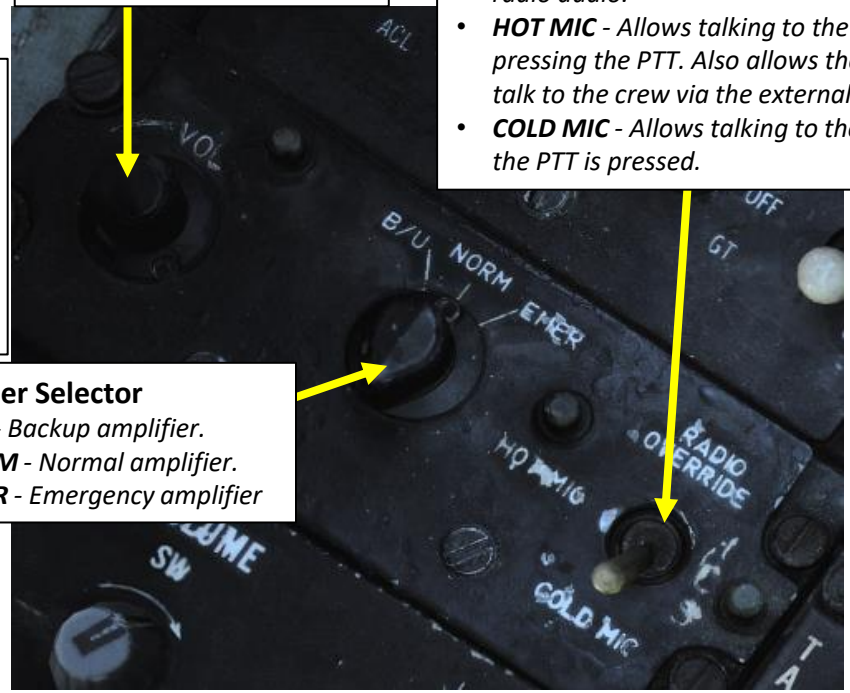


Pilot ICS Push-to-Talk (PTT) Switch

Switch allowing pilot to key one or both radios and intercommunication to RIO.

- ***ICS*** *- Keys intercommunication to RIO.*
- ***BOTH*** *- Keys both UHF 1 and V/UHF 2 for transmission (not simulated).*
- ***UHF1*** *- Keys UHF 1 for transmission.*
- ***UHF2*** *- Keys V/UHF 2 for transmission.*

ICS (Intercommunication System) Volume Control



ICS (Intercommunication System) Switch

- ***RADIO OVERRIDE*** *- Makes ICS audio override radio audio.*
- ***HOT MIC*** *- Allows talking to the RIO without pressing the PTT. Also allows the groundcrew to talk to the crew via the external interphone.*
- ***COLD MIC*** *- Allows talking to the RIO only while the PTT is pressed.*

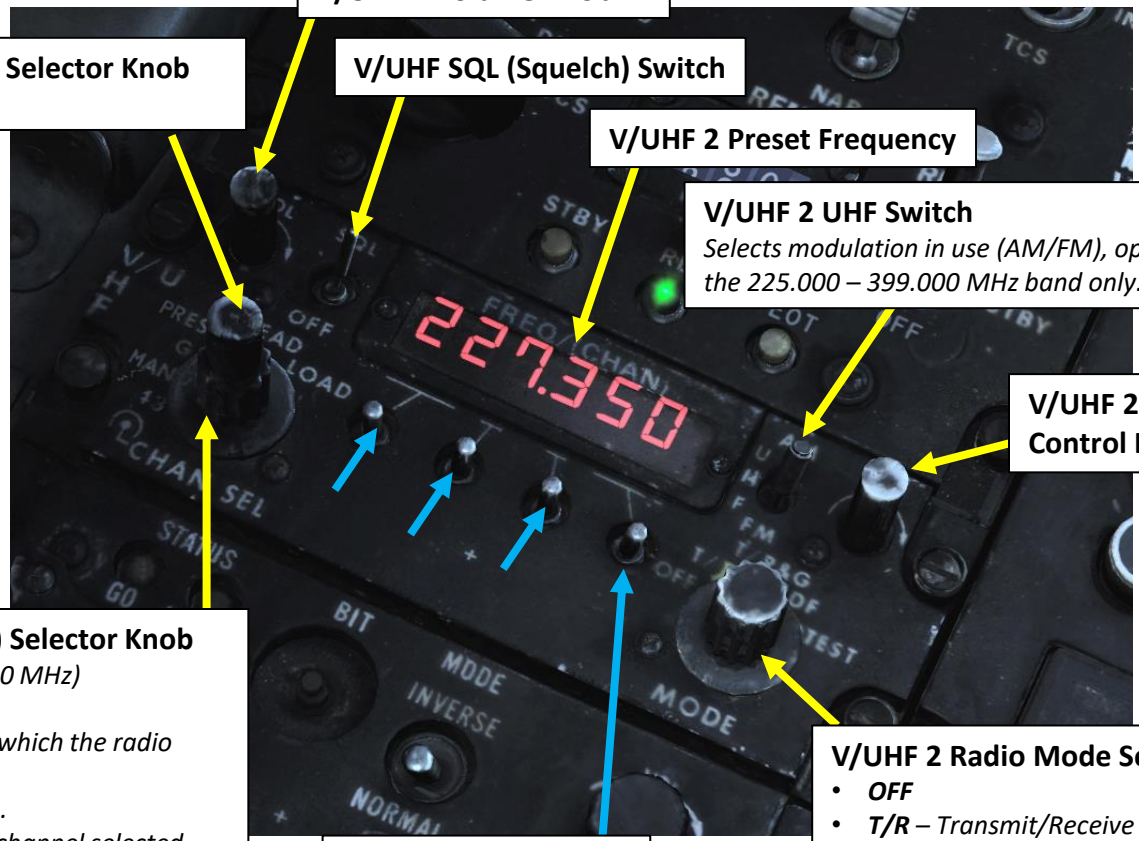
Amplifier Selector

- ***B/U*** *- Backup amplifier.*
- ***NORM*** *- Normal amplifier.*
- ***EMER*** *- Emergency amplifier*

AN/ARC-182 V/UHF 2 RADIO (RIO)

V/UHF 2 frequencies range from:

- VHF 30-88 MHz FM close air support
- VHF 108-118 MHz AM navigation, receive only
- VHF 118-156 MHz AM air traffic control
- VHF 156-174 MHz FM maritime
- UHF 225-400 MHz AM/FM military/NATO



V/UHF 2 Volume Knob

V/UHF 2 Preset Frequency (Inner) Selector Knob
Selects radio preset frequencies

V/UHF SQL (Squelch) Switch

V/UHF 2 Preset Frequency

V/UHF 2 UHF Switch
Selects modulation in use (AM/FM), operational in the 225.000 – 399.000 MHz band only.

V/UHF 2 Brightness Control Knob

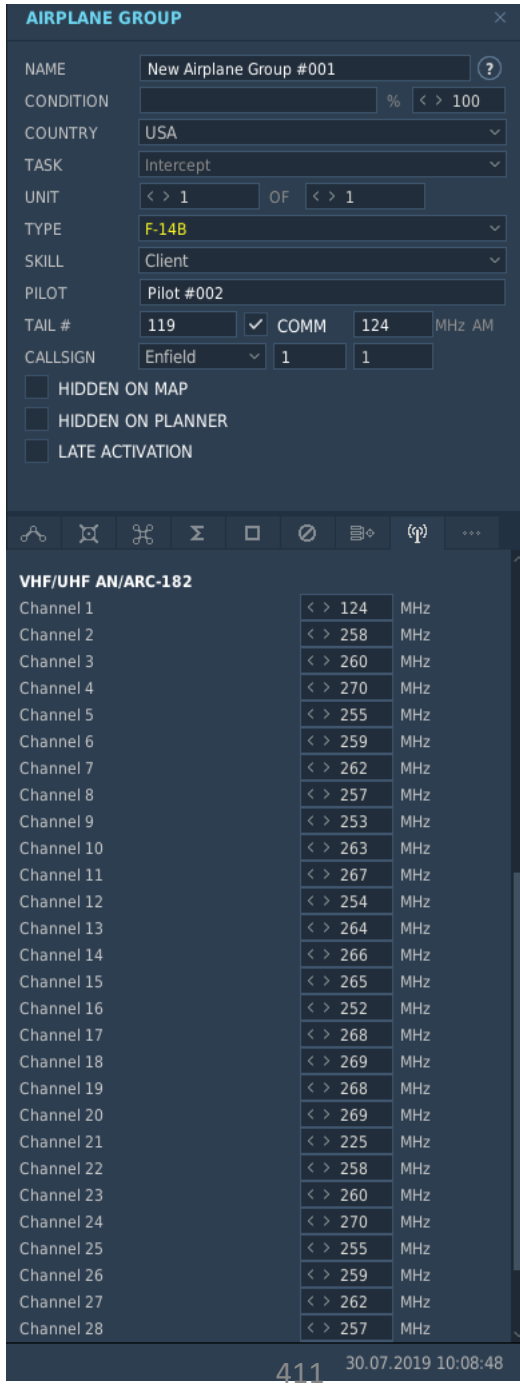
V/UHF 2 Frequency Mode (Outer) Selector Knob

- ***243*** *– UHF Guard frequency (243.000 MHz)*
- ***MAN*** *– Manual frequency selection*
- ***G*** *– Guard frequency in the band to which the radio transmitter was last tuned*
- ***PRESET*** *– Preset frequency selection.*
- ***READ****: Displays frequency of preset channel selected instead of the channel ID number*
- ***LOAD****: Automatically places displayed frequency into the memory of the selected preset channel*

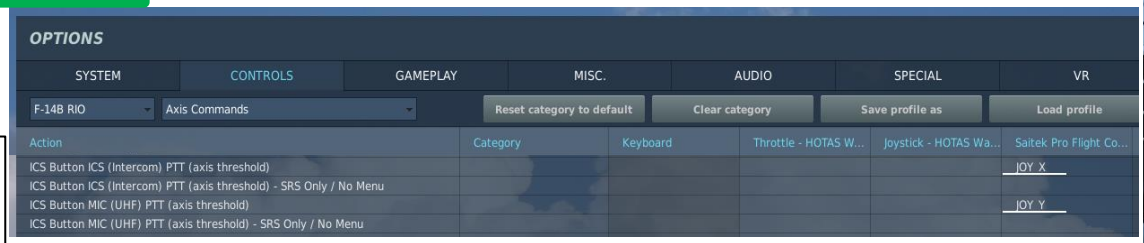
V/UHF 2 Frequency Select Switches

V/UHF 2 Radio Mode Selector Knob

- ***OFF***
- ***T/R*** *– Transmit/Receive*
- ***T/R+G*** *– Transmit/Receive+Guard*
- ***DF*** *– Automatic direction finding from 108.000 to 399.975 MHz*
- ***TEST*** *– Triggers BIT (Built-In Test)*



AN/ARC-182 V/UHF 2 RADIO (RIO)



Transmitter Select Switch
Selects which VHF/UHF radio the RIO PTT keys.
- *UHF 1 - Selects the ARC-159 UHF radio.*
- *BOTH - Selects both radios.*
- *V/UHF 2 - Selects the ARC-182 VHF/UHF radio.*

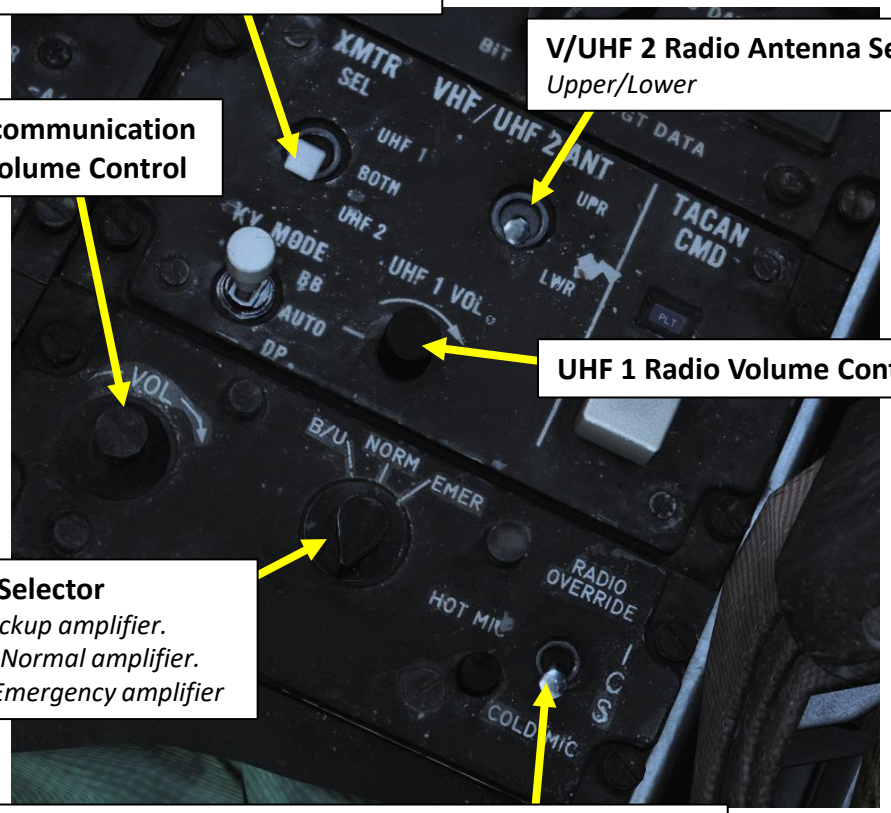


AN/ARC-159 UHF 1 Radio Remote Channel/Frequency Indicator

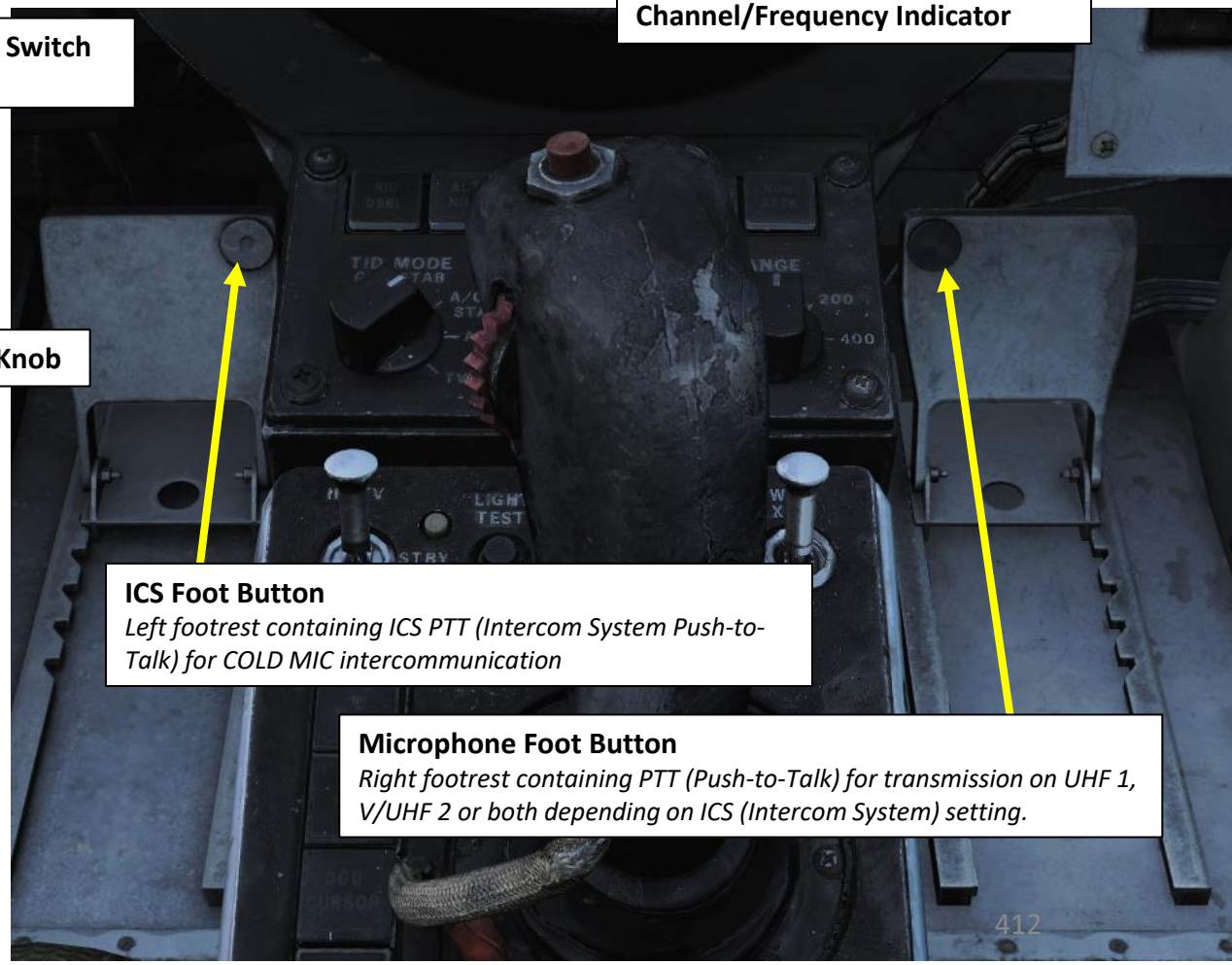
V/UHF 2 Radio Antenna Select Switch
Upper/Lower

ICS (Intercommunication System) Volume Control

UHF 1 Radio Volume Control Knob



Amplifier Selector
- ***B/U*** *- Backup amplifier.*
- ***NORM*** *- Normal amplifier.*
- ***EMER*** *- Emergency amplifier*



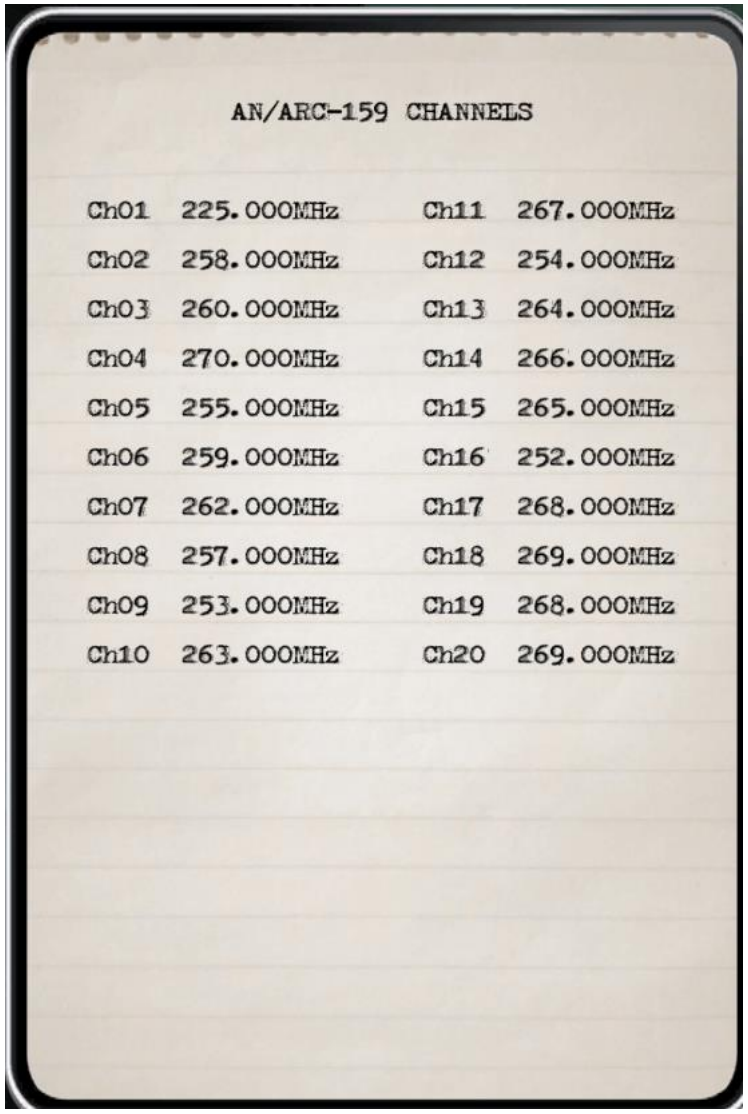
ICS Foot Button
Left footrest containing ICS PTT (Intercom System Push-to-Talk) for COLD MIC intercommunication

Microphone Foot Button
Right footrest containing PTT (Push-to-Talk) for transmission on UHF 1, V/UHF 2 or both depending on ICS (Intercom System) setting.

ICS (Intercommunication System) Switch
- ***RADIO OVERRIDE*** *- Makes ICS audio override radio audio.*
- ***HOT MIC*** *- Allows talking to the Pilot without pressing the PTT. Also allows the groundcrew to talk to the crew via the external interphone.*
- ***COLD MIC*** *- Allows talking to the Pilot only while the PTT is pressed.*

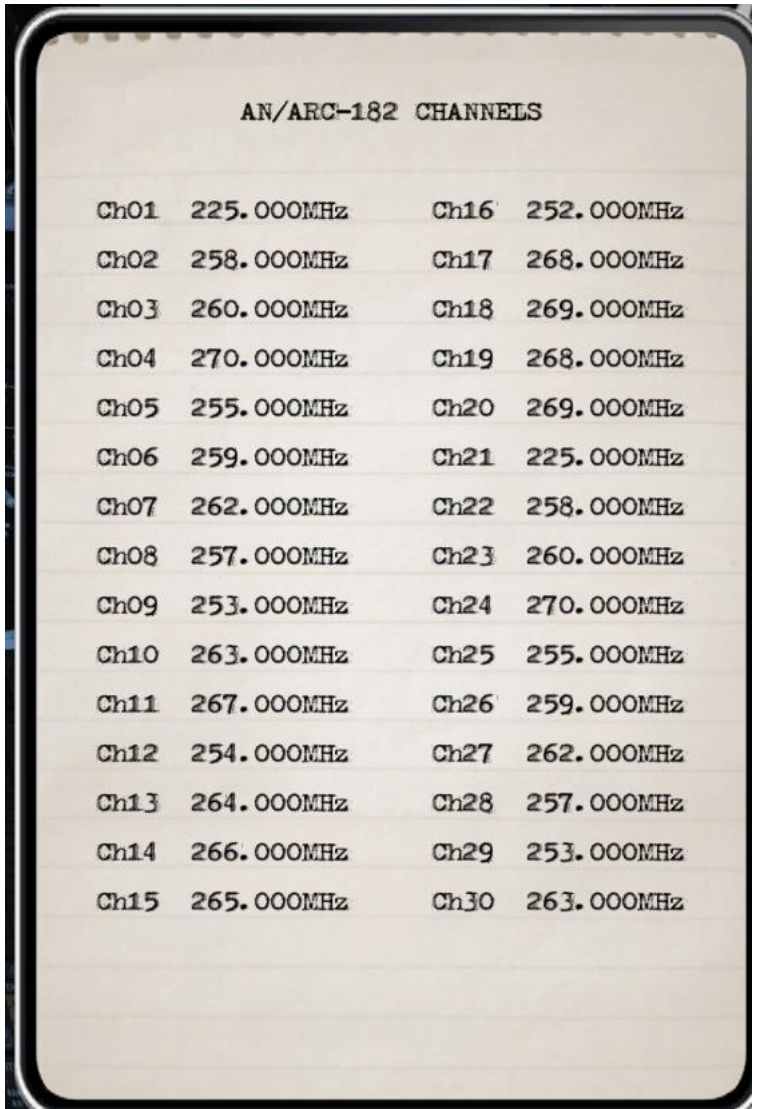
PRACTICAL CONSIDERATIONS

You can open up your kneeboard using “RSHIFT+K” Cycle through pages using the “[“ and “]” (kneeboard previous/next page bindings) to find the ARC-159 and ARC-182 Channels pages. This is helpful to know what frequencies the preset channels are set to.



AN/ARC-159 CHANNELS

Ch01	225.000MHz	Ch11	267.000MHz
Ch02	258.000MHz	Ch12	254.000MHz
Ch03	260.000MHz	Ch13	264.000MHz
Ch04	270.000MHz	Ch14	266.000MHz
Ch05	255.000MHz	Ch15	265.000MHz
Ch06	259.000MHz	Ch16	252.000MHz
Ch07	262.000MHz	Ch17	268.000MHz
Ch08	257.000MHz	Ch18	269.000MHz
Ch09	253.000MHz	Ch19	268.000MHz
Ch10	263.000MHz	Ch20	269.000MHz



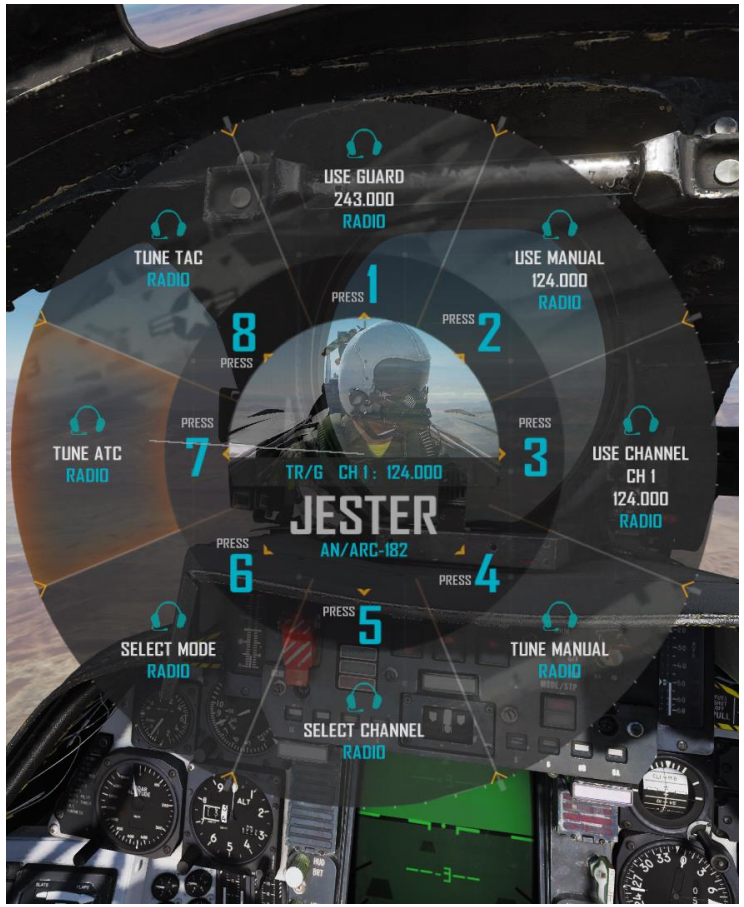
AN/ARC-182 CHANNELS

Ch01	225.000MHz	Ch16	252.000MHz
Ch02	258.000MHz	Ch17	268.000MHz
Ch03	260.000MHz	Ch18	269.000MHz
Ch04	270.000MHz	Ch19	268.000MHz
Ch05	255.000MHz	Ch20	269.000MHz
Ch06	259.000MHz	Ch21	225.000MHz
Ch07	262.000MHz	Ch22	258.000MHz
Ch08	257.000MHz	Ch23	260.000MHz
Ch09	253.000MHz	Ch24	270.000MHz
Ch10	263.000MHz	Ch25	255.000MHz
Ch11	267.000MHz	Ch26	259.000MHz
Ch12	254.000MHz	Ch27	262.000MHz
Ch13	264.000MHz	Ch28	257.000MHz
Ch14	266.000MHz	Ch29	253.000MHz
Ch15	265.000MHz	Ch30	263.000MHz

PRACTICAL CONSIDERATIONS

As the pilot, you can also use JESTER by pressing “A” twice to ask him to set ARC-182 (V/UHF2) radio frequencies. You can choose between preset frequencies, manual frequencies, tactical frequencies (aircraft carriers, AWACS, tankers, etc.) or ATC (Air Traffic Controllers) frequencies.







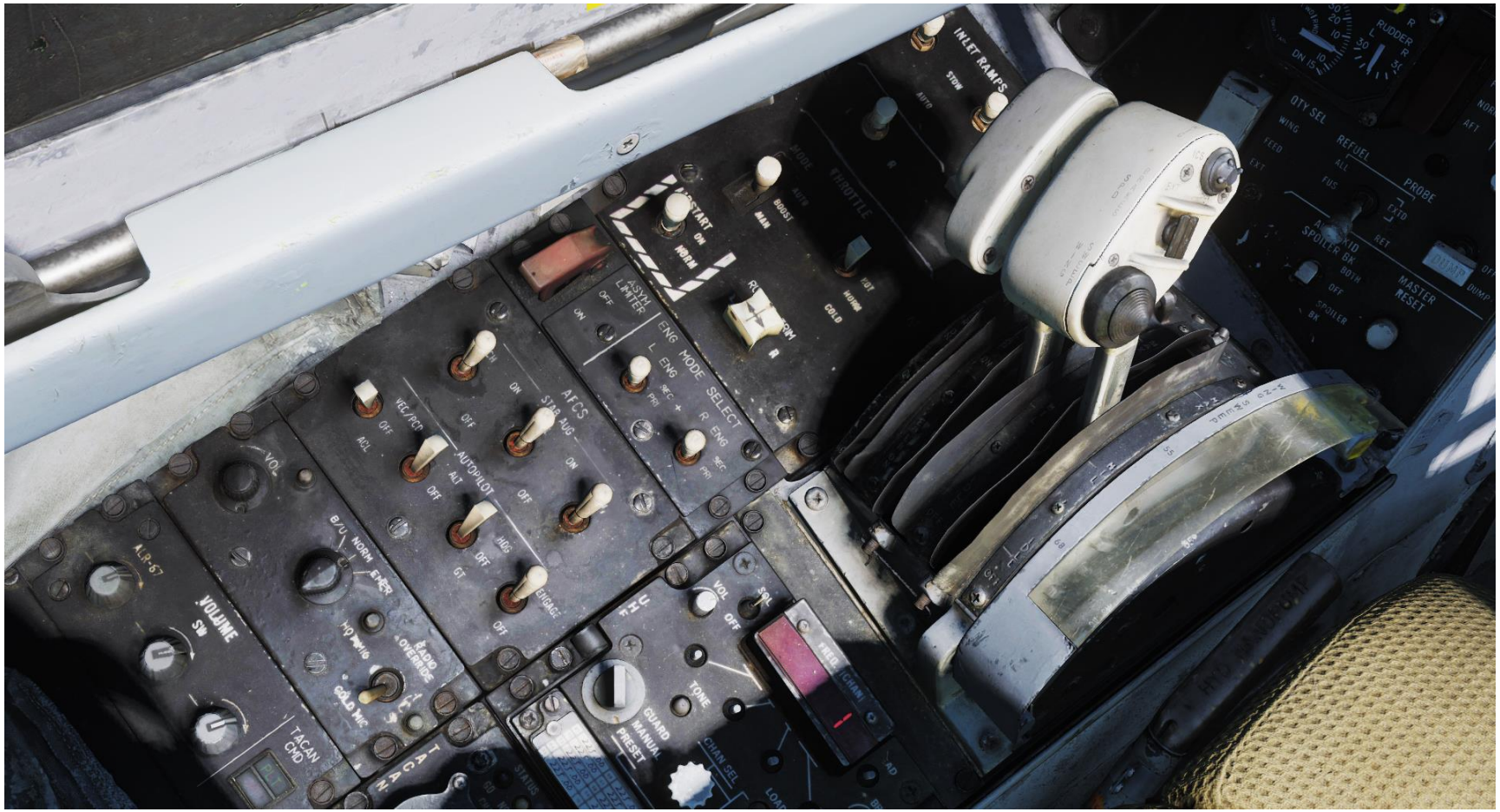
AFCS (AUTOMATIC FLIGHT CONTROL SYSTEM)

The Tomcat has a number of autopilot “relief modes” that assist the pilot in flying the aircraft. You can combine multiple autopilot modes together, in conjunction with the APC (Approach Power Compensator), which is basically an ATC (Automatic Throttle Controller).

Apart from stability augmentation the AFCS is also used to provide autopilot functionality. To use the autopilot all three stabilisation channels must be enabled.

Autopilot modes can also be combined together (i.e. setting a Heading Hold mode in conjunction with an Altitude Hold Mode is possible).

Note: All the autopilot modes can be overriden by enough force on the control stick or by depression of the autopilot emergency disengagement paddle, automatically resetting all autopilot switches to off.



AFCS (AUTOMATIC FLIGHT CONTROL SYSTEM)

AUTOPILOT MODES

- **ATTITUDE HOLD**: Attitude Hold. Aircraft will maintain the existing pitch and roll. Limited to within 30° pitch and 60° roll angles and the aircraft will be automatically moved within this range. Current attitude can be changed with the control stick and will be held when the stick is released.
    a) Ensure Autopilot Altitude Hold Mode switch, VEC/PCD/ACL Autopilot Selector, and Autopilot Heading Mode switch are all set to OFF
    b) Ensure Yaw, Pitch & Roll SAS switches are ON (FWD)
    c) Set Autopilot Switch to ENGAGE (FWD)

- **ALTITUDE HOLD**: Barometric Altitude Hold. When engaged, aircraft will maintain current heading and barometric altitude.
    a) Ensure Yaw, Pitch & Roll SAS switches are ON (FWD)
    b) Set Autopilot Switch to ENGAGE (FWD)
    c) Set Autopilot Altitude Hold Mode switch to ALT (FWD)
    d) Wait for the A/P REF warning light on the left side of the Vertical Display Indicator (VDI) to illuminate
    e) Press the Autopilot Reference/Nosewheel Steering button on the control stick to set the current altitude as the reference altitude.

- **HEADING HOLD**: Aircraft will maintain your current magnetic heading. Maneuver the aircraft to desired heading and with a bank angle of less than 5° to set heading.
    a) Ensure Yaw, Pitch & Roll SAS switches are ON (FWD)
    b) Set Autopilot Switch to ENGAGE (FWD)
    c) Set Autopilot Heading Mode switch to HDG (FWD)

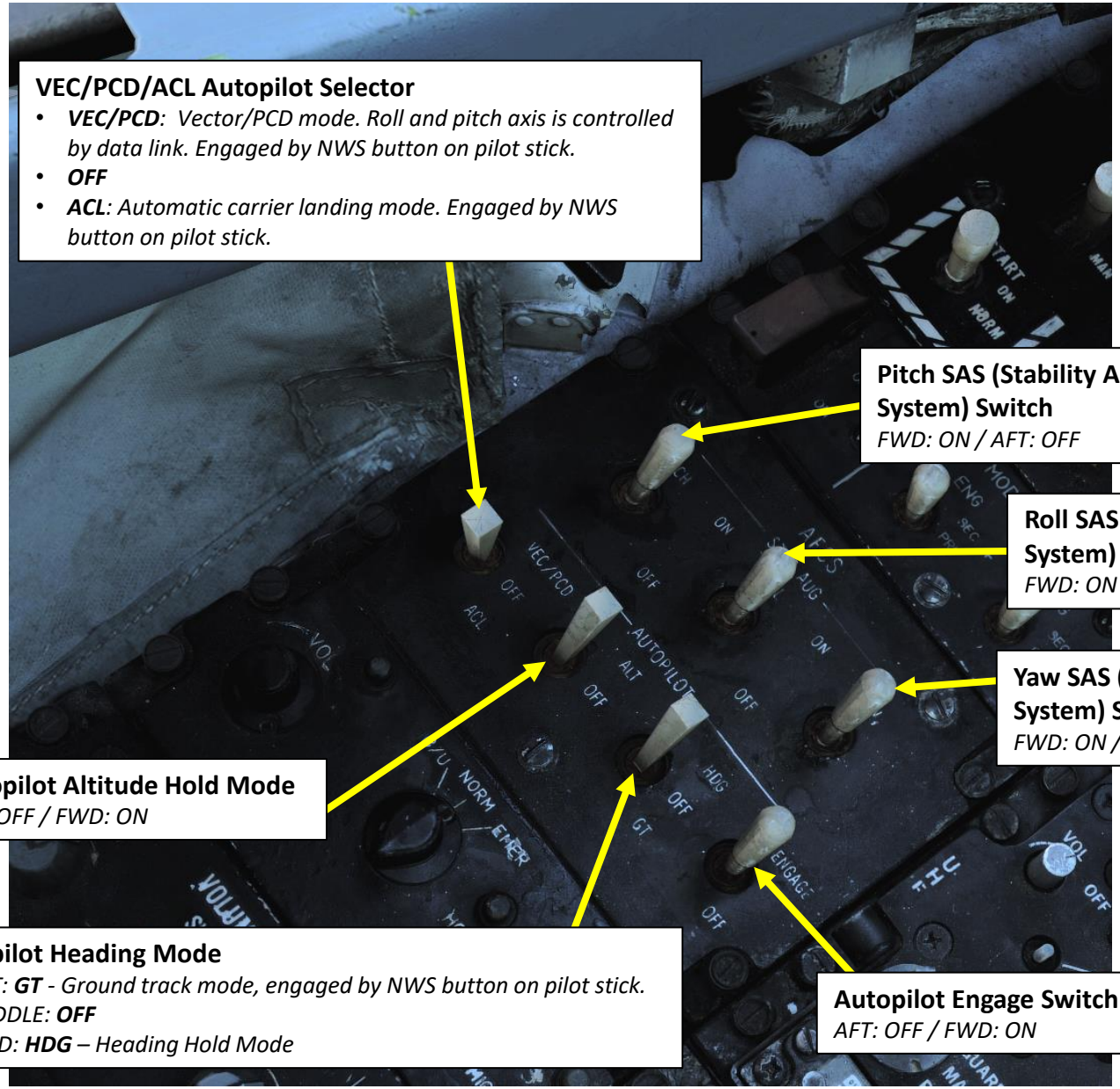
- **GROUND TRACK**: Ground track mode sets the autopilot to follow a ground track by compensating for aircraft wind drift (similar to heading hold). This mode uses INS (Inertial Navigation System) data instead of the magnetic compass heading.
    a) Ensure Yaw, Pitch & Roll SAS switches are ON (FWD)
    b) Set Autopilot Switch to ENGAGE (FWD)
    c) Set Autopilot Heading Mode switch to GT (AFT)
    d) Wait for the A/P REF warning light on the left side of the Vertical Display Indicator (VDI) to illuminate
    e) Press the Autopilot Reference/Nosewheel Steering button on the control stick to engage autopilot in Ground Track Mode.

- **VECTOR/PCD**: Datalink Vector / Precision Course Direction. Used to allow a Link 4 controller to remotely control the aircraft. This is not modelled in DCS.

- **ACL**: Automatic Carrier Landing. See ACLS section for more information.

AFCS (AUTOMATIC FLIGHT CONTROL SYSTEM)

AUTOPILOT MODES



VEC/PCD/ACL Autopilot Selector
- ***VEC/PCD***: *Vector/PCD mode. Roll and pitch axis is controlled by data link. Engaged by NWS button on pilot stick.*
- ***OFF***
- ***ACL***: *Automatic carrier landing mode. Engaged by NWS button on pilot stick.*

Pitch SAS (Stability Augmentation System) Switch
FWD: ON / AFT: OFF

Roll SAS (Stability Augmentation System) Switch
FWD: ON / AFT: OFF

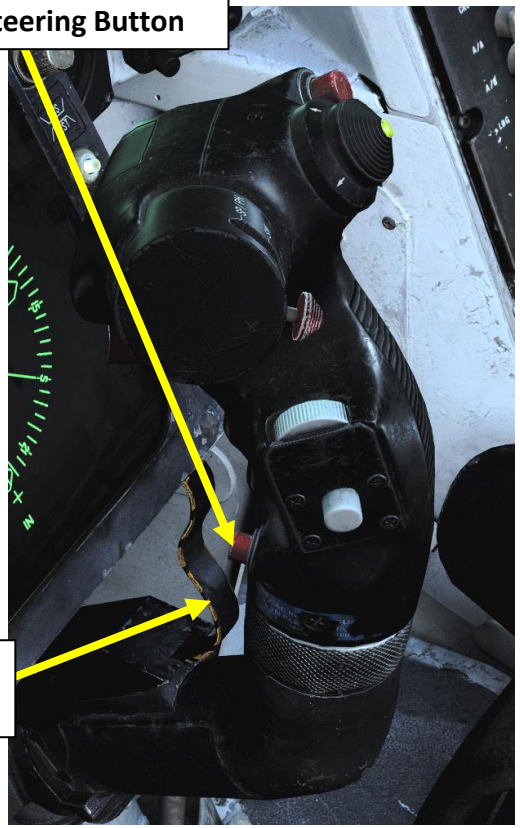
Yaw SAS (Stability Augmentation System) Switch
FWD: ON / AFT: OFF

Autopilot Altitude Hold Mode
AFT: OFF / FWD: ON

Autopilot Heading Mode
- *AFT: **GT** - Ground track mode, engaged by NWS button on pilot stick.*
- *MIDDLE: **OFF***
- *FWD: **HDG** – Heading Hold Mode*

Autopilot Engage Switch
AFT: OFF / FWD: ON

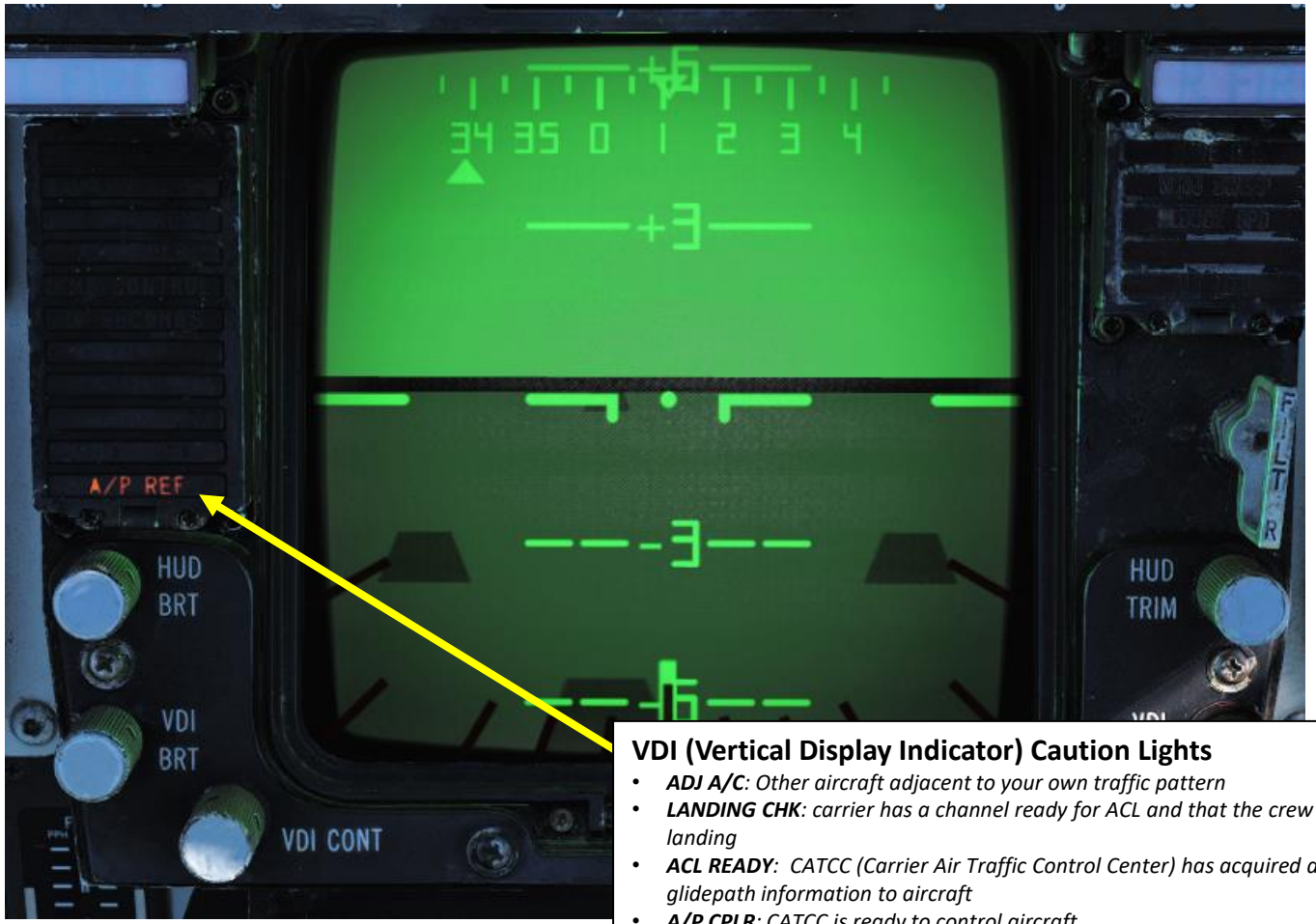
Autopilot Reference / Nosewheel Steering Button

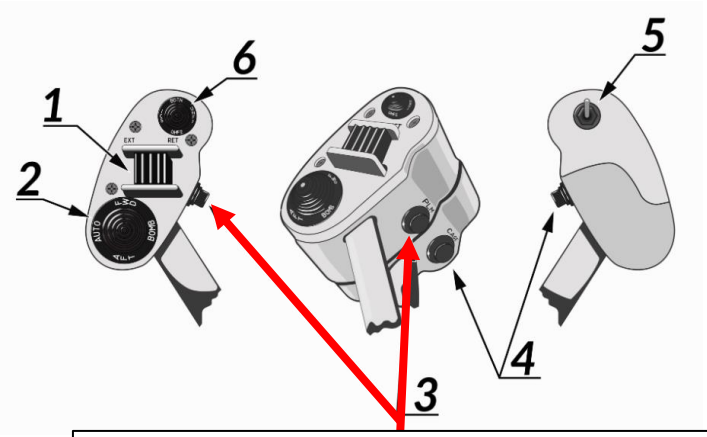


Autopilot Emergency Disengage Paddle

AFCS (AUTOMATIC FLIGHT CONTROL SYSTEM)

AUTOPILOT MODES





PLM Button
Button used to command pilot lockon mode of AWG-9. Also used to disengage autopilot while in ACL (Automatic Carrier Landing).

VDI (Vertical Display Indicator) Caution Lights

- ***ADJ A/C****: Other aircraft adjacent to your own traffic pattern*
- ***LANDING CHK****: carrier has a channel ready for ACL and that the crew should prepare for carrier landing*
- ***ACL READY****: CATCC (Carrier Air Traffic Control Center) has acquired aircraft and is transmitting glidepath information to aircraft*
- ***A/P CPLR****: CATCC is ready to control aircraft*
- ***CMD CONTROL****: aircraft is under data link control for landing*
- ***10 SECONDS****: indicates that carrier motion is added to data link info and commands during landing. Indicates 10 seconds to arrival at the next point in approach pattern in other modes.*
- ***TILT****: no data link command received for the last 2 seconds during ACL (Automatic Carrier Landing)*
- ***VOICE****: CATCC not ready for ACL, switch to standard voice procedures*
- ***AUTO THRO****: Auto throttle system is disengaged by other means than the throttle mode switch.*
- ***A/P REF****: autopilot selected but not engaged. Exception altitude and heading hold.*

APC (APPROACH POWER COMPENSATOR) / AUTOTHROTTLE

The Approach Power Compensator (APC) mode or the auto throttle mode is a system that allows for automatic throttle control for optimal angle-of-attack during approaches. Basically, the **auto-throttle will adjust power to maintain an ON SPEED AoA**.

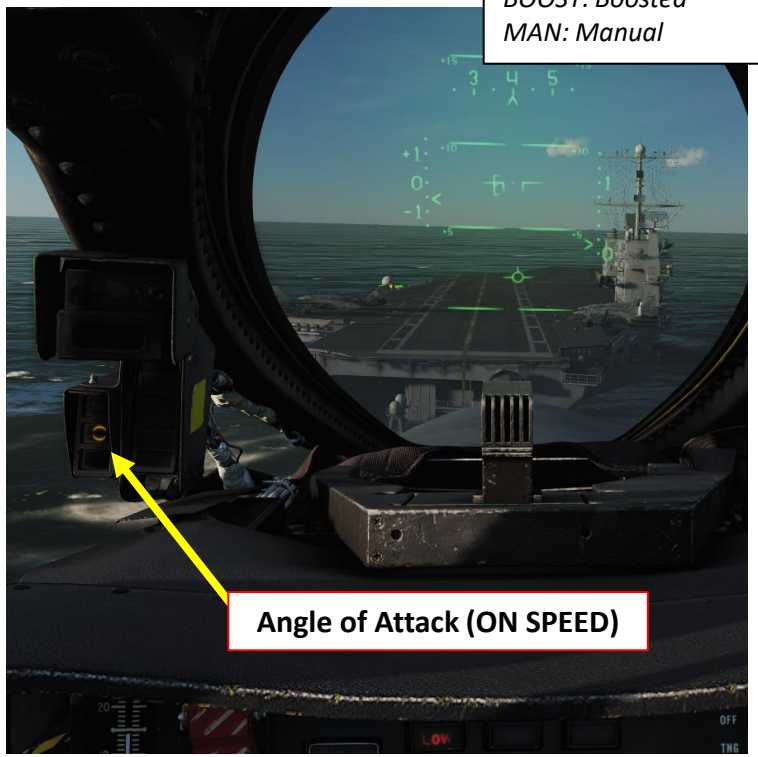
The auto throttle mode is solenoid held and will revert to boost mode if the criteria for automatic controls are not met.

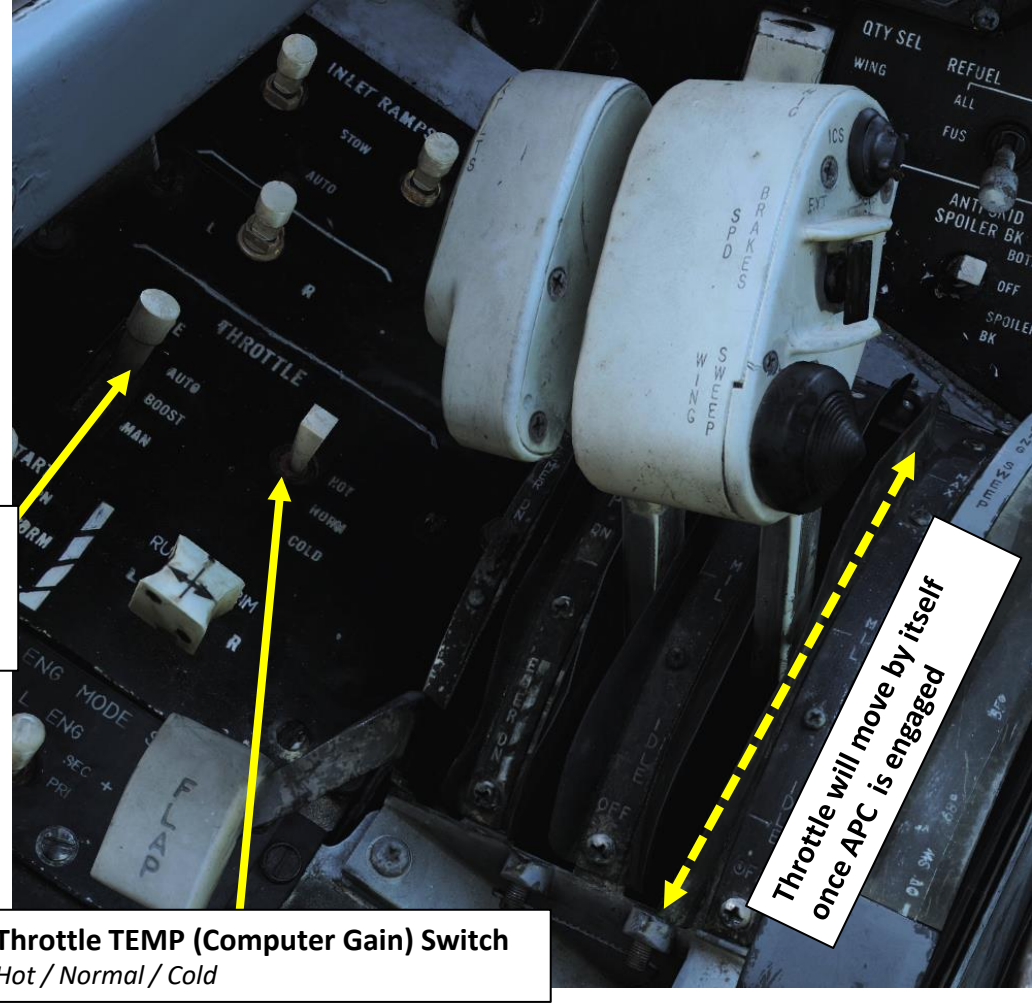
To allow selection of APC AUTO mode (**set Throttle Mode switch to AUTO/FWD**) :

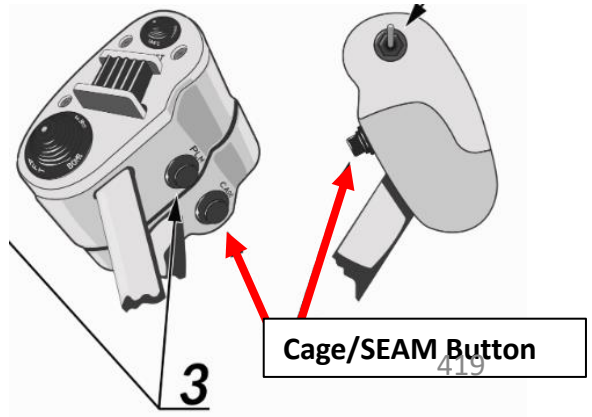
- **Throttles need to be between 75 to 90% rpm**
- **Landing gear handle needs to be down**
- **No weight on the wheels (in flight)**

If these criteria are no longer met, the throttles are manually overriden with force on the throttles or the Cage/SEAM button on the left throttle is depressed. When disengaging APC, the solenoid releases the switch and throttle mode reverts to Boost.

For additional auto-throttle tune the gain of the system can be set on the inlet ramps/throttle control panel. The settings are hot, normal or cold with hot increasing the throttle gain (and effective thrust) and cold decreasing it. These settings correspond to cold or hot external temperatures but should be set according to observed throttle control.







ICEMAN PILOT AI

If you are in Single Player and occupy the RIO seat, you can give the AI Pilot “ICEMAN” some basic commands to set heading, speed and altitude (angels). Take note that ICEMAN will not be able to takeoff, land or fight while you are in the RIO seat.



NAVIGATION SUMMARY

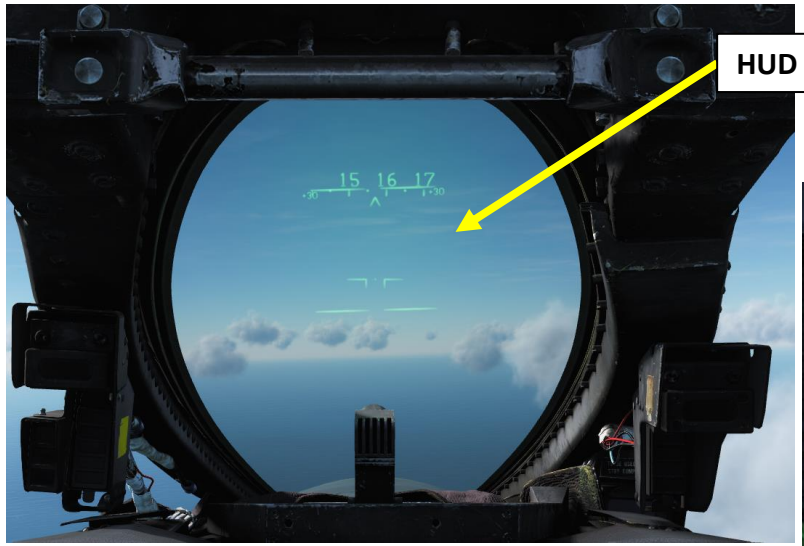
Navigation in the F-14 is a two-man job. The pilot can steer the aircraft towards a waypoint selected by the RIO, but it is the RIO's thankless task to input coordinates manually. This navigation section will be divided in sub-sections.

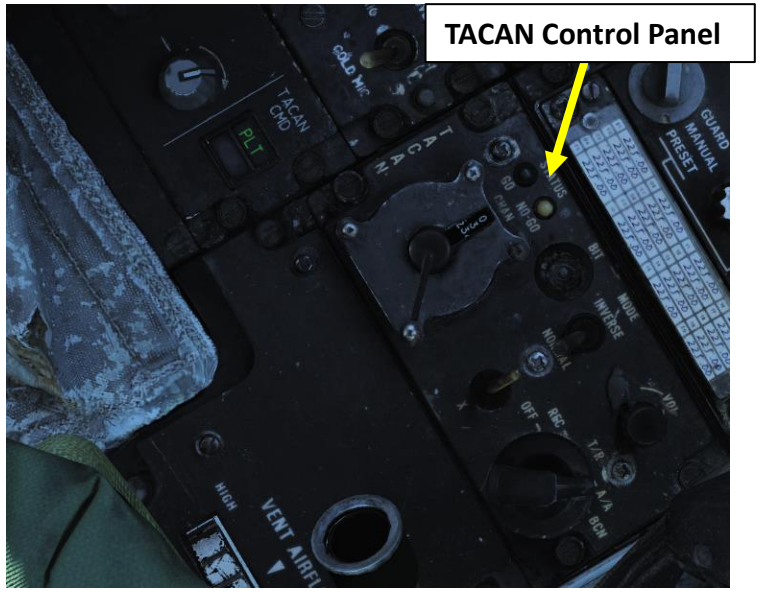
1. Introduction
2. Reference Point Types
3. How to Enter Waypoints (JESTER)
4. How to Enter Waypoints (RIO)
5. Waypoint Navigation (JESTER)
6. Waypoint Navigation (RIO)
7. TACAN Navigation
8. VOR & ADF Navigation
9. Bullseye & NAVGRID
10. ACLS Landing / Case III Recovery



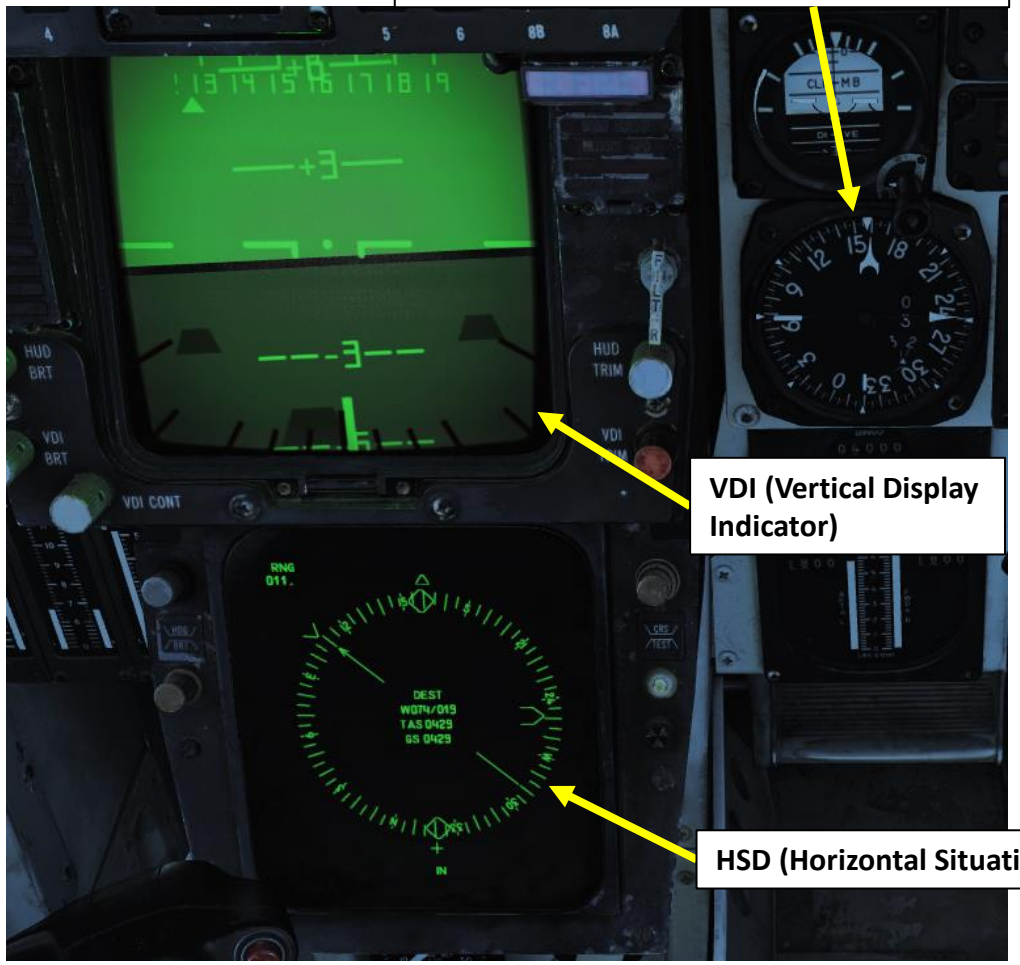
1 - INTRODUCTION

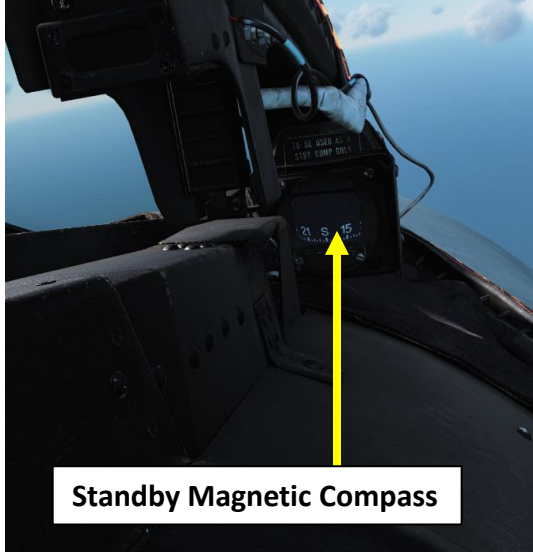
PILOT Cockpit





BDHI (Bearing Distance Heading Indicator)
Displays indicating azimuth and bearing information (including TACAN)







1 - INTRODUCTION

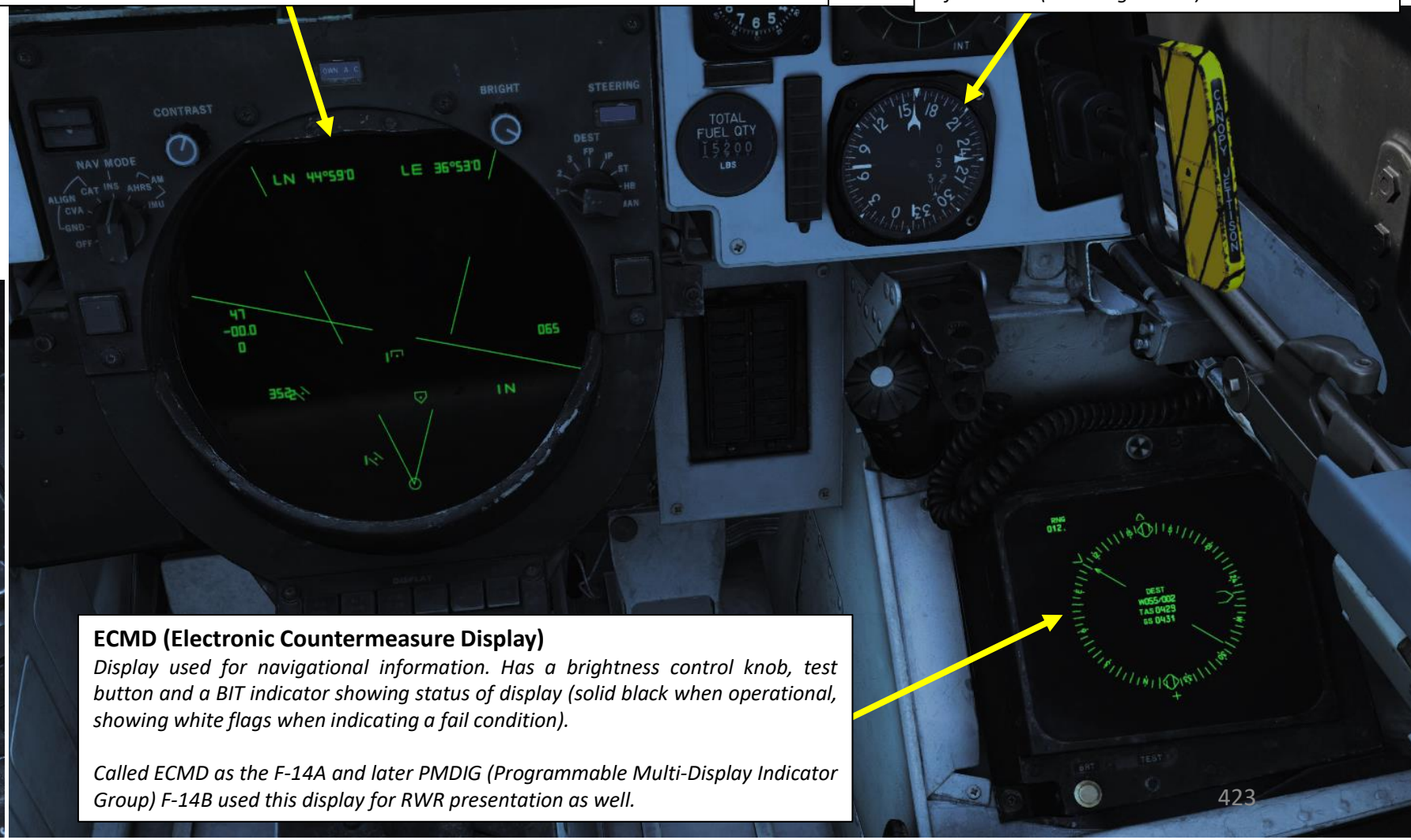
RIO Cockpit

TID (Tactical Information Display)
The TID is the main data display for the WCS (Weapon Control System). It displays a tactical picture to the RIO which is used to identify and select targets for the long range weapons on the F-14 Tomcat. Think of it as a top down map showing the relative coordinates of all presented tracks and symbols, but without a representation of the ground/surface features (map). It is also used in secondary roles as a display for entering data into the WCS, for navigation, for INS alignment and for the on board checkout, OBC.

BDHI (Bearing Distance Heading Indicator)
Displays indicating azimuth and bearing information (including TACAN)

TACAN Control Panel



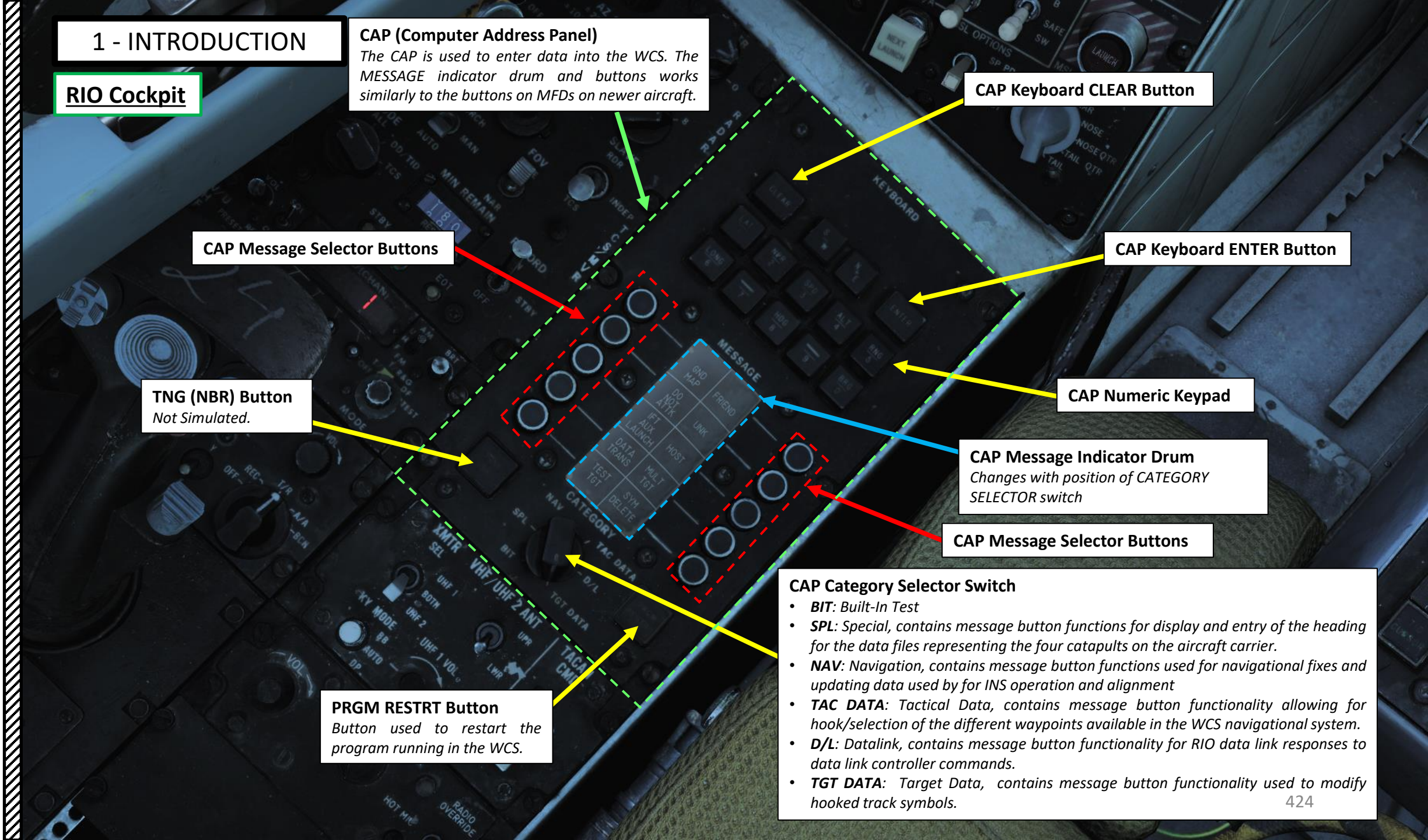


ECMD (Electronic Countermeasure Display)
Display used for navigational information. Has a brightness control knob, test button and a BIT indicator showing status of display (solid black when operational, showing white flags when indicating a fail condition).

Called ECMD as the F-14A and later PMDIG (Programmable Multi-Display Indicator Group) F-14B used this display for RWR presentation as well.

1 - INTRODUCTION

RIO Cockpit



CAP (Computer Address Panel)
The CAP is used to enter data into the WCS. The MESSAGE indicator drum and buttons works similarly to the buttons on MFDs on newer aircraft.

CAP Keyboard CLEAR Button

CAP Message Selector Buttons

CAP Keyboard ENTER Button

TNG (NBR) Button
Not Simulated.

CAP Numeric Keypad

CAP Message Indicator Drum
Changes with position of CATEGORY SELECTOR switch

CAP Message Selector Buttons

PRGM RESTRT Button
Button used to restart the program running in the WCS.

CAP Category Selector Switch

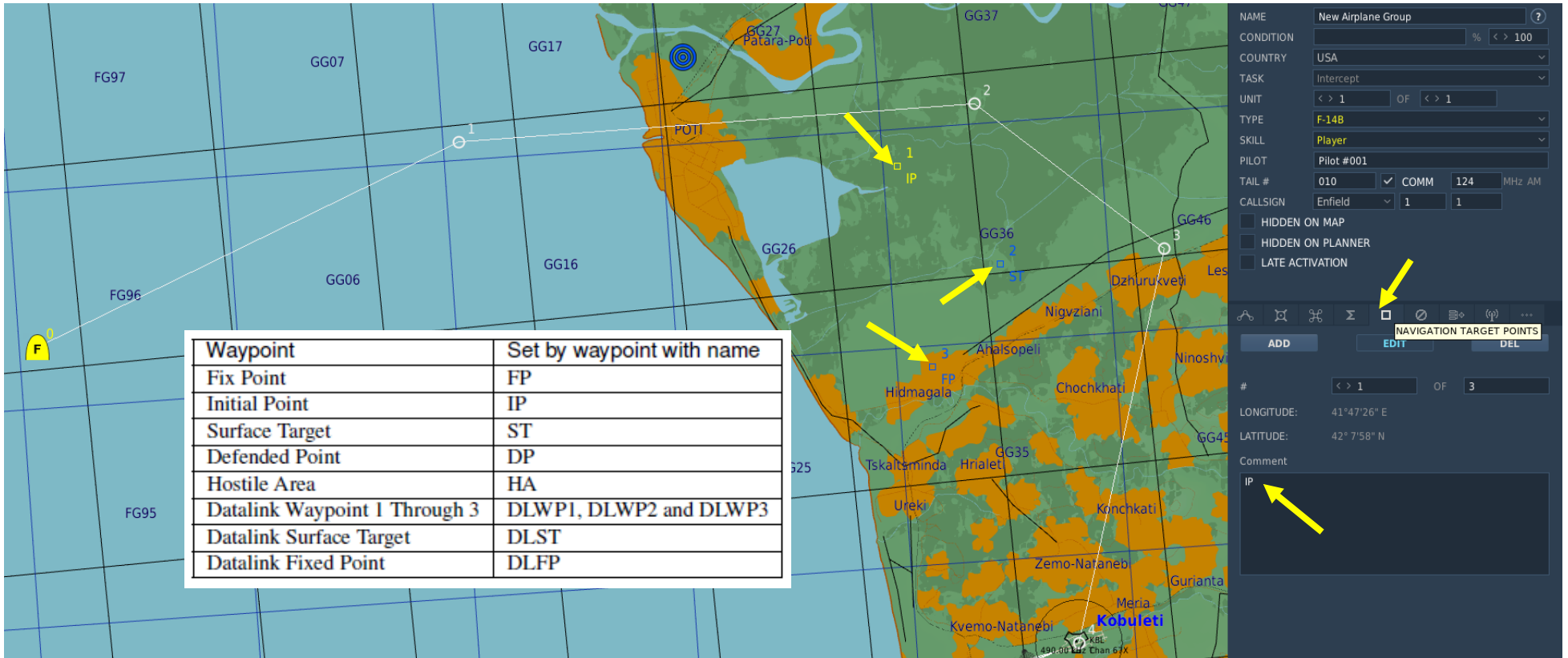
- ***BIT**: Built-In Test*
- ***SPL**: Special, contains message button functions for display and entry of the heading for the data files representing the four catapults on the aircraft carrier.*
- ***NAV**: Navigation, contains message button functions used for navigational fixes and updating data used by for INS operation and alignment*
- ***TAC DATA**: Tactical Data, contains message button functionality allowing for hook/selection of the different waypoints available in the WCS navigational system.*
- ***D/L**: Datalink, contains message button functionality for RIO data link responses to data link controller commands.*
- ***TGT DATA**: Target Data, contains message button functionality used to modify hooked track symbols.*

2 – REFERENCE POINT TYPES

The F-14 has the ability to store three waypoints, a fixed point (FP), an initial point (IP), a surface target (ST), a home base (HB), a defended point and a hostile area. Waypoints are dedicated for navigation purposes, but the other reference point types are used for other purposes. The coordinates of these points can be entered in the Mission Editor, or by JESTER or by the RIO manually.

- **Navigation Waypoints**: Used for navigation. A maximum of three waypoints can be stored at once.
- **Fixed Point** (FP): Used as an arbitrary point in space used to establish current position calculated by referring to external references
- **Initial Point** (IP): Often used as a starting reference point for a bombing run to a target
- **Surface Target** (ST): Used as coordinates for a ground target (i.e. an enemy bunker)
- **Defended Point** (DP) / MAN (Manual): Used as an area to protect (i.e. friendly troops on the ground)
- **Hostile Area** (HA): Used as coordinates for an area with known hostiles on the ground or in the air.
- **Home Base** (HB): Airfield or carrier that will be used to land.

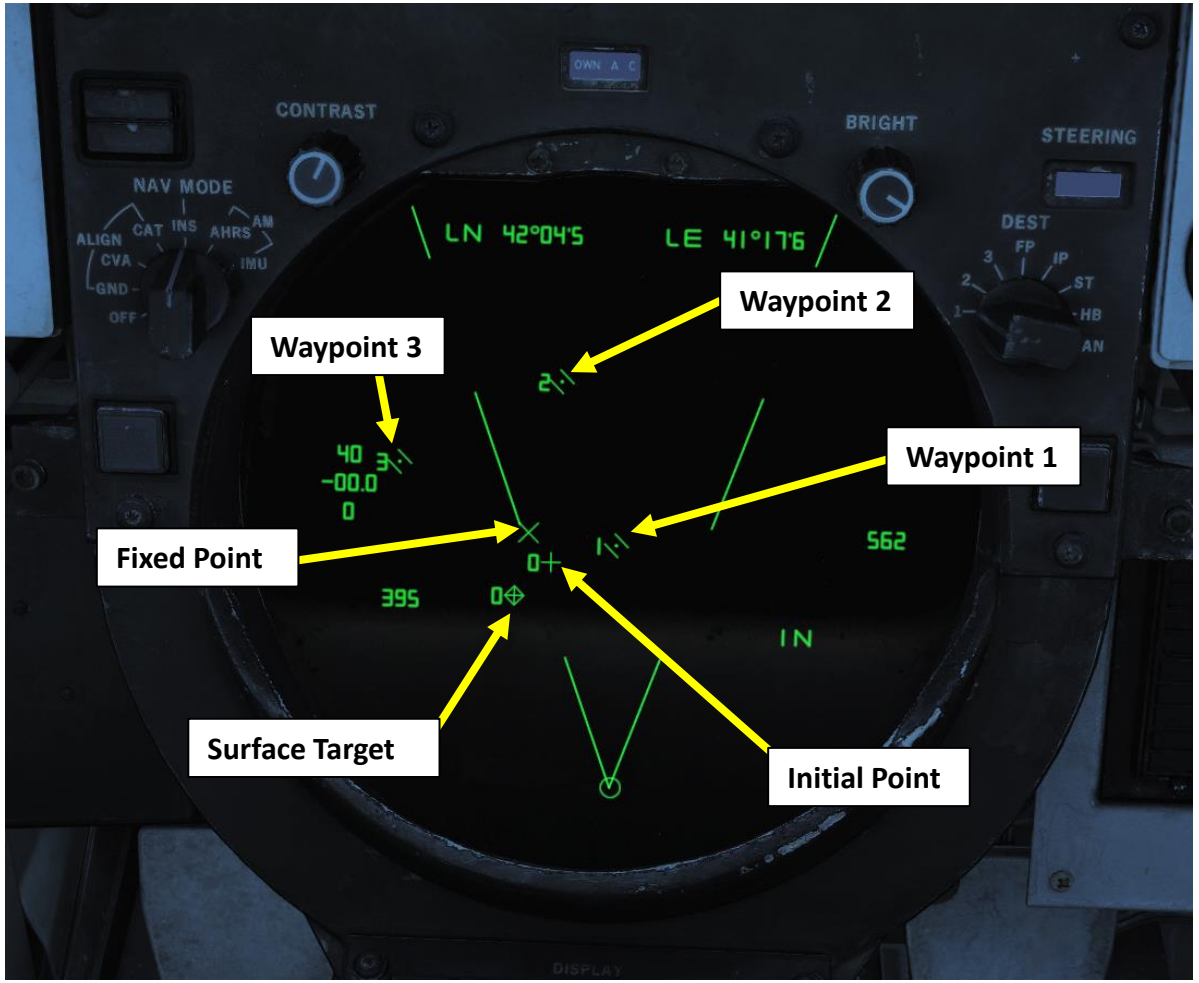


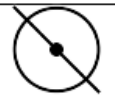
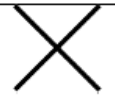
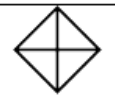
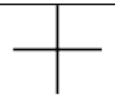


Waypoint	Set by waypoint with name
Fix Point	FP
Initial Point	IP
Surface Target	ST
Defended Point	DP
Hostile Area	HA
Datalink Waypoint 1 Through 3	DLWP1, DLWP2 and DLWP3
Datalink Surface Target	DLST
Datalink Fixed Point	DLFP

2 – REFERENCE POINT TYPES

All these different points can be monitored on the TID.



	Manually Entered Reference Points	
Home base		Waypoint representing home base, carrier or airfield.
Waypoint		WCS navigational waypoint, supplanted by number indicating waypoint 1, 2 or 3.
Defended Point		Waypoint used to show area to protect.
Fix Point		Generic fix-point waypoint.
Hostile Area		Waypoint indicating a hostile area.
Surface Target		Waypoint indicating a surface target.
IP		Waypoint used for air-to-ground engagement, see *Computer Initial Point*.

3 - WAYPOINT ENTRY - JESTER

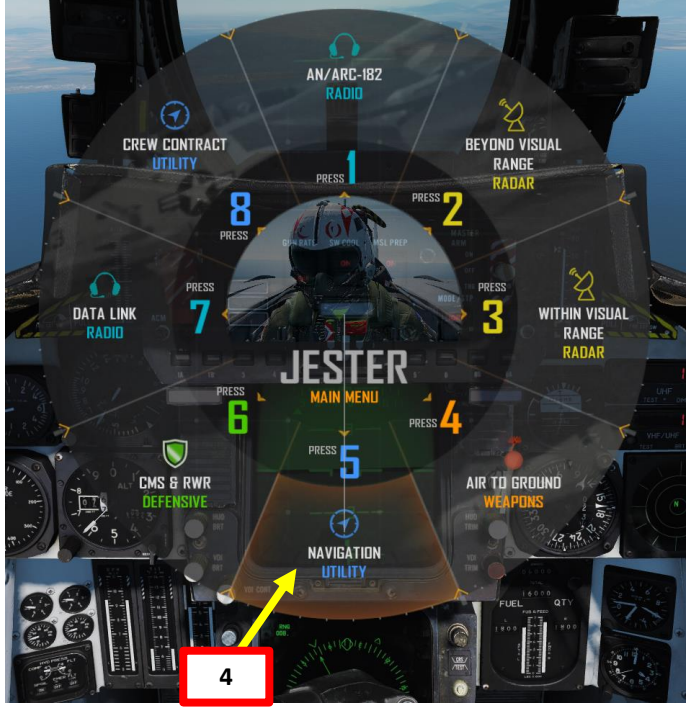
If you are flying with JESTER, you can easily create “Markers” on the F10 map and then ask JESTER to add them from the CAP (Computer Address Panel).

1. Press F10 to display the map, then select the MARK LABEL button
2. Click where you want to create a point, then type in a short but recognizable name for your waypoint (i.e. “Chuck WP1” for a navigation waypoint or “Chuck ST” for a Surface Target). Make sure to give it a name that makes sense since people in multiplayer will also be able to see it.

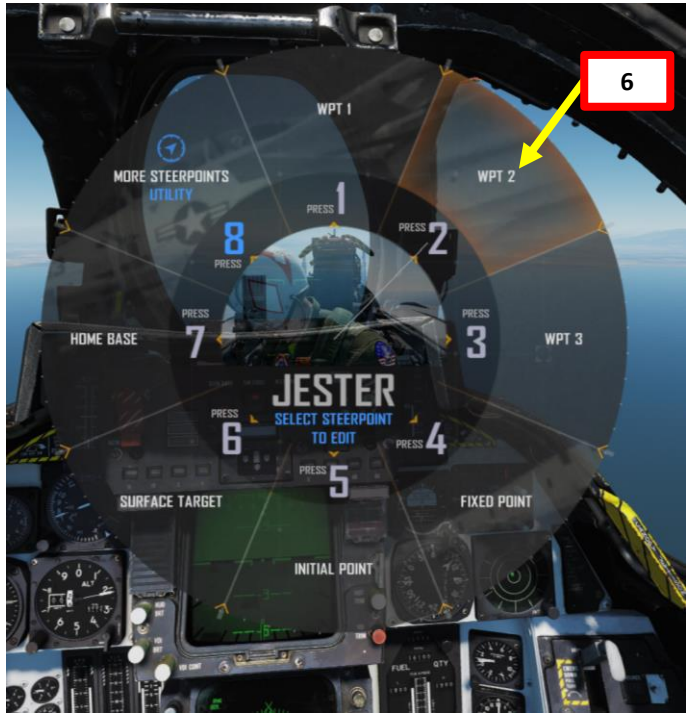


3 - WAYPOINT ENTRY - JESTER

3. Now that your Marker is created, JESTER will now magically know the coordinates of that marker (DCS: it's a magical place!).
4. Press "A" twice and access the NAVIGATION menu.
5. Access the "STEER POINT FROM MAP UTILITY" menu.
6. Select the waypoint type that you want to modify (i.e. WPT 2 for Navigation Waypoint 2).
7. Select the desired marker that you want to set as your new waypoint/fixed point/surface target/etc.
8. And that's it! JESTER will then do the boring exciting task of entering waypoint coordinates in the CAP (Computer Address Panel).









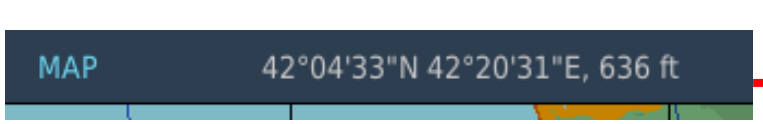
4 - WAYPOINT ENTRY - RIO

Remember when I told you about that RIO waypoint coordinates entry during the aircraft's start-up procedure? Well, there we are! Each time you spawn in a cold & dark F-14, you will have to enter the Waypoint, Fix Point, Surface Target, Initial Point and other point coordinates manually through the CAP (Computer Address Panel).

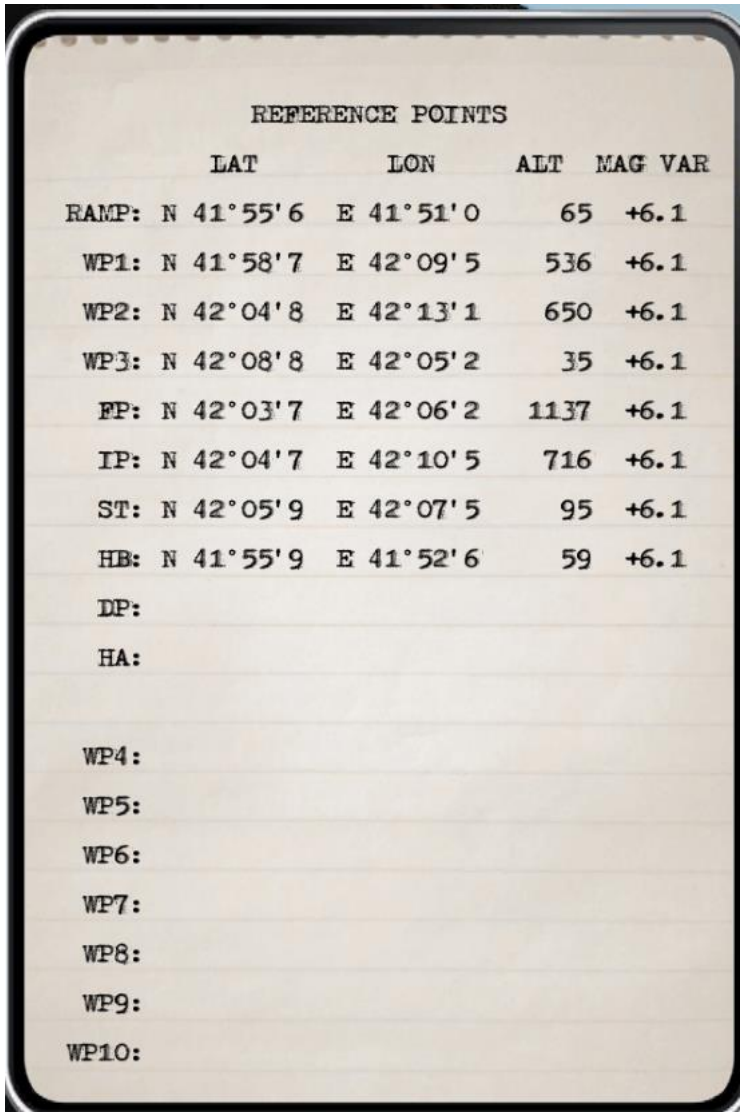
If the mission creator decided to make your life easier, he will have already pre-placed all these points for you. You can open up your kneeboard using "RSHIFT+K", then cycle through pages using the "[" and "]" (kneeboard previous/next page bindings) to find the REFERENCE POINTS page.

On the other hand, if the mission creator is evil or a lazy bastard, these points will not have been set and you will have to go through the F10 map to find your coordinates and convert them from a **D**egree, **M**inutes, **S**econds (DMS) format to a **D**egrees, **M**inutes, **T**enths of a **M**inute format.

As an example:
42°04'33'' North **42°20'31'' East** on the F10 map would be entered in the Tomcat CAP as **42°04'5 North** **42°20'5 East**
You can convert seconds into tenths of a minute by simply dividing the number of seconds by 60.



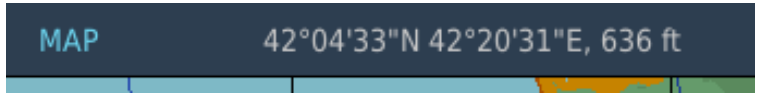




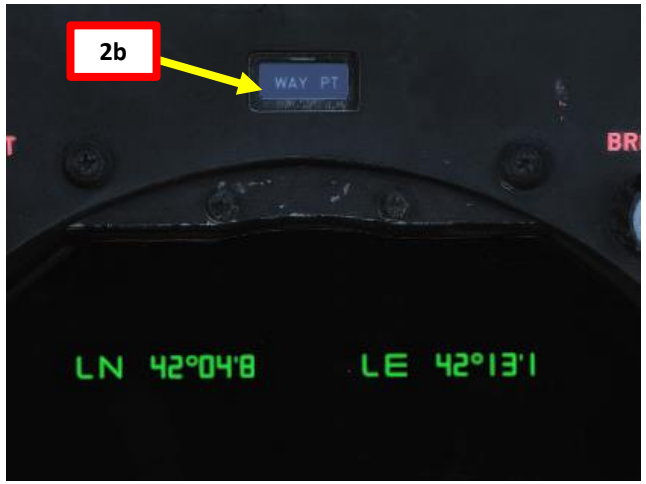
REFERENCE POINTS

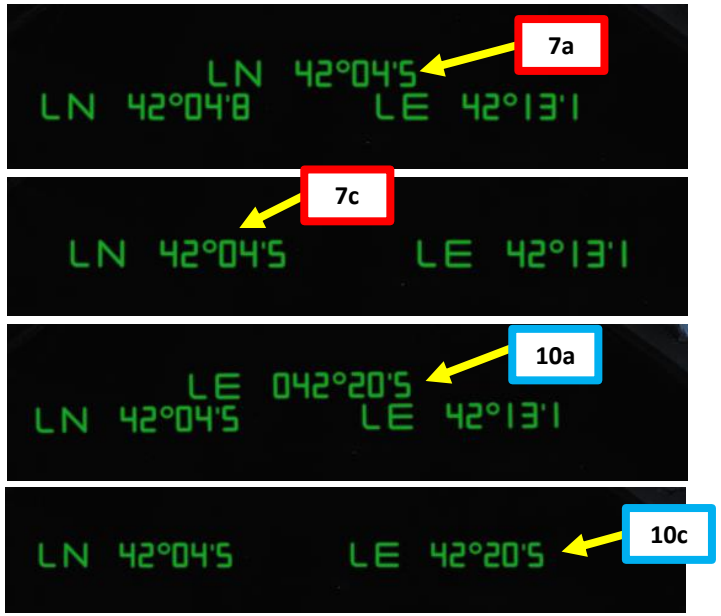
	LAT	LON	ALT	MAG VAR
RAMP:	N 41°55'6	E 41°51'0	65	+6.1
WP1:	N 41°58'7	E 42°09'5	536	+6.1
WP2:	N 42°04'8	E 42°13'1	650	+6.1
WP3:	N 42°08'8	E 42°05'2	35	+6.1
FP:	N 42°03'7	E 42°06'2	1137	+6.1
IP:	N 42°04'7	E 42°10'5	716	+6.1
ST:	N 42°05'9	E 42°07'5	95	+6.1
HB:	N 41°55'9	E 41°52'6	59	+6.1
DP:				
HA:				
WP4:				
WP5:				
WP6:				
WP7:				
WP8:				
WP9:				
WP10:				

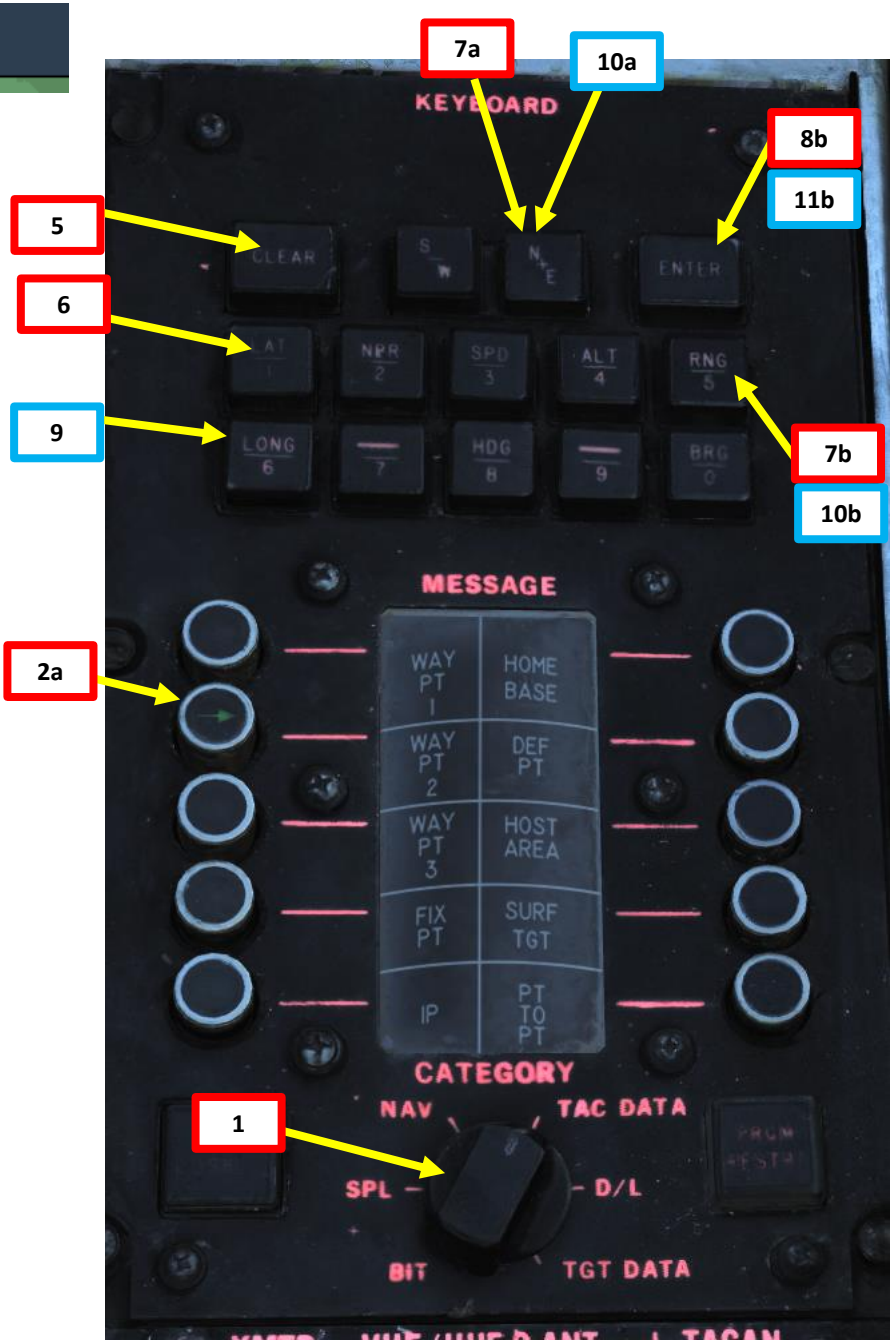
4 - WAYPOINT ENTRY - RIO



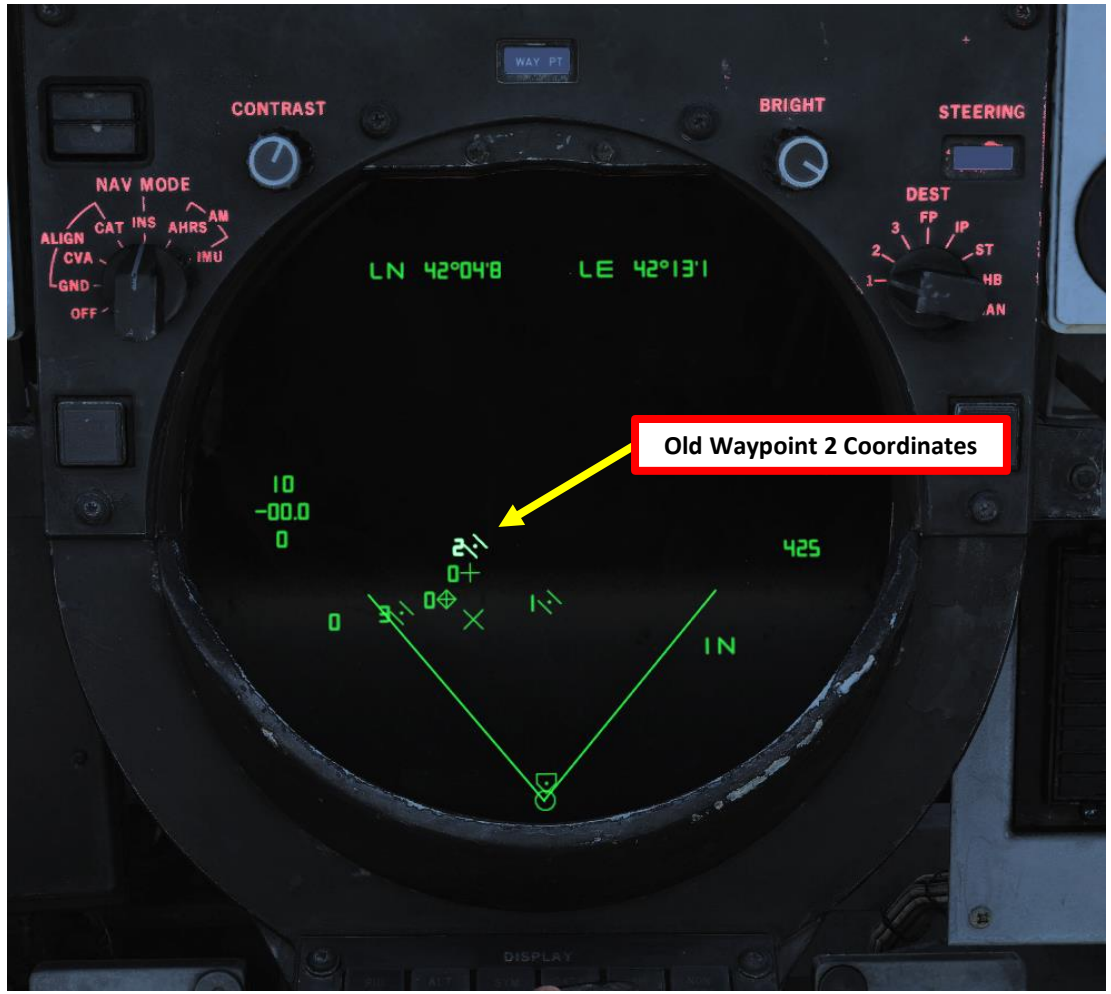
1. Set CAP (Computer Address Panel) CATEGORY selector to TAC DATA (Tactical Data)
2. Press the CAP Message selector button next to the waypoint/surface target/fixed point/etc. that you want to modify.
3. From the F10 map, our coordinates for waypoint 2 are:
   42°04’33’’ North 42°20’31’’ East in deg, min, seconds.
4. Convert these coordinates in Degrees, Minutes, Tenths of a Minute.
   Converted coordinates to input in the CAP: **42°04’5 North** 42°20’5 East
5. On the CAP keyboard, press the CLEAR button.
6. On the CAP keyboard, press the « 1 » (LAT for Latitude) button.
7. On the CAP keyboard, press « N+E » to select North coordinates, then type « **42045** »
8. Look at the top of the TID and confirm that the latitude coordinates are correct, then press “ENTER” to enter coordinates.
9. On the CAP keyboard, press the « 6 » (LONG for Longitude) button.
10. On the CAP keyboard, press « N+E » to select East coordinates, then type « 42205 »
11. Look at the top of the TID and confirm that the latitude coordinates are correct, then press “ENTER” to enter coordinates.

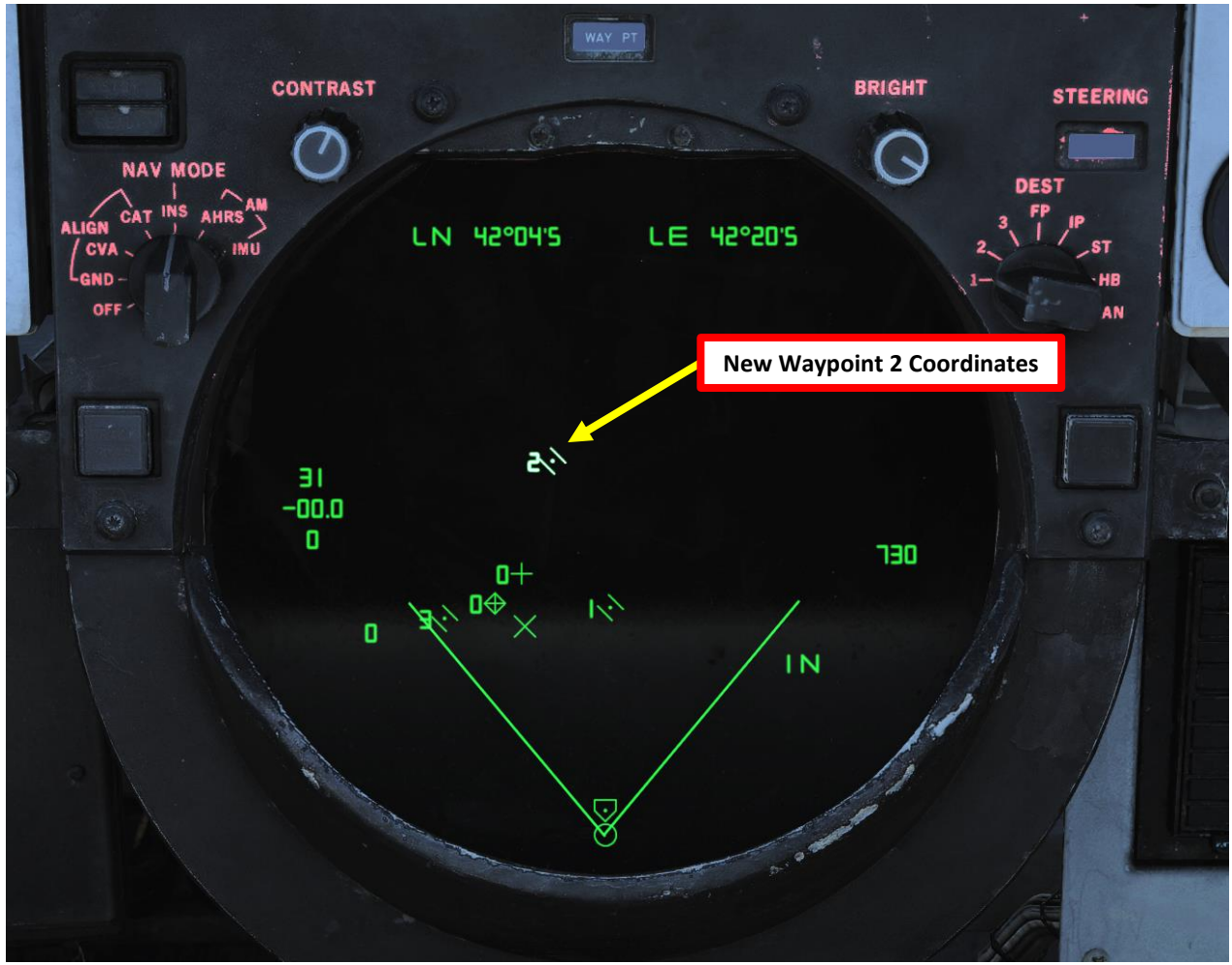






4 - WAYPOINT ENTRY - RIO



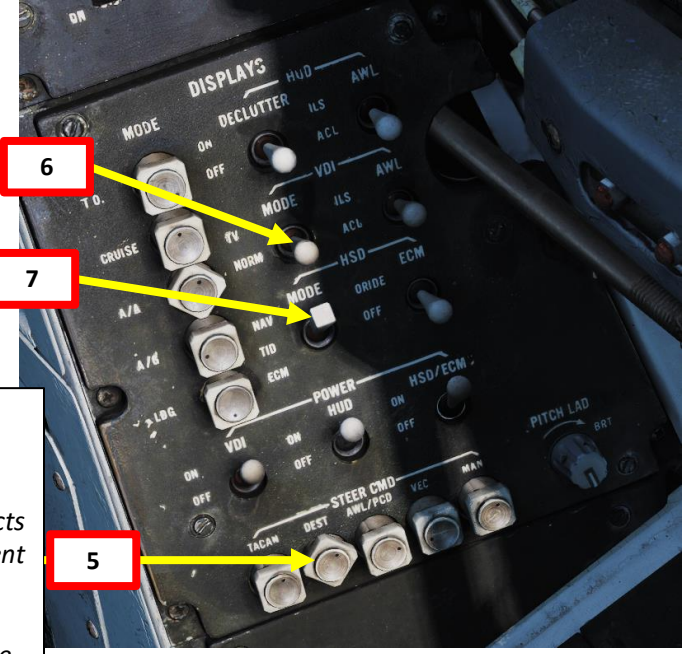


5 - WAYPOINT NAVIGATION - JESTER

1. Press “A” twice and access the NAVIGATION menu.
2. Access the “SELECT DESTINATION STEER POINT UTILITY” menu.
3. Select the waypoint that you want to track (i.e. WPT 1 for Navigation Waypoint 1).
4. JESTER will then select your desired waypoint provided the coordinates are already entered in the CAP.
5. From the pilot’s seat, select the DEST (Destination) Navigation Steer Command switch.
6. Set VDI Mode to NORM
7. Set HSD Mode to NAV

Navigation Steer Command Selectors:

- ***TACAN****: Selects TACAN as steering command source*
- ***DESTINATION****: Selects RIO set waypoint as steering command source*
- ***AWL/PCD****: AWL (All-Weather Landing)/PCD (Precision Course Direction), selects glideslope guidance (ILS/ACLS) for landing or PCD for air-to-ground engagement directions as steering command source*
- ***VECTOR****: selects data link deviation steering as steering command source*
- ***MANUAL****: selects manually selected course and heading as steering command source*



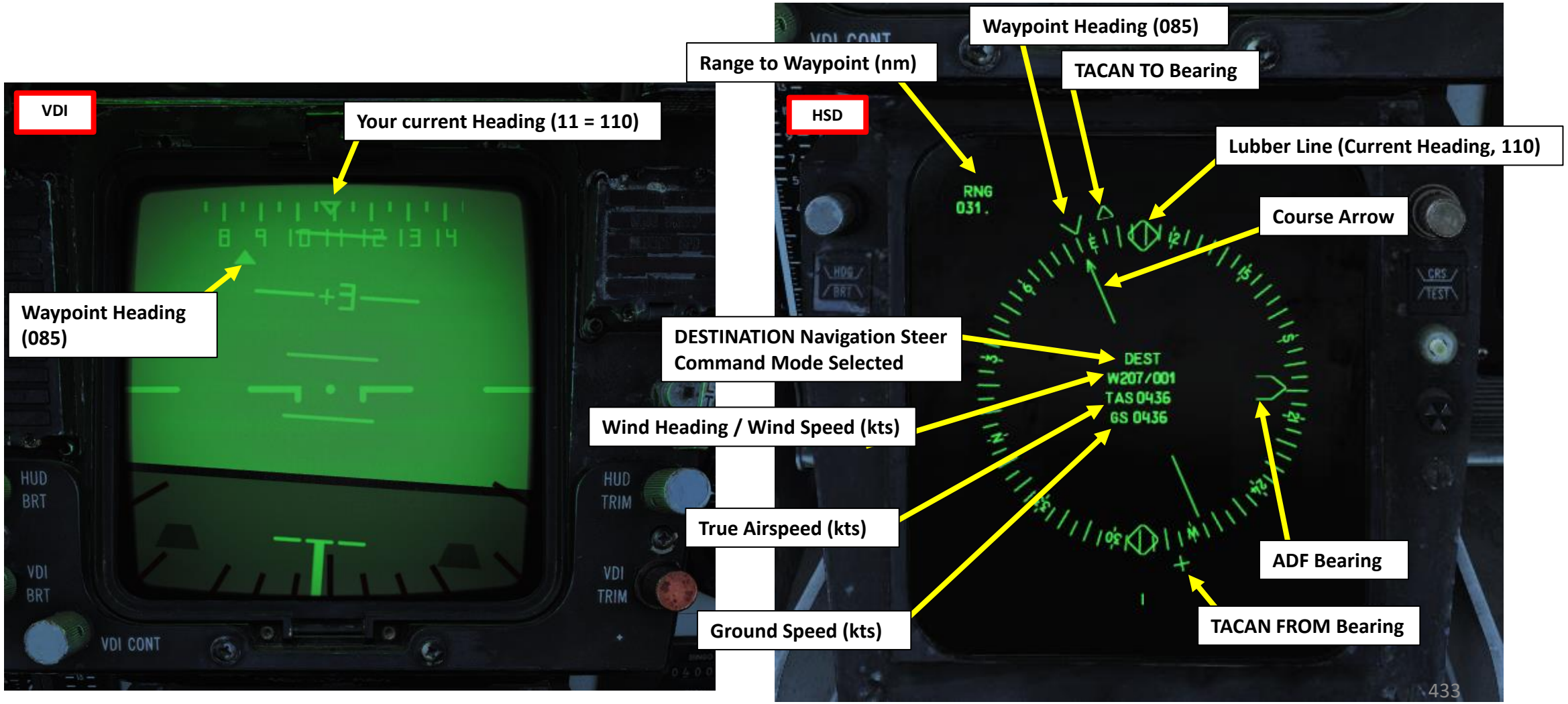






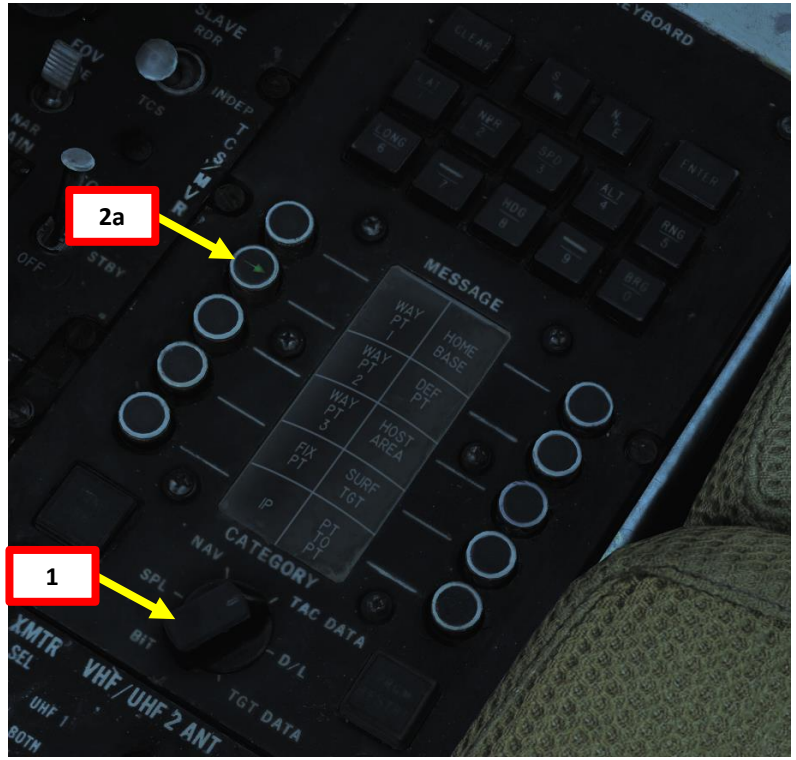
5 - WAYPOINT NAVIGATION - JESTER

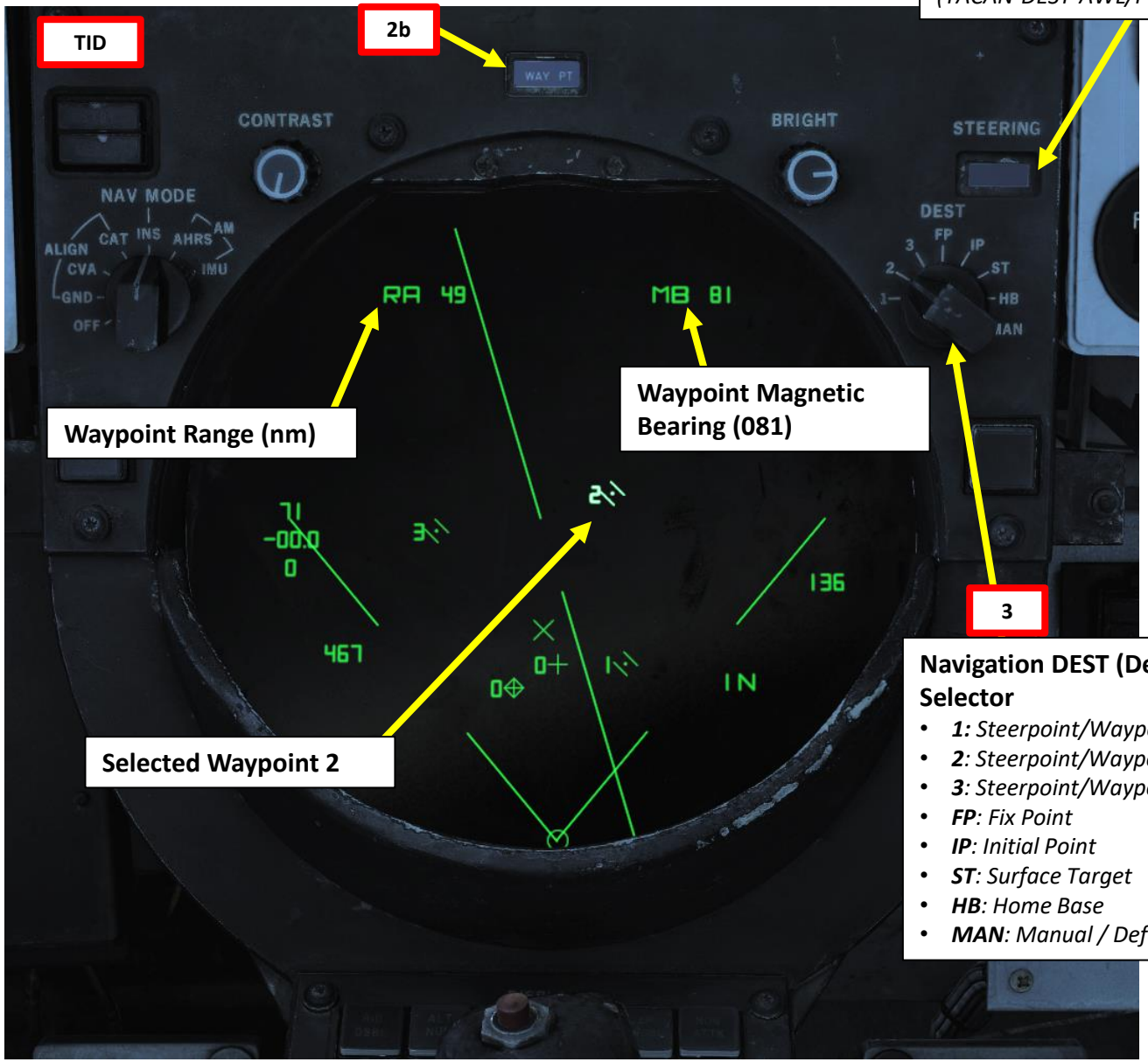
8. You can track the waypoint using the VDI (Vertical Display Indicator) and the HSD (Horizontal Situation Display).



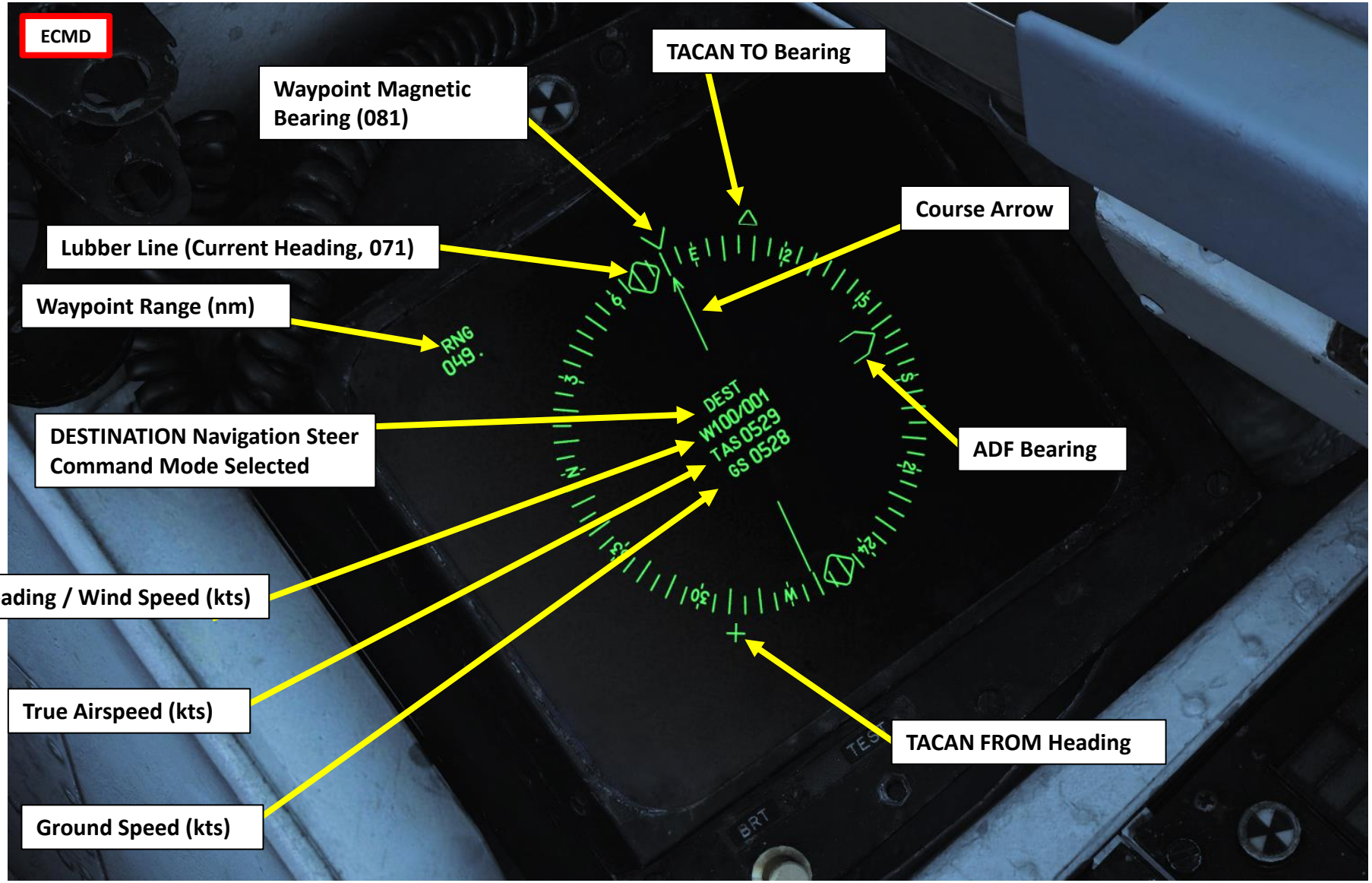
6 - WAYPOINT NAVIGATION - RIO

1. Set CAP (Computer Address Panel) CATEGORY selector to TAC DATA (Tactical Data)
2. Press the CAP Message selector button next to the waypoint/surface target/fixed point/etc. that you want to modify. We will use Waypoint 2. This will ensure the data displayed on the TID is from the correct waypoint.
3. Set the Navigation DEST Mode selector to “2” to track Waypoint 2. This will ensure the steering cues sent to the pilot on the HSD come from Waypoint 2.
4. Check the TID and ECMD to monitor waypoint range (RA) and magnetic bearing (MB).



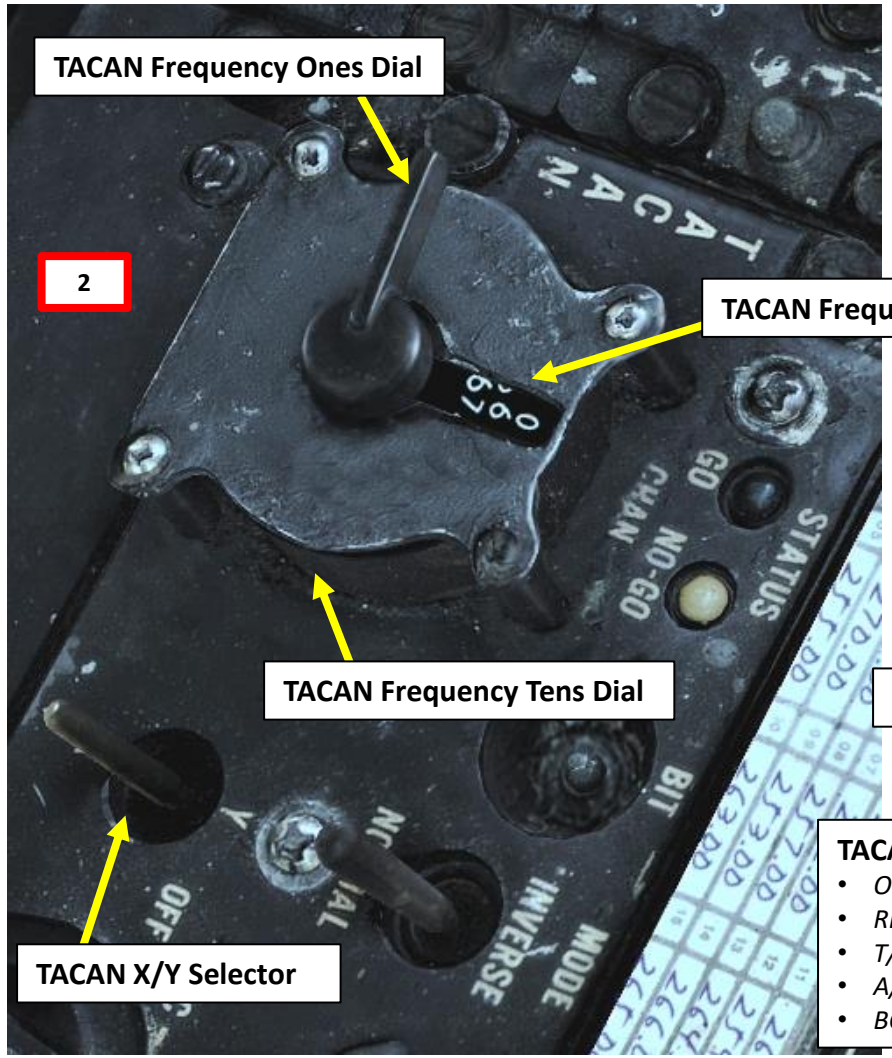


6 - WAYPOINT NAVIGATION - RIO

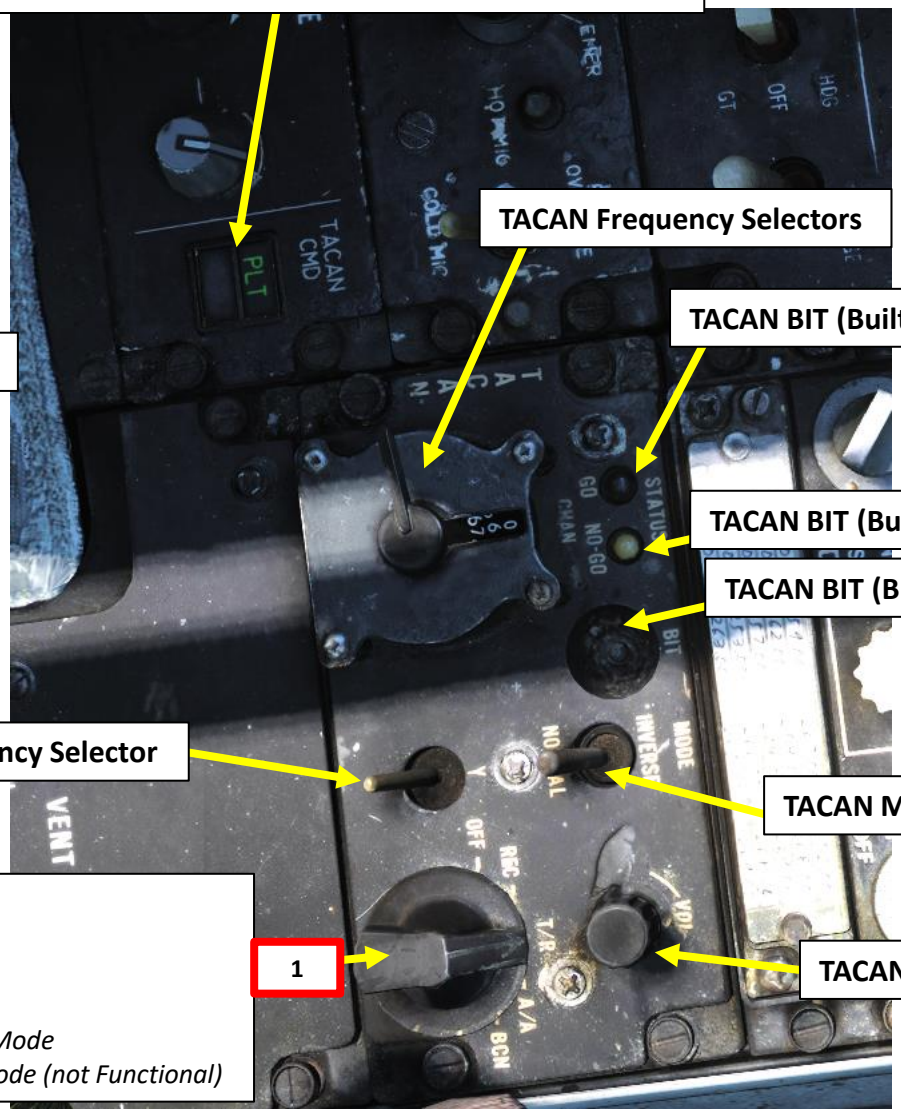


7 – TACAN NAVIGATION

1. Set TACAN Mode selector to T/R. Allow a warm-up period of 2 minutes.
2. Set TACAN Frequency using the X/Y selector and the Ones and Tens dials. We will set TACAN frequency to 67X.
3. Set TACAN CMD (TACAN Command) to PLT if you are the pilot or to NFO if you are the RIO.



TACAN CMD Indicator
Indicates current crewmember in command of the TACAN.
- ***PLT**: Pilot*
- ***NFO**: Naval Flight Officer (RIO)*



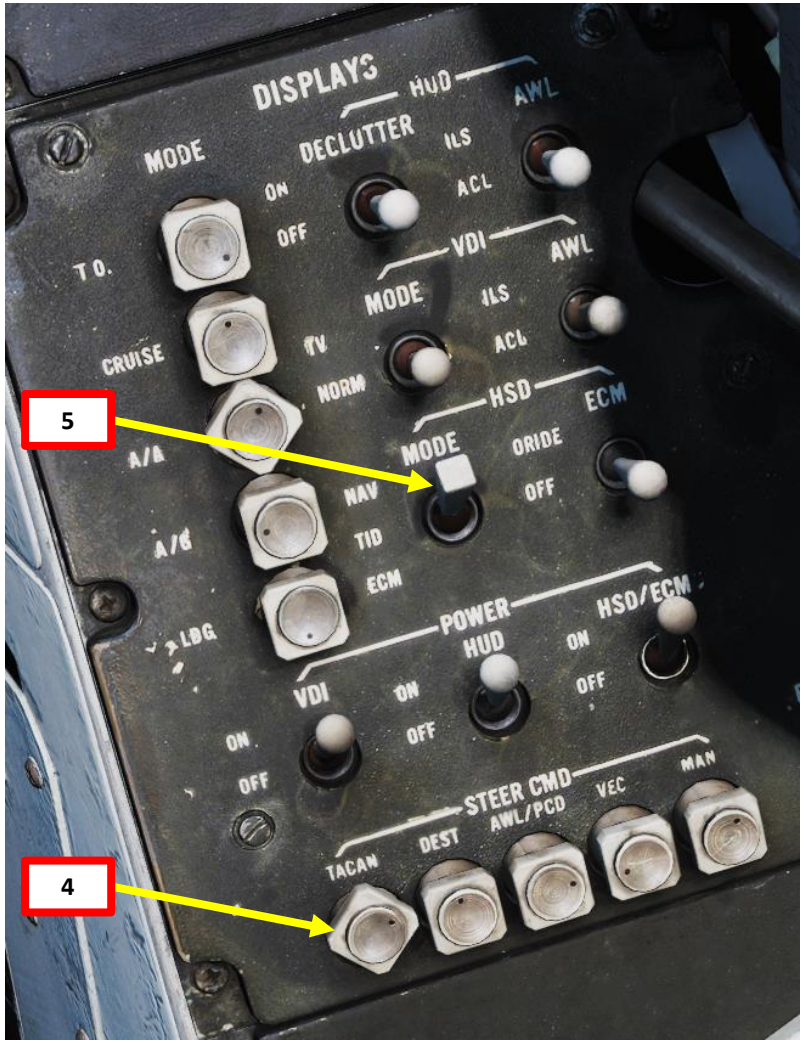
TACAN Mode Selector
- *OFF*
- *REC: Receive Only*
- *T/R: Transmit/Receive*
- *A/A: Air-to-Air TACAN Mode*
- *BCN: Beacon TACAN Mode (not Functional)*

7 – TACAN NAVIGATION

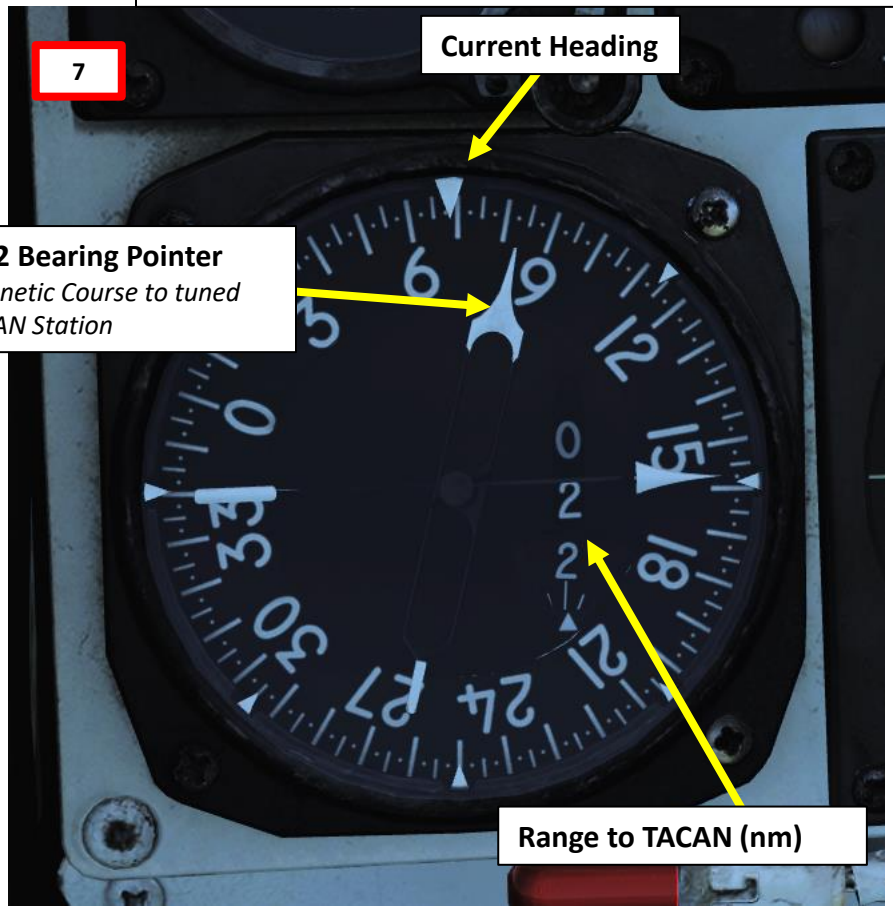
4. From the pilot's seat, select the TACAN Navigation Steer Command switch.
5. Set HSD Mode to NAV
6. On the HSD, set desired COURSE to TACAN (we will set it to 070)
7. Consult the BDHI and HSD to track TACAN

BDHI (Bearing Distance Heading Indicator)

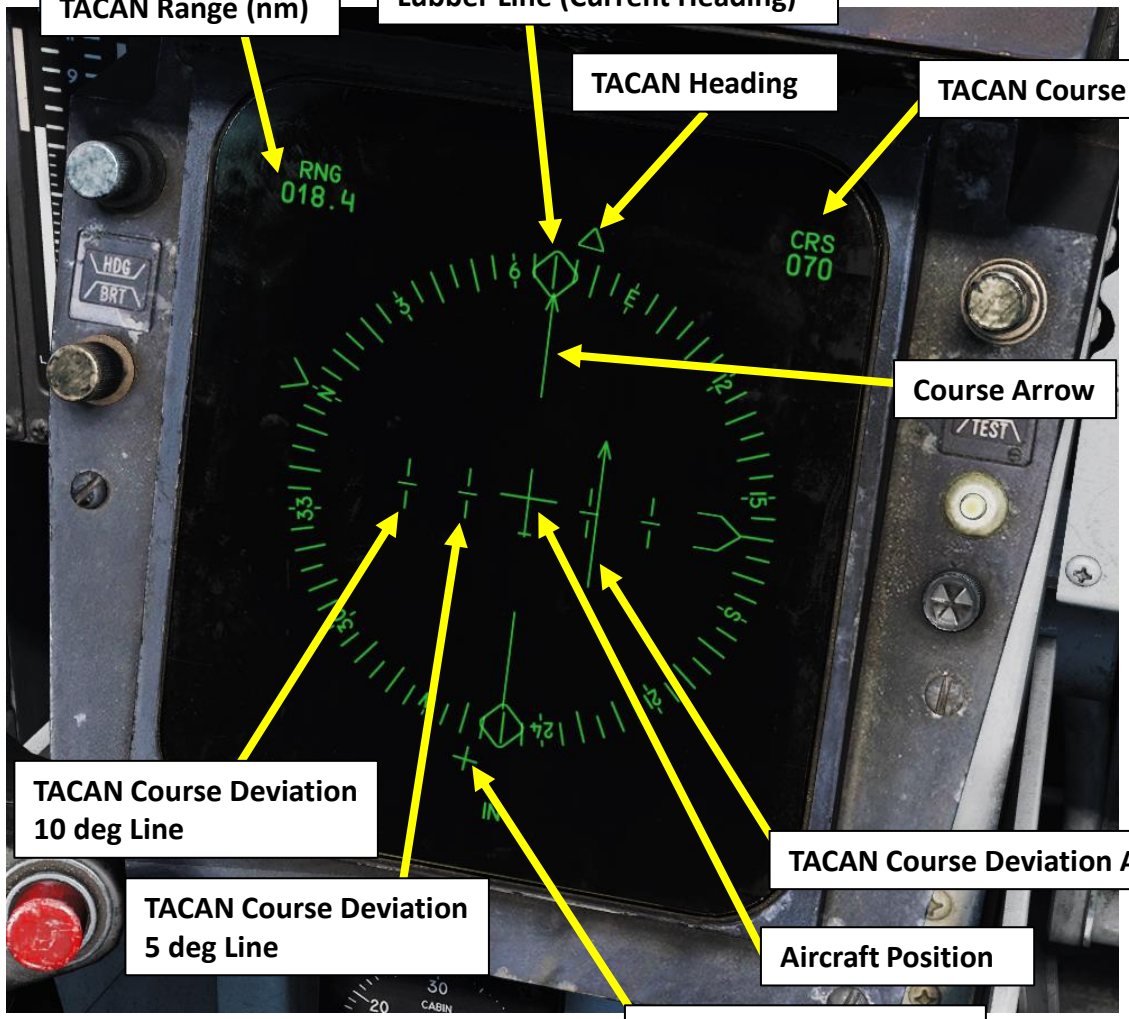
- *Displays indicating azimuth and bearing information.*
- *No. 2 bearing pointer (thick) indicates magnetic course to tuned TACAN station.*
- *No. 1 bearing pointer (thin) indicates bearing to tuned UHF/ADF station*
- *BDHI also indicates distance; counter indicates slant range to tuned TACAN station in nm*

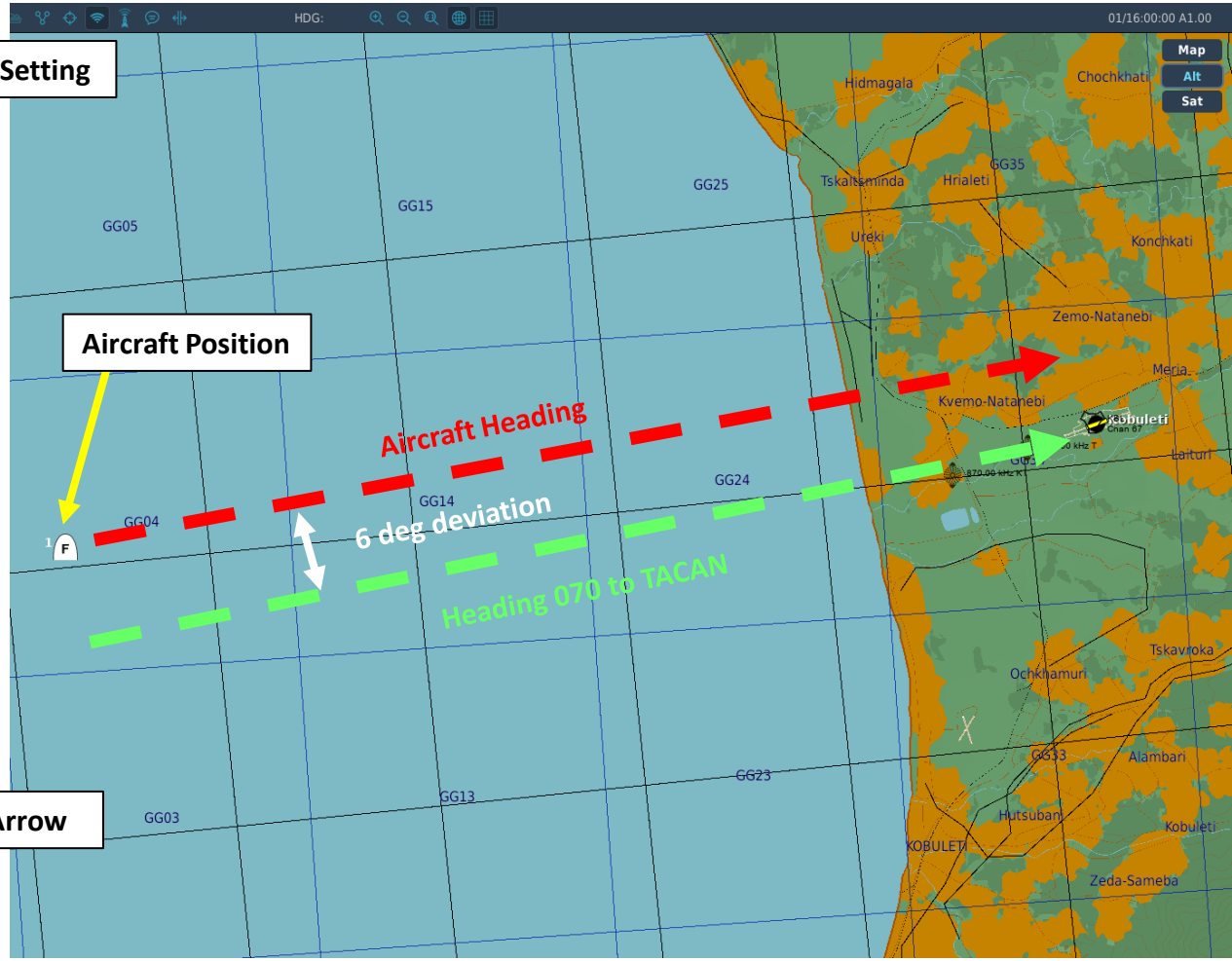






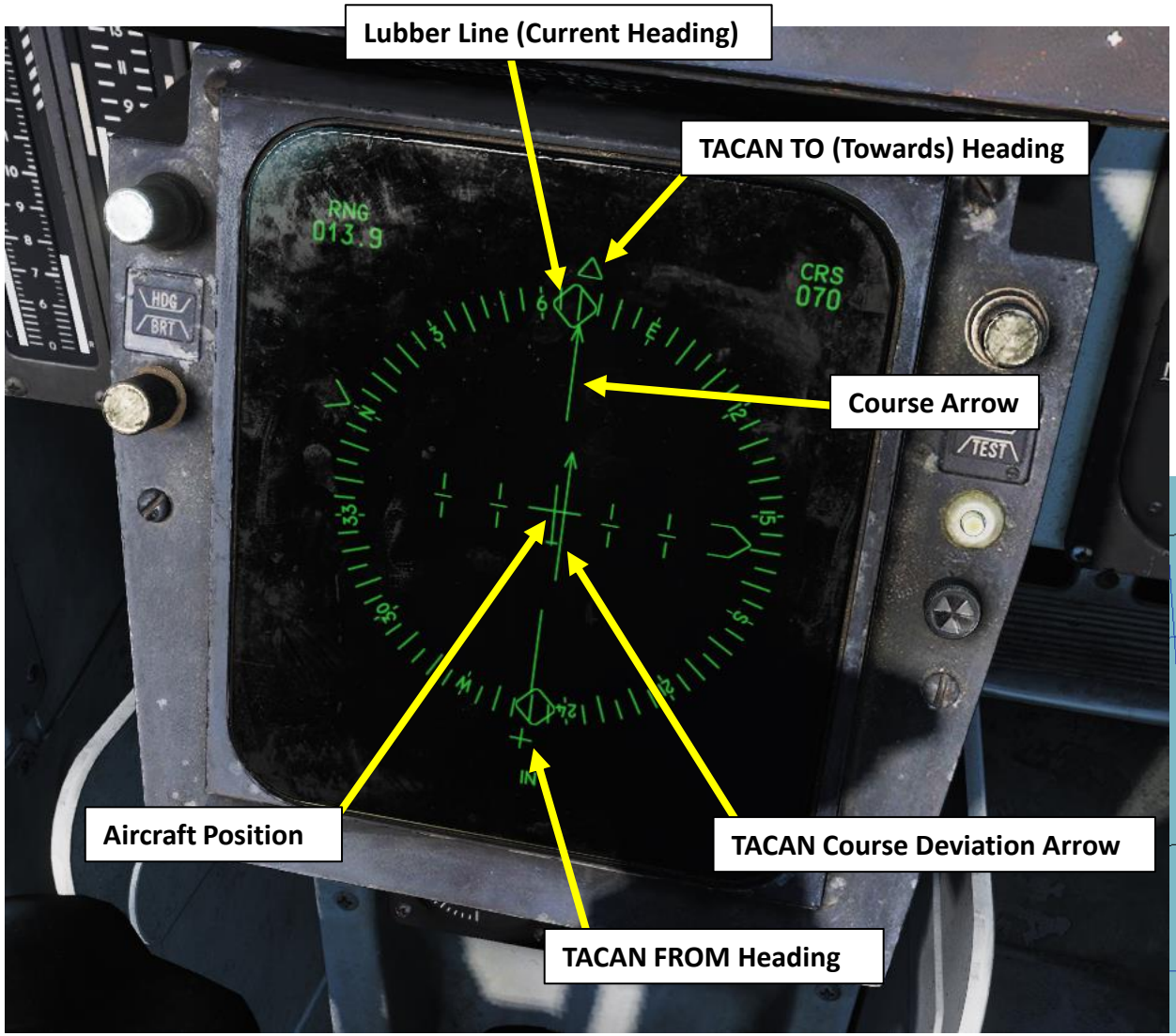
7 – TACAN NAVIGATION





7 – TACAN NAVIGATION

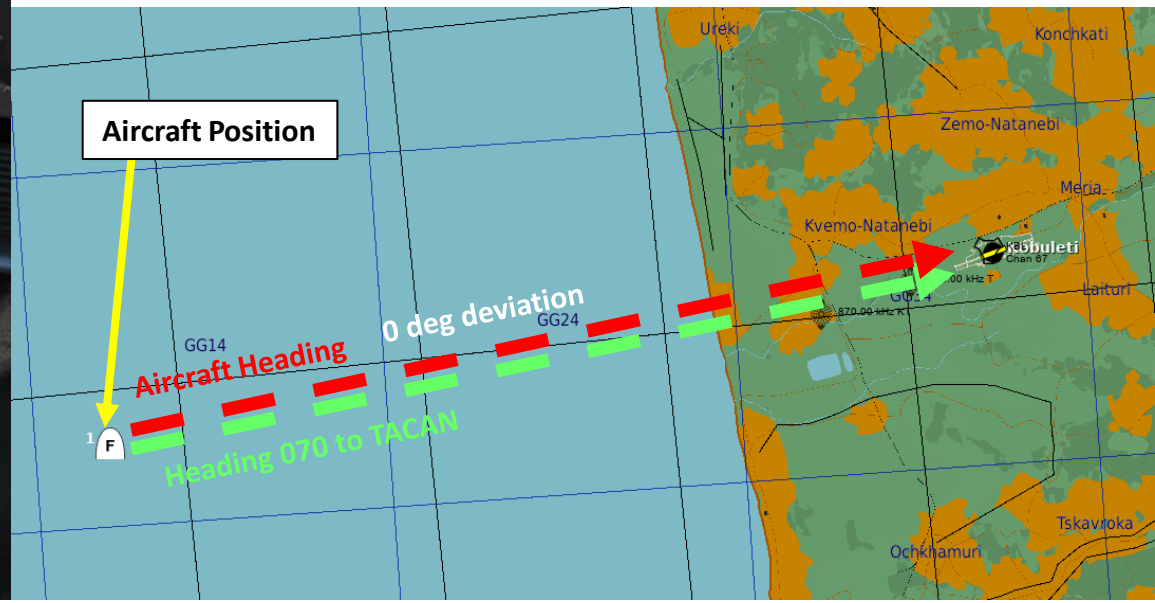
***Note**: You can use RSHIFT+K and the [or] keys to cycle through kneeboard pages to the TACAN LIST page. This will give you information about the nearest TACAN beacons available.*



TACAN LIST

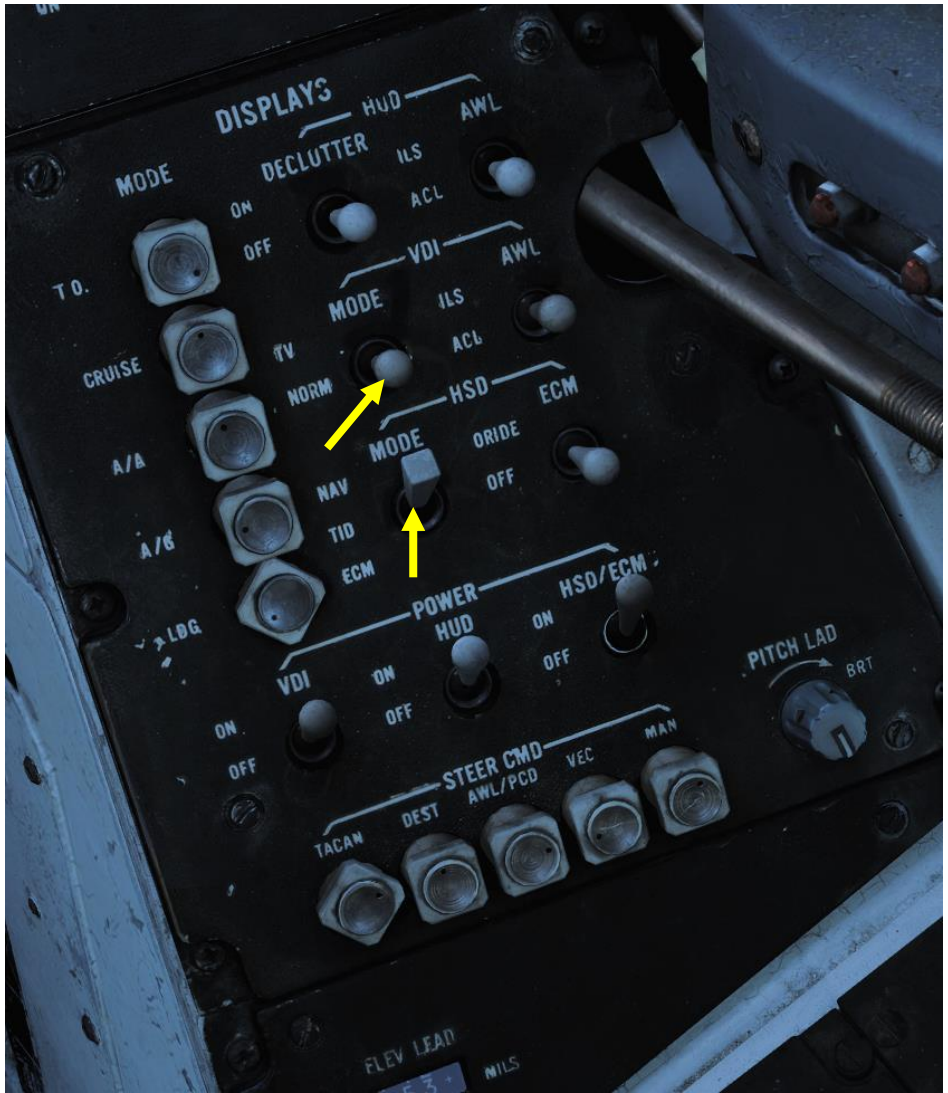
TKR 74X Carrier No 1

BTM	16X	N 41°36'6	E 41°36'0	49ft
GTB	25X	N 41°40'2	E 44°55'8	1604ft
KBL	67X	N 41°55'8	E 41°51'7	75ft
KTS	44X	N 42°10'7	E 42°28'8	165ft
TSK	31X	N 42°14'5	E 42°02'8	60ft
VAS	22X	N 41°37'8	E 45°01'6	1540ft



7 – TACAN NAVIGATION

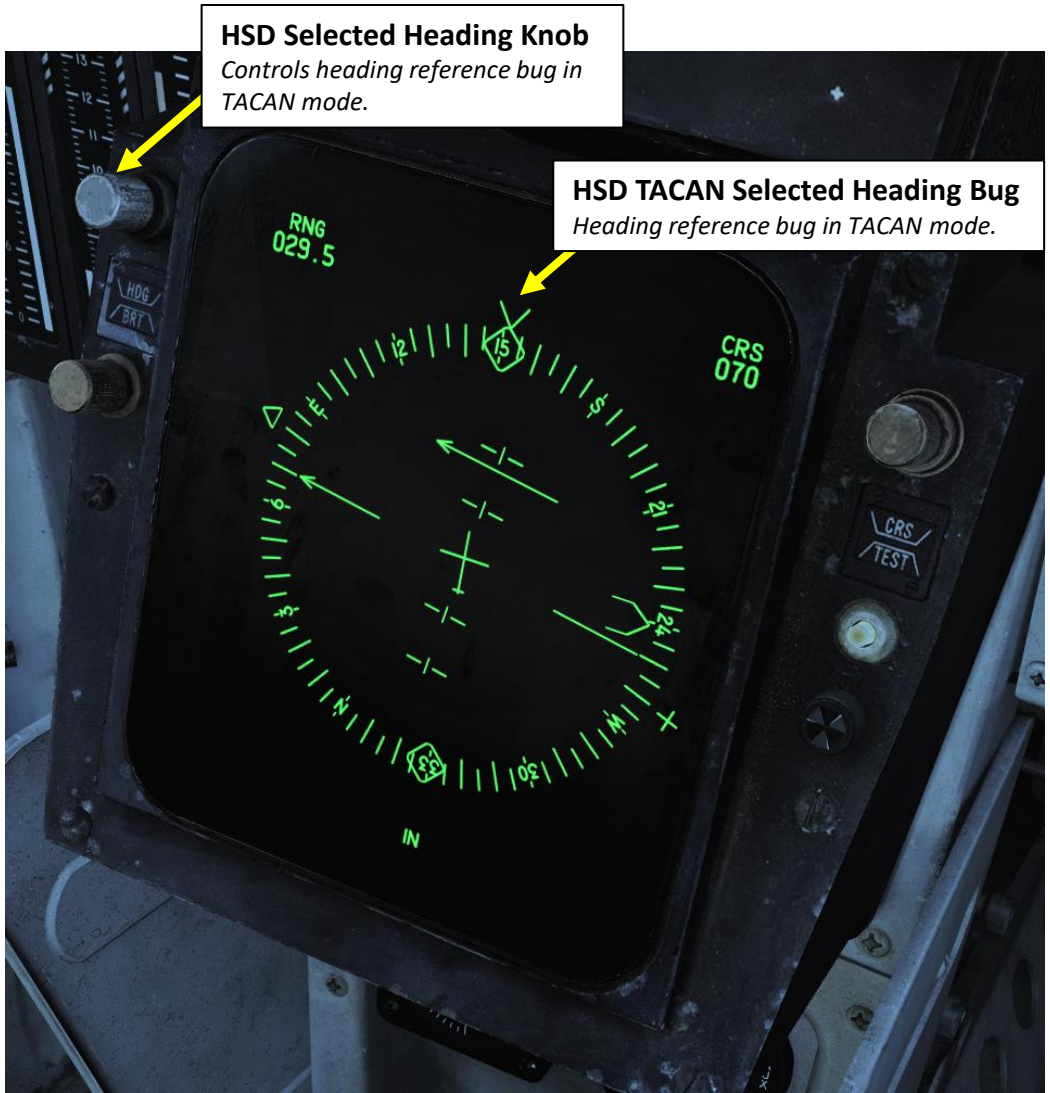
Note: if you want to have TACAN deviation on your VDI and HUD, set the HUD Display Mode to LDG (Landing) and your VDI Mode to NORM. We will touch this functionality in the ACLS landing tutorial.

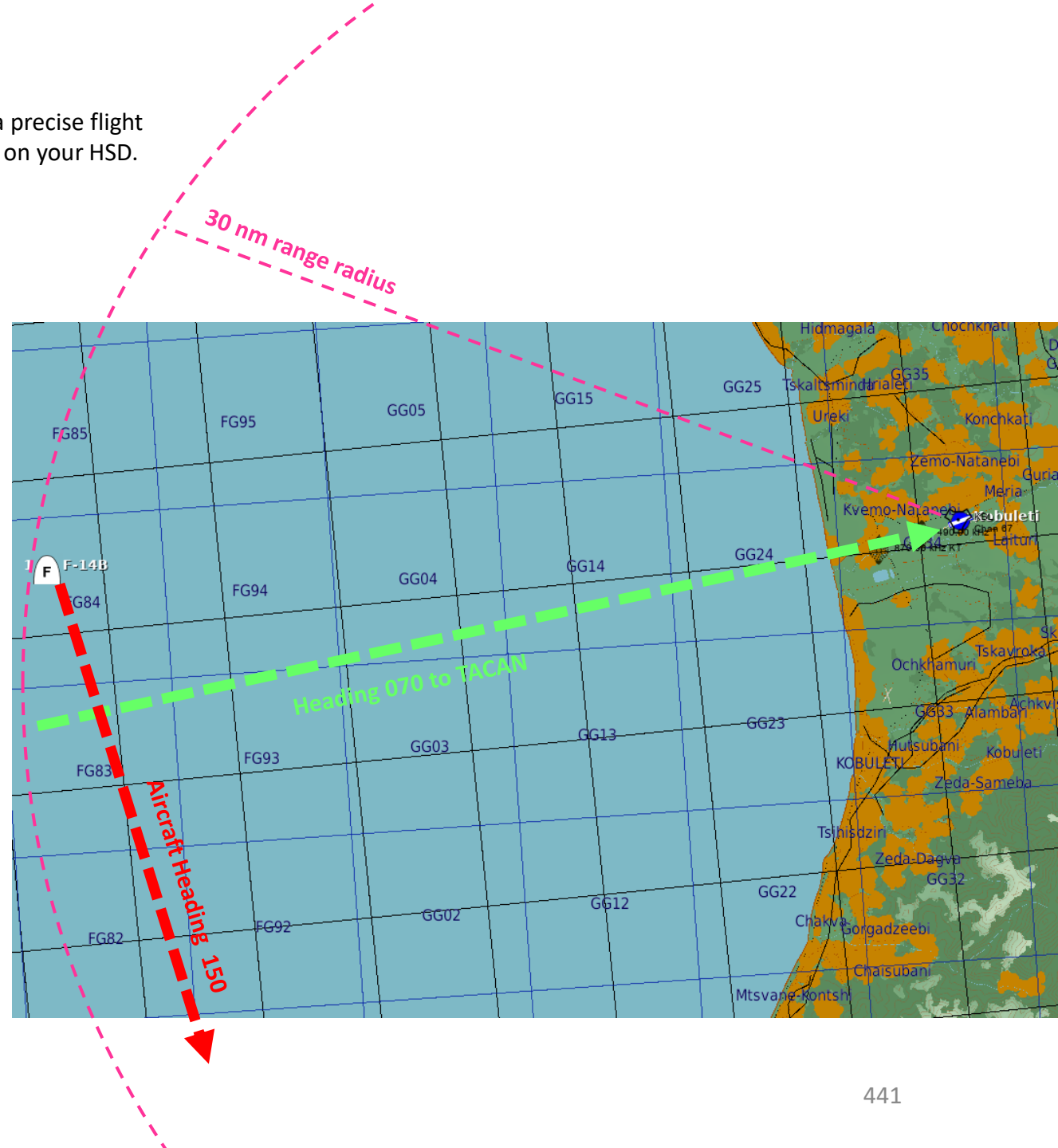




7 – TACAN NAVIGATION

Note 2: For some complex navigation or radial interception cases that require a precise flight path, you can use the HSD Selected Heading Knob which will set a heading bug on your HSD.

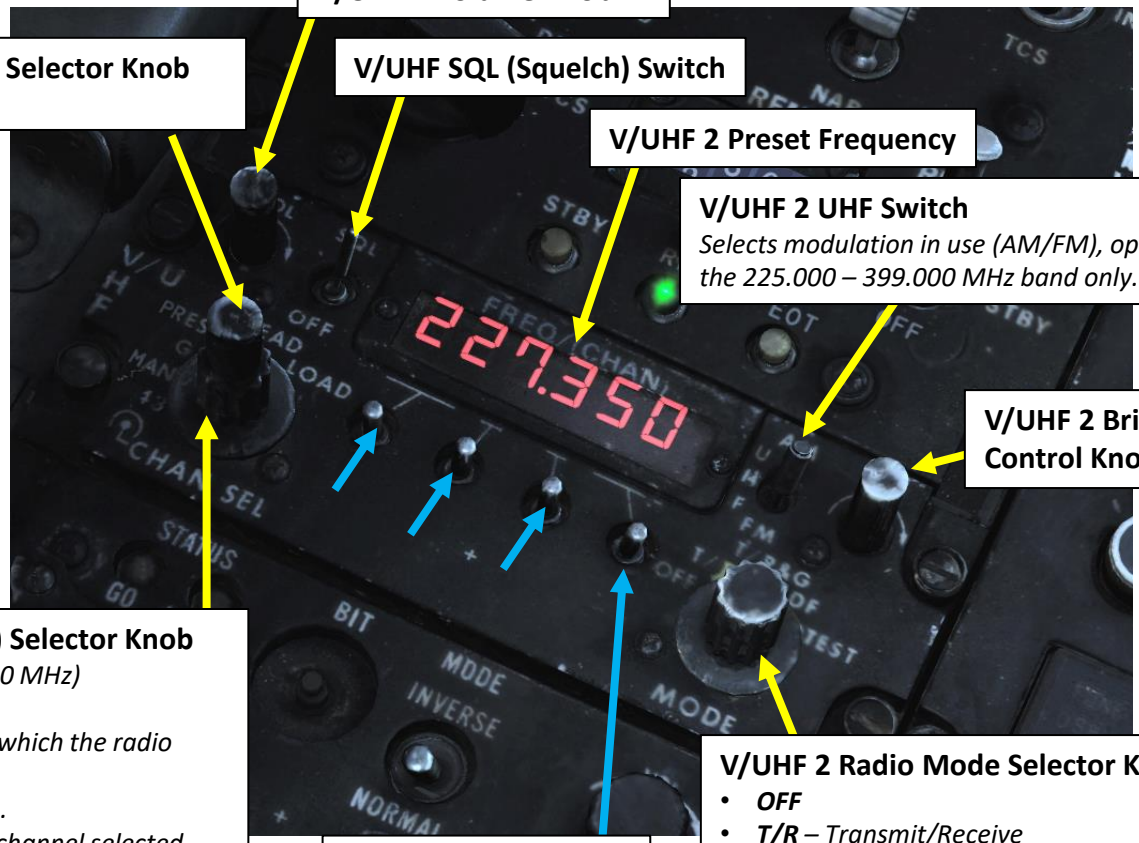




8 – VOR & ADF NAVIGATION

The UHF Automatic Direction Finder is used with the ARC-182 radio, which is controlled by the RIO. Take note that the ADF system for the ARC-159 radio in the pilot's seat is not functional. ADF provides relative bearings to transmitting ground stations or other aircraft. It can receive signals on any 1 of 30 preset channels or on any manually set frequency in the 108 to 399.975 MHz range. The system has a line-of-sight range, varying with altitude. **The system requires a 5-minute warmup period**. During the warmup time, failure indications should be disregarded. Bearing to transmitting stations is displayed on the pilot/RIO BDHI (No. 1 needle), pilot HSD, and RIO multiple display indicator. The ADF signal is interrupted during voice UHF transmissions. The only information you will have from ADF is azimuth, not range. Since the Tomcat isn't equipped with DME (Distance Measuring Equipment), we can only have azimuth information as well and no range.

V/UHF 2 frequencies range from:
- VHF 30-88 MHz FM close air support
- VHF 108-118 MHz AM navigation, receive only
- VHF 118-156 MHz AM air traffic control
- VHF 156-174 MHz FM maritime
- UHF 225-400 MHz AM/FM military/NATO



V/UHF 2 Volume Knob

V/UHF 2 Preset Frequency (Inner) Selector Knob
Selects radio preset frequencies

V/UHF SQL (Squelch) Switch

V/UHF 2 Preset Frequency

V/UHF 2 UHF Switch
Selects modulation in use (AM/FM), operational in the 225.000 – 399.000 MHz band only.

V/UHF 2 Brightness Control Knob

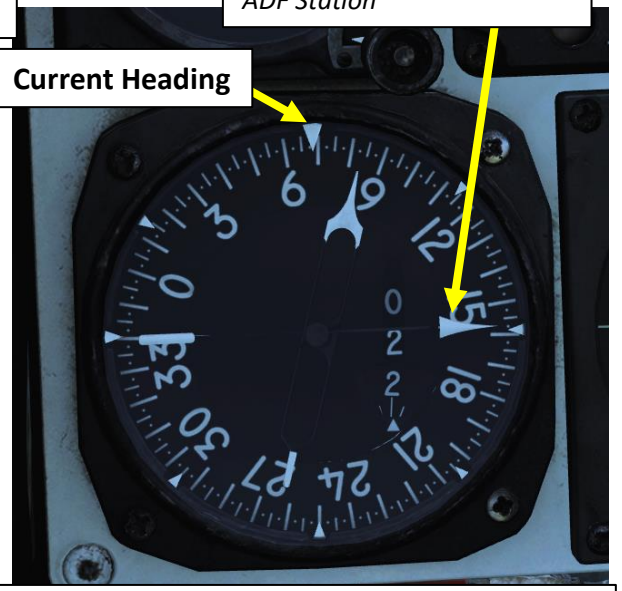
V/UHF 2 Frequency Mode (Outer) Selector Knob
- ***243*** *– UHF Guard frequency (243.000 MHz)*
- ***MAN*** *– Manual frequency selection*
- ***G*** *– Guard frequency in the band to which the radio transmitter was last tuned*
- ***PRESET*** *– Preset frequency selection.*
- ***READ****: Displays frequency of preset channel selected instead of the channel ID number*
- ***LOAD****: Automatically places displayed frequency into the memory of the selected preset channel*

V/UHF 2 Frequency Select Switches

V/UHF 2 Radio Mode Selector Knob
- ***OFF***
- ***T/R*** *– Transmit/Receive*
- ***T/R+G*** *– Transmit/Receive+Guard*
- ***DF*** *– Automatic direction finding from 108.000 to 399.975 MHz*
- ***TEST*** *– Triggers BIT (Built-In Test)*

No.1 Bearing Pointer
Magnetic Course to tuned ADF Station

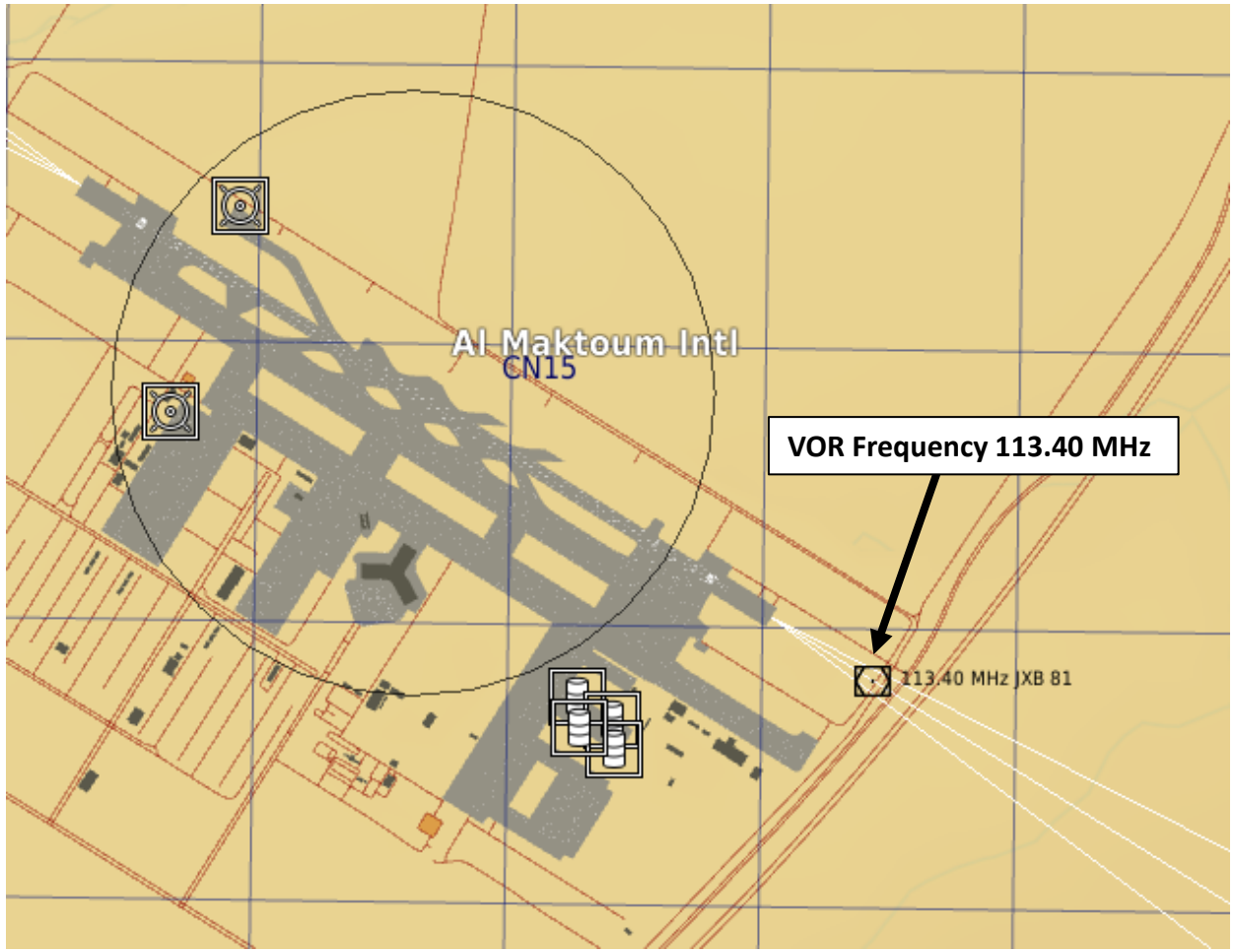
Current Heading

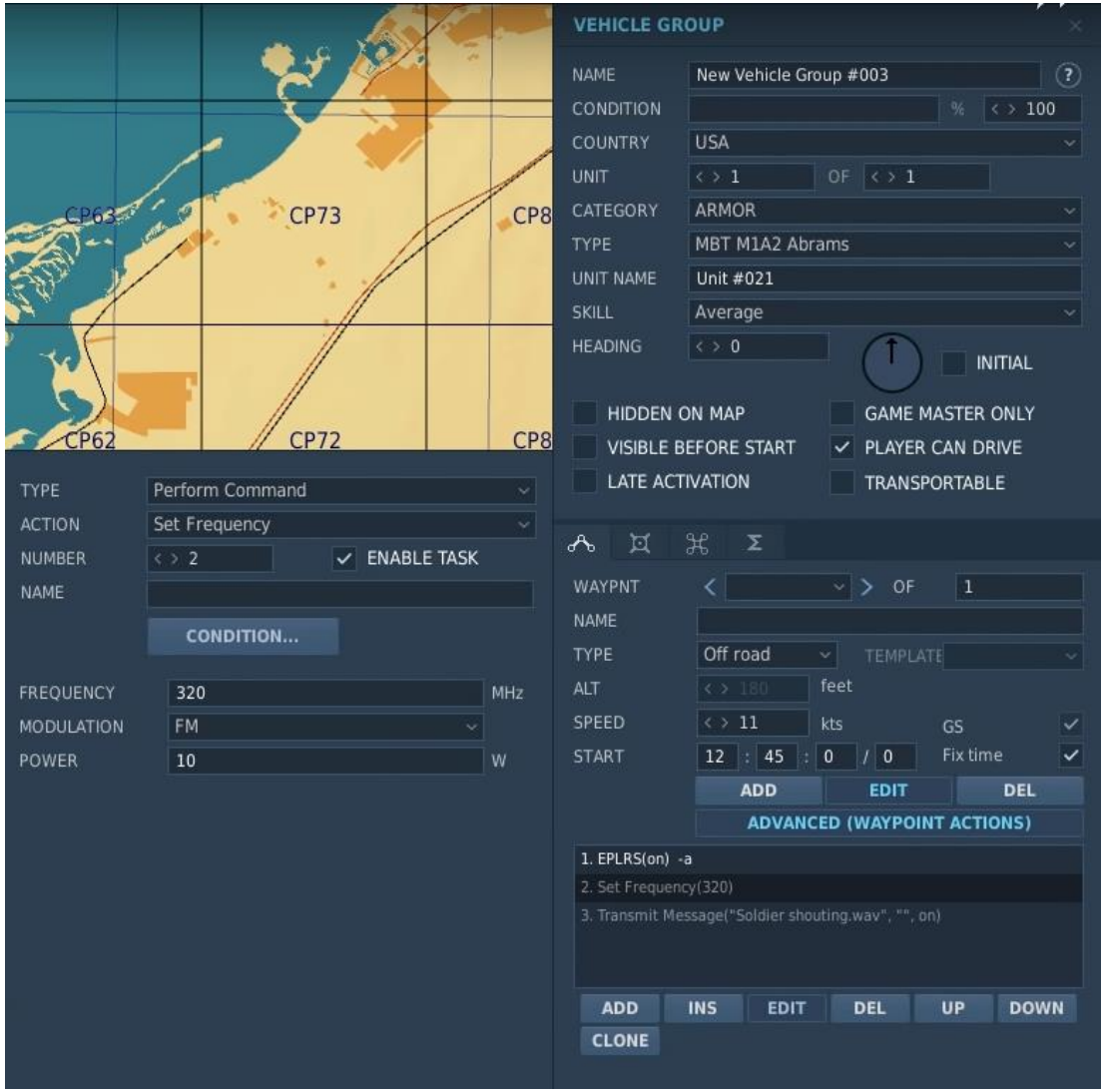


BDHI (Bearing Distance Heading Indicator)
No. 1 bearing pointer (thin) indicates bearing to tuned UHF/ADF station

8 – VOR & ADF NAVIGATION

VOR frequencies can be found in the mission editor or in the F10 map. For ADF, you will very likely have to place a unit in the mission editor that broadcasts on a valid frequency (i.e. 320 MHz FM).

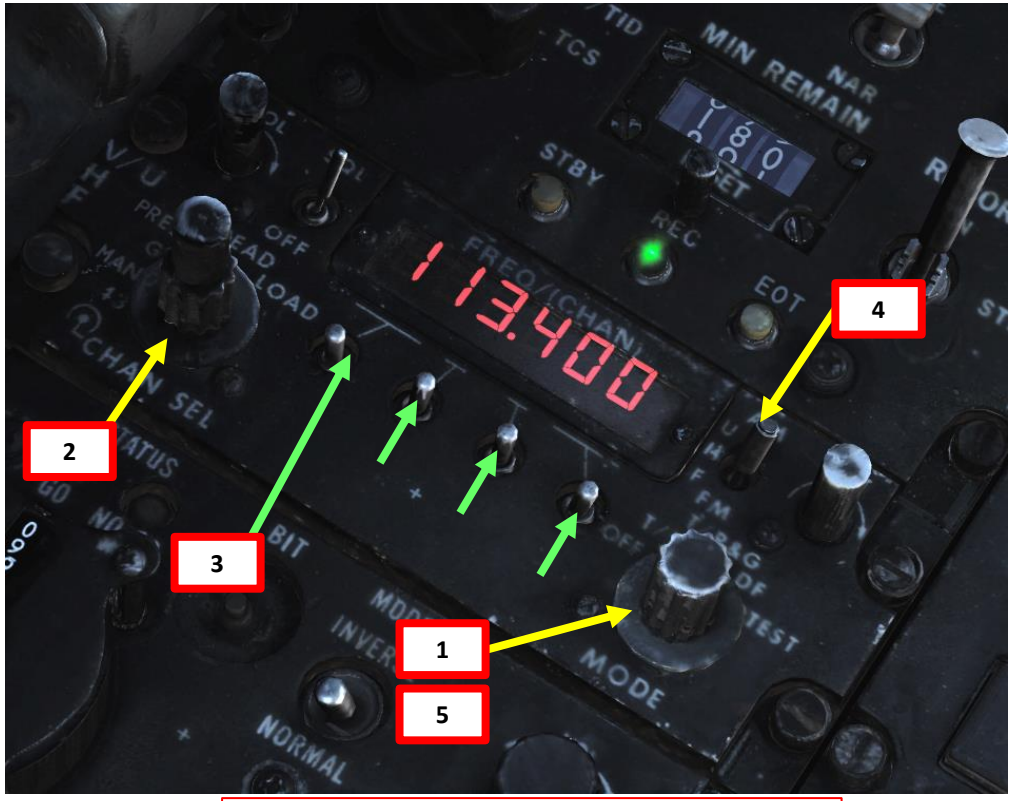




8 – VOR & ADF NAVIGATION

Here is a demonstration with a VOR from the RIO Seat.

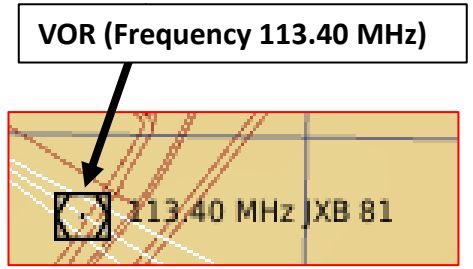
1. Set V/UHF 2 Radio Mode Selector to T/R for at least 5 minutes to warm-up.
2. Set V/UHF 2 Frequency Mode Selector to MAN
3. Set V/UHF 2 Frequency to VOR frequency (113.400 MHz) using Select switches.
4. Set V/UHF 2 UHF Switch to AM or FM band based on the frequency you are tracking. Since our VOR frequency is 113.40 MHz, it is in the AM band. Confirm that you hear the correct morse code of the tracked VOR.
5. Set V/UHF 2 Radio Mode Selector to DF (Directional Finding).





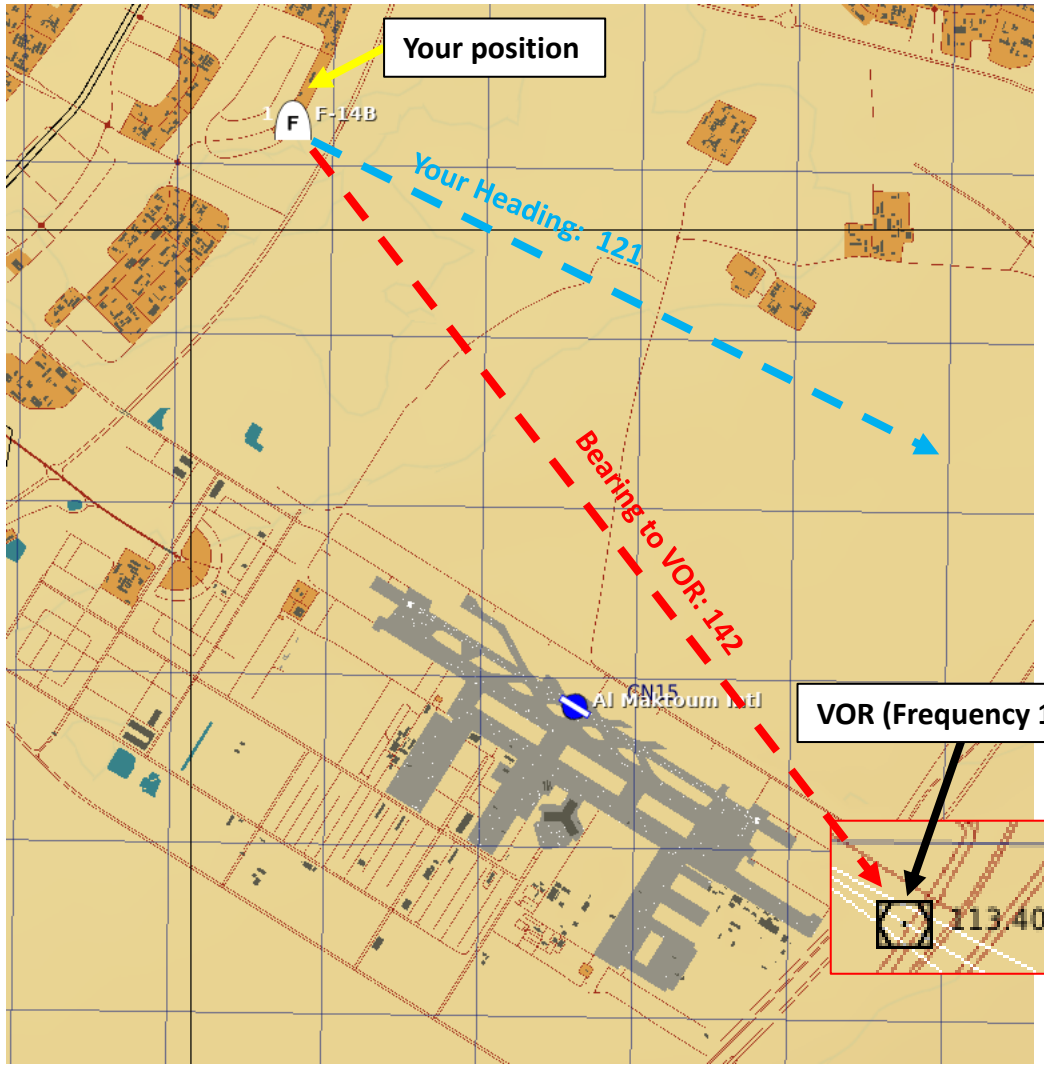
V/UHF 2 frequencies range from:

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- VHF 156-174 MHz FM maritime
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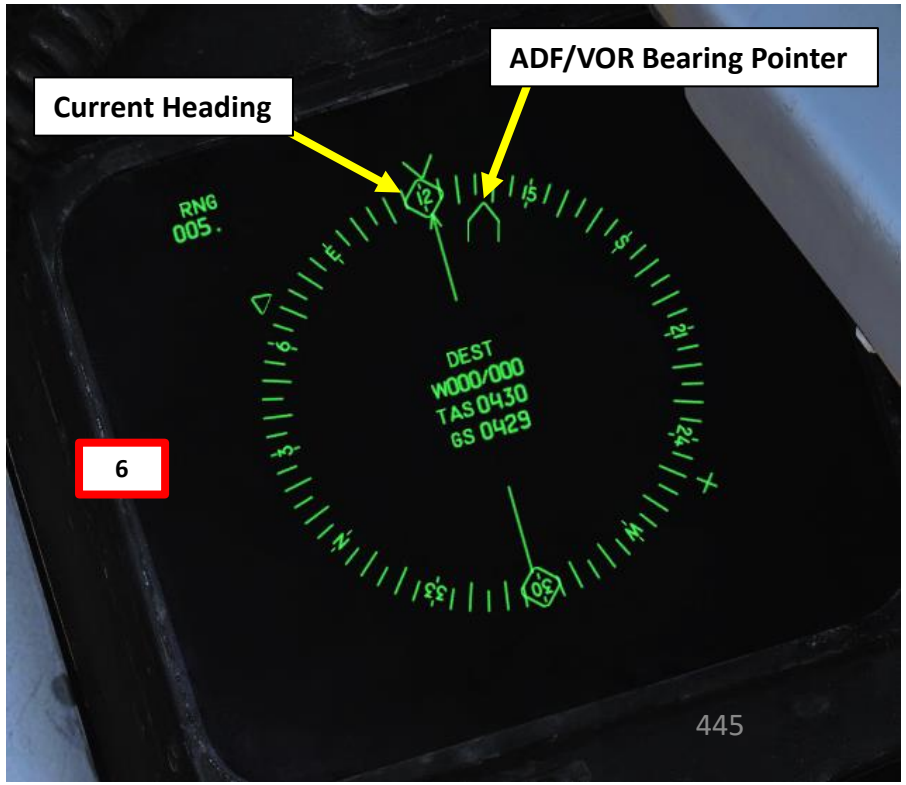


8 – VOR & ADF NAVIGATION

6. Consult No. 1 Bearing Pointer (thin needle) on the BDHI (Bearing Distance Heading Indicator) to find bearing to VOR. You can also consult the ECMD (rear cockpit) or the HSD (front cockpit).







9 - BULLSEYE & NAVGRID

This section will be divided in sub-sections.

- 9.1 – Introduction
- 9.2 – Grid
- 9.3 – Grid Display Modes
- 9.4 – Voice Codes
- 9.5 – Grid View Offsets
- 9.6 – Grid Setup (RIO)
- 9.7 – Grid Setup (JESTER)
- 9.8 – Using NAVGRID



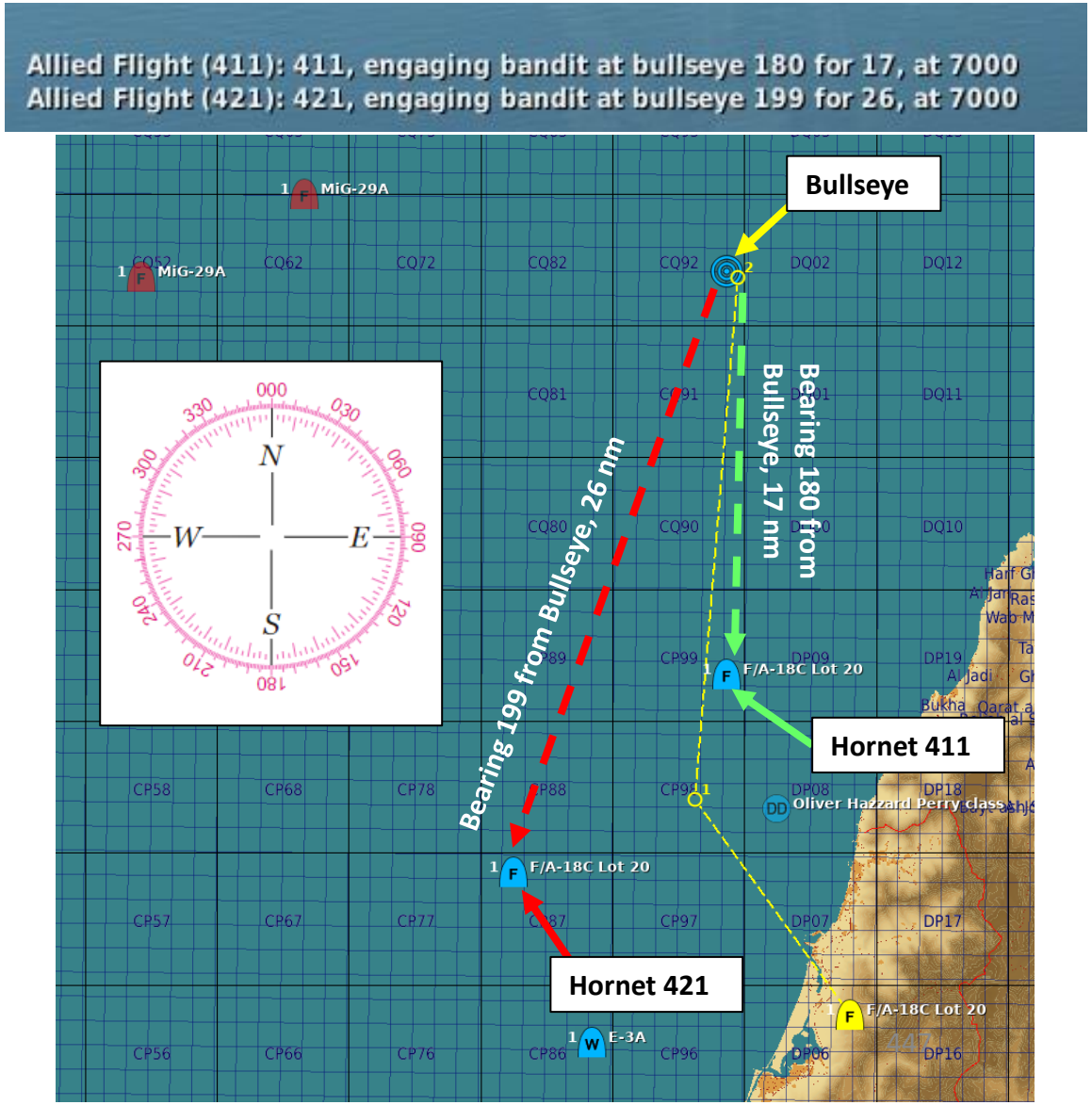
9.1 - BULLSEYE & NAVGRID - Introduction

A “Bullseye” is a fictional point in space used as a reference to locate yourself, friendly contacts and enemy contacts. If you know where the bullseye is and the enemy doesn’t, it gives you a way to communicate positions without the enemy knowing where to look from. Your wingmen and AWACS will often refer to “bulls” or “bullseye” on the radio. A bullseye call, used to communicate your position, is done in the following format:

- Bearing from bullseye
- Range from bullseye
- Altitude

Bullseye Explanation by JediLinks: https://youtu.be/vgcXcfeGb2M





9.1 - BULLSEYE & NAVGRID - Introduction

Ever heard of the game “Battleship”? It is played on ruled grids on which each player's fleet of ships (including battleships) are marked. The locations of the fleets are concealed from the other player. Players alternate turns calling "shots" at the other player's ships, and the objective of the game is to destroy the opposing player's fleet.

Now, where am I going with this analogy? In real life, the Tomcat’s main role was Fleet Air Defense (FAD). The aircraft was meant to protect a Carrier Battle Group (CVBG). Navigating at sea is different from navigating on land since you have no landmarks to use as a reference. This is why carrier groups needed to use a grid reference system to vector aircraft on CAP (Combat Air Patrol) interception missions.

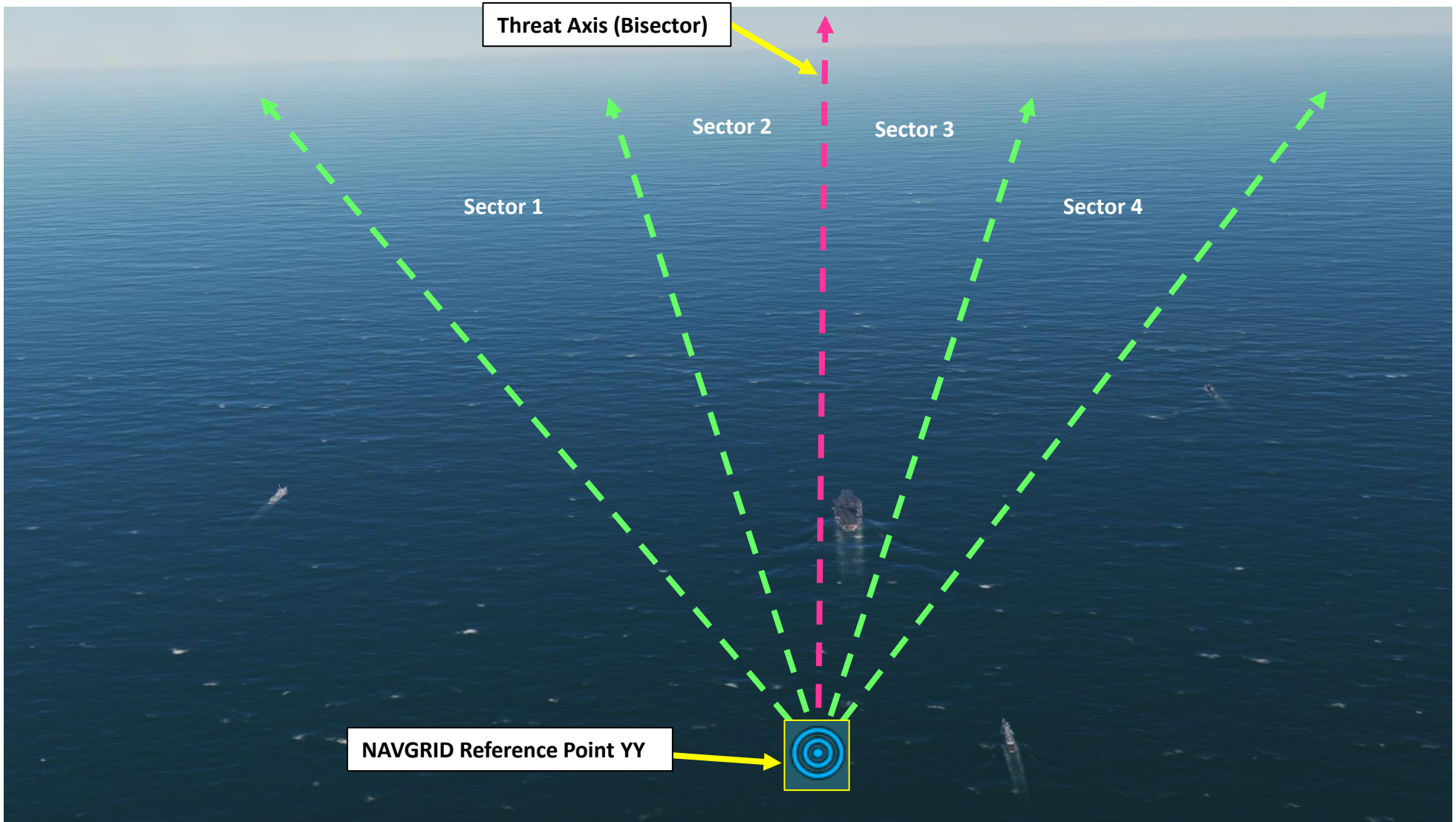
This grid reference system is what we call NAVGRID (Navigation Command and Control Grid), which works similarly to the Bullseye. The main use of NAVGRID is for several Tomcat pilots flying together in multiplayer and to use the same NAVGRID system, which will allow them to transmit target information quickly and efficiently.





9.1 - BULLSEYE & NAVGRID - Introduction

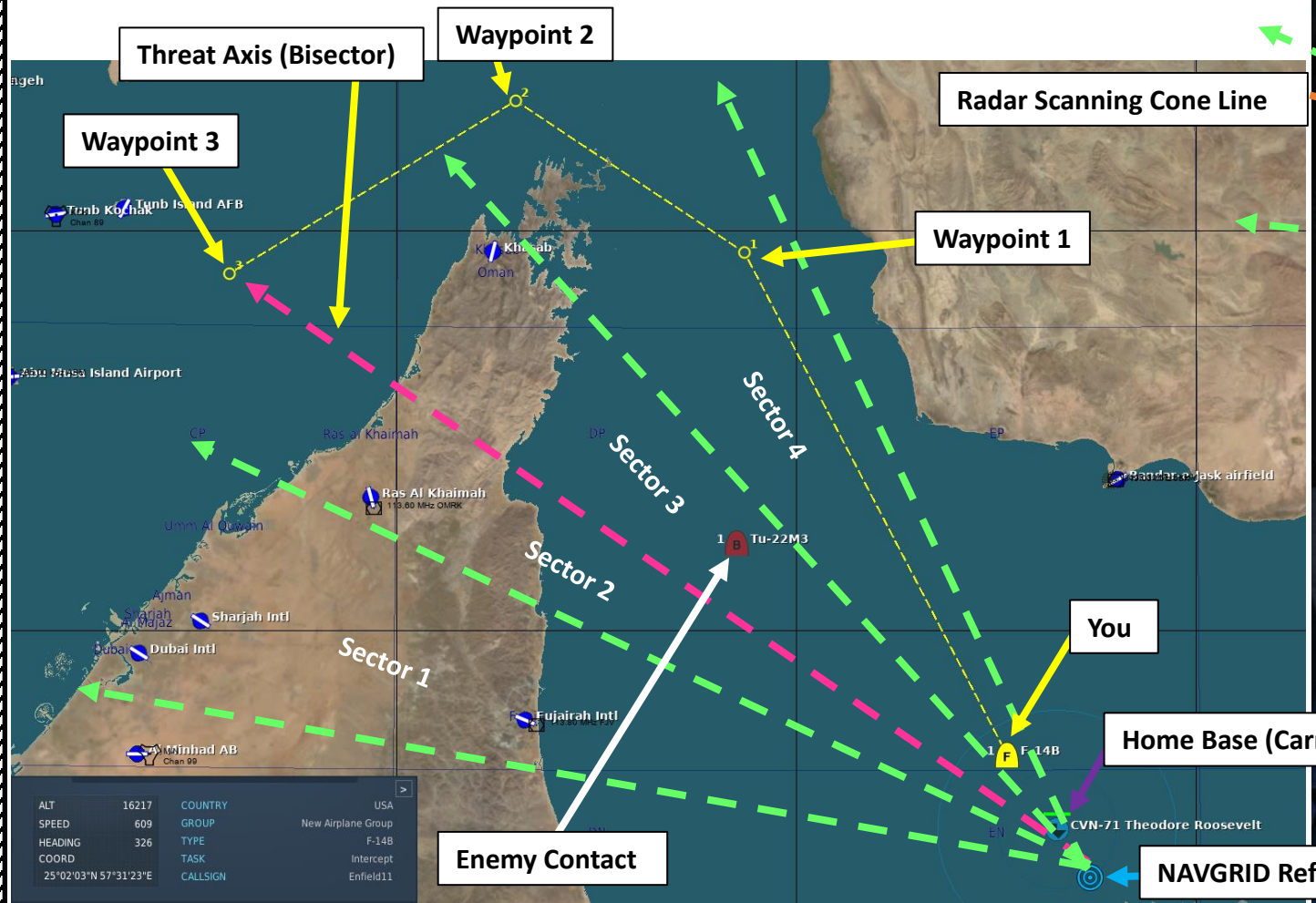
NAVGRID is a grid system that can be customized at will (number of sectors, orientation, coverage, and reference point), but it is generally oriented to the boat, or a point on the boat's path of travel across a given time period. The US Navy developed for defending carrier battle groups against Soviet air attacks a doctrine called "vector logic." It established a circular grid, not necessarily centered on the carrier, within which fighters could be moved like chess pieces. Vector Logic defined the threat sector (airspace an opposing air force could pass through in an attempt to detect or attack the fleet), which would then be communicated to interceptors. The grid is all about getting to where you need to be to protect the fleet.

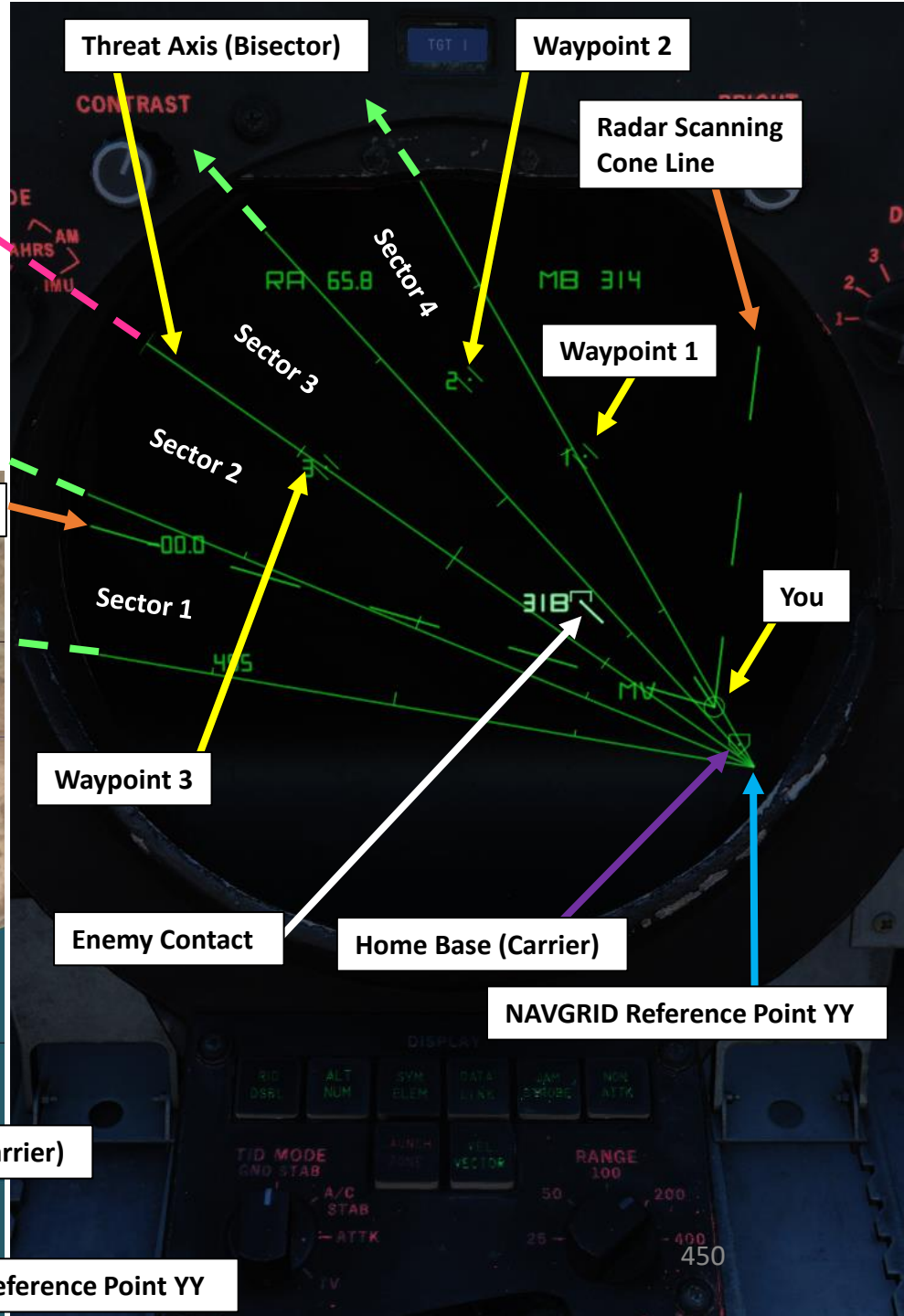


9.2 - BULLSEYE & NAVGRID - Grid

Here is a comparison between what the NAVGRID looks like and what it would look like on a map. In this case, the NAVGRID parameters are:

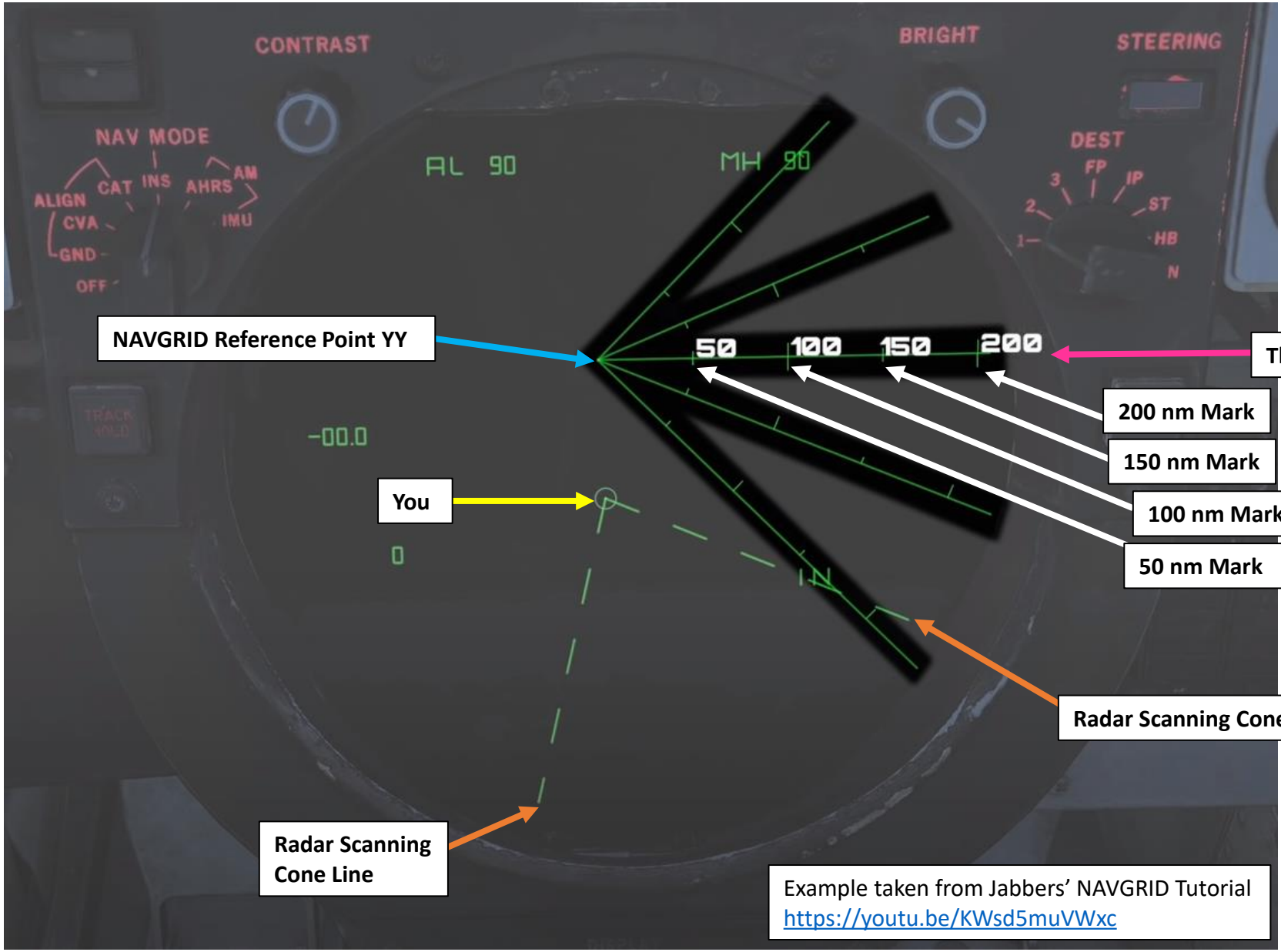
- **Reference Point YY**: Coordinates set on Bullseye
- **Threat Axis** (defines orientation of grid's bisector): Uses Bearing 304, which coincides with a projection from Bullseye to Waypoint 3
- **Number of Sectors**: 4
- **Grid Coverage Angle**: 50 deg





9.2 - BULLSEYE & NAVGRID - Grid

NAVGRID grid range is indicated by the large (100 nm interval) and small markings (50 nm interval) on the grid lines.



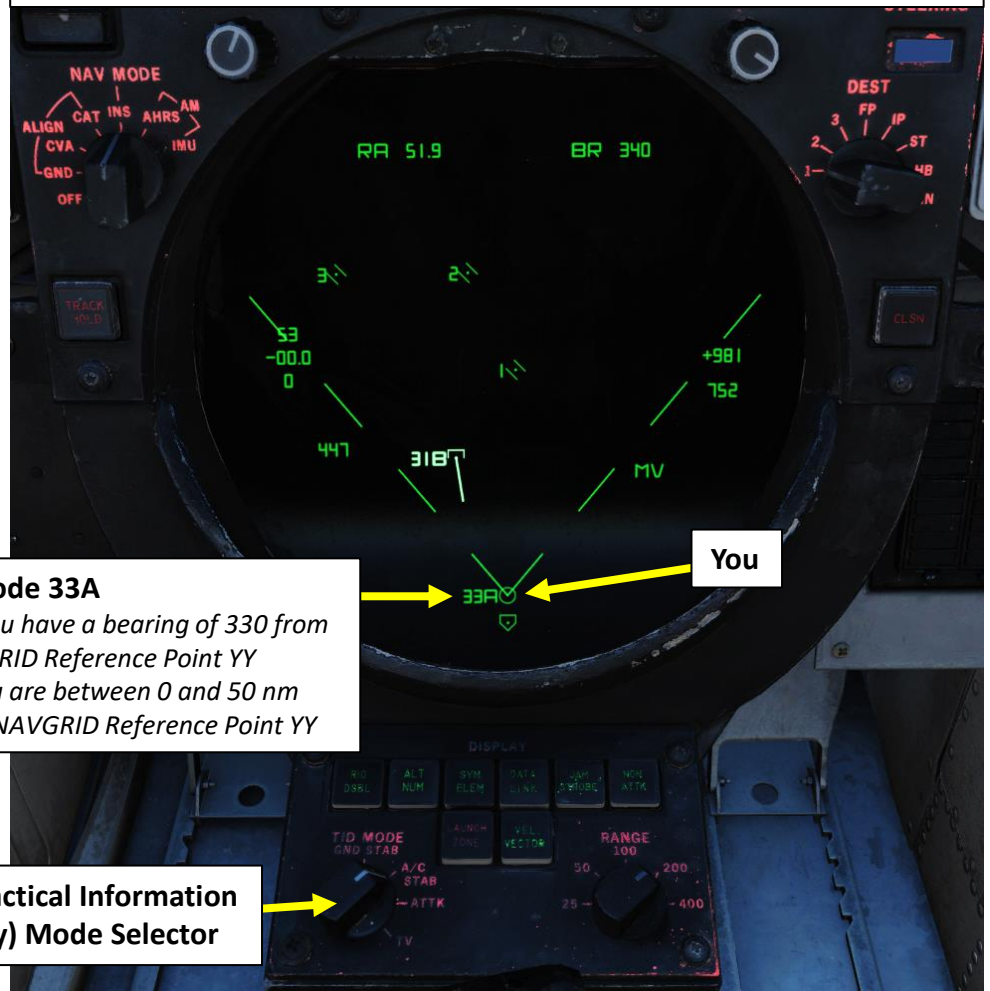
Example taken from Jabbers' NAVGRID Tutorial
https://youtu.be/KWsd5muVWxc

9.3 - BULLSEYE & NAVGRID - Grid Display Modes

The grid lines are only displayed if the TID Mode Selector is set to Ground Stabilized (GND STAB), which shows a top-down view with true north pointing up. If TID Mode Selector is set to Aircraft Stabilized (A/C STAB), a Voice Code will be displayed next to your own aircraft, showing your position from the NAVGRID Reference Point YY. This is useful to give your own position to your wingmen in relationship to the Bullseye (YY).

TID (Tactical Information Display) Mode – A/C STAB

- ***A/C STAB****: Aircraft Stabilized. Stabilizes the display to own aircraft meaning that the display moves along with own aircraft which stays put on the display. Own aircraft heading is used as up on the display.*



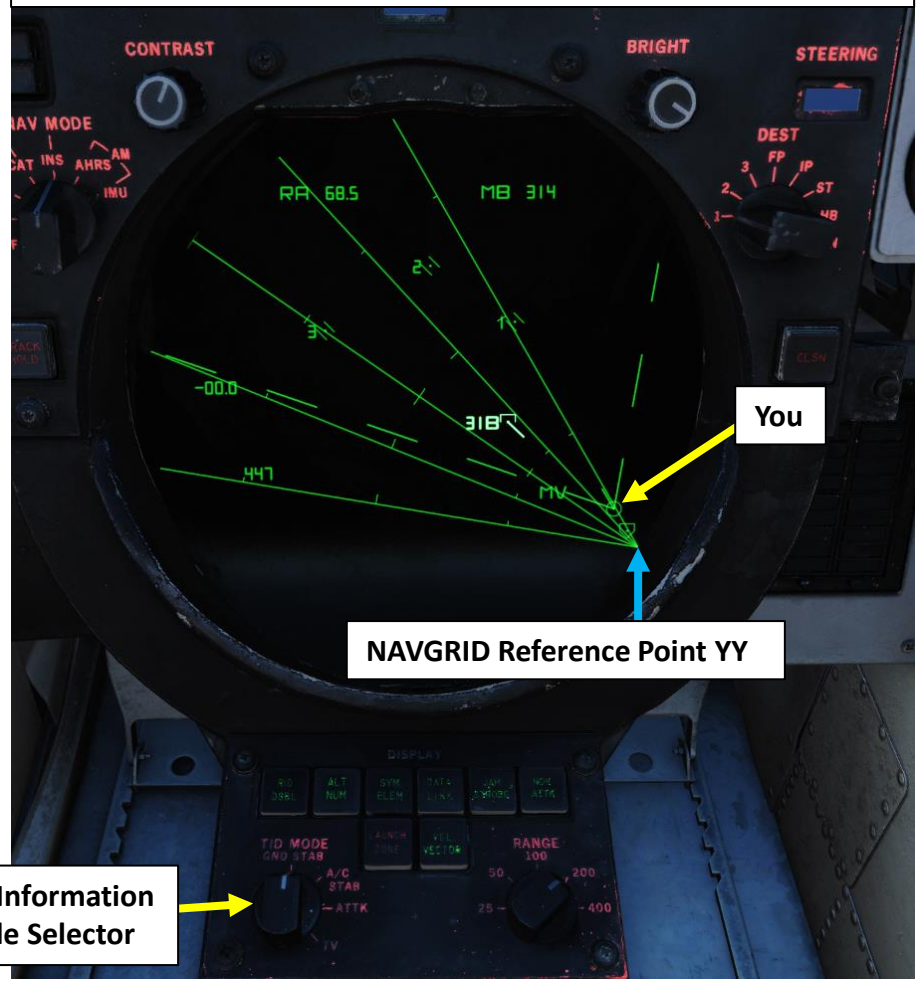
Voice Code 33A

- ***33****: You have a bearing of 330 from NAVGRID Reference Point YY*
- ***A****: You are between 0 and 50 nm from NAVGRID Reference Point YY*

TID (Tactical Information Display) Mode Selector

TID (Tactical Information Display) Mode – GND STAB

- ***GND STAB****: Ground Stabilized. Stabilizes the display to the ground meaning that the display is fixed while own aircraft moves on the display. True north is used as up on the display.*



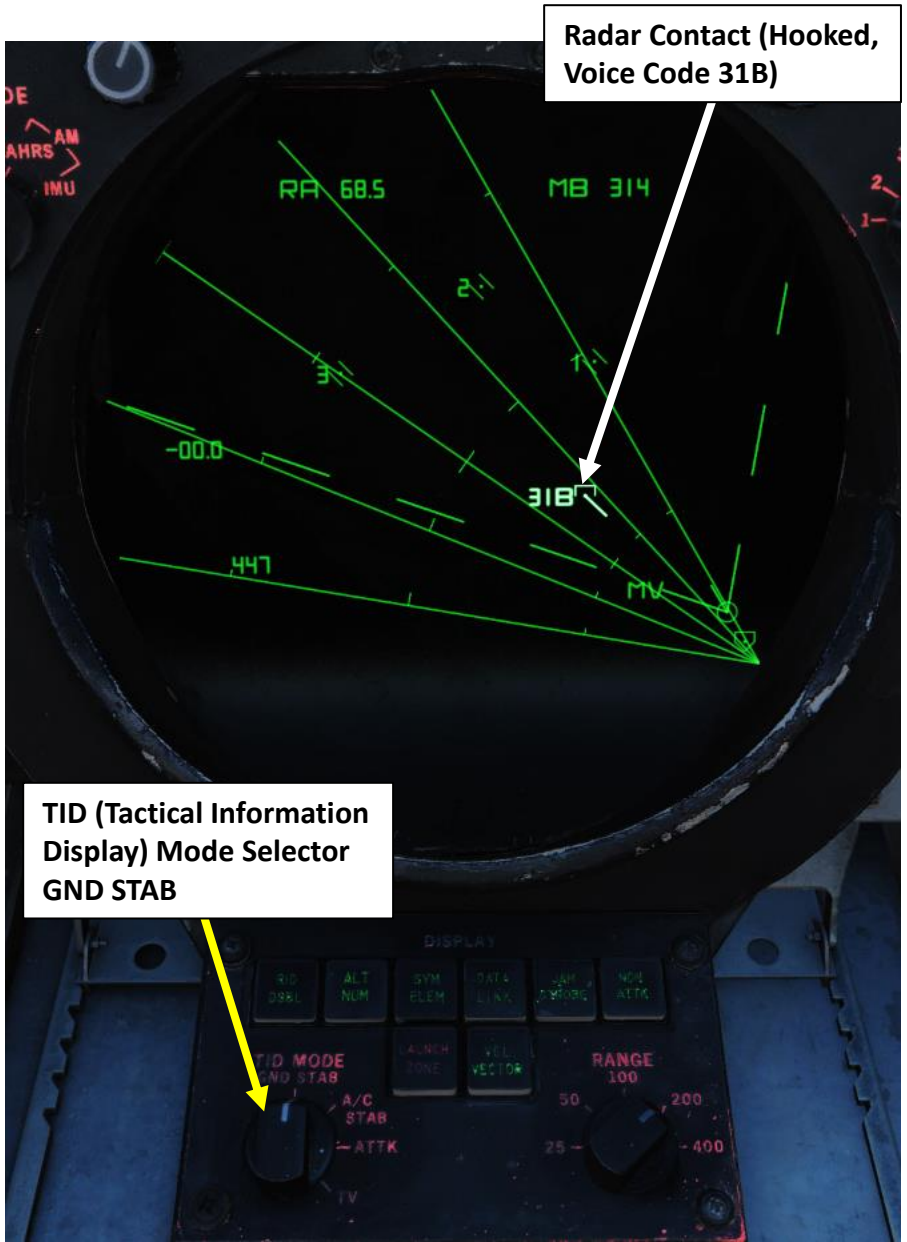
TID (Tactical Information Display) Mode Selector

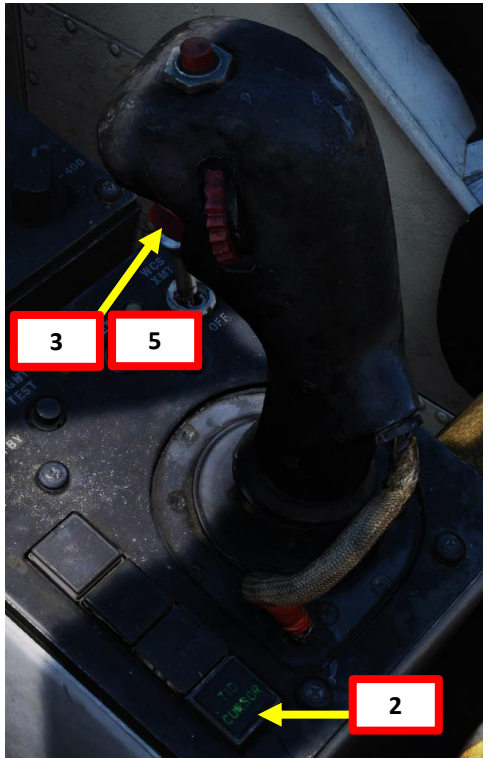
9.4 - BULLSEYE & NAVGRID - Voice Codes

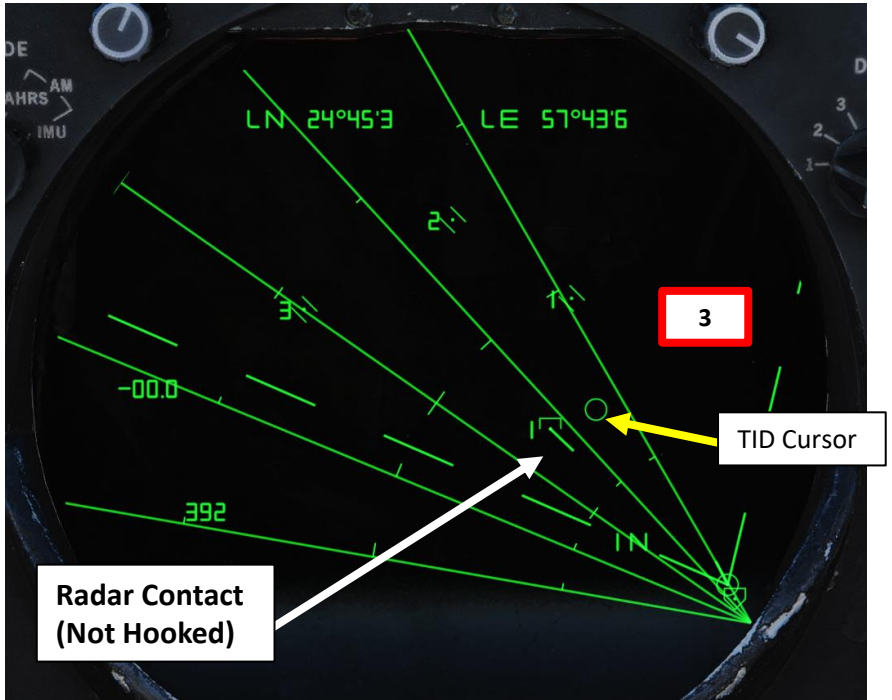
If you want to gather more information from a target without doing a proper radar lock, you can hook a target with the TID cursor. If the NAVGRID system is activated, a "Voice Code" indication will display information on its magnetic bearing and approximate distance from the Reference Point YY. Here is how you can get a Voice Code:

1. Select TWS MAN Mode
2. Select "TID CURSOR" TID Mode
3. Press and hold the first HCU trigger (Half-Action); the TID cursor will appear on the TID (Tactical Information Display).
4. Use the HCU stick to slew the TID cursor over the desired target.
5. Once the cursor is over desired contact, press the second HCU trigger (Full-Action) to select the target.
6. Selected target will display a Voice Code (i.e. 31B) and alternate with the target's altitude in thousands of feet.









9.4 - BULLSEYE & NAVGRID - Voice Codes

Traditional **Bullseye** Call: *Dodge 1-1, engaging bandit at bullseye 314 for 68, at 7000.*	Target is at a bearing of 314 from bullseye/YY, 68 nautical miles from bullseye/YY, altitude of 7000 ft.
Voice Code Call Equivalent: *Dodge 1-1, engaging bandit at 31 Bravo, 7000.*	

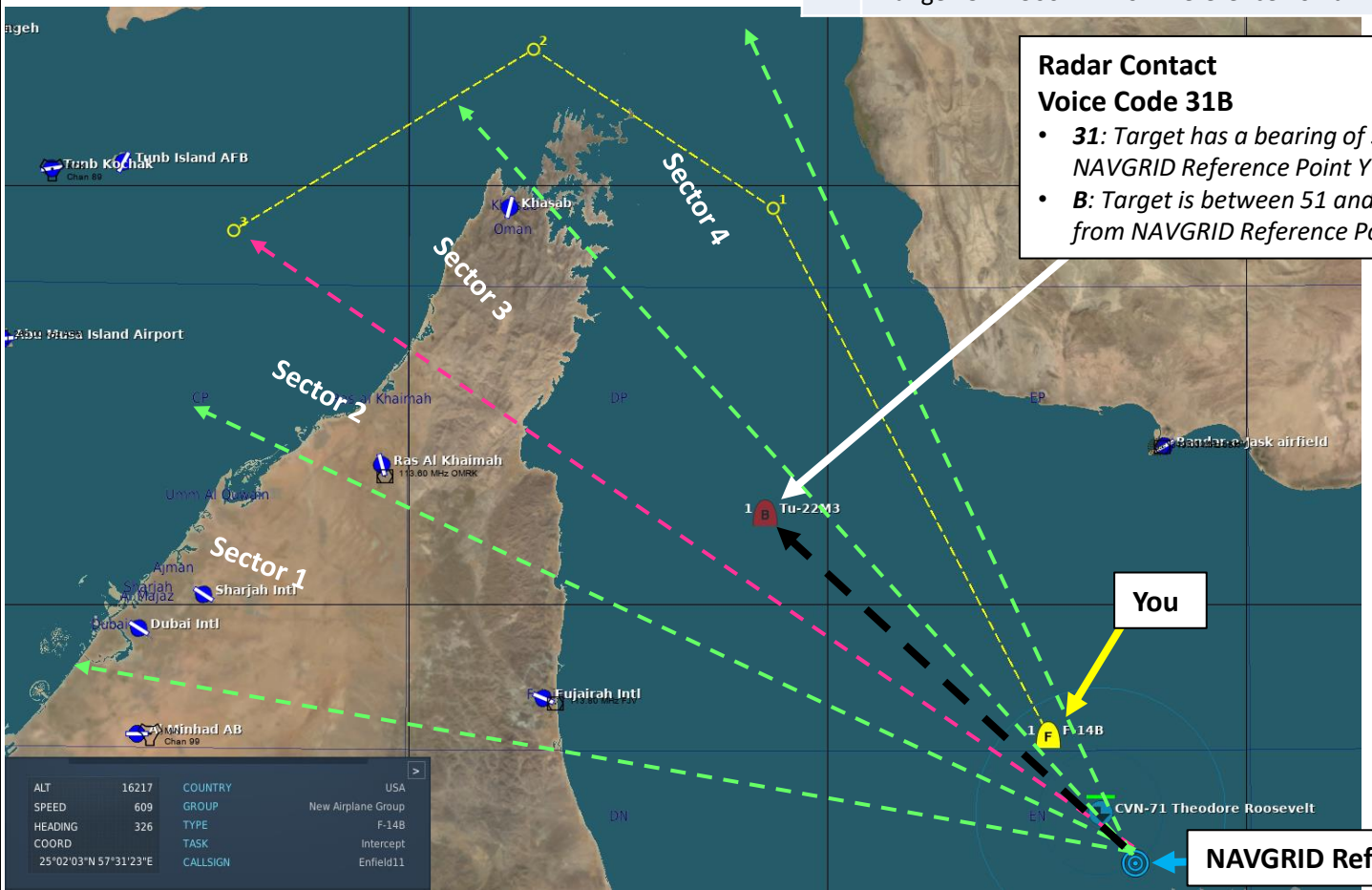
Voice Codes are displayed for current hook alternating with the altitude readout on the TID if ALT NUM is selected for display.

A voice code indicates bearing from Reference Point YY in tens (31 reading as 310 as an example) followed by a letter indicating range. A would indicate 0-50 nm while B indicates 50-100nm and so on for consecutive letters.

Voice codes are only indicated on hooked targets if the TID GND STAB is selected and NAVGRID system is defined and activated.

Voice Code Letter

A	Range 1 – 50 nm from Reference Point YY
B	Range 51 – 100 nm from Reference Point YY
C	Range 101 – 150 nm from Reference Point YY
D	Range 151 – 200 nm from Reference Point YY
E	Range 201 – 250 nm from Reference Point YY
F	Range 251 – 300 nm from Reference Point YY

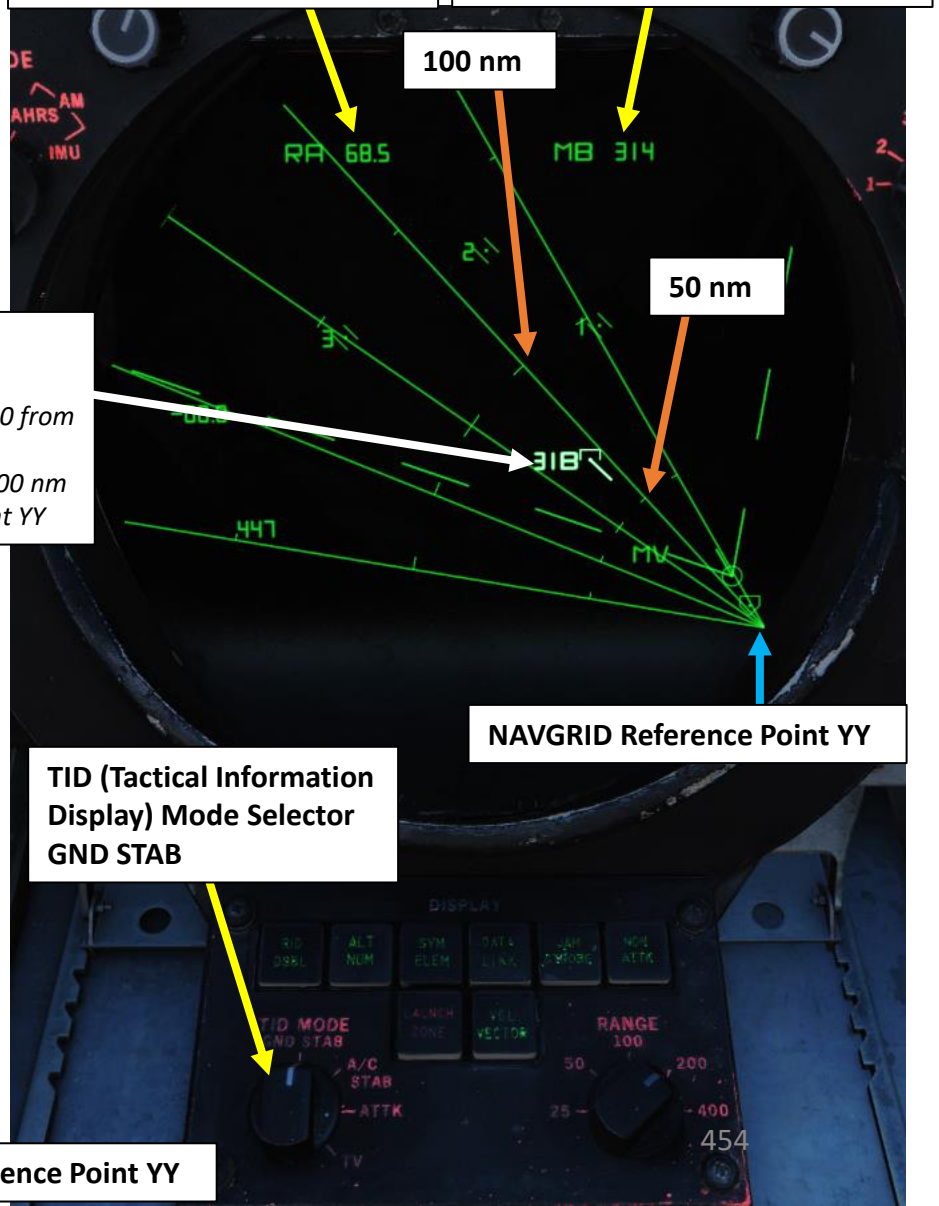


Radar Contact
Voice Code 31B

- ***31****: Target has a bearing of 310 from NAVGRID Reference Point YY*
- ***B****: Target is between 51 and 100 nm from NAVGRID Reference Point YY*

RA (Range) of hooked target from Reference Point YY is 68.5 nm

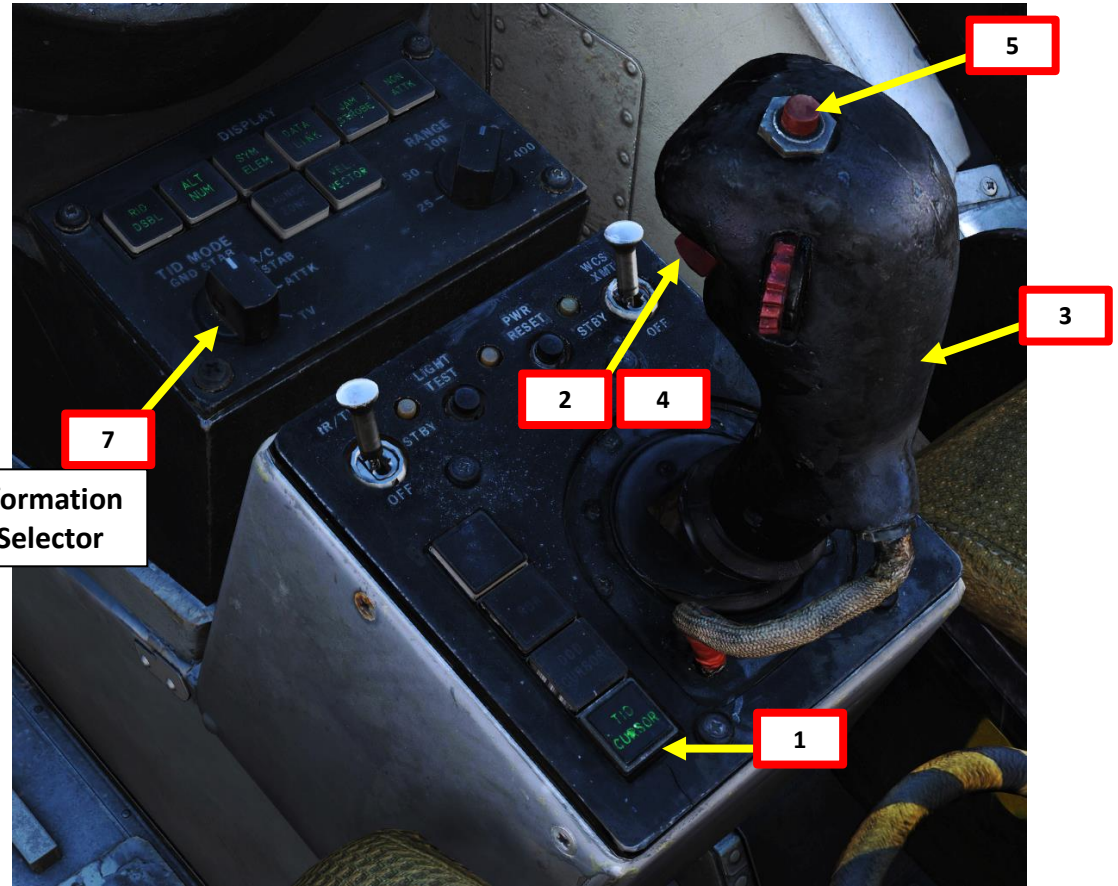
MB (Magnetic Bearing) of hooked target from Reference Point YY is 314

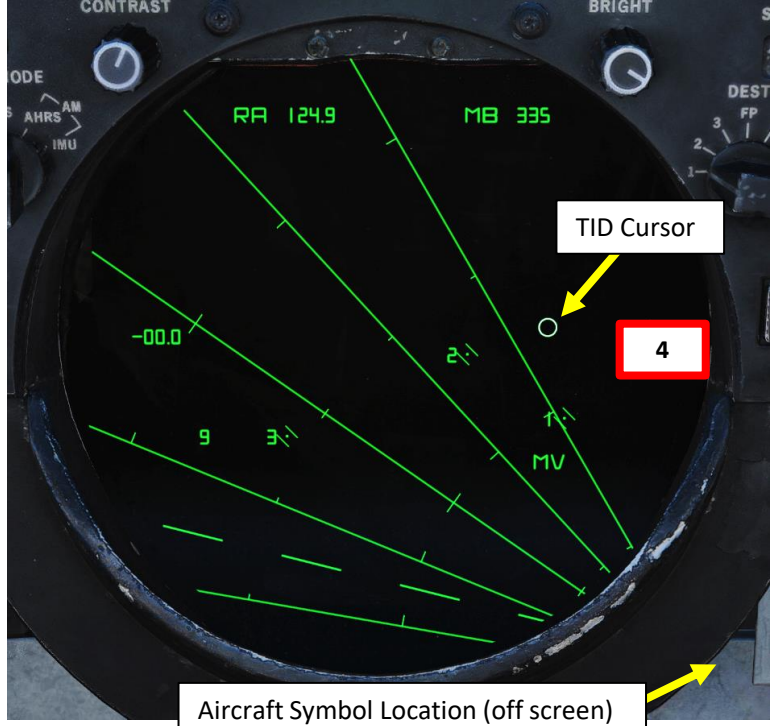


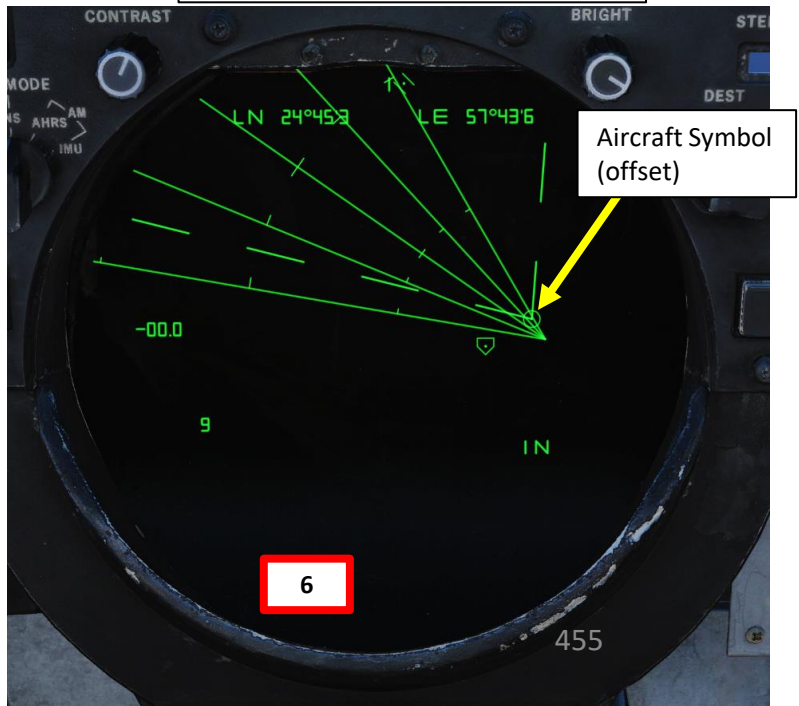
9.5 - BULLSEYE & NAVGRID – Grid View Offset

If you are in a situation where the aircraft symbol is not visible on the grid, it is possible to use the “HCU Offset” function to offset the aircraft symbol’s location and navgrid on the TID cursor’s location:

1. Select “TID CURSOR” TID Mode
2. Press and hold the first HCU trigger (Half-Action); the TID cursor will appear on the TID (Tactical Information Display).
3. Use the HCU (Hand Control Unit) stick to slew the TID cursor over the desired location of the aircraft symbol on the TID.
4. Once the cursor is over desired emplacement offset of the aircraft symbol, press the second HCU trigger (Full-Action). The TID Cursor will become highlighted.
5. Press the HCU Offset button on the HCU stick.
6. The aircraft symbol and navgrid will be offset as shown.
7. To reset the offset, set the TID Mode Selector to A/C STAB, then back to GND STAB.







9.6 - BULLSEYE & NAVGRID - Grid Setup (RIO)

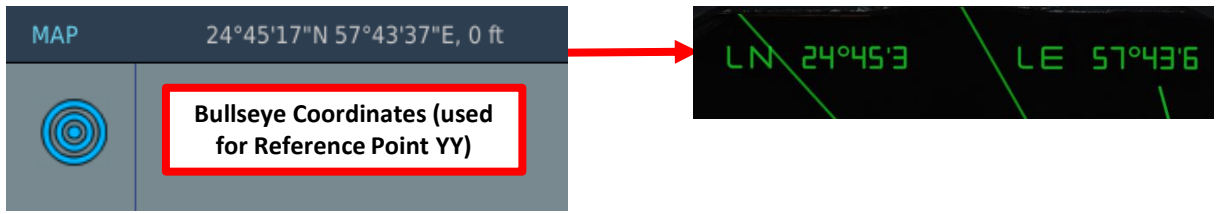
The NAVGRID setup (if done by the RIO) requires four things:

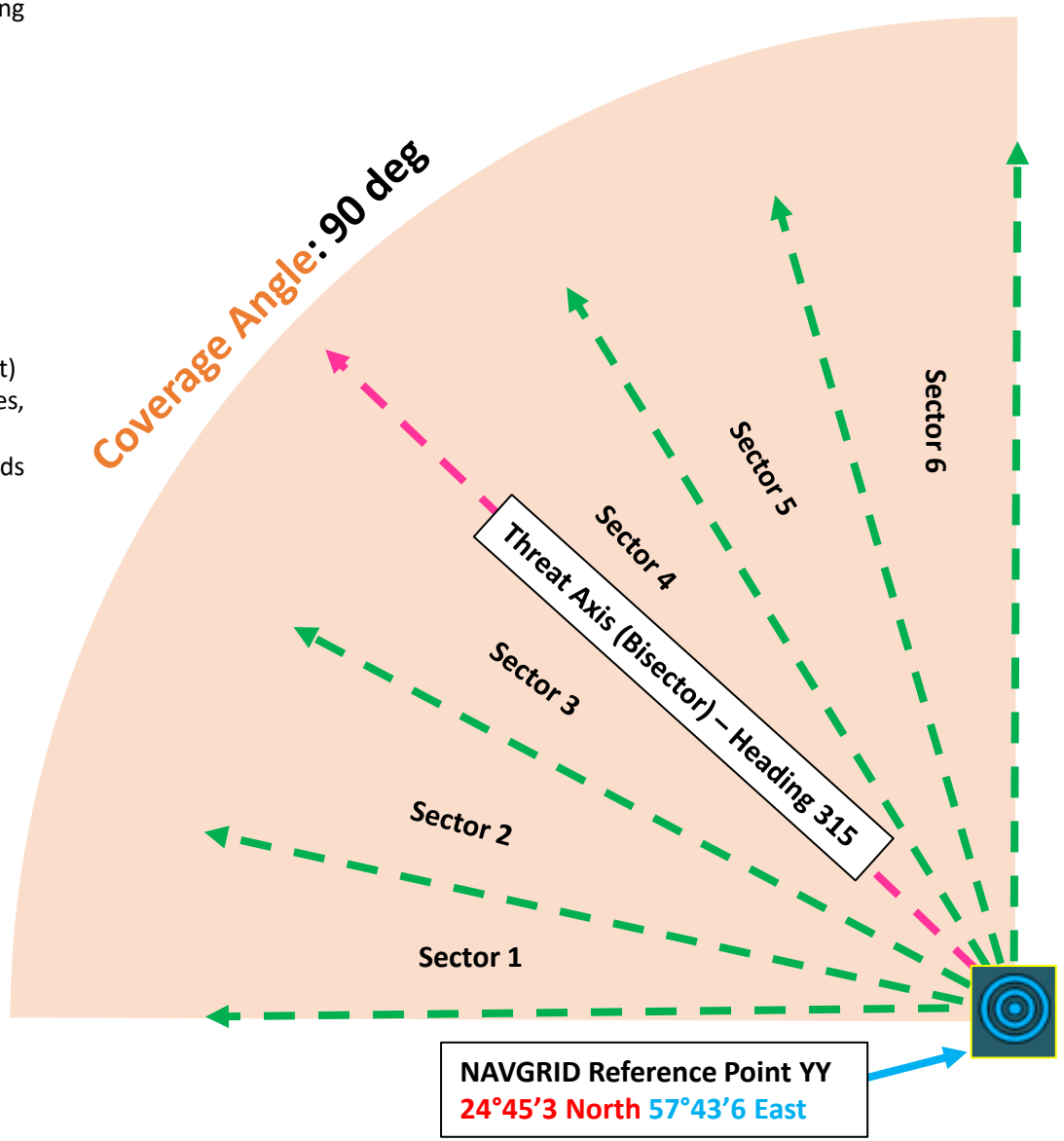
- A **Reference Point YY** (usually the coordinates of Bullseye, but it can be set anywhere you want depending on the mission requirements)
- A **Sector Count** (1 to 6)
- A **Coverage Angle** (from 30 to 180 deg)
- A **Threat Axis Heading**

****

In this example, we will create a NAVGRID with the following parameters:

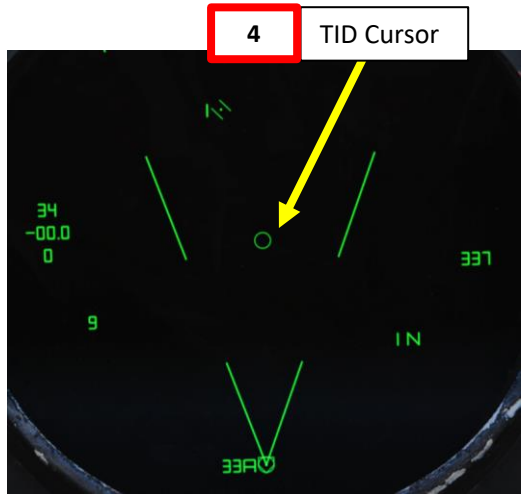
- Reference Point YY Latitude/Longitude Coordinates (set on Bullseye):
  - **24°45'17'' North 57°43'37'' East** (Deg, Min, Sec, using F10 Map)
  - **24°45'3 North 57°43'6 East** (Deg, Min, Tenth of a Minute, Computer Address Coordinates Format)
  - Note 1: convert them from a **D**egree, **M**inutes, **S**econds (DMS) format to a **D**egrees, **M**inutes, **T**enths of a **M**inute format.
  - Note 2: conversion of seconds into tenths of a minute is done by dividing the number of seconds by 60
- Sector Count: 6
- Coverage Angle: 90 deg
- Threat Axis (Bisector) Heading: 315

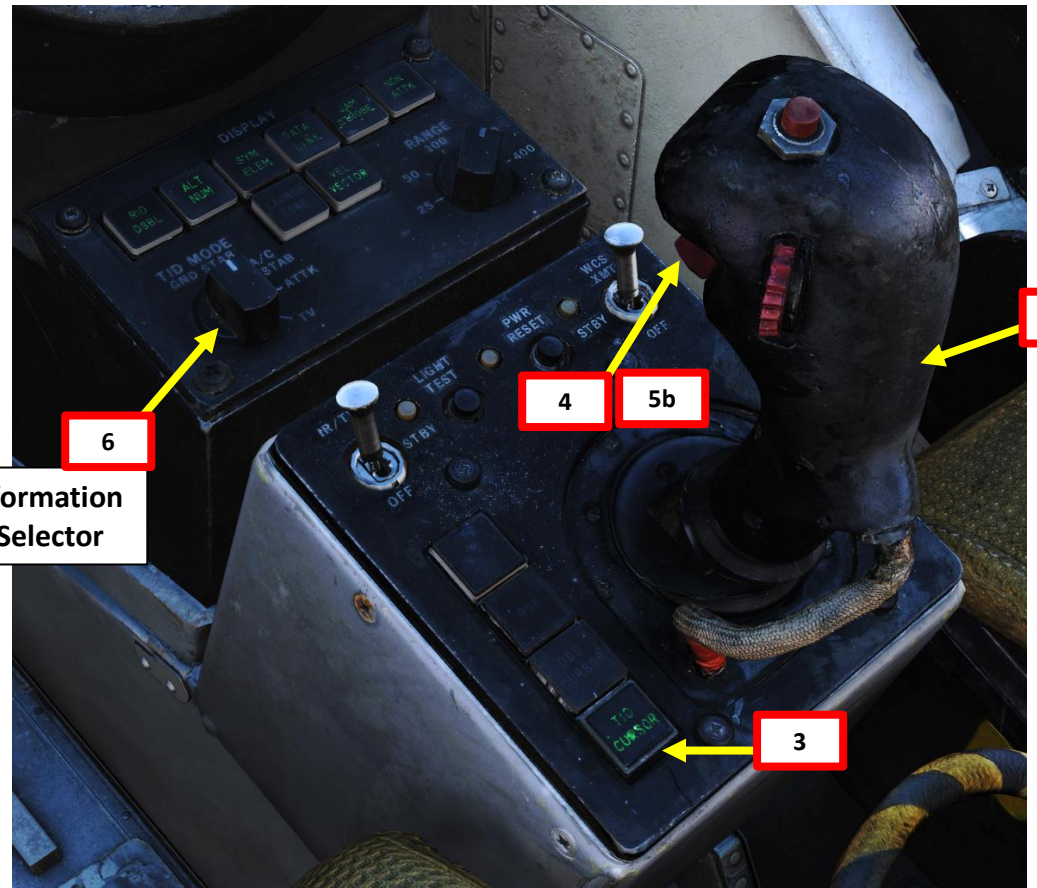




9.6 - BULLSEYE & NAVGRID - Grid Setup (RIO)

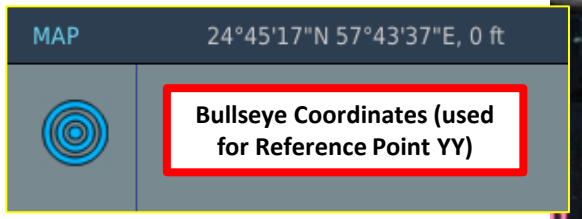
1. Set CAP (Computer Address Panel) CATEGORY selector to D/L (Datalink)
2. Press the CAP Message selector button next to NAV GRID. A green arrow indicates NAVGRID is activated.
3. Select “TID CURSOR” TID Mode
4. Press and hold the first HCU trigger (Half-Action); the TID cursor will appear on the TID (Tactical Information Display).
5. Use the HCU (Hand Control Unit) stick to slew the TID cursor anywhere on the TID page, then release HCU trigger (Half-Action). This will ensure that no waypoint is hooked and prevent you from unknowingly modifying existing selected waypoint coordinates.
6. Set TID Mode Selector to GND STAB.







9.6 - BULLSEYE & NAVGRID - Grid Setup (RIO)

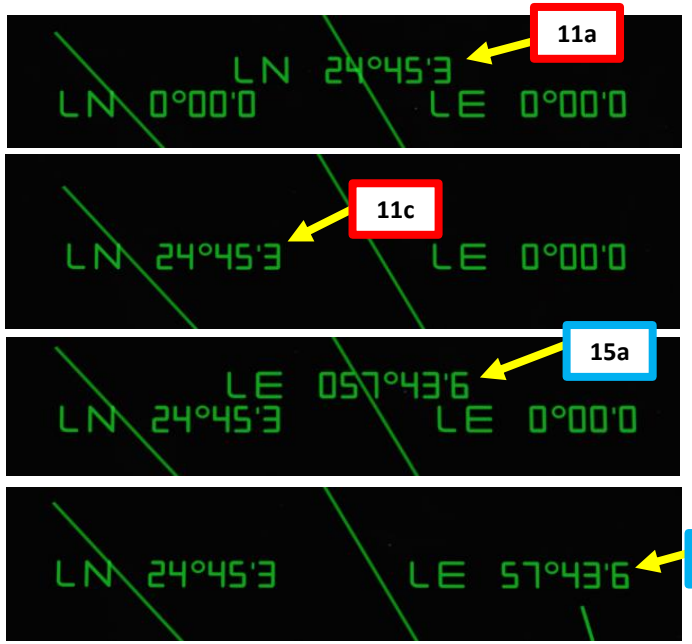


- *Reference Point YY Latitude/Longitude Coordinates (set on Bullseye):*
  - **24°45'17'' North 57°43'37'' East** (Deg, Min, Sec, using F10 Map)
  - **24°45'3 North 57°43'6 East** (Deg, Min, Tenth of a Minute, Computer Address Coordinates Format)

CREATE GRID REFERENCE POINT YY (BULLSEYE)

7. Verify that no waypoint/surface target/fixed point/etc. is selected or hooked on the TID
8. On the CAP keyboard, press the CLEAR button.
9. On the CAP keyboard, press the « 1 » (LAT for Latitude) button.
10. On the CAP keyboard, press « N+E » to select North coordinates, then type « **24453** »
11. Look at the top of the TID and confirm that the latitude coordinates are correct, then press "ENTER" to enter coordinates.
12. On the CAP keyboard, press the CLEAR button.
13. On the CAP keyboard, press the « 6 » (LONG for Longitude) button.
14. On the CAP keyboard, press « N+E » to select East coordinates, then type « **57436** »
15. Look at the top of the TID and confirm that the latitude coordinates are correct, then press "ENTER" to enter coordinates.







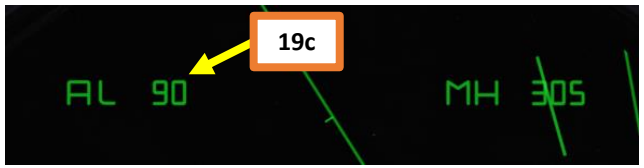
9.6 - BULLSEYE & NAVGRID - Grid Setup (RIO)

- **Coverage Angle**: *90 deg*
- **Sector Count**: *6*
- **Threat Axis (Bisector) Heading**: *315*

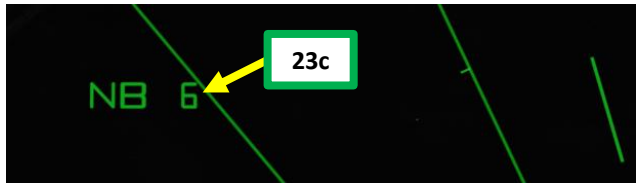
SET GRID SECTOR COUNT, COVERAGE ANGLE AND THREAT AXIS HEADING

16. On the CAP keyboard, press the CLEAR button.
17. On the CAP keyboard, press the « 4 » (ALT) button to select Coverage Angle.
18. On the CAP keyboard, type « **90** » to enter a coverage angle of 90 degrees.
19. Look at the top of the TID and confirm that the coverage angle is correct, then press “ENTER” to enter grid coverage angle.
20. On the CAP keyboard, press the CLEAR button.
21. On the CAP keyboard, press the « 2 » (NBR) button to select Sector Count (number of grid sectors).
22. On the CAP keyboard, type « **6** » to enter a Sector Count of 6 sectors.
23. Look at the top of the TID and confirm that the sector count is correct, then press “ENTER” to enter grid sector count.
24. On the CAP keyboard, press the CLEAR button.
25. On the CAP keyboard, press the « 8 » (HDG) button to select Threat Axis (Bisector) Heading.
26. On the CAP keyboard, type « **315** » to enter a Threat Axis heading of 315.
27. Look at the top of the TID and confirm that the heading is correct, then press “ENTER” to enter grid threat axis heading. Your grid will be oriented according to this heading.

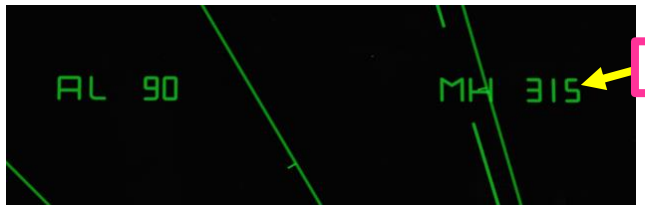


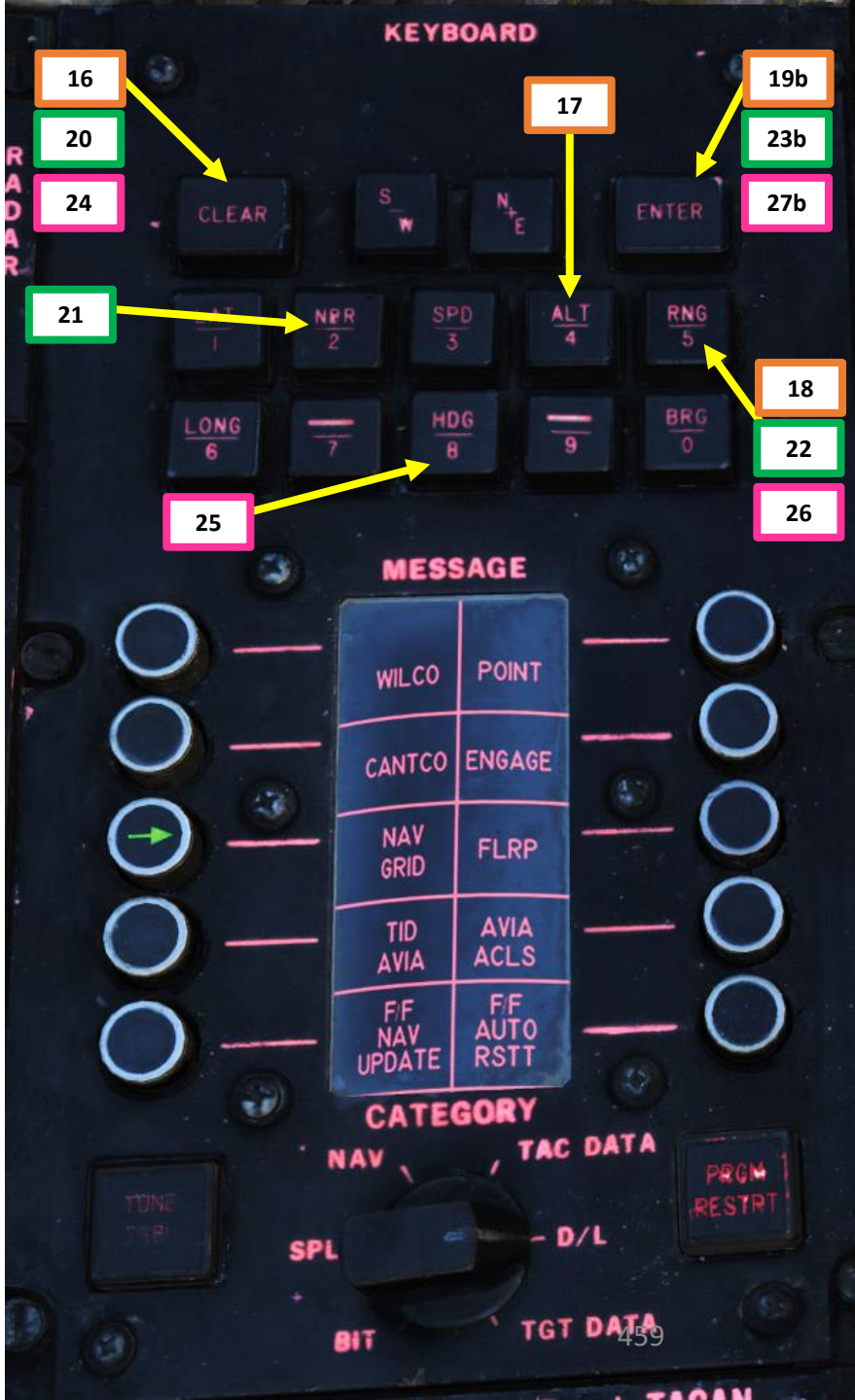










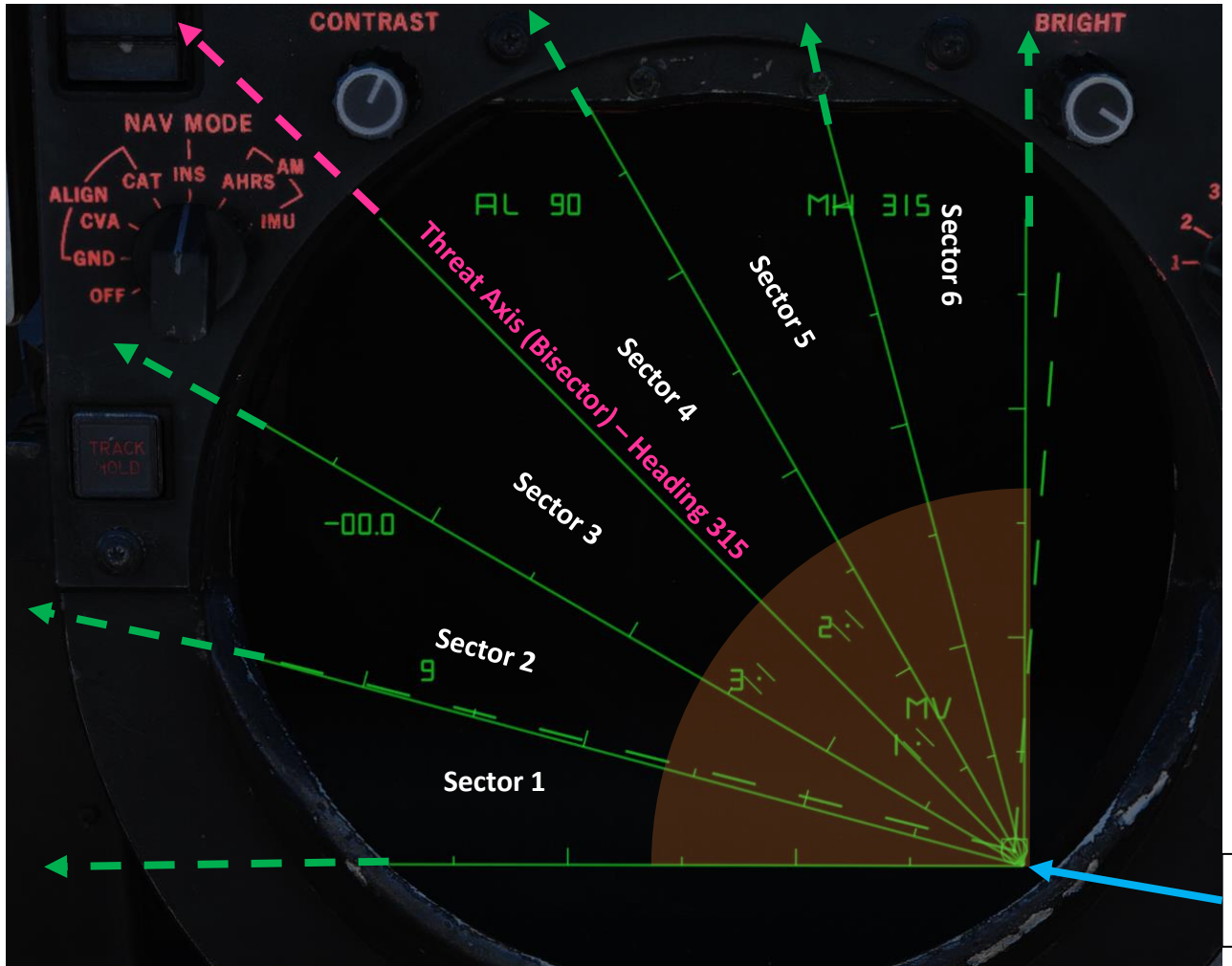


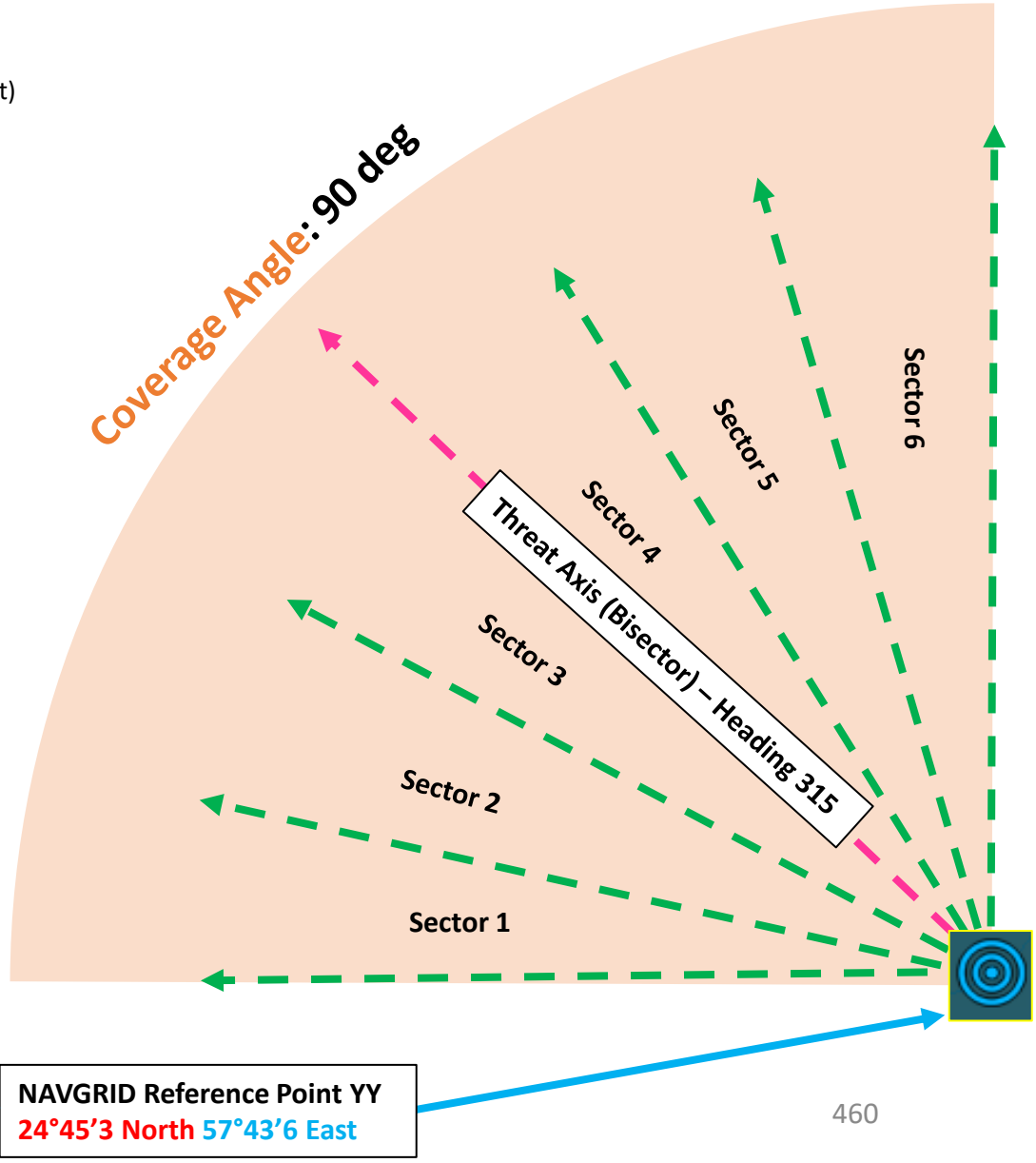
9.6 - BULLSEYE & NAVGRID - Grid Setup (RIO)

And that's it, we have a NAVGRID set up properly!

NAVGRID PARAMETERS

- *Reference Point YY Latitude/Longitude Coordinates (set on Bullseye):*
  - **24°45'3 North 57°43'6 East** (Deg, Min, Tenth of a Minute, Computer Address Coordinates Format)
- **Coverage Angle**: *90 deg*
- **Sector Count**: *6*
- **Threat Axis (Bisector) Heading**: *315*

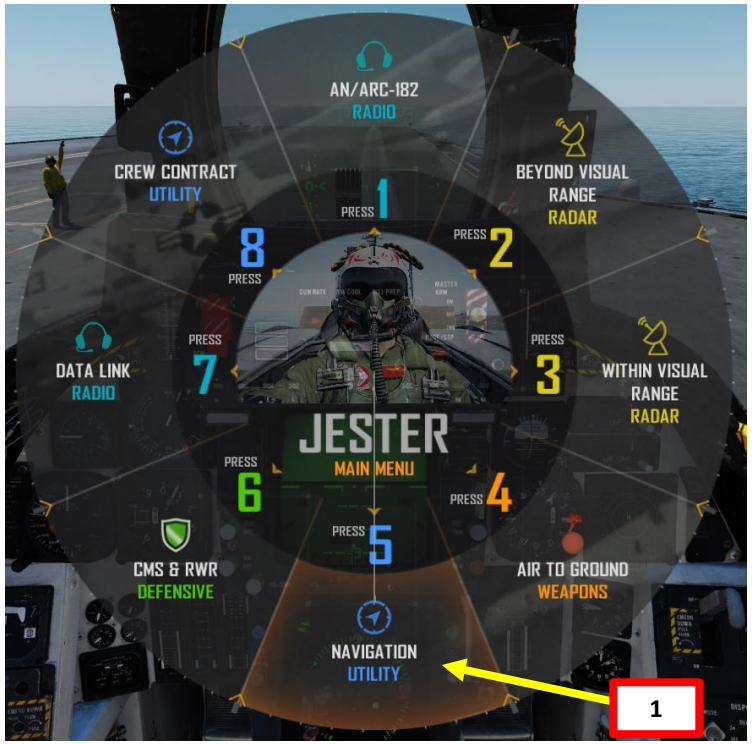


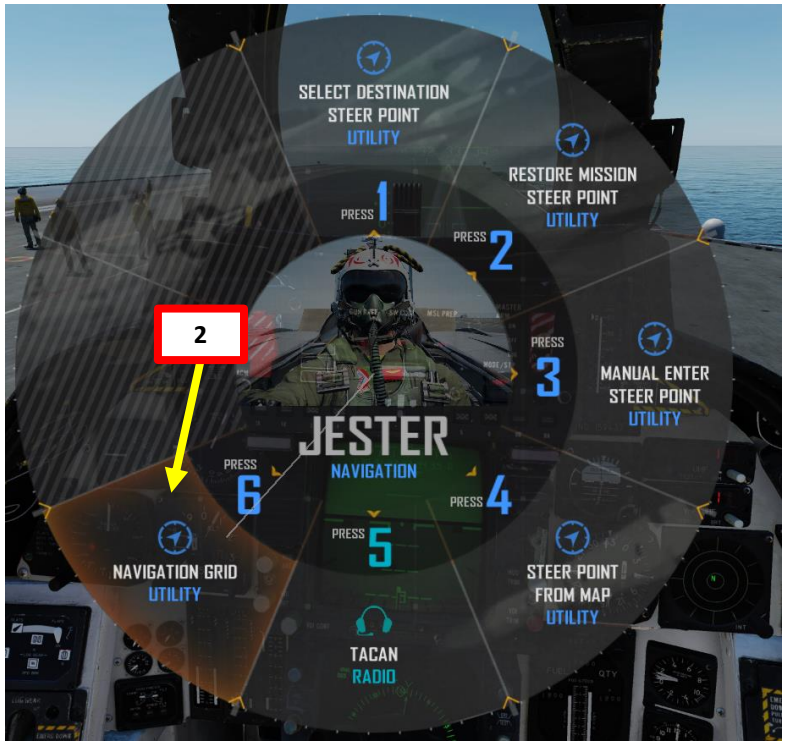


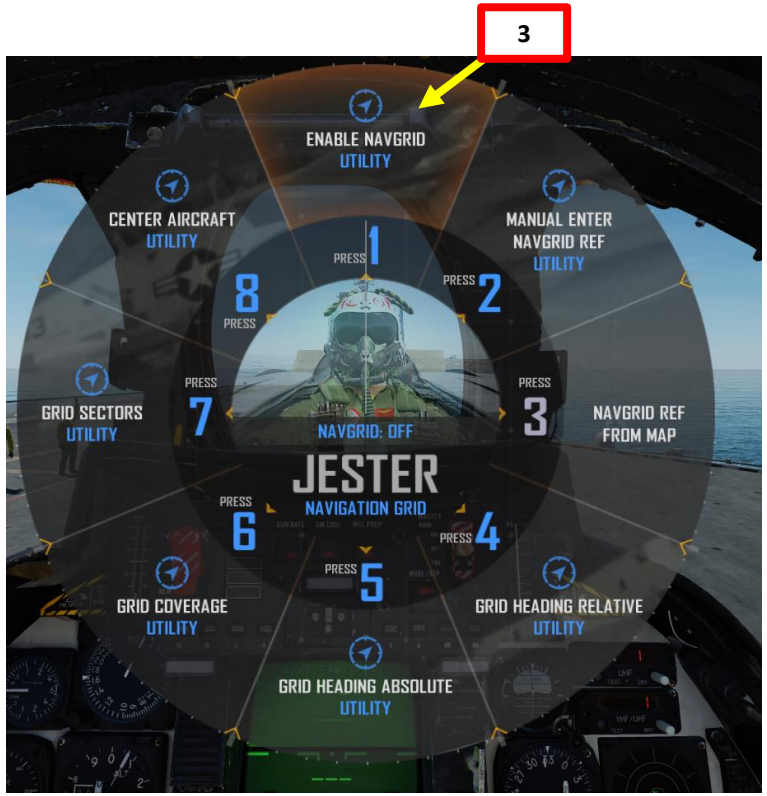
9.7 - BULLSEYE & NAVGRID - Grid Setup (JESTER)

JESTER can turn on the NAVGRID when requested by the pilot.

1. Press “A” twice and access the NAVIGATION menu.
2. Access the “NAVIGATION GRID UTILITY” menu.
3. Select the “ENABLE NAVGRID UTILITY”.
4. JESTER will then enable the NAVGRID.







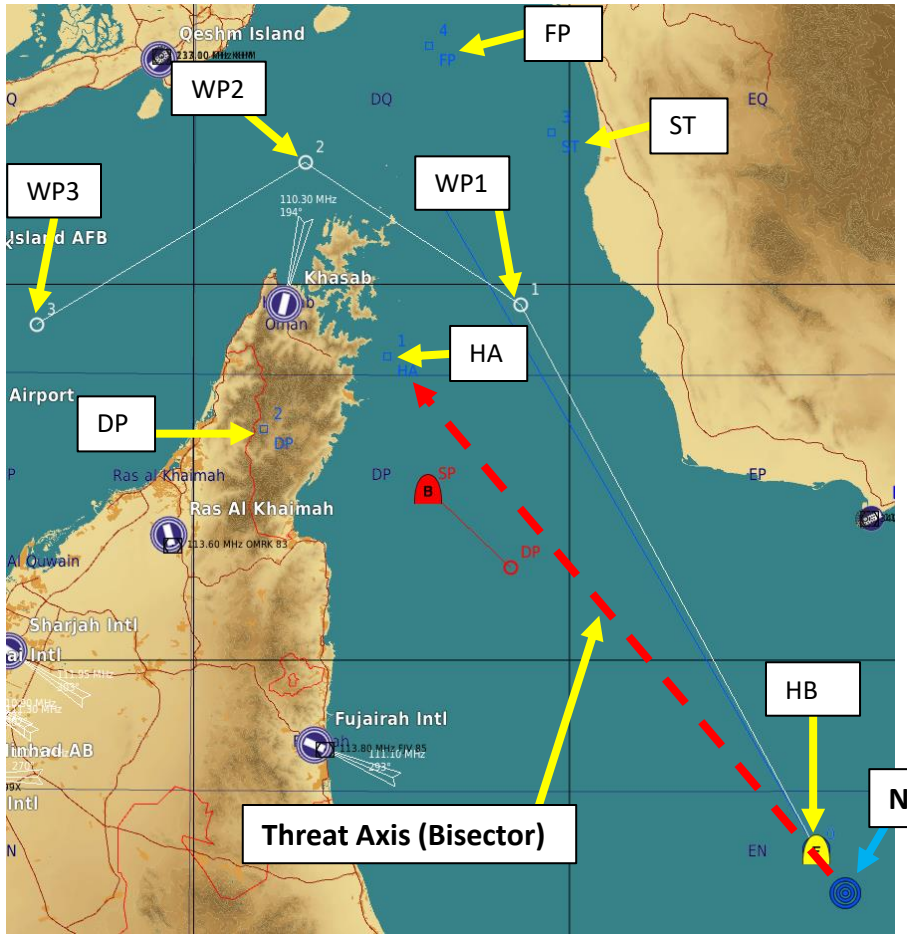
9.7 - BULLSEYE & NAVGRID - Grid Setup (JESTER)

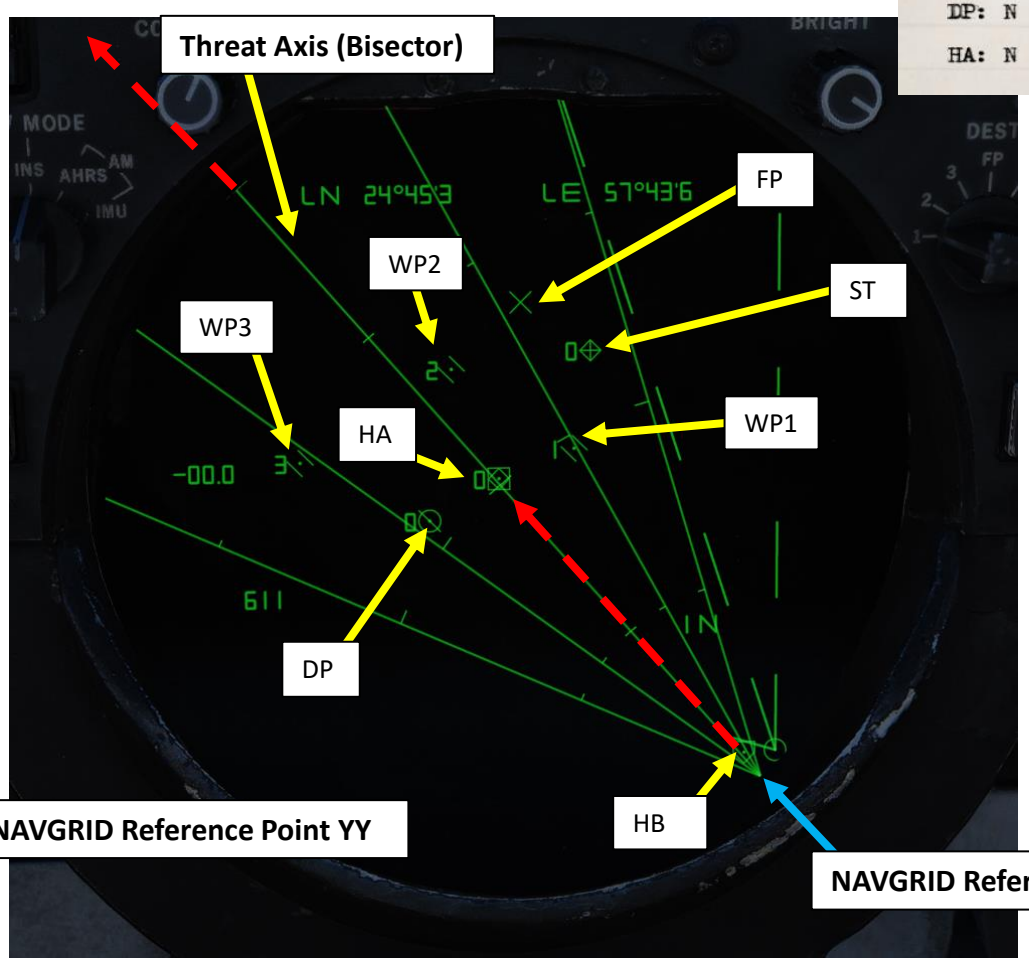
By default, JESTER will create a NAVGRID that uses the Bullseye as a Reference Point YY. He will then set the Threat Axis heading from the Bullseye to the Hostile Area (HA) Waypoint coordinates if already available in the CAP (Computer Address Panel). If No HA coordinates are available, JESTER will then use the Defended Point (DP) as a Threat Axis reference. If no DP is available, he will then use a Surface Target (and so on and so forth, using the Waypoint Order priority table). You can have a quick look at your waypoint coordinates by using "RSHIFT+K" and the [or] keys to cycle through kneeboard pages to the REFERENCE POINTS page. Then, by default JESTER will set a grid coverage angle of 50 degrees with 4 sectors.

- **Reference Point YY**: Coordinates set on Bullseye
- **Threat Axis** (defines orientation of grid's bisector): Uses Bearing 304, which coincides with a projection from Bullseye to Hostile Area (or any waypoint available from the Waypoint Order table).
- **Number of Sectors**: 4
- **Grid Coverage Angle**: 50 deg

REFERENCE POINTS

	LAT	LON	ALT	MAG VAR
RAMP:	N 24°51'6	E 57°39'0	74	+1.7
WP1:	N 26°10'2	E 56°52'2	0	+2.0
WP2:	N 26°30'6	E 56°17'7	0	+2.1
WP3:	N 26°07'0	E 55°34'9	0	+2.1
FP:	N 26°47'5	E 56°37'5	0	+2.1
IP:				
ST:	N 26°35'1	E 56°57'2	0	+2.1
HB:	N 24°51'6	E 57°39'0	0	+1.7
DP:	N 25°52'1	E 56°11'3	2538	+2.0
HA:	N 26°02'7	E 56°30'9	0	+2.0

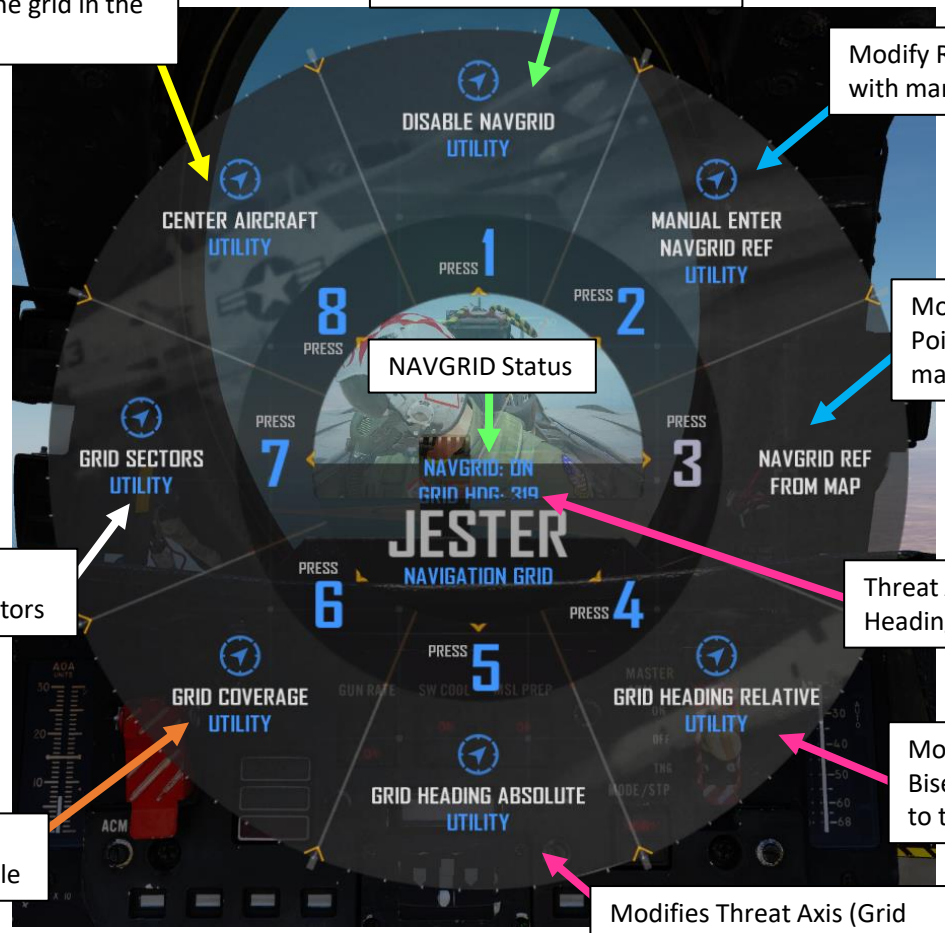




Waypoint Order	
1	HA (Hostile Area)
2	DP (Defended Point)
3	ST (Surface Target)
4	FP (Fix Point)
5	WP3 (Waypoint 3)
6	WP2 (Waypoint 2)
7	WP1 (waypoint 1)
8	HB (Home Base)
9	Aircraft Start Location

9.7 - BULLSEYE & NAVGRID - Grid Setup (JESTER)

The NAVGRID JESTER menu allows you to control NAVGRID parameters.



Offsets the aircraft symbol to the center of the TID screen, also offsetting the grid in the process.

Toggles NAVGRID ON or OFF

Modify Reference Point YY with manual coordinates

NAVGRID Status

Modify Reference Point YY with a F10 map marker

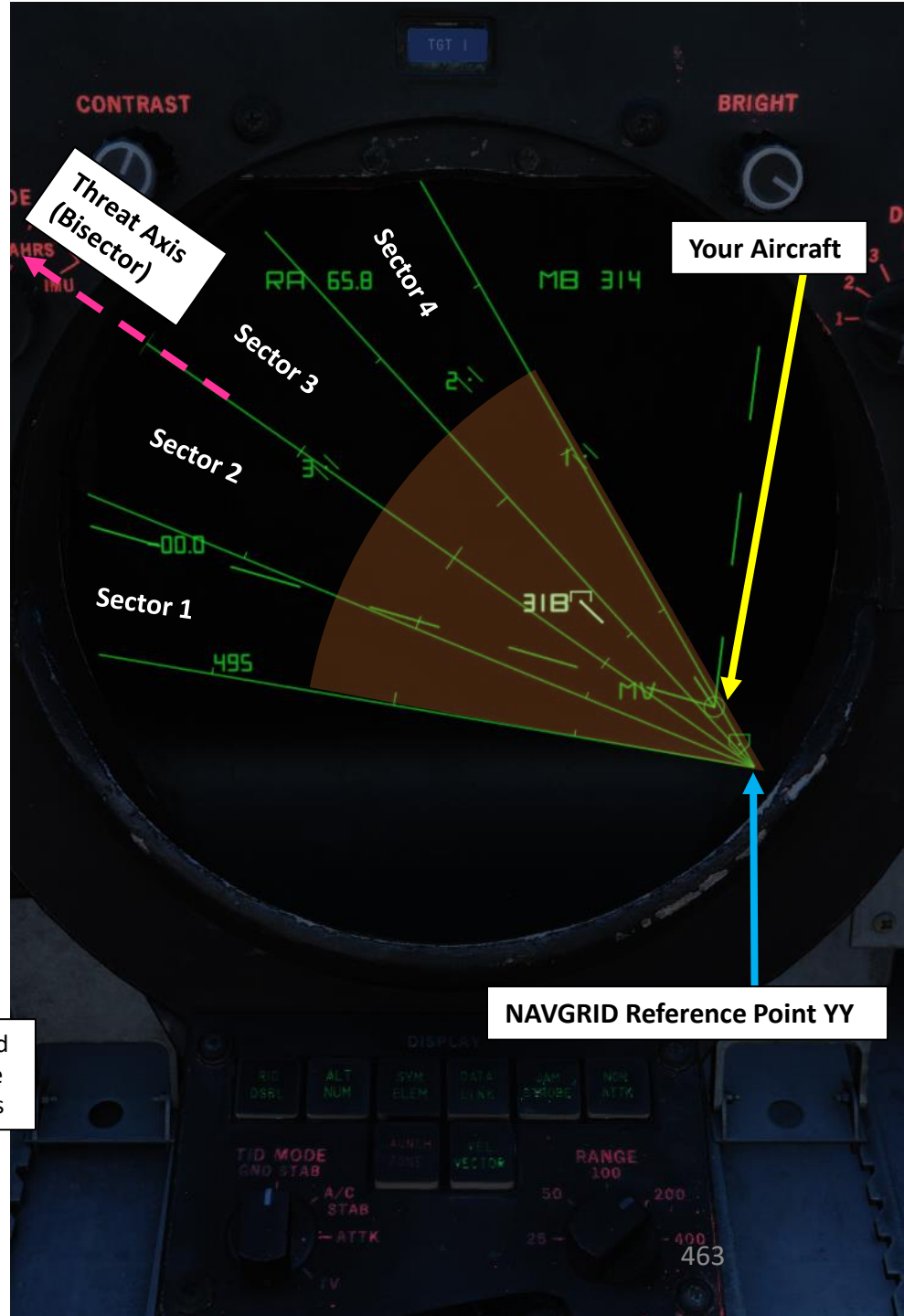
Defines grid number of sectors

Threat Axis (Grid Bisector) Heading

Defines grid coverage angle

Modifies Threat Axis (Grid Bisector) heading relative to the current Threat Axis

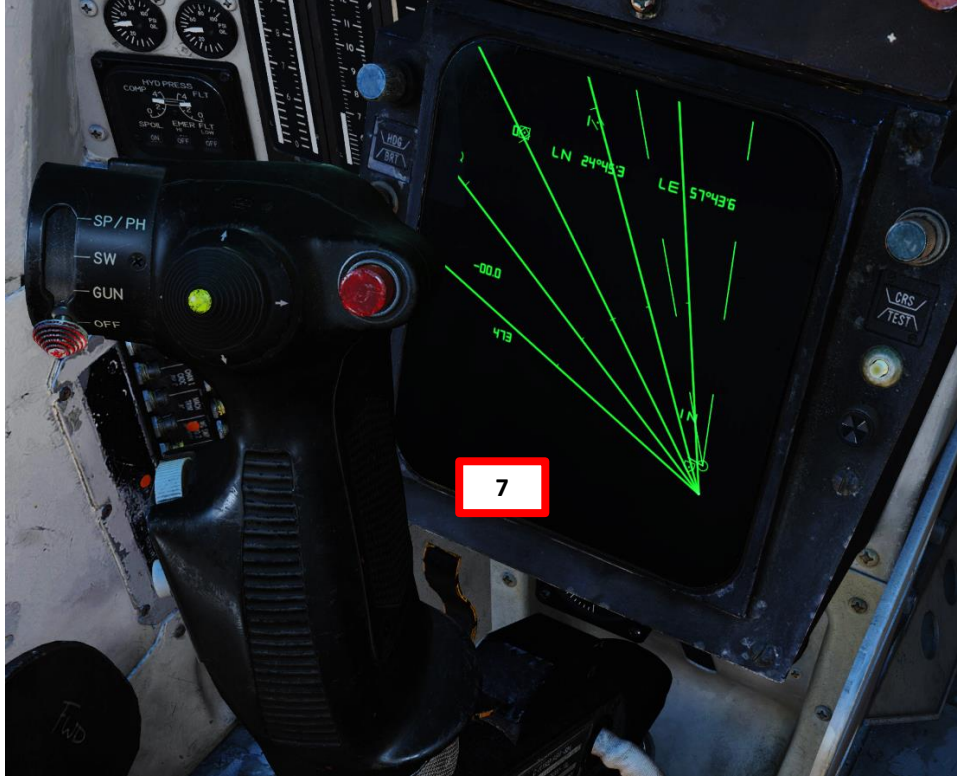
Modifies Threat Axis (Grid Bisector) heading by setting an absolute heading

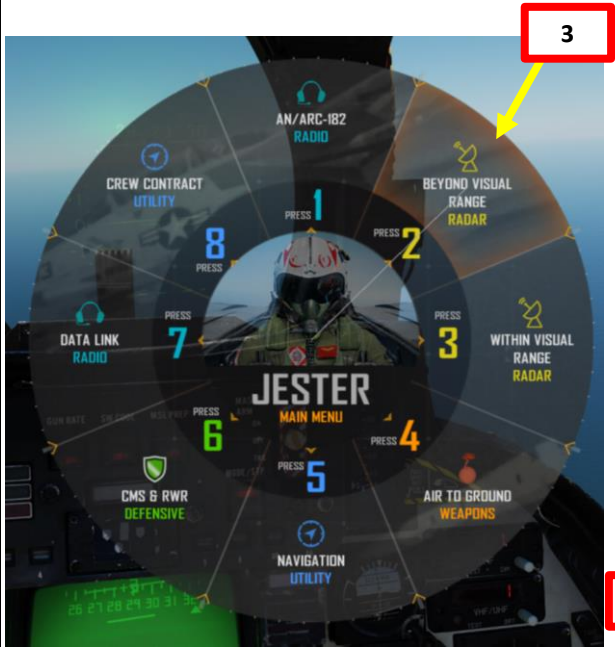


9.7 - BULLSEYE & NAVGRID - Grid Setup (JESTER)

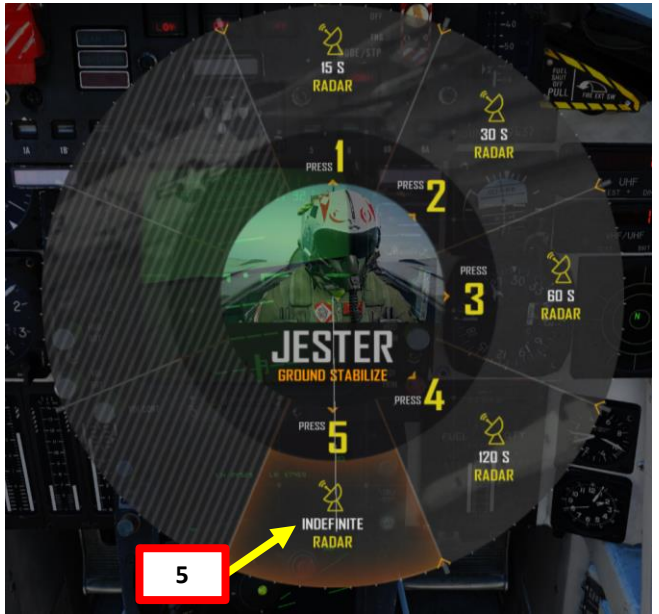
From the pilot's seat, if you want to be able to consult the NAVGRID as well you will have to perform a few simple tasks.

1. By default, JESTER uses the A/C STABILIZE radar mode, which does not display the NAVGRID since it is centered on the aircraft. We need to ask him to use GROUND STABILIZE instead.
2. Press "A" twice and access the JESTER main menu.
3. Access the "BEYOND VISUAL RANGE RADAR" menu.
4. Select the "GROUND STABILIZE RADAR".
5. Select INDEFINITE RADAR (or a specific time duration if you want to revert to A/C STABILIZE afterwards) to tell JESTER to set the radar to Ground Stabilize Mode (which is the only radar mode that will display the NAVGRID).
6. Set HSD Mode to TID to display the Tactical Information Display Repeater on the Horizontal Situation Display.
7. NAVGRID will now be visible from the pilot's seat.











9.8 - BULLSEYE & NAVGRID - Using NAVGRID

Now, now that we have learned how to create a grid… how do we use it? Well, here are two examples of NAVGRID applications.

EXAMPLE 1: GROUND-CONTROLLED INTERCEPTION (GCI)

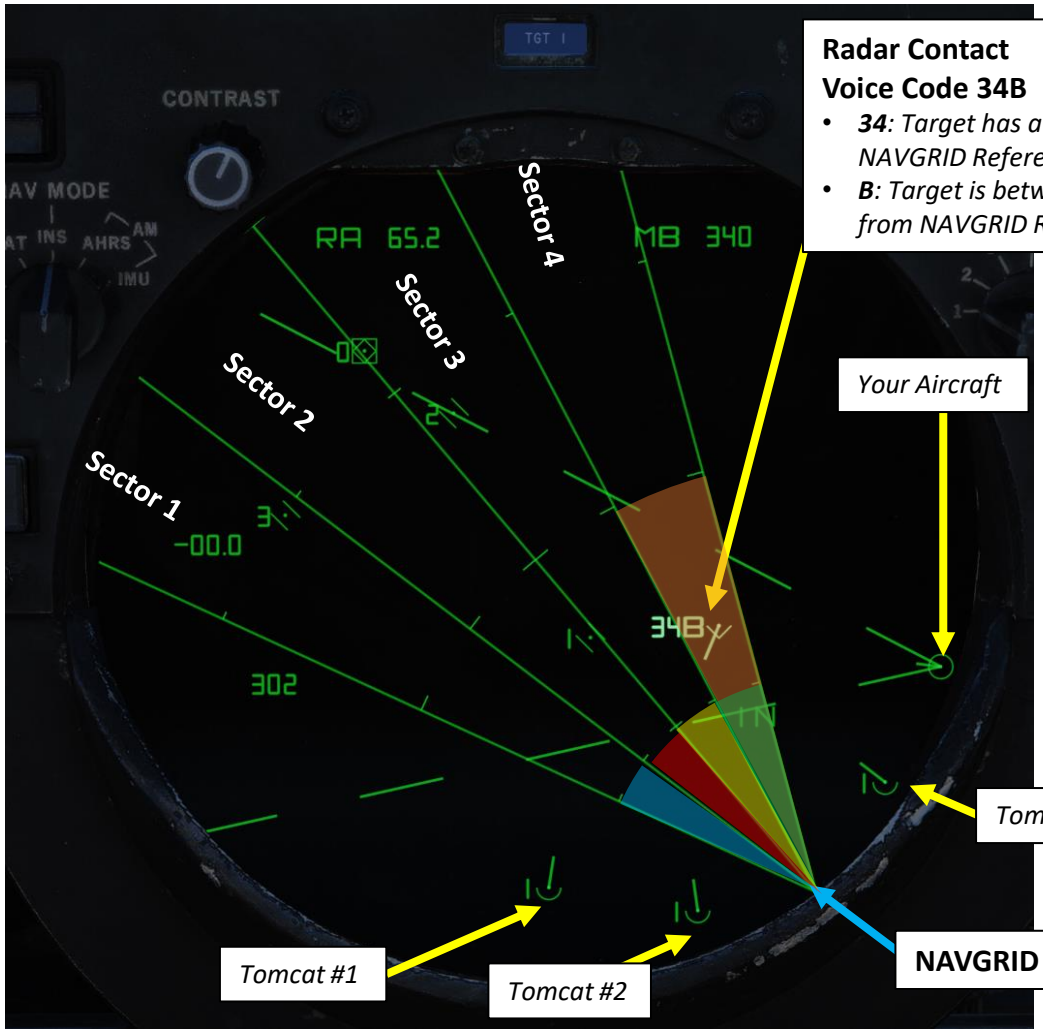
If a ground controller is online, he can determine with the team his own NAVGRID and vector aircraft to specific sectors.

If all four Tomcats use the same NAVGRID reference, Threat Axis, Coverage Angle and Number of sectors, a GCI can plan an interception mission like a game of chess. For instance, the GCI could communicate to the four Tomcat pilots the location of a radar contact with a specific sector or Voice Code:

- *« All flights, Hostile Backfire located in Sector 4 Bravo at 6000 ft. »*
- *« All flights, Hostile Backfire located at 34 Bravo at 6000 ft. »*

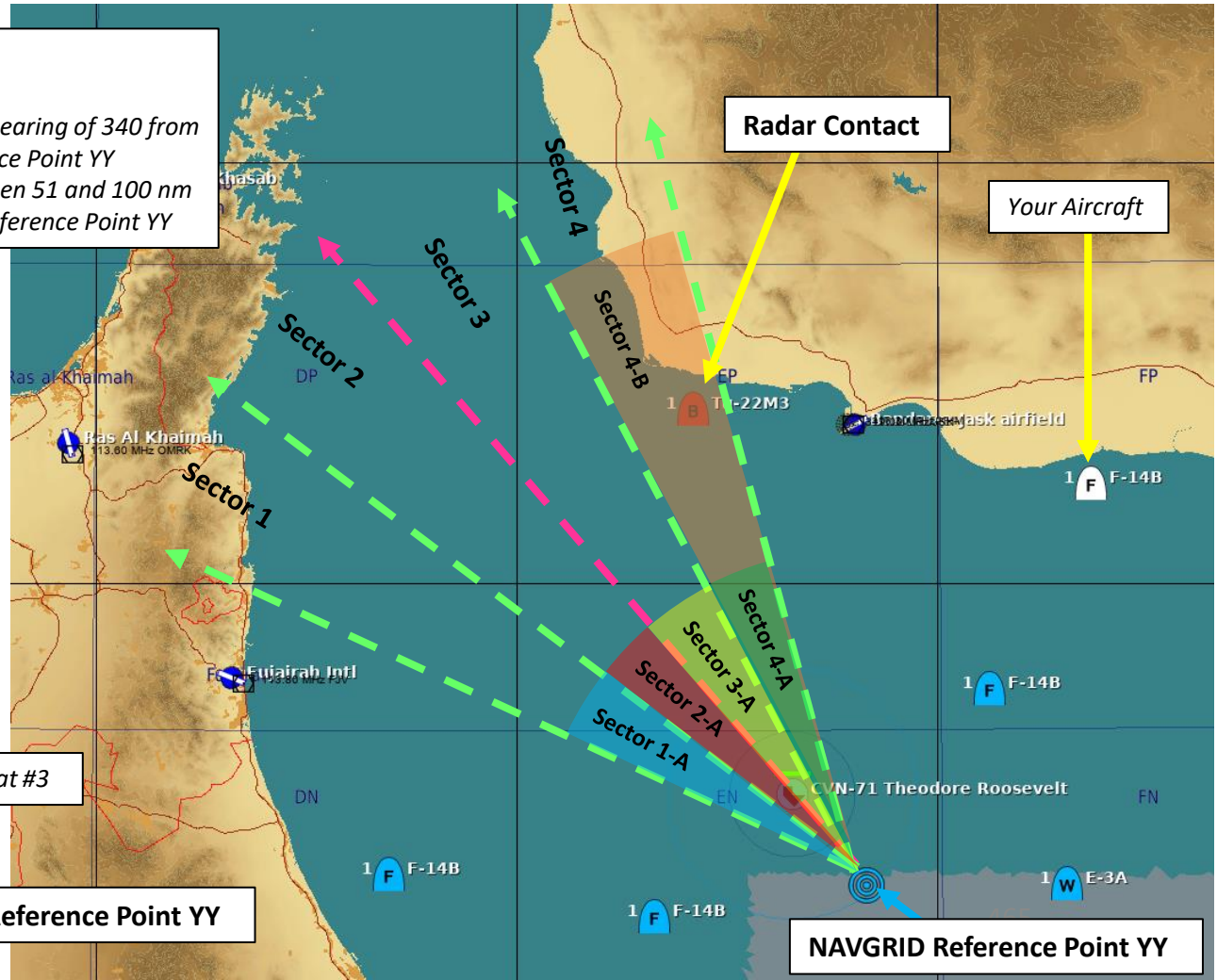
Just with that information, all pilots will know where the target is just by looking at their NAVGRID.

If the GCI is smart, he can also vector different flights for a BARCAP (Barrier Combat Air Patrol) mission by assigning each flight a sector to cover from a specific direction. He could assign you to cover Sector 4-A, while he could task Tomcat #3 with Sector 3-A, Tomcat #2 with Sector 2-A and Tomcat #1 with Sector 1-A.



Radar Contact
Voice Code 34B

- ***34****: Target has a bearing of 340 from NAVGRID Reference Point YY*
- ***B****: Target is between 51 and 100 nm from NAVGRID Reference Point YY*



9.8 - BULLSEYE & NAVGRID - Using NAVGRID

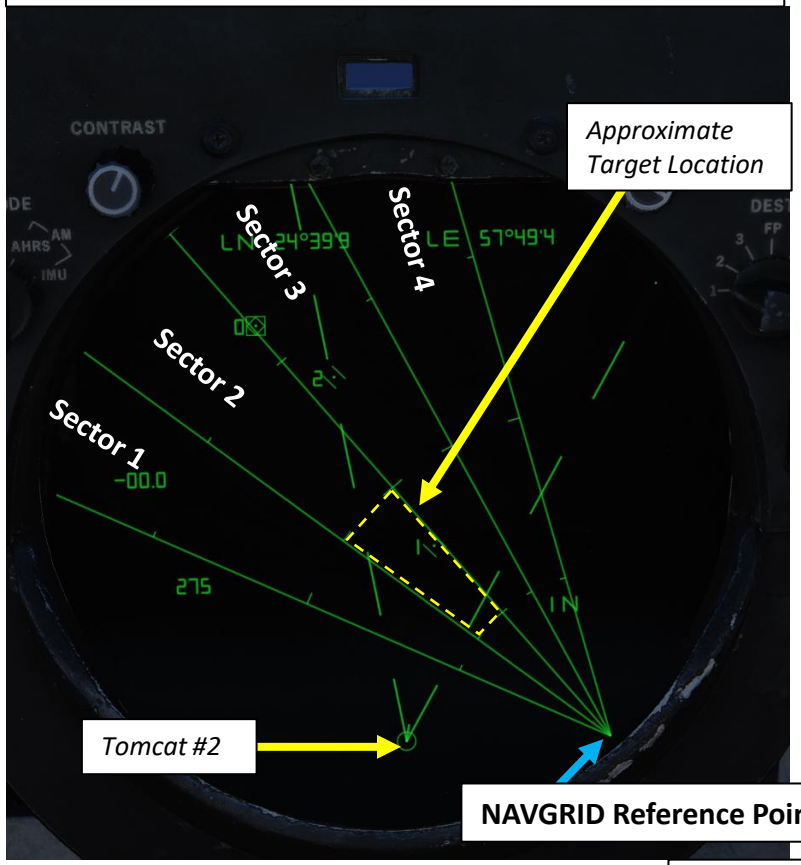
EXAMPLE 2: COMMUNICATING RADAR CONTACT LOCATION USING NAVGRID

If you (Tomcat #1) are flying with a wingman (Tomcat #2) and you want to transmit to your wingman the location of a target quickly, you can either communicate the Voice Code of the hooked radar contact or you could give him a general sector location to look.

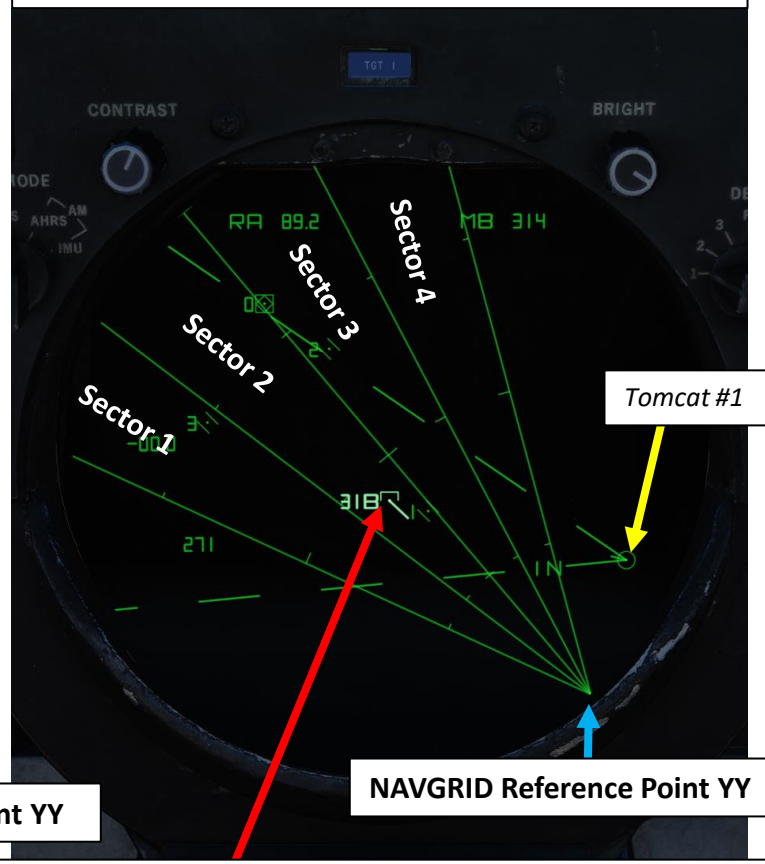
As an example, you could tell your wingman:
« Unknown contact, 31 Bravo at 5000 ft. » This will tell him to expect a target at a bearing of 310 from the NAVGRID Reference Point YY (Bullseye) from a distance between 51 and 100 nm.

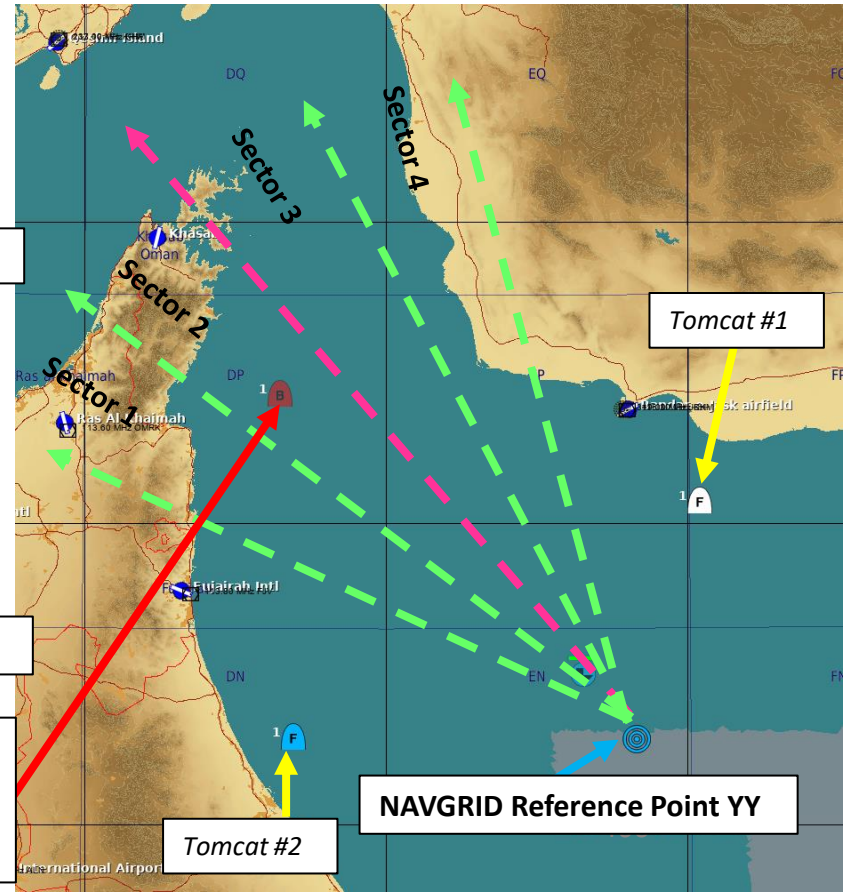
You could also say something more general but just as effective:
« Unknown contact, Sector 2 Bravo, at 5000 ft. » This will give your wingman a grid to work with.

NAVGRID View from Tomcat #2



NAVGRID View from Tomcat #1





Radar Contact
Voice Code 31B

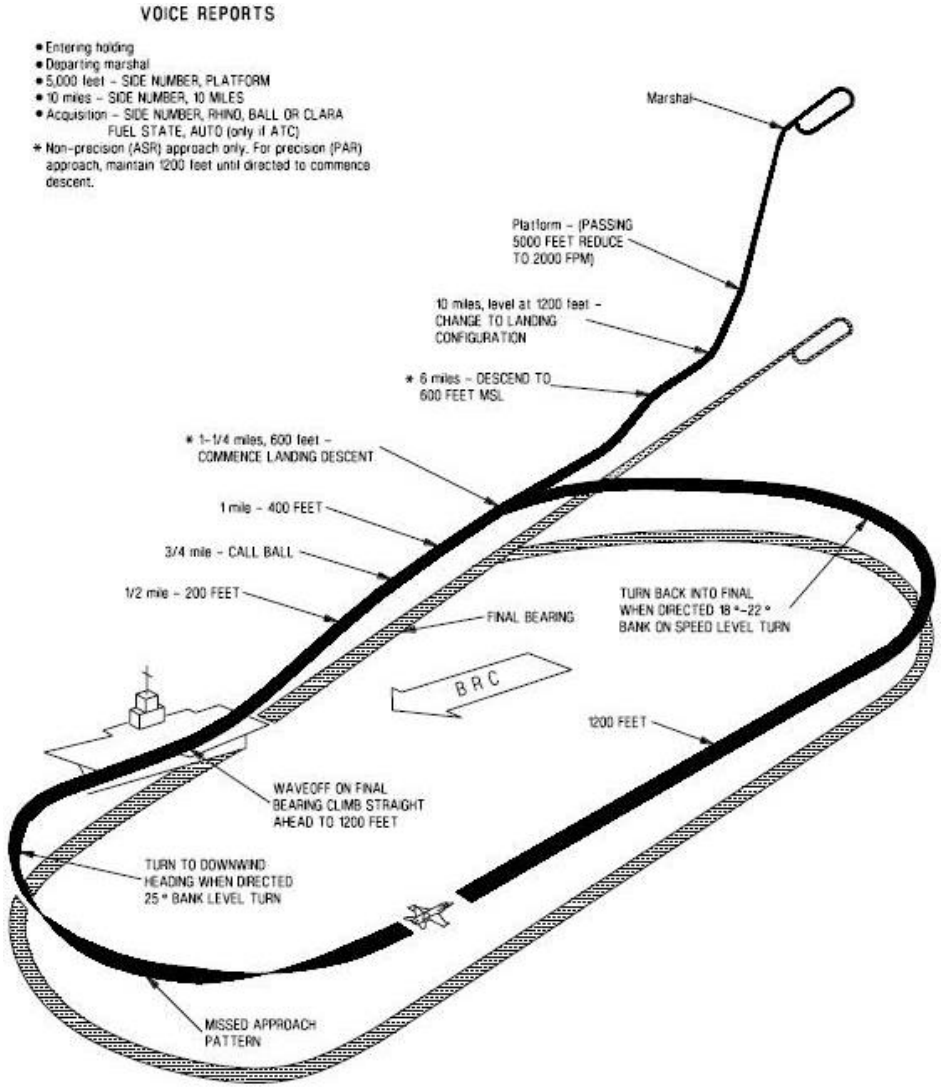
- ***31****: Target has a bearing of 314 from NAVGRID Reference Point YY*
- ***B****: Target is between 51 and 100 nm from NAVGRID Reference Point YY*

10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY

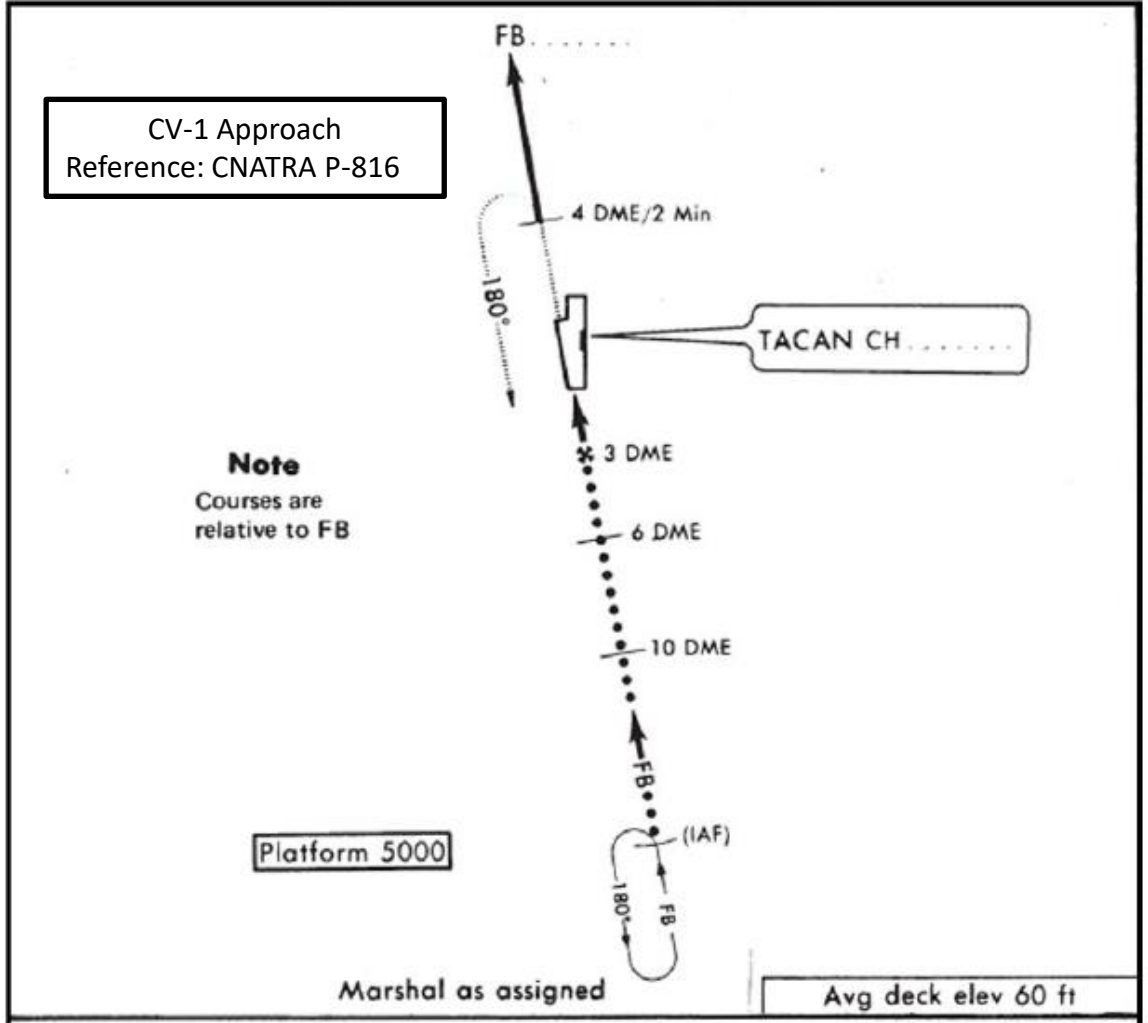


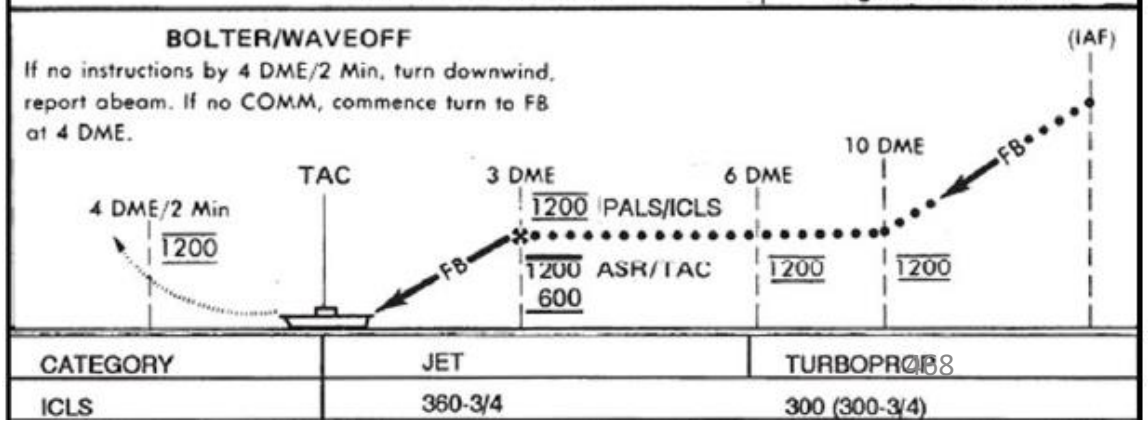
10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY

Case III recovery is used for all night operations, as well as during the day when the weather is below Case II minimums (less than 1,000-3). In other words, a Case III recovery is used for bad weather with low visibility conditions. The ACLS (Automatic Carrier Landing System) will act sort of like an ILS (Instrumented Landing System) but for a carrier (d'uh).



CV-1 Approach
Reference: CNATRA P-816





CATEGORY	JET	TURBOPROP
ICLS	360-3/4	300 (300-3/4)

10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY

The landing looks complicated, but it's not that bad once you figure out what you need to do. Don't worry, we'll go through it together.

- You will generally start a Case III recovery in the Marshal Zone. It's an airspace 25 nautical miles from the carrier where aircraft wait for landing clearances. We will use the carrier's TACAN beacon to orient ourselves and approach the carrier from a certain direction in reference to the beacon, which is what we call a radial. The Marshal Radial is usually 15 to 30 degrees off the Final Bearing. In our case, the final bearing is 360 deg, so the Marshal Radial is 030.

- We will follow the Marshal Radial (030) and descend from 10,000 ft to 5,000 ft at 250 kts with a descent rate of 4000 ft/min

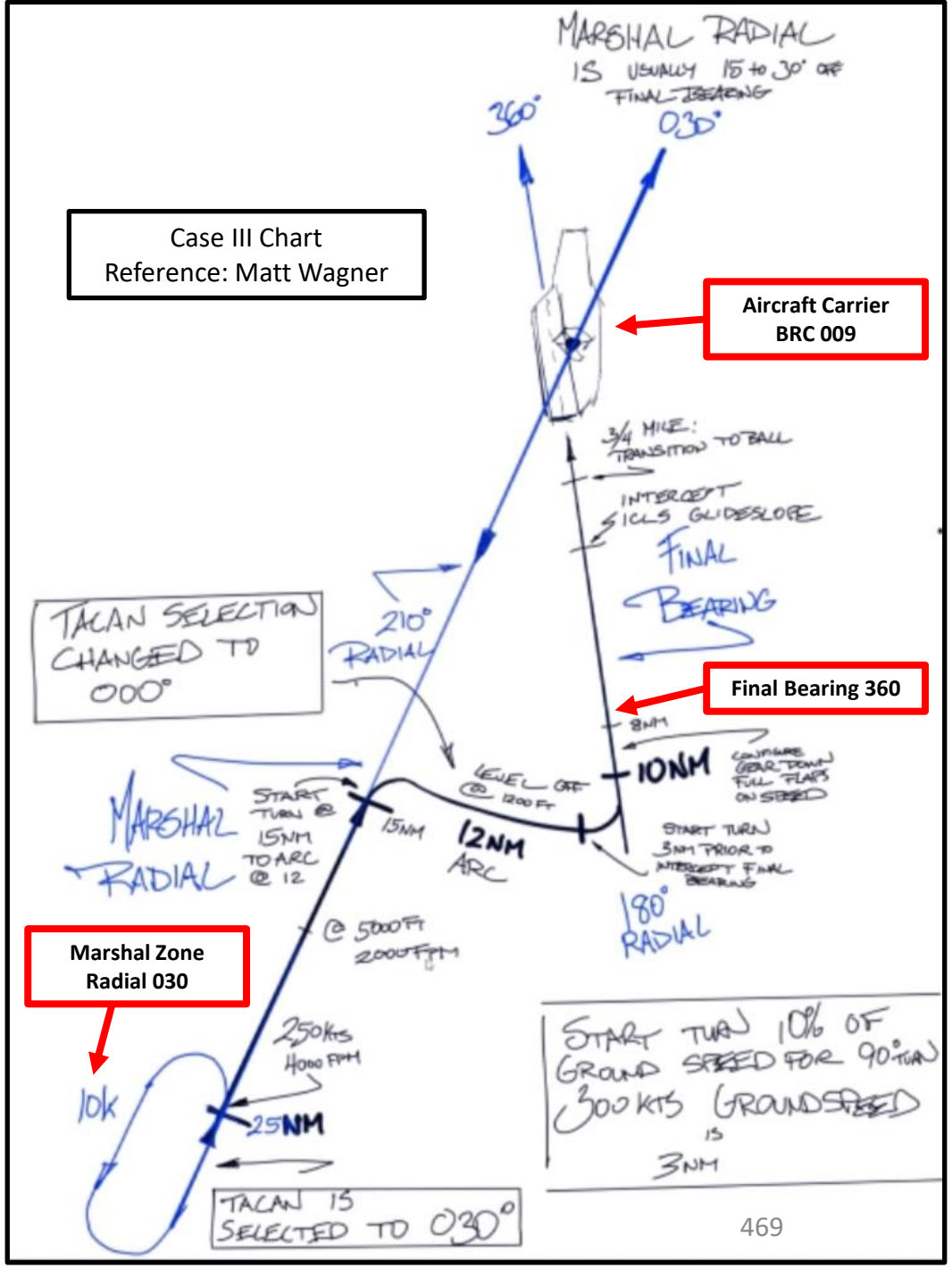
- Once we are 15 nm from the carrier on the Marshal Radial, we will turn 90 degrees right (030 + 90 degrees = 120 degrees) and maintain a 12 nm separation with the carrier.

- We will follow the "arc" until we reach the Final Bearing radial (360/000) approximately 10 nm from the carrier. We will then drop our gear down, set our flaps to full and set our angle of attack to ON SPEED AOA.

- Once we have turned to 360/000 and captured the carrier's localizer (indicates lateral deviation with runway centerline), we will then capture the glide slope (indicates vertical deviation with optimal path) using the ICLS (Instrumented Carrier Landing System).

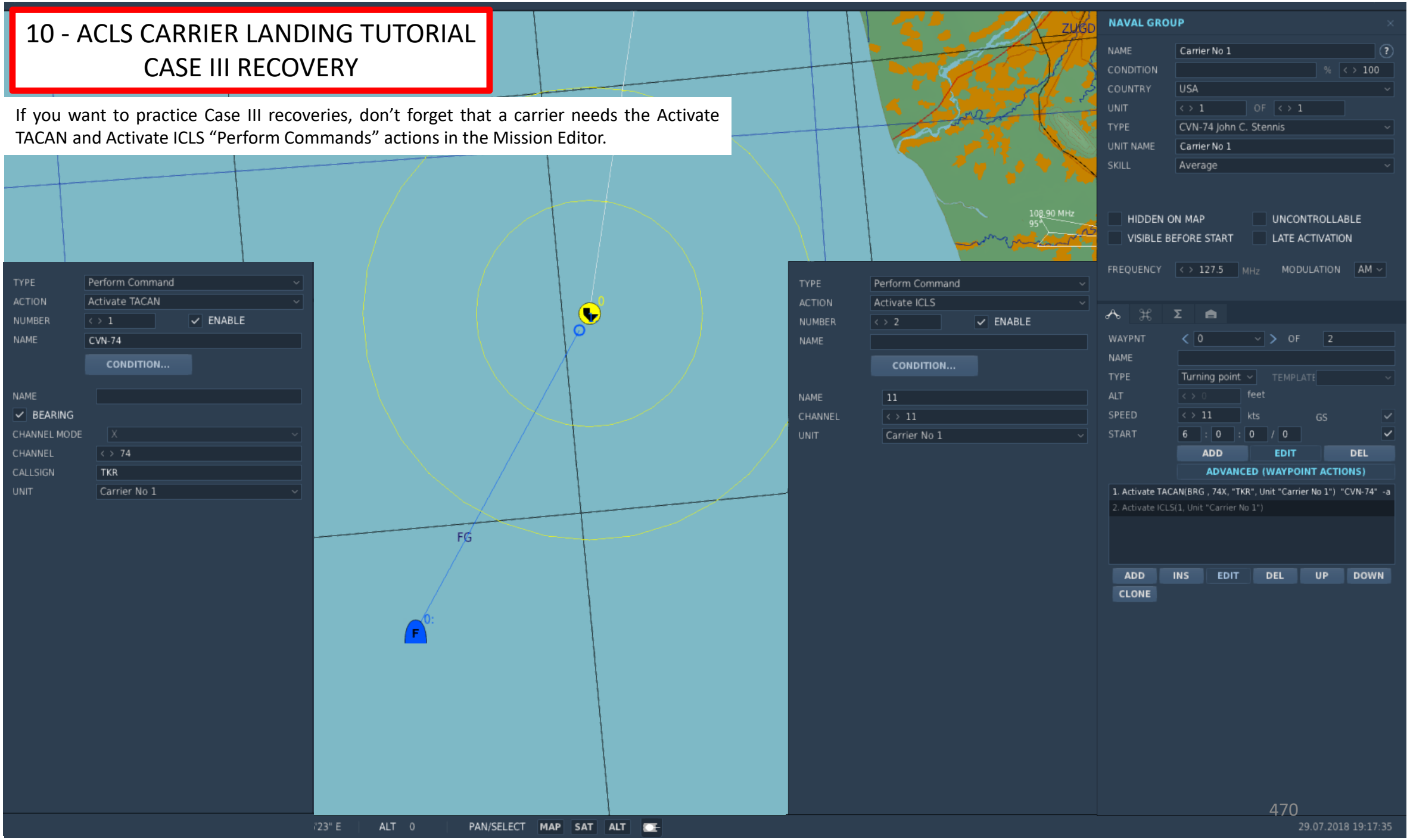
- Once we are 3/4 nm from the aircraft, we will track the meatball and use it as a reference to land.

- The TACAN is mostly used to help you track your radials and distance from the carrier during your approach. The ICLS, on the other hand, is used to give you a reference on where you should be during the final landing phase.



10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

If you want to practice Case III recoveries, don't forget that a carrier needs the Activate TACAN and Activate ICLS "Perform Commands" actions in the Mission Editor.

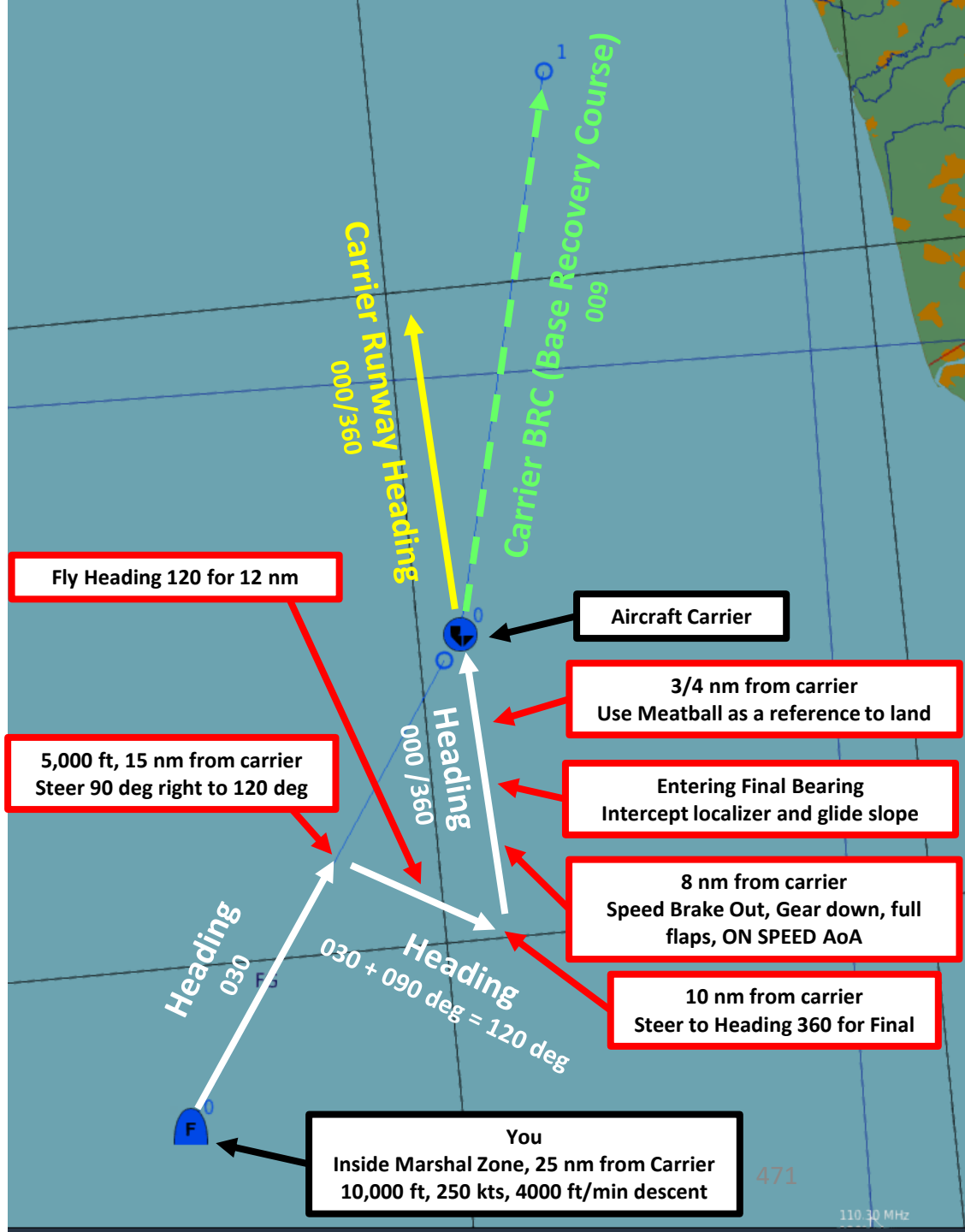


10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY

Here is a brief overview of what we'll do.

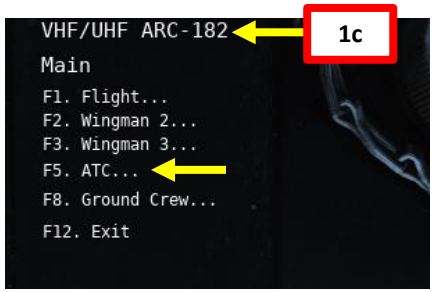




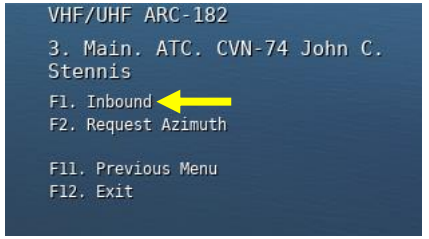


10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

1. Contact Carrier on the carrier's frequency to turn on the lights.
   a. Set either ARC-182 V/UHF 2 or ARC-159 UHF 1 radio frequency to the carrier's radio frequency. This can be done with:
      i. JESTER
      ii. From the pilot's seat with UHF 1 (if carrier frequency is within UHF1 range). Frequencies range from 225.000 MHz to 399.975 MHz.
      iii. From the RIO's seat with V/UHF 2. Frequencies range from:
         - VHF 30-88 MHz FM close air support
         - VHF 108-118 MHz AM navigation, receive only
         - VHF 118-156 MHz AM air traffic control
         - VHF 156-174 MHz FM maritime
         - UHF 225-400 MHz AM/FM military/NATO
   b. Press the MIC BUTTON UHF 2 (RCTRL+\) switch or the MIC BUTTON UHF 1 (RALT+\) switch on your throttle to contact the carrier. If the RIO is in charge of the radio, use the pedal in the appropriate ICS mode to communicate.
   c. Go in F5 – AT5 menu, then to the CVN-74 menu, then to the F1 – Inbound menu.
   d. The carrier will give you a QFE (Barometric Pressure Setting), a pattern altitude and other relevant information.
   e. And that's it, the carrier is now illuminated.
2. Set Barometric Pressure (QFE) stated by the carrier controller (i.e. 29.93 in Hg)









RIO AN/ARC-182 V/UHF 2 Radio Control Panel





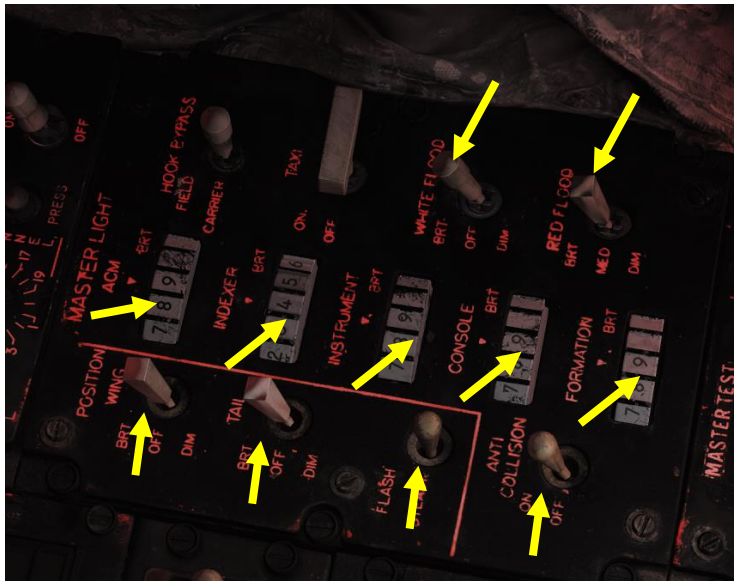




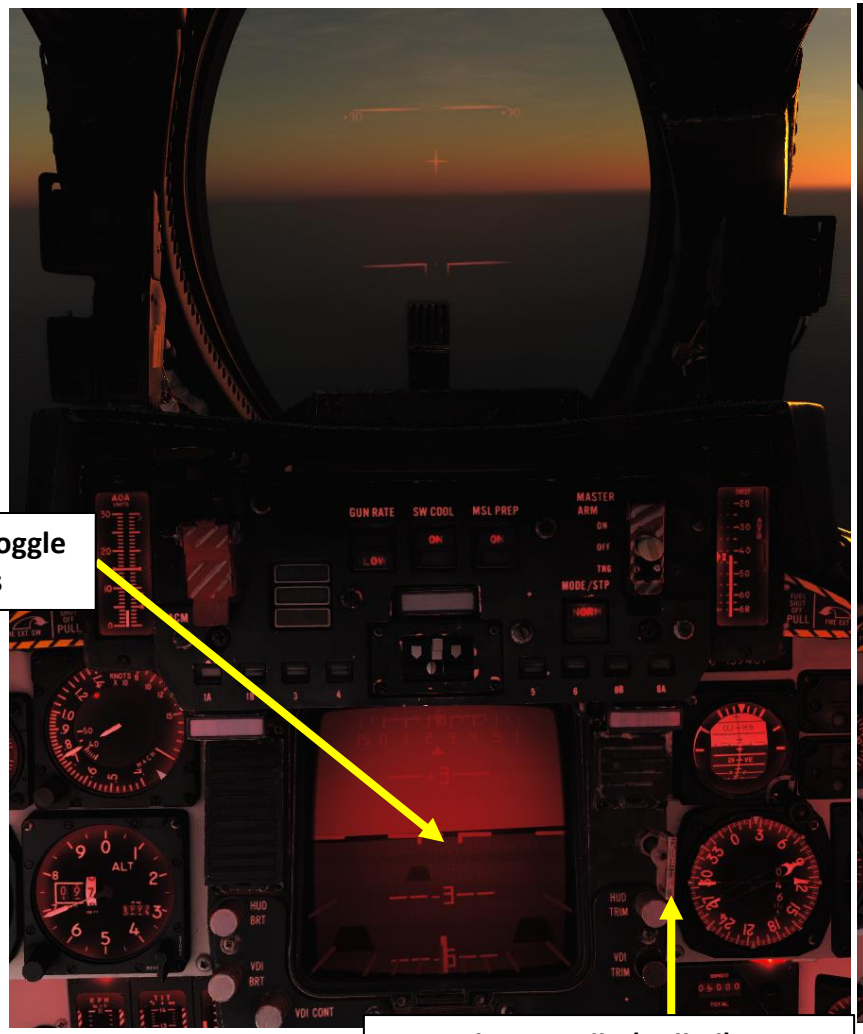


10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

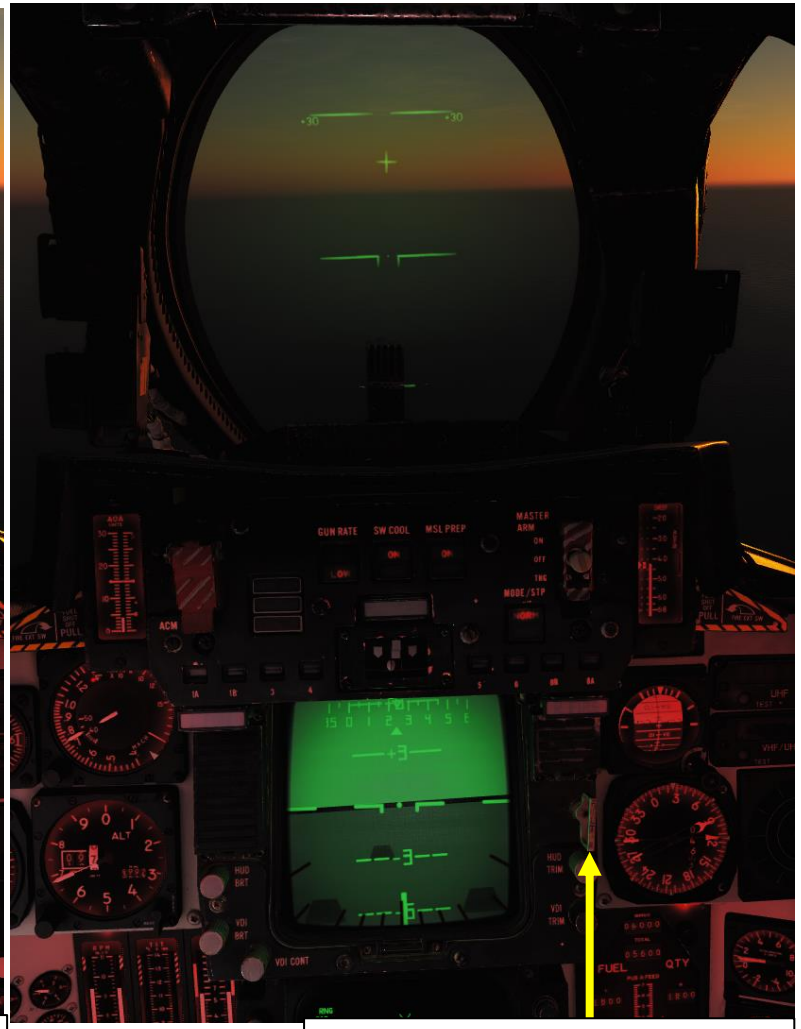
3. Adjust your interior cockpit lights as required.
4. If desired, pull the HUD Filter Handle to set a red filter on the HUD (Heads-Up Display)
5. If desired, click in the middle of the VDI (Vertical Display Indicator) screen to set a red filter on the VDI
6. Set navigation lights as required



Click in the middle of the VDI to toggle between red and green VDI filters



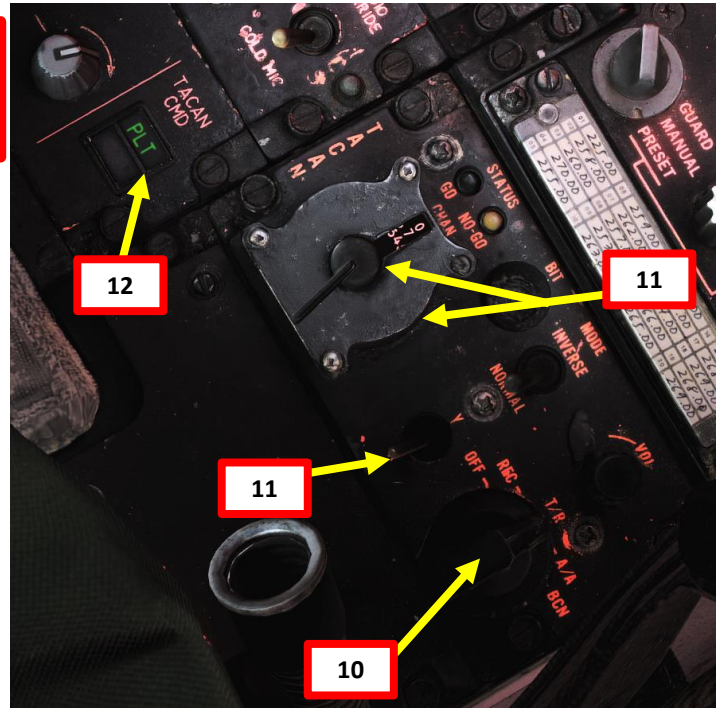
HUD Filter Handle (Pulled)
When pulled, inserts red filter for HUD night operation.

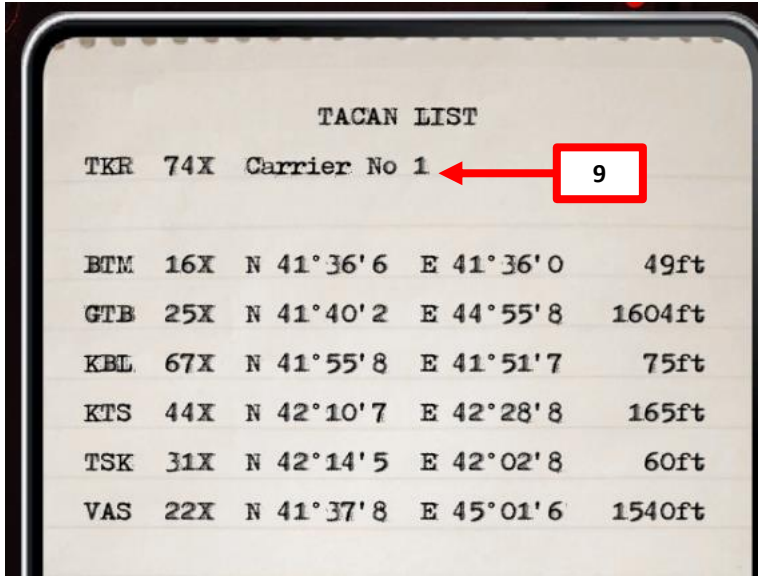


HUD Filter Handle (Pushed)
When pushed, leaves HUD in the day operation green filter.

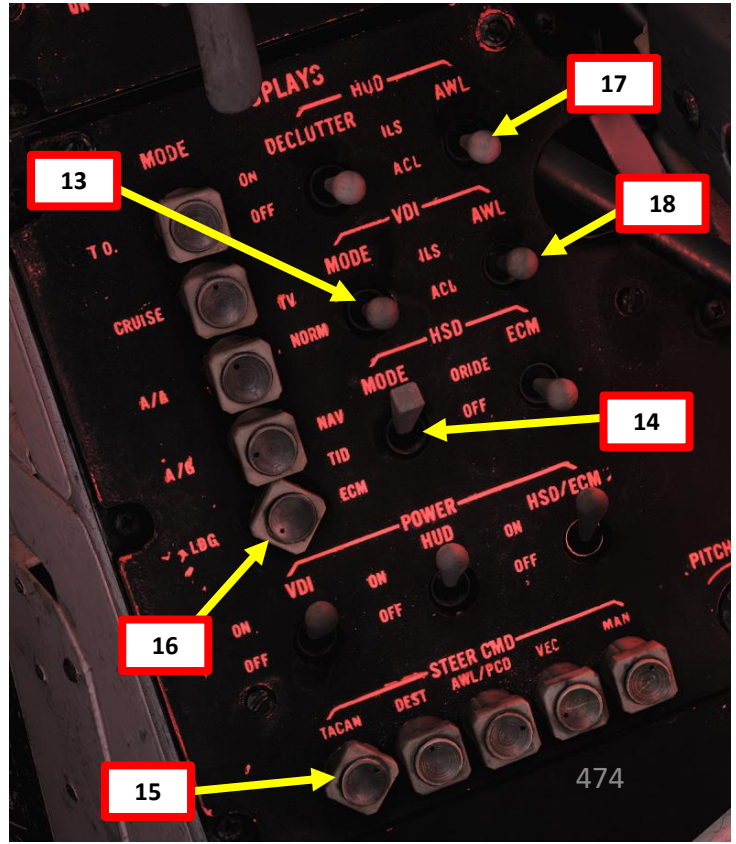
10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

7. Set ARA-63 ICLS (Instrument Carrier Landing System) Power Switch ON (FWD)
8. Set ARA-63 ICLS Channel Selector to ICLS frequency of the carrier (11 in our case, should be listed in mission briefing)
9. Use “RSHIFT+K” and the [or] keys to cycle through kneeboard pages to the TACAN LIST page. The TACAN frequency of the carrier should be listed there (74X).
10. Set TACAN Mode selector to T/R. Allow a warm-up period of 2 minutes.
11. Set TACAN Frequency using the X/Y selector and the Ones and Tens dials. We will set TACAN frequency to 74X.
12. Set TACAN CMD to PLT if you are the pilot or to NFO if you are the RIO.
13. Set VDI Mode to NORM
14. Set HSD Mode to NAV
15. Set Navigation Steer Command to TACAN.
16. Set HUD Mode to LDG (Landing). You could also set it to CRUISE, but LDG mode has the advantage of showing TACAN steering cues on the VDI and Heads-Up Display.
17. Set HUD AWL (All-Weather Landing System) Mode to ACL (Automatic Carrier Landing)
18. Set VDI AWL Mode to ACL



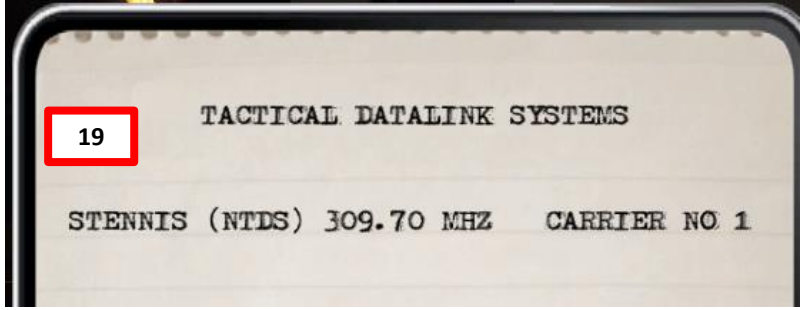


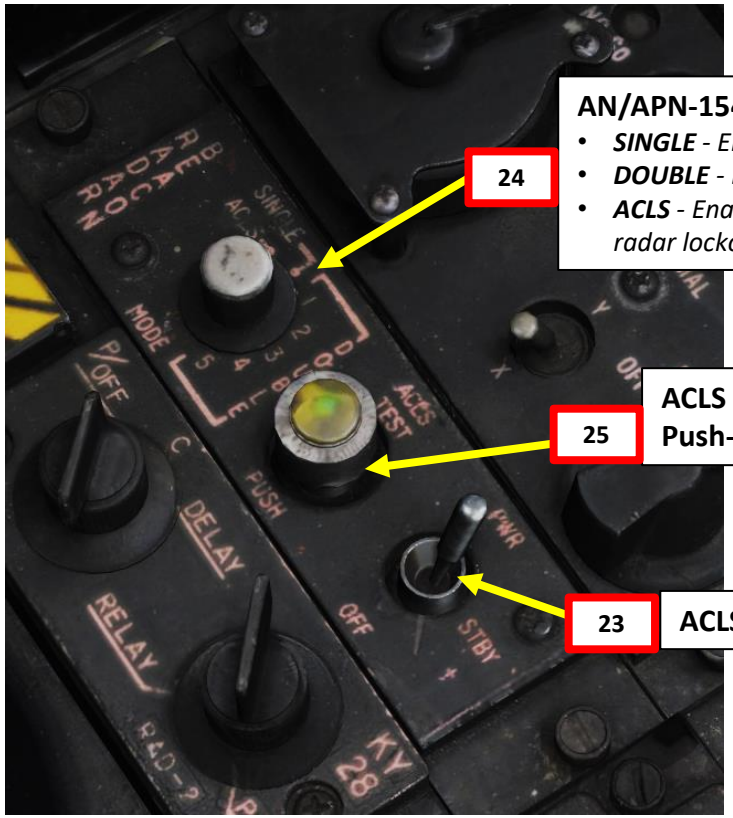




10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY

19. Use "RSHIFT+K" and the [or] keys to cycle through kneeboard pages to the TACTICAL DATALINK SYSTEMS page. The datalink frequency of the carrier (Stennis) should be listed there (309.70 MHz).
20. Set Datalink Power Switch – ON (FWD)
21. Set Datalink Mode Switch – TAC (AFT)
22. Set Datalink Frequency to the desired network. Our desired frequency is 309.70 MHz. Rotate the Datalink Frequency Select wheels to 09.7 as shown (the 3 is preset and cannot be modified).
23. Set Radar Beacon Power Switch to PWR (FWD)
24. Set Radar Beacon Selector Switch to SINGLE.
25. If the carrier's datalink frequency is set up properly, the ACLS Push-to-Test switch should illuminate. Then, you know that you are good to go.



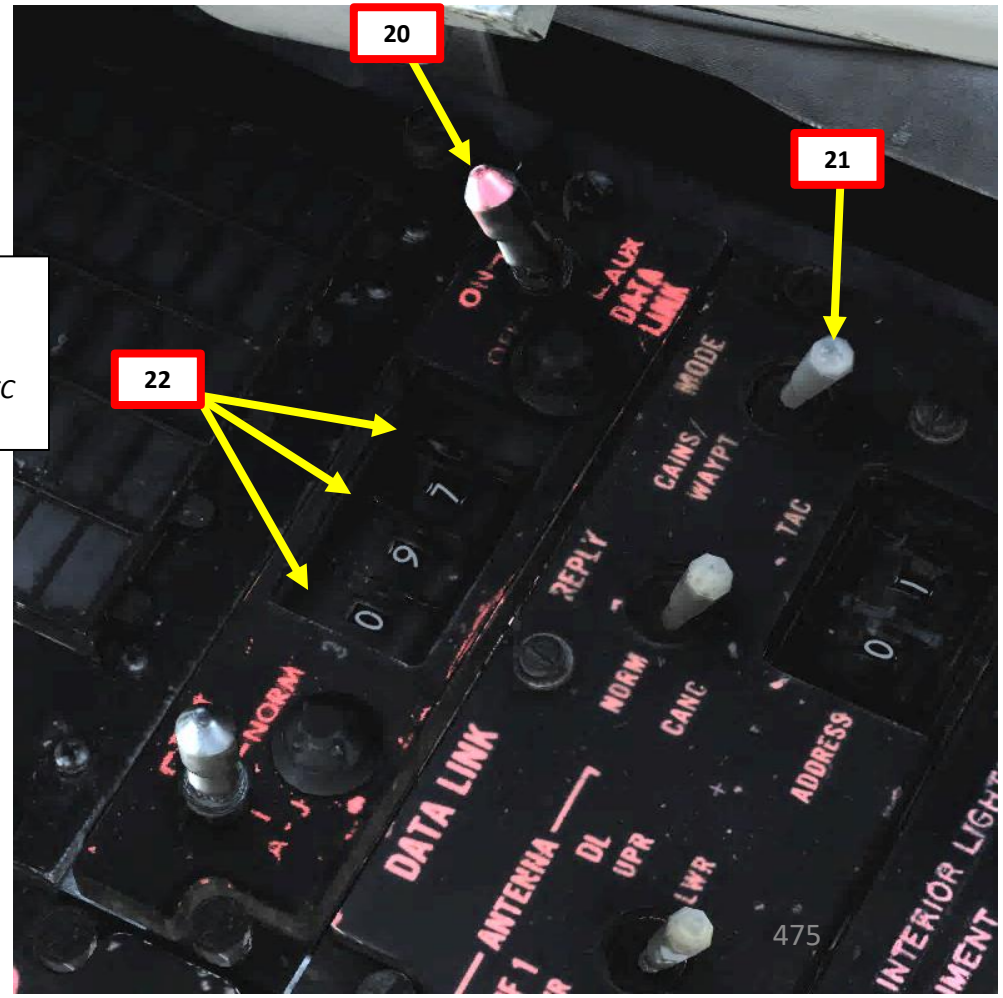


AN/APN-154 Radar Beacon Selector Switch

- ***SINGLE*** *- Enables beacon response to single pulse codes.*
- ***DOUBLE*** *- Enables beacon response to set double pulse code.*
- ***ACLS*** *- Enables augmenter operation for ACLS. Required for CATCC radar lockon for ACLS.*

ACLS (Automatic Carrier Landing System) Push-to-Test Switch

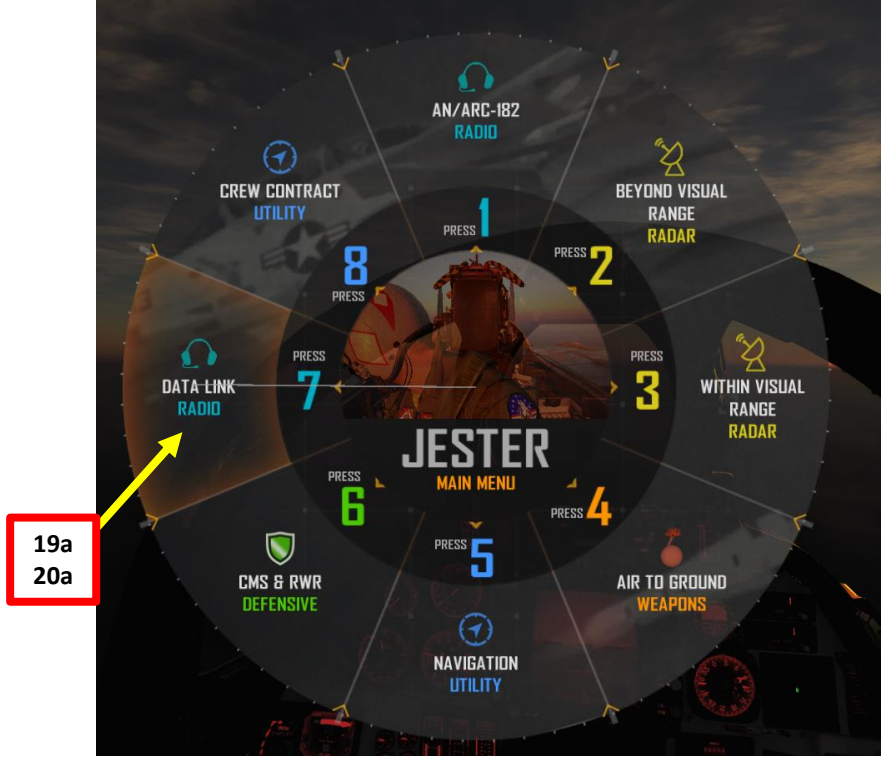
ACLS Radar Beacon Power Switch



10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

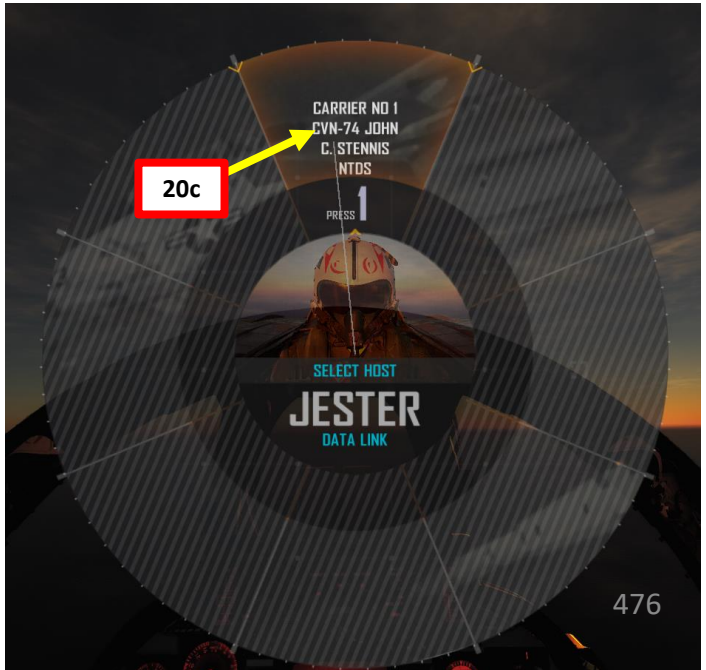
Alternatively, you can use JESTER to set up the Datalink frequency for you.

19. [J] Set Datalink Mode and frequency with JESTER. Use the JESTER Contextual Menu by pressing “A” twice and selecting “DATA LINK RADIO” (LCTRL+7). Then, select “SET MODE” (LCTRL+1) and select “TACTICAL DATALINK SYSTEM” (LCTRL+1).
20. [J] Then, you can set Datalink Frequency to the desired network. Use the JESTER Contextual Menu by pressing “A” twice and selecting “DATA LINK RADIO” (LCTRL+7). Then, select “SET HOST” (LCTRL+1) and select desired datalink host (CVN74 Stennis Carrier).



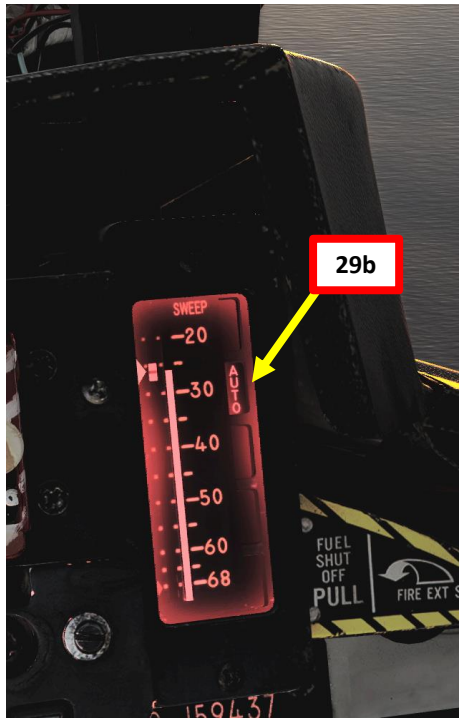


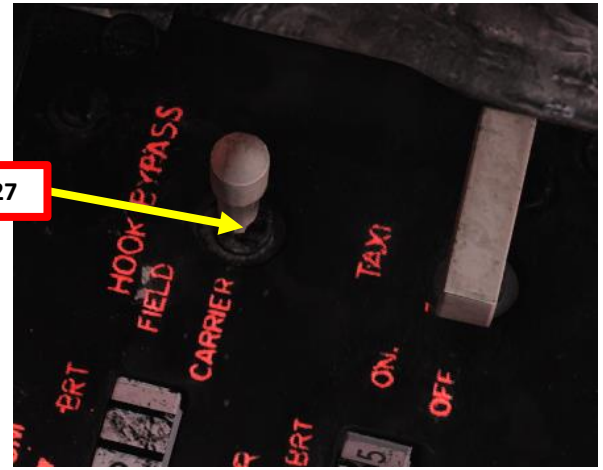


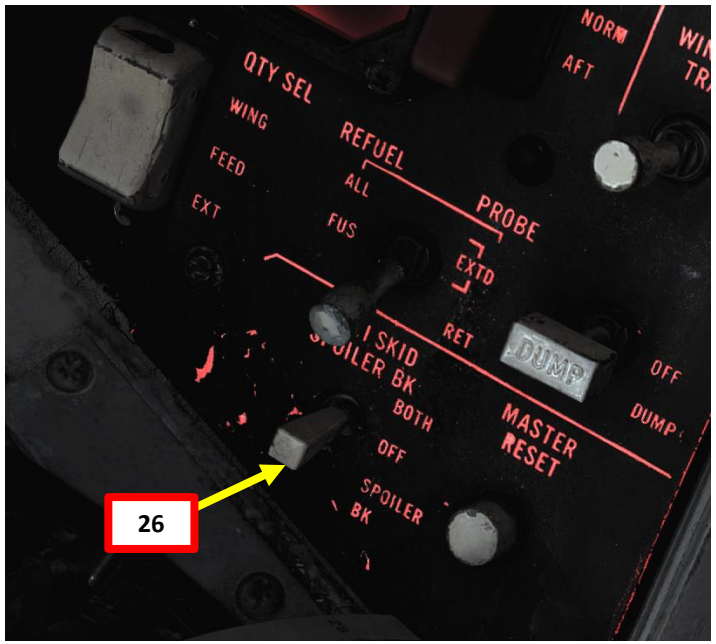


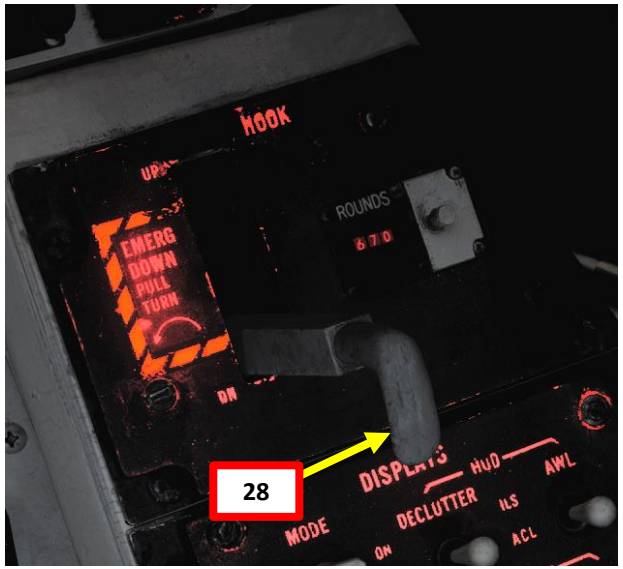
10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY

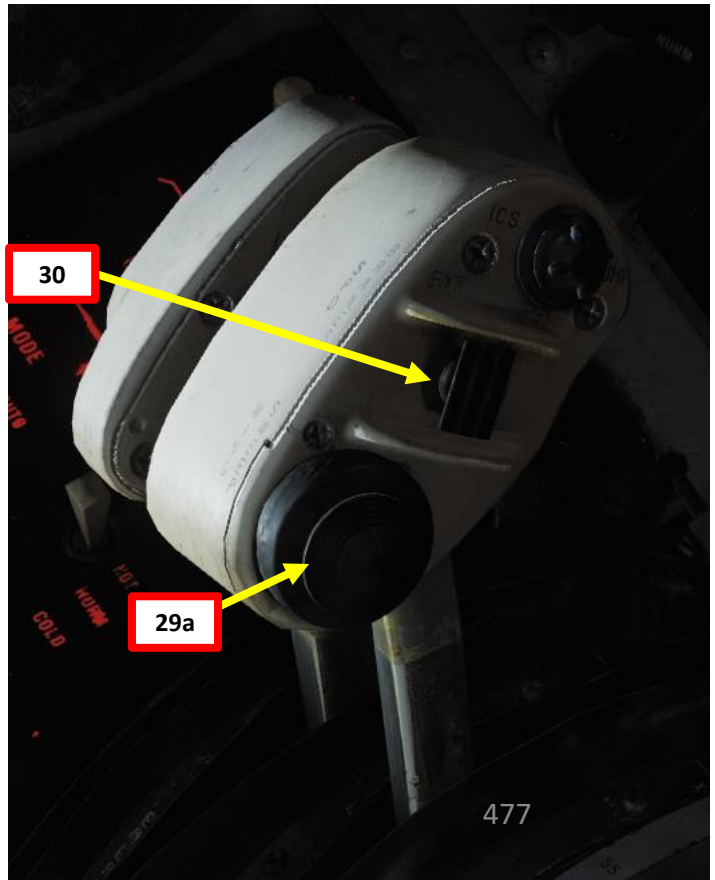
26. Set ANTI-SKID SPOILER BK switch OFF (MIDDLE)
27. Set HOOK BYPASS switch to CARRIER (AFT)
28. Set Hook Lever DOWN
29. Set Wing Sweep Mode to AUTO
30. Set Speed Brake OUT (Deployed)





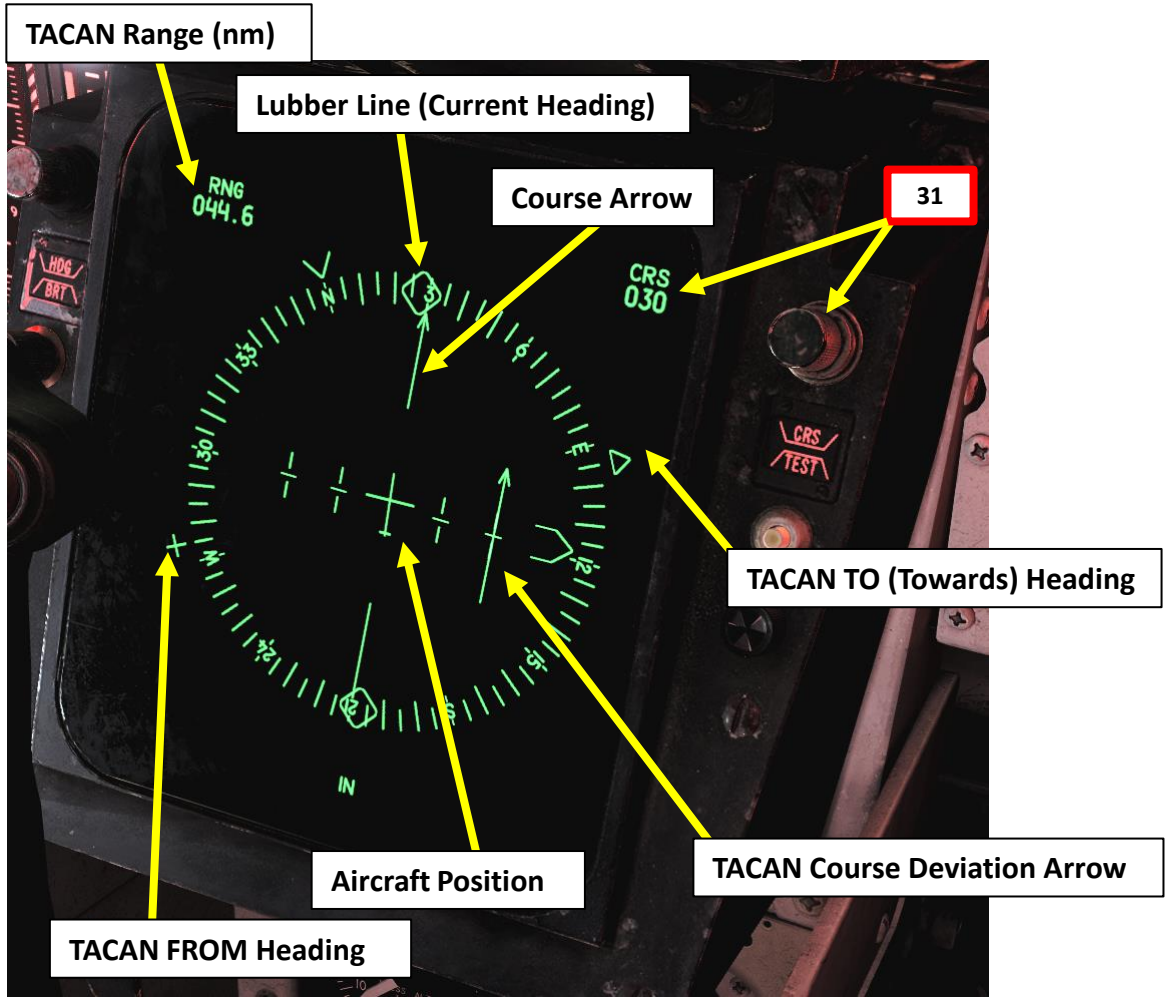


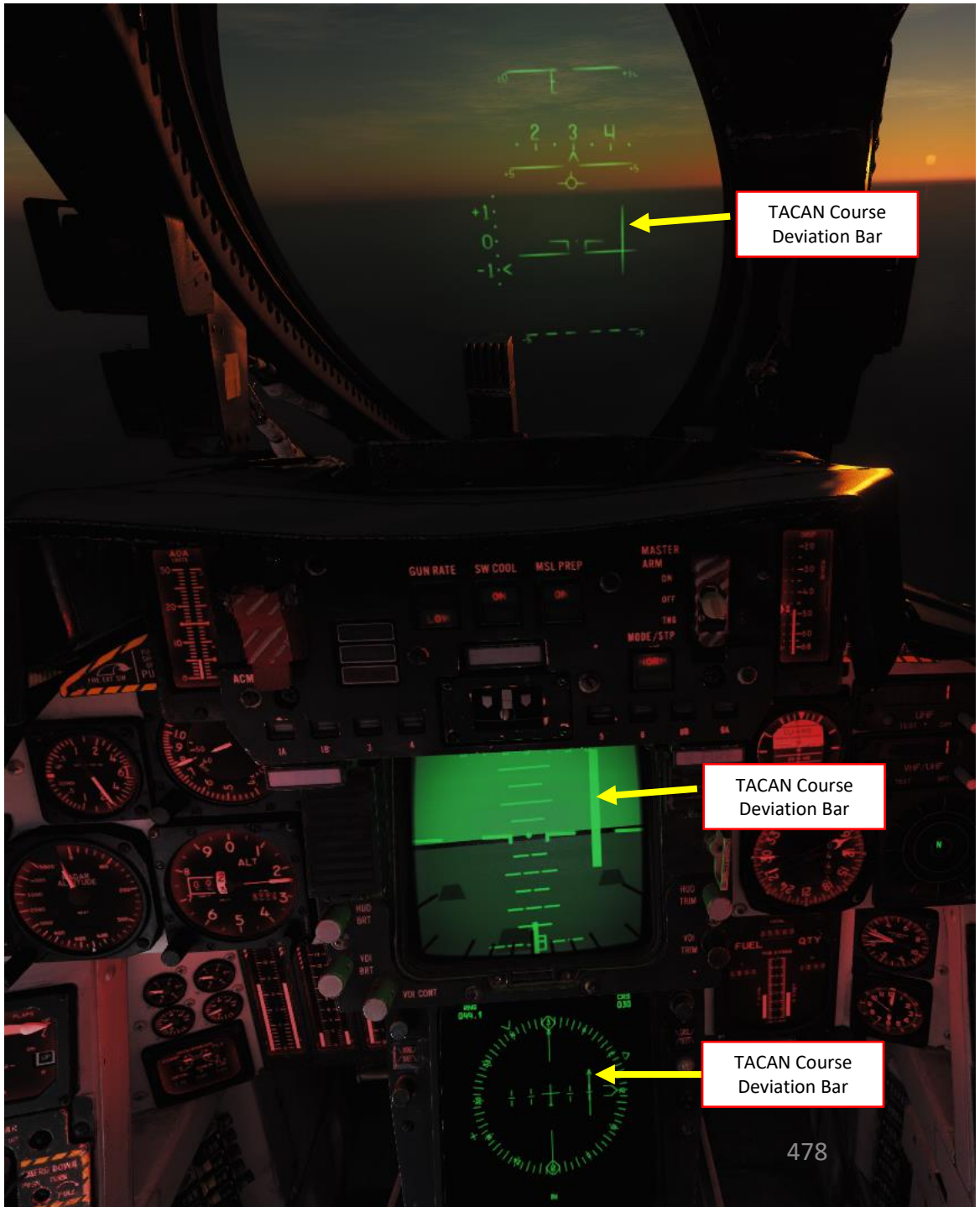




10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

31. Turn the CRS (Course Set) knob to set desired course for TACAN approach (030 for the Marshal Radial).

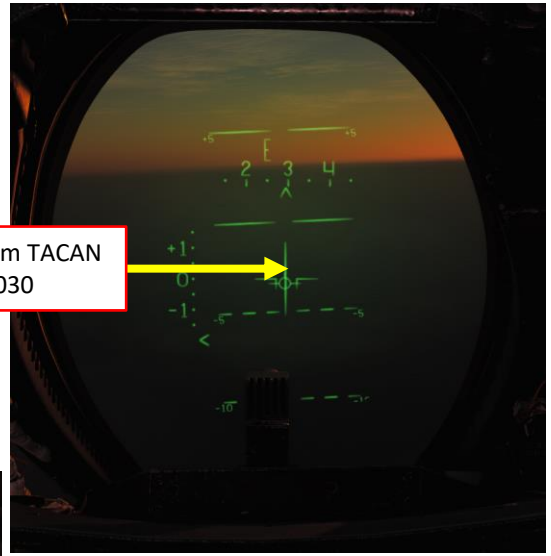


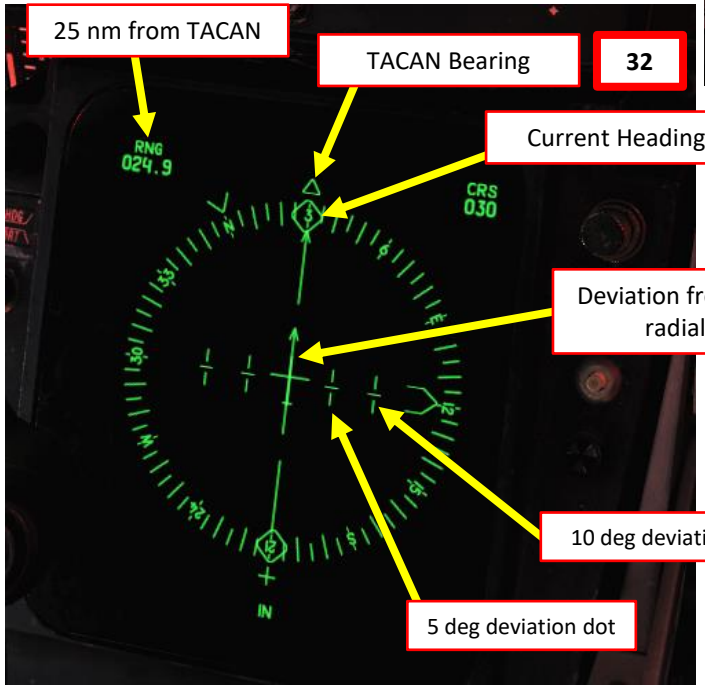


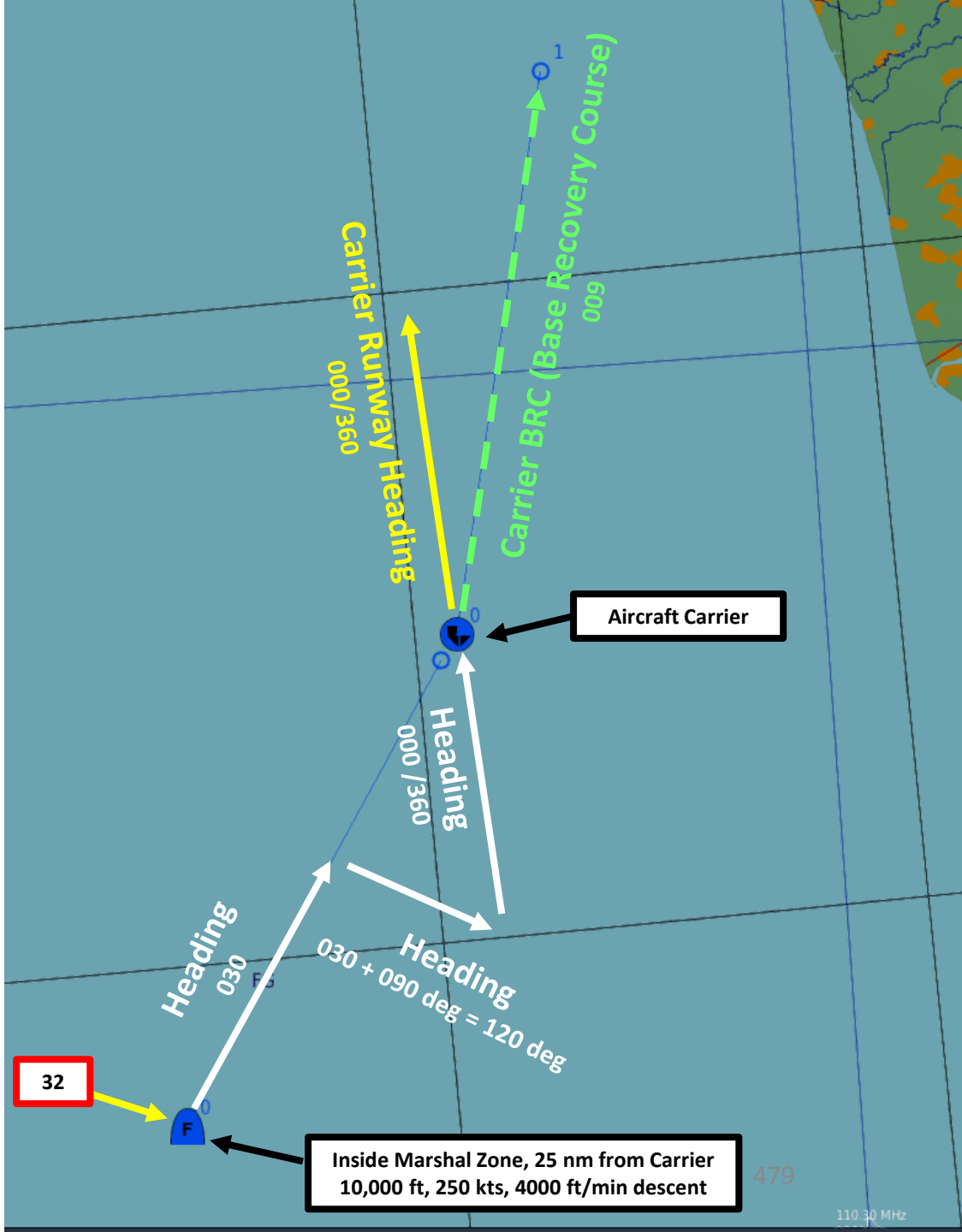
10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY

32. When you are 25 nm from carrier, follow the Marshal Radial (030) and descend from 10,000 ft to 5,000 ft at 250 kts.









10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

33. Maintain 5,000 ft until being 15 nm from carrier





Deviation from TACAN radial 030



25 nm from TACAN

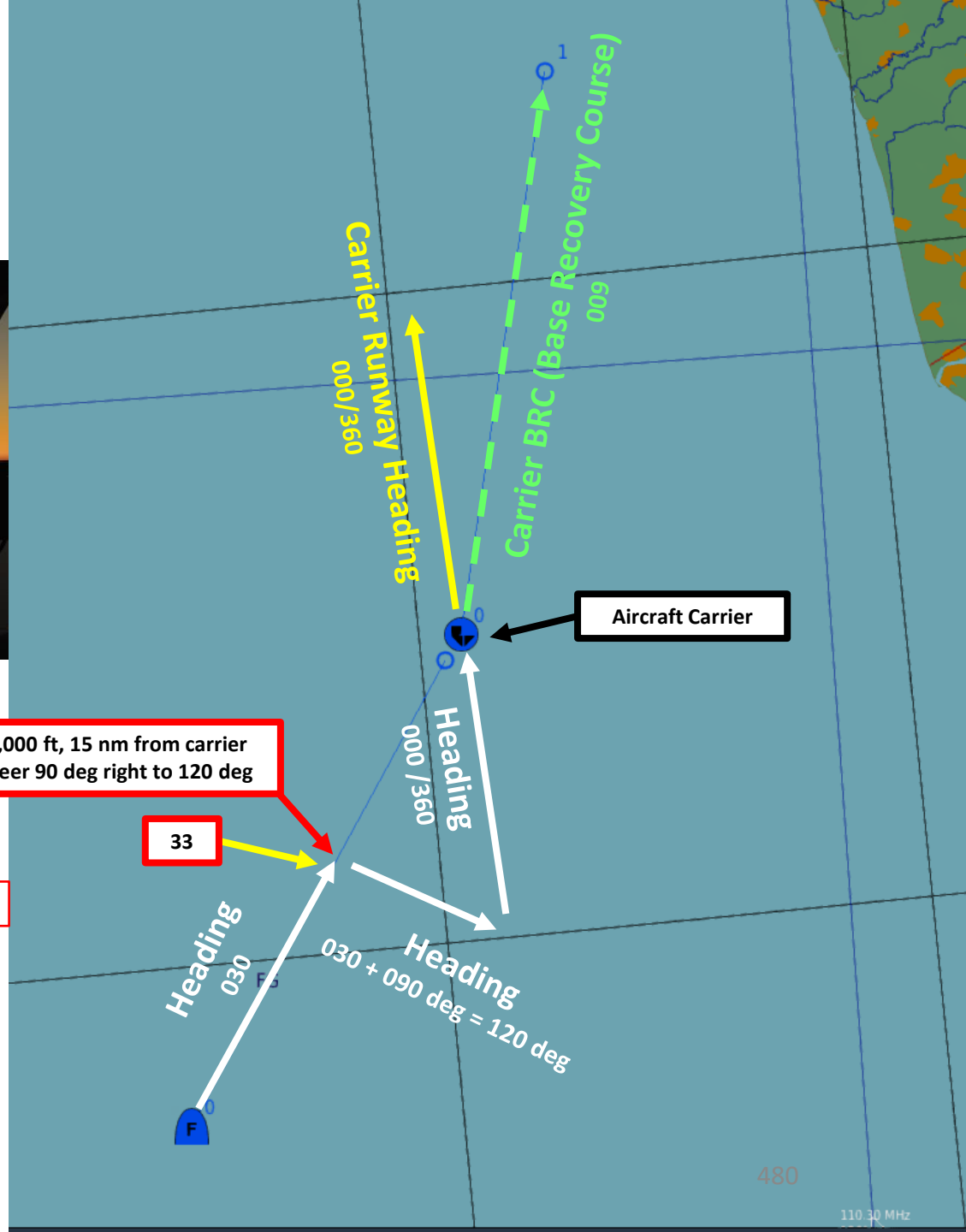
TACAN Bearing **33**

Current Heading

Deviation from TACAN radial 030 (3 deg)

10 deg deviation dot

5 deg deviation dot

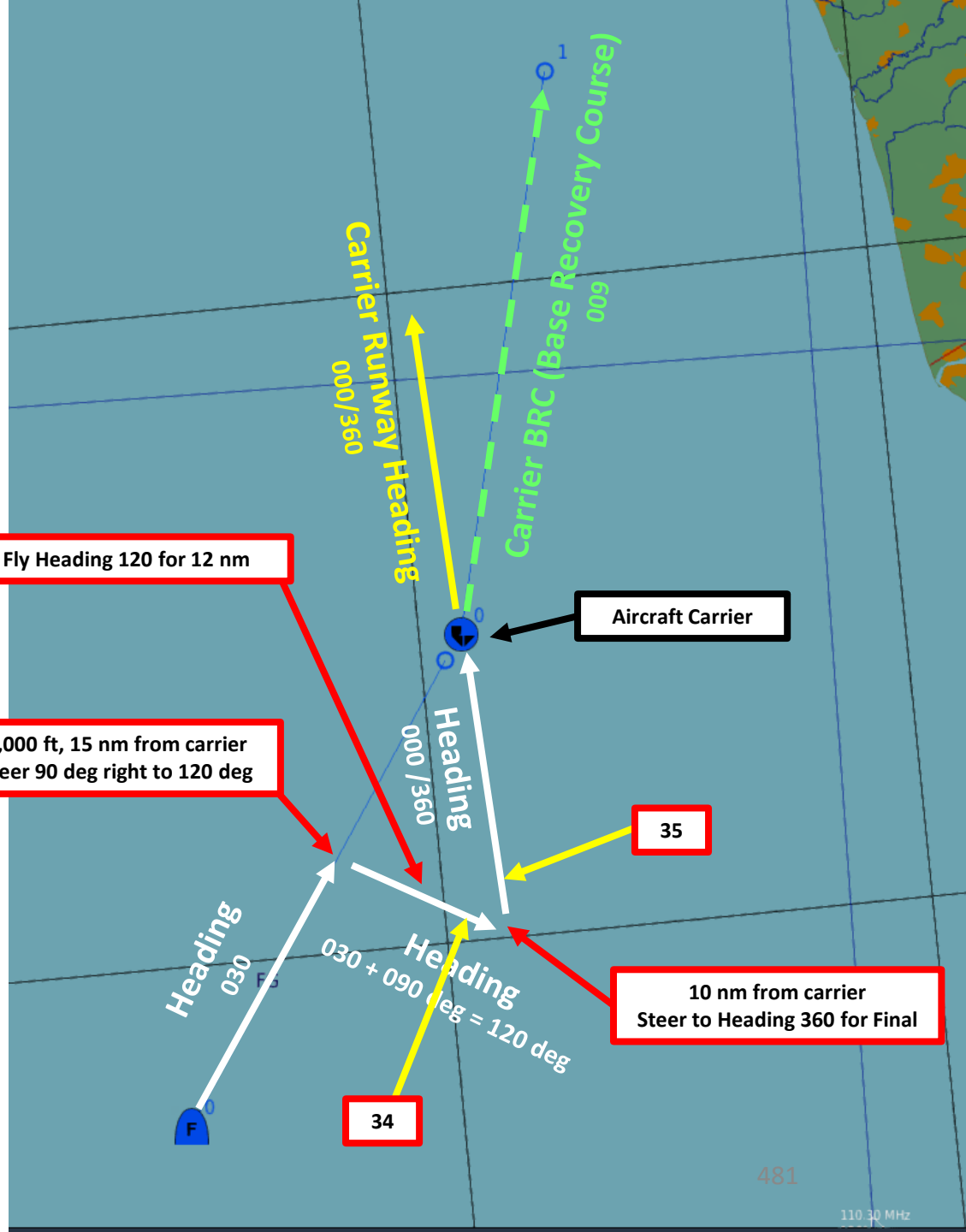


10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY

34. Steer 90 deg right to a heading of 120 and set TACAN course to the Carrier Runway Heading (000/360).
35. When crossing the carrier's runway heading radial of 360, steer aircraft to 360 for Final Approach.



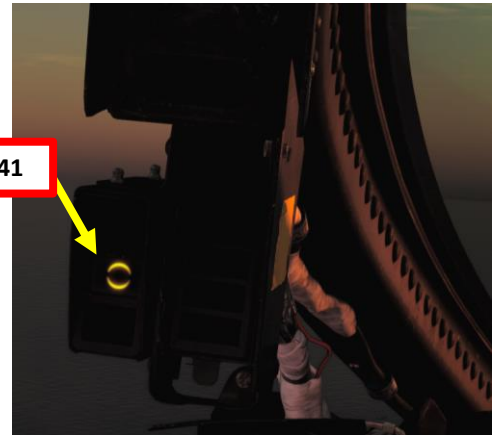


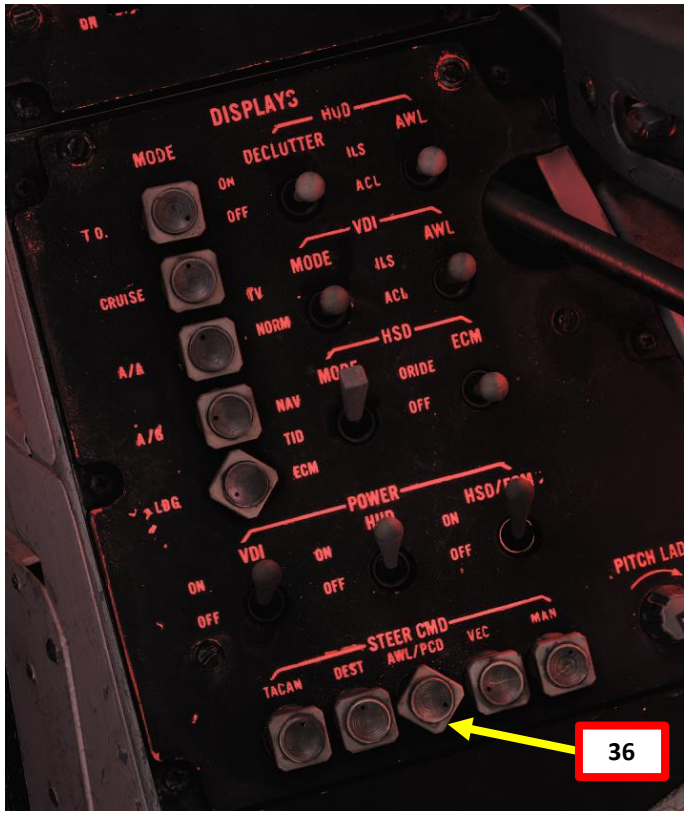


10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

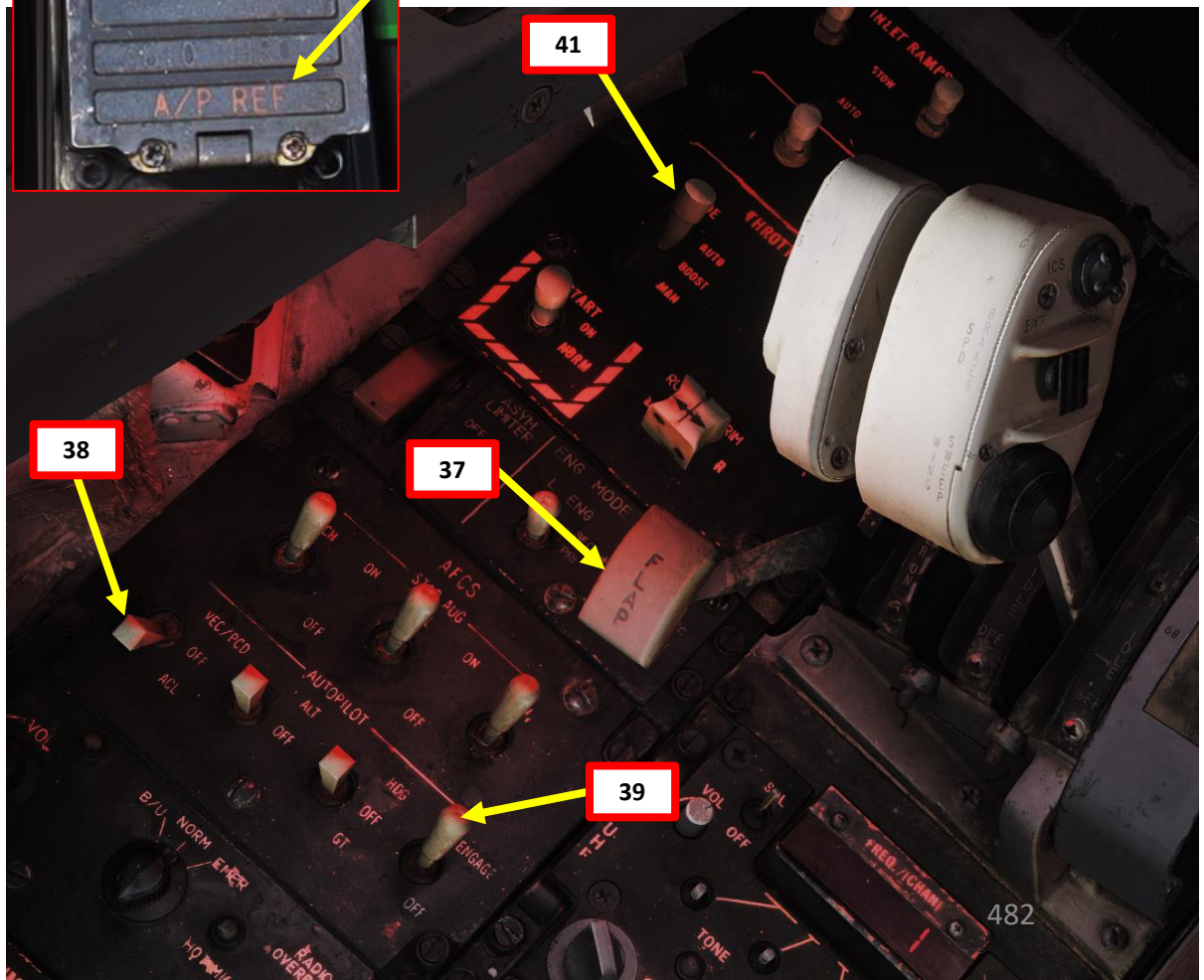
36. Once lined up on the final segment (10 nm out), select AWL/PCD (All-Weather System/Precision Course Direction) Navigation Steer Command.
37. When reaching 8 nm from carrier, set landing gear down, full flaps, settle aircraft attitude at On Speed AoA. Double-check that Anti-Skid Switch is OFF, Hook Lever is DOWN, Hook Bypass Switch is set to CARRIER.
38. Set VEC/PCD/ACL Autopilot selector to ACL (Automatic Carrier Landing) (AFT)
39. Set Autopilot Switch to ENGAGE (FWD)
40. A/P REF will indicate that autopilot selected but not engaged
41. Remove your hand from the throttle, then set Throttle Mode switch to AUTO (FWD). This will engage Auto-Throttle, which will automatically adjust thrust to maintain an ON SPEED AoA.





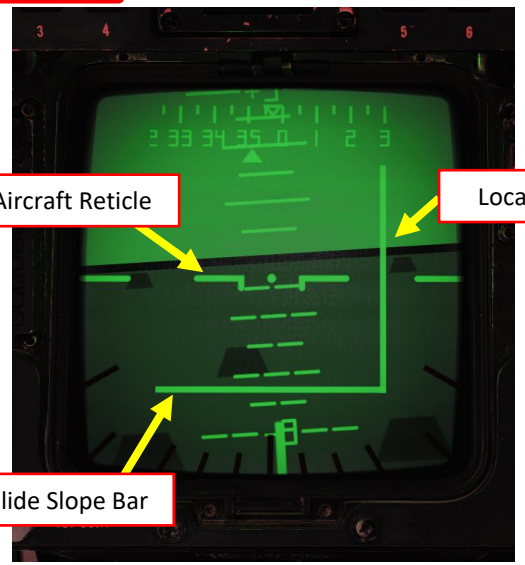


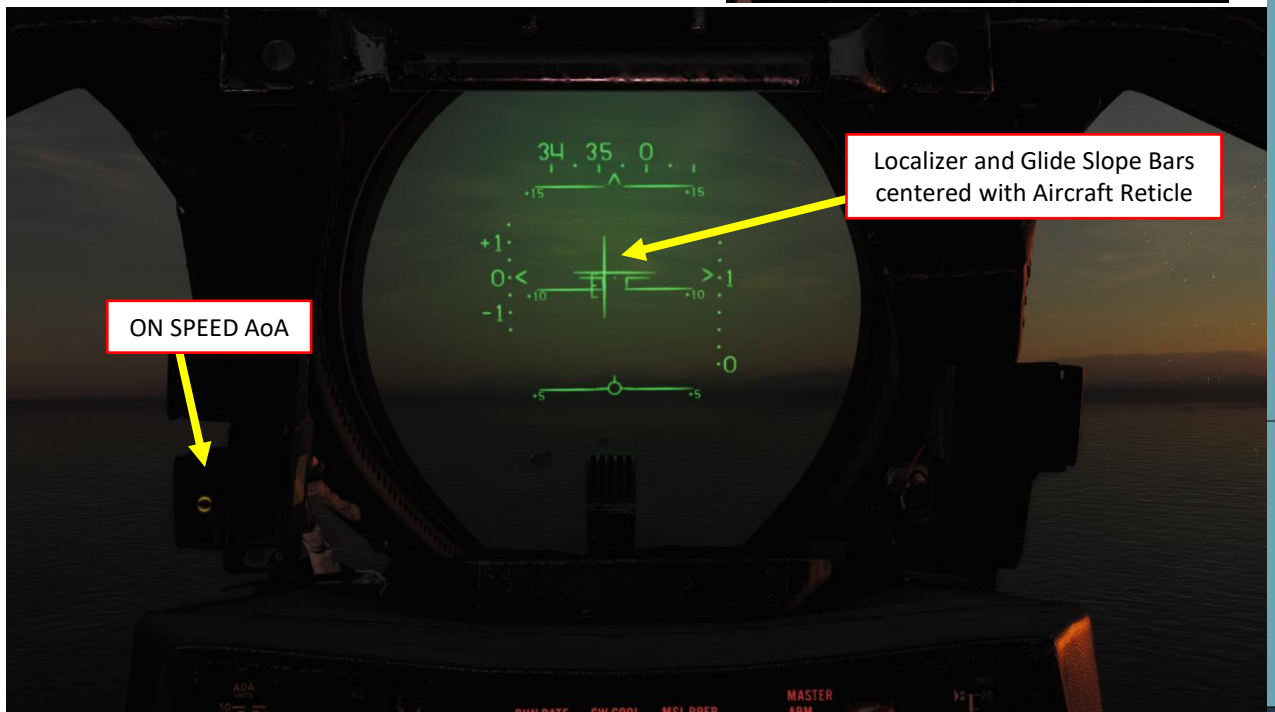


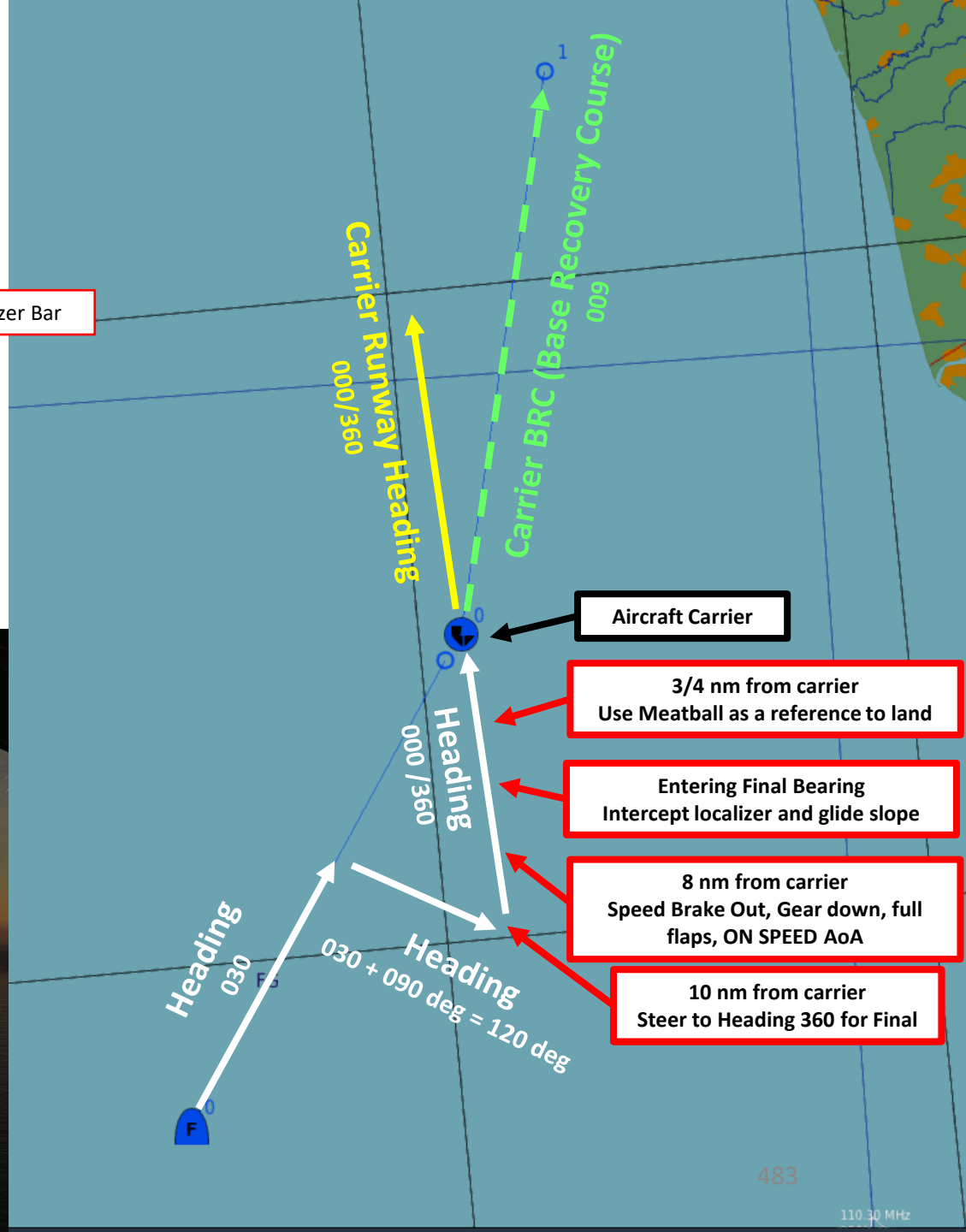


10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

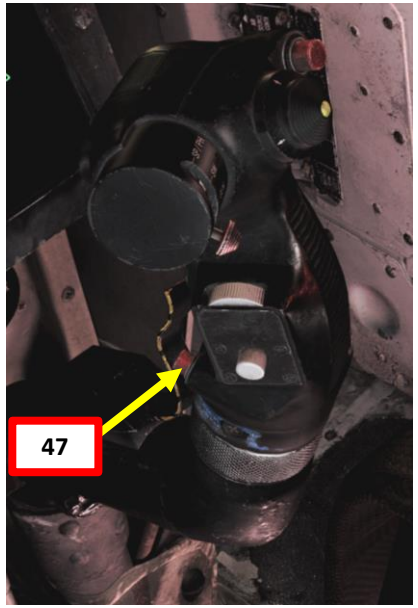
42. When entering final bearing, intercept **localizer** line to guide yourself **laterally** on the runway. Line up Aircraft Reticle with the Localizer Line. « Chase » the line.
43. Intercept the glide slope line to guide yourself **vertically** on the glide path. Line up Aircraft Reticle with the Glide Slope Line. « Chase » the line.







10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

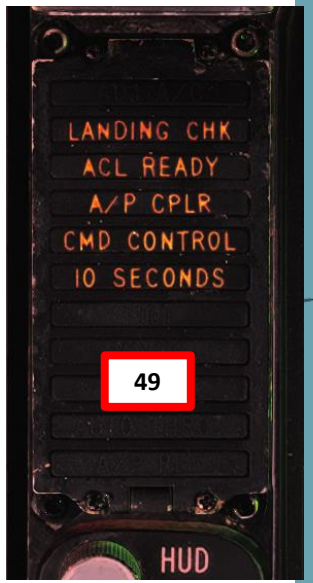


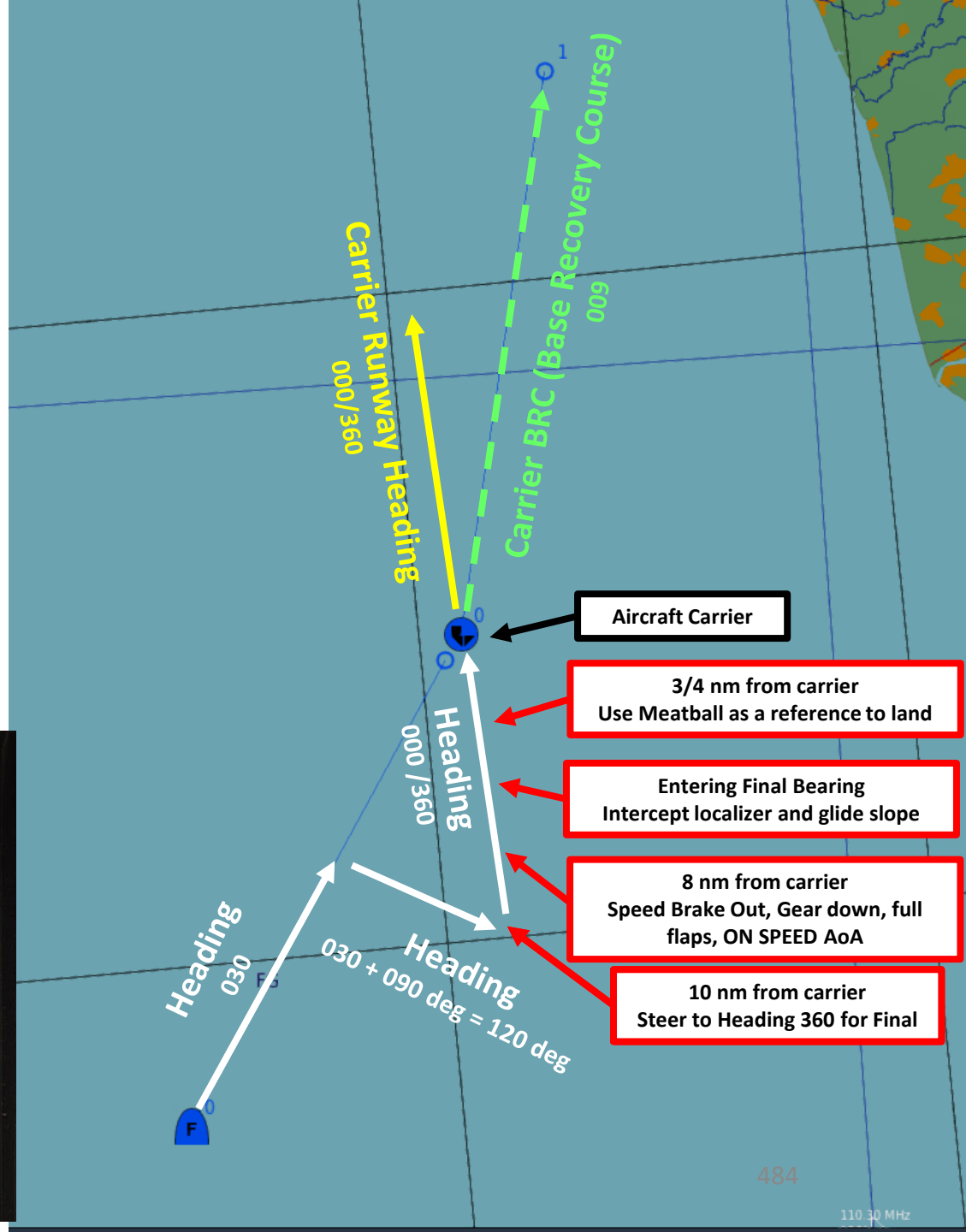
44. As you are 6 nm from the carrier, the **LANDING CHK** caution will illuminate. This means the carrier has a channel ready for ACL and that the crew should prepare for carrier landing.
45. As you are 4 nm from the carrier, the **ACL READY** caution will illuminate. This means the CATCC (Carrier Air Traffic Control Center) has acquired the aircraft and is transmitting glidepath information to the aircraft. The **AP/CPLR** caution will indicate the the CATCC is ready to control the aircraft.
46. Ensure Localizer and Glide Slope needles are centered or the ACLS (Automatic Carrier Landing System) will not be able to engage properly.
47. Press the Autopilot Reference / Nosewheel Steering Button to engage the automatic carrier landing system.
48. Once engaged, the **CMD CONTROL** caution will indicate that the aircraft is under datalink control for landing.
49. Once you are 10 seconds to arrival, the **10 SECONDS** caution will illuminate.









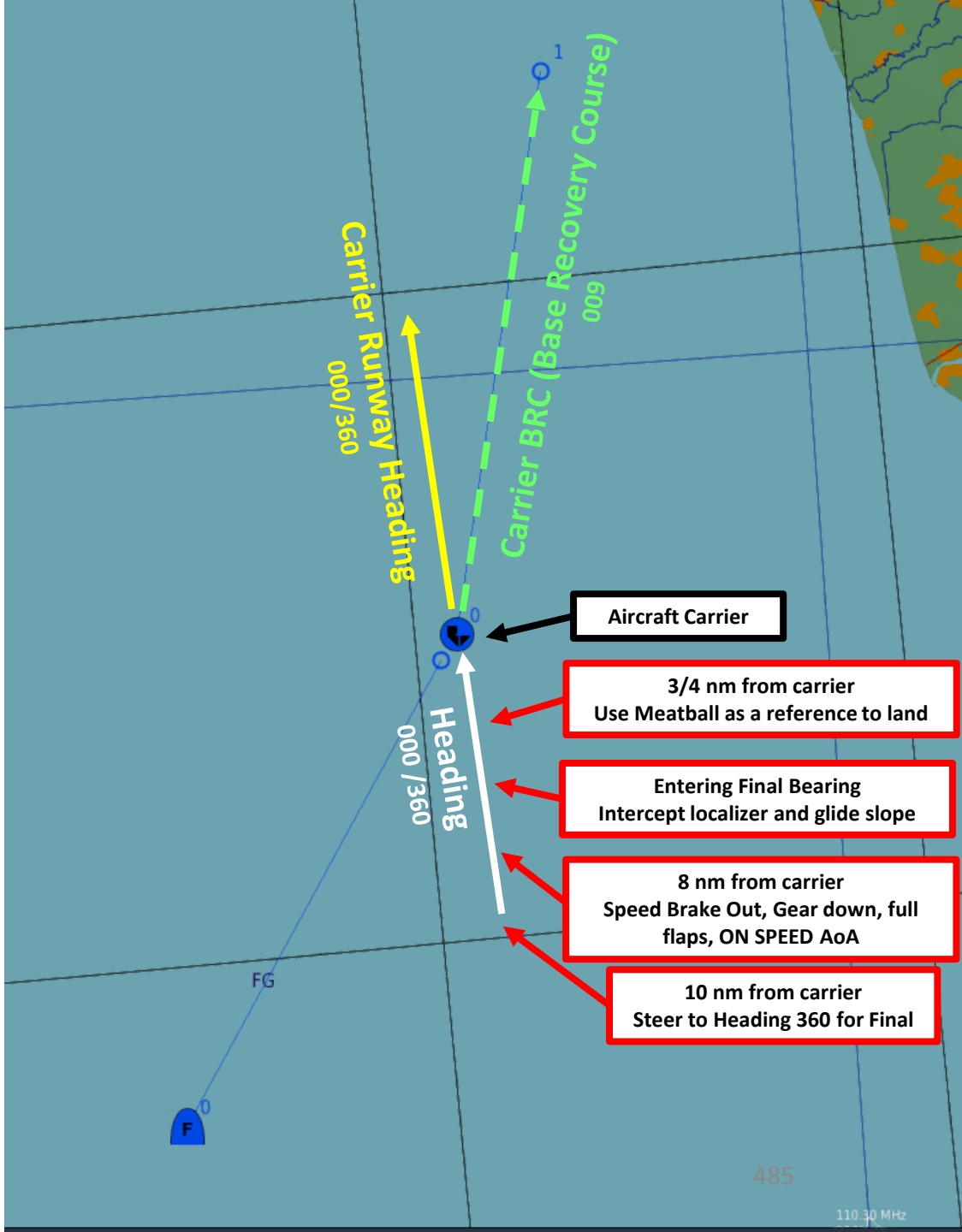


10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY

50. The ACLS will then automatically land the aircraft for you on the carrier. If the ACLS disconnects or the aircraft autopilot or autothrottle fails, be ready at any second to take back the controls and throttle up to go around.

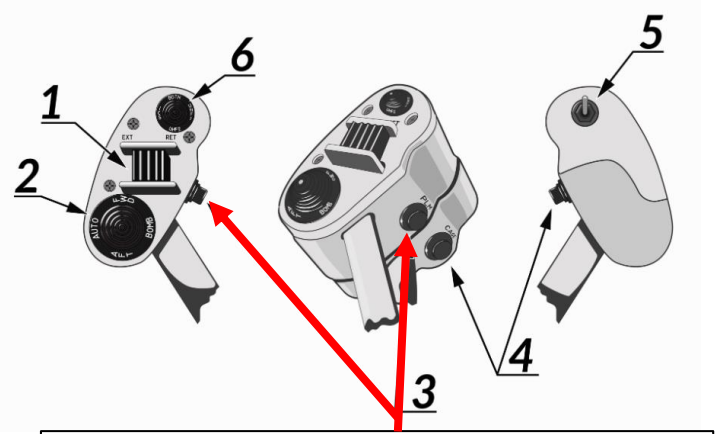






10 - ACLS CARRIER LANDING TUTORIAL CASE III RECOVERY

One last piece of advice for ACLS is that you must remember that the PLM (Pilot Lockon Mode) button on the throttle can be used to disengage the autopilot while in ACL (Automatic Carrier Landing) mode at any time.

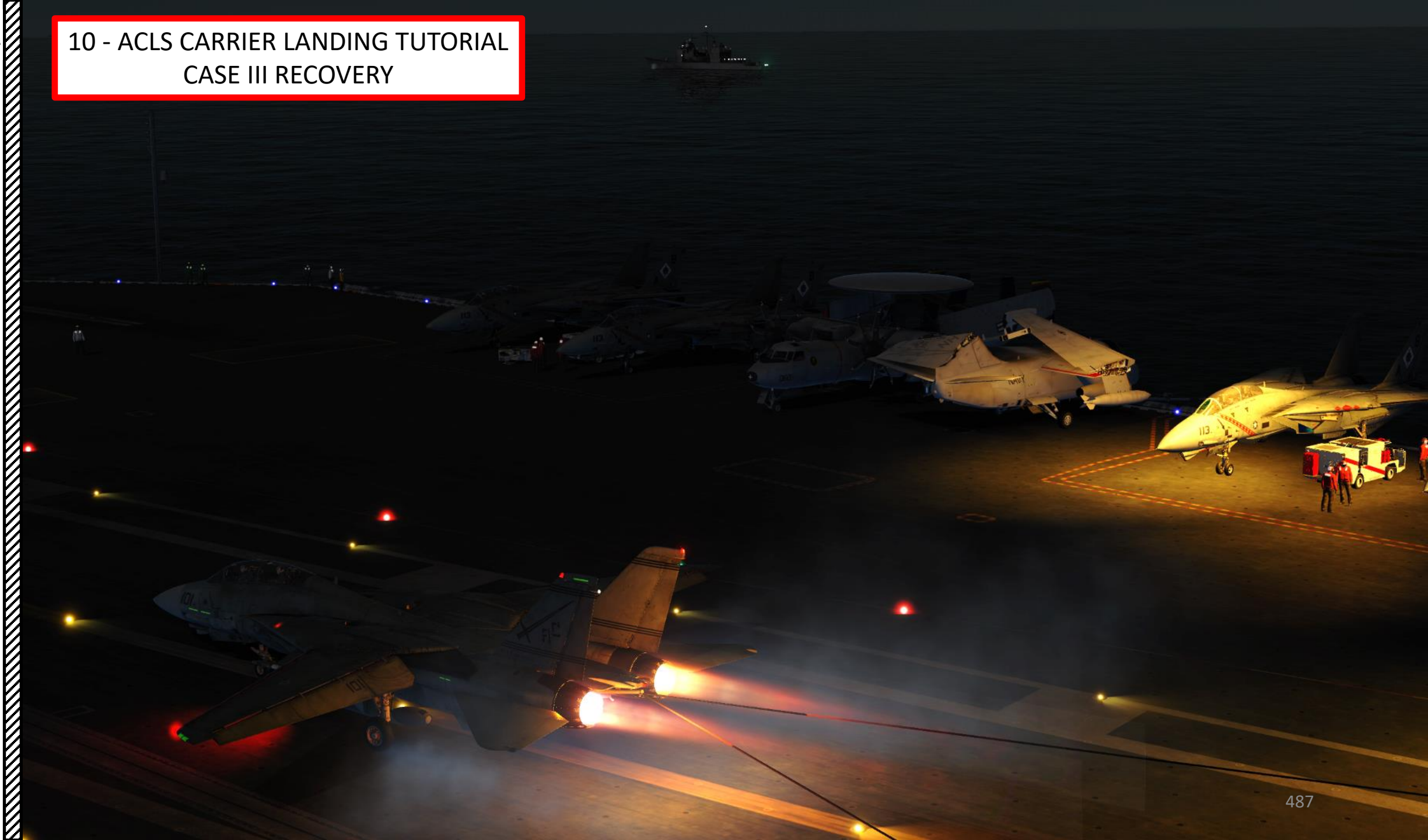


PLM Button
Button used to command pilot lockon mode of AWG-9.
Also used to disengage autopilot while in ACL.





10 - ACLS CARRIER LANDING TUTORIAL
CASE III RECOVERY



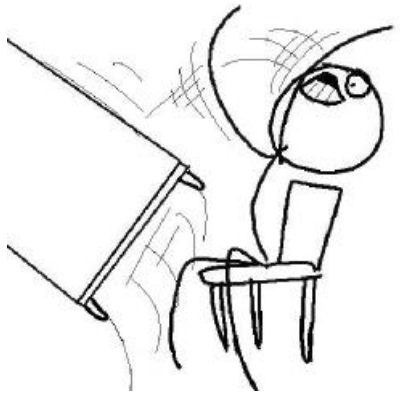
INTRODUCTION

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

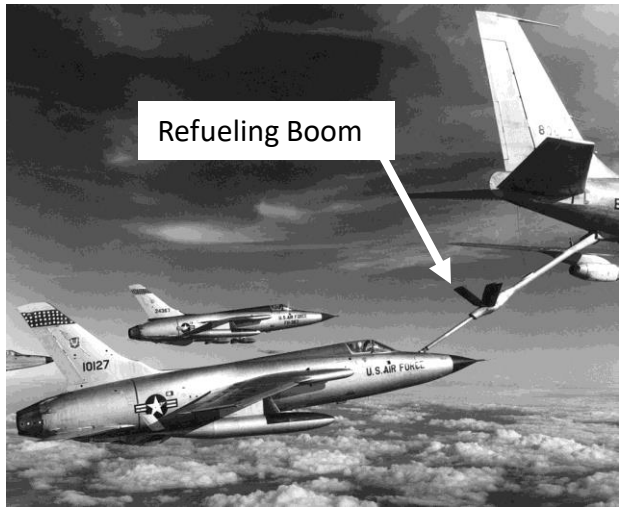
- The refueling aircraft available in DCS are:
  - The Ilyushin Il-78M "Midas", a russian **probe-and-drogue** tanker, which was developed from the Il-76
  - The Boeing KC-135 "Stratotanker", a US Air Force **flying boom** tanker, which was developed from the Boeing 367-80
  - The Lockheed S-3B "Viking", 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 Tomcat 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 or a S-3B tanker.









F-105 Thunderchiefs being refueled by a Boom system during the Vietnam War



Tornado GR4 being refueling by a Probe-and-Drogue system

F-14B TOMCAT

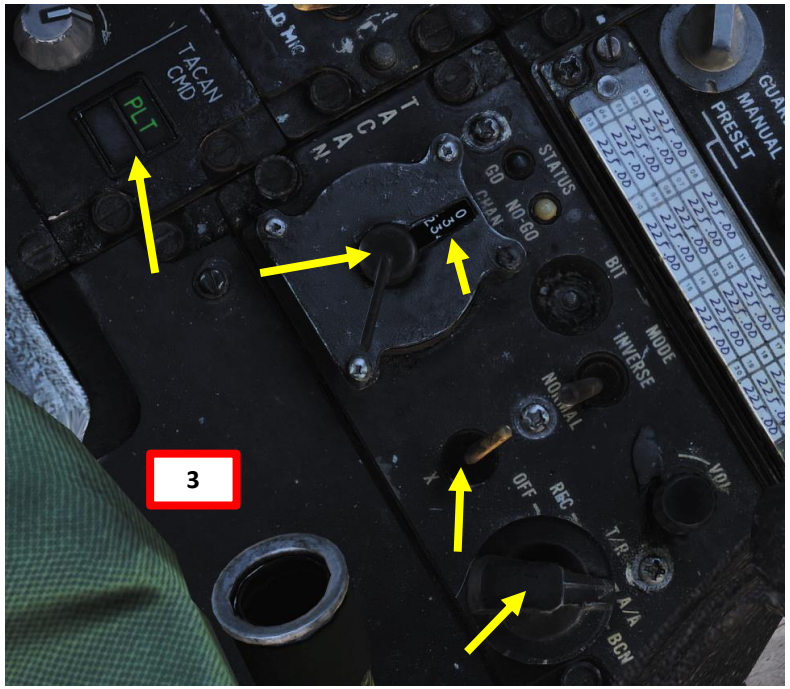
PART 16 – AIR-TO-AIR REFUELING

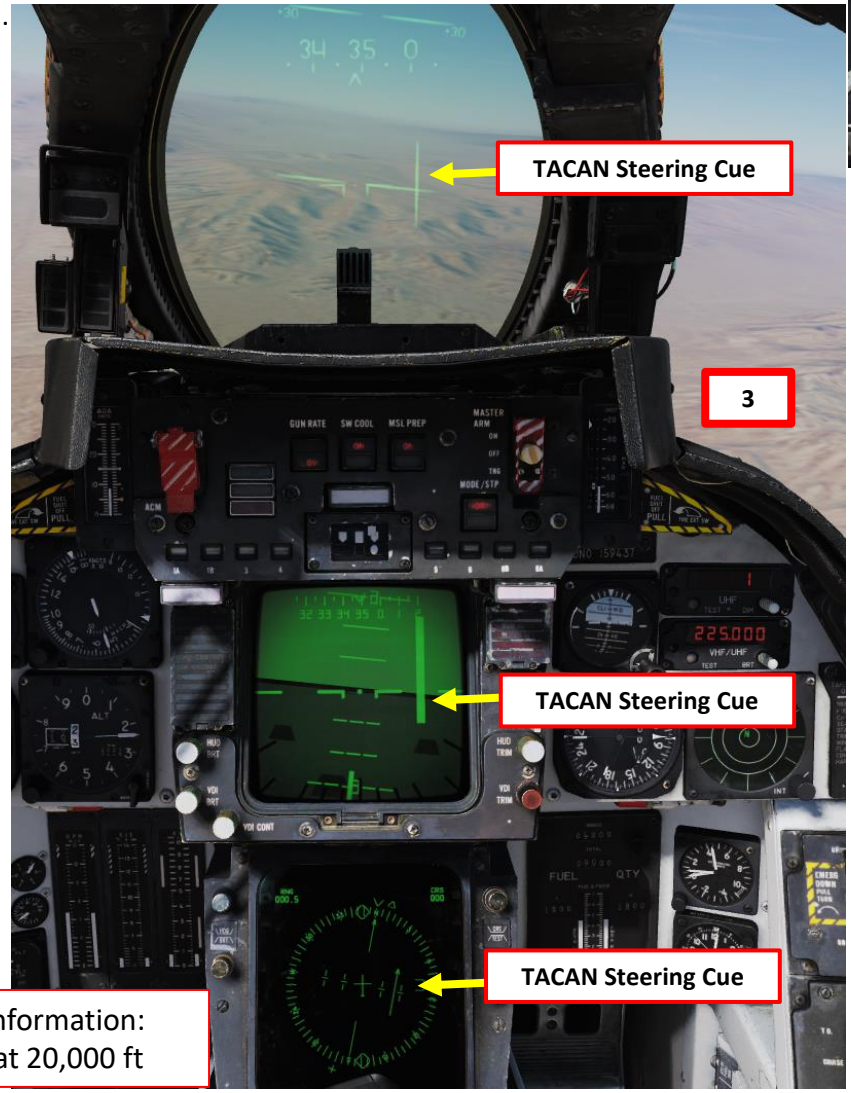
AIR-TO-AIR REFUELING DEMO

1. Consult mission briefing to know on which radio frequency you need to contact the tanker. In our case, we will use the frequency 225.000 AM from the VHF/UHF radio.
2. Set HUD Display Mode to CRUISE and Navigation Steer Command to TACAN
3. Find tanker using TACAN frequency (33Y) as shown in the NAVIGATION - TACAN section.
4. Communicate with TEXACO (tanker callsign) using the MIC UHF2 Button (RCTRL+\).
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 20,000 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.



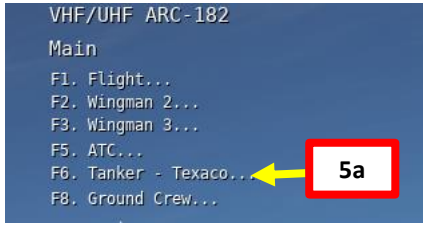


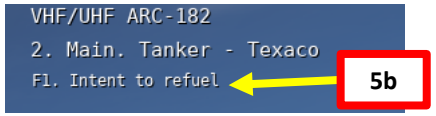


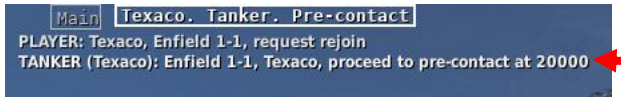
RSHIFT+K

TACAN LIST

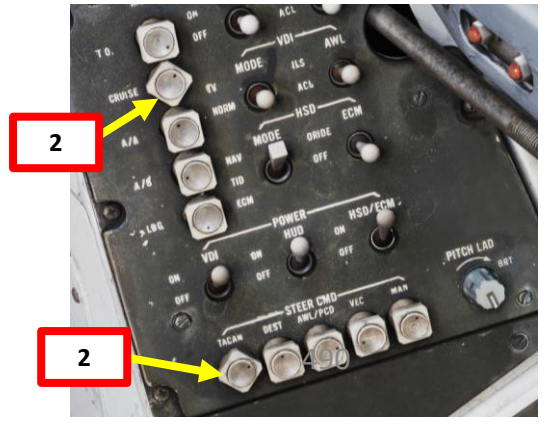
TKR	33Y	Texaco 1-1	KC-130		
BCE	75X	N 37°41'3	W112°18'2	8919ft	
BLD	114X	N 35°59'7	W114°51'8	3567ft	
BTY	94X	N 36°48'0	W116°44'8	2944ft	
CDC	120X	N 37°47'2	W113°04'1	5485ft	
DAG	79X	N 34°57'7	W116°34'7	1789ft	
EED	99X	N 34°46'0	W114°28'4	674ft	
GFS	91X	N 35°07'9	W115°10'6	4042ft	







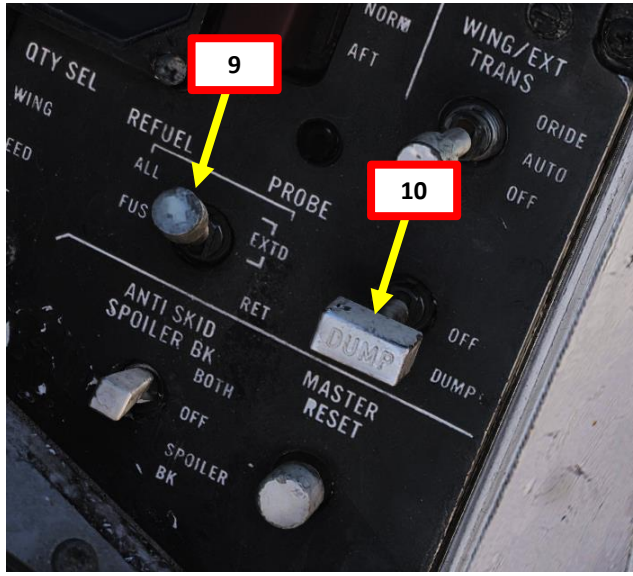
Pre-contact information: rendez-vous at 20,000 ft

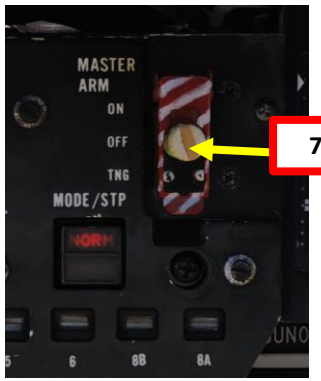


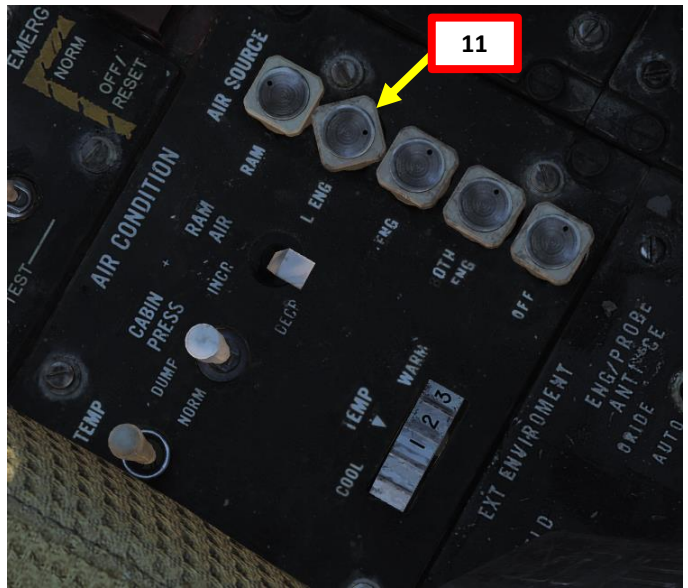
AIR-TO-AIR REFUELING DEMO

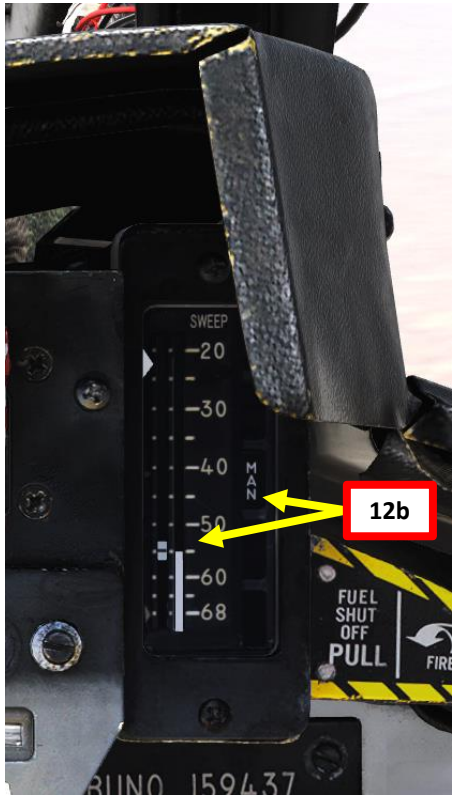
7. Set Master Arm Switch – OFF (DOWN)
8. Tell the RIO to set the WCS Switch – STBY
9. Set Refuel Probe switch to either ALL EXTD or FUS EXTD
10. Set Fuel Dump switch – OFF
11. Set Air Source – L ENG (will avoid fuel fumes going through air conditioning system)
12. Set Wing Sweep Thumb Switch – DOWN (BOMB). A constant wing sweep of 55 deg will help stabilize the flight of the aircraft.

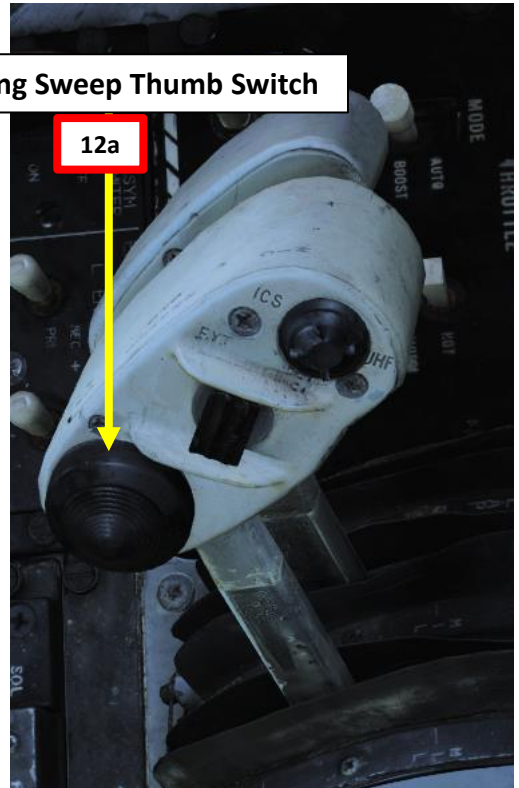


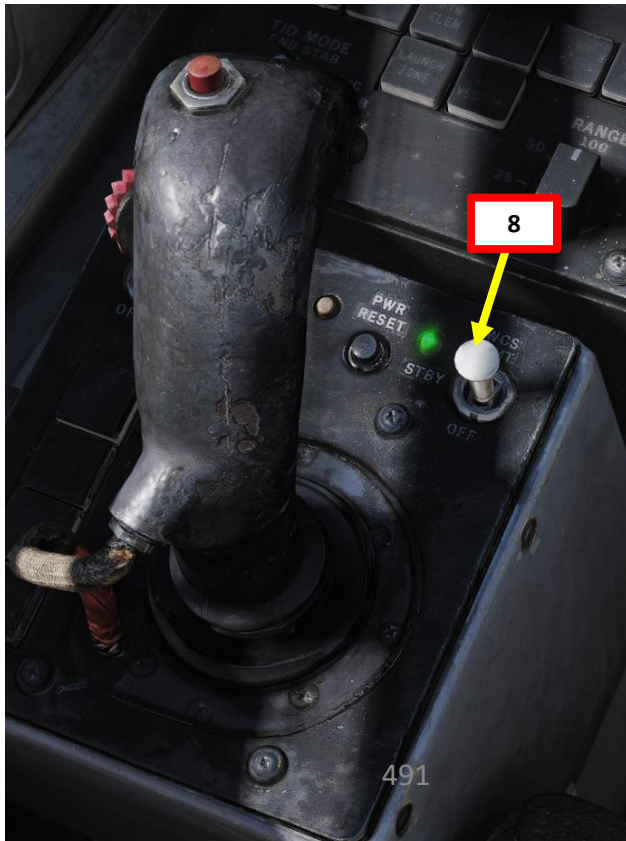










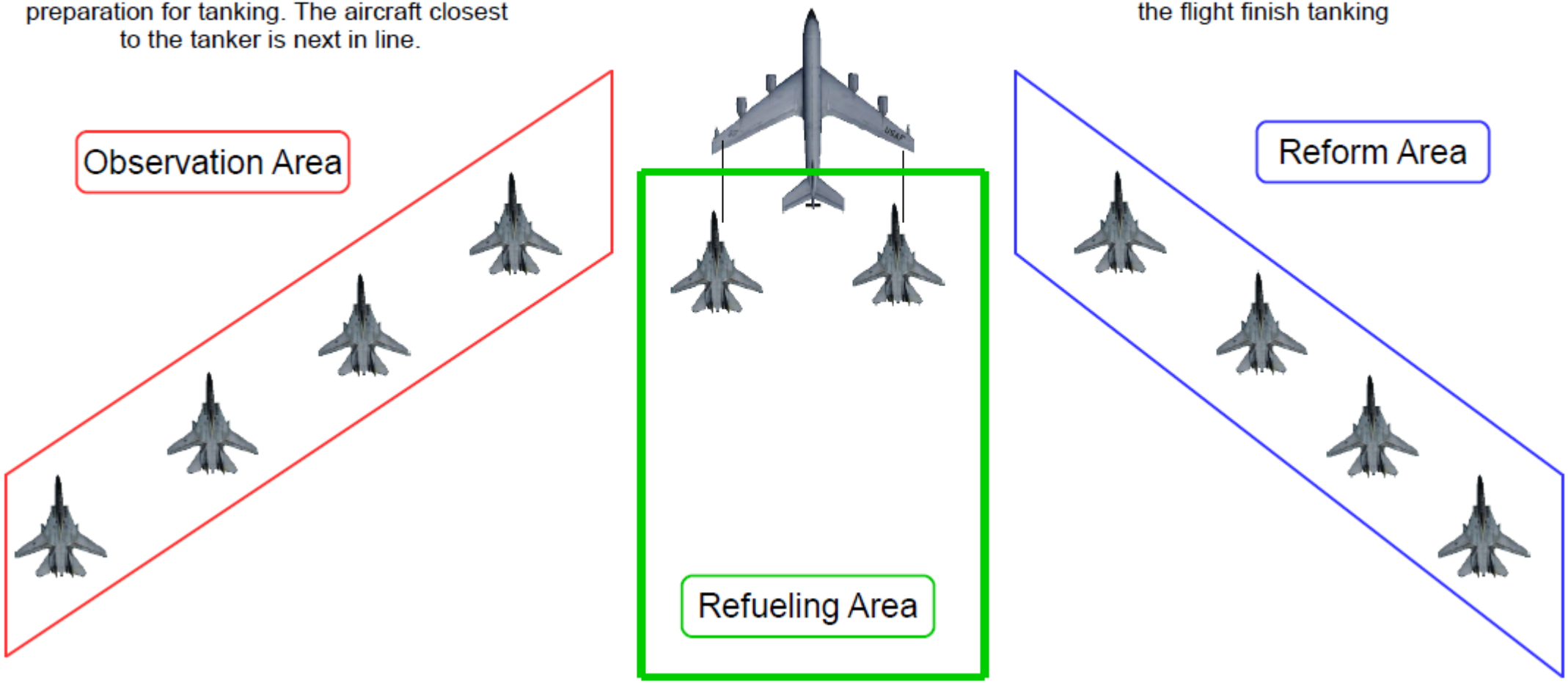


AIR-TO-AIR REFUELING DEMO

Procedures on Joining:

Observation Area
This is the area all incoming aircraft go in preparation for tanking. The aircraft closest to the tanker is next in line.

Reform Area
This is the area you wait while the rest of the flight finish tanking



Source: MD-44 F-14B Guide
https://forums.eagle.ru/showthread.php?t=241254

AIR-TO-AIR REFUELING DEMO

13. Make sure refueling probe has deployed correctly. Keep in mind that you may not exceed 350 kts with an extended refuel probe.
14. When you are less than 0.1 nm away from tanker, position yourself as shown on picture.
15. When in position, use your radio menu to select “Ready Pre-Contact” (F1).
16. The tanker’s pilot should answer you with “Cleared Contact” and should deploy his drogue basket and start to accelerate to cruising speed.
17. 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.
18. Keep the aircraft **trimmed at ALL TIMES**. Approaching untrimmed is living hell. Be careful with the throttle since it has a very fast response time. Use airbrake if you need to slow down quickly while maintaining altitude.
19. When adjusting power, make very small power adjustments since the engine response time is very fast and the F110 engines are very powerful, even in IDLE regimes.



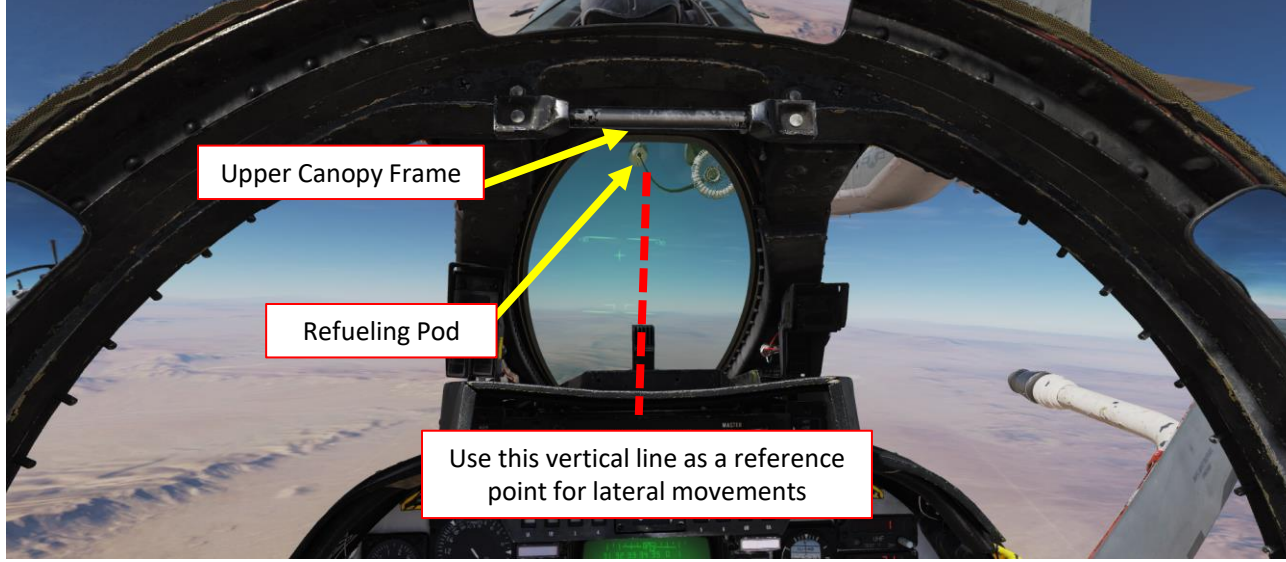


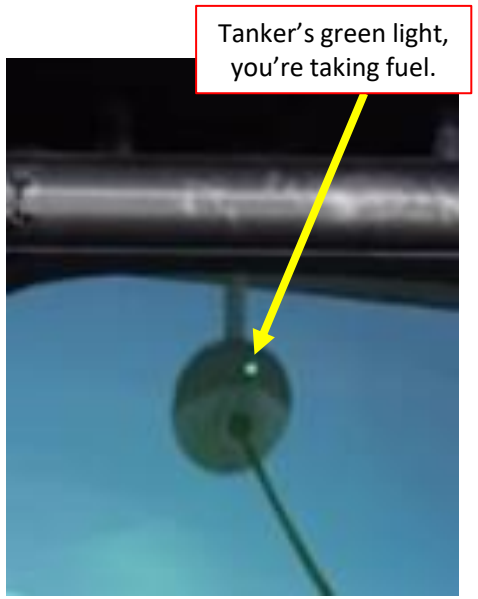




AIR-TO-AIR REFUELING DEMO

20. Insert your probe into the drogue basket by using your reference point. Align the left-most refueling pod of the tanker with the middle upper section of the canopy frame, **both vertically and laterally.**
21. 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 engine.
22. Keep formation with the tanker until your refueling is complete. Don’t aim for the probe, aim for the tanker’s engine.
23. Detach your probe form the basket by throttling down and set Refuel Probe switch to RETRACT.



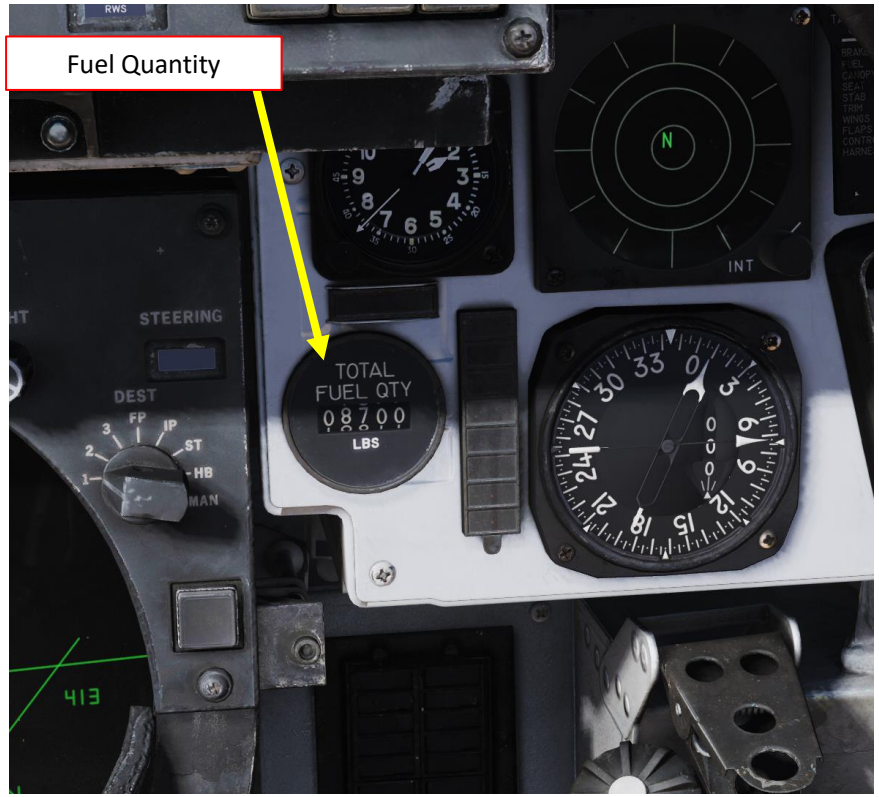




AIR-TO-AIR REFUELING DEMO

Note: While the pilot is busy refueling, the RIO can monitor the fuel refueling progress and keep the pilot updated. The JESTER AI will also give you corrections and advice (while cracking some jokes in the process).







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 is a great demo of air-to-air refueling by 104th_Maverick.

- https://youtu.be/mlNT28ZFKbA

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.



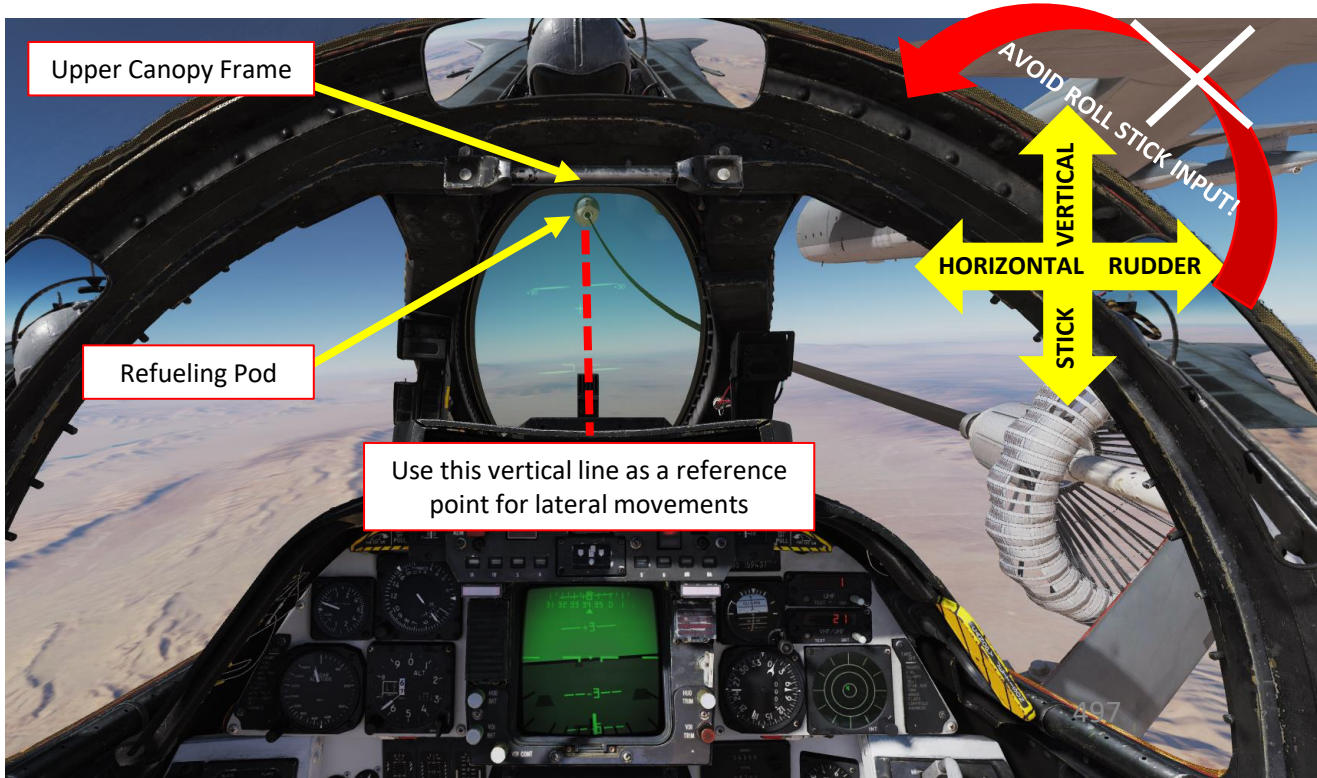




TIPS AND TRICKS

- 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 rolling** your aircraft when you are tracking the basket: you will change the orientation of your lift vector and it will make you drift vertically and horizontally, which doesn't help at all. 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 and using my rudder at the same time. The aircraft reacts 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 basket.
- Once I have a satisfying attitude and that the basket is placed as per the reference points (left-most refueling pod of the tanker aligned with the middle upper section of the canopy frame, **both vertically and laterally**), **I gradually throttle up** and increase speed to **match the tanker's speed**. Make sure that you keep a constant speed as much as possible.
- Avoid big throttle movements as the Tomcat B's engines respond very quickly and are very powerful.
- 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 **REFERENCE POINT (REFUELING POD + CANOPY FRAME). DO NOT LOOK AT THE BASKET**. Nothing else matters.
- Once I am approaching the basket, I make sure to avoid inducing rolling motions while displacing myself with the rudders and the vertical stick input ONLY. This way, your aircraft stays straight and delicately drifts left or right based on the **rudder input**, while you can **fine-tune your vertical attitude** with your stick.
- Trim, trim, trim! Trimming is the name of the game. The better trimmed you are, the easier the approach will be.





Heatblur F-14 Wiki
http://www.heatblur.se/F-14Manual/
Used for Part 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

Home of M.A.T.S.
http://www.anft.net/f-14/
Used for Part 3, 8, 13

Jabbers F-14 Tutorials (Youtube)
https://www.youtube.com/watch?v=wl9l9MDRxXk&list=PLbEi2nhCxrDVOAgxR59UgR0TnmC4qHkAi
Used for Part 2, 3, 4, 5, 6, 8, 9, 10, 12

Redkite F-14 Tutorials (Youtube)
https://www.youtube.com/watch?v=R9-8UCj66Ds&list=PLml_c09ciucs3Q2SsJ2HDHBGpTbfkDwE4
Used for Part 3, 6, 9, 10, 15

104th_Maverick F-14 Case I Carrier Landing Tutorial (Youtube)
https://www.youtube.com/watch?v=NMDuXrtHWno
Used for Part 6, 15

104th_Maverick DCS F-14 Tomcat Air to Air Refueling Tutorial (Youtube)
https://youtu.be/mlNT28ZFKbA
Used for Part 16

OverKill DCS F-14 Tutorials (Youtube)
https://www.youtube.com/watch?v=1AfENikz58g&list=PLjjb3OaSRCPNfHzcEu41AJAw1IoOBERcj
Used for Part 3, 5, 6, 9, 10

Spudknocker F-14 Tutorials (Youtube)
https://www.youtube.com/watch?v=I4Dnl8ECJhc&list=PLZ8X4p18pdbmUs_ujgpyRSMXg8vzGR46Z
Used for Part 6, 10

Crash Laobi 1-Minute DCS F-14 Tutorials (Youtube)
https://www.youtube.com/watch?v=zJqnkMDYUPU&list=PL-uF4jhpky8VD6mKjxfNFG-TJSZq4fmEh
Used for Part 4, 5, 6, 15

Matt Wagner DCS: F/A-18C Hornet – Episode 16: CASE III Introduction
https://youtu.be/DvlMHnLjbDQ
Used for Part 15

PART 1 – INTRODUCTION & JESTER AI
PART 2 – CONTROLS SETUP
PART 3 – COCKPIT & EQUIPMENT
PART 4 – START-UP PROCEDURE
PART 5 – TAKEOFF
PART 6 – LANDING
PART 7 – ENGINE MANAGEMENT
PART 8 – FLIGHT & AERODYNAMICS
PART 9 – RADAR & SENSORS
PART 10 – OFFENCE: WEAPONS & ARMAMENT
PART 11 – DEFENCE: RWR AND COUNTERMEASURES
PART 12 – DATALINK & IFF
PART 13 – RADIOS
PART 14 – AUTOPILOT
PART 15 – NAVIGATION & ACLS LANDING
PART 16 – AIR-TO-AIR REFUELING
PART 17 – REFERENCE MATERIAL

ACRONYMS

ACL	Automatic Carrier Landing
ACLS	Automatic Carrier Landing System
ACM	Air Combat Maneuver
ACQ	Aquisition
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
ADL	Armament Datum Line
AFCS	Automatic Flight Control System
AFTC	Augmenter Fan Temperature Control
AHRS	Attitude Heading Reference System
AICS	Air Inlet Control System
AOA	Angle of Attack
APC	Approach Power Compensator
ASH	Automatic Stored Heading
ATC	Active Transfer Command
ATLS	Automatic Thrust Limiting System
ATTK	Attack
AVTR	Airborne Video Tape Recorder
AWL	All-Weather Landing
BATR	Bullet at Target Range
BDHI	Bearing-Distance-Heading Indicator
BIT	Built-in Test
BRC	Base Recovery Course
BRST	Boresight
BRU	Bomb Rack Unit

CADC	Central Air Data Computer
CAINS	Carrier Aircraft Inertial Navigation System
CANTCO	Can't Comply
CAP	Computer Address Panel
CCIP	Continuously Computed Impact Point
CICU	Computer Integrated Converter Unit
CLSN	Collision
CM	Continuous Monitor
CRS	Course
CRT	Cathode Ray Tube
CSA	Continuous Semi-Active
CSDC	Computer Signal Data Converter
CTVS	Cockpit Television Sensor
CV	Aircraft Carrier
CW	Continuous-Wave
DDD	Detail Data Display
DDI	Digital Data Indicator
DECM	Defensive Electronic Countermeasures
DEF PT	Defended Point
DES	Designate

DEST	Destination
DF	Direction Finder
D/L	Data Link
DLC	Direct Lift Control
DME	Distance Measuring Equipment
DPLR	Doppler
ECA	Expanded Chaff Adapter
ECM	Electronic Countermeasures
ECCM	Electronic Counter-Countermeasures
ECMD	Electronic Countermeasures Display
ECS	Environmental Control System
EGT	Exhaust Gas Temperature
EIG	Electronic Instrument Group
ETA	Estimated Time of Arrival
EXP	Expand
FAR	False Alarm Rate
FCLP	Field Carrier Landing Practice
FEMS	Fatigue Engine Monitoring System
FF	Fuel Flow
FLOLS	Fresnel Lens Optical Landing System

ACRONYMS

FMR	Frequency Ranging
FOV	Field of View
FRL	Fuselage Reference Line
FSK	Frequency-Shift-Keyed
FWD	Forward
GACH	Gimbal Angle Crosshair
GCI	Ground Controlled Intercept
GCS	Gun Control System
GM	Ground Map
GPS	Global Positioning System
GSS	Gun Scoring System
GT	Ground Track
HB	Homebase
HCU	Hand Control Unit
HDG	Heading
HOJ	Home-on-Jam
HOST	Hostile
HPRF	High Pulse Repetition Frequency
HSD	Horizontal Situation Display
HSI	Horizontal Situation Indicator
HUD	Heads-up Display

IAS	Indicated Airspeed
ICLS	Instrument Carrier Landing System
ICS	Intercommunications
IFF	Identification Friend or Foe
IFR	Instrument Flight Rules
IFT	In-Flight Training
ILS	Instrument Landing System (ICLS)
IMN	Indicated Mach Number
IMU	Inertial Measurement Unit
INS	Inertial Navigation System
IP	Initial Point
IR	Infrared
IRAT	IR Angle Tracking
ITER	Improved Triple Ejector Rack
ITS	Integrated Trim System
JAM	Jamming
JAT	Jam Angle Track
KCAS	Knots Calibrated Airspeed
KTS	Knots
LAR	Launch Acceptable Region

LCD	Liquid Crystal Display
LCOS	Lead Computing Optical Sight
LOS	Line of Sight
LPRF	Low Pulse Repetition Frequency
LSO	Landing Signal Officer or “Paddles”
LTE	Launch-to-Eject
M	Mach
MA	Missile Alert
MAD	Magnetic Azimuth Detector
MAG VAR	Magnetic Variation
MAN	Manual
MAND	Mandatory
MDIG	Multipurpose Display Indicator Group
MEC	Main Engine Control
MIL	Military
ML	Missile Launch
MLC	Mainlobe Clutter
MLG	Main Landing Gear
MOAT	Missile on Aircraft Test
MMGS	Multiple Mode Gun Sight
MRL	Manual Rapid Lockon

ACRONYMS

MSL	Mean Sea Level
NAV GRID	Navigation Command and Control Grid
NBR	Number
NFO	Naval Flight Officer
NFOV	Narrow Field of View
NM	Nautical Miles
NOZ	Nozzle
NTDS	Naval Tactical Data System
OBC	On-Board Check
Paddles	See LSO
PAL	Pilot Automatic Lockon
PCD	Precision Course Direction
PD	Pulse Doppler
PDCP	Pilot Display Control Panel
PDRSL	Pulse Doppler Radar Slaved
PDS	Pulse Doppler Search
PDSTT	Pulse Doppler Single Target Track
PH	AIM-54 Phoenix Missile
PLM	Pilot Lockon Mode
PRF	Pulse Repetition Frequency
PRI	Primary
PRSL	Pulse Radar Slaved
PS	Pulse Search
PSTT	Pulse Single Target Track
PT	Point
QADL	Cue-to-ADL
QDES	Cue-to-Designate
QHUD	Cue-to-HUD
QSNO	Cue-to-snowplow
QWP	Cue-to-waypoint
RACH	Radar Angle Crosshair
RDR	Radar
RDROT	Radar on Target
RECON	Reconnaissance
RIO	Radar Intercept Officer
RNG	Range
RNGRT	Range Rate
ROT	Range on Target
RTGS	Real-Time Gun Sight
RWS	Range While Search
SAM	Surface to Air Missile
SAS	Stability Augmentation System
SAT	Simultaneous Alignment and Test
SCP	Sensor Control Panel
SD/A	Sample Data/Active
SEAM	Sidewinder Expanded Acquisition Mode
SINS	Ship Inertial Navigation System
SP	AIM-7 Sparrow Missile
ST	Surface Target
STAB	Stabilization
STAB AUG	Stability Augmentation
STBY	Standby
STC	Sensitivity Time Control
STT	Single Target Track
SW	AIM-9 Sidewinder Missile
TACAN	Tactical Air Navigation
TARPS	Tactical Air Reconnaissance Pod System
TAS	True Airspeed
TCS	Television Camera Set
TDS	Tactical Data System

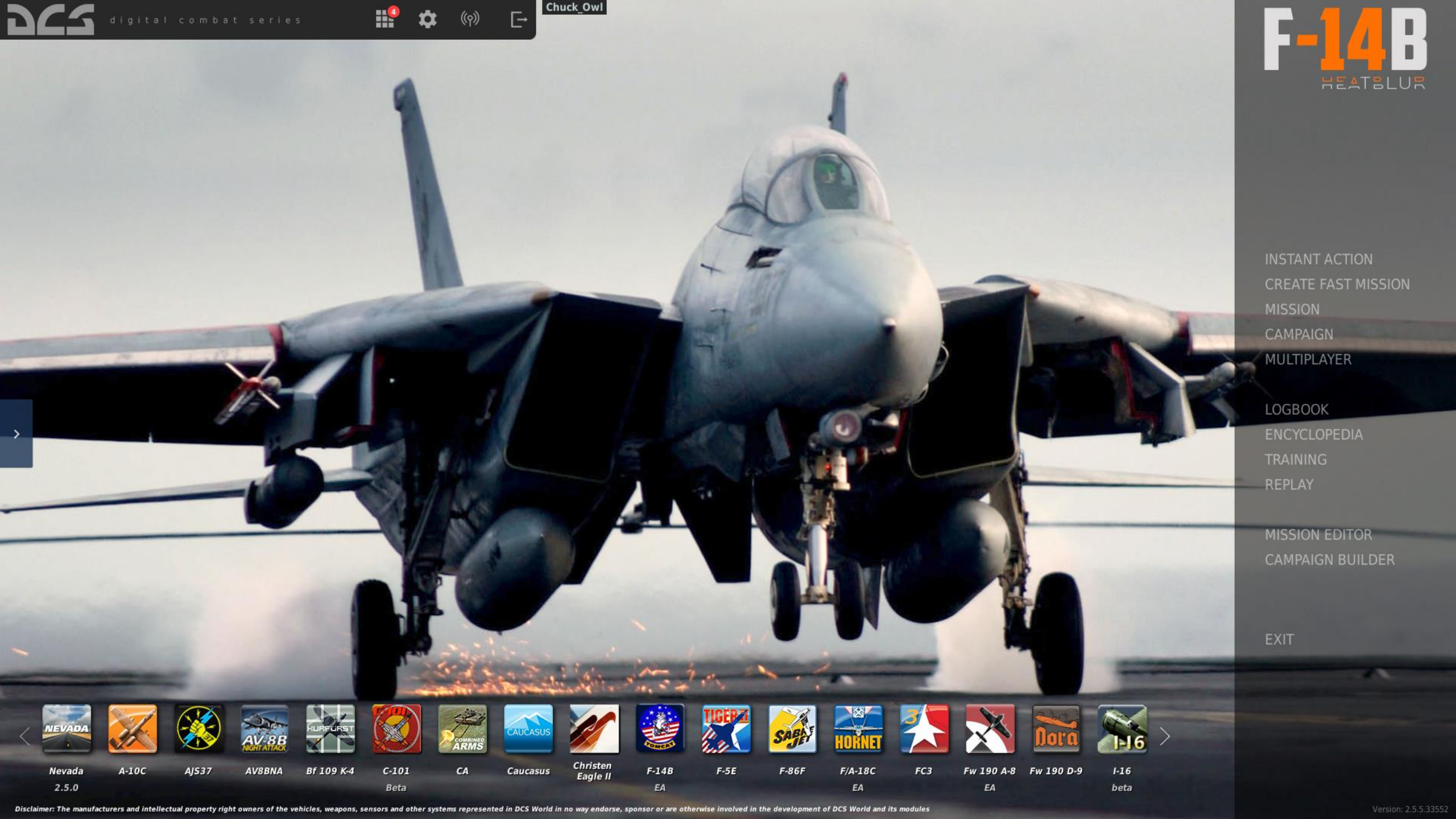
ACRONYMS

TER	Triple Ejector Rack
TGT	Target
THRLD	Threshold
TID	Tactical Information Display
TIT	Turbine Inlet Temperature
TTG	Time-to-Go
TUIR	Time Until in Range
TUMR	Time Until Maximum Range
TUOR	Time Until Optimum Range
TWS	Track While Scan
TWSA	Track While Scan Automatic
TWSM	Track While Scan Manual
UHF	Ultra High Frequency
UTC	Coordinated Universal Time
Vc	Closing Velocity Rate
vC	Computed MAG VAR
VDI	Vertical Display Indicator
VDIG	Vertical Display Indicator Group (HUD & VDI)
VEC	Vector
VFR	Visual Flight Rules
VID	Visual Identification
vM	Manual MAG VAR
VMCU	Voltage Monitor Control Unit
VSL	Vertical Scan Lockon
VTR	Video Tape Recorder
WCS	Weapon Control System
WFOV	Wide Field of View
WILCO	Will Comply
WOD	Wind over the Deck
WOW	Weight on/off Wheels
YY	Geographic Reference Point for NAV GRID

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