Initial Qualification Training

GT-1.1 Cockpit Familiarization

1st Virtual Fighter Wing

By “Demo” 09/21/08 v1.4

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GT-1.1 – Cockpit Familiarization

Welcome to Initial Qualification Training at the 1st Virtual Fighter Wing! The following presentation may appear daunting because of its length, but remember you are not required to memorize any of it, or learn it all in a day, week, or month. Instead, use this presentation as a resource that can answer your questions, and improve your skills as virtual fighter pilot. Best of luck during your training!

Basic Overview

Objectives

Ground Training 1.1 (GT-1.1)…

Goals

- Introduce pilots to the F-16C and accomplish cockpit familiarization training.
- All pilots should be able to demonstrate proper checklist usage and sound understanding of aircraft normal procedures and operating limits.
- The focus of GT-1.1 is to prepare student airmen for a cockpit functionality review with an IP during CR-100, Basic Operations Evaluation. Students are expected to understand and/or demonstrate any of the following tasks related to Cockpit Familiarization listed below.

Specific Tasks

1. Describe the control surfaces of the F-16
2. Explain the flight control system in the F-16
3. Be able to ID the majority of important switches/features of the F-16 cockpit
4. Demonstrate a sound knowledge of what each switch group/section of the cockpit does
5. Describe ICP-DED Functionality & Features
6. Basic understanding of the EWS, TWS, and RWR Functionality
7. Basic understanding of the F-16s avionics suite, including the Inertial Navigation System (INS)

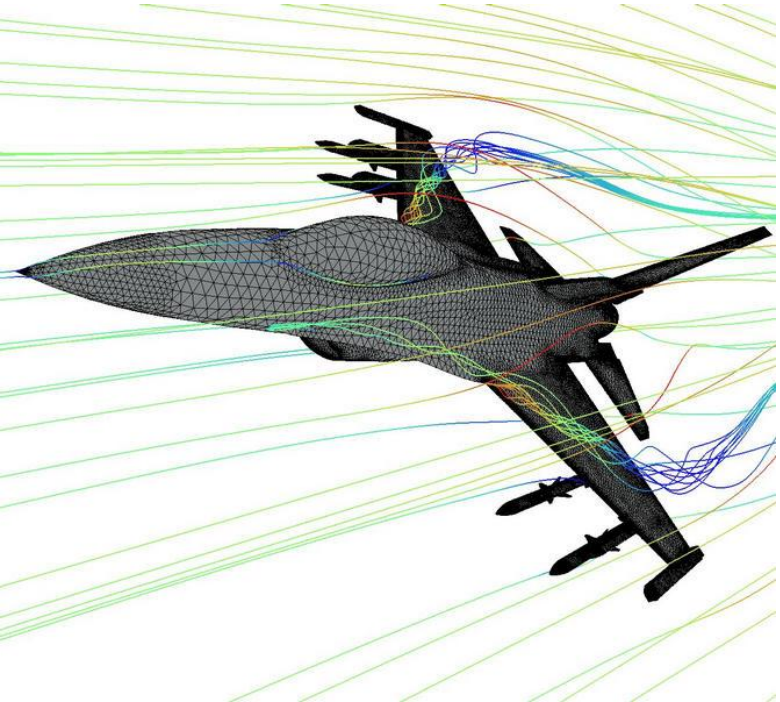
Part I – Introducing the Viper

F-16 Fighting Falcon

Introducing the Viper…

General Dynamics/Lockheed Martin F-16

The Lockheed Martin **F-16 Fighting Falcon** is a multirole jet fighter aircraft originally developed by General Dynamics for the USAF. Designed as a lightweight fighter, it evolved into a successful multirole aircraft. The Falcon's versatility is a paramount reason it has proven a success on the export market, having been selected to serve in the air forces of 25 nations. The F-16 is the largest Western fighter program with over 4,400 aircraft built since production started in 1976. Though no longer being bought by the U.S. Air Force, advanced versions are still being built for export customers.]



The Fighting Falcon is a dogfighter with numerous innovations including a frameless, bubble canopy for better visibility, side-mounted control stick to ease control while under high *g*-forces, and reclined seat to reduce the effect of *g*-forces on the pilot. It was also the first fighter aircraft deliberately built to sustain 9-*g* turns. Some versions have a thrust-to-weight ratio greater than one, providing enough power to climb and accelerate vertically – if necessary. Although the F-16's official name is "Fighting Falcon", it is known to its pilots as the "**Viper**".

F-16 Fighting Falcon Cont'd

AKA The "Viper"…

Technology

The most important piece of the YF-16 is the Electronic Flight Control System. For the first time ever an aircraft was not flown by cables linking the stick to the flight control surfaces, but the complete system was electronic and used servos to control the rudder, ailerons etc. These fly-by-wire flight controls allow much more precise control of the aircraft than the heavy and more complex hydro mechanical flight control system. Not only the flying qualities improved, but safety as well, because it imposes g limits to keep the pilot from overstressing the airframe and angle of attack limits to prevent stall and departing. The aircraft will (try to) protect the pilot from dangerous commands. In this day and age of digital aircrafts (most obviously the Airbus aircraft were designed with this in mind) it is hard to imagine what a revolution fly-by wire was.

Conventional aircraft require constant downward loads on the horizontal tail to maintain their flight level. The F-16 FCS however is designed with "relaxed static stability": high speed computers (however, compared to the machine you run your simulator on they seem incredibly slow) stabilize the aircraft at any desired cruise speed or maneuver condition by making quick, small adjustments to the control surfaces so controlled flight is maintained. Without the computer the aircraft cannot be flown. Even the best pilot would not be fast enough to react.

F-16 Fighting Falcon Cont'd

AKA The "Viper"…

Models & Production

In 1975 when the U.S. Air Force started its production, Belgium, The Netherlands Denmark and Norway followed with their orders a few months later, bringing the initial program to 998 aircraft. Ten years later, 17 air forces in 16 nations had ordered more than 3,000 F-16s. In 1983 the 1000th aircraft was delivered, the 2,000th in 1988, the 3000th in 1991 and the 4000th in 2000. During its production time the F-16 had of course extensive changes, i.e. choice of engines, night attack capabilities etc. The MLU (Mid-Life Update) started in 1991, modernizing the avionics with the latest technologies, cockpit and the latest weapons and added 'over the horizon' capability. Nowadays more than 4,200 F-16's have been delivered to 19 countries. F-16s are notoriously difficult to divide into models and variants. 'Blocks' and 'models' are intertwined into a bewildering list. But here are the most important variations.

F-16 Fighting Falcon Cont'd

AKA The "Viper"…

Models & Production Cont'd

- **Block 1**,**Block 5 and Block 10** for USAF and the first European countries.
- **Block 15** two hardpoints added to the chin of the inlet, larger horizontal tails, wide-angle Head-Up Display, system for 'over the horizon' weapons.
- **Block 20** increased maximum weight for 9 G maneuvers, MLU cockpit, avionics and other provisions.
- **Block 25** First F-16C/D models, increased multi role capacity.
- **Block 30/32** two new engines: F110-GE-100 and F100-PW-220. computer memory expansion and seal-bonded fuselage fuel tanks
- **Block 40/42** Various modifications/product improvements include the chaff/flare dispenser and the advanced radar warning receiver.
- **Block 50/52** Capable of using the Lockheed Martin low-altitude navigation and targeting for night (LANTIRN) system**.**
- **Block 60** larger fuel tanks for greater range, new cockpit displays, an internal sensor suite, a new mission computer and other advanced features including a new agile beam radar.
- **Block 60/62** Projected development, subject to customer demand. No firm configuration, specifically designed for the United Arab Emirates.
- **F-16A** Pratt & Whitney F100-PW-200 turbofan, rated at 12,240 lb.s.t. dry, 14,670 lb.s.t. full military, and 23,830 lb.s.t. with afterburning. Maximum speed: Mach 2.05 at 40,000 feet. Service ceiling 55,000 feet. Maximum range 2400 miles. Initial climb rate 62,000 feet per minute. Dimensions: wingspan 32 feet 9 1/2 inches, length 49 feet 3 1/2 inches, height 16 feet 8 1/2 inches, wing area 300 square feet.
- **F-16B** Standard tandem two-seat version of F-16A; fully operational both cockpits; fuselage length unaltered; reduced fuel.
- **F-16C** Current production version, capable of all-weather operations and compatible with Beyond Visible Range (BVR) missiles.
- **F-16D** Standard tandem two-seat version of F-16C.
- **F-16 Mid-Life Update (MLU)** provides the A and B models with new radar, cockpit and computer, which makes it possible to fly night and day missions and in all weather conditions.

F-16 Fighting Falcon Cont'd

AKA The "Viper"…

Models & Production Summary

In its complete development the external model hardly changed at all. Because of the excellent aerodynamic and structural design of the original F-16, the external lines never needed serious change. The F-16's growth potential, however, has been fully utilized. The aircraft has undergone six major block changes incorporating four generations of core avionics, five engine versions, five radar versions, five electronic warfare suites and two generations of most other subsystems.

Future Plans

As there are already unmanned aircraft, the so-called Uninhabited Combat Air Vehicles (UCAV), Lockheed Martin is researching a demonstration type of an unmanned F-16 to prove autonomous vehicle control, up-link command technologies, and to develop operational requirements. But also there are also studies to modify the F-16 into a remotely piloted drone: the aircraft could be piloted from the ground. Another idea, the F16 UCAV has a sixty-foot wingspan and 22,100 pounds of internal fuel capacity. The configuration could maintain an un-refueled, eight-hour presence on a nominal combat air patrol mission. A prototype could be built and flying in less than two years.

The Joint Strike Fighter of Lockheed-Martin and the EuroFighter, built by a consortium from Germany, Italy, Spain and the UK, is chosen by most NATO countries to take over from the F-16 in the next decade. Many feel these aircraft will be last manned fighter aircraft. In that whole history the F-16 holds a very special place, since it's the only aircraft that has NEVER been beaten when opposing similar numbers. It never lost a head to head combat situation.

F-16 Fighting Falcon Cont'd

Fly-By-Wire…

Flight Systems

To fully understand the flying capabilities of the F-16 it is important to understand some of the main systems and principles that make it the maneuverable fighter it is. *Translated from RNoAF F-16AM technical training documents to a very basic technical English by Dag R. Stangeland*.

F-16 Flight Control System (FLCS)

The Flight Control System in the F-16 is a computer controlled system. The main 3 components of this system are as follows:

- Primary FLCS: Controls the aircraft in the PITCH, ROLL and YAW axis via the primary control surfaces.
  - -Horizontal stabilizers (Pitch)
  - -Flaperon (Roll)
  - -Rudder (Yaw)
- Secondary FLCS: The purpose of this system is to increase/optimize lift, aerodynamic braking and enhance maneuverability. To do this the secondary control surfaces are used.
  - -Leading Edge Flap (LEF)
  - -Trailing Edge Flap (TEF)
  - -Speedbrakes
- The Air Data System (ADS):
  - -The ADS transmits signals to the FLCS via a pneumatic origin, such as AOA, Airspeed, Altitude, Mach-number, Temperature and Sideslip.

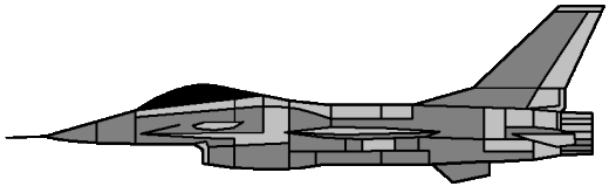
F-16 Fighting Falcon Cont'd

Technical Data…

Flight Control System Cont'd

The pilot induces steering commands to the FLCS via the Side Stick Controller (SSC) and rudder pedals. Then the signals are generated electrically and sent to the FLCS, where they are processed together with inputs from the air data system and feedback from gyros and accelometer. Based on these inputs, the final rudder deflection/input is generated and will determine what position the rudder should be in. The signal from the FLCS out to the Integrated Servo Actuator (ISA) is electrically driven but the main ISA that moves the rudder/control surface is hydraulically powered from hyd. system A and B. In addition to SSC and rudder pedals the pilot can give inputs to the FLCS via Manual Trim Panel (MTP). The MTP can trim the aircraft in all 3 axes. The FLCS is also equipped with an Autopilot (AP) function that can maintain attitude, altitude and heading based on the pilot's choice. The Horizontal Stabilizers moves the aircraft in the pitch axis and assists during roll. They operate symmetrically in pitch maneuvering and asymmetric during roll maneuvering. They can move 25° up and 25° down from streamline.

The Flaperons move the aircraft around the roll axis. They can deflect 23° up to 20° down from streamline position. When the Landing Gear Handle is set to the down position, both flaperons will automatically go down to 20° and work as Trailing Edge Flaps. If flaperon is in the TEF mode and you maintain airspeed in excess of 240 kts the down deflection will decrease gradually from 20° and be fully streamline when reaching 370 kts. TEF mode will then be unavailable. Rudder pedals send inputs to the aircraft in the yaw axis. The rudder can deflect 30° to each side from the center position.



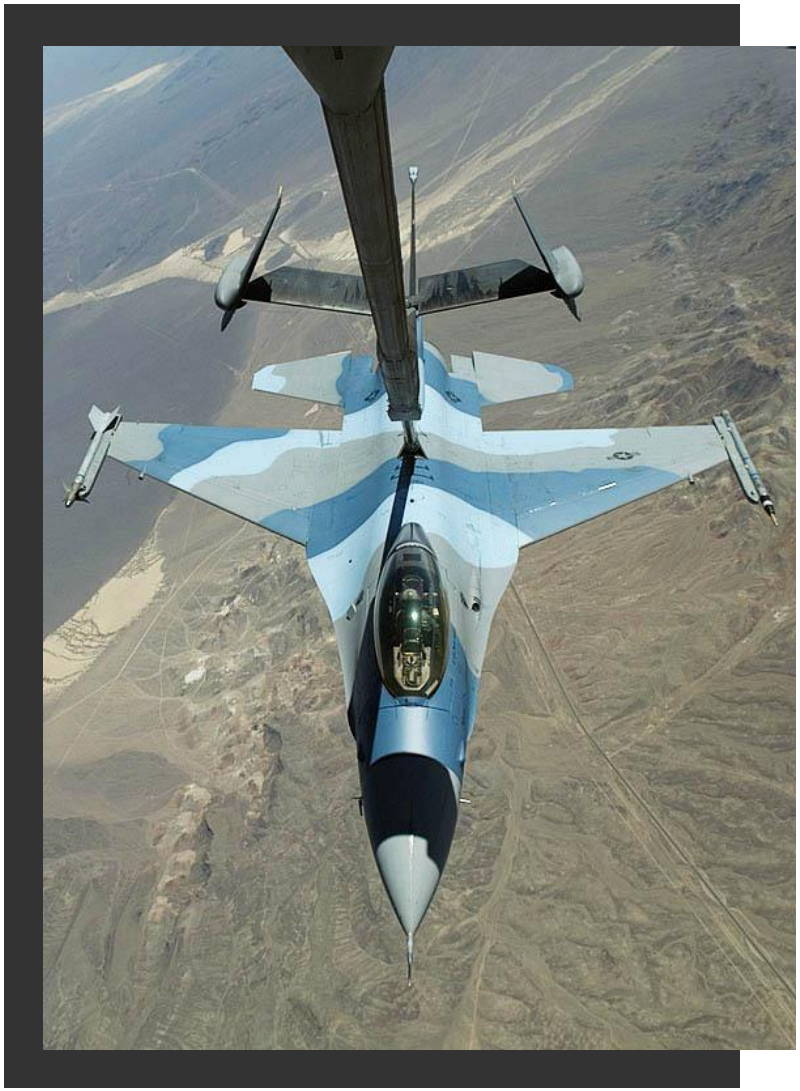
F-16 Fighting Falcon Cont'd

Stable Instability…

Relaxed Static Stability

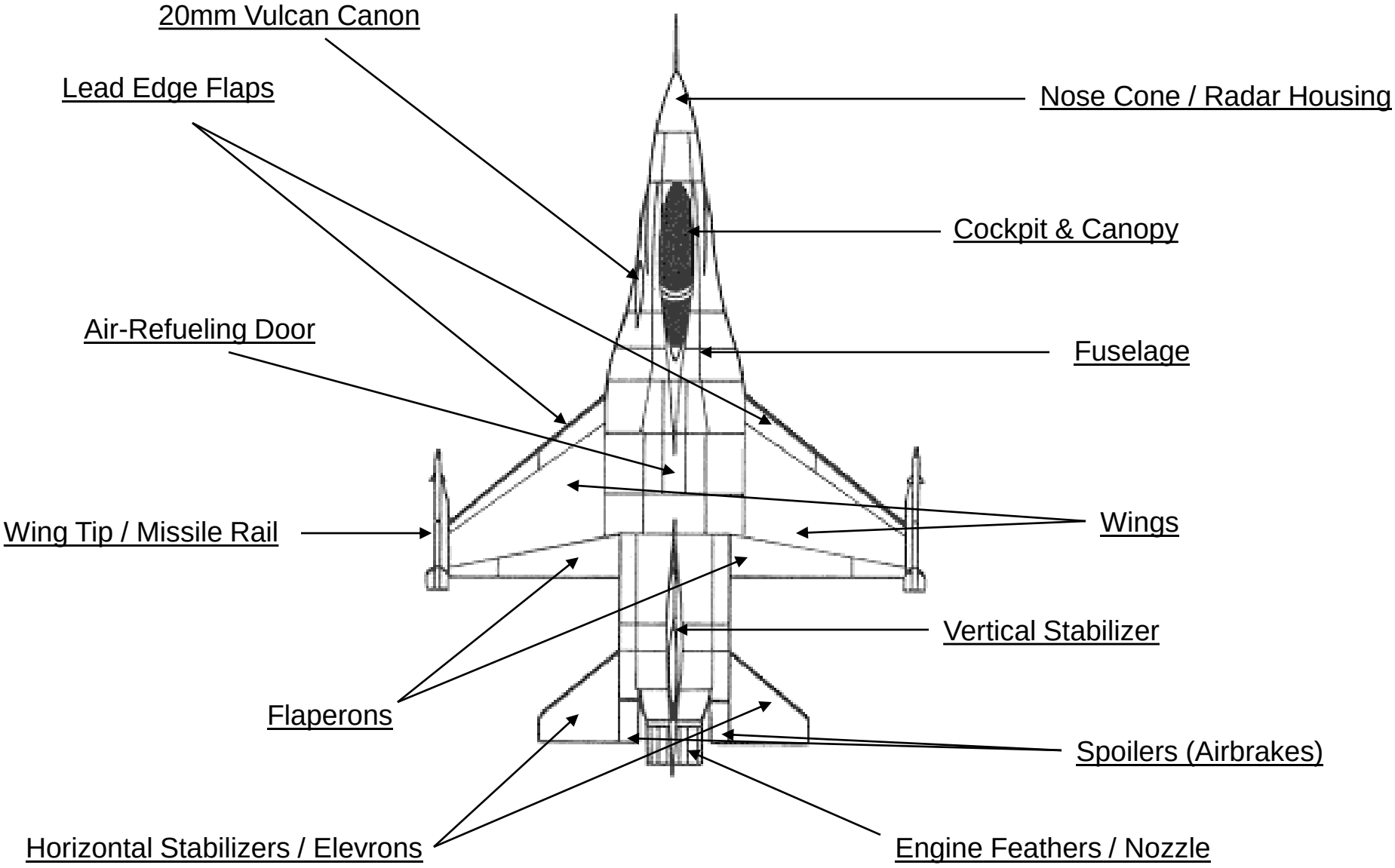
As opposed to many other aircraft the F-16 is built for an unstable mode, so called Relaxed Static Stability (RSS). RSS means that aerodynamically the F-16's point of lift is forward of the aircraft's Center of Gravity (CG). This means that with increased AOA the lift will increase and thereby the AOA will increase and increase lift further. In the end the aircraft will break or stall. The aircraft will, as a result, not find its stable position in flight. To control this, the FLCS is dependent continuous feedback from the gyros and accelometers. With increased airspeed the point of lift will move aft and at a speed of Mach 1.0 the lift will be at the same point as the CG. Above Mach 1.0 the lift will be behind the CG. This means that the F-16 is aerodynamically stable above Mach 1.0. Advantages with an unstable aircraft:

- Reduced Drag
- Increased maneuverability
- Rapid response from pilot inputs
- Smaller control surfaces which means less weight.



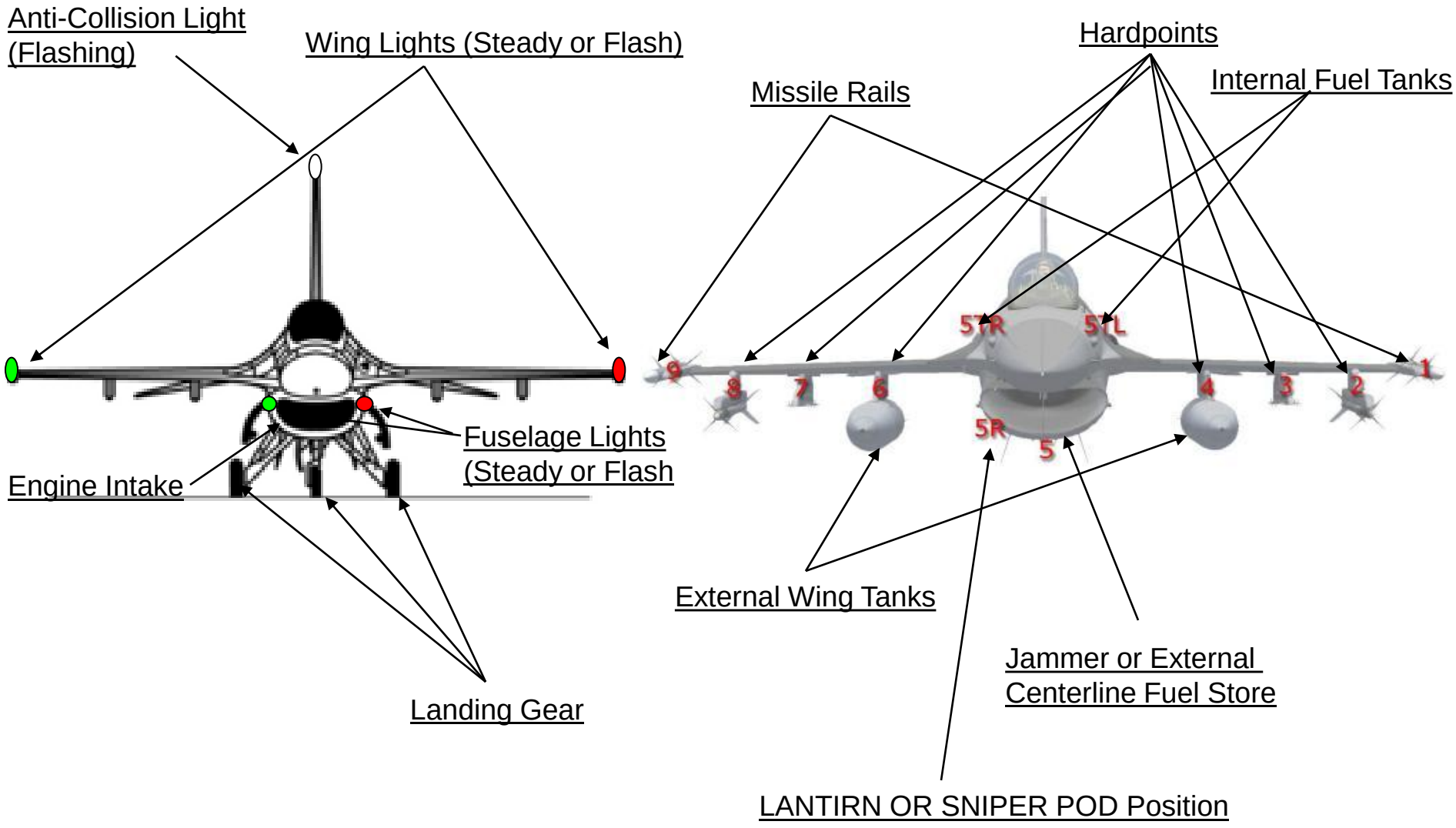
F-16 Fighting Falcon Cont'd

Sum of the parts…



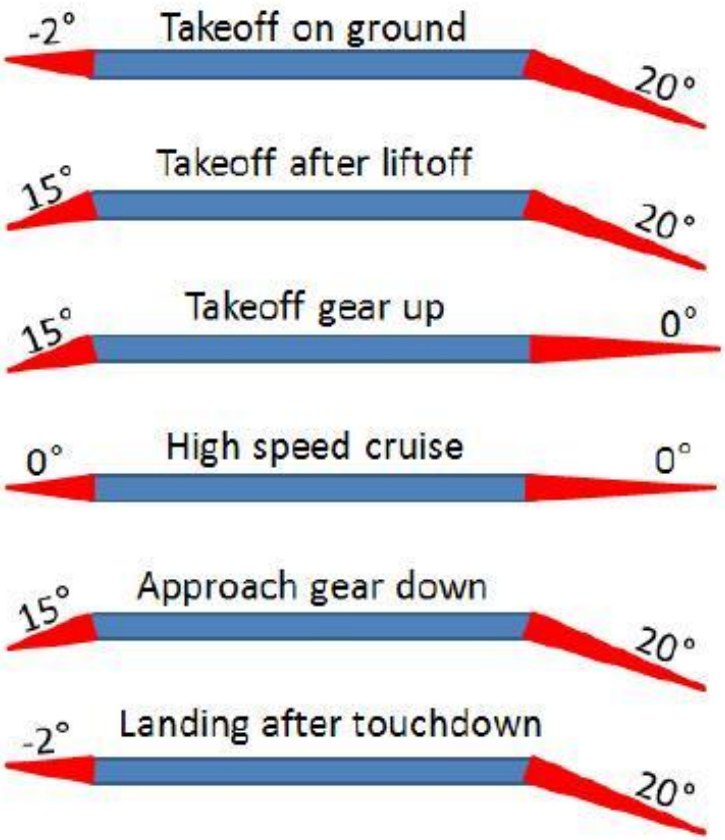
F-16 Fighting Falcon Cont'd

External Parts…



F-16 Fighting Falcon Cont'd

F-16 Flaps…



Leading Edge Flaps

While most people are familiar with trailing edge flaps (the control surfaces at the rear of the wing that deploy to increase lift at the expense of additional drag, the F-16 also has Leading Edge Flaps. They increase lift during take-off and landing and automatically change the curvature of the wing in various flying conditions. This gives better take off/landing performance, lift-to-drag ratio resulting in better maneuverability and a more efficient vertical tail during high AOA. The LEF is mechanically driven by a Power Drive Unit dependent on steering input from Electronic Component Assembly (ECA). The input signals to the ECA are calculated from Mach-number, AOA and Altitude, during flight. The LEF can deflect from 2° to 25° dependent on what the ECA tells it to do. On landing the LEF will automatically go to 2° UP position when the aircraft has Weight On Wheels and the speed on wheels is 60 kts. The LEF is controlled by the LE Flaps switch. This has two positions; AUTO or LOCK. It remains in AUTO during normal flight. If put in LOCK it will remain in the position it is set, independent on what the ECA says.

The F-16 has a semi automated flaps system that controls both Leading Edge Flaps (LEF) and Trailing Edge Flaps (TEF). Under normal conditions it is controlled by the Flight Computers. It is however possible to manually extend the Trailing Edge Flaps with the Alternate Flaps switch and to 'lock' the Leading Edge Flaps. Locking them simply means they are not controlled by the system and stay in the position they were in when the switch was set to LOCK. The automated flap settings are shown here.

- **LE FLAPS LOCK** - Locks Leading Edge Flaps in current position
- **ALT FLAPS EXTEND** - Trailing Edge Flaps extend to 20°

F-16 Fighting Falcon Cont'd

Key Components…

Speed Brakes

The speed brake can deflect to 60° in the fully open position. With Landing Gear Handle Down and Main Landing Gear Down and Locked the operation of speed brakes will be limited to 43° deflection to prevent it from scraping the ground during landing. This limit can be overridden by holding the SPB BRK switch in the aft position. If the switch is released the speed brake will go back to 43° open. When the aircraft has Nose Landing Gear Weight On Wheel, the speed brake can be fully opened to 60° and again function as a brake.

The purpose of the speed brakes is as follows:

- Aerodynamic braking of the aircraft
- Increase of maneuverability
- Easier to control landing speed.

In real life, the speed brake is controlled by the SPD BRK switch on the throttle grip**. The switch has 3 positions:

- Aft position is spring-loaded to mid position. With the switch in aft pos. the speed brake is opened gradually.
- Mid position. Speed brake will remain in last position used.
- Fwd position. Speed brake closes to fully closed position.

***In OF and AF, the speed brake is controlled by hitting "B" on the keyboard, which fully extends or retracts the speed brakes. If you have a Thrustmaster Cougar, you can program the Aft, Mid, and Fwd positions as well).*

F-16 Fighting Falcon Cont'd

Additional Info…

Operators of the F-16

Bahrain		Greece		Netherlands		Portugal		Turkey	
Belgium		Jordan		Norway		Singapore		UAE	
Chile		Indonesia		Oman		Taiwan		United States	
Denmark		Israel		Pakistan		South Korea		Venezuela	
Egypt		Italy		Poland		Thailand			

F-16 Fighting Falcon Cont'd

Combat Experience…

F-16C/D

The F-16C/D has seen its fair share of combat with the USAF over the last 18 years. It was the workhorse of the 1991 Gulf War conflict, with 248 aircraft on hand. At 13,087 sorties, the F-16s flew more missions than any other combat aircraft, and together with the B-52, dropped the most bombs. After Desert Storm, Vipers remained in the region to enforce the no-fly order over north and south Iraq. During that time, a patrolling F-16 was targeted by an Iraqi MIG-25, which was shot down with an AIM-120. This was the first combat kill using the AMRAAM and the first F-16 kill. On January 17th, 1993, an F-16C destroyed an Iraqi MIG-23, also with the AIM-120.

Vipers were active over the Balkans during Operations Deny Flight, Deliberate Force and Allied Force. In 1994, two pairs of USAF F-16Cs were patrolling the no-fly zone over Bosnia as part of Deny Flight when they were vectored onto six Yugoslav G-4 Super Galebs on a bombing mission. Four of the G-4s were shot down by AIM-120s and AIM-9 missiles. This marked the first offensive action by a NATO war plane. Operation Deliberate Force saw 22 F-16s flying strike and SEAD missions. Once again over the Balkans for Operation Allied Force in March-June 1999, F-16s strike, Forward Air Control, close air support, combat air patrol and SEAD. Some 126 USAF Vipers took par in the operation.

USAF F-16Cs took part in the initial strikes against the Taliban during Operation Enduring Freedom in Afghanistan. During Iraqi Freedom, the USAF deployed 133 Block 50/52 Vipers, including 71 F-16CJs, to the Gulf region. They flew strike and SEAD missions and accumulated many of the 8,800 fighter sorties flown by USAF aircraft. Due to the ongoing conflict, Vipers from active duty, National Guard and Reserve squadrons continue flying in the region.

F-16 Fighting Falcon Cont'd

Combat Experience…

F-16 A/AM/MLU/IAF

The F-16's first air-to-air combat success was achieved by the Israeli Air Force (IAF) over the Bekaa Valey on 28, April 1981 against a Syrian Mi-8 helicopter, which was downed with cannon fire following an unsuccessful attempt with a AIM-9. In 1981, eight Israeli F-16s executed Operation Opera, their first employment in a significant air-to-ground operation. This raid severely damaged Osiraq, an Iraqi nuclear reactor under construction near Baghdad. A year later, during the initial air battle of the 1982 Lebanon War, the IAF achieved the first F-16 "kill" of another fighter with a successful AAM shoot-down of the a Syrian MIG-21. The following year, during Operation Peace for Gaililee (Lebanon War) Israeli F-16s engaged Syrian aircraft in one of the largest air battles involving jet aircraft, which began on June 9th and continued for two more days. At the end of the conflict, the IAF credited their F-16s with 44 air-to-air kills, mostly MIG-21s, and MIG-23s and claimed to have suffered no air-to-air losses of-their own. During the Soviet-Afghan War, Pakistan Air Force (PAF) F-16s shot down at least ten intruders from Afghanistan. Four of the kills were Afghan Su-22 bombers, three were Afghan transports, and one was a Soviet Su-25. Most of these kills were achieved using the AIM-9 Sidewinder, but a Su-22 was destroyed by cannon fire. In 1992, two Venezuelan F-16s took part in the November Venezuelan Coup Attempt on the side of the government. In particular, the two F-16As strafed targets on the ground and shot down two OV-10 Broncos with AIM-9Ps and one AT-27 Tucano with cannon fire as these rebels-flown aircraft attacked loyalist army positions. During the 1999 Kargil War, Indian Air Force MIG-29s provided fighter escort for Mirage 2000s dropping laser guided bombs on targets. Indian Air Force MIG-29s armed with AA-12s beyond visual range missiles, were able to lock onto Pakistani F-16s, whereas the Pakistani F-16 aircrafts were not equipped with BVR missiles at that time, they were forced to disengage. As a result, the PAF restricted itself to flying combat air patrols over Pakistani territory. And subsequently, the Indian Air Force was able to deliver strikes on Pakistani positions in India w/out threat from PAK interceptors

F-16 Fighting Falcon Cont'd

Combat Experience…

F-16 A/AM/MLU/IAF

During the second Lebanon War in 2006, Israeli F-16s, the workhorse of the Israel Defense Forces, participated in the 2006 Lebanon War. The only reported F-16 loss was an IDF F-16I that crashed on July 19th when one of its tires burst as it took off for Lebanon from an air base in the Negev. The pilots ejected safely and there were no casualties. More recently, IAF F-16s have participated in the Gaza strip conflict with Hamas.

In 2008, Turkish built F-16s w/ LATIRN pods from the 181st Squadron took part in the bombing of PKK infrastructure located in North Iraq during Operation Sun.

Other F-16 Incidents/Conflicts

On October 10th, 1996, during an air-to-air confrontation in disputed airspace over the Aegean Sea, a Greek Mirage 2000 is reported to have accidentally fired an R550 Magic and shot down a Turkish F-16D, which the Turkish government claims was on a training mission in international airspace of the Greek Island of Samos, close to the Turkish mainland. The Turkish pilot died, while the co-pilot ejected and was recued by Greek forces. While the Turkish government admits the loss, the Greek government officially denies the shootdown occurred.

On May 23rd, 2006, two Greek F-16 Block 52+ jets were scrambled to intercept a Turkish RF-4 reconnaissance aircraft and its two F-16 escorts off the coast of the Greek island of Karpathos. A mock dogfight ensued between the two sides' F-16 which ended in a midair collision between a Turkish F-16 and a Greek F-16. The Turkish pilot ejected safely after his jet was destroyed, but the Greek pilot was killed when his canopy and cockpit were destroyed during the collision.

Summary – Part I

Introducing the Viper…

The F-16 'Fighting Falcon'

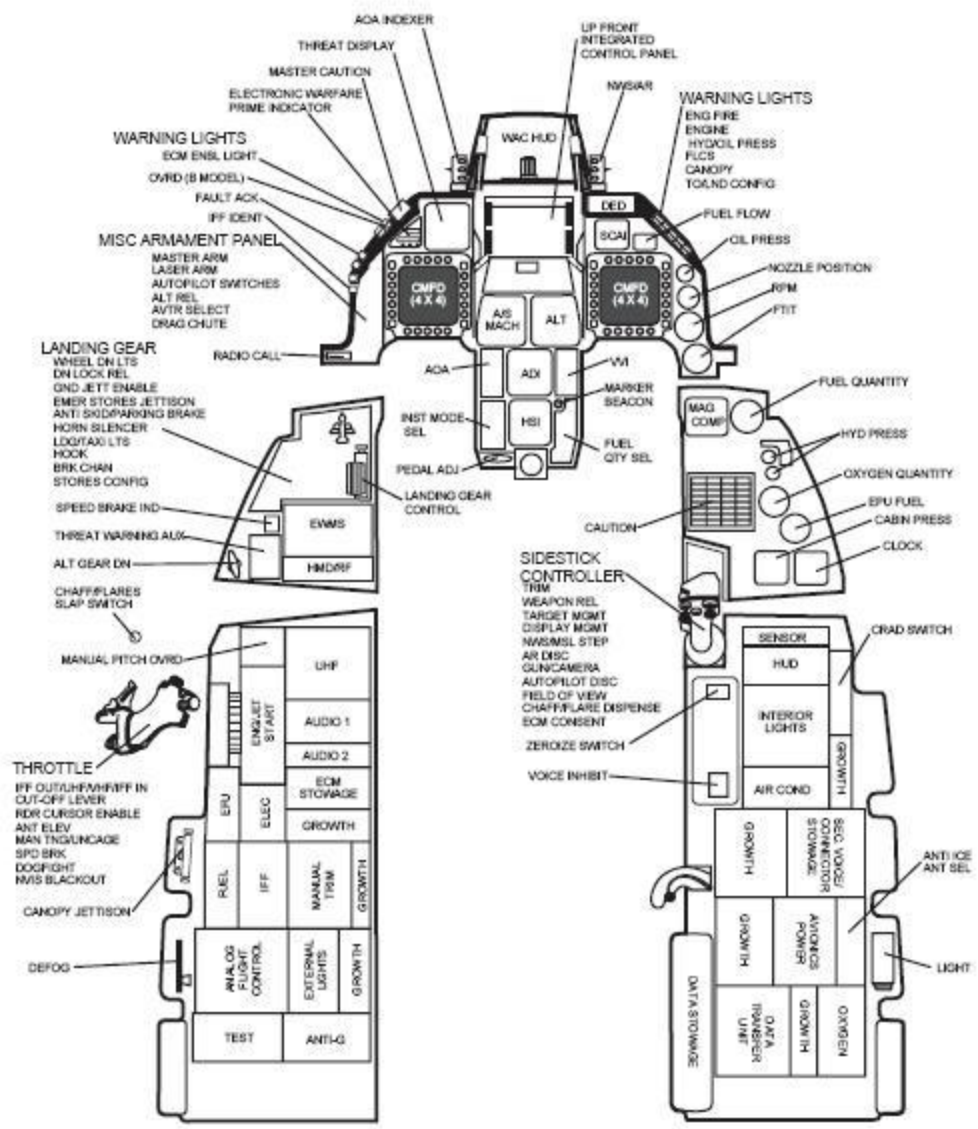
- The F-16 (and its variants) is a multirole fighter capable performing all the mission tasks efficiently and effectively
- The Falcon's versatility is a paramount reason it has proven a success on the export market, having been selected to serve in the air forces of 25 nations.
- The F-16 has many models and variants, but all maintain a similar core of features
- The 'Viper' was the first fighter to use a computer controlled 'fly-by-wire' flight controlled system. The FLCS makes it easy for the pilot to focus on mission related systems and not flying the aircraft
- The F-16 is designed to be unstable to increase its maneuverability
- Can perform a stunning 9 G's because of its design (a result of the seat angle)
- In the hands of a professional, the Viper can be a deadly weapon

Semper Viper

Part II – Cockpit Familiarization

Cockpit Familiarization

"In the pit"…



Goals/Objectives

- Introduce new pilots with the F-16 cockpit, its switches, instruments, and displays
- Enable new pilots to use any and all functional capabilities of the F-16 cockpit
- Start cockpit familiarization – giving a basic overview of the cockpit

Specific Tasks

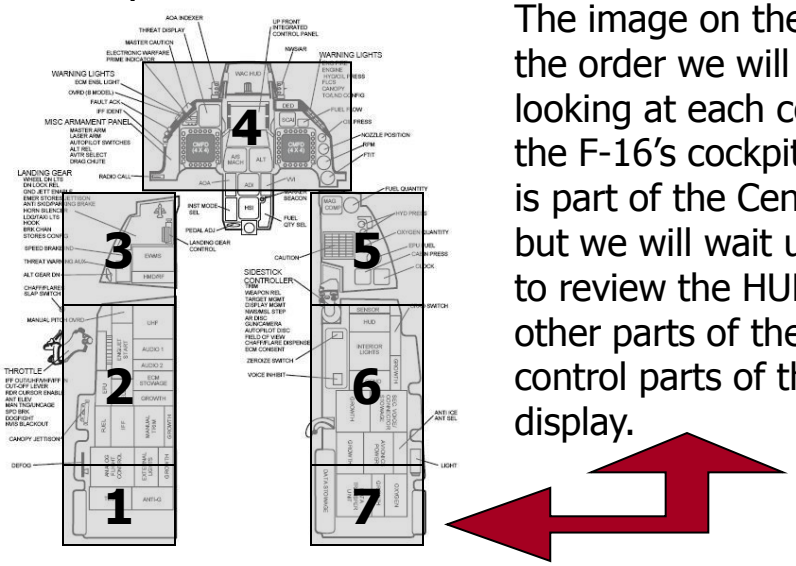
- Label all of the important features of the F-16 cockpit, specifically functional features in Falcon 4.0 (OF & AF)
- Give a basic explanation of what each switch does and its primary uses in F4
- Cover when each switch is generally used, and why they are used
- Give new pilots the tools necessary to understand GT-1.2, such as knowing where all the switches are for following a ramp start (or emergency) checklist

Cockpit Familiarization

Cockpit Guide

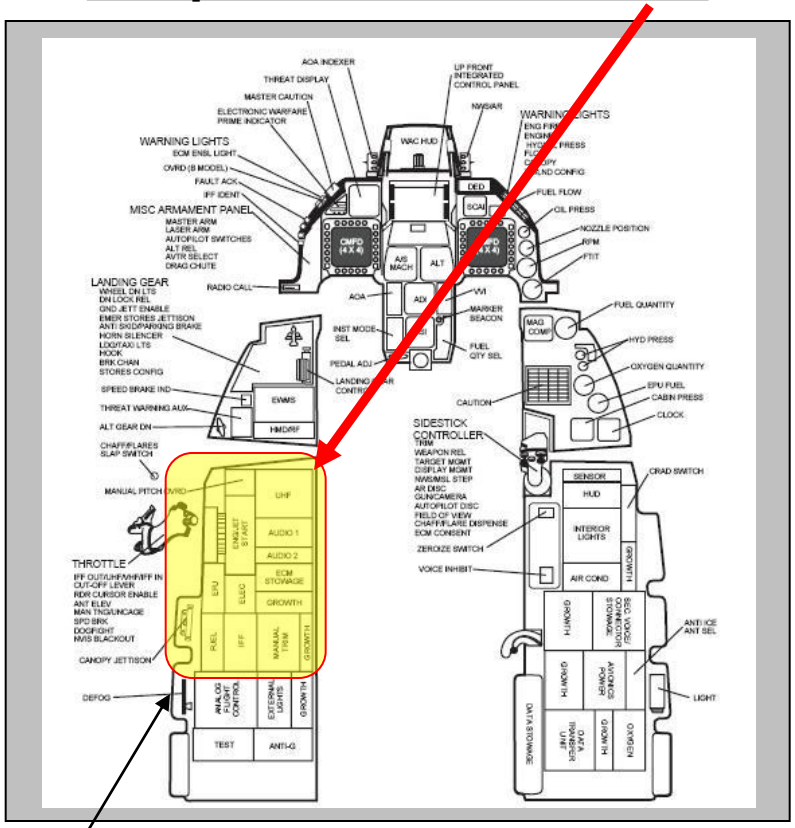
How we will perform cockpit familiarization

During the following slides, we will start Cockpit Familiarization by moving from the back left of the cockpit (Port Aft Switch Group) to the front (Central Consol) then to the back right of the cockpit (Starboard Aft Switch Group) in order, while labeling and defining each part of the cockpit. Keep an eye on the "Cockpit Guide" (an example is shown on the right) which shows what part of the cockpit we're talking about. If you have any questions, see your Primary IP.



The image on the left shows the order we will go in looking at each console of the F-16's cockpit. The HUD is part of the Center Console, but we will wait until the end to review the HUD because other parts of the cockpit control parts of the HUD display.

Cockpit Guide – Port Console

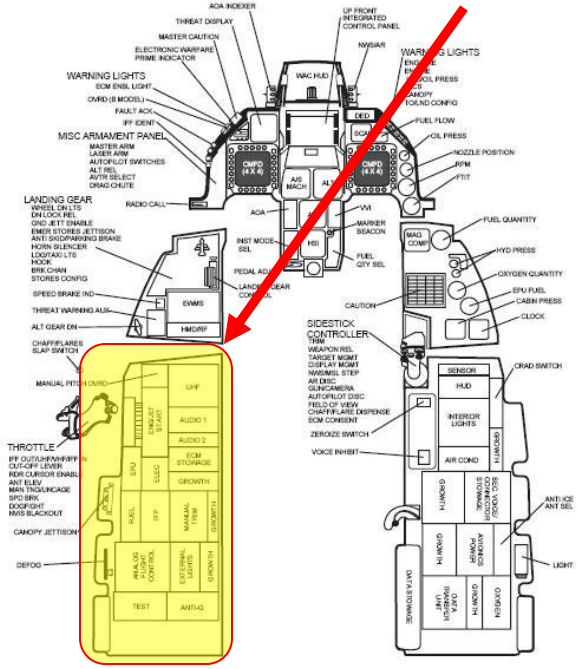


This yellow and red box displays which section of the cockpit we are currently looking at.

Cockpit Familiarization

Port Switch Group

Cockpit Guide – Port Console



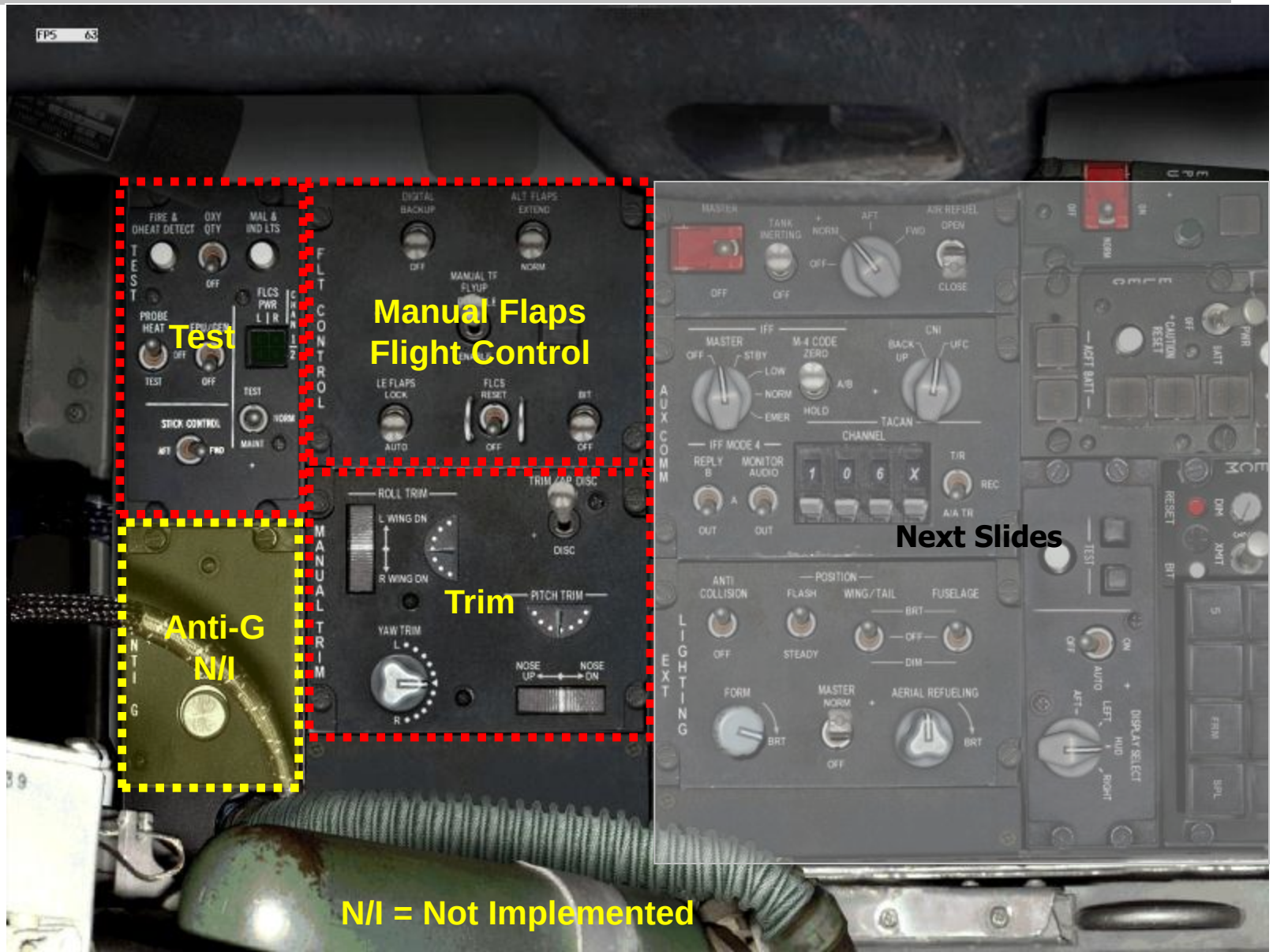
Note: The following slides will show individual portions of the port switch group. They are broken up only to make labeling more convenient for me. Pay close attention to the name of the cockpit switch group and images on this page to know which switch group I am talking about.

Left Console Overview

Comms Radio – UHF Radio Settings
Audio – Volume settings for radios
Int Light – Internal cockpit lights (toggle on/off)
Start – Engine / Jet Start switches
Elec – Main power/electronics
EPU – Emergency Power Unit
Counter Measure – Electronic Countermeasures Stowage (ECM), and Jammer pod power (for some F-16 models)
EXT Light – External aircraft lights (wing, fuselage, and anti-collision)
AUX Coms – Auxiliary Communication switch group (AUX TACAN Channels, CNI/Back-Up, etc…)
Fuel – Fuel Controls (Engine Feed, Air Refuel Door Switch, and Master Fuel Switch)
Trim – Aircraft Manual Trim Settings
Flight Control – Flight Control Surfaces Manual Settings (Alt Flaps, LE Flaps, etc…)
TEST – Test emergency lights and warnings inside the cockpit.
ANTI-G – (N/I) Anti-G Suit Settings.

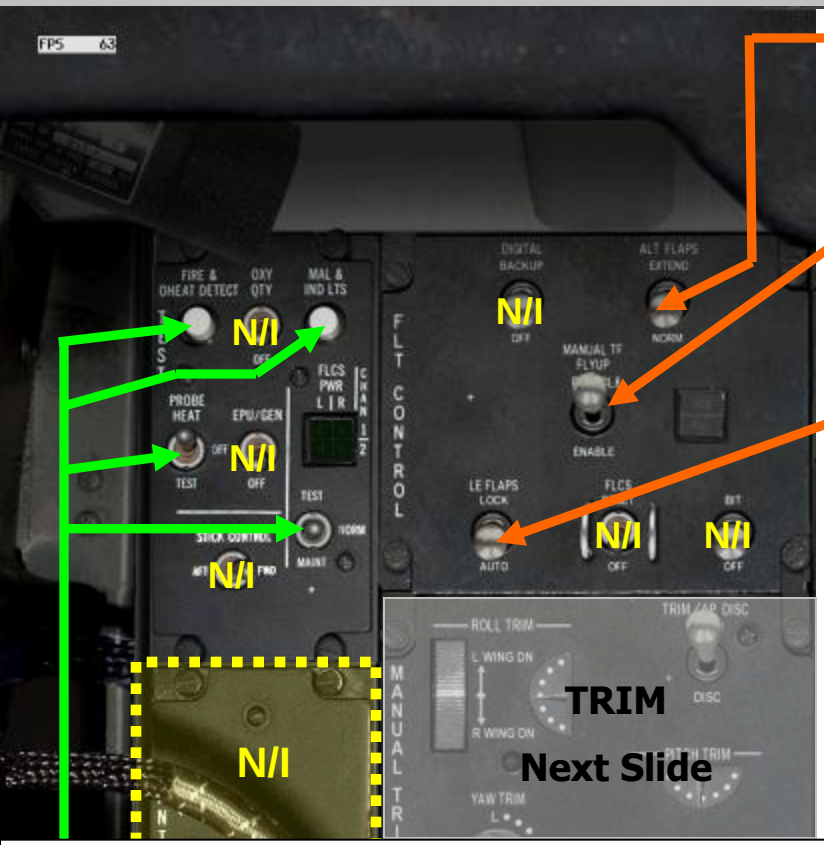
Cockpit Familiarization

Port Aft Switch Group– Trim, Test, and Flight Control…



Cockpit Familiarization

Port Aft Switch Group – Test and Manual Flaps



ALT FLAPS

Extends/Retracts Trailing Edge Flaps. It has two settings.

- EXTEND - Training Edge Flaps (TEF) extend regardless of LG handle.
- NORMAL – Trailing Edge Flaps (TEF) operation controlled by LG handle.

Manual TF FLYUP

- DISABLE – Fly-up protection not available in manual trailing flaps.
- ENABLE – Fly-up protection available in manual trailing flaps (TF) for TF or SWIM detected failure.

LE FLAPS

- LOCK – Manually locks Leading Edge Flaps (LEF) in present position and illuminates the FLCS warning light and FLCS LEF LOCK PFL.
- AUTO – Leading Edge Flaps (LEF) are automatically controlled as a function of MACH number, Altitude and AOA.

Note:

The manual flaps described above are not required during normal flight since the FLCS system will extend and retract them when needed. However, you can override the FLCS by extending/retracting the flaps manually. Just remember to use them with caution

Test Panel

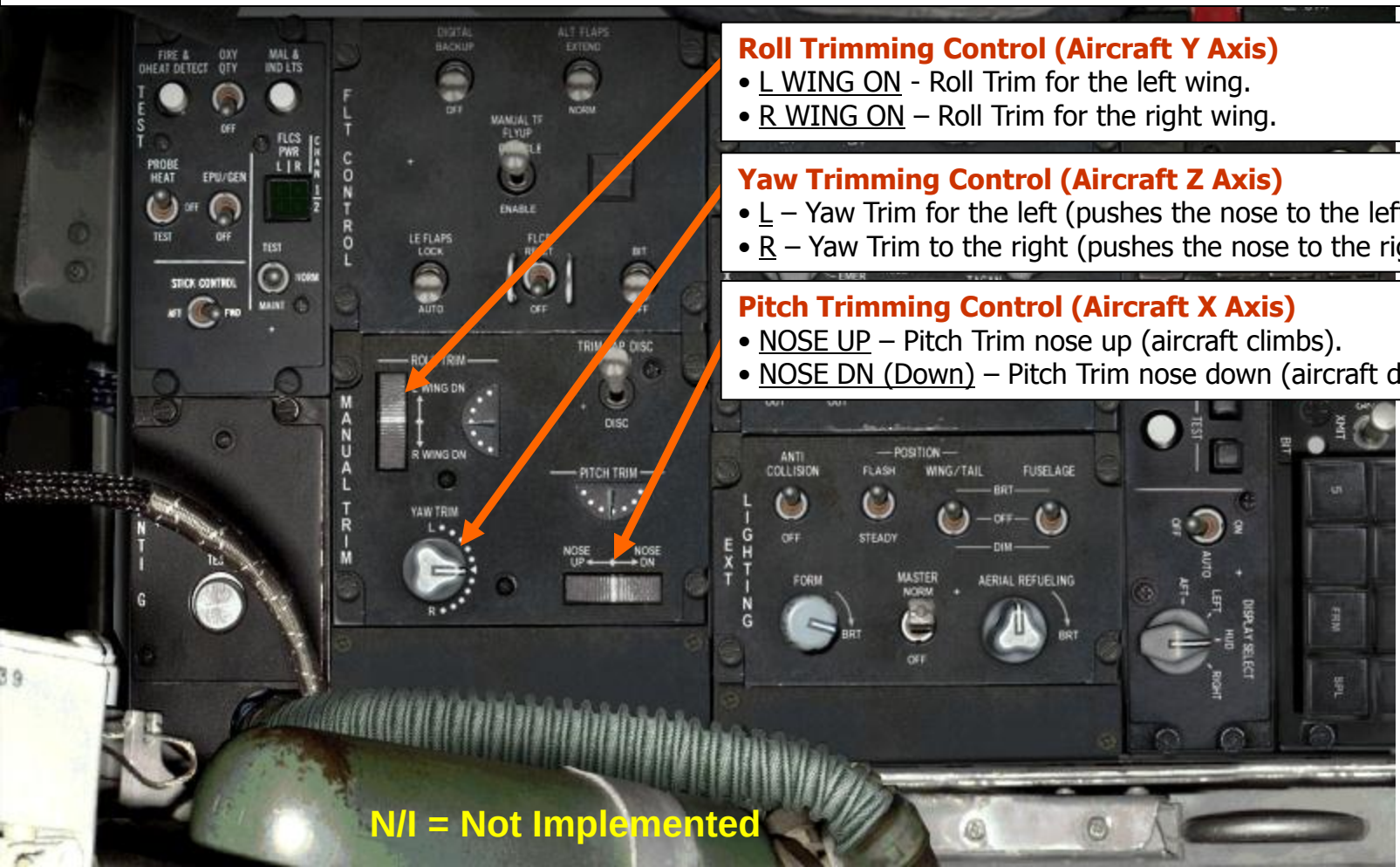
- FIRE – Checks both systems and will illuminate the ENG FIRE warning light and the OVERHEAT caution light.
- MAL & IND LTS – If you press this, all the warning lights should come on. This allows you to see where they are and if there are any broken bulbs.
- PROB HEAT – This supplies heat to the external pressure probe, an so stops it freezing up. If this were to happen wrong airspeed indications would result.
- TEST – TEST – Main PWR switch is in the MAIN PWR: Tests FLCC power output. MAIN PWR switch is in BATT: Tests FLCC power output on aircraft battery. NORM – Main PWR switch is in MAIN PWER: Tests EPI PMG power availability during EPU/GEN test on ground. MAIN PWR switch is in BATT: Not used. MAINT – For maintenance use on the ground only.

Cockpit Familiarization

Port Aft Switch Group– Trim, Test, and Flight Control…

Note About Trim

Trimming is not required in the F-16 as much as other aircraft as the FLCS takes care of many of the effects. However, trimming is still required occasionally. Normally this is done from the control on the joystick, but backups are available (shown below). Common instances when trimming the F-16 is required is when you have taken damage or have a FLCS fault. In those circumstances being able to trim the aircraft is a lifesaver, so please practice using the trim panel.



Roll Trimming Control (Aircraft Y Axis)

- L WING ON - Roll Trim for the left wing.
- R WING ON – Roll Trim for the right wing.

Yaw Trimming Control (Aircraft Z Axis)

- L – Yaw Trim for the left (pushes the nose to the left).
- R – Yaw Trim to the right (pushes the nose to the right)

Pitch Trimming Control (Aircraft X Axis)

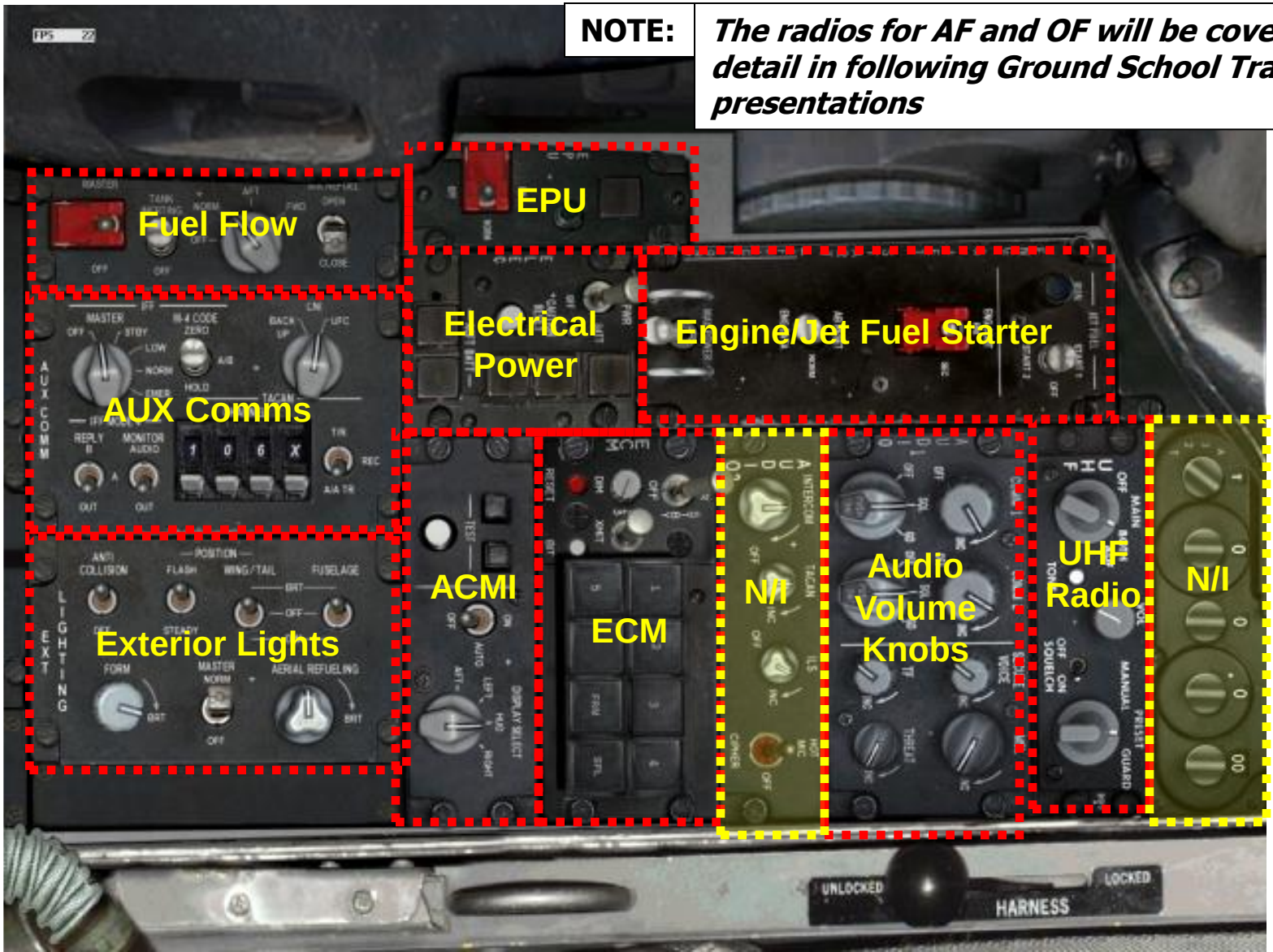
- NOSE UP – Pitch Trim nose up (aircraft climbs).
- NOSE DN (Down) – Pitch Trim nose down (aircraft descends)

N/I = Not Implemented

Cockpit Familiarization

Port Switch Group – At a glance…

NOTE: ***The radios for AF and OF will be covered in detail in following Ground School Training presentations***



Cockpit Familiarization

Port Switch Group – Power, JFS, ACMI, UHF Radio…

Main Electrical Power Switch

The main switch here is the big switch for all electrical power. The F-16 has several electrical systems and generators. The main sources of electrical power are:

- Main Generator
- Standby Generator
- Emergency Power Unit (EPU)
- Battery

The main power switch has 3 positions, OFF = Power off, BATT = Battery Power, PWR = Main Generator. You want it set to PWR for normal operations.

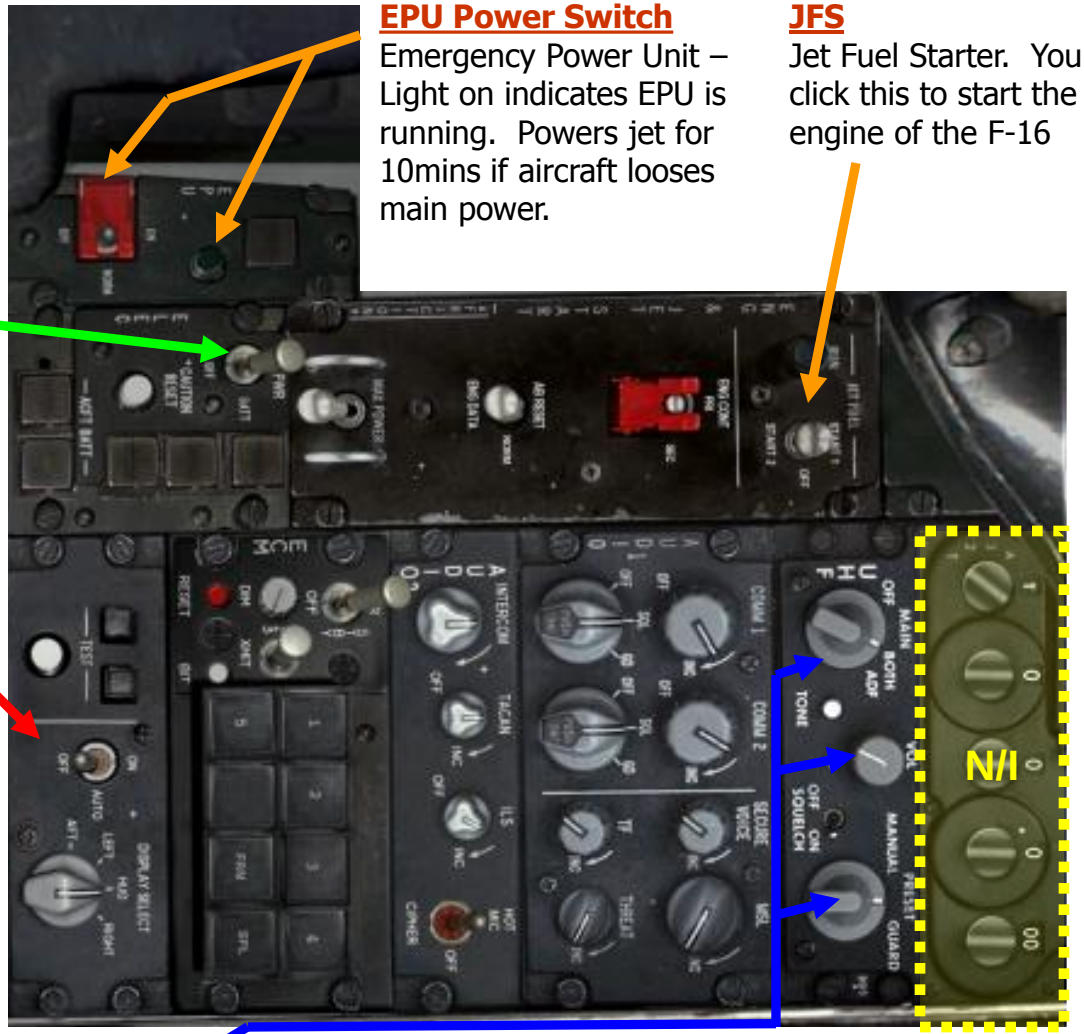
ACMI (Flight Recorder)

Air Combat Maneuvering Instrumentation (ACMI) allows you to record and play back a visual record of your flight. In some models of the F-16, the ACMI switch will have 3 positions

Main Generator

- OFF – ACMI is off.
- AUTO – ACMI records only when pilot releases a weapon
- ON – ACMI is on all the time.

Real F-16 Fact *– The ACMI in a real F-16 is attached to the wing, and it looks like a sidewinder missile without fins. It also records the flight, but records more details such as pilot inputs and whether or not a simulated fire or release of ordnance was a good kill or not.*



EPU Power Switch

Emergency Power Unit – Light on indicates EPU is running. Powers jet for 10mins if aircraft looses main power.

JFS

Jet Fuel Starter. You click this to start the engine of the F-16

UHF Radio – This is where you turn on the UHF (Uniform) radio (OF only). You should always set this to BOTH and GUARD and turn the volume up.

Cockpit Familiarization

Port Switch Group– JFS Engine Start, Audio, and ECM

Starting Fuel

AUTO LEAN – If UFC (EEC ON or OFF), lean fuel flow is provided during the engine start cycle until 30 seconds after the main generator comes online, then fuel flow increases by 100pph (Rick Fuel Flow). In BUC, rich starting fuel flow is provided. RICK – Fuel flow is rich at all time. LEAN – Fuel flow is lean at all times.

MAX Power

- MAX POWER – Delivers maximum thrust at 1.1 MACH or above and the throttle is at MAX AB.
- OFF – Normal Position.

ECM (Jammer)

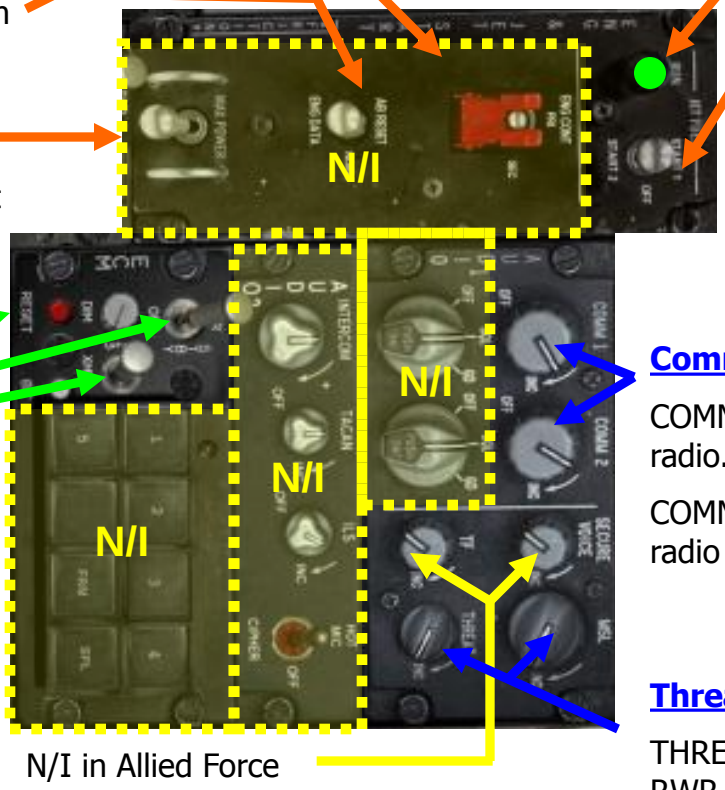
- OPR – ECM (Jammer) operation is enabled
- STBY – ECM is in standby-mode
- OFF – ECM is off

Unknown Features

The operation of these features are classified, and therefore, unknown for us.

EEC

EEC – EEC (Electronic Engine Control) in operation. OFF – EEC not in use. BUC – 80: Transfer occurs when throttle is in OFF or above BUC idle. Less 80: If RPM is above 52% transfer occurs regardless of throttle position.



N/I in Allied Force

RUN

Illuminates **Green** w/in 30 seconds after initiating JFS start to indicate that the JFS has attained governed speed.

JFS

In F4, click here to start the aircraft's engine. START 1 – Vents one of the hydraulic accumulators to the hydraulic start motor. OFF – JFS is shut down. START 2 – Vents both hydraulic accumulators to the hydraulic start motor.

Comm1/Comm2 Volume Controls

COMM1 – Controls volume of the UHF radio.

COMM2 – Controls the volume of the VHF radio

Threat / MSL Volume Controls

THREAT – Controls the volume level of the RWR and EWS warning sounds

MSL – Increases volume of the missile tone from the AIM-9 missile being monitored.

Cockpit Familiarization

Port Switch Group– Engine Feed, AUX Comms, Ext Lights

Engine Feed / Fuel Control

This switch group controls how much fuel is pumped to the engine. It has four positions, OFF-All fuel pumps are off. Fuel will still transfer using gravity and siphon feeds, but you will encounter problems in negative G maneuvers with the engine being fuel starved, NORM –Normal Positions, all fuel pumps are on, AFT-Fuel is transferred from the L/A sytem only. FWD-Fuel is transferred from the F/R system only.

Air-Refueling Door

This switch for the aerial refueling door opens and closes the air-refueling door. The air-refueling door must be opened before attempting in-flight refueling. Whilst the air-refueling door is open, the FLCS switches into landing gains mode (slow control responses.

AUX Comms / CNI Control

The CNI (Communications, Navigation, IFF) switch indicates where navigation data will be coming from. When set to the UFC (Upfront Controls) position, the navigation system uses the ICP. Specifically, data is taken from programmed steerpoints, markpoints or datalink points. When set to Backup, navigation data comes from the TACAN channel programmed into the TACAN station selector.

TACAN Function Knob

Set the know to TR (Transmit Receive) to determine that the TACAN signal comes from an airbase. Set the TACAN function knob to AA-TR (Air-to-Air/Transmit Receive) to determine that the TACAN signal comes from a tanker.

Backup TACAN Channel Entry Consol

You can use this TACAN channel entry system as a backup if the Upfront Controls (UFC) are not functioning properly. Do so by entering in the TACAN channel then the appropriate band. The TACAN system uses two bands. The X band is used only for ground stations, while the Y band can be used for both ground stations and air operations (such as tanker operations).

External Lights

These control the external lights on the F-16, which are on the tail, fuselage, and wings. The Anti-Collision Lights are flashing white lights on the top of the vertical stabilizer. The Wing/Tail and Fuselage lights are red and green lights on the wing tip and fuselage of the F-16. Green lights are on the port (left) side of the aircraft, and red on the starboard (right) side of the aircraft. The Master Light Switch should be set to NORM to turn them on, and OFF to turn them off. And they should be set to STEADY during normal operations, and FLASH when you have an emergency or you are taxiing or moving the aircraft.

Cockpit Familiarization

Closer Look at the Engine Feed & Ext Lights

Master Fuel Switch

This is the master on/off switch for fuel supply. Only change this in the air if you feel like doing a flame out landing or try out the ejection seat ☺

Tank Inerting

Tank Inerting works by replacing fuel vapors in the fuel tanks with nitrogen enriched air. This reduces the chance of explosion if you pick up some flak.

Eng Feed (Engine Feed)

Should be set to NORM for normal operations *(see previous slide for more details).*

Air Refuel

Click to open/close air-refueling door.

Form

Set the brightness of anti-collision and position lights.

Anti-Collision Lights

Turns white anti-collison lights on the tail ON or OFF.

Position Light

Set's your wing/fuselage lights to FLASH (lights flash) or STEADY (lights don't flash).

Air-Refueling Light

Set the brightness of aerial refueling lights.

Master Light Switch

Exterior Master Light Switch enables lights to be on or off. Must be set to NORM before you can turn on the exterior lights on the aircraft.

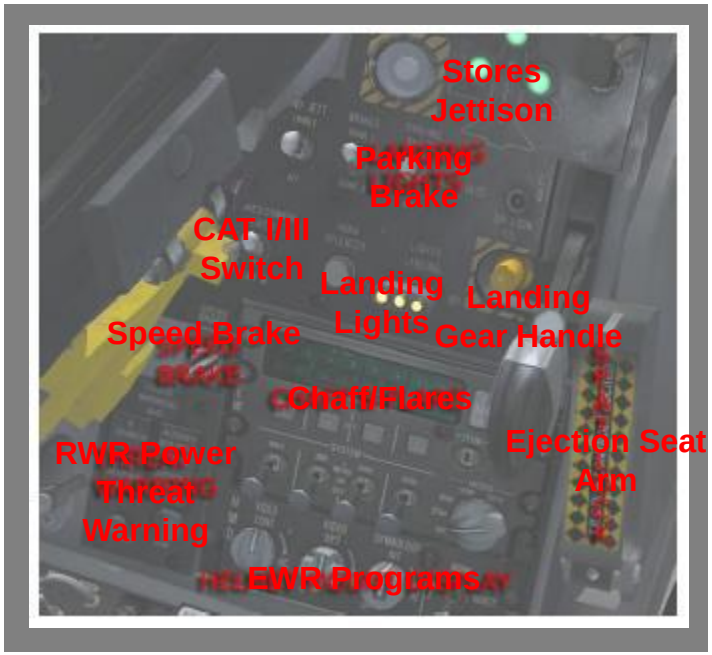
Wing/Tail and Fuselage

Turns wing and fuselage lights on, off or dim. The three settings are OFF (lights off), BRT (lights on normal brightness), and DIM (lights are dim).

Cockpit Familiarization

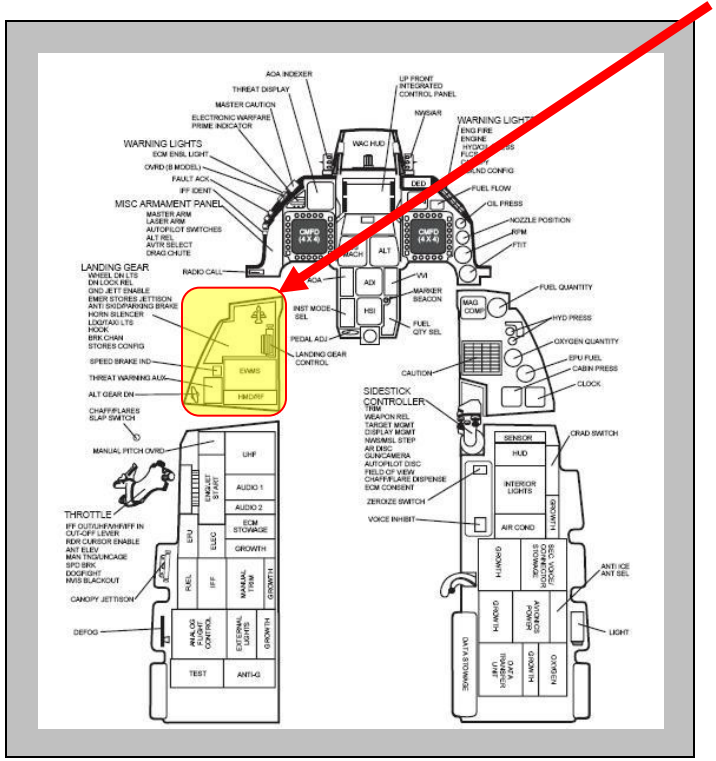
Port AUX Console…

Left Aux Console



Stores Jettison – Button to drop stores
CAT I/III – Switch between CAT I & CAT III
Speed Brake– Extend/Retract Speed Brakes
Landing Lights – Landing Lights On/Off
RWR Power – Power RWR (and status)
Landing Gear – Extend/Retract Landing Gear
Chaff/Flare – Countermeasures power & settings
EWR Programs – EWR Programs & Status
Ejection Seat Arm – Arms/Disarms ejection seat

Cockpit Guide – Port AUX Console



The Port (Left) AUX Console has includes some advanced features of the F-16 cockpit, such as the EWS panel. The following slides will give a basic overview of the Port Aux Console. Future Ground School material will provide more details.

Cockpit Familiarization

Left AUX Panel…

Alternate Landing Gear Alternate way to lower your landing gear for emergencies

Landing Gear Lights – Displays if landing gear is extended or retracted. Green lights indicate the gear is extended and locked. "Three Green" means all three wheels are extended and locked.

Stores Jettison – Pushing the button here will jettison (drop) ALL your stores (including ordnance and fuel stores).

Gear Handle – Clicking here will extend or retract your landing gear.

Parking Brake – Enables/Disables the parking brake.

Brake Channels – (N/I) Sets brakes to channel 1 or channel 2

GND JETT – Enable/disable jettison while still on the ground

Down Lock Release – Release the gear lock

Landing Lights – Turns landing lights on or off

Horn Silencer – Turn off the low warning horn

Stores Config – CAT I – Maneuverability of the aircraft is category 1 (can pull max G), CAT-III Maneuverability of the aircraft is category 3 (G-load on aircraft is limited)

Speed Brake Status – Stripes means brakes are retracted, and dots means your speed brakes (spoilers/air-brakes) are extended

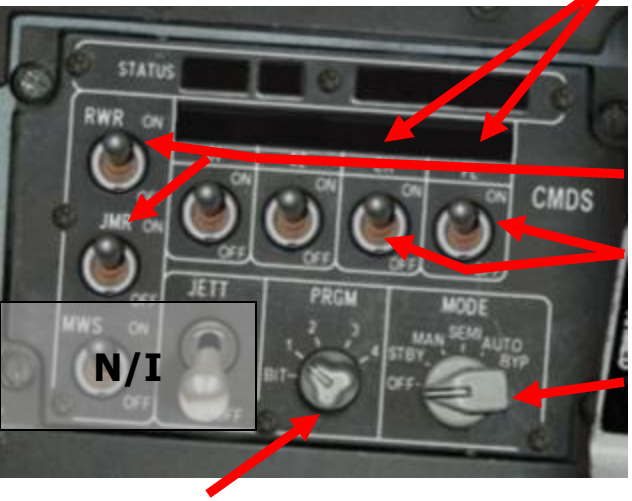
Threat Warning AUX– These switches power and control your Radar Warning Receiver (RWR). *More details next slide.*

Manual Pitch Override – This switch sets the manual pitch control to normal or override (for deep stall recovery).

Cockpit Familiarization

Left AUX Panel…

EWS Panel



This will display the number of chaff (CH) and flares (FL) you have,

RWR– This switch controls whether or not the EWS system receives RWR data. Switch it to ON to use SEMI and AUTO modes – otherwise the EWS doesn't get launch warnings from the RWR.

JMR – SEMI and AUTO Jammer operations only work if this switch is set to the ON position.

Chaff (CH)/Flare (FL) – Chaff and flares are only released in SEMI or AUTO when these switches are in the ON position. Manual Chaff/Flare program release does not depend on the state of these switches.

MODE:

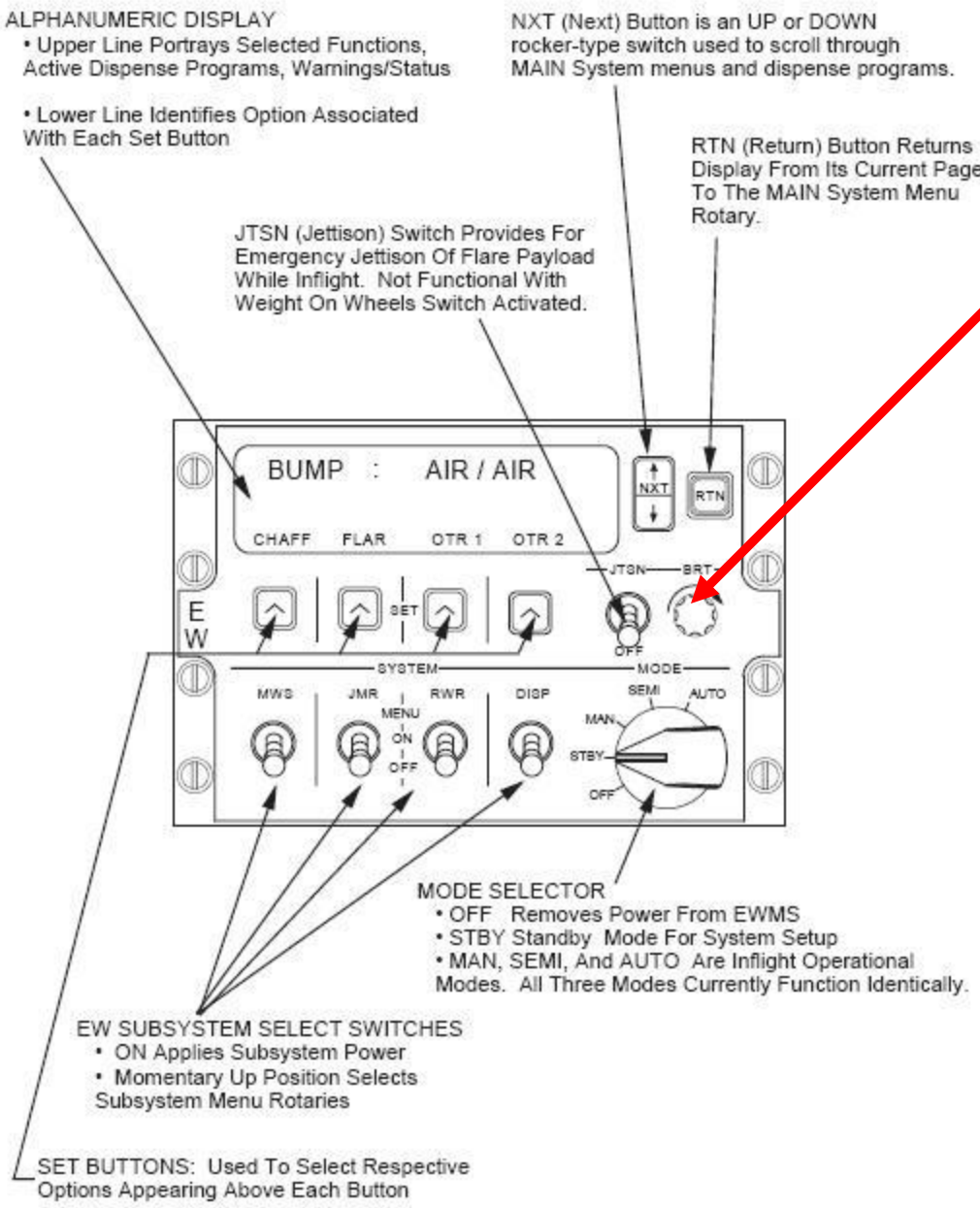
- OFF: The system is switched off completely. No Flare/Chaff release is possible.
- STBY: To manually re-program one of te default programs through the ICP, switch to EWS to standby mode.
- MAN: To manually launch the selected Flare/Chaff program.
- SEMI: When a radar spike is detected by the RWR, the VMS calls out "Jammer" to ask you if you want to turn the Jammer on (only if the REQJMR Option in the ICP is set to ON). If so, turn it on manually. When a missile launch is detected by the RWR, Chaff/Flares are automatically released according to the currently selected program on the PRGM switch.
- AUTO: When a radar spike is detected by the RWR, the Jammer is turned on automatically (only If REQJMR Option in the ICP is set to ON). When a missile launch is detected by RWR, Chaff/Flares are released automatically according to the currently selected program (PRGM)

Default Chaff/Flare Programs (PRGM)

- PRGM 1 – 3 x Chaff
- PRGM 2 – 1 x Chaff and 4 x Flare
- PRGM 3 – 2 x Flare
- PRGM 4 – 2 x Chaff and 2 x Flare

- PRGM 1: High-Med Altitude SAM Evasion
- PRGM 2: A-A IR Missiles
- PRGM 3: A-A Missiles
- PRGM 4: Pop-up A-G sequence, when you don't know what the threat could be, for example IR missile or a radar guided SAM

Cockpit Familiarization



F-16 AM/MLU EWS Panel

You turn on the RWR in the F16-AM (in OF) and F-16 MLU in AF by hitting this button. It's worth noting that some of the older model F-16s in F4 use the MLU/AM cockpit.

Cockpit Familiarization

Threat Warning System (TWS)

TWS Panel

FCC Power Switch
Fire Control Computer Power

FCC – Power ON
OFF – Power OFF

Aux. Warning Panel F-16C

- **SRCH (S)** - Displays search radars on RWR.
- **ACT/PWR** - Radar activity detected on RWR (This will flash any time the RWR is detecting radar activity while simultaneously displaying radar symbols on the RWR)
- **LOW** – Sets RWR priority to low altitude threats (good for low altitude operations)
- **SYSTEM POWER** - Power to RWR (hit this to power the RWR)

Cockpit Familiarization

Radar Warning Receiver

Threat Warning System

The ALR-69 TWS (Threat Warning System) is a passive system that detects radar emissions hitting your aircraft. These emissions can be from other aircraft or from ground units. The ALR-69 registers and processes these emissions and determines the type of radar, the signal strength and the bearing. The TWS consists of the RWR and the threat warning lights.

RWR is at the top right of the cockpit

RWR (Radar Warning Receiver)

The RWR displays symbols that represent tracking radar signals coming from SAMs, AAA and aircraft radar. The 16 highest priority threats are displayed according to their bearing and radar signal strength. The stronger the radar signal, the closer to the center of the display. The RWR represents a God's eye view around your aircraft. You are at the center of the circle, and threats appear around the circle in relative bearing to your aircraft. When your F-16 is inverted, the symbols on the RWR flip left and right to keep a true ground track relationship. They return to normal when the aircraft returns to a non-inverted attitude. The Tactical Reference in AF and OF displays the RWR symbols for all of the radar units you're likely to encounter, along with their threat tones.

Cockpit Familiarization

Radar Warning Receiver Cont'd

TWS/RWR Panel F-16C

- **HANDOFF** - Press to override which threat is selected (indicated by a diamond around the threat
- **LAUNCH** - Missile Launch Detected! Take immediate action
- **PRI MODE** - Declutters the RWR. Push to display only top 5 threats. When unlit, RWR will show up to 16 threats
- **NAVAL** - Increases priority of Naval threats
- **UNK** - Unknown button controls whether radars which are undetermined by the TWS are displayed. If pushed, unknown targets will be displayed as a U symbol
- **TGT SEP** - Unstack threat symbols that are overlaid on each other

Cockpit Familiarization

Radar Warning Receiver Cont'd

TWS/RWR Panel F-16 AM/MLU

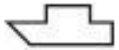
1. Target Separation Light (Unstack Symbols)
2. RWR Display
3. Chaff and Flares available numbers
4. Low altitude threats warning
5. Chaff and Flare available numbers
6. ECM standby/Exmit display
7. Priority mode enabled light
8. Unknown radar sources enabled light
9. Missile launch warning light
10. RWR active light
11. Jammer enabled light.

Buttons and switches in green, instruments / lights in blue

Although the F-16 AM and F-16 MLU RWR's look different, they operate in F4 the same as the other F-16 models if you know how to use them. One area most pilots miss when flying the AM or MLU is that the power switch for the RWR is in a different location. So it's important you understand how to use the TWS/RWR in any model of F-16.

Cockpit Familiarization

Radar Warning Receiver Cont'd

RWR Symbology	
Search radar	S
Unknown radar	U
Active radar missile	M
Hawk	H
Patriot	P
Naval	
Modern aircraft	
Older aircraft	
Anti-aircraft artillery	A
Surface-to-air missiles	2,3,4,5,6,8,15
Chaparral	C
Launch warning	
Highest priority target	
Nike/Hercules	N

RWR Note:

Contrary to popular belief (and incorrectly described in the AF Manual), the RWR does not display distance to threats. The RWR solely displays signal strength and bearing to the threat. If you are familiar with certain threats, you can make inferences of distance to threat, but that would only be an estimate and not very accurate.

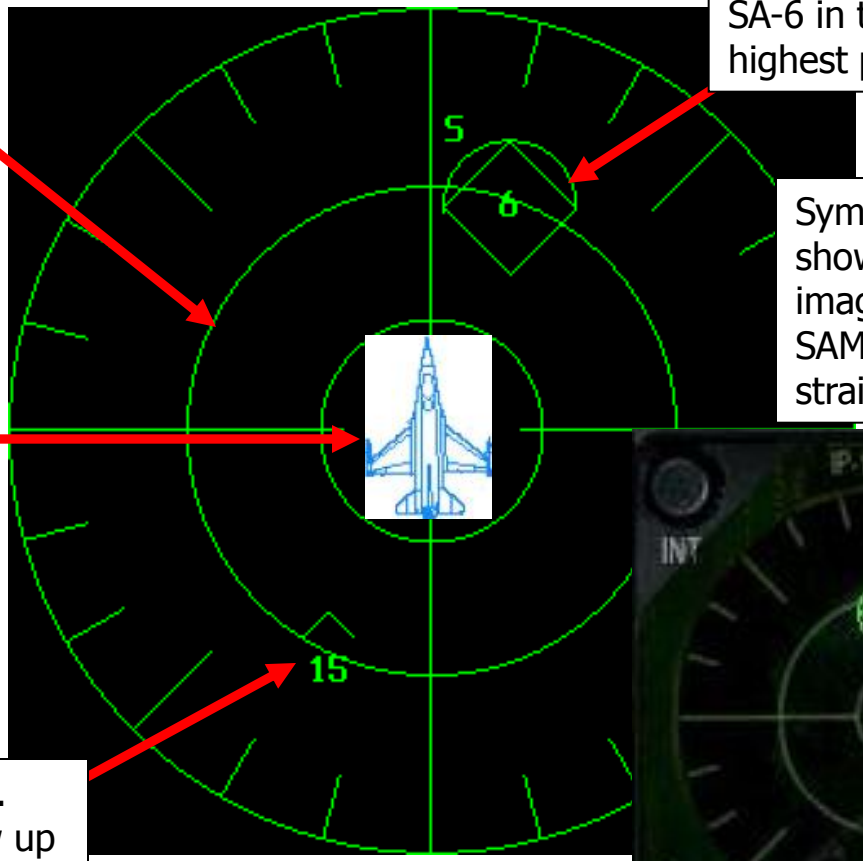
Cockpit Familiarization

Radar Warning Receiver Cont'd

If a threat is inside this circle, it is within lethal range. Take immediate action to negate the threat.

Symbols enclosed in a diamond are the highest priority threat to your aircraft, as you can see the SA-6 in this example is the highest priority threat.

This is how the RWR is oriented, looking down on your aircraft. Radar emissions at the top of the RWR are in front of you, and emissions at the bottom are behind you. I put a small F-16 aircraft symbol to show you how the RWR illustrates the bearing to a radar emission. *(There's actually no little blue F-16 in the real RWR.)*



Symbols enclosed in a circle show a launch warning. The image below shows a SA-6 SAM missile launch coming straight at you.

This shows a F-15 at your 7 o'clock. For the most part, aircraft will show up w/ their type (ie a MIG-29 will be displayed as 29)

Cockpit Familiarization

Port Eyebrow & Console

Master Caution Light – The Master Caution Light usually lights up whenever an individual caution light illuminates. It will not illuminate for an eyebrow warning light. Because the Master Caution light is in front of the cockpit, it is easier to see than the caution lights on the warning panel. It will also light up when you reach bingo fuel. You can turn off the Master Caution Light by clicking on it or hitting Control+C on your keyboard.

F-ACK – Fault Acknowledge, if you press on this, it will check for any faults in the aircraft and display them on the Fault acknowledge display above the Caution/Warning Panel. *More details in the coming slides.*

R/F Toggle – This switch allows you a quick way to turn off dectable emissions (your radar – FCR). It has three positions:

- NORM – Normal mode, systems are as set
- QUIET – Radar emissions reduced, and the AGP-66 radar is put into Standby.
- SILENT – ALL radar emissions are silenced (no radar/FCR or radar altimeter), and no TFR, the system will indicate a TF failure and generate a TF fail light and WARN indication.

ECM – This light illuminate if the ECM is powered.

Laser Arm – Turn on the Forward Looking InfraRed (FLIR) pod's targeting laser for Laser Guided Bombs (LGBs).

Alt Rel – Alternate Weapons Release.

Cockpit Familiarization

Port Eyebrow & Console

Master Arm – This controls access to all weapons systems. It has three positions:

- ARM – Weapon systems are armed (Weapons Free)
- OFF – All weapons are inactive
- SIM – Weapon systems can be used, but the actual launch, or deployment of weapons is stopped, so you can practice in this mode.

Auto Pilot Controls – The F-16 auto pilot has 3-axis. There are two switches that control the Autopilot (AP) operation: the ROLL and PTCH switch. The PITCH switch engages the AP by putting it in the ALT HOLD or ATT position. The AP system tracks your current altitude in the ALT Hold position or your current altitude in the ATT position.

Pitch	Effect	ROLL		
		HDG SEL	ATT HOLD	STRG SEL
ALT HOLD	AP holds current Altitude	Follow HSI heading	Hold roll angle and altitude	Follow course to next waypoint
OFF		AP OFF	AP OFF	AP OFF
ATT HOLD	AP holds current Attitude (pitch)	Follow HSI heading	Hold roll and pitch angle	Follow course to next waypoint

ALT REL – Alternate Side Stick Controller Weapons Release N/I).

ADV MODE:

- ACTIVE – Terrain Following System active.
- STBY – Terrain Following System standby.
- OFF – Terrain Following System inactive.

Cockpit Familiarization

Auto Pilot Settings…

Attitude Hold

The attitude hold mode is available in either pitch or roll when the pitch and roll mode switches are placed in the ATT HOLD position. Once ATT HOLD is engaged, the aircraft will be held within +/-0.5 degrees in pitch and +/-1 degree in roll. To do a roll and/or pitch correction, use the Autopilot Override. The Autopilot Override (paddle switch CTRL+3) will decouple all autopilot inputs while it is depressed. Upon release of the Autopilot Override, the autopilot hold modes capture the reference at release and the heading select guides the aircraft towards the selected HIS heading.

Heading Select

To use this mode, switch to the HDG SEL position on the ROLL switch. The autopilot system uses the heading error signal from the HSI to command the necessary bank angle (up to 30 degrees) to capture the heading that has been set on the HIS. The aircraft will automatically turn though the smallest angle to any heading selected by the pilot, and will maintain that heading within +/-1 degree. To use your current heading, adjust the heading select knob on the HIS to align the heading marker (Captain's bars) to the aircraft heading. Then engage HDG SEL.

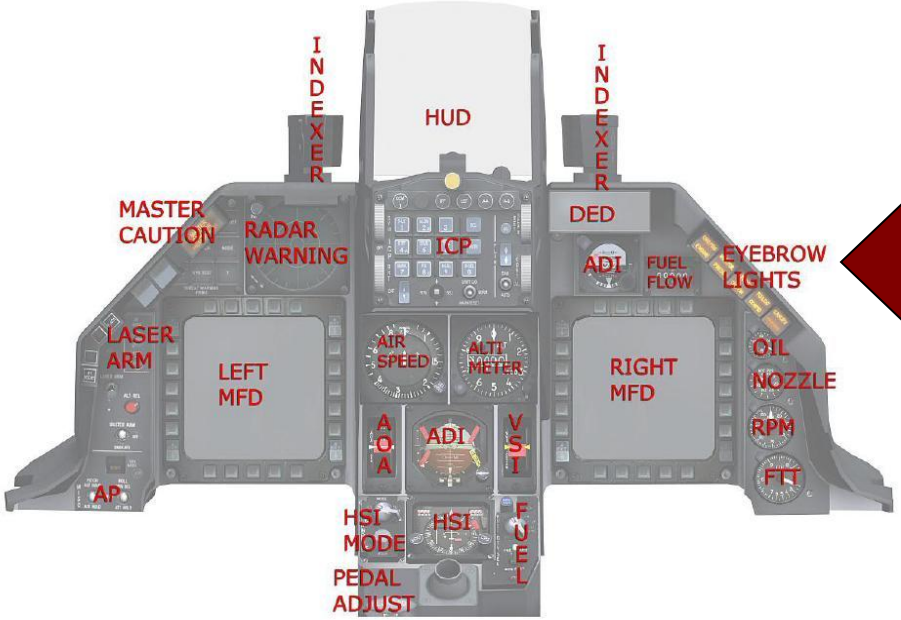
Altitude Hold

Upon engagement of the ALT HOLD position on the PITCH switch, the autopilot system receives an altitude error and altitude rate signal referenced to the conditions existing at the time of selection. The autopilot will control to within +/-100' with bank angles less than +/-30 degrees. If you selected Steerpoint autopilot mode, your F-16 will automatically fly to the current steerpoint. If the autopilot is set to Combat, your F-16 will automatically fly and fight by itself (in AF only). It will evade attacking aircraft, try to get you into position to shoot down any enemy aircraft and will also fire your weapons. The Combat autopilot will also automatically refuel if you request refueling from a tanker (again in AF only).

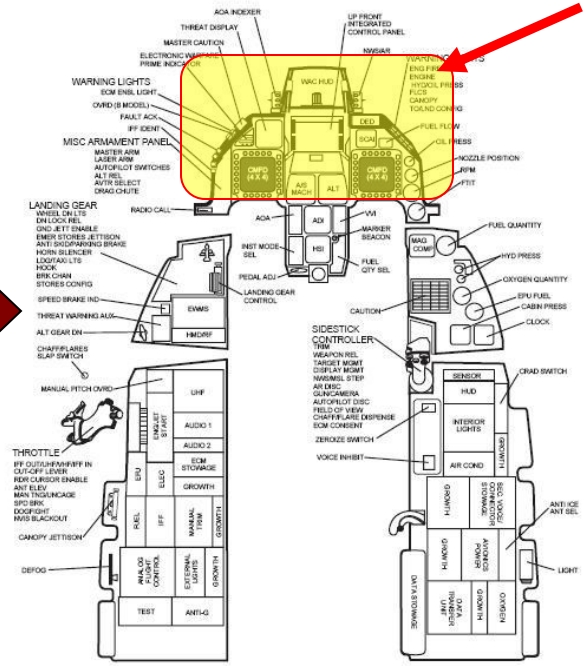
Cockpit Familiarization

Center Console…

Center Console Overview



Cockpit Guide – Center Console



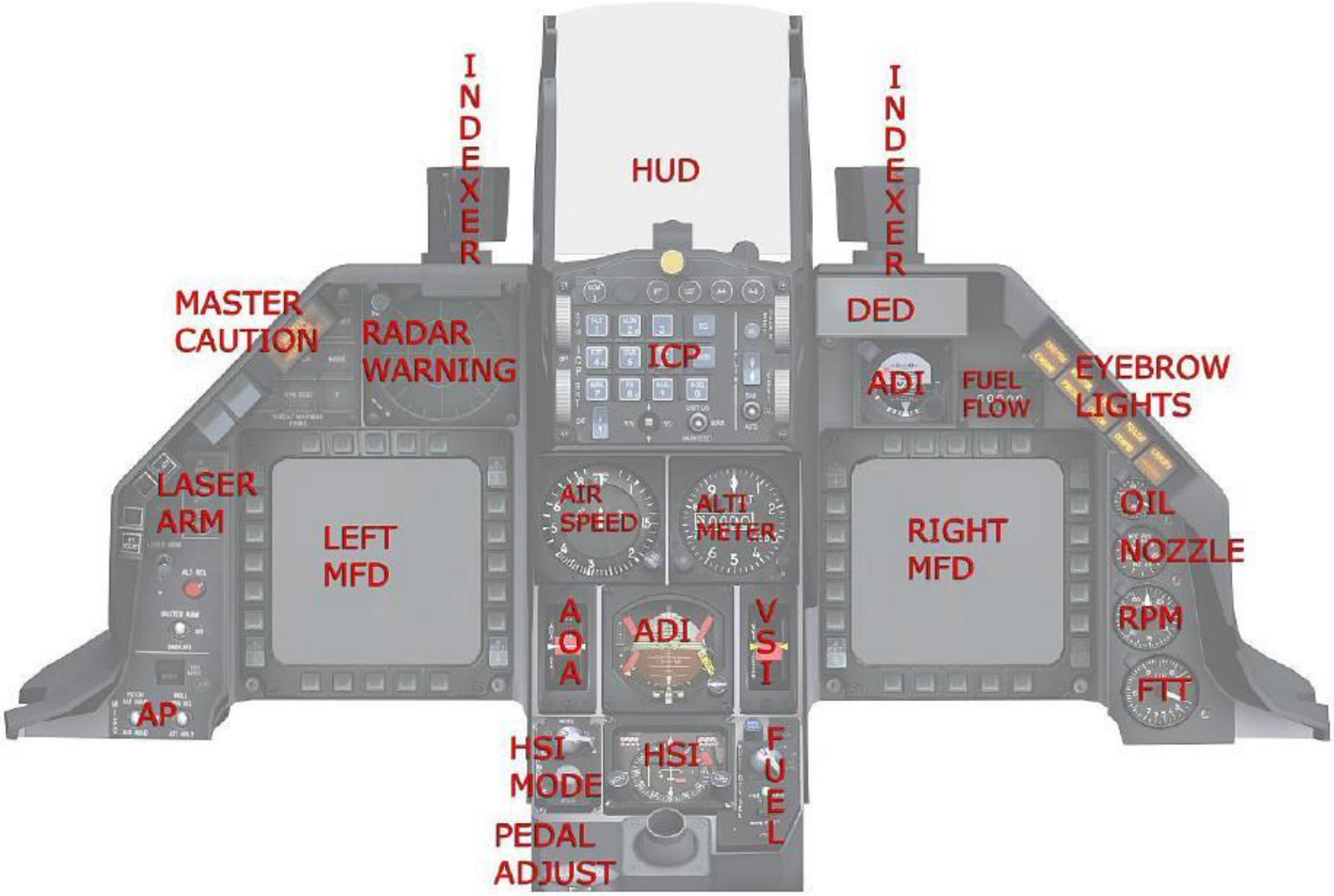
General

The following is an introduction to the Center Console of the F-16. It would take a ton of slides to describe every detail of the Center Console, so in this presentation, we will only cover the basics. You will learn more of the details in following Ground School training material. At the end of this presentation, you should be able to identify each of the switches, gauges, displays, toggles and their function on the Center Console. If you just focus on that, you will be on the right path for your IQT course. Should you have any questions, see your Primary IP for further direction or questions.

Cockpit Familiarization

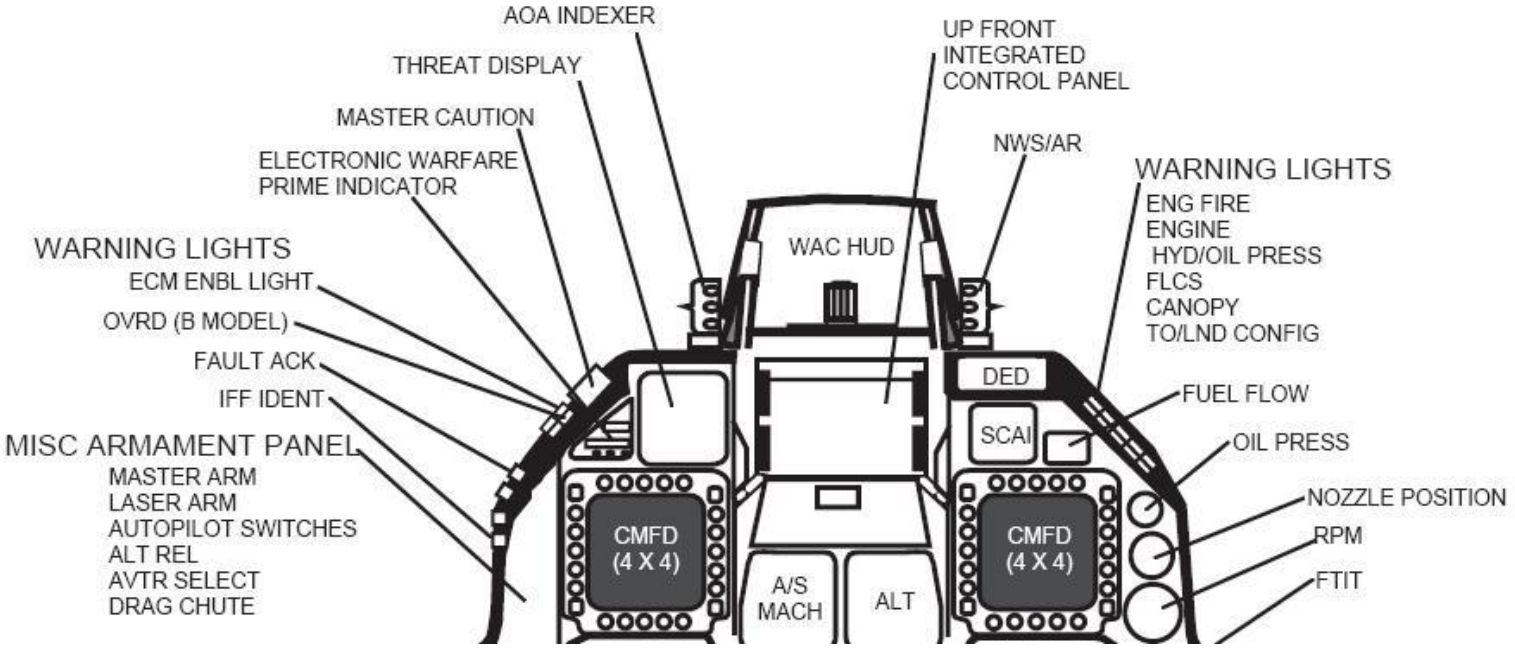
Center Console…

Center Console Basic Overview



Cockpit Familiarization

Center Console At a Glance…

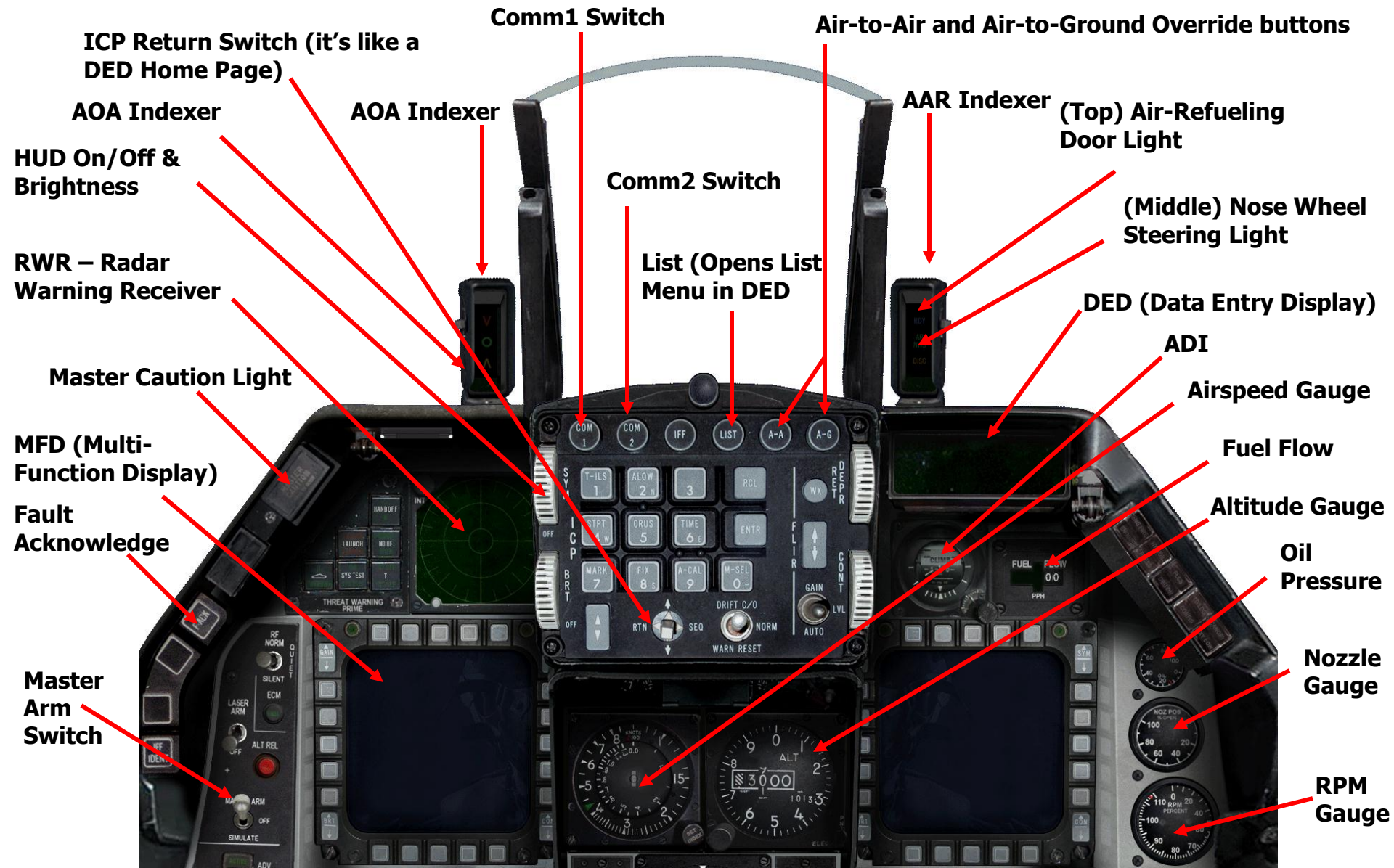


Basic Overview Cont'd

Misc Armament Panel – Just above the Left AUX Panel, the Misc Armament Panel has various combat critical components, including arming the aircraft, the laser for LGBs, Alternate Weapons Release, Auto-Pilot, and ECM lights.
Warning Lights – The Warning Lights on the left and right 'eyebrow' includes several warning lights to ensure the pilot doesn't miss any faults or caution with the aircraft. If a light is lit, you should look at the Warning Panel on the Right Aux Panel to see exactly what the problem is and take the correct course of action.
Threat Display – The Radar Warning Receiver
AOA Indexer – A red and green display that's a bank up Angle of Attack indicator should you loose the HUD.
WAC HUD – The HUD is projected here, and displays critical information so the pilot doesn't have to look down at his instruments.
Up Front Integrated Panel – The ICP is a number pad and group of buttons that serve as Up Front Controls for the pilot
NW/AR – The right indexer shows if the nose wheel steering is enabled, and/or if the Aerial Refueling door is open.
Gauges – The right side of the Center Console has various important engine gauges, such as RPM, Fuel Flow, Oil Pressure, etc...

Cockpit Familiarization

Center Console…



Cockpit Familiarization

Center Console…

Left Eyebrow Warning Lights

Eyebrow warning lights indicate more serious events that pose immediate life-threatening conditions.

- T-F – Terrain Following failure. Indicates a failurein the terrain following system.
- IFF Button – Failure in IFF System in the F-16 (N/I in F4)
- OVRD – Manual pitch is OVERIRIDE

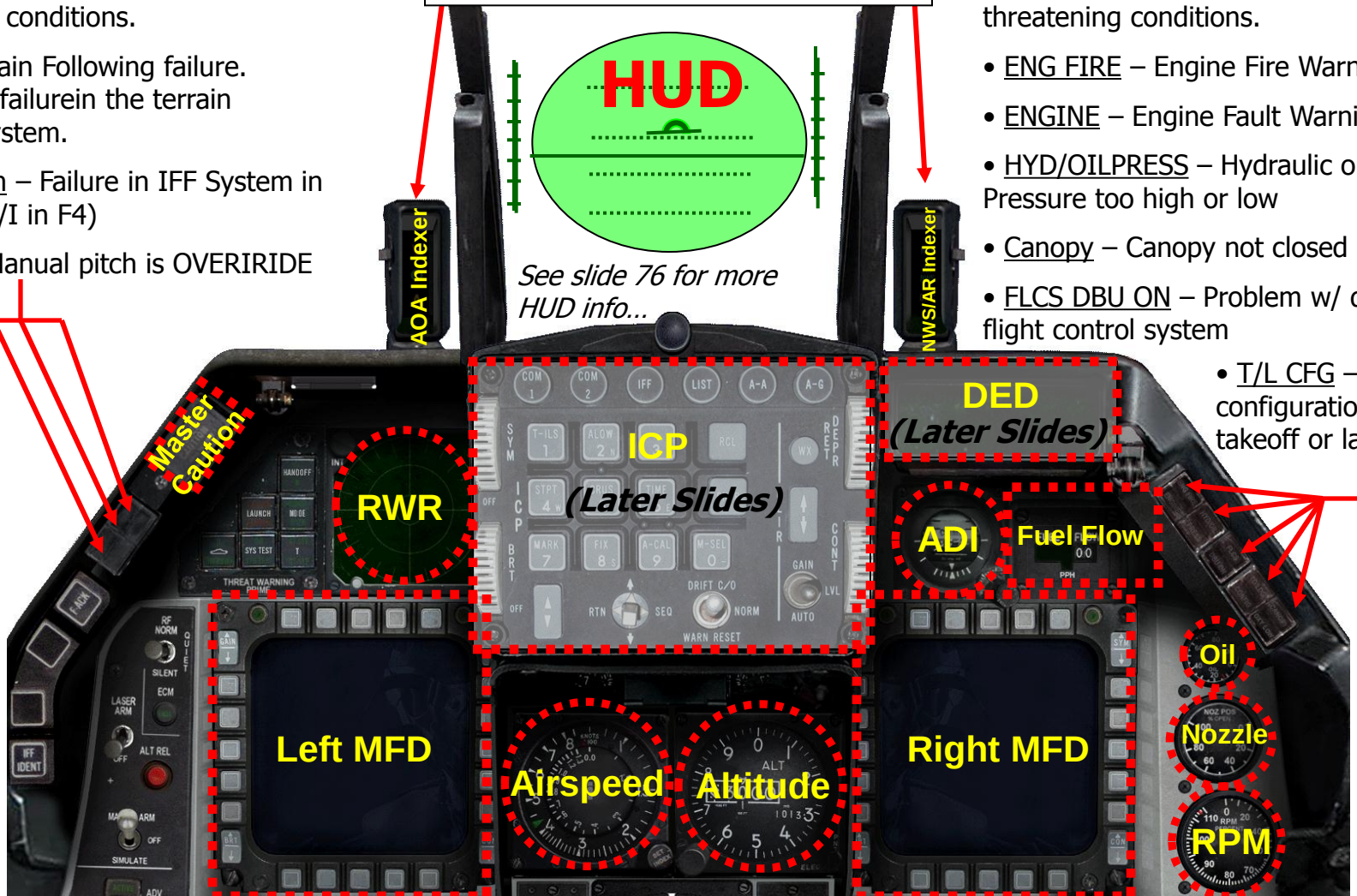
AOA Indexer and NWS and Aerial Refuel Indexers

See Next Slide

Right Eyebrow Warning Lights

Eyebrow warning lights indicate more serious events that pose immediate life-threatening conditions.

- ENG FIRE – Engine Fire Warning
- ENGINE – Engine Fault Warning
- HYD/OILPRESS – Hydraulic or Oil Pressure too high or low
- Canopy – Canopy not closed
- FLCS DBU ON – Problem w/ dual flight control system
- T/L CFG – Incorrect configuration for takeoff or landing



Cockpit Familiarization

AOA / NWS / AR Indexers…

AOA Indexer Lights

To the left of the HUD there are three vertically arranged symbols that comprise the AOA (Angle of Attack) Indexer. Angle of Attack is the attitude of the aircraft during flight. Your AOA is particularly important during landing because the nose must be up while you are descending or you will hit the runway too hard. The AOA Indexer visually represents your angle of attack, by illuminating its symbols. Use the symbols to adjust your AOA to the proper angle:

- Top Red Symbol – If lit, your AOA is too high for landing (more then 15 deg)
- Middle Green Symbol – If lit, your AOA is 13 deg and you are on speed w/ correct AOA for landing.
- Bottom Yellow Symbol – If lit, your AOA is too low for landing (less than 11 deg).

NOTE:

If the top or bottom symbol is lit simultaneously with the middle green symbol, this means that your AOA is between these two values.

NWS / AR Indexer Lights

This indicator, located to the right of the HUD, provides status information during air refueling and taxiing on the ground.

- RDY (Top Blue Light) – The RDY display illuminates in blue when your Aerial Refueling door is open (in AF it illuminates blue when you are cleared for contact by the tanker)
- AR/NWS – The air refueling/nose wheel steering display illuminates in green for two reasons. For Air Refueling it means your aircraft is connected to the boom of the tanker ("Contact"). And the other is when you are on the ground, it will illuminate green when your nose wheel steering is enabled.
- DISC – The DISC displays illuminates in red when the tanker disconnects the boom or you are not flying within parameters.

Cockpit Familiarization

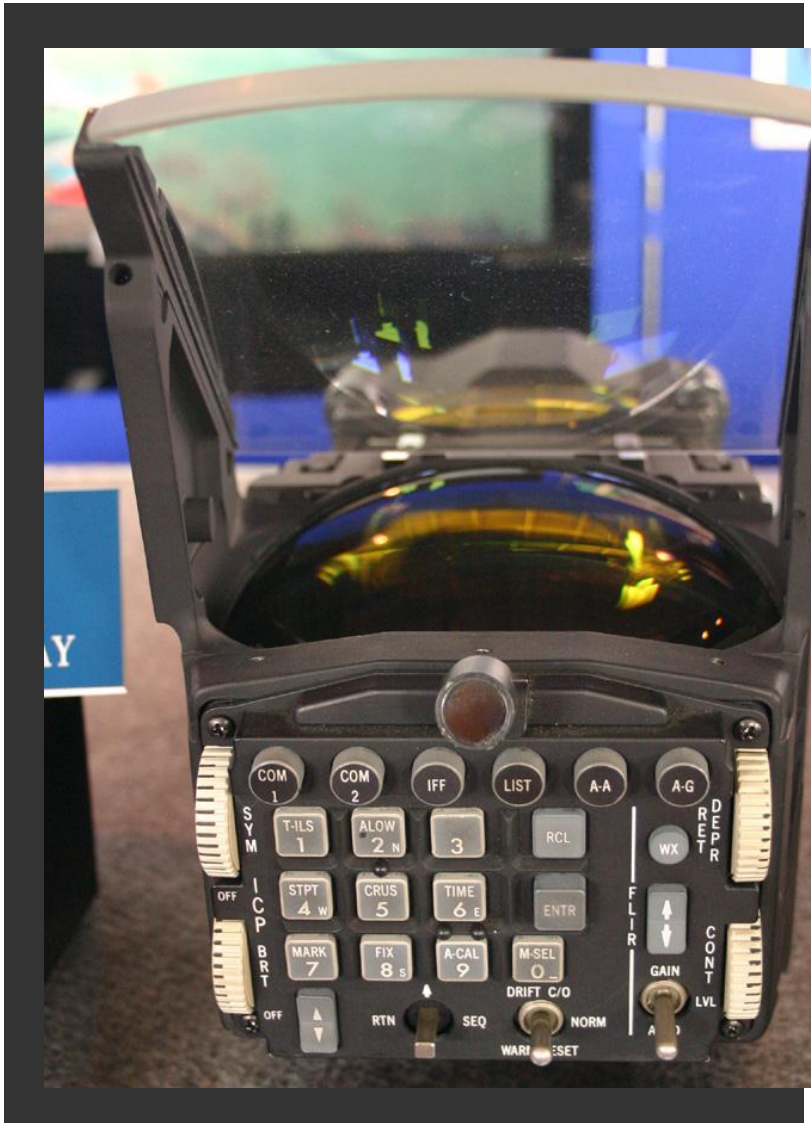
Integrated Control Panel (ICP)…

The ICP and DED Basic Overview

The ICP (Integrated Control Panel) is an upfront console that gives you control over frequently used communications, avionics, and navigation functions. The ICP is used in conjunction with a 5-line data display device called the DED (Data Entry Display). The ICP also provides buttons to access a number of important combat functions, such as Master Modes for Air-to-Air and Air-to-Ground weapons systems. The purpose of the ICP, similar to the HUD, is the keep the pilot looking up and outside instead of looking down in the cockpit when he needs to hit switches. The ICP is a very useful and important tool for the F-16 pilot. The following slides will demonstrate all of the functions available using the ICP.

The DED (Data Entry Display) is the display panel to the right of the ICP. The DED is like a monitor, and the ICP is like a keyboard. You can't use one without the other. The ICP and DED are referred to as Up Front Controls. The following slides will illustrate the functions, menus, and displays of the DED.

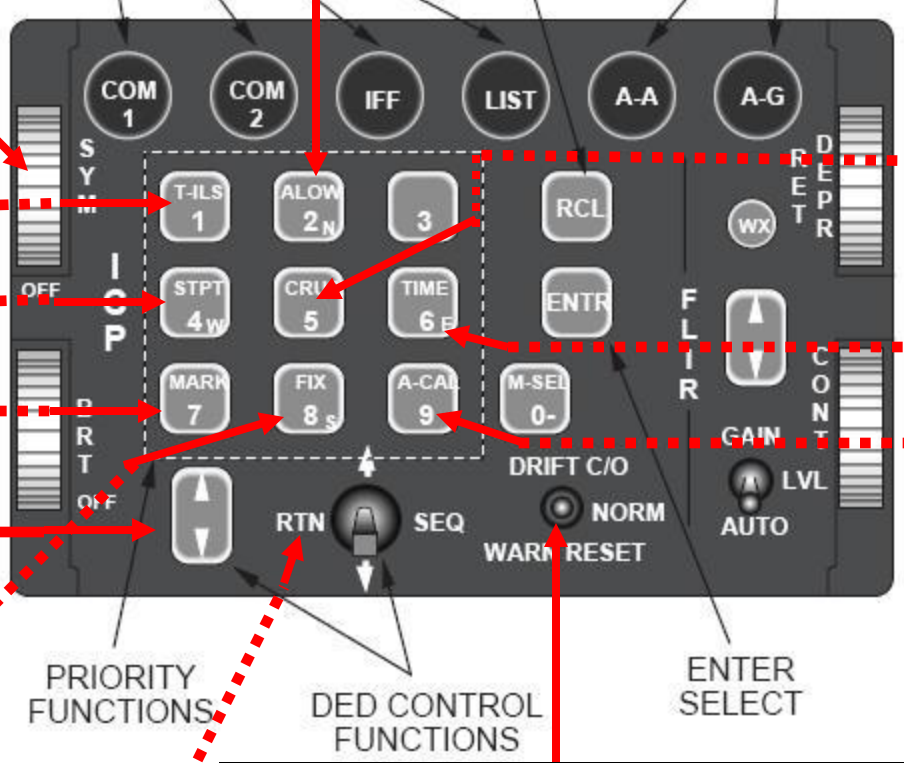
(Above) ***Default DED Screen***



(Above) ***ICP and HUD***

Cockpit Familiarization

ICP Button's Functions…



2 and/or access to altitude/hardeck (altitude warnings) DED page.

More details on the ICP Secondary Buttons in future slides in this presentation.

Turn HUD on here and/or adjust HUD brightness.

1 and/or access ILS DED pg

4 and/or access steerpoint DED pg

7 and/or access markpoint DED pg

Change steerpoint or cycle options in DED

8 and/or access to the FIX DED pg

5 and/or access to predictive fuel state, ETA / TOS steerpoint info, system time, and winds DED pg

6 and/or access time DED pg

9 and/or access to A-CAL DED pg

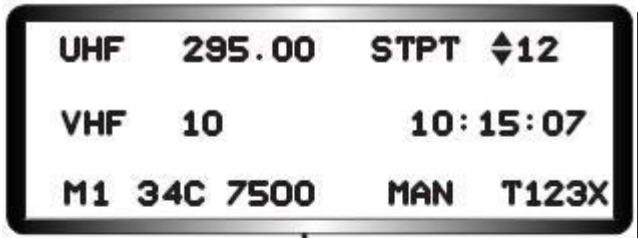
RTN – Returns DED back to 'Home' page (start over)

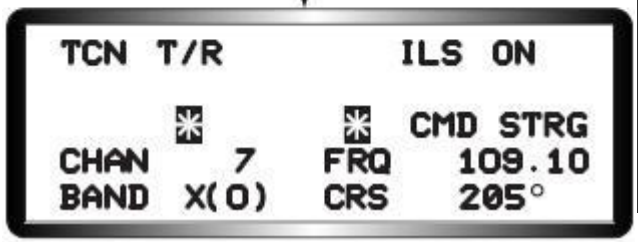
DRIFT C/O – Center HUD when drifting (be sure to disable when dropping bombs

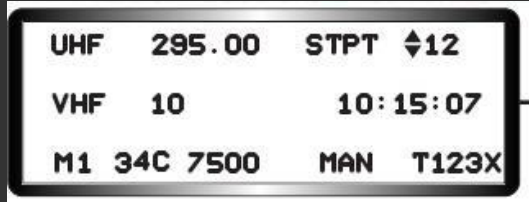
WARN RESET – Resets warnings, such as "FUEL" warnings on the HUD

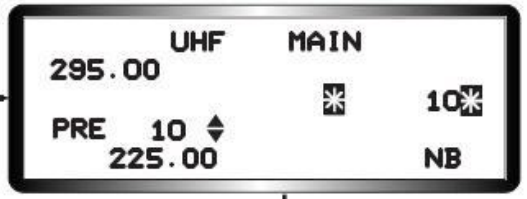
Cockpit Familiarization

Data Entry Display (DED)…









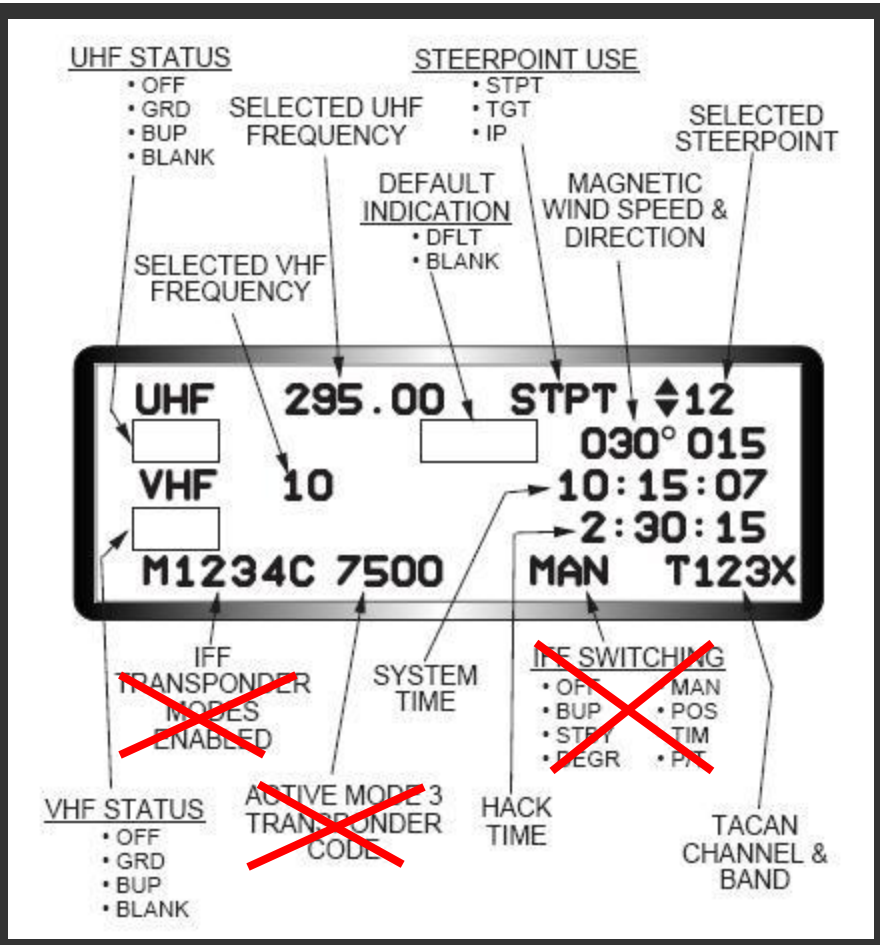
(Above & Left) **Shown here are a couple examples of the information the DED can display. Left shows how to access the TACAN & ILS pg by hitting "1" on the ICP, and above/right shows what happens when you hit the Comm1 or Comm2 override buttons above the ICP.**

DED

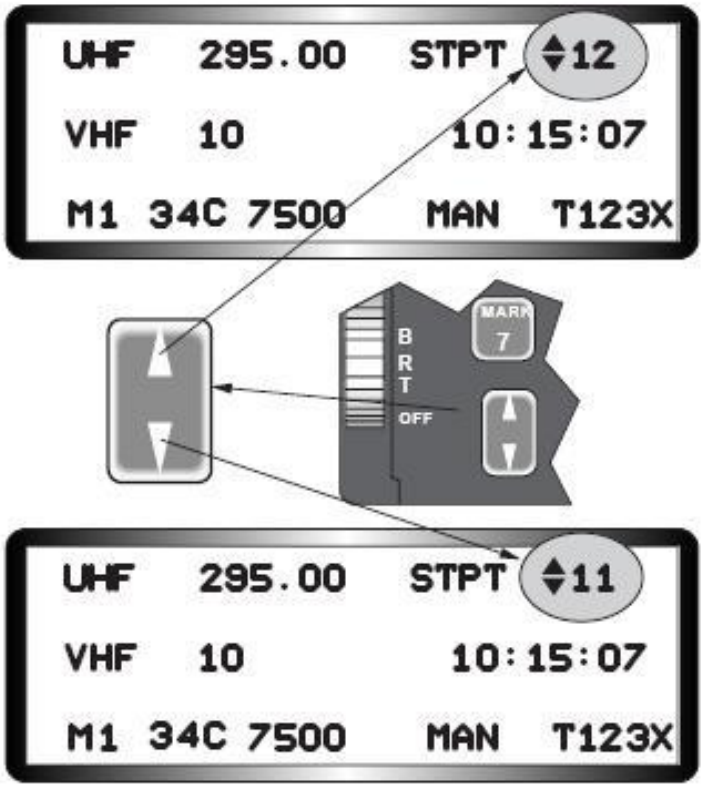
The Data Entry Display (DED) is used for various functions, such as entering TACAN channels, ILS frequencies, fuel warnings (Bingo), steerpoint information (GPS coordinates), and EWS programs. The DED can be accessed by the ICP numbers (shown in the previous slide), or via the LIST override button above the ICP when the Up Front Controls (UFC) are enabled. The DED is a critical component of the F-16 cockpit. We will cover all of the functions of the various DED pages in later Ground School presentations, but during the next few slides we will illustrate the basic functions of the DED, and how to access its menus using the LIST button above the ICP, and the numberpad.

Cockpit Familiarization

Data Entry Display (DED) Overview…



✕ = **Not Functional**



The top right of the DED display shows the currently selected steerpoint. You can the steerpoint by hitting "S" on the keyboard or by using the 'up' and 'down' arrows on the ICP.

Cockpit Familiarization

DED and the ICP…

DED Using the ICP

The **ENTR** button stands for ENTER, and is used as such.

The **Data Command Switch** is the four-way switch below the ICP. Its four labeled positions and corresponding functions are:

- **RTN** – Return back to DED Home Page (Start Over)
- **UP** – Cycle through the editable options forward
- **SEQ** – Cycle through subpages and options
- **DOWN** – Cycle through the editable options backwards

The **ICP Increment/Decrement Function** arrows shown here are used to change steerpoints, and/or cycle through some of the subpages shown in the DED. For example, when entering Chaff and Flare programs using the DED and ICP, you switch programs by using the ICP increment/decrement function button. The Data Command Switch up and down arrows are used to highlight a section of the DED menu for data entry, whereas the Up and Down arrows of the ICP increment/decrement is used to change entire pages of the DED.

The **RCL (Recall)** button is like a clear button, allowing you to clear the last data entry. If pushed twice, the entire input is cleared.

You can access the priority DED functions just by hitting certain buttons on the ICP. *See the next slide for details…*

Cockpit Familiarization

DED Priority Functions Using the ICP Numbers…

ICP/Button	Label	Function Provided
1	T-ILS	Entry for TACAN and Instrument Landing System
2	ALOW	Entry for Altitude Low warning
3		Entry for Digital Terrain System
4	STPT	STPT Entry for Steerpoint Latitude, Longitude, Elevation, etc.
5	CRUS	Information for Cruise Endurance and Range
6	TIME	Entry for System Time
7	MARK	One Switch Hit Mark of a Latitude, Longitude, Elevation
8	FIX	Alignment of the Inertial Navigation Set
9	A-CAL	Alignment of the System Altitude.

For more technical information about this part of the cockpit, see the *F-16 MLU Guide 1* in the PDF section of the IQT Download

Cockpit Familiarization

ICP Secondary Function Buttons…

Any of the numeric keys that have letters on them are Secondary Buttons that take you specific DED subpages.

ICP Key Numbered Keypad (0-9)

The numbered keypad (numbers 0-9) are the Secondary buttons. They are labeled with a three or four letter abbreviation if they directly access a subpage. They are used as a normal numeric keypad for data entry on subpages with data entry options.

In AF, you can also access these buttons by pressing CONTROL plus the associated key on the numeric keypad. Note that the buttons are laid out in the same approximate order on the keyboad as they are on the ICP.

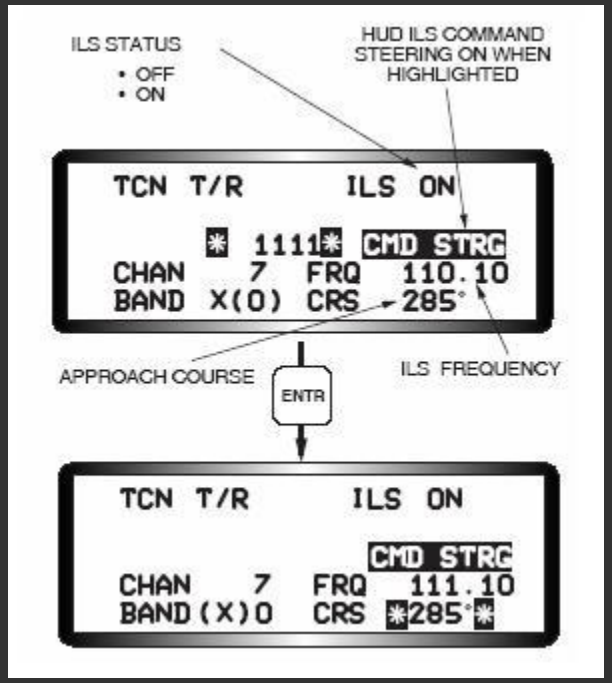
The purpose of the ICP keypads being linked to specific DED subpages is so the pilot can quickly access commonly used pages of the Date Entry Display (DED). Instead of having to hit LIST, then go access the page, you can simply click on the number on the ICP to get you to the right page. Once you've accessed the page you wanted, and wish to return back to the default display, you simply hit the RTN (return) switch on the ICP. Also, keep in mind that the secondary buttons will only access the subpages if you are at the default DED display. Once you are in a DED page, using the numbered keypad will only function as a data entry keypad. They won't work as a shortcut once in that case. So remember to hit the RTN DCS switch to return to the default page before using the ICP numeric keypad secondary buttons.

The following slides will cover the basics of each of the secondary buttons shortcuts to subpages…

Cockpit Familiarization

ICP Secondary Buttons (Shortcuts)…

T-ILS Page (Secondary Numeric Key 1)



(Above) The OF ILS DED page. Later IQT training documents will describe how to use the ILS system in OF and AF. For now, you just need to how to get to the ILS DED page.

Although the OF T-ILS page appears similar to the AF, it functions very differently. The ILS in OF has been almost totally rewritten and now is true to life. It includes proper operation of the localizer and glideslope bars, ILS course caret, command steering symbol as well as the real limits of the ILS/localizer signal have been coded. The DED (Data Entry Display) has been updated to reflect proper operation of the controls.

The ILS is used to perform precision instrument approaches using azimuth (localizer) and vertical (glideslope) approach cues in the cockpit independent of any airport precision radar. The system in OF and real life operates on VHF frequencies of 108.10 to 119.95 MHZ. The ILS is turned on and off using the ILS volume control knob on the Audio 2 Panel on the left console. The system is controlled from the T-ILS DD page, which is accessed using the T-ILS button (1) on the ICP. Command steering (CMD STRG) is automatically the mode selected on FCC/MMC power up, but may be deselected/selected by positing the asterisks around CMD STRG and pressing the M-SEL button. The pilot tunes the ILS by entering the desired 4-5 digits ILS frequency in the scratchpad and presses ENTR. The system recognizes that an ILS frequency has been entered and the asterisks step to the Course (CRS) wind. The pilot then keys in the course with the ICP keys and presses ENTR. The CRS setting in the DED is not connected to the CRS setting on the HIS. For consistent ILS display, the ILS approach heading should be set at both the DED and HIS.

Cockpit Familiarization

ICP Secondary Buttons (Shortcuts)…

ALOW Page (Secondary Number Key 2)

Press ALOW button (or numeric keypad CTRL+8) to set your low altitude warning limit. On the HUD, the ALOW setting looks like a sideways "T" on the altitude tape.

ALOW DED Page

MSL Setting

Increment or decrement the low altitude alarm using the Secondary buttons. By default, your Minimum Safe Level (MSL) floor is set to 10,000ft. Should the aircraft enter that area during a descent the VMS ("Bitchin' Betty") will call out "ALTITUDE-ALTITUDE". The MSL floor setting is independent to the RALT. Terrain Following Advisory (TD ADV) is not implemented at this time.

CARA ALOW

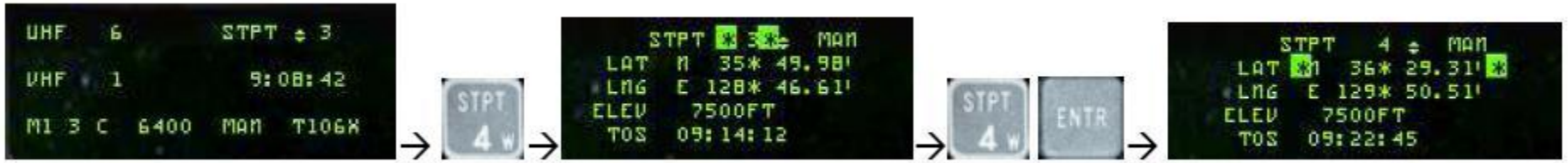
Increment or decrement the repeating VMS "ALTITUDE-ALTITUDE" warning you will receive when below the CARA ALOW altitude. For example, its default setting is 300ft, so if you are below 300ft you will hear the "ALTITUDE-ALTITUDE" constantly until you get above 300ft. The only time you won't hear the altitude warning is if you have your gear down, or you disabled "Bitchin' Betty". When doing low-altitude operations, you will definitely want to consider lowing this altitude or disable the VMS warnings.

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

ICP Secondary Buttons (Shortcuts)…

Steerpoint Page STPT (Secondary Number Key 4)



Again, the STPT page appears similar to the AF version, but has some significant changes. You still use the ICP numeric keypad to enter the LAT/LNGs, and RCL/ENTR to accept the new data entries. The following will provide more details:

Punching "4" on the ICP brings the pilot to the Steerpoint (STPT) page. The scratchpad asterisks will initially be at the top as seen above. The pilot may punch another number (4, Enter) to select a different steerpoint as the current steerpoint. All steering cues will update to reflect the new selection (#4 in this example). The pilot may "dobber" down with the Data Control Switch (DCS) to each individual field on the page and edit it as desired –latitude, longitude, elevation and Time On Station (TOS). Note that while editing the lat/long, the pilot will see immediate feedback from his steering cues (tadpole, STPT diamond, ETE/ETA, bearing/distance, etc) in the HUD and in heads-down displays since the STPT he is editing is his current steerpoint. Elevation may be edited as well, but it does not function like the real aircraft. In the real aircraft, the elevation is the MSL elevation of the steerpoint. In the Falcon 4 world, this elevation field is the MSL elevation that the aircraft was designated to fly at to this steerpoint as directed by the campaign/TE flight plan generator. The pilot may also toggle auto steerpoint sequencing (AUTO) on and off (MAN) by dobbering right to SEQ on the steerpoint DED page. With auto steerpoint sequencing, the system will automatically increment the steerpoint when the aircraft is within 2 miles of the steerpoint and the range is increasing. Auto steerpoint sequencing is indicated on the CNI page with a letter "A" displayed next to the current steerpoint. Nothing is displayed when in manual sequencing. See your IP for any specific questions regarding the STPT page.

Cockpit Familiarization

ICP Secondary Buttons (Shortcuts)…

CRUS Page (Secondary Number Key 5)

You can access the CRUS page by pressing the 5 on the ICP numeric keypad. The CRUS stands for Cruise Management, which is where information about fuel efficiency and predicative fuel states is displayed. Within the CRUS page, there are 4 sub pages, continue pressing the 5 key on the ICP to access them:

RNG (Range)
Shows the current waypoint, how much fuel you will approximately have when you reach I, and wind information.

HOME (Homeplate – Steerpoint 1)
Shows the same info as the RNG page plus the optimum cruise altitude for your HOME waypoint.

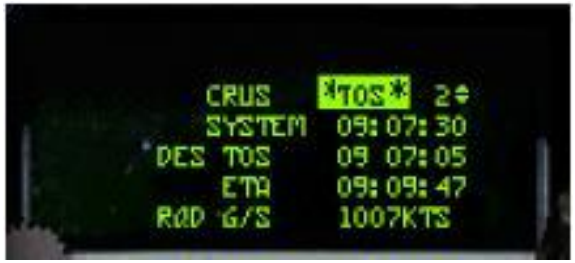
EDR (Endurance)
Shows the time left until bingo with optimum speed (mach#) in relation to fuel (bingo). Steerpoint selection does not effect this but bingo setting does. Wind information included.

TOS (Time on Steerpoint)
Shows your current waypoint, system (or if running, HACK) time, time left until reaching the current waypoint, estimated waypoint arrival time, and the required (approximate) ground speed to reach the waypoint on time. Push SEQ button, or Secondary 1-9 to cycle the pgs

RNG DED Page

HOME DED Page

EDR DED Page

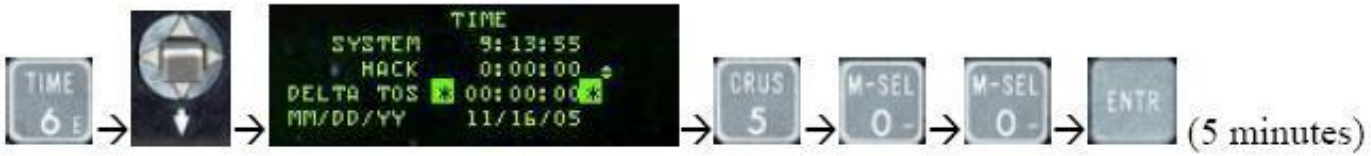


TOS DED Page

Cockpit Familiarization

ICP Secondary Buttons (Shortcuts)…

TIME Page (Secondary Number Key 6)



Hitting 0- designates a negative value.

Original TOS
9:33:33
9:38:15
9:44:21
9:46:18
9:49:44
9:51:37
9:55:45
9:58:55
10:00:00

New TOS
9:38:33
9:43:15
9:49:21
9:51:18
9:54:44
9:56:37
10:00:45
10:03:55
10:05:00

The Time page includes the system time, a hack clock time, a delta time on station and the month/day/year.

The hack clock may be started or stopped by using the INC/DEC switch . The DELTA TOS value allows you to adjust all destination TOS with one entry to accommodate changes in takeoff and/or rendezvous times. By dobbering down to the DELTA TOS field, enter the delta time to any steerpoint. If required, press the 0- key prior to your entry to designate it as a negative value. Press ENTR to apply the DELTA TOS to all TOS.

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

ICP Secondary Buttons (Shortcuts)…

MARK Page (Secondary Number Key 7)

Cursors moved out of the way yields "x".

Setting Markpoints

The mark function (7 on the ICP) allows the pilot to store and display up to 5 steerpoints for reference, later access and employment. Mark points are stores in STPT 26-30. The pilot can use it to mark downed airmen, mark targets by flying over them, or use sensors such as the radar to mark targets or points of interest. There are currently two submodes available for employment—OFLY (overfly) and FCR (radar).

Upon hitting 7, the system will take an OFLY mark. If the pilot hits ENTR while the mark page is still called up, the coordinates will update with the new location. If the AG radar is called up and the Original TOS pilot dobber's right to "FCR" on the MARK page, presses ENTR, the system will take an FCR mark at the position of the AG radar cursors. A small, yellow "x" appears on the HSD. In the air-to-air mastermode, only the OFLY mark is available. HUD and TGP marks are not implemented at this time

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

ICP Secondary Buttons (Shortcuts)…

FIX Page (Secondary Number Key 8)

Permits selection of sensors to update INS position (N/I).

A-CAL Page (Secondary Number Key 9)

Used to update system altitude and/or INS position (N/I).

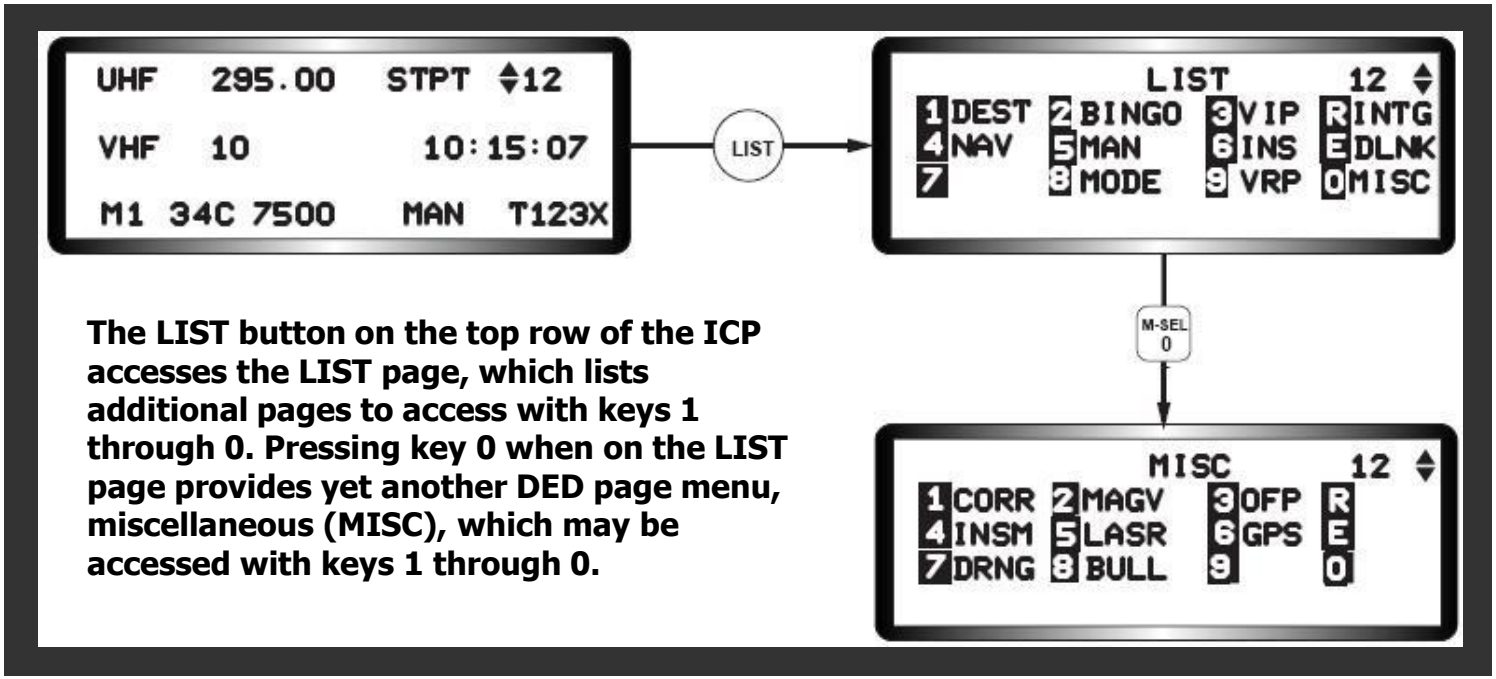
FIX DED Page

A-CAL DED Page

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

DED LIST Menu…



The LIST button on the top row of the ICP accesses the LIST page, which lists additional pages to access with keys 1 through 0. Pressing key 0 when on the LIST page provides yet another DED page menu, miscellaneous (MISC), which may be accessed with keys 1 through 0.

The following slides will cover the basics of each option in the LIST menu of the DED.

DEST - Destination (1)

Displays the GPS coordinates of the selected steerpoint. Use the ICP Increment/Decrement (PREV/NEXT) button to change the selected steerpoint. The steerpoint coordinates may be changed using the secondary buttons. Enter the GPS coordinates of the new steerpoint destination and press enter to implement the change.

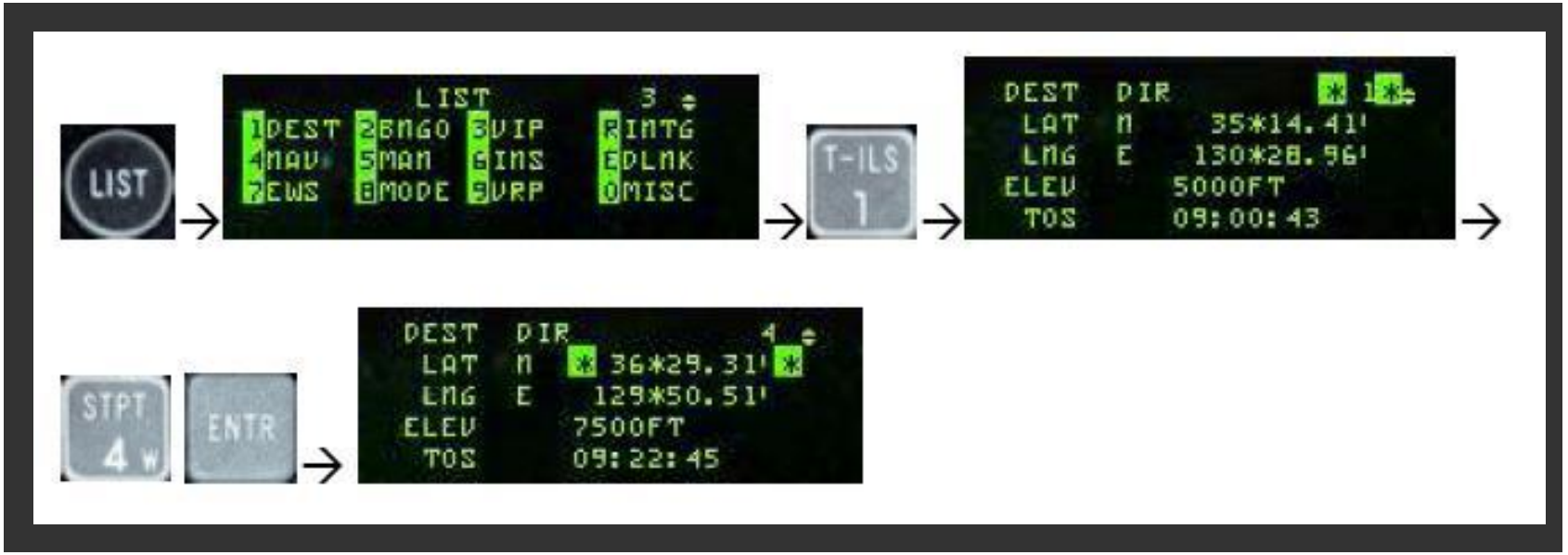
DEST DED Page

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

DED LIST Menu…

DEST - Destination (1) Cont'd



The Destination (DEST DIR) DED page is nearly identical to the STPT page (accessed by hitting the 4 Secondary botton on the ICP numeric keyboard). The only difference between the two is that the DEST page must be used to observe and/or change coordinates of a particular steerpoint without affecting navigation to the current steerpoint.

Cockpit Familiarization

DED LIST Menu…

BINGO (2)

Sets the BINGO Fuel warning level (when you will get a warning of your fuel state - like a reminder). It can be set using the number buttons on the ICP. Push the ENTR button to implement the changed warning level

BINGO DED Page

VIP - Visual Initial Point Page (3)

Set location information for the Visual Initial Point (VIP). Enter a Visual Initial steerpoint for the target steerpoint (the target waypoint needs to be the active steerpoint)

VIP DED Page

NAV (4)

Displays and controls FCC NAV Filter operation and some GPS functions. Not implemented.

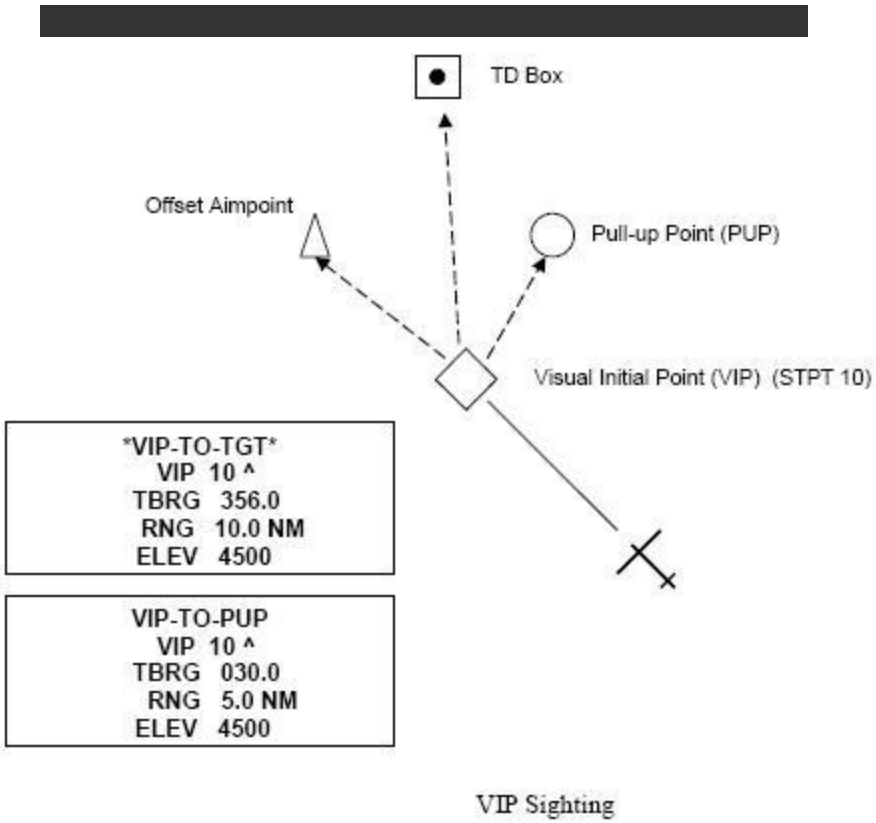
NAV DED Page

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

ICP Secondary Buttons (Shortcuts)…

VIP - Visual Initial Point Page (3)



Visual Initial Point Sighting. Visual initial point (VIP) sighting is used in preplanned submodes to plot a target on the HUD at a true bearing and range from a visually identifiable overfly point. Overfly updates to the SPI and HUD slews are not implemented. The VIP sighting mode also allows for an unknown target position to be referenced from a known position (steerpoint) during a mission. By preplanning the IP, bearing, range, and elevation can be entered while airborne to define the target.

While in VIP, navigation steering to the IP is provided via the HSI and the azimuth steering line to the target on the HUD. Cursor zero reverts the system solution back to the original navigation solution if cursor slews are made. Bearing, range and elevation data for the IP may be entered by pressing LIST3 on the ICP. VIP is mode-selected by placing the scratchpad asterisks on "VIP-TO-TGT" and pressing "0". Offset aimpoints and IP sighting may be used simultaneously.

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

DED LIST Menu…

MAN – Manual Gun Funnel Adjustment (5)

Set the manual ballistics for the gun using the DED scratchpad. Valid data entries change the size of the gun funnel to match the wingspan of known threats. The default is 35 feet, an effective setting for small to medium fighters (e.g. MIG-29)

MAN DED Page

Aircraft	Span (ft)	Aircraft	Span (ft)
A-10	58	F-111	48
F-14	51	F-15	43
F-16	31	F-18	38
F-4	39	F-5	27
MiG-21	24	MiG-23	37
MiG-25	46	MiG-29	36
MiG-31	46	Su-24	44
Su-25	51	Su-27	42

The above chart displays the wingspan of most of the threat aircraft you may face in F4.

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

Data Entry Display (DED)…

INS – Inertial Navigation System (6)

The first line displays the align time/status, RDY mnemonic, and steerpoint. The other lines display your current GPS coordinates, heading and groundspeed. Use this page to set your current reference coordinates before aligning the INS.

This isn't needed on normal ramp start (as the coordinates are already programmed into the system, but may come in handy to manually reprogram the coordinates after a full system shutdown and restart on another base.

INS DED Page

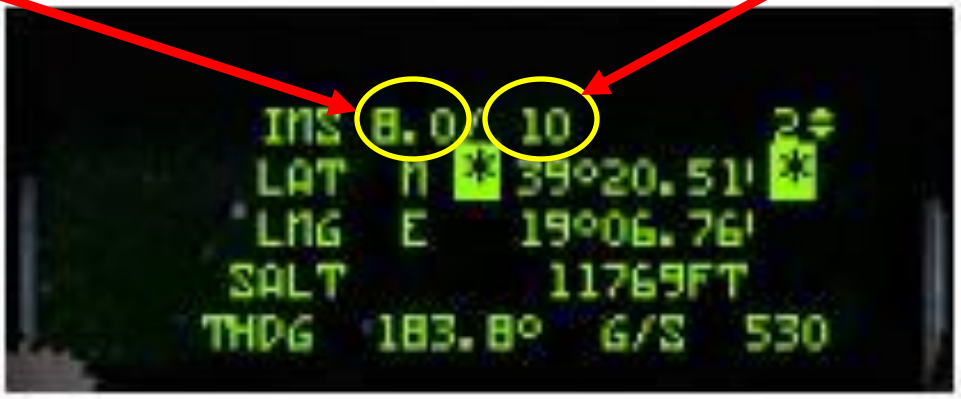
INS Alignment Time

This number shows the elapsed time of your INS alignment shown in minutes. Once you start your aircraft's alignment (by hitting NORM on the avionics panel), this number will start at 0.0 and increase to 8.0 climbing 1.0 minute at a time. Your aircraft is aligned once it reaches 8.0. It's important you know how to access the INS page because your flight lead may need to know the status of your aircraft's alignment during the ramp start procedure. If none of what I wrote above makes sense to you, don't worry. It will be described in detail later in this presentation.

More details on INS Alignment later in this presentation…

INS Alignment Status

The 10 below represents the INS alignment status (not the time). A full INS alignment will take 8 minutes and show a status of 10 (the example below shows that the INS is fully aligned because of the 10.



Hit LIST, then 6 on the ICP to see the INS System DED page.

Cockpit Familiarization

Data Entry Display (DED)…

EWS – Electronic Warfare System (7)

Control page for the Electronic Warfare System. Toggling the REQJAM option to ON automatically turns the jammer on when the RWR system detects a radar spike. Set the warning level for expendables by toffling BINGO to ON, then manually set chaff and flare low warning levels. When BINGO is ON, the VMS will call out "Low" when your chaff/flare levels reaches the alarm level set (and in OF it won't let you drop chaff/flare unless you are in MAN mode). REQJAM and BINGO options are toggles with any of the secondary buttons.

EWS DED Page

To create your own chaff/flare programs, use the SEQ button to access the programming mode (you need to set the EWS mode switch to STBY first). The PREV/NEXT button then switches between four different default programs. More info about chaff and flare programs will be covered in following ground school training presentations.

Cockpit Familiarization

DED LIST Menu…

MODE – Mast Mode (8)

The current master mode may be changed through this page should the master mode buttons on the ICP become inoperative. Use the SEQ button to choose the mode you want to change to, then press the 0 button to select it. (You can only choose between A-A and A-G master modes). The active mode is drawn color inverted. Pushing 0 on a selected mode will change the FCC into NAV mode.

MODE DED Page

VRP – Visual Reference Point (9)

Set location information for Visual Reference Point (VRP). Enter a VRP for the target steerpoint (target steerpoint needs to be the active steerpoint).

VRP DED Page

INTG – Interrogation (RCL)

Check or set AIFF modes and code for interrogation (N/I).

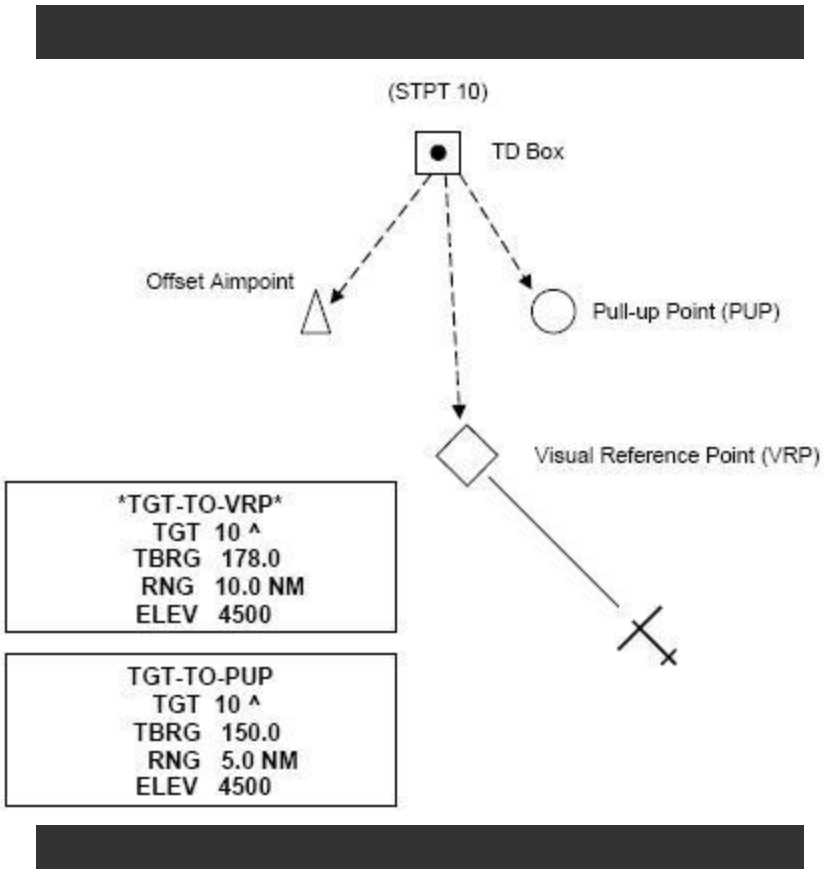
INTG DED Page

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

ICP Secondary Buttons (Shortcuts)…

VRP – Visual Reference Point (9)



Visual Reference Point Sighting (VRP). Visual reference point (VRP) sighting mode is used in preplanned submodes to plot a reference point on the HUD as a true bearing and range from the target. This allows the utilization of a known, visually identifiable position, or RP point, to initiate an attack. Again, overfly updates to the SPI and HUD slews are not implemented. Pull-up Point (PUP) TD Box Offset Aimpoint Visual Initial Point (VIP) (STPT 10). While in VRP, navigation steering is provided to the target via the HSI and via the azimuth steering line on the HUD.

Initially, the sighting point rotary is on TGT. While in VRP, the steerpoint defines the target and the RP is defined as a bearing and range from the target and an elevation (remember, use "0"). Bearing, range and elevation data for the RP may be entered by pressing LIST9 on the ICP. VRP is mode-selected by placing the scratchpad asterisks on "TGT-TO-VRP" and pressing "0". Offset aimpoint and RP sighting are available simultaneously.

N/I = Not Implemented in F4 (Not Operational)

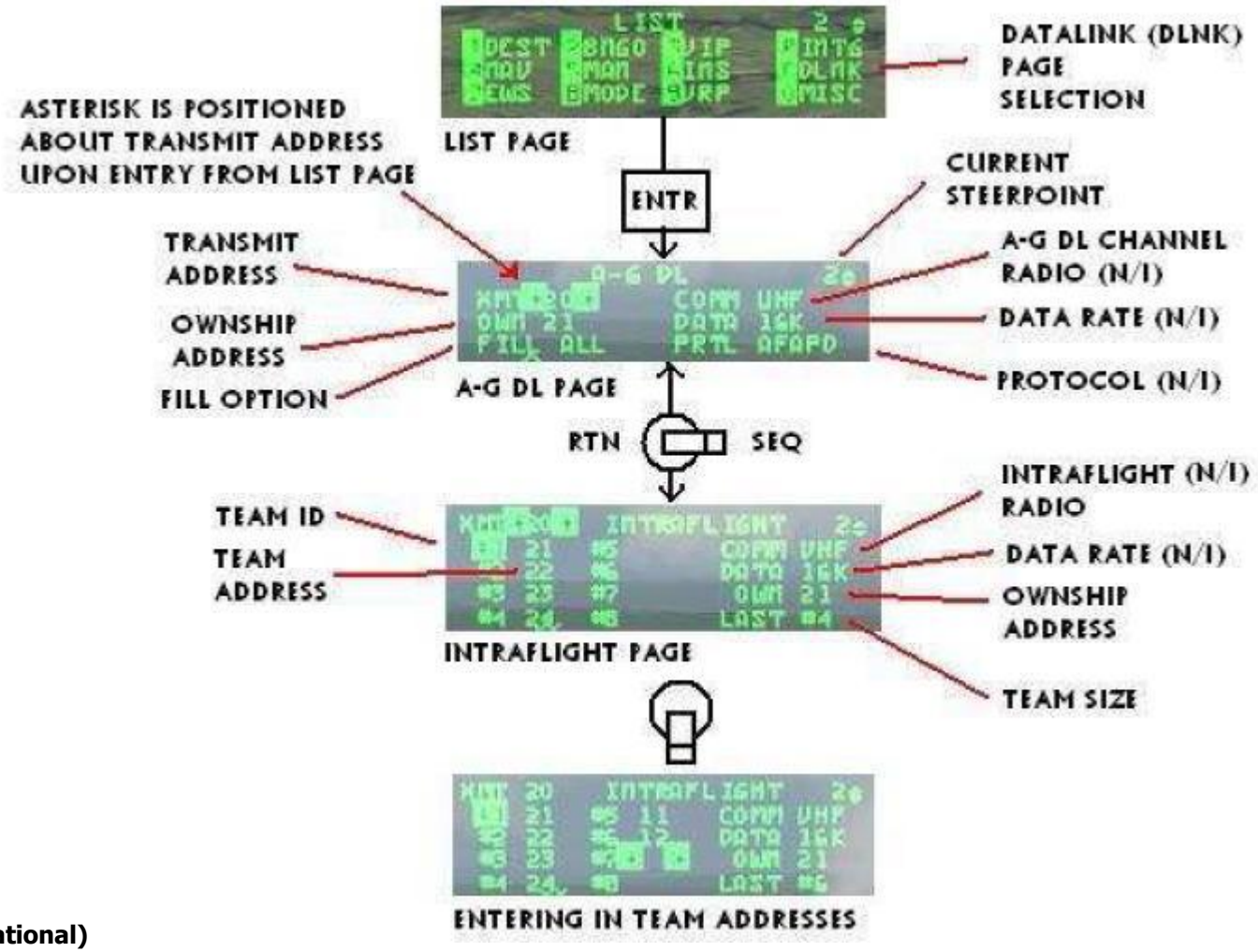
Cockpit Familiarization

DED LIST Menu…

DLINK – Data Link (ENTR)

Your datalink is a secure radio channel that allows your aircraft to send and receive information to other aircraft, and supporting blue forces. This page will show your datalink address, and by hitting the SEQ button, will allow you to enter additional datalink address (see Puki's datalink video tutorial for more info on DL in OF).

What's important to know now is how to get to the datalink page in the LIST menu – by hitting LIST then ENTR on the ICP.



N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

DED LIST (Misc) Menu…

MODE – Mast Mode (0)

By hitting O (MISC) when you are in the LIST menu, the DED will display an additional menu.

MISC DED Menu Page

CORR – Correction (MISC-1)

Allows checking/input of the correction coefficient for the HUD, CTVS, CAMERA and left and right hardpoints (Not functional in F4).

CORR LIST/MISC DED Page

MAGV Magnetic Variation (MISC-2)

Displays the actual magnetic variation at the aircrafts location. This info would be used to correct the INS for positional errors in the real aircraft. (Not functional in F4.

MAGV LIST/MISC DED Page

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

DED LIST (Misc) Menu…

OFP Operational Flight Program (Misc-3)

The Operational Flight Program (OFP) page shows the program numbers for the UFC, FCR, MFDs, FCC, SMS, and DTE (N/I)

OFP Menu Page

ISNM – Inertial Navigation System Memory (MISC-4)

This is the place where INS parameters like drift errors, maintenance data and manufacturer codes are stored (N/I).

ISNM Page

LASR (MISC-5)

Page for setting the targeting pod laser pulse code (N/I) and lasing timer (default setting: lasing begins 8 seconds before impact). In OF or AF you can change the time when the laser begins lasing the target. If you are at higher altitudes I recommend increasing it to 15 seconds or so (more details on this in Mission Qualification Training).

Laser Page

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

DED LIST (Misc) Menu…

GPS Global Position System (Misc-6)

Displays information about the GPS system (N/I)

GPS Page

DRNG – (MISC-7)

Set manual correction to a consistent A-G miss distance (N/I).

DRNG Page

See next page for Misc Menu 8 (MISC-8) - Bullseye

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

DED LIST (Misc) Menu…

BULL – Bullseye* (MISC-8)

The bullseye page is available in the LIST/MISC Menu. Here you can enable/disable the bullseye to show on your MFDs and HUD, by hitting 0.

In OF, the bullseye's default steerpoint is #25. The BE can be changed to any steerpoint. In the example below, the BE is changed to STPT 3 and the pilot sees STPT and BE co-location on the FCR and HSD. Recall that the AI and AWACS will only use the location that is stored in STPT 25 and that the pilot has the possibility of overwriting this location so be careful.

* See the next page for the AF Bullseye page.

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

DED LIST (Misc) Menu…

WPT Page (Misc-9)

Info and settings for Harpoon (Penguin) missile operation. (N/I)

Real F-16 Use of WPT Page:

The P-RDR provides a blind attack capability using FCR radar ground mapping features to identify the target. To initiate a P-RDR attack, the pilot acquires the target on the FCR, refines the target and waypoint cursor positions as necessary, maneuvers to the desired launch conditions, and depresses the pickle button.

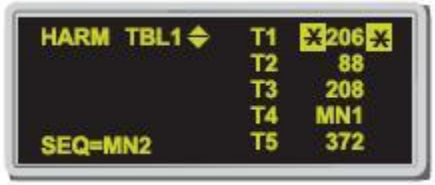
WPT Page

HARM – (MISC-9)

Verify/modify HARM threat table data (N/I).

Real F-16 Use of HARM Page in Real Life:

HARM DED pages are used to view, verify, and modify the three threat tables and the five manual threats used for the HARM mission. The threat tables contain either decimal ID's or manual threats. The decimal ID's (0-999) access threat parameters in the ALIC's database. Manual threats are made up of threat parameters transmitted to the ALIC. Both decimal ID's and manual threat parameters allow the ALIC to compute information necessary for successful launches in the various HARM modes. The two HARM DED page types are the HARM Threat Table and HARM Manual Threat pages.



HARM Page (Real Life)

N/I = Not Implemented in F4 (Not Operational)

Cockpit Familiarization

Center Console Performance Instruments…

MACH Disk – This section of the airspeed indicator displays your MACH speed (the smaller arrow pointing to the exposed center of the gauge). Your MACH speed is also shown in the bottom left of the HUD.

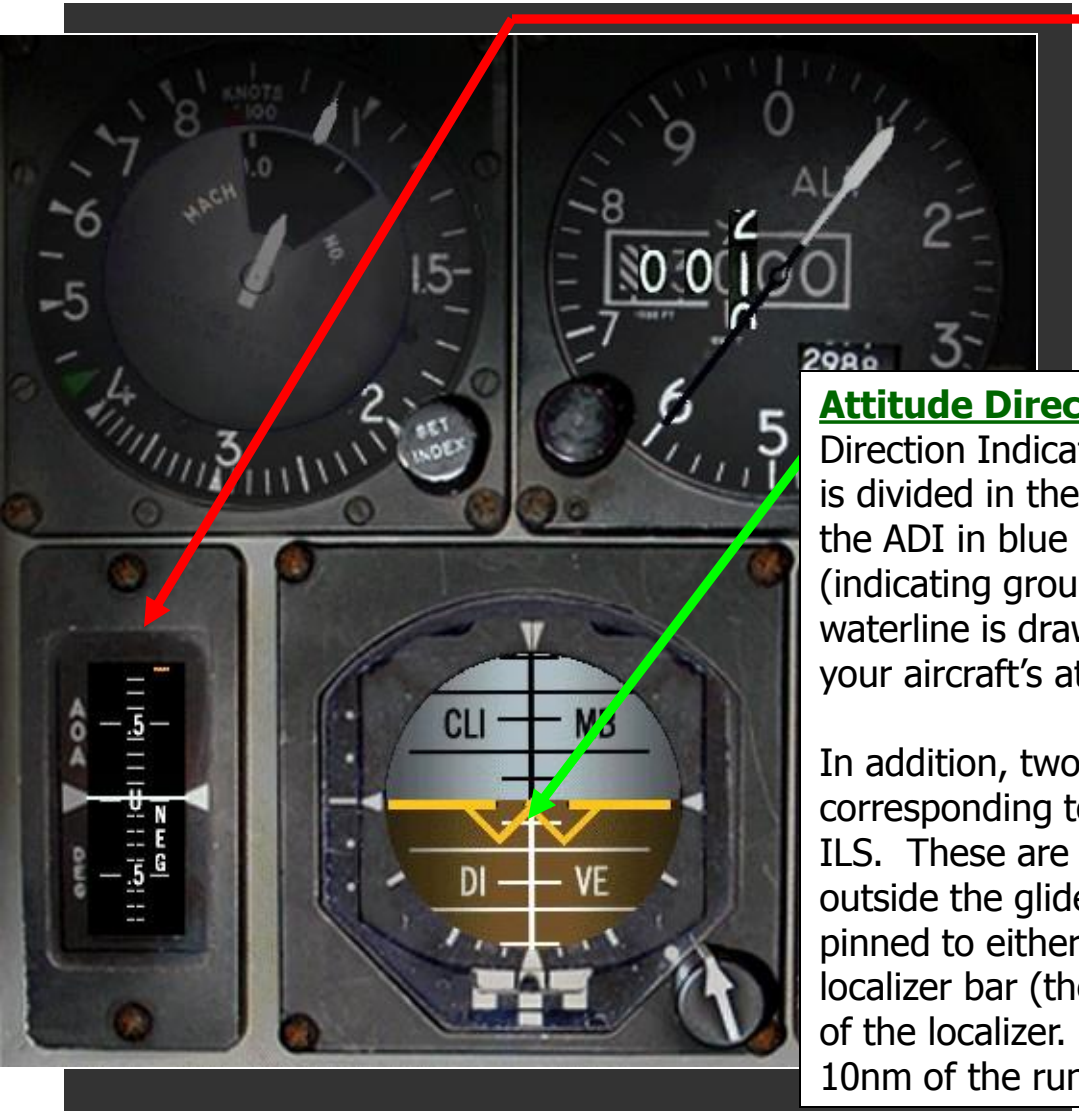
Airspeed/MACH Disk – This indicator, below the ICP, shows the current airspeed with the range from 80 to 800 knots. Read the airspeed on the outside dial. The inside dial within the window shows your current speed as a factor of MACH (the speed of sound). Since MACH varies according to altitude, a MACH value of 1.0 will not always equal the same calibrated airspeed. The orange arrow points to the airspeed value in knots (KCAS).

Altimeter (100 x ft) – The altimeter displays your altitude above sea level (barometric) which can differ from you altitude above ground level (AGL) : Barometric Readings (NOT AGL!!) Dial Numbers are Hundreds Boxed digits are Thousands

Vertical Velocity Indicator (VVI)
Indicates the current rate of descent or climb in foot per minute. Descending flight is represented in Black, and White represents the climbing flight. The VVI has a range of 6,000ft per minute. You can also put a vertical velocity display on the HUD in NAV mode if the altitude tape is displayed and the scales switch is set to VV in the HUD control panel.

Cockpit Familiarization

Center Console Performance Instruments…



Angle of Attack (AOA) Indicator – The AOA indicator displays the current angle of attack numerically on a moving tape (in degrees). The range is +/-32 degrees. The tape is color-coded from 9 degrees to 17 degrees, corresponding to the colors of the AOA indexer. It will also provide a visual warning of a impending stall.

Attitude Direction Indicator (ADI) – The ADI (Altitude Direction Indicator) displays the pitch and roll of the aircraft. It is divided in the center by a horizon line, with the top half of the ADI in blue (indicating sky) and the bottom half in brown (indicating ground). The dividing line matches the horizon. A waterline is drawn across the ADI to provide a reference to your aircraft's attitude.

In addition, two white ILS bars are overlaid on the ADI corresponding to the glide slope and deviation scales used for ILS. These are backups for the ILS HUD mode. If you are outside the glide slope and deviation limits, the bars will be pinned to either side of the ADI out of sight. The side the localizer bar (the vertical bar) is pinned to indicate the direction of the localizer. The ILS bars only function if you are w/in 10nm of the runway.

Cockpit Familiarization

Instrument Mode Selector / HSI / Fuel Quantity Selector

Instrument Mode Selector – (4 position switch):
Selects between TACAN and NAV data. TACAN data refers to signals generated by TACAN beacons on airbases and tankers. NAV data refers to steerpoints, markpoints and datalink points programmed into your navigation system. It has 4 settings.
ILS/TCN - Info to current manually set TACAN station plus ILS deviation bars (Glide Slope Deviation or GSD and Localizer Deviation or LD)
TCN - Info to current manually set TACAN station
NAV - Info for current selected steerpoint stored in flight computer
ILS/NAV - Info for current steerpoint stored in flight computer plus ILS bars

Cockpit Familiarization

Instrument Mode Selector / HSI / Fuel Quantity Selector

HDG:
Calibrate the Compass Rose

Fuel Quantity Selector:
This selector switch allows you to see what you have in the various tanks: by changing the switch, it alters what is shown in the Fuel Quantity gauge. The F-16 has several fuel tanks, and it is essential that they are used correctly, else the whole center of gravity can move around. The engine is fed from reservoir tanks that can sustain fuel flow in high and negative G maneuvers. These in turn are fed from two systems. The forward tank just behind the pilot, which is topped up from the right wing tank, which can be fed from the right external fuel tank. The aft tank feeds the other reservoir, and is fed in turn from the left wing tank, and the external left tank. If a centerline tank is carried, this feeds into both wing tanks.

Fuel Quantity Selector Positions (Changes Needles on Fuel Gauge):

- NORM- The digits show the total fuel, and the two hands show the amount of fuel in the forward/right and aft/left tanks. These hands should be close together otherwise there will be a weight imbalance.
- TEST- Is a test position and the two hands should point to 3000, and the total read 6000.
- RESV- Shows the amounts in Fwd/Aft reservoirs. This is the amount of fuel ready to go to the engine.
- INT WING- Shows amount of fuel in the right/left internal wing tanks
- EXT WING- Shows amount of fuel stored in any external wing tanks
- EXT CENTER- Shows amount of fuel stored in any external centerline fuel tanks

Cockpit Familiarization

External Fuel Transfer & Fuel Quantity Selector

Ext Fuel Transfer:

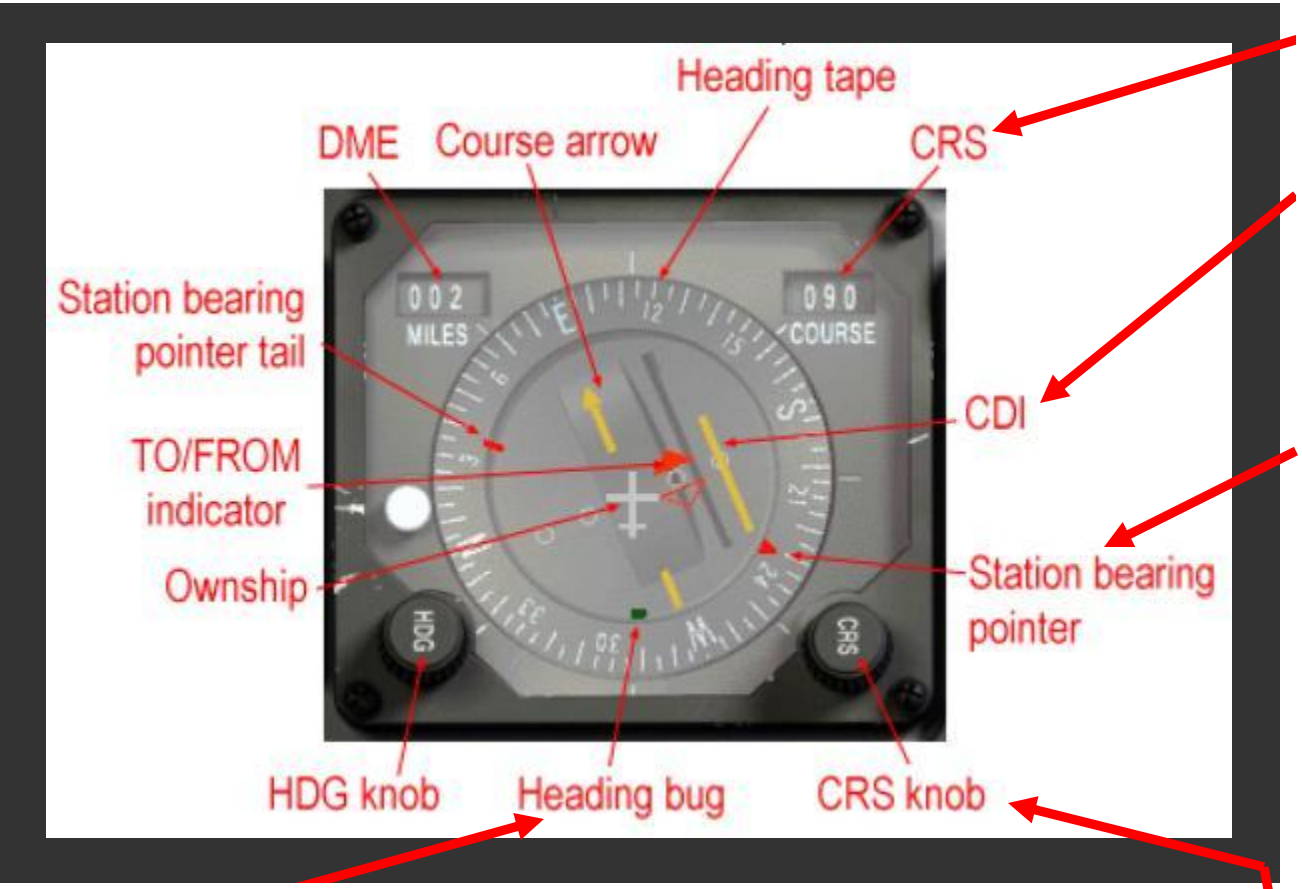
- NORM – Fuel transfer from the center tank first, then from the external wing tanks.
- WING FIRST – Fuel Transfer from external wing tanks first, than from the center tank.

NOTE:

The normal fuel transfer procedure from external to internal is to transfer fuel from the centerline tank first, then from the external wing tanks. However, this may be overridden by setting the fuel transfer switch to WING FIRST.

Cockpit Familiarization

Horizontal Situation Indicator…



Course

Enter desired course here.

Course Deviation Indicator

Gives the position of the selected radial relative to the position of your aircraft.

Station Bearing Pointer

Points directly to the selected station. This arrow is really interesting both for the beginner and the advanced user. Firstly it clearly gives the bearing to the station and for the most advanced user it can be used as an ADF (Automatic Direction Finder) able to track a virtual NDB.

Heading Bug

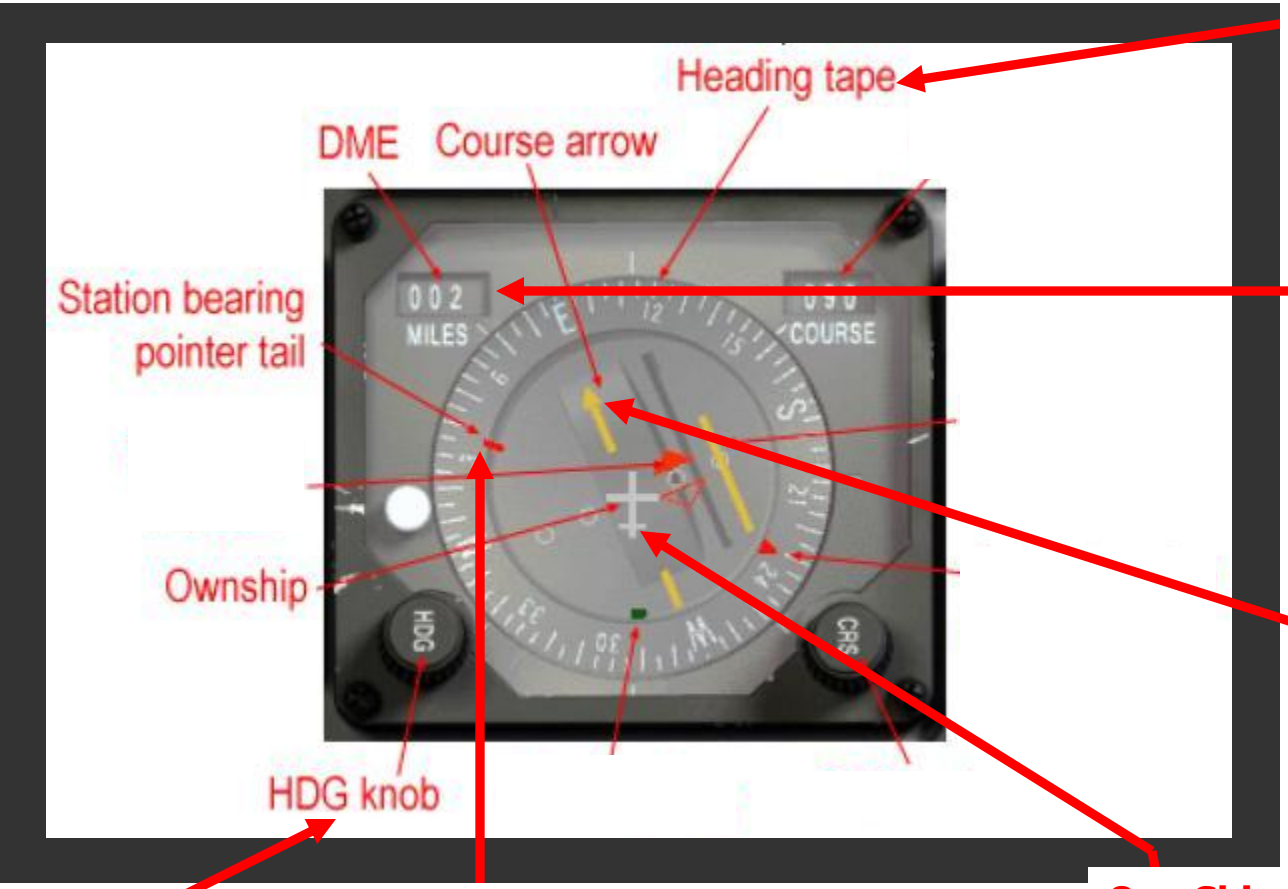
Moves accordingly to the HDG knob. It's a reference heading that is used by the autopilot system in ROLL HDG SEL mode. It can also be used as a reminder of headings (wind corrections, …) when you don't use the autopilot.

CRS Knob

Set the desired radial

Cockpit Familiarization

Horizontal Situation Indicator Cont'd…



Heading Tape

Gives your heading on the 12 o'clock position.

Distance Measuring Equipment

Gives slant range between you and the selected station or steerpoint.

Course Arrow

Points to the selected course on the heading tape.

Heading Bug

Allow to set the heading bug on a selected heading.

Station Bearing Pointer Tail

That's the tail of the red pointer, giving the reciprocal heading of the station bearing.

OwnShip

God's eye view of your aircraft.

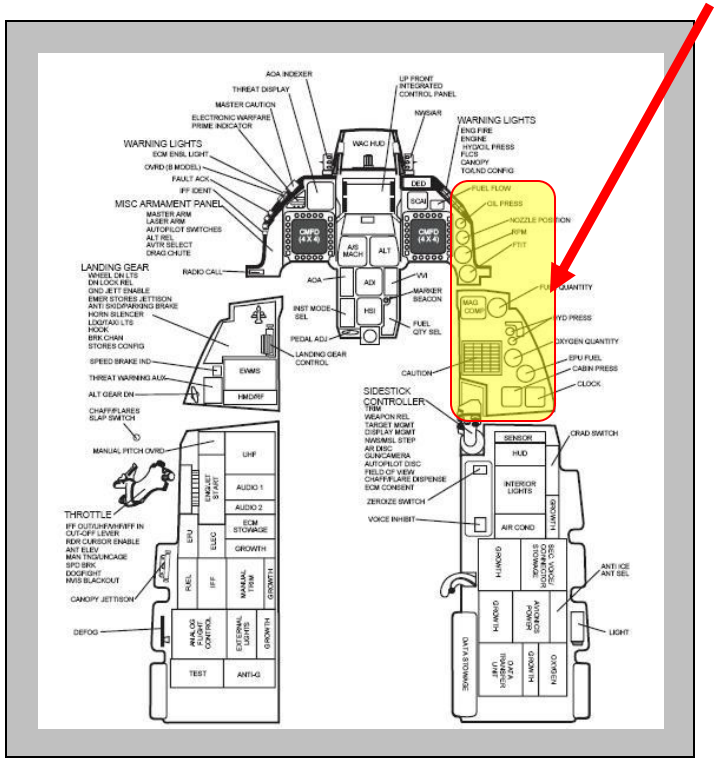
NOTE:

Don't worry about knowing what everything means on the HSI. We will cover it in much more detail in later GT presentations.

Cockpit Familiarization

Starboard AUX Console…

Cockpit Guide – Port AUX Console



The Starboard (Right) AUX Console has some important features of the F-16 cockpit, such as the Fuel Gauge, Warning/Caution Panel, and back up clocks and compasses. The following slides will identify and describe each of its features.

Starboard (Right) Aux Console

Compass – Basic compass in case you loose HUD
Fuel Gauge – Display total fuel (internal & external) via the numbers, and needles display fuel for selected fuel store.
Hydraulic Pressure – Hydraulic Pressure (A/B)
Oxygen Meter (O_2) – Oxygen in liters
EPU Fuel Meter – Displays EPU fuel indicator
Cabin Pressure – Cabin Pressure (in 15psi=nominal)
Clock – Clock (red=hrs, grey=mins, yellow secs

Cockpit Familiarization

Starboard AUX Console Cont'd…

Oil Pressure – The oil pressure indicator displays engine oil pressure, ranging from 0 to 100 psi (pounds per square inch). If the pressure drops below 15 psi, you have a serious oil pressure leak. If the pressure is too high or too low, the Right Eyebrow Oil Pressure Caution Light is illuminated.

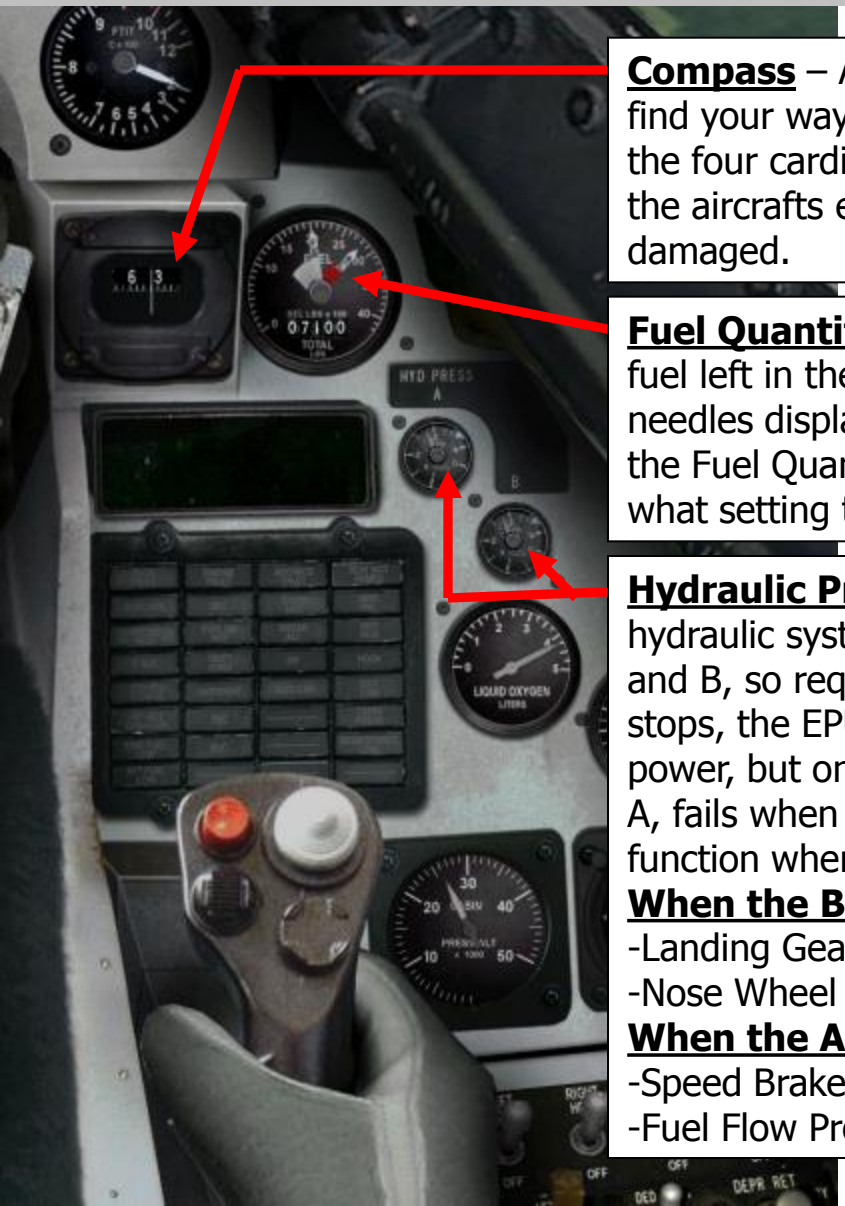
Nozzle Position Indicator – Displays the position of the engine nozzle. The indicator will be mostly open at idle, closed at Mil power (100% thrust but no afterburner), and fully open at full afterburner. Its important to watch this indicator to make sure you are not in afterburner when you don't want to be. If it starts to move, you are in burner wasting a lot of fuel.

Revolution Per Minute (RPM) Indicator – Displays the engine Revolutions Per Minute. RPM is expressed as a percentage from 0% to 100%. 100% is the equivalent of full military power (in which the throttle is at the top detent, before afterburner).

Fan Turbine Inlet Temperature Indicator – Shows the Fan Turbine Inlet Indicator. This should be below 700 degrees C during normal operations. If this gets in the red lines (area), then you are in trouble and should refer to the Emergency Procedures Checklist).

Cockpit Familiarization

Starboard AUX Console Cont'd…



Compass – A backup compass in case you loose the HUD (very helpful to find your way home w/ a wounded bird!). It is marked N, E, S, and W for the four cardinal directions with markers every 30 deg. Since it's not tied to the aircrafts electrical systems, it will function even if your HUD or HSI is damaged.

Fuel Quantity Indicator – The numbers at the bottom display the total fuel left in the aircraft (total of all fuel stores internal or external). The needles display the remaining fuel in the fuel stores you have selected using the Fuel Quantity Selector (the needle position will change depending on what setting the Fuel Quantity Selector is on – Int Wing, Ext Wing, etc..)

Hydraulic Pressure A/B – Two dials show the pressure in the A and B hydraulic systems. These two independent systems are served by both A and B, so required a double failure to affect them. If the main engine stops, the EPU will activate automatically, and provide emergency hydraulic power, but only to the A systems. The primary hydraulic system, Hydraulic A, fails when the EPU shuts down. None of the aircraft control surfaces function when both systems are down.

When the B hydraulic system fails, the following will fail:

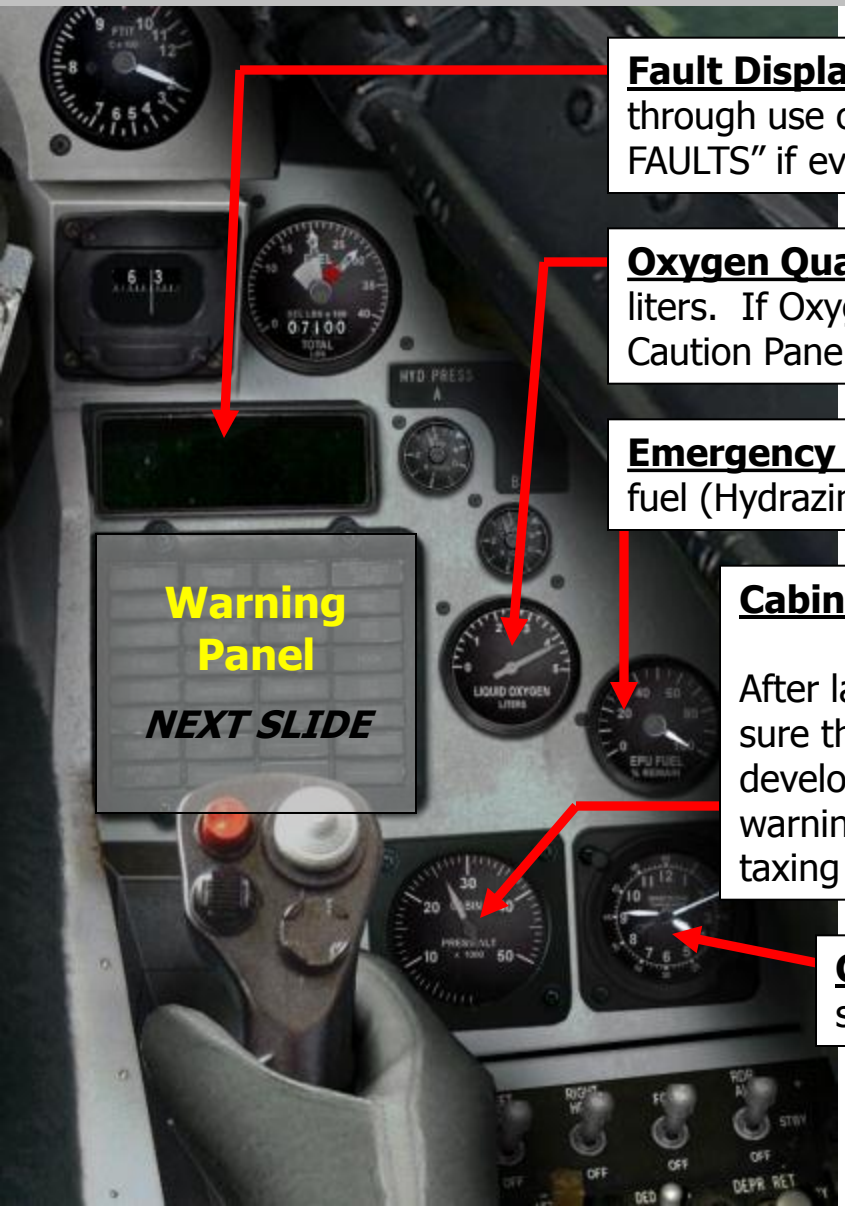
-Landing Gear	-Drag Chute System	-Air Refueling	-JFS
-Nose Wheel Steering	-Gun	-Wheel brakes	

When the A hydraulic system fails the following system will fail:

-Speed Brakes
-Fuel Flow Proportioner

Cockpit Familiarization

Starboard AUX Console Cont'd…



Fault Display – Displays information about system status and faults through use of the F-ACK button on the Left Eyebrow. Will display "NO FAULTS" if everything is operating correctly.

Oxygen Quantity Indicator – Shows the remaining Oxygen supply in liters. If Oxygen levels run low then the "OXY LOW" warning light on the Caution Panel will illuminate.

Emergency Power Unit (EPU) – Displays the remaining quantity of EPU fuel (Hydrazine).

Cabin Pressure – Indicates the current Cabin Pressure in feet.

After landing and before the canopy is opened, the pilot must make sure that the inside/outside pressures are equal. If the canopy develops a leak or the canopy is not closed, the CABIN PRESS warning light will illuminate. Always check the Caution Panel before taxing to ensure there or no faults or warnings.

Clock – Backup clock in case you loose any of your primary systems, such as the DED, HUD, or MFDs.

Warning Panel (Caution Panel Illuminator Lights)

The caution light panel contains a number of lights that, when lit, indicate problems with onboard systems. Whenever one of these lights comes on, the Master Caution lamp will also be lit. Turn off the Master Caution lamp by clicking it or pressing CONTROL+C. Below and on the following slides, we will explain what each light means when it's illuminated.* - **See GT-1.2 Normal & Emergency Procedures for details on what to do when a specific light is illuminated.*

FLT CONT SYS	ENGINE FAULT	AVIONIC FAULT	SEAT NOT ARMED
Failure in FLCS control system (aircraft handling will not act correctly)	The caution light indicates that there is a loss of valid data to the engine. This will result in loss of some or all your engine capabilities.	This indicates a general fault with the system avionics or FLCS. You'll have to examine the other caution or warning lights to determine additional details about the problem.	The ejection seat is not armed

Warning Panel (Caution Panel Illuminator Lights)

ELEC SYS	SEC	EQUIP HOT	NWS FAIL
A failure in the electrical system somewhere. Check the electrical panel for more information.	You're running in secondary engine controls	Some of the avionics equipment is not being cooled sufficiently.	When this light is illuminated, it means that the nose wheel steering system has failed. You will have no ability to steer the aircraft while on the ground.

PROBE HEAT	FUEL/OIL HOT	RADAR ALT	ANTI SKID
The probe heat is not working, this may give an invalid air speed.	The fuel oil is hot.	This light indicates a malfunction of the radar altimeter. If it is lit, you won't have a functional radar altimeter (including the AL display on the HUD). You still have the use of the barometric altimeter for altitude data.	The anti skid on the breaking system is not functional.

CADC	INLET ICING	IFF	HOOK
The CADC (Central Air Data Computer) has had a problem.	Failure of the probes or related wiring/hardware to the inlet anti/deicing system.	If there is an IFF fault, other aircraft may not be able to identify you electronically.	The F-16 hook that is used only in emergency landings. Normally, the hook is in the up position. When this caution light is illuminated, the hook is not up and locked

Warning Panel (Caution Panel Illuminator Lights)

LE FLAPS	OVERHEAT	NUCLEAR	OXY LOW
There is a malfunction with the leading edge flaps.	The engine is overheating. Reduce throttle to minimum needed to fly and land as soon as possible. Your engine will eventually explode if problem persists.	Problems in the nuclear release circuitry.	The onboard oxygen system is running low.

ATF NOT ENGAGED	EEC	ECM	CABIN PRESS
Automatic Terrain Following System malfunction	Alternator has failed.	Failure of ALQ-61 Jammer Pod.	Failure of cabin pressurization system (close the canopy!)

FWD FUEL LOW	BUC	———	———
This indicates that you have reached a specific minimum fuel status in the forward tanks. The Fuel Low light will come on when you have 400lbs of fuel left in the front tanks. Check to see if this condition is caused by a fuel leak due to damage.	The engine is running in using the backup fuel control system. You have to be very careful with the throttle controls as there is no longer a computer looking after your inputs.	Nothing	Nothing

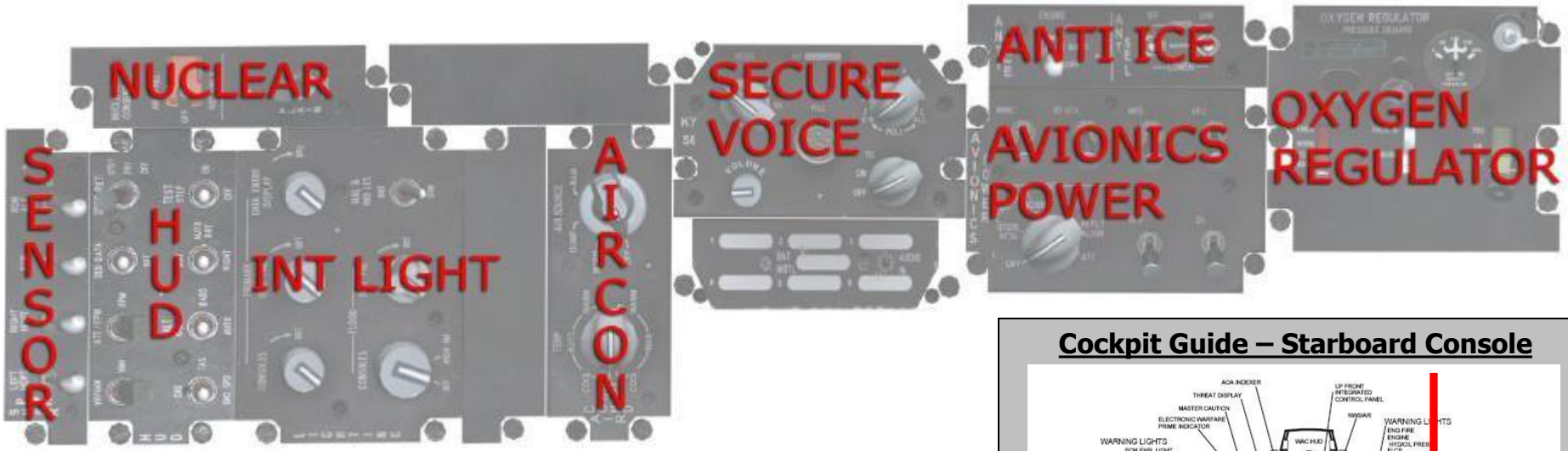
Warning Panel (Caution Panel Illuminator Lights)

AFT FUEL LOW	STORES CONFIG	-------	-------
This indicates that you have reached a specific minimum quantity fuel status in the real tanks. The Fuel Low light will come on when you have 250lbs of fuel left in the rear tanks.	The CAT I or CAT II stores config is in the wrong setting for the stores loaded.	Nothing	Nothing

Cockpit Familiarization

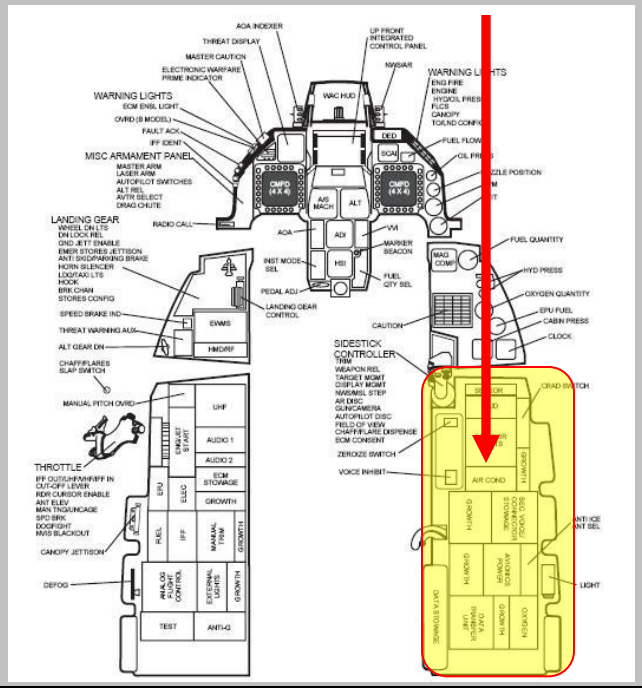
Starboard Console…

Right Console Overview



Sensor – Hardpoints and radar altitude settings
HUD – HUD display settings
Int Light – Internal cockpit lights (toggle on/off)
Nuclear – Nuclear consent switch (N/I)
Air Con – Air conditioner and air flow settings
Secure Voice – N/I (in OF or AF)
Anti Ice – Anti-Ice Settings (duh!)
Avionics Power – GPS, Datalink, INS, etc… Settings (very important)
Oxygen Regulator – Oxygen for the pilot's mask (N/I)

Cockpit Guide – Starboard Console



Cockpit Familiarization

Starboard Switch Group (Part I)…

RDR ALT Switch:

Options:

ON
STBY
Off

On – Radar altitude is on and therefore displays your AGL altitude.

Off – Radar altitude is off

FCR Switch:

Options:

ON
Off

On – Fire Control Radar (FCR) is on

Off – Fire Control Radar is off

Right Hardpoint Switch:

Options:

ON
Off

On – If on the right hardpoint is active (meaning weapons data from that hardpoint is communicating w/ the weapons systems (ordnance can be deployed)).

Off – Right hardpoint is off

Left Hardpoint Switch:

Options:

ON
Off

On – If on the left hardpoint is active (meaning weapons data from that hardpoint is communicating w/ the weapons systems (ordnance can be deployed).

Off – Fire Control Radar is off

Cockpit Familiarization

Starboard Switch Group (Part II)…

DPR RET Switch (Manual Bombing)

Options:

STBY
PRI
Off

DED Data Switch:

Options: DED Data/Off

- DED Data position shows DED data on HUD

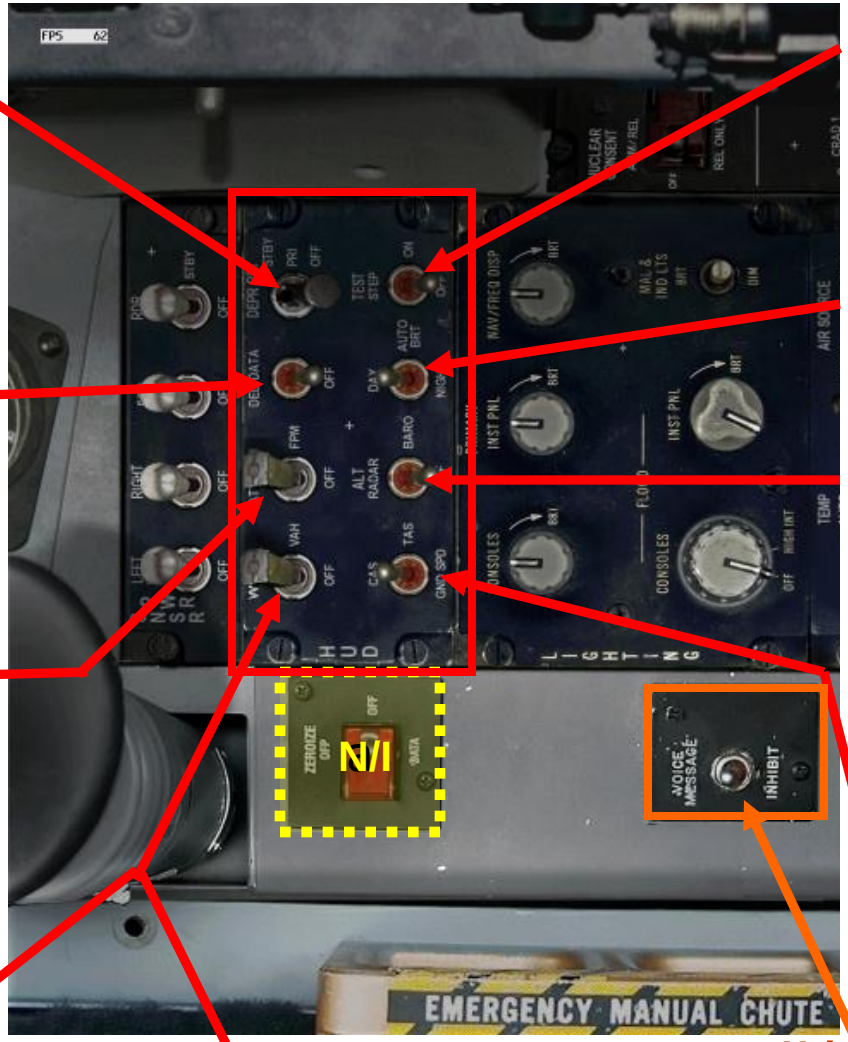
Flight Path Marker Switch

Options: (ATT/FPM/OFF)

- ATT - Pitch bars and FPM on HUD
- FPM - No pitch bars
- Off - no pitch bars or FPM

SCALES Switch

- VV/VAH - Vert. Velocity, Altitude and heading on HUD in NAV mode only
- VAH - Altitude and Heading tapes only
- Off - Removes tapes – discrete data only



Test Switch

- Step
- On
- Off

Brightness Control Switch

- For HUD. Select DAY, NIGHT or AUTO brightness.

Altimeter Switch

- RADAR - Radar altimeter
- BARO - Barometric altimeter True airspeed
- AUTO -selects radar when <1500' AGL and Baro when above 1500' AGL

Velocity Switch

- CAS - Calibrated Airspeed
- TAS - True airspeed
- GND SPD - Ground speed

Voice Inhibit

- INHIBIT – Turns off "Bitchin Betty" warnings sounds

Cockpit Familiarization

Starboard Switch Group (Part III)…

Internal Cockpit Lights

Lights On/Off

- To turn the internal cockpit lights on, turn all of these switches on (turn them all off to turn them off).
- **Instrument Panel Lights** – Dimmer control for instrument panel
- **Navigational and Frequency Display** – Dimmer control for Navigational and Frequency Displays.
- **Console Floods –** Dimmer control for Console Lights over floodlights
- **Instrument Panel Floods –** Dimmer control for instrument panel lights over floodlights.
- **Malfunction and Indexer Lights –** BRT – Malfunction and indexer lights to max brightness, CENTER – Spring-loaded center, DIM – Dimmer malfunction and indexer lights

Air Conditioner:

- Not operational in F4

Air Source:

- **Off** – Engine bleed air valves close. All air-conditioning, cooling and pressurizing functions shut off, including anti-g suitt, canopy seal and fuel tank pressurization.
- **Norm** – Air-Conditioning system set for automatic temperature and pressure regulation.
- **Dump** – Cockpit pressure Dump valve opens to atmospheric pressure. Conditioned air ventilates cockpit and performs all other systems functions.
- **RAM –** Engine bleed air valves close. All air-conditioning, cooling and pressurizing functions shut off, including anti-g suit, canopy seal and fuel tank pressurization. The ram air valve opens to admit ram air to ventilate the cockpit and avionics equipment.

Cockpit Familiarization

Starboard Aft Switch Group (Part I)…

MMC Power Switch

Fire Control Computer

Inertial Navigation (INS) System Knob

Purpose - INS alignment needed for accurate navigation.

- **OFF** – Power off the Internal Navigation System
- **STOR HDG** – N/I
- **NORM** – Normal alignment requires 8mins for a full gyrocompass alignment. If a pilot cannot wait for a full alignment, he may switch to the NAV mode after approximately 3 mins, then once airborne select IN-FLIGHT ALIGN and wait for the cue in the HUD showing alignment is complete.

Anti-Ice – ON – The inlet heater turns on, AUTO – Seventh-stage bleed air is directed to the fixed inlet guide vanes and nose cone when engine icing is detected, OFF – Electrical power closes the engine anti-ice valve.

Antenna Selector – **IFF** UPPER – Select the upper IFF Antenna, NORM – Auto select the IFF Antenna that is receiving the strongest signal, LOWER – Select the lower IFF Antenna
UHF Upper – Select the Upper UHF Antenna, NORM – Auto select the UHF Antenna that is strongest signal, LOWER – Select lower UHF Antenna

INS Status in HUD – It flashes ALIGN RDY when INS alignment is complete

- **NAV –** Once your INS is aligned (after 8 mins) and you see the INS ALIGN flashing on the bottom right of your HUD, you switch the INS knob to NAV.
- **IN FLT ALIGN** – The INS may be aligned inflight, however its designed for get-home capability only (it's not the best way to align the jet). However, it will take much longer then the a standard alignment (NORM). To use it:

1. Set your INS knob to NORM
2. Wait until 3 mins (3.0 on INS status), then switch to NAV
3. Switch to IN FLT ALIGN once airborne and wait for alignment.

Cockpit Familiarization

Starboard Aft Switch Group (Part II)…

MFD Power Switch
Enables (Turns On) Multi-Function Display

UFC (Up Front Controls)
Up Front Controls Power Switch

Oxygen Regulator –
EMERGENCY - Set oxygen pressure to emergency.
NORMAL – Set oxygen pressure to normal
TEST MASK – Test the oxygen mask
SUPPLY ON/OFF – Set oxygen care on/off
OXYGEN – Set the oxygen interest

ST/STA Power Switch
Stores Station System

Inertial Navigation (INS) System Knob Cont'd

STOR HDG – The Stored Heading alignment is used whenever a faster than normal alignment is needed, for example, when the operating from an alert status (scramble). The alignment is performed using a previously computed true heading and should take approximately 1 ½ minutes.

Datalink
Link (must be ON to see wingman data linked information in your HSD)

DL – Power on the Datalink (DL), required to Datalink wingman positional data and JSTAR updates

OFF – Power OFF Datalink

ATT - Laser Tracker Alignment System (LTAS). This is for the newest F-16 models, and we have limited info on it.

GPS Power Switch
Global Positioning System

GPS – Power ON Global Positioning System
OFF – Power OFF Global Position System

Cockpit Familiarization

Starboard Aft Switch Group (Part III)…

FCC Power Switch
Fire Control Computer Power

FCC – Power ON
OFF – Power OFF

SMS Power Switch
Stores Management System

SMS – Power ON
OFF – Power OFF

Avionics Starboard Aft Switch Group Model Variation
Depending on the version of F-16 (and F4) you are flying, some of the avionic switches will be different then the previous page's overview (ie FCC and SMS Power Switches)

MAP Power Switch
Enable MAP avionics system

MAP – Power ON
OFF – Power OFF

INS Align Tip:

- *Don't move the aircraft until you are fully aligned* Even if you just want to move the aircraft a little during your rampstart, it will adversely affect your alignment*
- *If you accidently select NAV before you are fully aligned, switch it back to NORM and wait until the HUD and INS status (using the DED) shows you are aligned.*

**Datalink (DL) – Tip:*

The DL switch has to be on for Datalink to work (being able to see your wingmen or other flights in your package on the HSD, and send data and/or target info. However, if you don't want Datalink to be enabled, you can leave it off. A example of when you would want to leave it off is when you are training with friendly aircraft. Let's say I'm doing some BVR (Beyond Visual Range) training with my wingman… If I want him to practice finding me on radar, I would turn off my Datalink so he can't see me on his HSD and has to rely on his radar to find me.

**If you have to move the aircraft before it's fully aligned, switch to NAV, and once airborne switch to IN FLT ALIGN (in-flight align)*

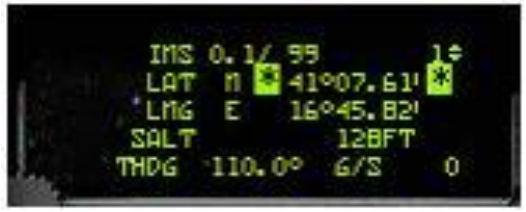
Ramp Start

INS Aligning the Aircraft…

INS – Inertial Navigation System Details

The following gives a basic description of the INS alignment process. This section will be covered in more detail during the ramp start guide.

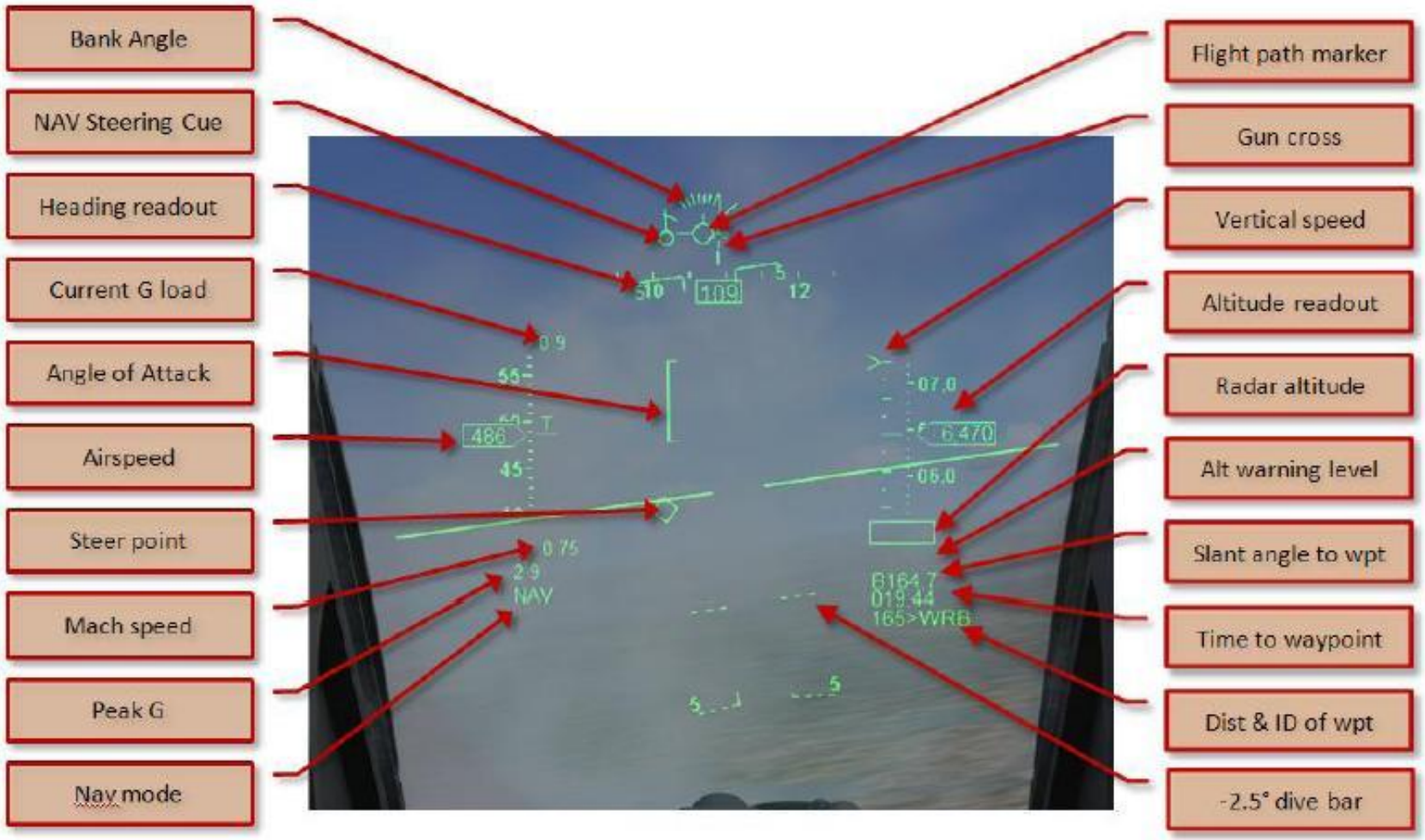
1. Place the INS Switch, located on the avionics panel, into ALIGN NORM position
2. On the INS DED page that is being called up automatically upon placing the switch to NORM, verify the coordinates of your position are correct. When on ground, the current GPS coordinates are displayed on the kneeboard. During a normal flight, no change of coordinates should be necessary. However, if you are flying from one airbase to another one and shut the jet down, to perform another rampstart from the new base, the coordinates need to be entered or the INS will think it's in a wrong location, and thus wrong navigation information. If the coordinates are entered after 2 minutes of alignment, the INS will reset istelf and start to algin from the beginning. The HUD also shows that the INS is aligning, with an ALIGN mnemonic in the lower left corner. It will flash ALIGN RDY when your INS alignment is complete.
3. Let the INS align. A full alignment takes 8mins. The first line shows the alignment time versus the alignment status. Alignment time is shown in tenths of minutes. A INS Status of 99 means the INS is not aligned at all, and thus can't provide any information, such as heading or attitude, and thus the instruments will reflect this lack of data.
4. After the full 8 mins of alignment the INS has reached a status of 10. This most precise alignment. The INS drifts roughly 1NM per Hour with this alignment status. The HUD's ALIGN mnemonic changes to a flashing a RDY on bottom left of HUD.
5. Once the INS reaches 8 minutes and a status of 10, place the INS switch into NAV to conclude the alignment procedure. Letting the alignment continue for longer then 8 mins (by not switching to NAV once aligned) will not have any effect on the amount of drift or the INS status.



Cockpit Familiarization

Heads-Up-Display (HUD)…

HUD Overview



Cockpit Familiarization

Heads Up Display (HUD) Cont'd…

HUD Options

Symbology tailoring option switches are as follows:

SCALES - Selects vertical velocity, velocity, altitude and heading scales, and the Bank Angle Indicator (BAI).

FPM - Selects attitude bars and Flight Path Marker (FPM).

DED DATA - Displays DED data in the lower portion of the HUD.

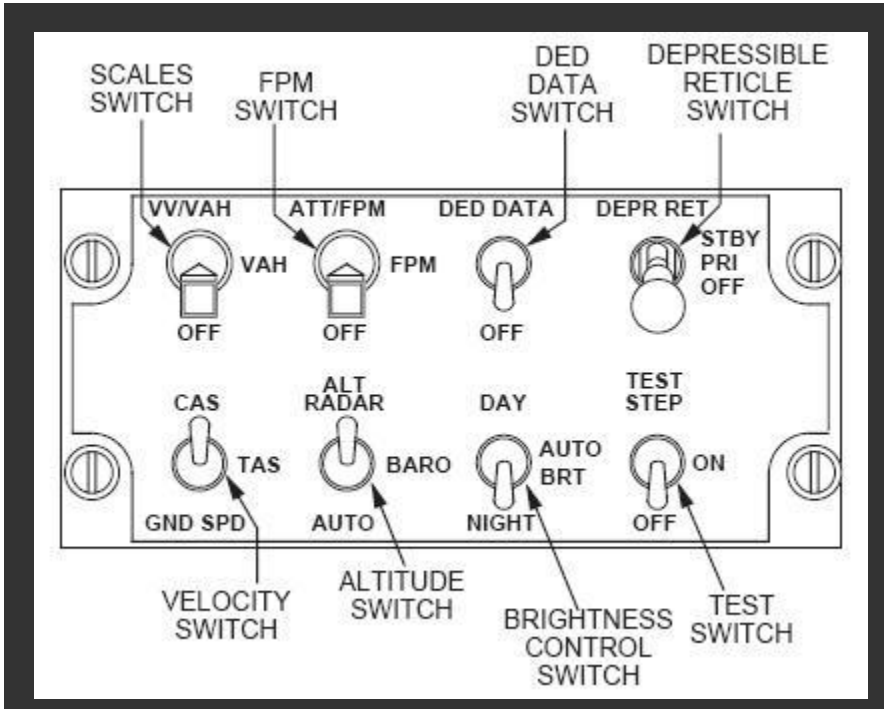
VELOCITY - Selects Calibrated (CAS), True (TAS), or Ground Speed (G/S) display options.

ALTITUDE Selects barometric, radar, or automatic altitude display options.

BRIGHTNESS - Selects brightness levels from off to full intensity for DAY, off to half intensity for NIGHT, and automatic symbol to background ratio in varying light for AUTO.

RETICLE - Selects Primary (PRI) and Standby (STBY) depressible reticle options. STBY selects reticle and removes all other symbology. PRI selects reticle and allows all other symbology to remain.

TEST - Controls the display of four HUD test patterns.



HUD Remote Control Panel. The HUD control panel, located on the right console (Figure 1-12), allows the pilot to select certain HUD symbology options to tailor the HUD format to current needs. Symbology options are master mode dependent. Airspeed and altitude (digital) are always displayed in the HUD regardless of master mode or HUD control panel switch locations.

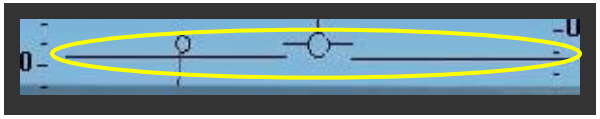
For more technical information about this part of the cockpit, see the *F-16 MLU Guide 1* in the PDF section of the IQT Download

Cockpit Familiarization

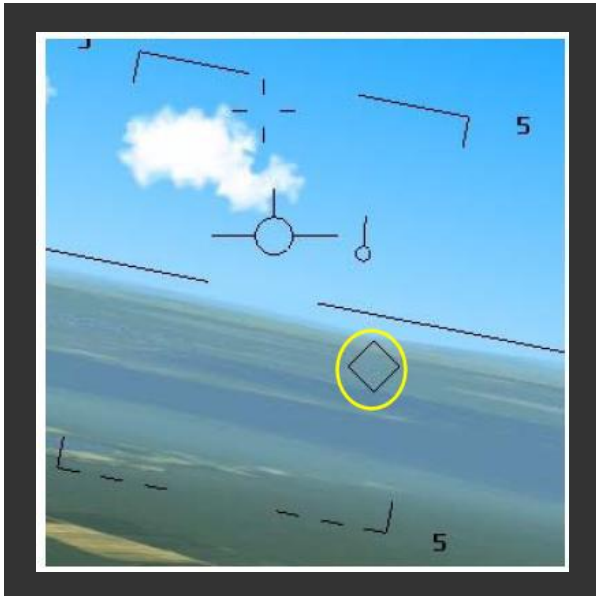
"Heads-Up-Display (HUD) Cont'd…

Important HUD Symbology

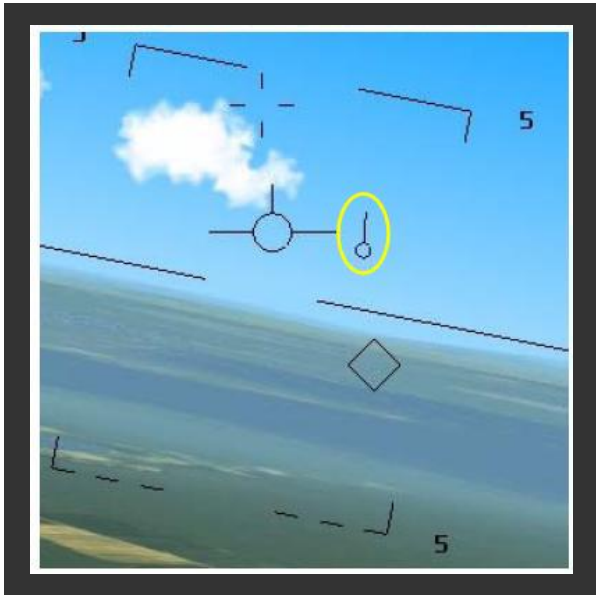
Some of the HUD symbology will be discussed in more detail during following IQT Ground School presentations, but we will cover all of the basic symbols displayed in the HUD.



HUD Horizon Line – This is used so the pilot can visually see if he is climbing and/or descending. If the FPM is on this line, he is not climbing nor descending.



Steerpoint Diamond – This diamond shaped figure represents the location of the selected steerpoint using the 'lat and longs' that were programmed into your datacartride. The steerpoint diamond will only be visible in Nav and Air-to-Ground master modes.

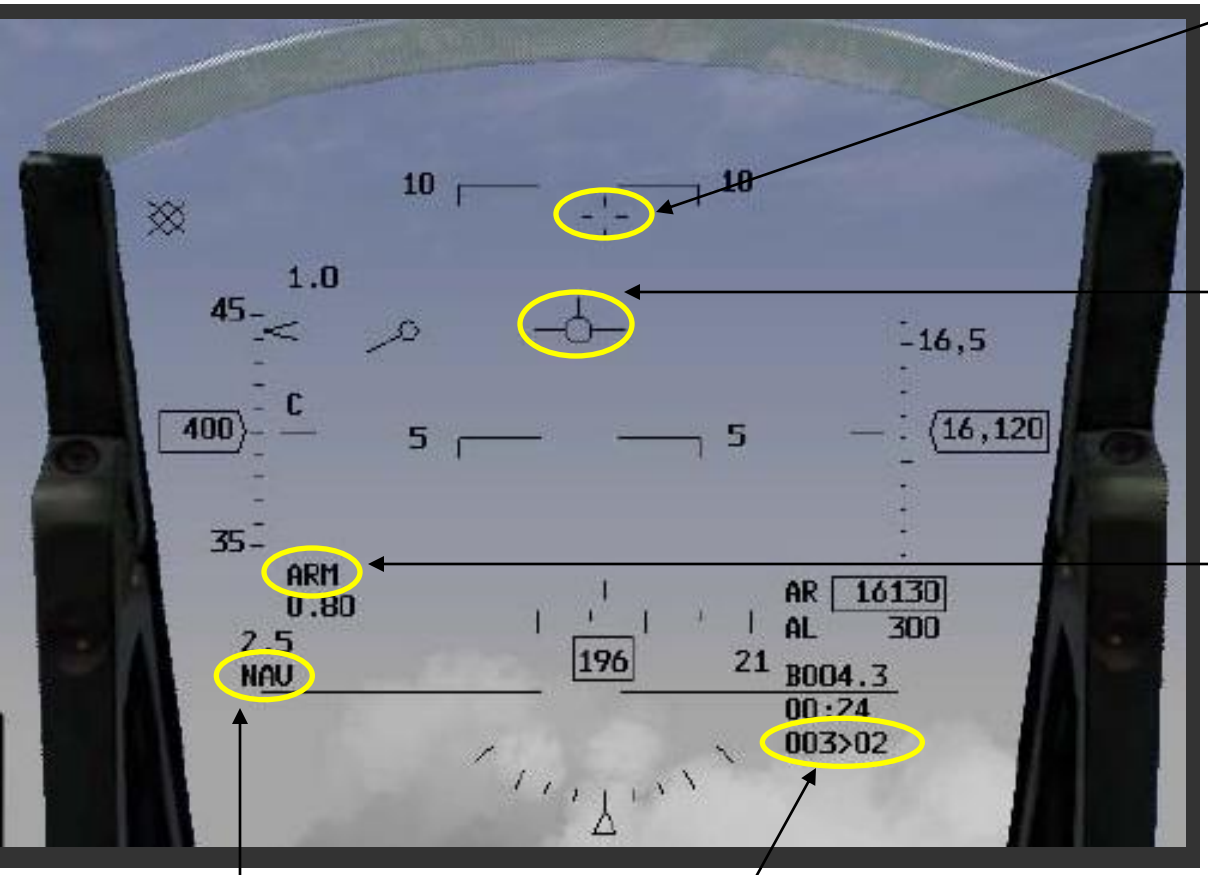


Nav Steering Cue – Looks like a tadpole. The line points to the selected steerpoint. If the line is pointing to the right, the selected steerpoint is to the right of you. If it's pointed down (6 o'clock), it means the selected steerpoint is behind you.

Cockpit Familiarization

"Heads-Up-Display (HUD) Cont'd…

Important HUD Symbology Cont'd



Gun Cross – The Gun Cross represents where the nose of the aircraft is pointing (and not where it's going. It should not be used to shoot at targets since it does NOT represent where the bullets will go (use a A-A or A-G master mode symbology for that).

Flight Path Marker (FPM) – This airplane shaped figure displays the flight path of the aircraft (where it's going). It is independent of the gun cross because it represents where the aircraft will be, and not where it is pointing.

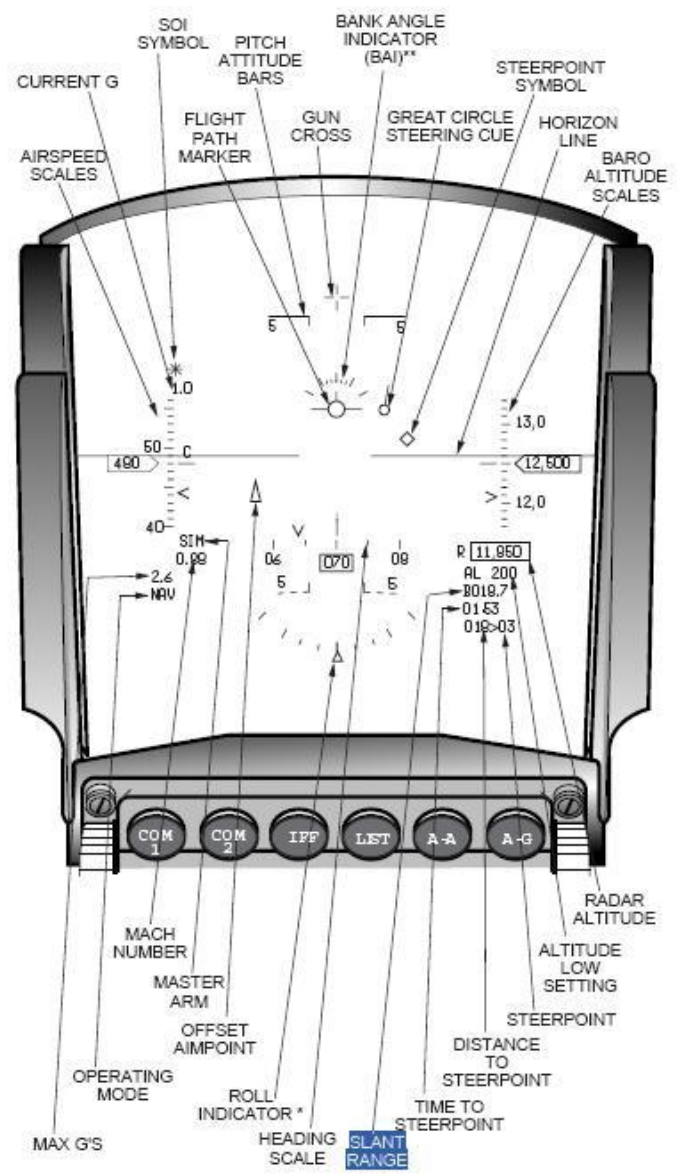
Master Arm – This part of the HUD displays whether or not the master arm is turned on (you able to fire). "ARM" means it's on, "SIM" means it's set to simulate, and if nothing is shown, it means the master arm is set to SAFE.

Master Mode – This part of the HUD will display which master mode you are in (Nav, MRM, DF, AG).

Steerpoint / Distance – This section displays the selected steerpoint - "2", and the distance to the selected steerpoint – "3". The "3" means 3 nautical miles.

Cockpit Familiarization

Heads Up Display (HUD) Cont'd…



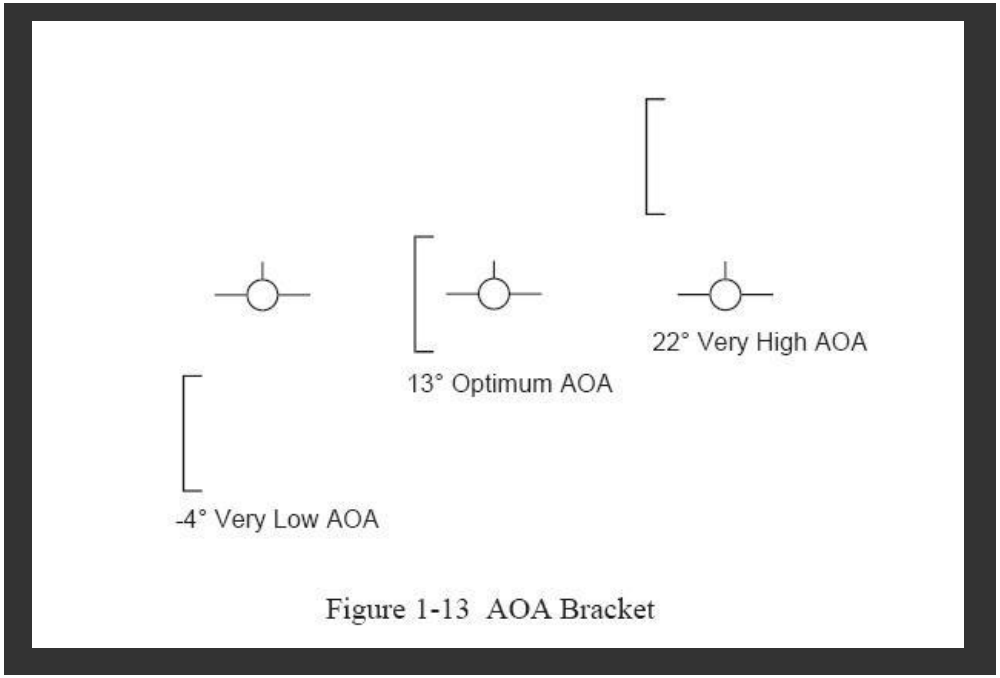


Figure 1-13 AOA Bracket

Angle-of-Attack (AOA) Bracket. The AOA bracket indicates angle of attack angles between -4 degrees (deg) and 22 deg to aid the pilot in establishing the optimum AOA of 13 deg for landing. The figure above shoes the AOA bracket limits. The only time you will see it is when your gear is down. When you are landing, you will want the flight path marker (FPM) in the middle of the vertical staple.

Appendix/Definitions

DEFINITIONS

N/I = Not Implemented in F4. A feature of the F-16 not simulated in Falcon 4.0.* **Please remember there are some differences between AF and OF, therefore, there may features that are implemented in OF that aren't implemented in AF, and vice versa. See your Primary IP for any questions.*

REFERENCES

- *To be updated*
- *Dash-34 Open Falcon Manual*
- *Lead Pursuit Falcon 4.0: Allied Force*
- *F-16 Mid-Life-Update (MLU) Vol. 1 and Vol 2.*
- *USAF Flying Operations Manuals*
- *General Dynamics/Lockheed Martin F-16 Manual*
- *F-16.net*

Reference

Navigation

The table to the right breaks down how to use your navigation system. The first column lists the objective (what you want to do). The second column shows the settings for various switches and knobs. The third column shows the effects of these settings on the HSI (if any). The fourth column shows the effects of the same settings on the ADI (if any). The navigation system in your F-16 is composed of many interconnected parts: the mission computer, the TACAN channel selector, the HSI, the ADI, etc…

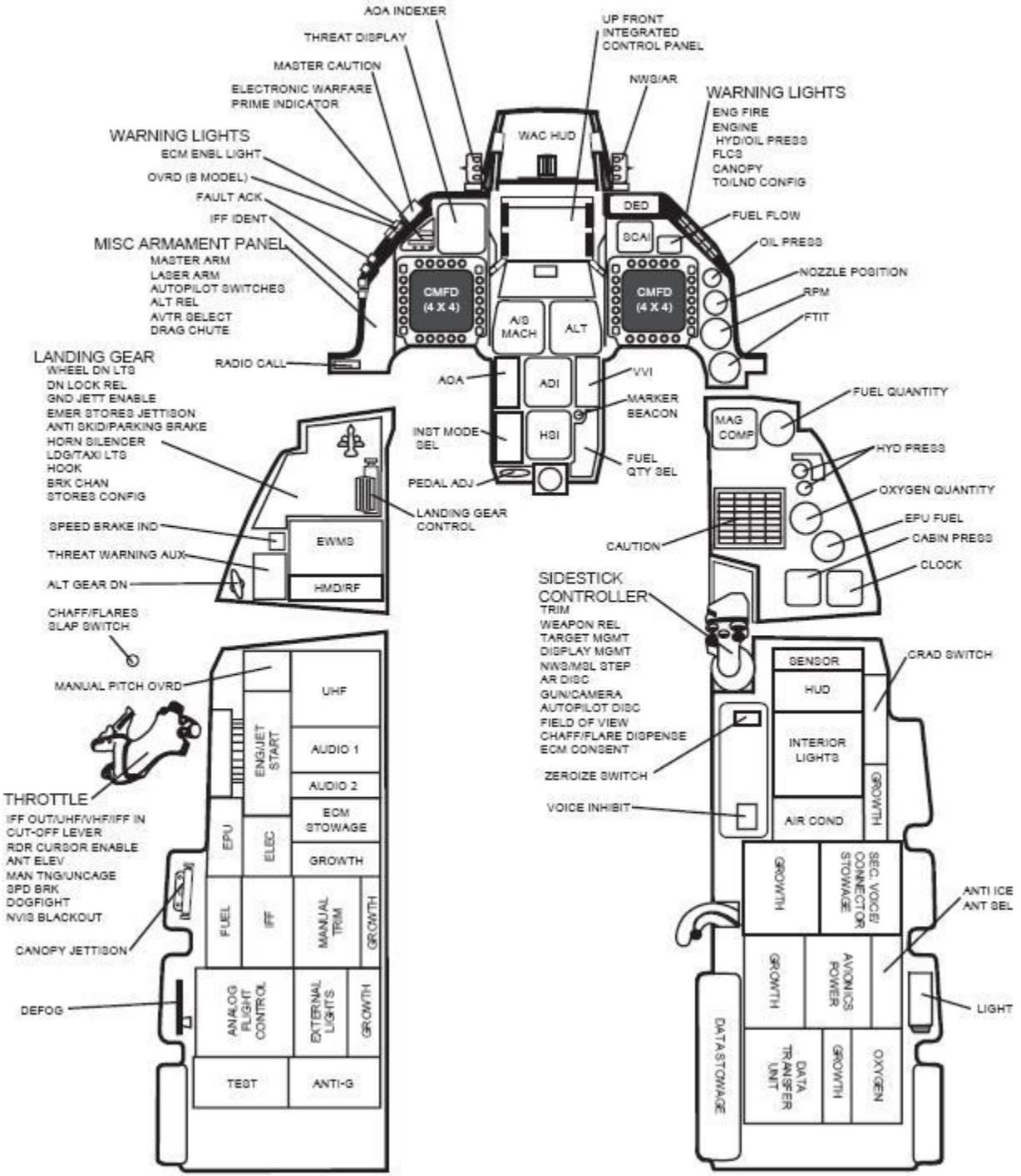
Essentially, navigation data comes from either the mission computer or the TACAN system. Which data source depends on a number of different switches and settings. The navigation data ends up on the HSI and the ADI. In the table to the right, the first four examples use the NAV mode for Navigation. The Nav system is the part of the mission computer that remembers steerpoints and markpoints. Use the ICP to select your destinatin and set the Instrument Mode Selector to switch to either NAV, or NAV/ILS.

The remaining examples use the TACAN system for navigation. The TACAN system consists of the TACAN channel selector, the TACAN functions knob and part of the mission computer. At the start of the Campaign and Tactical Engagement missions, the mission computer looks up the stores the associated TACAN channels for any landing and refueling steerpoints. The TACAN channel selector lets the pilot input navigation data manually. The TACAN function knob determines whether the TACAN signal is coming from a tanker (AA-TR) or an airbase (TR). The CNI switch determines whether the TACAN signal comes from the mission computer (UFC) or the TACAN channel selector (Backup). The ILS bars on the ADI only function when the Instrument Mode selector switch is set to either NAV/ILS or TCN/ILS.

Objective	Settings	HSI	ADI
Fly to a steerpoint	Set ICP to STPT Set CNI switch to UFC Set Instr Mode selector switch to NAV		
Land on an airbase runway (landing point)	Set ICP to STPT Set CNI switch to UFC Set Instr Mode selector switch to NAV/ILS		ILS bars on ADI in view
Fly to a markpoint	Set ICP to MARK Set CNI switch to UFC Set Instr Mode selector switch to NAV		
Fly to a tanker using manual TACAN	Set TACAN function knob to AA-TR Set CNI switch to Backup Set Instr Mode selector switch to TCN	Course warning flag is set To-From indicator in view	
Fly to an airbase using manual TACAN	Set TACAN function knob to TR Set CNI switch to Backup Set Instr Mode selector switch to TCN	To-From indicator in view	
Land at an airbase using manual TACAN	Set TACAN function knob to TR Set CNI switch to Backup Set Instr Mode selector switch to TCN/ILS		ILS bars on ADI in view
Fly to a preset airbase using TACAN	Set ICP to T-ILS Set CNI switch to UFC Set Instr Mode selector switch to TCN	To-From indicator in view	
Land at a preset airbase using TACAN	Set ICP to T-ILS Set CNI switch to UFC Set Instr Mode selector switch to TCN/ILS		ILS bars on ADI in view
Fly to a preset tanker	Set ICP to T-ILS Set CNI switch to UFC Set Instr Mode selector switch to TCN	To-From indicator in view Course warning flag is set	

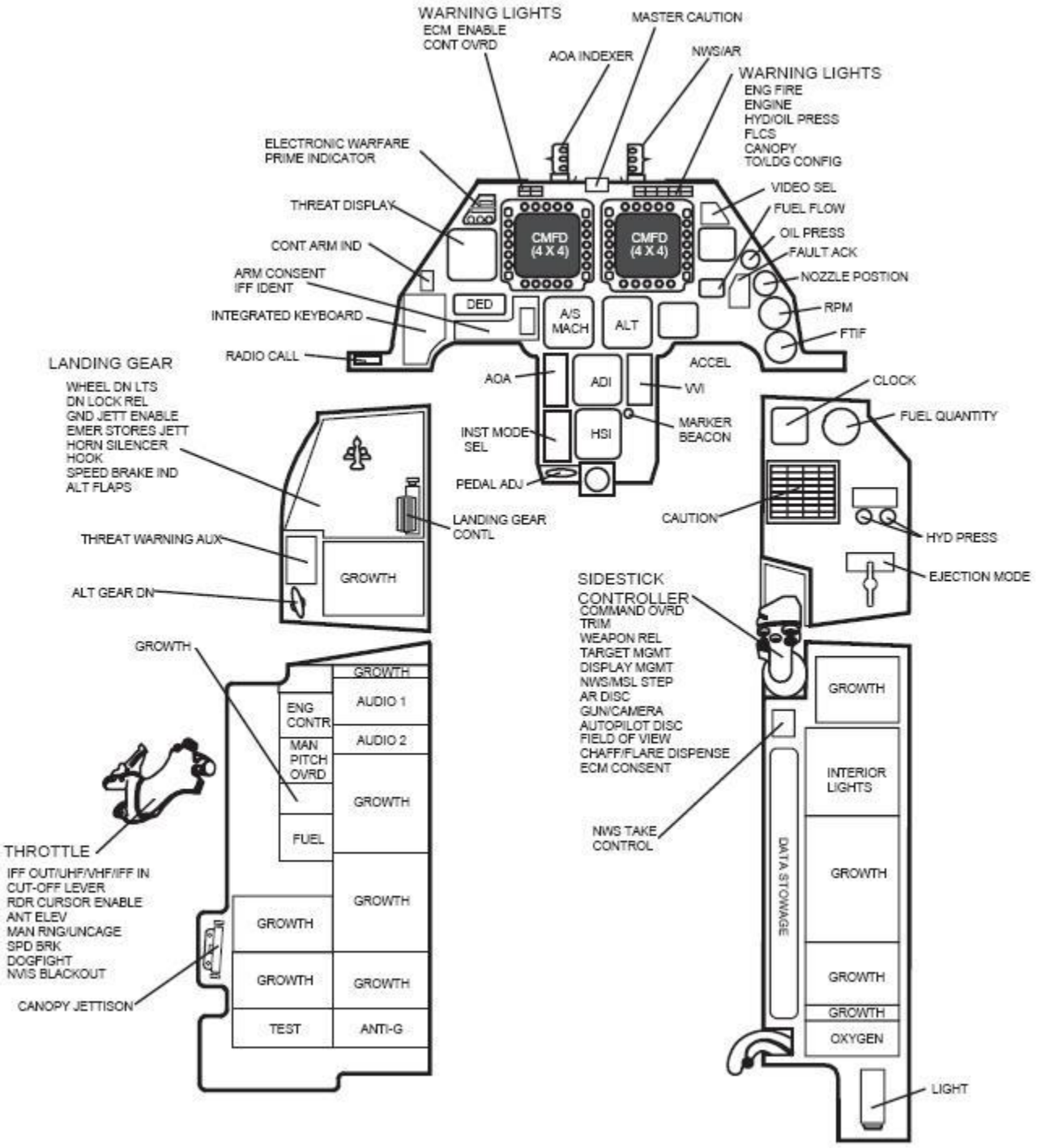
Cockpit

At a glance (Big)



Cockpit

At a glance (Big) Part II

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