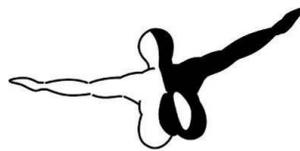




**Aerosoft**  
**F-16 Fighting Falcon X**



aerosoft<sup>GMBH</sup>

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Dedicated to Caitlin. Life is short, don't waste it all on computer games, people are far more important.

## INTRODUCTION

It took a long time to finish this project and during development we met some serious problems. But the F-16 had to be done. It's the best known fighter after all. But soon after the project started it grew into a multi headed monster that was being pulled by many people into many directions, everybody wanted their ideal F-16 and the project nearly spun out of control because of that. But about halfway through, we made an important decision to focus PURELY on the flying and on nothing else. So we spend all effort on the aircraft itself and nothing on the things that are seen for some other aircraft. Things like ground objects when the aircraft has the parking brakes set. Also we decided not to do any offensive or defensive stuff, FSX is not a military simulator and it will at best be some nice effects. Not good enough in our mind. So no bombs that fall or missiles that track helpless B747s

So what you get here is an aircraft, nothing more and nothing less. It is most likely as complex as any aircraft for FSX has ever been, most certainly it is about 6 times more complex than FS2004 could show. It's so good that several parts of this project are now used to train actual F-16 pilots.

## CREDITS

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Above anything else we should credit **Finn, Vin, Dag and Raymond**, they were of incredible help to this project and we can honestly say they were the ones who saved it on at least two occasions.

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## F-16 FIGHTING FALCON HISTORY

Started as a project to construct a small high maneuverable light fighter, and at lower costs than ever before the Tactical Fighter Requirements Division of Air Force Headquarters funded a study in the early seventies for the preliminary design and analysis of several configurations for a lightweight fighter. Amongst other aims they wanted low wing loading and high thrust loading; knowing that this was very difficult because of the contradistinction: low wing loading means larger wings thus more weight and more drag and high thrust loading (thus more powerful engines) means higher fuel consumption and thus short range. The Air Force needed a lower-cost alternative to the F-15 in modernizing and expanding its air force and due to the political and economic situation at this time (oil crisis!!) the United States needed a low cost fighter for export to replace a large number of aging aircraft of NATO member countries.

### PROGRAM

General Dynamics and Northrop were the finalists out of the ten competitors for the competition in April 1972. They received about \$40 each million to create two prototypes. General Dynamics had the first one (Model 401) completed in December 1973 in Fort Worth and it was transported to Edwards AFB, California, on January 8<sup>th</sup> 1974. Phil Oestricher, the test pilot Of General Dynamics flew the YF-16 on January, 20 1974 for its maiden flight, continued by its first official flight on February 2<sup>nd</sup>. Northrop rolled out the P-600 in April 1974 at Hawthorne, California and named it YF-17. It made its first flight at Edwards Air Force Base on Mat 9<sup>th</sup>. December 1974 the competition ended and in 1975, on January the 13<sup>th</sup> the Secretary of the Air Force John McLucas assigned the YF-16 from General Dynamics as the winner: "The airplane with the best performance at the lowest cost." (Secretary of Defense James Schlesinger).

### TECHNOLOGY

Compared with the YF-17 the YF-16 had a mission radius advantage of 200 nautical miles; a sustained turn rate advantage of 0.5 degree/second at Mach 1.2 at 30.000 feet, a fifteen second accelerating advantage from Mach 0.9 to Mach 1.2 at 30.000 feet and a ferry range advantage of 350 nautical miles.

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.

## MODELS AND 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 1000<sup>th</sup> aircraft was delivered, the 2,000<sup>th</sup> in 1988, the 3000<sup>th</sup> in 1991 and the 4000<sup>th</sup> 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.

- **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.

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.

## SPECIFICATIONS

Manufacturer:	Lockheed Martin Tactical Aircraft Systems Fort Worth, Texas
Wingspan:	31 feet 0 inches without tip-mounted AAMs 32 feet 9.75 inches with tip-mounted AAMs
Wing Aspect Ratio:	3.20 : 1
Fuselage Length:	49 feet 4 inches
Overall Height:	16 feet 8.5 inches
Tail plane Span:	18 feet 3.75 inches
Wheel Track:	7 feet 9 inches
Wheel Base:	13 feet 1.5 inches
Wing Gross Area:	300.0 sq feet
Flapperons (total):	31.32 sq feet
Leading Edge Flaps :	36.72 sq feet
Fin:	43.10 sq feet
Rudder:	11.65 sq feet
Tail Surfaces:	63.70 sq feet (GE Variant)
No. Engines:	One
Eng Manufacturer:	General Electric
Engine Designation:	F110-GE-100 turbofan
Engine Power:	27,600-lbs with afterburning (P&W Variant)
OR	
Engine Manufacturer:	Pratt & Whitney
Engine Designation:	F100-P-220 turbofan
Engine Power:	23,450-lbs with afterburning
Empty Weight:	18,238-lbs with F100-PW-200 turbofan 19,020-lbs with F110-GE-100 turbofan
Max External Load:	12,000-lbs
Max Comb Takeoff Weight:	23,765-lbs with the F110-GE-100 turbofan

Maximum Takeoff Weight:	27,185-lbs ( F-16C with a F110-GE-100 ) for an air-to-air mission without drop tanks 37,500-lbs ( F-16C Block 30/32 ) with maximum external load 42,300-lbs ( F-16C Block 40/42 ) with maximum external load
Wing Loading:	95.0-lb/sq ft at 28,500-lbs AUW 141.0-lb/sq ft at 42,300-lbs AUW
Thrust/Weight Ratio (cln):	1.1 to 1
Combat Takeoff Weight:	23,765-lbs with the F110-GE-100 turbofan
Maximum Internal Fuel:	6,846-lbs
Maximum External Fuel:	6,760-lbs
Maximum Ordnance:	20,450-lbs for a 5-g maneuver 11,950-lbs for a 9-g maneuver
Maximum Level Speed:	Above Mach 2.0 at 40,000 feet
Service Ceiling:	More than 50,000 feet
Radius of Action:	852-miles on a hi-lo-lo-hi mission with two 2,000-lb bombs, two Sidewinders, 1,040 US gallons external fuel, tanks dropped when empty 392-miles on a hi-lo-lo-hi mission with four 2,000-lb bombs, two Sidewinders, 300 US gallons of external fuel, tanks retained 230-miles on 2 hour 10 min CAP mission with two Sparrows and two Sidewinders, 1,040 US gallons of external fuel 818-miles on a point intercept mission with two Sparrows and two Sidewinders, 1,040 US gallons of external fuel
Ferry Range:	2,417 miles with drop tanks
Symmetrical g-Limits:	+9 with full internal fuel
Maximum Climb Rate:	50,000 feet per minute at sea level
Typical Take-Off Run:	2 ,500 feet at MTOW
Typical Landing Run:	2,500 feet at normal landing weight
Cannon:	One internal 20-mm M61A1 Vulcan cannon with 511 rounds
AAMs:	Wingtip launch rails for AIM-9L/M/P Sidewinder missiles Alternatives to Sidewinder are MATRA Magic 2 or Rafael Python 3
Pylons:	Centerline pylon stressed for 2,200-lbs at 5.5-g load; 1,200-lbs at 9-g Inboard wing pylons stressed to 4,500-lbs at 5.5-g load; 2,500-lbs at 9-g Center wing pylons stressed to 3,500-lbs at 5.5-g load; 2,000-lbs at 9-g Outboard wing pylons, usually used for additional AIM-9 carriage, stressed to 700-lbs at 5.5-g load; 450-lbs at 9-g load
Unguided Bombs:	Most unguided weaponry is authorized for carriage, including Mk 82 bombs and cluster munitions on triple-ejector racks, or Mk 84 bombs carried singly on wing pylons.
Guided Bombs:	AGM-65 Maverick anti-armor missile and Penguin anti-ship missile (Norway). Pakistani aircraft equipped with ATLIS laser-designator and Paveway LGBs One internal 20-mm M61A1 Vulcan cannon with 511 rounds
Smart Weapons:	The F-16C/D is basically similar to the F-16A/B, but with greater accent on "smart" weapons. Block 50/52 aircraft have full AGM-88 HARM capability, while LANTIRN-equipped aircraft can autonomously launch GBU-10 and GBU-12 laser-guided bombs.

## 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-16AM 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.

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 accelerometer. 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.

## 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 accelerometers. 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.

## SPEEDBRAKES

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.

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 speed brakes is as follows:

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

## 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.

## FLIGHT MODELS IN FSX

The described systems all have been faithfully reproduced in the FSX version of the F-16 and result in an aircraft that is easy to fly. Very easy to fly in fact as it tends to go where the nose is pointed. As long as you follow the checklists and the data note in there you should find no great difficulties in handling the F-16.

There are two aspects though, that have proven difficult to our testers. The first is that landing. Most people who fly the aircraft for the first time tend to have problems reducing speed enough and crash on landing. Both these problems can be solved with Aerodynamic Braking. During your approach you keep a high AoA (so your nose is not pointed where you are going but much higher) and after touchdown you keep the nose up and let the drag slow you down until you get to 80 knots and you can start to use your wheel brakes.

The second issue the testers found hard to understand how the configuration of the aircraft affects the handling. The F-16 can carry seriously large loads and most of it is external. So apart from the extra weight you also have to handle the extra drag. While a fully loaded Cessna still flies very similar to an empty one, the difference between an F-16 configured for a demo flight and one that is ready for a long range bombing mission is immense.

All the models in this product have separate flight models that are linked to the type of engine, F-16 model and above all the external stores. The more pods, missiles, tanks or bombs below your aircraft the heavier it is and the more drag it has. More important, the aircraft performance will be affected and limited. Depending on the external stores the maximum G-load the aircraft can handle will differ.

On the Store screens you can see the stores on your aircraft. It also shows if you are in CAT III or CAT I condition. CAT III has limitations such as limited turn performance below Mach 0.7 and pitch damping to counter excessive AoA (18 degrees at CAT III and 25 degrees at CAT I). On the same screen you will find the max G the aircraft can handle. Do not be surprised to break things when you exceed this value. Contrary to general belief the flight systems do not fully prevent the pilot from exceeding these values! Knowing the aircraft you fly is vital.



## VIEWS AND PANEL NAVIGATION

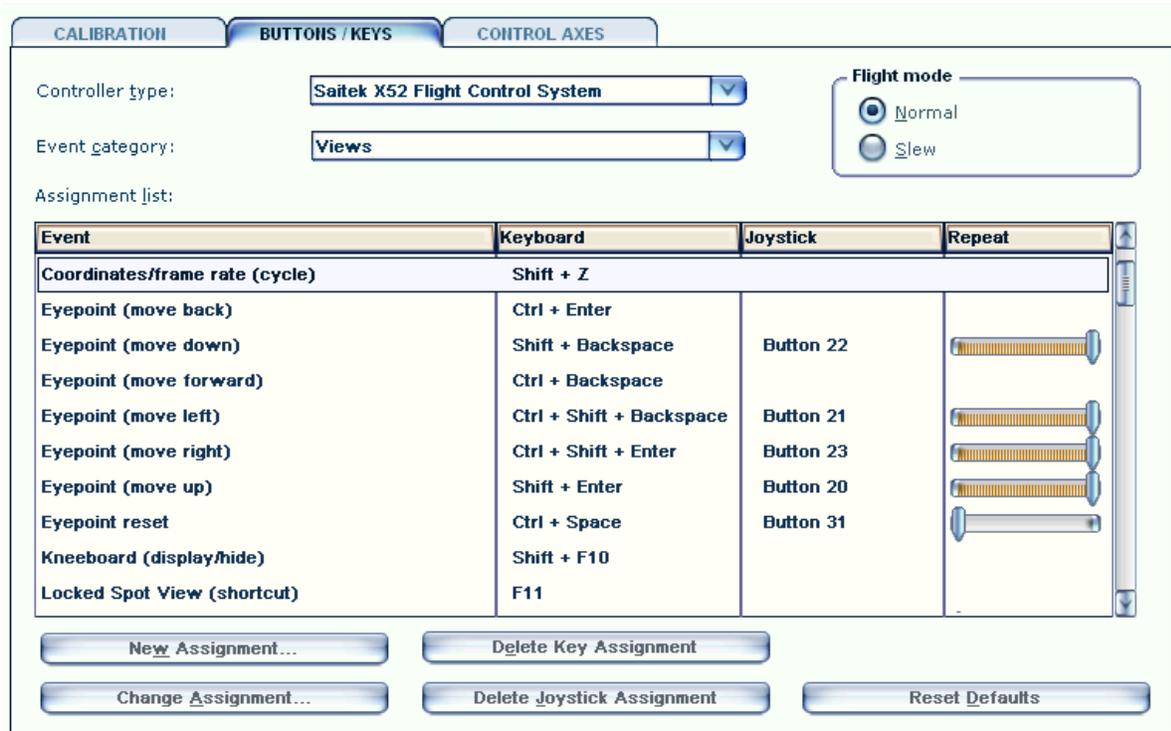
The cockpit of the F-16 is rather special as there are very few aircraft that give that much external visibility. The whole cockpit is very low and when you sit in it you really feel like you are sitting on top of the aircraft. For flight simmers this brings a new problem as many of the controls are not visible in the default views.

## TRACKIR AND MOVING VIEWPOINTS

By far the best solution is to use a view system like TrackIR that adds huge realism to this product by panning your view as you move your head and even moving your viewpoint. If you move your head sideways and forwards, it allows you to look UNDER some of our panels. There is nothing that comes close to this and we can't advise this enough. See below to see a view that is only possible with one of these devices.



Now we assume your joystick has at least a pan option that allows you to slew your view, but this might still hide some panels behind the throttle or the side stick. To solve this we advise you to assign some of the buttons on your joystick to moving the viewpoint itself. When you are able to move the view direction (standard on most joysticks) and the view position (as advised here) you have unlimited freedom.



Shown above is the assignment of a secondary four-way switch on the joystick to the movement of the viewpoint. A fifth switch is assigned to a reset of the view because it is very easy to lose orientation. The movement is set to repeat, the reset is a single event.

## FSX VIEWS

The third way to navigate the panels is with the built in views of FSX. With the [s] key you select the main category of view and with the [a] key you select the view inside that category. We assigned several special views to assist you. The Tower, Runway and Outside views are FSX standard.

- Cockpit
  - Cockpit (no obstructions)
  - Default view (HUD)
  - Center Console
  - Left MFD
  - Left Aux Console
  - Left Console
  - ICP-DED
  - Right Aux Console
  - Right Console
  - Right MFD.
- Aircraft
  - Tail
  - Nose
  - Right Wing
  - Left Wing
  - Landing Gear
  - Trail
  - Belly

## CONSOLES, PANELS AND CONTROLS

There are 3 major cockpit layouts used in the F-16 and we included the two most used, the C-model and the MLU-model. They differ in several panels but for some less important panels we chose to use only one version. It is not always clear what mouse button to use on what control, so small graphics are added to help with this.

	<p>Left and right mouse buttons are used to use the control. Most of the time the left mouse button will turn the control right and the right mouse button will turn it left</p>
	<p>Only left mouse button is used to set the control. Most of the time this is used for simple 2 mode switches</p>
	<p>Left mouse button depressed and move the mouse up and down are used for some controls that have unlimited settings. For example the setting of the rudder pedals to suit the length of your legs.</p>



## MULTI FUNCTION DISPLAYS

The two large displays on both sides of the center console are used for navigation and as the radar screen. The MFDs are activated with the Avionics Power panel on the right console.

### LEFT MFD (RADAR)

The left MFD is dedicated to the radar. It will be able to track all the AI aircraft that you see in the simulator. Only targets in a 60 degree cone in front of the aircraft will be detected and when there are many targets the load on the systems computer will increase a lot. Radar range can be cycled through 5, 10, 20 (default), 40 and 80 NM. All targets will show a trail showing the history of the target hits. The active target will show red for 10 seconds and always will show the attitude in thousands of feet above the radar dot.

Using the click zone on the display allows you to cycle through the targets and selects one as the 'Locked' target. Information on this target will be shown on the display. Target Heading and Speed are shown, just as Aspect Angle and Overtake Speed.

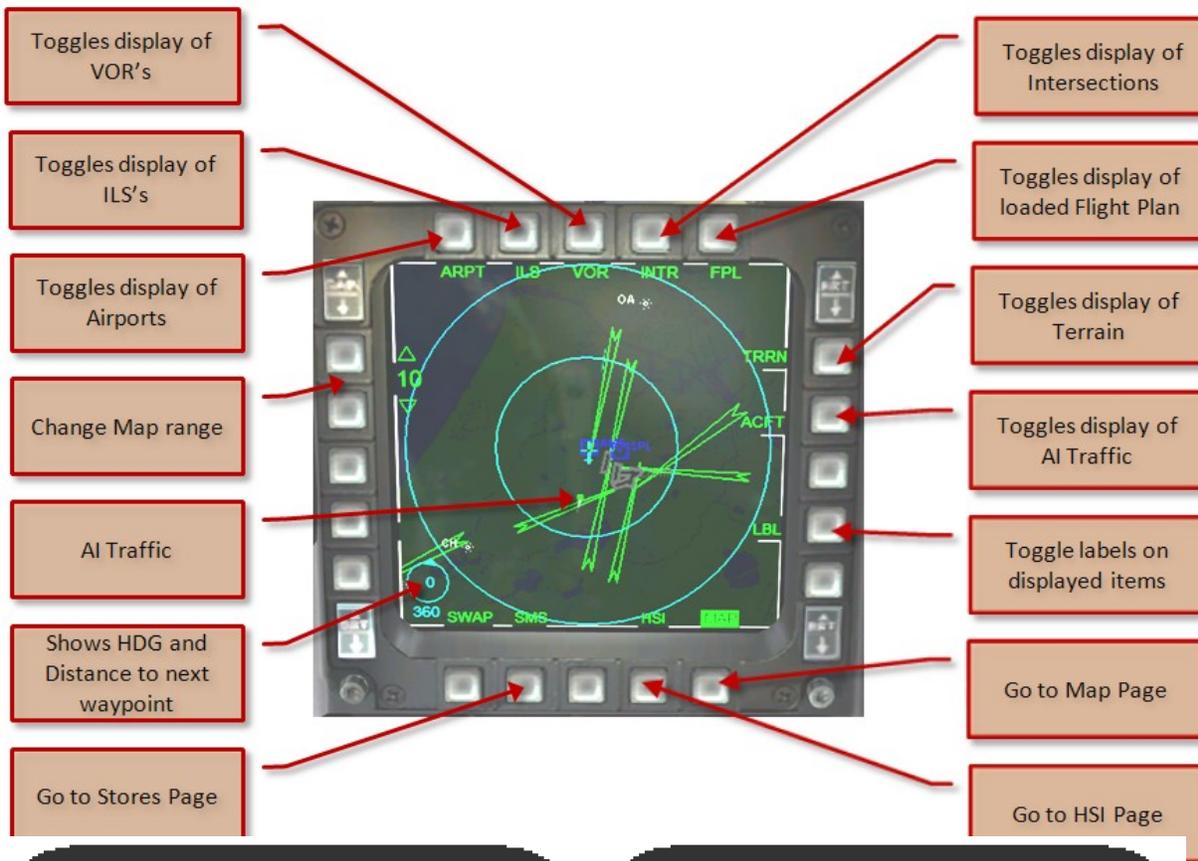


One of the more complex bits of information on this screen is the Aspect Angle. It has nothing to do with the position of the target in relation to your heading but only shows the angle between the (extended) tail of the target and your position. If the indicated Aspect Angle is zero, you are directly behind the target (but you could be flying any, even an opposite, heading). It is important in combat as you like to get this angle as small as possible to avoid being detected and to increase your chances of hitting the target.

### RIGHT MFD (NAVIGATION)

The right MFD has three main pages

- HSI page - shows a large HSI that is a lot easier to use then the smaller HSI on the center console.
- SMS STORES page - shows the current stores that are underneath the aircraft and the Maximum G-load of the current configuration. Exceed this load and things could break.
- MAP page - Shows a moving map. Please note that display of Traffic is not fully realistic as it also shows traffic that is outside the normal radar capability. This kind of information however is currently being sent by other sources to many aircraft so in that aspect it is not fully impossible.

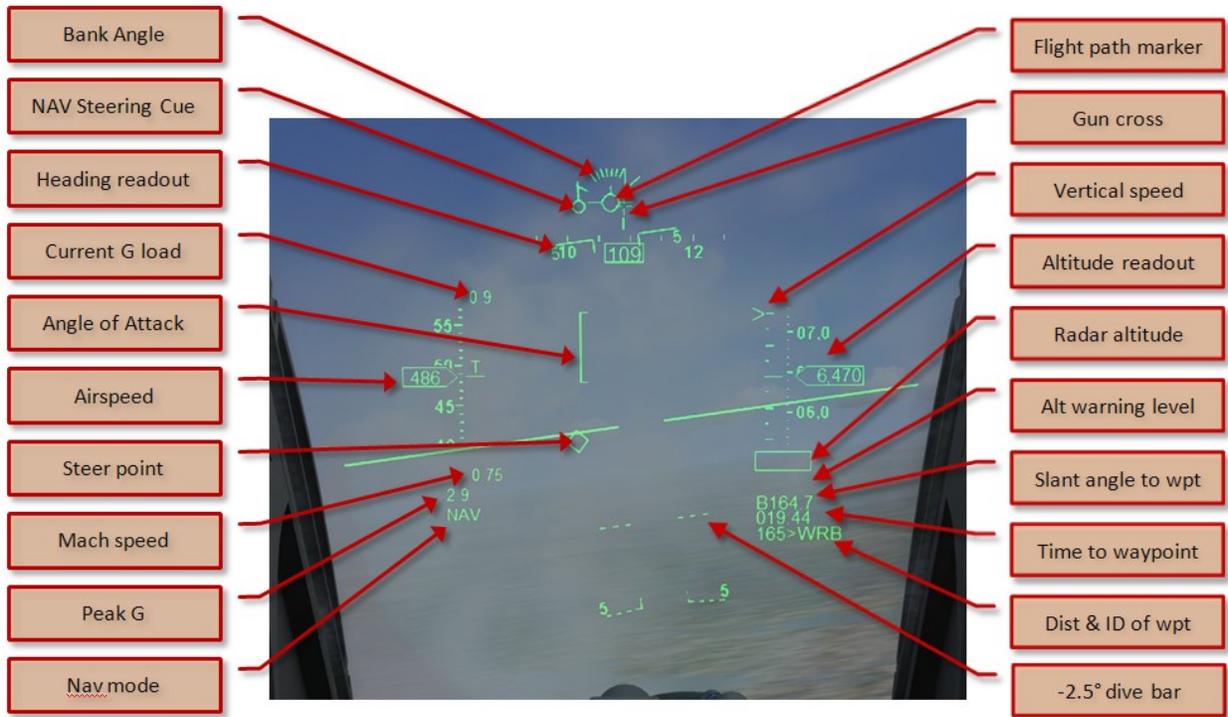


## HEADS UP DISPLAY

By far the most important display for the pilot is the HUD that allows the aircraft to be flown without having to look at any other instrument. It is displayed on a thick plate of glass directly in front of the pilot. The HUD is switched on with a control on the ICP (the top left wheel) and the HUD CONTROL panel on the left console where you can select what is seen. The amount of information can be rather confusing and it is advised to slowly add more elements as you get more hours in your log book.

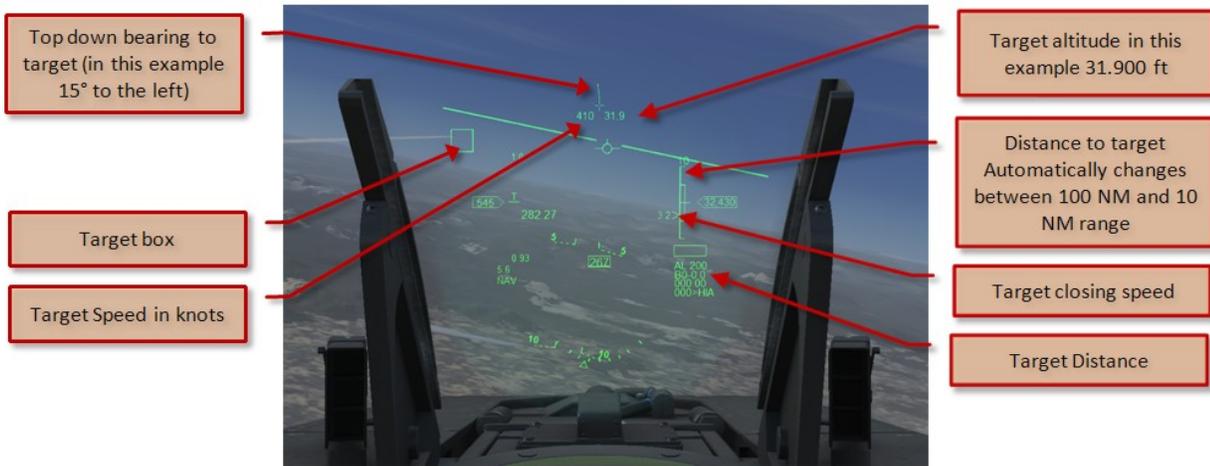
### STANDARD HUD

The standard HUD is used for normal flight and for initiating an intercept.

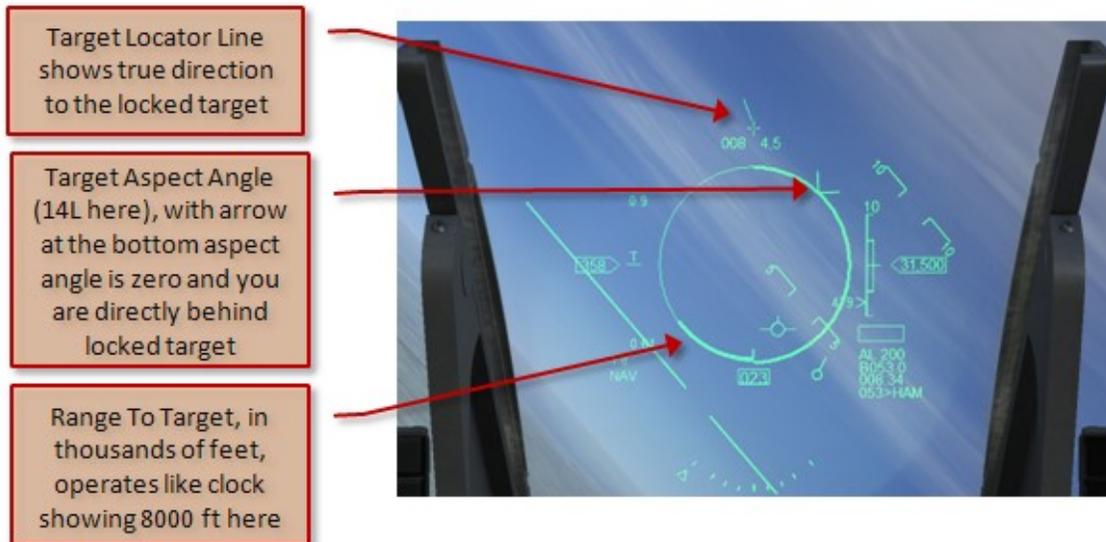


### INTERCEPT HUD

When you get closer to a radar locked target it is easier to switch to the intercept HUD. This HUD will show automatically when a target is locked. To unlock the radar use the click zone in the radar.



When the A-A button in the ICP is pressed a different intercept HUD is shown that makes it easier to close and track the locked target from shorter distances.



## LEFT AUX CONSOLE

The Left Aux Console holds most controls dealing with the wheels and brakes. The following panel parts do not have functions on this console;

### THREAT WARNING AUXILIARY PANEL

Panel not operational because it has no meaning in FSX.

### CHAFF/ FLARE PANEL

Panel not operational because it has no meaning in FSX.

### HELM MOUNT DISPLAY PANEL

Panel not operational because it has no meaning in FSX.



### ALTERNATE GEAR DOWN CONTROL

Panel not operational.

### LANDING GEAR PANEL



This panel contains more than just the landing gear, but as the landing gear lever is the most obvious control, it bears this name.

**LANDING LIGHTS** - Toggles Landing Lights

**TAXI LIGHTS** - Taxi lights located on the main gear doors

**PARKING BRAKES** – Toggles parking brake on/off

**GEAR LEVER** - Toggles gear (will light red when using in FSX + Xpack). Wheel lights will be green when gear is down and locked

**HOOK** – Toggles tail hook extension

**GEAR LIGHTS** - The gear lights show green when down and locked and red when gear is in motion.

EMER STORES JETTISON - inop

GND JETT ENABLE - inop

BRAKES CANH 1 / CHAN 2 - inop

STORES CAT I / CAT III - inop

HORN SILENCER - inop

DN LOCK REL - inop

## ACES-II EJECTION SEAT CONTROL



The ACES-II is the standard ejection seat in many US military aircraft. It's known as a Zero-Zero ejection seat meaning it can operate from zero altitude and zero airspeed. Though highly complex in construction the actual use is limited to two controls, the Firing Control handle (that is inop in our model) and the Ejection Control Safety Lever. When in vertical position (with the right mouse button) the seat is secured, when in horizontal position (left mouse button) the seat is operational. In flight the seat is always armed, when the canopy is opened the seat needs to be secured.



## SPEED BRAKE INDICATOR

The speed brake indicator shows a dotted pattern when retracted and a striped pattern when extended

## RIGHT AUX CONSOLE

The Right Aux console holds various instruments. The following panel parts have not been simulated:

### EPU FUEL

We found it nearly impossible to simulate this section correctly and decided not to include it.

### PFD

The Pilot Fault Display is not incorporated in this model.

### LIQUID OXYGEN

The Oxygen Quantity Indicator shows the remaining liters of liquefied oxygen. As there is no system in FSX that simulates this, the gauge is inop.

### CLOCK

Even in a Fly-By-Wire aircraft as the F-16 there is a mechanical wind up clock. It also serves as a stopwatch but because that's rather hard to use we decided not to add that to the clock.

### COMPASS

When all your navigation sources fail you can always rely on the compass as it is a standard 'whiskey' compass that does not need any electricity or vacuum source. Of course it has all the problems related to a standard compass, for example it shows incorrect headings if the aircraft is slowing down or speeding up.



**FUEL QUANTITY**

The Fuel Quantity gauge shows the fuel remaining in the tanks. What is actually shown depends on the Fuel Quantity knob on the Center Console. The total remaining fuel is shown in the digital display.

**CAUTION PANEL**

The Caution Panel warns the pilot about system problems. When there are no systems in FSX that could trigger these failures the lights are not used.

FLT CONT SYS	Problem in Flight Control Systems
FWD FUEL LOW	Forward fuel tank too low
AVIONICS	Indicates a general fault with the system avionics
ANTI SKID	Malfunction with the Anti Skid (ABS)
ADC	Failure in pressure sensing/computation SYS or AOA SYS
AFT FUEL LOW	Aft fuel tank too low
AFT NOT ENGAGED	AUTO TF position selected on TF switch
HOOK	Hook is not up and locked
LE FLAPS	LE FLAPS switch in LOCK or LED internal malfunction
OVERHEAT	Engine overheat condition
RADAR ALT	Malfunction of the radar altimeter
NWS FAIL	The nose wheel steering system has failed
CADC	CADC (Central Air Data Computer) internal malfunction
EEC	Engine alternator failed
EQUIP HOT	Avionics equipment cooling air temperature/pressure insufficient
CABIN PRESS	Problem with cabin pressure
ELEC SYS	Problem with electric bus system
BUC	BUC (Backup Fuel Control) selected and engine operating in BUC
IFF	Other aircraft will not be able to identify your electronically
OXY LOW	Liquid oxygen is too low
INLET ICING	Ice on wings or on engine inlet
FUEL OIL HOT	Fuel or oil too hot
NUCLEAR	Malfunction in nuclear control circuits (only USA)
ENGINE FAULT	A loss of valid Mach data to the engine will degrade engine performance
SEAT NOT ARMED	ACES-II Seat is not armed
STORES CONFIG	Stores configuration and CAT I/III switch are not true
PROBE HEAT	Problem with the probe heat

**HYDRAULIC PRESSURE**

The Hydraulic Pressure indicators show the pressure in the two hydraulic systems. There are two versions (block 25,30/32 and Block 40/42, 50.52, MLU but the indication is the same. If these gauges show a total lack of pressure your aircraft will be uncontrollable.

**LEFT CONSOLE**

The left console holds most and communication and electrical controls, all engine start and fuel controls and the flight control panels. The following panels are not used at all in our simulation of the F-16.

**ANTI G PANEL**

Panel is non functional

**AUDIO**

Panel is non functional.

**ELECTRONIC COUNTER MEASURE PANEL**

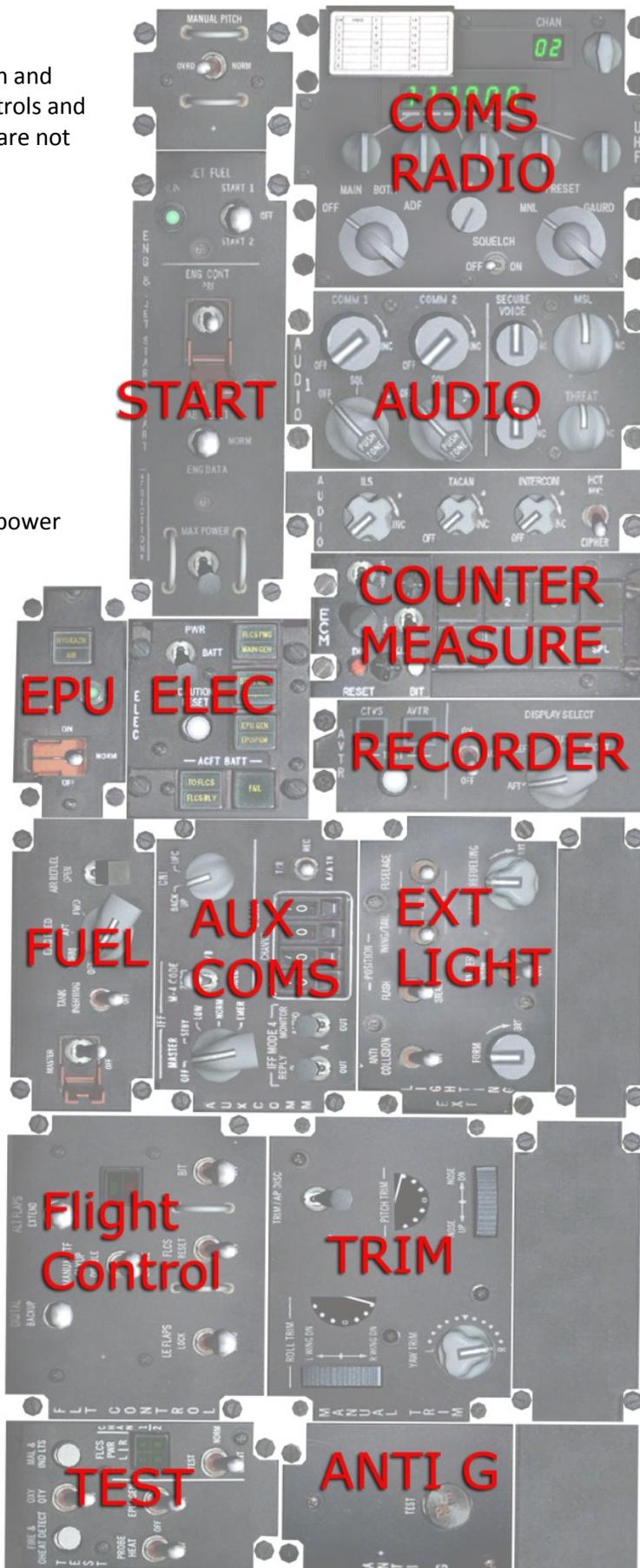
Panel is non functional

**EPU**

The Emergency Power Unit provides hydraulic power to the aircraft for a period of up to 10 minutes. When normal hydraulic pressure is not resumed in this period the aircraft will be uncontrollable. There is a gauge at the right aux console showing the remaining Hydrazine fuel. Due to problems we found late in development this panel is non operational

**RECORDER PANEL**

Panel is non functional



## AUX COMS PANEL



We implemented only the channel setting and linked to the Transponder in FSX. Click with the left mouse to set the transponder codes. Some important military routine codes:

- 0001 - High speed uncontrolled flight
- 4000 - FR Military training
- 7001 - Sudden climb out of low level military VFR (UK only)
- 7777 - Military intercept



## CANOPY CONTROLS

The canopy is opened with a small switch above the Left Console. The switch is locked with the “Octopus” that also serves as a secondary securing latch. To open the canopy move the octopus up and click the switch beneath it. To close and lock the canopy, click the switch and lock with the octopus. In flight the Octopus always needs to be down. On the C models the Canopy Switch is located more to the back, over the ECU panel. The Canopy Jettison Handle and the Manual Canopy Control are inop.



## ELECTRONIC



This panel contains the main power switch that determines if the aircraft systems run from any of the electrical sources: Battery, Main Generator, Standby Generator or Emergency Power Unit. The status lights show possible problems.

### MAIN POWER

- **MAIN POWER** - connects the engine generator to the system bus and battery to the battery bus
- **BATT** - connects the battery to the system bus and battery bus, disconnects generator
- **OFF** - Disconnects generator from aircraft systems

### STATUS LIGHTS

- **FLCS PMG** - FLCS not getting power
- **MAIN GEN** - Main generator online or offline
- **STBY GEN** - Standby Generator online or offline
- **EPU GEN** - EPU on but not supplying power to essential busses
- **EPU PMG** - EPU on but not supplying power to all sections of FLCS
- **TO FLCS** - Flight Control System no or low voltage
- **FLCD RLY** - Flight Control System no or low voltage
- **FAIL** - Aircraft battery failure

CAUTION RESET - inop

## ENG START PANEL



The ignition panel is used to start the engine.

- ENG CONT** - Toggles automatic Ignition
- JET FUEL STARTER** - Starts the hydraulic engine that starts the engine rotation
- AB RESET - inop
- MAX POWER - inop

## EXT LIGHTS PANEL



All external lights are controlled by this panel.

- MASTER** - Main power switch for all external lights
- ANTI COL** - Toggles strobe light (top of vertical tail)
- WING/TAIL** - Toggles navigation lights (wingtips, tail, and engine inlet)
- FUSELAGE** - Toggles formation lights (top, bottom)
- FLASH/STEADY – inop
- AERIAL REFUEL - inop
- NORM/BRIGHT - Logo Lights (Formation lights)

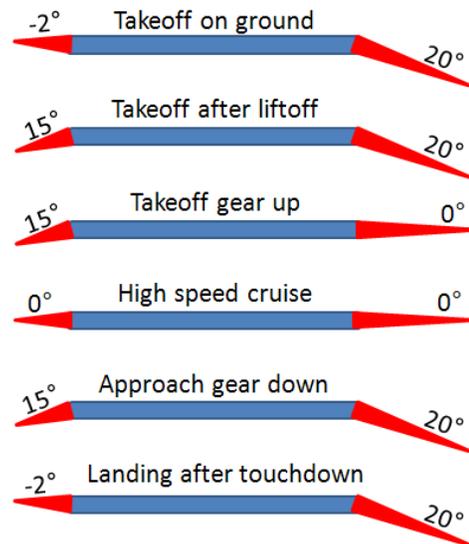
The formation lights are supported by the logo lights in flight (see below). Please note that FSX has a very nasty bug with lights that makes it impossible to position them accurately. Lights MOVE in relation to the center of the model when your view position moves. This is a limitation that could not be circumvented. Also note that the logo lights are done as in standard FSX aircraft and are linked to the panel lights. This could not be avoided.

## FLT CONTROL PANEL



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°



## FUEL PANEL

The fuel panel holds most (but not all) controls related to fuel tanks and fuel pumps.



### MASTER FUEL SWITCH

- **MASTER** - Opens the fuel shutoff valve
- **OFF** - Closes the fuel shutoff valve



### ENG FEED

- **OFF** - Shuts down all electrical fuel pumps
- **NORM** - Activates all electrical fuel pumps (default use)
- **AFT** - Feeds from aft fuselage and left wing tank only
- **FWD** - Feeds from forward fuselage and right wing tank only

**AIR REFUEL**

- **OPEN** - Opens the refuel door on top of fuselage, opens all inter-tank connections and enables refuel door lights. See the separate chapter on refueling at the end of the manual
- **CLOSED** - Closes refuel door

TANK INERTING - inop

**MANUAL TRIM PANEL**

Although the F-16 is trimmed automatically there are trim controls for all three axes available on the manual trim panel. In FSX the use of these trim controls will be needed because full support for a fly-by-wire system is lacking. Control is most efficient when the mouse wheel is used.

**ROLL TRIM** – will trim either wing up or down

**YAW TRIM** – will trim the nose left or right

**PITCH TRIM** – will trim the nose up or down

TRIM/AP DISC - inop

NORMAL - inop

MANUAL TF FLYUP - inop

FLCS RESET - inop

BIT & BIT STATUS LIGHT - inop

**TEST PANEL**

This panel holds all the switches that are used to test warning lights and other systems. Most are not used in our model.

**MAL/IND** will light up all warning lights

All others switches inop

**UHF COMS PANEL**

The UHF coms panel is used to set the coms radios and to set the ADF receiver.

**Main Switch** - Toggles receiver on/off

**CHAN** - Switches between com 1 and com 2

**SET BUTTONS** - Set the frequency of Com 1 or Com 2

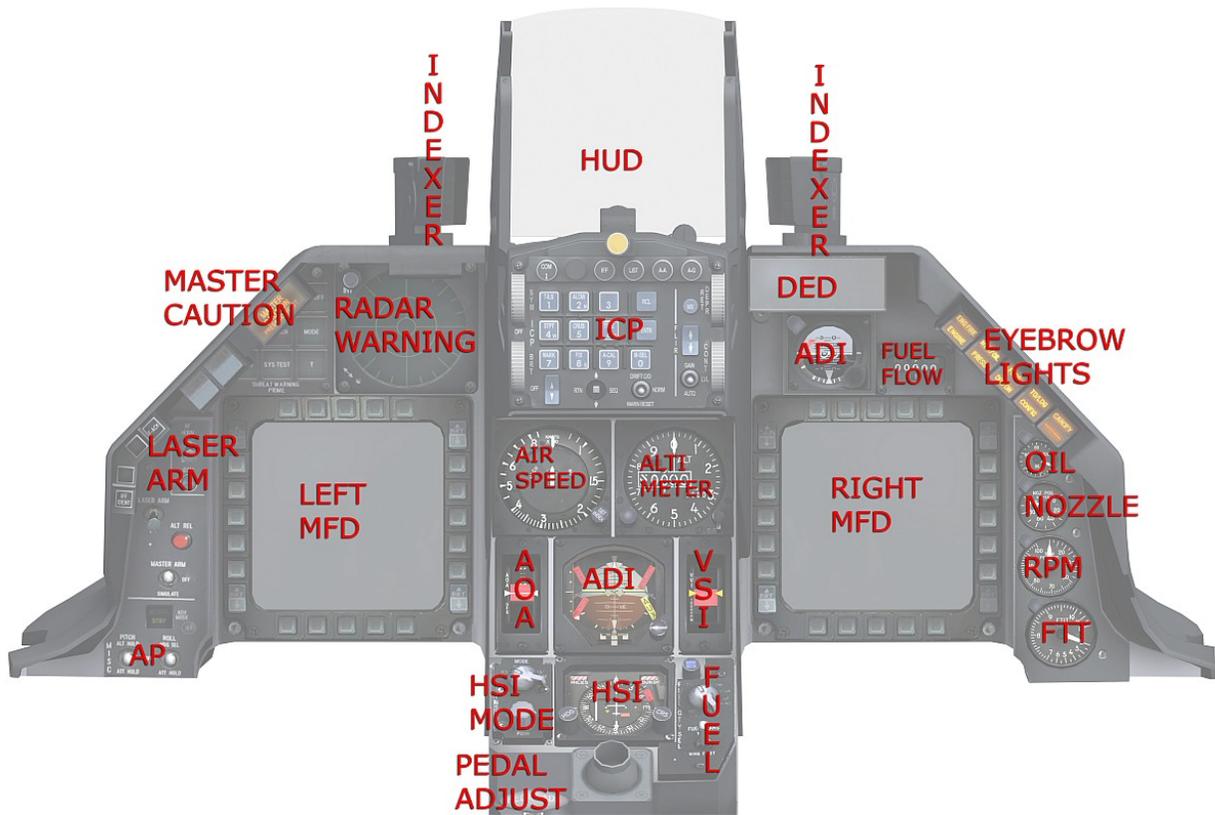
VOL - inop

PRESET Switch - inop

SQUELCH - inop

## CENTER CONSOLE

The center console contains all of the most important gauges and controls. The most complex parts (HUD, DED, ICP and MFD's) are discussed in separate sections.



### AIRSPEED INDICATOR

The airspeed indicator on the Center Console is a backup of the speed indication on the HUD. It shows airspeeds between 80 and 800 knots in Indicated Airspeed

### ALTIMETER

The altimeter on the Center Console is a backup of the altimeter on the HUD. The knob is used to set barometric pressure, the MODE is inop. Normally a setting of 29,93 in.HG is set above 5000 feet

### ANGLE OF ATTACK INDICATOR

This indicator shows the actual Angle of Attack. It is more precise than the AOA indexer lights.

### ATTITUDE DIRECTION INDICATOR

This gauge shows the pitch and bank of the aircraft and also the ILS needles when an ILS signal is received.

## AOA INDEXER LIGHTS

The Angle Of Attack indexer lights on the left side of the HUD shows the ideal angle of attack for landing. If the center light is on it means the AOA is between 11 and 15 degrees, if the top one is on the AOA is too high, if the bottom one is on it means the AOA is too low. The AOA indexer is only activated when the gear is down and the aircraft not on the ground. There is a backup AOA indicator on the lower center panel that is more robust and not depending on the more complex parts of the systems.

## AUTO PILOT



The auto pilot systems in the F-16 are rather rudimentary with just pitch and roll controls. Please note you will need to cycle through modes to get to a certain setting sometimes. To disengage the auto pilot from Bank (Roll mode) or Attitude (Pitch mode ) mode, move both switches to OFF.

Then either move the Roll mode switch from OFF to Heading mode and back to OFF, or move the Pitch mode switch from OFF to Altitude and back to OFF. This is needed due to a limitation of FSX

### ROLL

- **HEADING MODE** - Holds heading set in HSI
- **OFF** - Roll mode off
- **BANK MODE**- Holds bank attitude

### PITCH

- **ALTITUDE HOLD** - Holds current altitude
- **OFF** - Pitch mode off
- **ATTITUDE HOLD** - Holds current pitch attitude

## BACKUP ATTITUDE DIRECTION INDICATOR

As the Attitude Direction indicator is one of the most important gauges there is a backup ADI gauge that uses a separate system. It does not show the ILS bars.

## FUEL FLOW INDICATOR

The Fuel Flow Indicator shows the amount of fuel the engine is using in pounds per hour.

## FUEL QUANTITY PANEL



Using the main rotary switch (using left and right mouse clicks) you can see the amount of fuel in the tank. The EXT FUEL TRANS switch is inop

- **TEST** - shows 6000 lbs in digits and both needles should point to 2,000 lbs
- **NORM** - shows forward/right and aft/left remaining fuel
- **RSVR** - shows the remaining fuel in the forward and aft tanks
- **INT WING** - shows remaining fuel in the internal wing tanks
- **EXT WING** - shows remaining fuel in the external wing tanks
- **EXT CENTER** - shows remaining fuel in the external center tanks

## HORIZONTAL SITUATION INDICATOR



The HSI indicator functions as in any standard aircraft and indicates your location in regards to radio beacons that are being received.

## INSTRUMENT MODE PANEL



The instrument mode panel holds two controls, but only one is active. The TACAN system is not implemented at this moment.

### MODE

- **ILS/TCN** - navigation data from TACAN-ILS (dummy)
- **TCN** - navigation data from TACAN (dummy)
- **NAV** - navigation data from NAV 1/2
- **ILS/NAV** - navigation data from NAV 1/2

## MARKER BEACONS

The Marker beacon light will show when the aircraft is over a beacon. The color indicates the kind of beacon.

Marker	Short	Distance	Modulation	Ident	Color
Outer Marker	OM	4.0 NM	400 Hz	---	Blue
Middle Marker	MM	0.6 NM	1.300 Hz	- . - . -	Yellow
Inner Marker	IM	0.1 NM	3.000 Hz	.....	White

## MASTER CAUTION

Whenever a caution is detected and a caution light is lit on the caution panel the Master Caution light will be lit - pressing the Master caution will acknowledge the caution and the Master Caution light will switch off. Any new (or remaining) caution condition will re- activate the caution again. Whenever a caution exist on the caution panel, which has been acknowledged by pressing the Master Caution button, this caution can be "Recalled" by pressing the Master Caution button again.

## MISC ARMAMENT PANEL

Depending on the version this panel allows control of different systems



**LASER ARM** - Starts animation of laser pod

MASTER ARM - inop  
 ALT REL - inop  
 AF HORN - inop  
 ECM LIGHT - inop  
 AUTO TF - inop  
**HUD** - inop  
 DRAG SHUTE - inop  
 VERTICAL VELOCITY INDICATOR  
 ADV MODE LIGHT (only Block 40/42, 50/52) - inop

## NOSEWHEEL INDEXER LIGHTS

The three indexer lights on the right side are used for aerial refueling and the correct light will be on when the refueling door on top of the fuselage is open, The middle light however also indicates that Nose Wheel steering is available. It will light when the speed is below 60 knots. Over 60 knots nose wheel steering is deactivated.

## PEDAL ADJUST

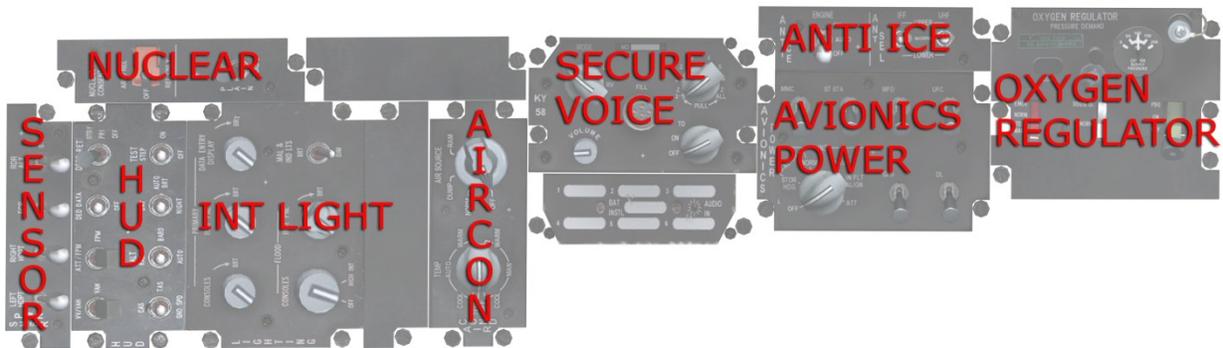


When you right click and drag the mouse the pedals will move backward and forward to suit your length.

## VERTICAL SPEED INDICATOR

The VVI shows the vertical speed of the aircraft. There are two versions, one with a needle (European) and one with a vertical moving bar (US). This instrument is a backup of the primary VSI indicator on the HUD.

## RIGHT CONSOLE



The following panels are not simulated in this model.

### OXYGEN REGULATOR

Though FSX has functions for it we decided not to include this to reduce the complexity. Therefore this panel is not simulated.

### DATA TRANSFER UNIT

Before a flight the pilot will insert a Data Transfer Cartridge into the DATA TRANSFER UNIT. These cartridges hold the navigation data and all other information the systems need for that flight. There is no function in FSX for this so the panel is not functional.

### ANTI ICE / ANTENNA SELECTOR panel

When the Engine anti ice switch is set to the ON position seventh-stage bleed air is directed to the fixed inlet guide vanes and nose cone and the structural inlet electrical heater turns on. The AUTO function is not implemented. The Antenna Selector switches are not functional.

### NUCLEAR CONSENT

The actual use of this panel is a closely guarded secret but we'd just like to warn you NOT to activate this without written and confirmed order.

## ZEROISE

Use of the single button on this panel will clear most databases on the aircraft and is only used when the aircraft is about to fall into enemy hands. This panel is not simulated.

## SECURE VOICE

This panel is not simulated as FSX has no options for this kind of communication.

## AIR CONDITIONING



**AIR SOURCE** Controls the pressurization of the cockpit and fuel tanks. Use left and right mouse key to operate.

- **OFF** - engine bleed air valves closed, no pressurization of any system (neither cockpit, neither fuel tank)
- **NORM** - standard setting during flight, will keep cockpit pressurized and regulates temperature
- **DUMP** - operates cockpit pressure dump valve to make cockpit pressure equal to outside pressure, is needed to open the cockpit
- **RAM** - engine bleed valves close, all cooling and pressurization systems off, ram air valve open allows ram air to ventilate cockpit and avionics.



**TEMP** - Allows you to set a comfortable temperature.

## AVIONICS POWER panel



The AVIONICS POWER holds the most important controls for the avionic systems. After you got electrics to the busses you need to set these switches to activate the main displays.

### INS SWITCH

- **OFF** - Deactivate INS
- **CAL** - This will initiate, calibrate and automatically switch to NORM after 6 minutes when lat/lon is feed to DED
- **IN FLT ALIGN** - This will initiate a 1 minute calibration process
- **NORM** - Will immediate get lat/lon (default position in flight)

**MFD** - toggles MFDs on/off

**UFC** - toggles DED on/off

**GPS** - toggles internal GPS receiver

**ST STA** - toggles FSX NAV mode (GPS/NAV)

**MMC** - dummy

**DL** - dummy

## HUD REMOTE CONTROL PANEL



The HUD remote control panel determines what is shown on the HUD. Note there are two versions of this panel, depending on the model.

### VY VYH / VAH / OFF

- **VY/VAH** - display vertical velocity, velocity, altitude, heading plus Bank Angle Indicator
- **VAH** - display velocity, altitude and heading
- **OFF** - heading, velocity and altitude scales only as digital readouts

### ATT / FPM / FPM / OFF

- **ATM/FPM** - display the Flight Path Marker and the Pitch Ladder
- **FPM** - display the Flight Path Marker
- **OFF** - no Flight Path Marker and Pitch Ladder

### DED DATA / PFL / OFF

- **DED DATA** - displays DED data in the HUD
- **PFL** - displays Pilot Fault List data (only in block 40/42 current, 50/52)
- **OFF** - does not display DED data or Fault Lists data

### CAS / TAS / GND SPD

- **CAS** - displays Calibrated Airspeed
- **TAS** - displays True Airspeed
- **GND SPD** - displays Ground Speed

### ALT RADAR / BARO / AUTO

- **ALT RADAR** - displays radar altitude AGL (altitude above ground)
- **BARO** - displays altitude above MSN (sea level)
- **AUTO** - displays BARO above 1500 AGL, ALT RADAR below 1500 AGL

### DAY/AUTO BRT/NIGHT

- **DAY** - full bright
- **AUTO BRT** - automatic brightness leveling
- **NIGHT** - sets half brightness

### DEPR RET STB / PRI / OFF

Normally used to depress some information on the HUD. We use it to select the source for the steering information on the HUD

- **STB** - Selects NAV1
- **PRI** - Selects NAV2
- **OFF** - Selects GPS

TEST STEP / ON / OFF - inop

## LIGHTING panel



The switches on this panel control the interior lighting and will activate the dimmed cockpit lights. We linked all the switches to the same FSX command. There are two versions of this panel, with the MLU version having additional controls that are all inop.

**PRIMARY CONSOLES** - toggles internal lights

**PRIMARY INST PNL** - toggles internal lights

**FLOOD CONSOLES** - toggles internal lights

**FLOOD INST PNL** - toggles internal lights

MAL IND LTS - inop

PRIMARY DED - inop

INDV LTG CONT - inop (only in MLU version)

NVIS - inop (only in MLU version)

## SENSOR POWER MANAGEMENT PANEL



The switches on this panel control the power to the fuselage hard points and the Fire Control systems. These are not operational. This panel also controls the RADAR ALTIMETER using the left and right mouse buttons. The system should be STANDBY or OFF when ground crew is near the aircraft but ON when you want the HUD to display your altitude above ground.

### RADAR ALT

- **ON** - activates the radar altimeter systems
- **STBY** - powers the radar altimeter systems but does not transmit
- **OFF** - switches the radar altimeter systems off

## INTEGRATED CONTROL PANEL & DATA ENTRY DISPLAY

The ICP is the main interface to most systems in the F-16. Many parts of it have no function in FSX or are classified but we were able to include a lot of the functionality. The DED shows the information selected on the ICP on 5 lines of 25 characters.



### ENTERING DATA

When you need to enter data you will first need to select the correct line using the Cursor Movement switch. The active line is shown with an \* at the beginning and the end. When you select the correct line enter the new data with the ICP Numeric Keys and confirm with the ENT key. When you made a mistake you can clear the whole line with the RCL key. On some screens (BINGO and WAYPOINTS) the two way switch left of the Cursor Movement switch can be used.



### CAGE FLIGHT PATH MARKER

When this switch is activated the Flight Path Marker and everything attached to it (ILS needles, AoA bracket and Pitch ladder) is caged. This means there is little or no left or right movement, this stabilized mode makes it easier to use these HUD elements.

Note: in that mode, the HUD accurately shows climb / dive angle, and AoA. What is NOT accurate now is the flight path marker with respect to the outside world, especially in azimuth. In other words the absolute link between the flight path marker and the scenery is lost. Deviation between HUD horizon and the visible scenery horizon will be greatest when AoA, sidlip, and angle of bank are high.

## OVERRIDE BUTTONS

When none of the function override buttons is pushed in the DED will show the base screen as shown above. The function buttons work like radio buttons so only one can be in (active). When you press the button that is in (active) it will pop out and no function will be selected and the base DED screen will be displayed.

- **COM 1** - Displays the set COM 1 radio (please note the radio is set using the COMS RADIO panel)
- **COM 2** - Displays the set COM 2 radio (please note the radio is set using the COMS RADIO panel)
- **IFF**- Displays a dummy IFF display
- **LIST** - Shows a menu to access the options (see below)
- **A-A** - switches the HUD to an AA mode.
- **A-G**- inop

## LIST PAGE

The list page is a menu to other options. You select these options with the ICP numeric keys.

- **1 DEST** - Displays the data of the waypoints on your flight plan.
- **2 BINGO** - Sets the bingo fuel level (see below).  
The F-16 uses fuel at a very high rate, certainly at afterburner setting and it is very important to maintain a close eye on your fuel load. To help you with this it is possible to set a 'bingo' fuel level. When you got that much fuel left a warning will appear in your HUD. Normally you would set this level to the amount of fuel needed to fly back to base from the furthest point in your flight plan. This level is set using the standard ICP procedure (see above)
- **3 VIP** - inop
- **4 NAV**- Displays the NAV menu (see below)  
On the navigation page you can set the frequencies for the two navigation radios and the course used by these systems. Setting the frequencies and courses is done with the standard ICP procedure (see above)
- **5 MAN** - inop
- **6 INS** - Displays the Inertial Navigation System data. To show correct data the Inertial Navigation needs to be activated when the aircraft is powered up.
- **8 MODE** - inop
- **9 VRP** - inop
- **MISC** - Displays a secondary menu, none of this is used

## HOW TO SHOW ILS BARS ON THE HUD

From the base DED page (so without any Override buttons depressed)

1. Press **LIST** then **4** to select the NAV pages
2. Select NAV1 Frequency and enter the correct frequency
3. Select NAV1 Course and enter the correct course
4. Press **LIST** to come back to the DED base page
5. Press the **1** (T-ILS) key
6. Check that the Frequency and CRS is correct on this page too
7. On Avionics power panel set the switch ST.STA to off
8. On the Nav mode selector select ILS/NAV (turn fully to the right)

When there is a active ILS transmission the ILS bars will now be active

## SIDE STICK CONTROLLER, THROTTLE QUADRANT SYSTEM AND ANIMATIONS

There are many special animations that have no real function but increase the realism of the cockpit.

### SIDE STICK CONTROLLER

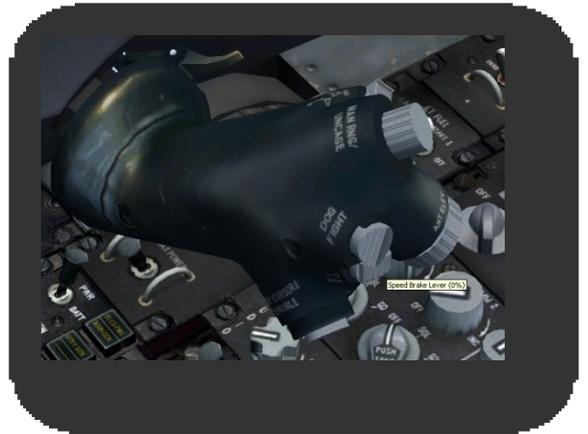


The side stick was one of the major innovations of the F-16. It was located to the side of the cockpit so the full arm of the pilot could be supported making high G maneuvers easier to control. Furthermore the stick was almost fully static. It did not move as other controls in aircraft did. It senses force applied to it and not movement. We added a tiny bit of animation to give the user some feedback though. There are no controls on the side stick for the FSX pilot.

### THROTTLE QUADRANT SYSTEM

There are several controls that are located on the Throttle Control. Most are linked to weapons systems and are not used in our model.

- **SPEEDBRAKES** - The speed brakes are toggled with the SPEED BRAKE CONTROL switch or with the spoiler command of (*FSX [/] on a standard keyboard*). Speed brake extension is shown on LEFT AUX panel. The speed brakes are manual but will move automatically under certain conditions; When the speed brakes are open when the gear is extended, they will automatically partially close (from 60% to 43%) to compensate for the drag of the gear. When the nose wheel touches down the speed brakes are automatically fully extended.
- **CUTOFF RELEASE SWITCH** - The small lever on the throttle prevents the throttle from being pulled all the way into the fuel cutoff position inadvertently. When you click this switch the throttle will advance to idle/starting 12% position. The throttle can now not be moved back until the small switch is clicked (and your hardware throttle is fully closed). This will close the fuel lines and shut down the engine.
- COMMUNICATION SWITCH – inop
- MANUAL RANGE / UNCAGE SWITCH – inop
- DOGFIGHT / MISSILE OVERRIDE SWITCH – inop
- ANTENNA ELEVATION – inop
- CURSOR SWITCH - inop



### JET STARTER DOORS

On the right side of the fuselage, under the wings are two small doors that open when the engine is started. These doors allow additional air to stream into the engines.

## RUDDER PEDAL SYSTEM



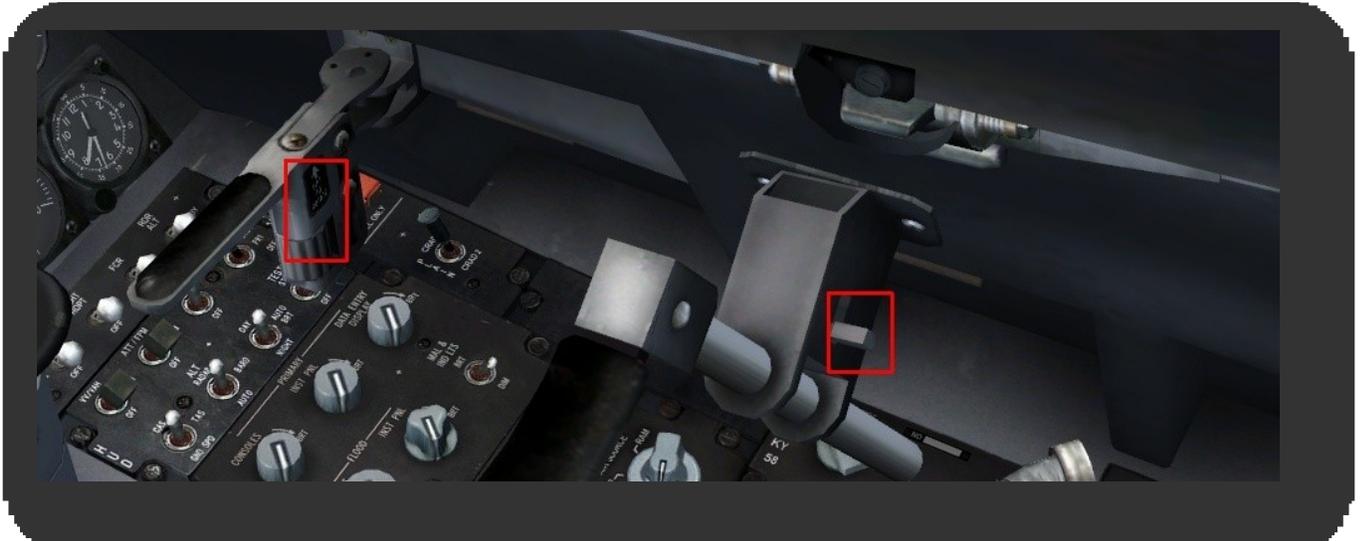
The whole pedal control system can be moved forward and backward to suit the pilot with the pedal adjust lever. Drag this lever up and down with the left mouse button. Please note there is NO movement of the pedals when you control the aircraft on the ground (the pedals are not used in flight) as it uses the same system as the stick. It measures force applied to it, not movement. However we added a little movement so there is some feedback to the user. The brake pedals will animate when the brakes are applied.



## ARM RESTS



Although a simple object, it is very important because it supports the right arm of the pilot under high G-loads. Left clicking moves it towards you, right clicking on the armrest will move it out of the way so you can see the controls beneath it better. The rear arm moves up and down using the left and right mouse buttons when clicked on the small lever on the structure that fixes the arm rest to the side. Animating the arm rests makes it easier to see the panels below them without having to move the view point. The click zones are shown on the image.



## OCTOPUS



The *octopus* locks the canopy and in many models hides the canopy control switch. Always have the canopy down when you fly. (see the left console section for more detail).



## EJECTION CONTROL SAFETY LEVER

The ejection seat is nothing more than a bomb/rocket that a pilot sits on. It is very important the systems are locked when the aircraft is not being flown so unwanted deployment is impossible. The moment you are shutting down the engine you flip this lever up and the system will be safe. The ground crew will always check this before they reach inside the cockpit.

## CANOPY



The canopy can be opened with the default [shift]-[e]-[1] command. It is more realistic to use the canopy switch. Note the switch is either underneath the octopus or a bit further aft and that the canopy will only open when the octopus is up.

## PILOT VISOR

The Pilot Visor is linked to the default Water Rudder command [shift]-[w].

## LASER PODS

Several of the targeting pods have animations that are triggered with the Laser Arm switch. When switched on the pods will either start a scanning animation

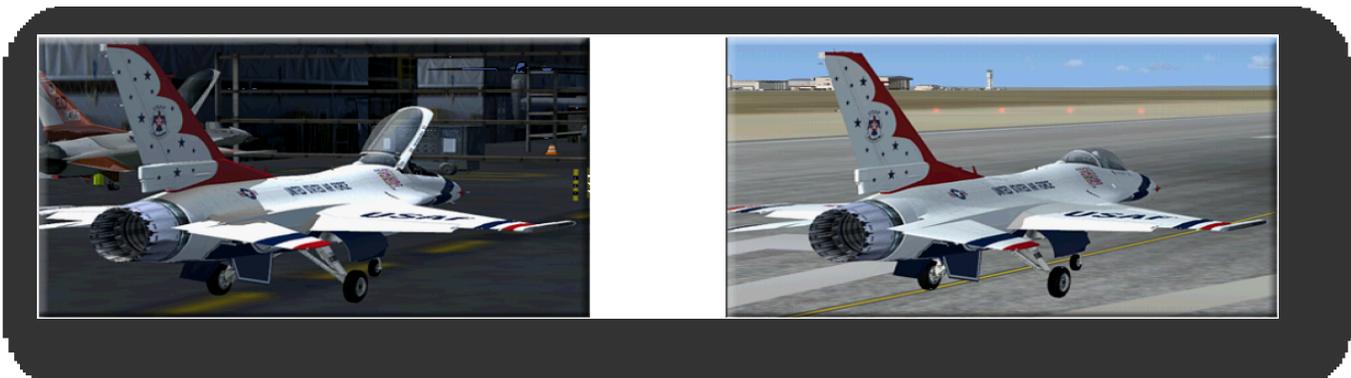


or animate from the stored state to the active state (with the sensors forward).



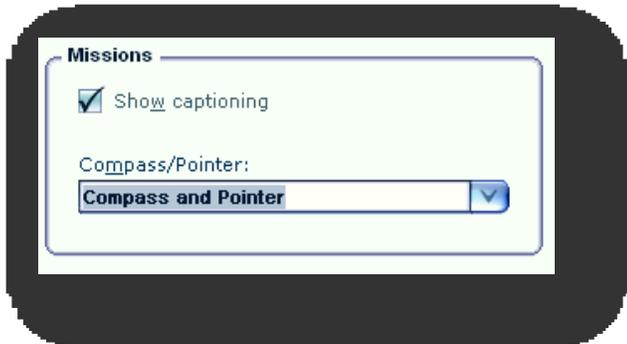
## CONFIGURATOR

There are many controls that you need to set to fully be able to use many of the systems. And most of them cannot be stored by FSX. So our good friend Finn made a simple to use configurator. When you press [SHIFT]-[2] you get two images, the left shows the aircraft with all systems down in the hangar, the right one shows the aircraft ready for take-off. Click the condition you want and all the systems will be set correctly.



## MISSIONS

There are two exciting missions included that will test your skills. You will find them in the Aerosoft Flights section in the Mission section. Both missions are self explanatory. Just keep in mind that it is probably a good idea to set Show captioning and Compass + Pointer on in the Options | Settings | General dialog as shown in the image here.



- HOME
- FREE FLIGHT
- MISSIONS**
- MULTIPLAYER
- PILOT RECORDS
- LEARNING CENTER
- SETTINGS

Category: Aerosoft Flights Aerosoft Flights

Skill level: ( All Skill Levels ) Explore the aerosoft flights.

Show saved Missions

Title	Level
Bushhawk XP - Introduction	BEGINNER
BHXP Assisted Flight: FlyIn Fishing	BEGINNER
BHXP Assisted Flight: Flightseeing at Mt Edg	BEGINNER
BHXP Assisted Flight: Flightseeing Blue Mou	BEGINNER
BHXP Assisted Flight: Columbia Spring	BEGINNER
BHXP Assisted Flight: Along the Cascades	BEGINNER
BHXP Assisted Flight: Alpine Canoeing	BEGINNER
BHXP Assisted Flight: Aleutian Supply I	BEGINNER
BHXP Assisted Flight: Aleutian Supply II	BEGINNER
BHXP Assisted Flight: Aleutian Supply III	BEGINNER
BHXP Assisted Flight: Aleutian Supply IV	BEGINNER
BHXP Assisted Flight: Flightseeing Mount R	BEGINNER
BHXP Assisted Flight: Salmon Air	BEGINNER
20th FW - Air Force One	INTERMEDIATE
77th Gamblers - Intercept	INTERMEDIATE
Needle in a haystack	INTERMEDIATE

**20th FW - Air Force One**



Description

Air Force One is returning from Japan. Escort the President and his staff safely to Hawaii where he has a scheduled meeting with the Secretary of State.



## IN-FLIGHT REFUELING

The F-16 is able to refuel in-flight using the fuel connector on top of the fuselage. In contrast to the system where the receiving aircraft has to do most of the work, this refueling system is fully controlled by the tanker aircraft crew and the F-16 just as to be in the right location. As there is no true in-flight refueling option in FSX we created a system that allows the user to refuel from ANY airliner type aircraft. Just find one, maneuver in to the right position and open the fuel door. If you stay in position long enough, your internal tanks will fill up. The correct position is between 170 and 100 feet behind and between 15 and 30 feet below the 'tanker'. The image shown gives you a good example of what it should look like.



The three indexer lights right side of the HUD show your refuel status:

- **RDY** - Refuel door open, ready to receive fuel
- **AR/NWS** - Connected and receiving fuel
- **DISC** - Refuel door open, but not connected yet

Please note that due to limitations of FSX refueling is done in steps of 25% and only the internal tanks will be filled.



## TWEAKING

We encourage people to alter this product and assist that process in many ways. Feel free to discuss this in our forum.

## MODEL CONFIGURATION FILES

Although it is NOT possible to change the visual model of the aircraft you can change the behavior of the aircraft. The aircraft.cfg files for each model actually contain the information for ALL the models and we simply disable the lines that should not be used. Take the weight and balance section for example. If you look at model shown on this page you will see that it has a variety of external missiles, tanks and target pods. In the aircraft.cfg this is shown like this:

```
[WEIGHT_AND_BALANCE]
max_number_of_stations = 11
station_load.0= 220.0, 13.50, 0.00, 1.60, Pilot
station_load.1= 335.0, 0.00, -16.70, 0.00, AIM-120 AAMRAM
// Station 1
station_load.2= 192.7, 0.00, -13.50, -1.75, AIM-2000 IRIS-T // Station 2
station_load.3= 461.0, 0.00, -7.50, -2.25, EX-TANK 370 // Station 4
station_load.4= 440.0, 0.00, 1.00, -4.00, AN/AAQ-33 Sniper // Station 5R
station_load.5= 461.0, 0.00, 7.50, -2.25, EX-TANK 370 // Station 6
station_load.6= 192.7, 0.00, 13.50, -1.75, AIM-2000 IRIS-T // Station 8
station_load.7= 335.0, 0.00, 16.70, 0.00, AIM-120 AAMRAM // Station 9
// station_load.X= 335.0, 0.00, -16.70, 0.00, AIM-120 AAMRAM // Station 1
// station_load.X= 195.0, 0.00, -16.70, 0.00, AIM-9 Sidewinder // Station 1
// station_load.X= 195.0, 0.00, -16.70, 0.00, SmokeWinder // Station 1
// station_load.X= 192.7, 0.00, -13.50, -1.75, AIM-2000 IRIS-T // Station 2
// station_load.X= 335.0, 0.00, -13.50, -1.75, AIM-120 AAMRAM // Station 2
// station_load.X= 195.0, 0.00, -13.50, -1.75, AIM-9 Sidewinder // Station 2
// station_load.X= 500.0, 0.00, -13.50, -1.75, GBU-12 Paveway II // Station 2
// station_load.X= 807.0, 0.00, -10.50, -2.00, AGM-88A HARM // Station 3
// station_load.X= 611.0, 0.00, -10.50, -2.00, GBU-12 Paveway II // Station 3
// station_load.X= 461.0, 0.00, -7.50, -2.25, EX-TANK 370 // Station 4
// station_load.X= 450.0, 0.00, -2.75, 2.00, Conf. Fuel Tank // Station 5TL
// station_load.X= 674.0, 0.00, -0.00, -4.00, AN/ALQ-131 ECM Pod // Station 5
// station_load.X= 635.0, 0.00, -0.00, -4.00, AN/ALQ-184 ECM Pod // Station 5
// station_load.X= 354.0, 0.00, -0.00, -4.00, EX-TANK 300 // Station 5
// station_load.X= 440.0, 0.00, 0.00, -4.00, AN/AAQ-33 Sniper // Station 5R
// station_load.X= 450.0, 0.00, 0.00, -4.00, AN/AAQ-28 Litening // Station 5R
// station_load.X= 100.0, 0.00, 0.00, -4.00, AN/ASQ-213 HTS // Station 5R
// station_load.X= 450.0, 0.00, 2.75, 2.00, Conf. Fuel Tank // Station 5TR
// station_load.X= 461.0, 0.00, 7.50, -2.25, EX-TANK 370 // Station 6
// station_load.X= 611.0, 0.00, 10.50, -2.00, GBU-12 Paveway II // Station 7
// station_load.X= 807.0, 0.00, 10.50, -2.00, AGM-88A HARM // Station 7
// station_load.X= 611.0, 0.00, 13.50, -1.75, GBU-12 Paveway II // Station 8
// station_load.X= 123.0, 0.00, 13.50, -1.75, ACMI Pod // Station 8
// station_load.X= 123.0, 0.00, 13.50, -1.75, FPR Pod // Station 8
// station_load.X= 195.0, 0.00, 13.50, -1.75, AIM-9 Sidewinder // Station 8
// station_load.X= 335.0, 0.00, 13.50, -1.75, AIM-120 AAMRAM // Station 8
// station_load.X= 192.7, 0.00, 13.50, -1.75, AIM-2000 IRIS-T // Station 8
// station_load.X= 123.0, 0.00, 16.70, 0.00, ACMI Pod // Station 9
// station_load.X= 123.0, 0.00, 16.70, 0.00, FPR Pod // Station 9
```



```
// station_load.X= 195.0, 0.00, 16.70, 0.00, SmokeWinder // Station 9
// station_load.X= 195.0, 0.00, 16.70, 0.00, AIM-9 Sidewinder // Station 9
// station_load.X= 335.0, 0.00, 16.70, 0.00, AIM-120 AAMRAM // Station 9
```

All the lines starting with // are not used by FSX but if you'd like to make the aircraft fly as it would with an external center tank it is easy to take this line:

```
// station_load.X= 354.0, 0.00, -0.00, -4.00, EX-TANK 300 // Station 5
```

and add it to the active section with the // removed. The stations that can be used are shown here. Note the two stations ON TOP of the fuselage; they are only for the conformal fuselage tanks.



The same is true for other sections, for example the fuel section looks like this:

```
[FUEL]
fuel_type = 2
number_of_tank_selectors = 1
electric_pump = 1
fuel_dump_rate = 0.00185

LeftAux = 0.00, -5.50, 0.00, 82.5, 0.0 // F-16 Left WingTank
RightMain = 5.00, 0.00, 0.00, 442.5, 0.0 // F-16 Forward Main Tank
LeftMain = -5.00, 0.00, 0.00, 442.5, 0.0 // F-16 Aft Main Tank
RightAux = 0.00, 5.50, 0.00, 82.5, 0.0 // F-16 Right Wing Tank

// Center3 = 0.00, 0.00, -3.75, 300.0, 0.0 // Center External Drop Tank
// LeftAux = 0.00, -7.14, -1.84, 452.5, 0.0 // Left Wing + External Drop Tank
// RightAux = 0.00, 7.14, -1.84, 452.5, 0.0 // Right Wing + External Drop Tank
// LeftAux = 0.00, -3.49, 1.46, 307.5, 0.0 // Left Wing + Conformational Fuel Tank
// RightAux = 0.00, 3.49, 1.46, 307.5, 0.0 // Right Wing + Conformational Fuel Tank
```

Again you see that all possible tanks are included and we just disabled some of the tanks.

## REDUX SHOCKWAVE LIGHTS

FSX has serious problems with lights (as noted in other sections of this manual) and some of these problems are solved by A2A's Redux lights. And they are more than a fix as they look really nice and we advise you to use them. We provided the configuration files for them to make it easy to use them. In every *aircraft.cfg* you will find the correct light locations with // in front of that line. Just remove those //s and add //s to the beginning of the original lights locations. Follow the Redux manual for any additional step needed. <http://www.a2asimulations.com/store/shockwavelights/>

## DIFFERENT MODELS

Although we feel a generous selection of models is supplied we realize that there are dozens more that are possible and you would like a model that is not included. Please come to our forum and let us know what you'd like to see. We make no promises, but there will be more layouts. We do NOT intend to provide duo versions or some of the more exotic versions though.

## PAINTKIT

A fully documented paintkit is available to registered customers. We have a section on our forum available to discuss, share and request liveries.

## FAQ

Q: I want to shoot and bomb stuff.

A: Sorry, very early in the project development we decided to keep this about flying and not about fighting. Not only because we think FSX should not be seen as a combat sim but also because there are many things that are technically impossible or would require a lot of additional resources to complete.

Q: The afterburner does not look as I expect it to be.

A: With the release of FSX SP2, FSK ESP and FSX Acceleration things with effects and lights have not become easier. An afterburner effect that works on all models seems nearly impossible so we decide to go for an afterburner that does not rely on effects but is modeled. Also keep in mind that on the real aircraft the visual effect can differ hugely due to environmental light, moisture and temperature levels. These cannot be modeled in FSX.

Q: The speed brakes extend fully before retracting.

A: This was an issue that cannot be avoided without losing the partial retraction when the gear extends.

Q: The external lights are placed incorrectly.

A: Indeed. FSX has problems keeping lights in position. If you change your viewpoint the light will move as well in relation to the aircraft. One of the nastiest bugs in FSX but there is nothing that can be done. We tried keeping them in the aircraft.cfg and we tried adding them to the MDL but it all is the same. The closer to the center of the model the worse the problem is so the fuselage lights have most problems. You will also notice how the shine THROUGH the model (in this case inside the engine air inlet) -- another bug in the effects modeling.

Q: Why are there no things like blocks, generators etc when I apply the parking brakes?

A: For one simple reason: even when not shown they would add code to the MLD files and we decided to use ANY bit possible on the aircraft itself.

Q: Why am I overstressing the aircraft all the time?

A: Contradictory to what most people think the flight computers do not prevent this. Under ideal (or rather least ideal) conditions it is possible to pull so much G that even a clean and empty F-16 will break. When you got stores underneath your aircraft you might be in Cat III conditions and limited to 5.5 G. Exceed that and there is a good chance you will break parts of the aircraft. When in doubt check the stores screen on the MFD to see what your maximum G load is.

For an updated FAQ see our forum: <http://www.forum.aerosoft.com/index.php?showforum=141>

**F-16 PROCEDURES / CHECKLIST****COCKPIT INTERIOR CHECK**

<input type="checkbox"/> PARKING BRAKE	SET
<input type="checkbox"/> ALT FLAPS	NORM
<input type="checkbox"/> LE FLAPS	AUTO
<input type="checkbox"/> TRIM CONTROLS	CENTER
<input type="checkbox"/> FUEL MASTER	MASTER (guard down)
<input type="checkbox"/> ENG FEED	NORM
<input type="checkbox"/> AIR REFUEL	CLOSE
<input type="checkbox"/> EXT LIGHTS	AS REQUIRED
<input type="checkbox"/> MASTER LIGHT	AS REQUIRED
<input type="checkbox"/> LANDING TAXI LIGHT	AS REQUIRED
<input type="checkbox"/> HOOK	OFF
<input type="checkbox"/> MASTER ARM	OFF
<input type="checkbox"/> LASER ARM	OFF
<input type="checkbox"/> LANDING TAXI LIGHT	AS REQUIRED
<input type="checkbox"/> FUEL QTY SEL	NORM
<input type="checkbox"/> SNSR PWR	OFF
<input type="checkbox"/> INTERIOR LIGHT	AS REQUIRED
<input type="checkbox"/> AIR SOURCE	NORM
<input type="checkbox"/> AVIONICS POWER	OFF

**BEFORE START**

<input type="checkbox"/> MAIN POWER	BATT
<input type="checkbox"/> Verify FLCS RELAY light	OFF
<input type="checkbox"/> MAIN POWER SWITCH	MAIN PWR
<input type="checkbox"/> Verify FLCS RELAY light	OFF
<input type="checkbox"/> Verify TOFLCS light	ON
<input type="checkbox"/> Verify ELEC SYS light	ON
<input type="checkbox"/> Verify SEC light	ON
<input type="checkbox"/> Verify HYD/OIL light	ON
<input type="checkbox"/> MASTER CAUTION light	RESET

**ENGINE START**

<input type="checkbox"/> THROTTLE	IDLE (full back)
<input type="checkbox"/> JFS	START 1
<input type="checkbox"/> Verify RPM	Over 20%
<input type="checkbox"/> THROTTLE	TOGGLE IDLE DETENT
<input type="checkbox"/> Verify RPM	IDLE
<input type="checkbox"/> THROTTLE	BACK TO IDLE
<input type="checkbox"/> Verify HYD/OIL light	Check Off

**AFTER ENGINE START**

<input type="checkbox"/> INS	NORM
<input type="checkbox"/> SENSOR POWER	ALL ON
<input type="checkbox"/> AVIONICS POWER	ON
<input type="checkbox"/> HUD + HUD MODES	ON and SET

**ENGINE CHECK**

<input type="checkbox"/> Verify FUEL FLOW	500...1500 PPM
<input type="checkbox"/> Verify RPM	60%...70%
<input type="checkbox"/> Verify FTIT	< 575
<input type="checkbox"/> Verify HYD/OIL lights	ALL OFF

**BEFORE TAXI**

<input type="checkbox"/> MASTER MODE	NAV
<input type="checkbox"/> MASTER ARM	SAFE
<input type="checkbox"/> RADAR	OFF
<input type="checkbox"/> Verify GEAR	DOWN/LOCKED/GREEN
<input type="checkbox"/> LANDING LIGHTS	ON
<input type="checkbox"/> EJECTION SEAT	ARM
<input type="checkbox"/> CAUTION LIGHTS	ALL OFF
<input type="checkbox"/> FLIGHT CONTROLS	CHECK FREE
<input type="checkbox"/> CONTACT TOWER	REQUEST TAXI
<input type="checkbox"/> NOSEWHEEL STEERING INDEXER light	Check on

**TAXI**

<input type="checkbox"/> LIGHTS	CHECK
<input type="checkbox"/> PARKING BRAKE	RELEASE
<input type="checkbox"/> SPEEDBRAKE	CHECK CLOSED
<input type="checkbox"/> SPEED	20 KTS MAX
<input type="checkbox"/> FUEL FLOW	CHECK
<input type="checkbox"/> BRAKES	TEST

**BEFORE TAKE OFF**

<input type="checkbox"/> AIRPORT ELEVATION	NOTE & CHECK
<input type="checkbox"/> HUD	CHECK
<input type="checkbox"/> TRIM	CHECK NEUTRAL
<input type="checkbox"/> SEAT	CHECK ARMED
<input type="checkbox"/> RADAR ALT	ON

**TAKE OFF**

<input type="checkbox"/> POWER	FULL MIL (AB WHEN NEEDED)
<input type="checkbox"/> CAUTION / ENGINE	OFF / GREEN
<input type="checkbox"/> AIRSPEED 150 KTS	ROTATE
<input type="checkbox"/> POSITIVE CLIMB	MAINTAIN 10 DEGREES POSITIVE
<input type="checkbox"/> GEAR	IN
<input type="checkbox"/> SPEED	> 200 KTS

**APPROACH (see illustration)**

<input type="checkbox"/> RADIO TOWER (20 NM OUT)	CALL INBOUND
<input type="checkbox"/> DED / HUD mode	ILS
<input type="checkbox"/> MASTER ARM	OFF
<input type="checkbox"/> FUEL	CHECK

**BEFORE LANDING**

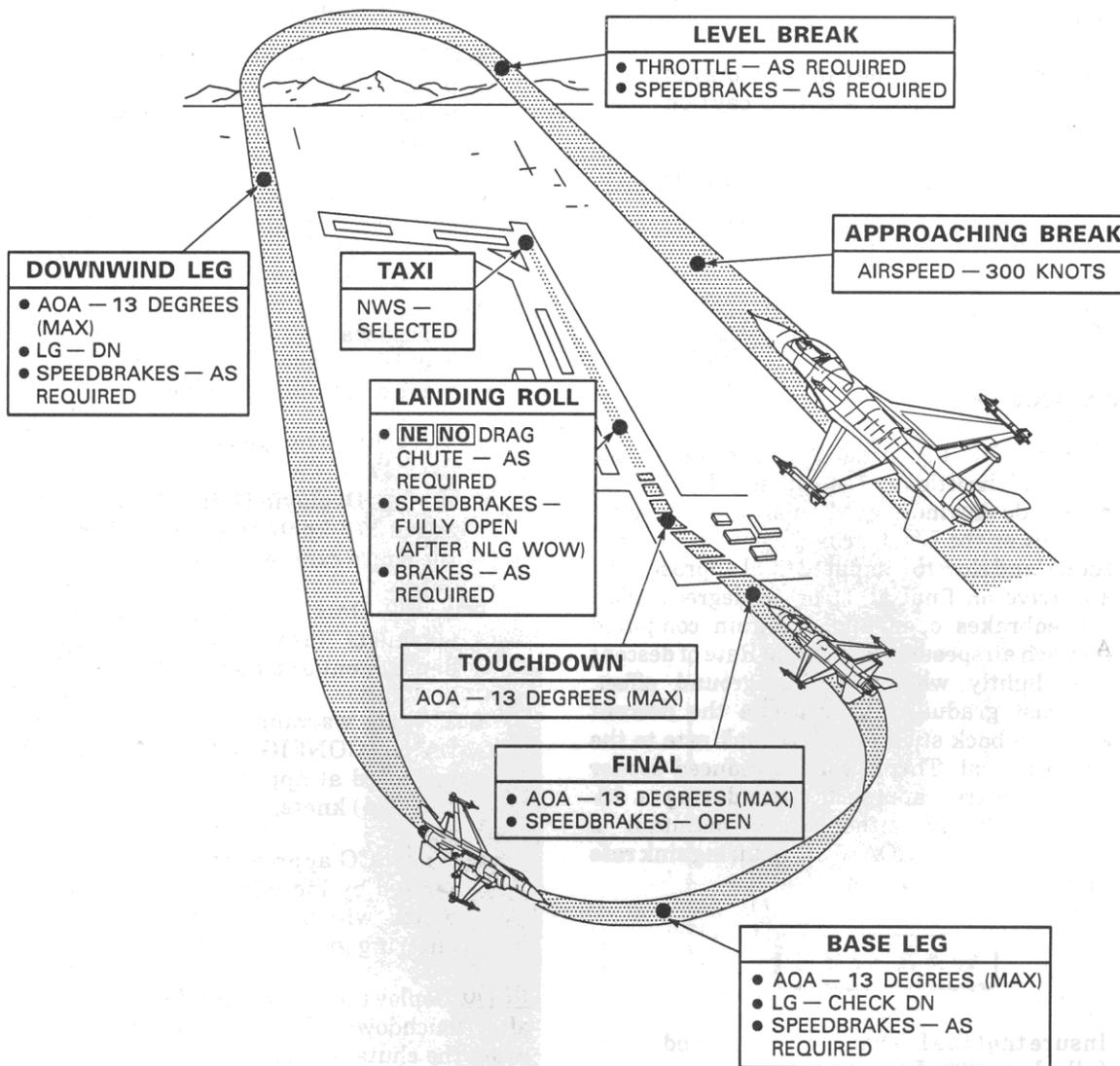
<input type="checkbox"/> RADIO TOWER (5 NM OUT)	GET CLEARANCE
<input type="checkbox"/> DED / HUD	CHECK FOR ILS
<input type="checkbox"/> LANDING LIGHT	ON
<input type="checkbox"/> SPEED	< 250 KTS
<input type="checkbox"/> GEAR	DOWN / LOCKED / 3 GREEN
<input type="checkbox"/> SPEEDBRAKE	FULLY DEPLOYED
<b>FINAL</b>	
<input type="checkbox"/> AOA	13° (green)
<input type="checkbox"/> SPEED	< 150 KTS
<input type="checkbox"/> GEAR	CHECK DOWN

**AFTER LANDING**

<input type="checkbox"/> SPEED	DECREASING
<input type="checkbox"/> AOA	MAINTAIN AERO BRAKING
<input type="checkbox"/> SPEED 80 KTS	ENGAGE BRAKES
<input type="checkbox"/> SPEED 30 KTS	VACATE RUNWAY
<input type="checkbox"/> DED	ILS MODE OFF
<input type="checkbox"/> CAUTION	CHECK ALL OFF
<input type="checkbox"/> SPEEDBRAKE	OFF
<input type="checkbox"/> RADAR ALT	OFF

**SHUT DOWN**

<input type="checkbox"/> PARKING BRAKES	SET
<input type="checkbox"/> EJECTION SEAT	SAFE
<input type="checkbox"/> HUD	OFF
<input type="checkbox"/> SENSOR POWER	ALL OFF
<input type="checkbox"/> AVIONICS POWER	ALL OFF
<input type="checkbox"/> THROTTLE	TOGGLE IDLE DETENT
<input type="checkbox"/> FUEL PUMPS	OFF
<input type="checkbox"/> RPM	CHECK DECREASING
<input type="checkbox"/> MASTER LIGHT	OFF
<input type="checkbox"/> AIR SOURCE	OFF
<input type="checkbox"/> MASTER FUEL	OFF
<input type="checkbox"/> MAIN POWER	OFF
<input type="checkbox"/> RAYBAN	ON
<input type="checkbox"/> COOL ATTITUDE	ACHIEVED



**NOTE:**

FINAL APPROACH AIRSPEED/13 DEGREES AOA CROSS-CHECK.

- **A** 125 KNOTS + 4 KNOTS PER 1000 POUNDS OF FUEL/STORE WEIGHTS. ADD 8 KNOTS FOR 11 DEGREES AOA APPROACH.
- **B** 129 KNOTS + 4 KNOTS PER 1000 POUNDS OF FUEL/STORE WEIGHTS. ADD 8 KNOTS FOR 11 DEGREES AOA APPROACH.