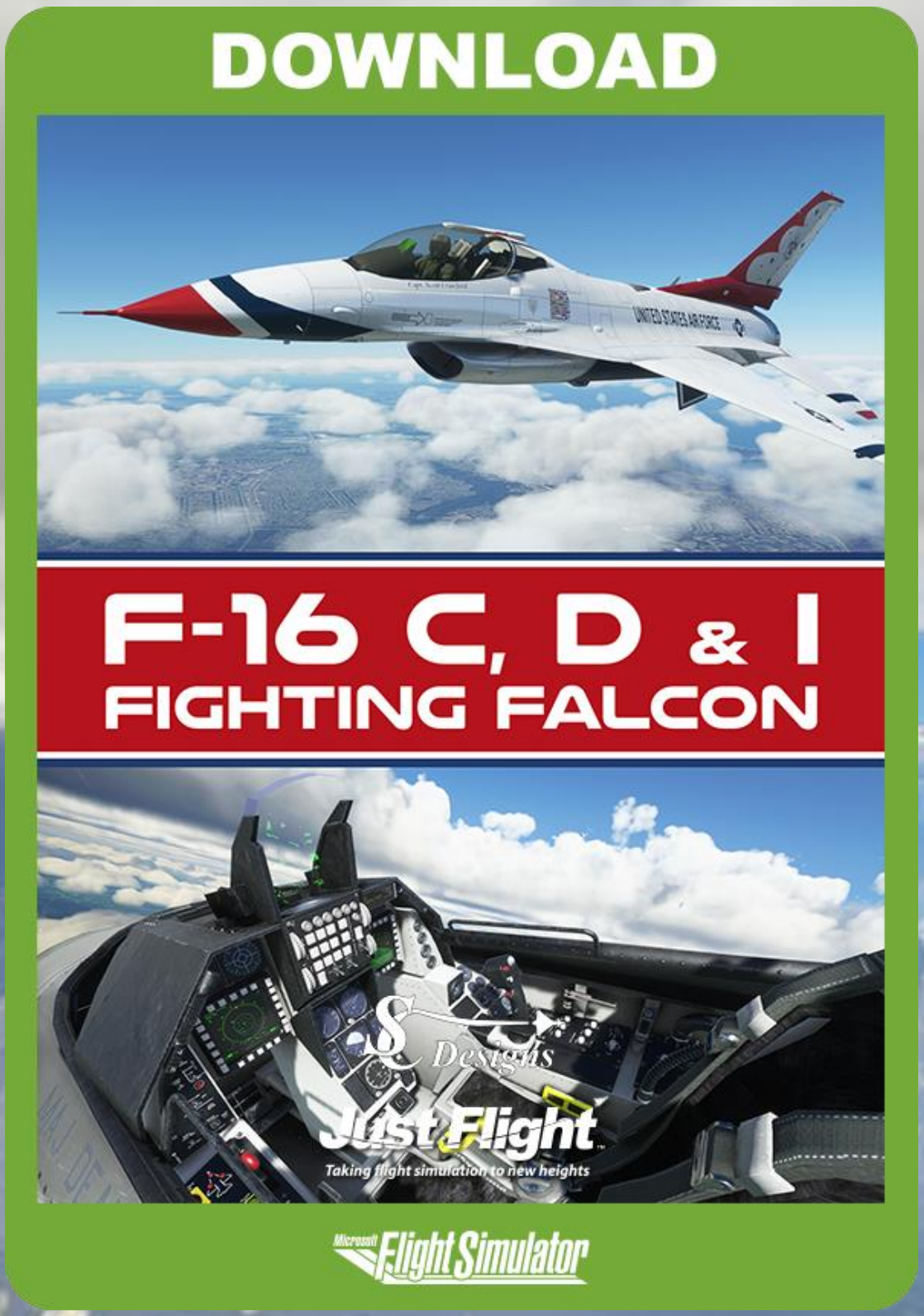
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F-16 C, D & I
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F-16 C, D & I FIGHTING FALCON

OPERATIONS MANUAL

Welcome to the *SC Designs* F-16C, D and I Fighting Falcons. This manual will guide you through the operation of the aircraft, and ensure that you enjoy flying the airplane.

It should be noted that although this rendition of the F-16 Fighting Falcons is not "*study-level*", it is sufficiently complex to require some training to master the airplane. To get the best out of the F-16, it is required to read this manual in full.

CONTENTS

GENERAL PERFORMANCE TABLE

- Crew = 1
- Length = 49 ft 5 in (15.06 m)
- Wingspan = 32 ft 8 in
- Height = 16ft
- Wing area = 300 sq ft
- Empty weight = 18,900 lbs
- Max take-off weight = 26,500 lbs
- Fuel capacity = 7,000 lbs internal
- Engines = GE-F110 afterburning turbofan (23,400lbs max-thrust at sea level)
- Maximum airspeed = Mach 2.05 (at high altitude) – Mach 1.2 at low altitude
- Range = 2,277 nautical miles with external tanks
- Combat Range = 295 nautical miles
- G-limits = +9.0 G, -3G

The F-16 Fighting Falcon is one of the most recognisable aircraft in the world, incorporating the classic, sleek lines of a fighter and utilising some of the latest advances in computer-controlled aerodynamics. The aircraft is considered to be one of the most difficult opponents to beat in air-to-air combat, combining a relatively small size with an enormously powerful engine and perfect all-round visibility for the pilot.

Developed for the United States Air Force as an air-superiority fighter, it has since evolved into a highly capable multi-role aircraft in service with twenty-five air forces around the world. More than 4,600 Fighting Falcons have been built. Equipped with a fly-by-wire control system, teardrop canopy for high visibility and pilot situational awareness, and with a unique slanted ejection seat to help the pilot cope with high G-forces, the fighter's lightweight, small size and huge single engine give it an unbeatable performance in close air-combat that keeps the F-16 competitive even against today's most capable fifth-generation fighter aircraft.

Note: Weapons are only available on versions of this aircraft purchased for PC *outside* of the Marketplace, i.e, from third-party stores. This is due to Microsoft Terms and Conditions for sale on the in-game Marketplace.

AIRCRAFT FAMILIARISATION

Although the Falcon was designed as a lightweight fighter aircraft with export potential, it has undergone several transformations during its lifetime, in the form of Block releases that have added extra features, avionics, weapons and enhanced radar. One additional feature common to many variants are conformal fuel tanks mounted upon the upper fuselage flanks, giving extra range for Combat Air Patrols. This rendition of the F-16s does not focus specifically on any one "Block" production aircraft.

The Falcon's high agility and good thrust-to-weight ratio make it a capable dogfighter, and as such it has seen further service as an "Aggressor" aircraft for both the United States Air Force and the United States Navy, with the famous Fighter Weapons School, "*Top Gun*", at NAS Fallon, Nevada.

PANEL LAYOUT (PILOT)

The cockpit of the F-16A Fighting Falcon is a mixture of Multi-Function-Displays common to many modern aircraft, and analogue gauges reminiscent of the aircraft's design era, the 1970s. The cockpit is surprisingly small compared to many fighter aircraft as a result of weight-saving considerations during its design, and the pilot sits quite high above the canopy sill, increasing visibility further through the large teardrop-shaped canopy.

The aircraft contains a full navigation suite as well as a full autopilot system, as well as analogue flight instruments and a Heads-Up Display mounted directly in the pilot's line of sight, to relay vital flight information. The twin-seat F-16D trainer version has a copy of the front cockpit that contains the same instrumentation with a slightly different layout, and the MFD screens contain information relayed from the front seat position.

(**Note**: Although all of the buttons and switches in the F-16's cockpit are operable, those marked as INOP in MSFS do not have an active function assigned at this time, as the simulator does not support it).

MAIN PANELS

Top Left panel: Radar Warning Receiver (INOP in MSFS) and launch annunciator lights

Centre Top panel: Autopilot command and DED control panel

Top Right panel: DED digital display, back-up artificial horizon, fuel flow gauge

Left MFD: Navigation information

Right MFD: Forward Looking Infra-Red display / HUD data repeater

Lower Centre Panel: Airspeed Indicator, Altitude

"Bingo" or minimum flight fuel for the F-16 Fighting Falcon is set at 3,000lbs. Bingo warning lights will alert the pilot should fuel quantity sink below 3,000lbs, signifying an immediate need to land or air-to-air refuel.

PILOT'S LEFT FORWARD PANEL

Upper Panel: Weapons control switches (INOP in MSFS)

Main Panel Upper: Landing gear annunciator lights, Hook lever, Anti-Skid switch, Parking brake switch, landing lights switch, Landing Gear lever

Main Panel Lower: Threat Warning Receiver launch warning lights, CMDS switches (INOP in MSFS)

Activating the Refuel Probe will open the probe bay and also add 25% fuel to the Fighting Falcon while in flight. The Fuel Dump switch can be used to dump fuel to reach landing weight.

PILOT'S RIGHT FORWARD PANEL

Upper Panel: Oil pressure gauge, nozzle position gauge, RPM gauge, EGT gauge

Main Panel: Whiskey compass, fuel gauge (percent of total), Hydraulic pressure gauges, Warning Lights Panel, Oxygen gauges, cabin pressure gauge, clock

The warning panel contains a bank of thirty-two annunciator lights that will warn the pilot of any issues that arise with the aircraft before, during and after flight. By clicking on the warning panel itself, the user can make the control column disappear (as in the above image), in order to see the gauges and warning panel more clearly if desired.

HUD

Clockwise from top centre: Heading, altitude tape, Radar Altitude, air pressure setting (inches mercury), Local Time, Bank indicator, G-Force, AoA, Ground Speed, Mach, Airspeed indicator, vertical speed tape.

Centre: Waterline, Velocity Vector

The Heads-Up Display contains basic flight information projected digitally onto a glass screen in front of the pilot. To the left of the HUD is the Angle of Attack indicator, which contains three lights to help the pilot maintain the correct AoA when landing.

The central display contains a pitch ladder at 5-degree increments, calibrated to the physical world outside the aircraft. The “Velocity Vector” is calibrated as closely as possible to represent the true path of the aircraft in the absence of collimation of the display. This will be updated as soon as collimation is possible in MSFS.

The HUD displays well under most conditions, but can be tough to see against particularly bright skies or cloud in MSFS. Although there is a brightness control, it does little to alleviate the visibility when encountering these conditions, so revert to the right MFD for flight information, or the analogue flight instruments, when required.

PILOT'S LEFT SIDE PANEL

Front panels section; Engine crank switch, Transponder panel, Navigation Radio panel, ADF panel, Autopilot Master switches panel.

Rear Panel section: External lighting switches, IFF Selector switches, Fuel dump / refuel door switches, Elevator and rudder Trim switches and indicators, Fuel cut-off switch, FCLS selector switches.

The Autopilot master switches alongside the throttle contain the master AP controls such as Approach Hold, IAS Hold, Master AP engage etc. These can be used in conjunction with the Up-Front Control Panel and the DED for complex navigation routines.

The large yellow handle to the top right of the image opens and closes the canopy.

There is more detail on the Autopilot and navigation systems on page 27.

PILOT'S RIGHT-SIDE PANEL

Forward Panel section: Battery, avionics, HUD power switches, Internal lighting knobs and dimmer knob, Smoke switch

Rear Panel section: Engine / Windshield De-Ice switches, Ladder, Visor, Mask, Chocks and Covers switches (rear-most panels)

The switch banks to the very right of the image contains switches that allow the user to raise or lower the crew's helmet visor, and also remove their oxygen mask. There are further switches that allow the display of aircraft covers, boarding ladder and wheel chocks. These will only display when the master battery switch is set to "off".

REAR COCKPIT MAIN PANEL

The rear seat position of the F-16D Fighting Falcon is most commonly used by instructors when training new pilots as they learn to fly the F-16. The HUD and Multi-Function Displays are repeaters from the front cockpit. The analogue instruments, warning panel and all flight instruments are fully operational, allowing for instructional flights as and when MSFS allows for shared-cockpit operations.

FLYING THE F-16 FIGHTING FALCON

The DC Designs F-16 Fighting Falcons are not designed to be "*study level*". However, they are intended to be as accurate in terms of aerodynamics as we can make them in MSFS. We also like to include the "*quirks*" of any aircraft we build, in order to try to give the user some idea of what it might be like to fly these aircraft in real life.

It is required that you learn the limitations and systems of this rendition of the aircraft in order to master it. While we have kept those essential systems and quirks to a minimum in order to preserve as much "fun" in the flying as we can, the Fighting Falcon would not be a Fighting Falcon without them. A handy tip for newcomers is that although the F-16 is famous for its ability to perform 9G manoeuvres, simply pulling hard on the stick and expecting the airplane to "turn on a dime" will likely result in disappointment, a dramatic loss of airspeed and an impending argument with the ground below that you're unlikely to win. High performance aircraft such as the F-16 can indeed perform remarkable manoeuvres, but they must be handled with care and precision to avoid over-stressing them or, worse, losing control entirely and entering a spin.

If you're starting from cold-and-dark, on the apron, you will find that the aircraft will have its chocks and covers deployed. The F-16 Fighting Falcon is fitted with an Auxiliary Power Unit, so engine-start is a fairly straight-forward procedure with no ground power option required.

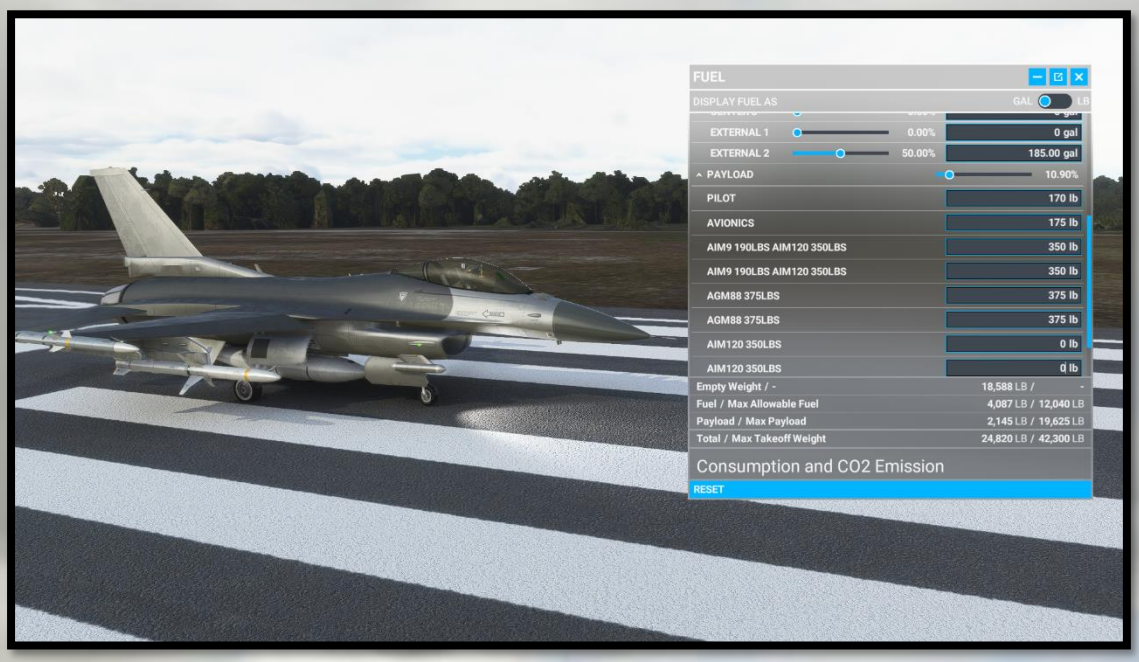
Remove all covers and chocks from the aircraft using the cockpit selector switches, and then start with your checklists, detailed on the next page.

CHECKLISTS

The F-16 Fighting Falcons come with a comprehensive checklist inside the simulator, which you can use to ensure the proper start-up procedure. Just move your mouse up to the top of the screen and select the “Checklist” option. If you’re in a hurry and just want to get flying, you can use the keyboard command CTRL-E to quick-start the engines. Be certain to check your fuel quantity to make sure you have enough for your flight, that the fuel valve switch is set to open, and that both battery and avionics are switched on.

Aircraft weight is something that is important to *all* aircraft. All aircraft have a *maximum take-off weight*, which if exceeded can cause the airplane to fly poorly or, at worst, not fly at all and crash. For this reason, it is advised that you select both fuel and ordnance individually and not using the menu’s “payload” slider, as this can easily put the aircraft beyond its maximum take-off weight.

If you select a full load of ordnance on the F-16 Fighting Falcon, you must then sacrifice fuel-load to keep the weight below the maximum of 42,300lbs. F-16 Fighting Falcons can take-off with external tanks, the required ordnance for the mission, and a low fuel-load before then going to join with a tanker to air-to-air refuel. Once airborne, the aircraft could then fill up with fuel. You can do the same after taking off and climbing out, by extending the refuel probe – doing so will add 25% to your total fuel load.



In the above image, the pilot has selected external tanks with 50% fuel in each, has internal fuel (just out of the menu shot in tanks CENTER 1 and 2) and has also loaded AIM-9 *Sidewinder* missiles and two AMRAAM medium-range missiles, by typing in the relevant weights as listed in the stations on the right of the menu. Total weight is 24,820 with 4,087lbs of fuel aboard.

Ensure all three power switches (Battery, Avionics and HUD) are switched on, check fuel state and that fuel shut-off levers are pushed *in*, Inlet Valves set to Auto. Now, flick the ENG 1 Crank Switch and wait for the engine to spool up.

With your payload set, and fuel checked, you're ready to taxi. The F-16's flaps and slats are automatic and will detect their required settings based on a variety of aerodynamic factors, automatically adjusting themselves to provide optimum lift.

The F-16A Fighting Falcon rotates at around 120 knots, with the nose up at ten degrees and held there until the aircraft “unsticks” itself from the runway. Gear retraction should be brisk as the aircraft will accelerate rapidly in full afterburner. The aircraft’s auto-trim system will engage above 245 knots to assist the pilot in precision control, while the flaps and slats will retract automatically.

Cruising airspeed for the F-16 is anywhere between 350 and 450 knots depending on mission profile. When on Combat Air Patrol, the Fighting Falcon can “loiter” on station at 250 knots to conserve fuel.

FIGHTING IN THE F-16 FIGHTING FALCON

The F-16 was designed as a born-and-bred air-combat platform, and its handling characteristics reflect that. However, at this extreme end of manoeuvring capability, a departure from controlled flight is always much closer at hand. Being rough with the controls or just pulling on the stick and expecting to get 9Gs everywhere, will get you nowhere.

In real life, as per this rendition of the F-16 Fighting Falcon, the aircraft was limited in performance in certain areas of the flight envelope. Above certain weights, the Fighting Falcon is limited to 7G, for instance. These limitations are maintained via the aircraft's internal systems, which control manoeuvring performance based on factors such as weight and airspeed.

SPIN RECOVERY PROCEDURE

The Fighting Falcon is reluctant to spin, but will do so if treated poorly. Another important factor in avoiding loss of control is persistent aileron inputs at low airspeed:

Hard aileron-input at most airspeeds can induce adverse yaw, resulting in the deep stall of one or both wings and a departure from controlled flight.

A departure in this manner will typically involve the Fighting Falcon "mushing in" toward one wing with high yaw. To recover;

Maintain throttle and RPM (do *not* use afterburner)
Stick: pro-recovery, maintain depending on rotational velocity
Rudder: opposite yaw indicator
Airspeed: monitor for 140 knots +

If the pilot is able to keep the nose down for long enough, and control the rotation, the Fighting Falcon will accelerate via gravity beyond 120 knots and control surface authority will be restored. Await 250 knots indicated before attempting level flight.

Do NOT attempt spin-familiarisation training below 12,000ft altitude. If attempting such training, seek at least 24,000ft altitude, and use max-aileron input rolls with the nose high, at less than 250 knots indicated, to initiate the spin.

AUDIO WARNING TONES (Bitchin' Betty)

A series of automated warning tones are designed to alert the crew of the F-16 when conditions of flight are encountered that can threaten the safety of the aircraft.

1. Compressor stall warning
This warning will sound when the engine is nearing compressor-stall conditions.
2. Low altitude warning
This warning will sound when the aircraft is descending through 10,000ft, and is designed to alert the crew to ground proximity (given the F-16's high velocities)
3. Landing gear warning
If the Fighting Falcon slows to landing airspeeds when below 10,000ft, this warning emits a continuous tone until the undercarriage is lowered.

AIR COMBAT MANOEUVRING

For the DC Designs F-16 Fighting Falcons, here is the basics of how to get the best out of your aircraft should you encounter a willing adversary in multiplayer;

Keep your energy up

Don't go into the fight at 900 knots with an eyeballs-out-G break into the enemy. Aim for 6-7Gs and maintain 'corner velocity' (400-420 knots). This will ensure the F-16's tightest turn *radius*, against its best turn *rate*, as you try to out-turn your opponent and gain the advantage by sliding into his 6 o'clock position.

Try to lure your opponent to lower altitudes

The F-16 fights best below 10,000ft, where engine thrust is greatest and turn rates the highest. The F-15 Eagle is more powerful above 20,000ft. The F-18E Super Hornet has better high AoA performance than the Falcon, but bleeds energy more easily. Even the much bigger and heavier F-14 Tomcat is a dangerous opponent if flown well. *Never* fight your enemy's fight - force them to engage you on your own terms.

Use the vertical.

The F-16 is an energy fighter, and using the vertical can force an opponent to lose situational awareness. On that note, last but not least, try to keep your eyes on your opponent…

"LOSE SIGHT, LOSE THE FIGHT"

INTERNAL LIGHTING

The F-16 cockpit comes with full night-lighting options, each of which can be dimmed using the “ratchet” wheels alongside the lighting switches on the pilot’s right-side panel.

External lighting consists of navigation lights, strobe lights and tail lights (sometimes known as logo lights) which illuminate the aircraft’s tail markings.

LANDING THE F-16 FIGHTING FALCON

The F-16 is *very sensitive* to low airspeeds in the landing configuration, and requires careful handling in the circuit. All landings in the F-16 Fighting Falcon are conducted in the same way. A recovery to the airbase is conducted with the aircraft entering the overhead pattern on the active runway heading, at 1,000ft and 350 knots. At mid-field, the aircraft conducts a 4G break into the downwind, slowing to 150 knots while lowering gear. The pilot should check fuel and also calculate aircraft weight to ensure the F-16 is not too heavy to land, and trim the aircraft to be light on the stick at 150 knots.

A curved, descending finals approach is conducted, with the aircraft rolling out onto the final with the AoA glideslope indicator showing a green circle. Over the threshold the power is cut to idle, and the F-16 allowed to sink before a gentle flare to touchdown at around 130 knots. Some pilots opt to use spoilers in the final approach, others aerodynamic breaking in order to slow down on the runway. In any case, allow the nosewheel to lower gently, and then apply braking once all wheels are down.

The F-16 taxies best below 20 knots with slow turns to avoid excess roll due to ordnance weight on the wings.

CUSTOMISING YOUR FIGHTING FALCON

(PC only)

One of the most sought-after features of modern flight simulator aircraft is the means to customise the appearance of the aircraft to the user's preference. F-16 Fighting Falcons are often customised, with pilots frequently decorating helmets with artwork and flight suits with patches, while the aircraft themselves often bear the names of the pilots flying them.

To help you customise your aircraft, a paint kit has been included, and the aircraft makes use of the Microsoft Flight Simulator "decal" material extensively for the pilots and their flight suits and helmets. In addition, the canopy names are also applied using decals. By using this system, it is possible to edit the names on the canopies, the patches on the flight suits, the artwork on the crew helmets and even the crew's faces, meaning that you can put your own face on that of the pilot as you see fit.

The above image shows a close-up of the F-16C pilot. You can see that the flight suit shoulder patches show the Fighting Falcon logo. The pilot's visor has been set to the "up" position so that you can see his face, and the canopy bears the pilot's name.

The same aircraft from the other side, with custom squadron flight suit patches visible.

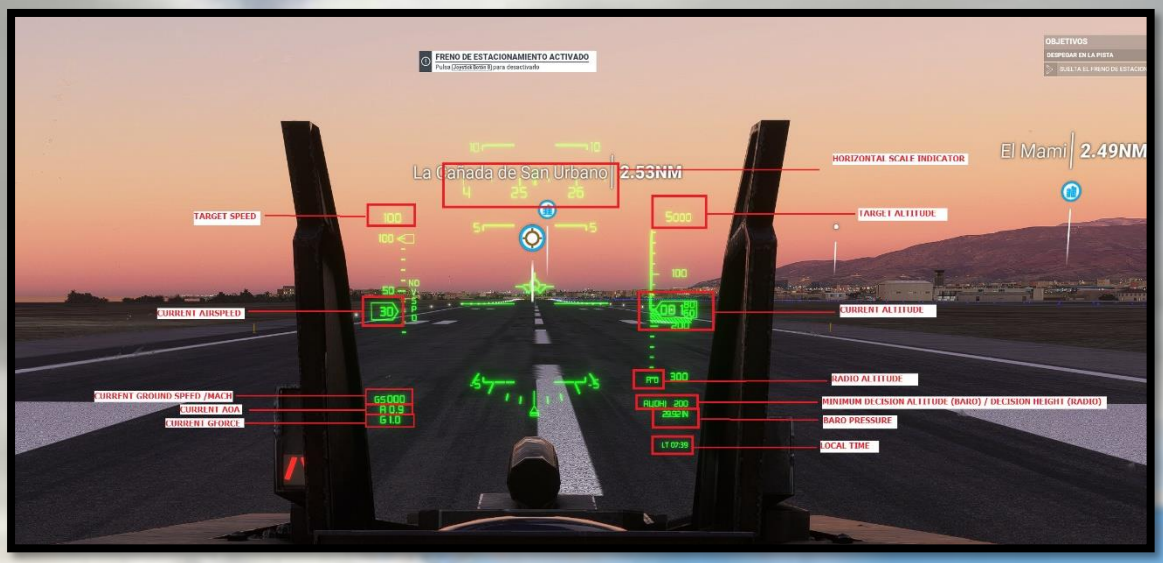
Simply use from the paint kit the image sheets named **F16_Pilot** to alter the crew's faces; **Pilot_Patches** to alter flight suit patches and names; **DCD_External_Decals** to alter the names on the canopy; and **F16_Pilot_Helmet** to alter the helmet artwork.

For now, the best way to alter the Fighting Falcon's textures is to save your new artwork as a .DDS file and use it to 'over-write' the existing textures. However, MSFS itself as a simulator is a work-in-progress so we don't know at this time whether this method will always be possible. For further repainting tasks, refer to the paint kit for templates for the main aircraft itself, and to the many on-line tutorials for the latest information on how to get your new artwork onto a new airplane in MSFS.

Alternatively, download the MSFS Software Development Kit, and learn how to compile new "packages" for yourself that contain only the new livery you have created. This can then be added to your simulator's "Community" folder and will then show up as an aircraft livery in the simulator.

AUTOPILOT SYSTEMS

HUD SYMBOLOGY:



AUTOPILOT BUTTONS AND KEYS:

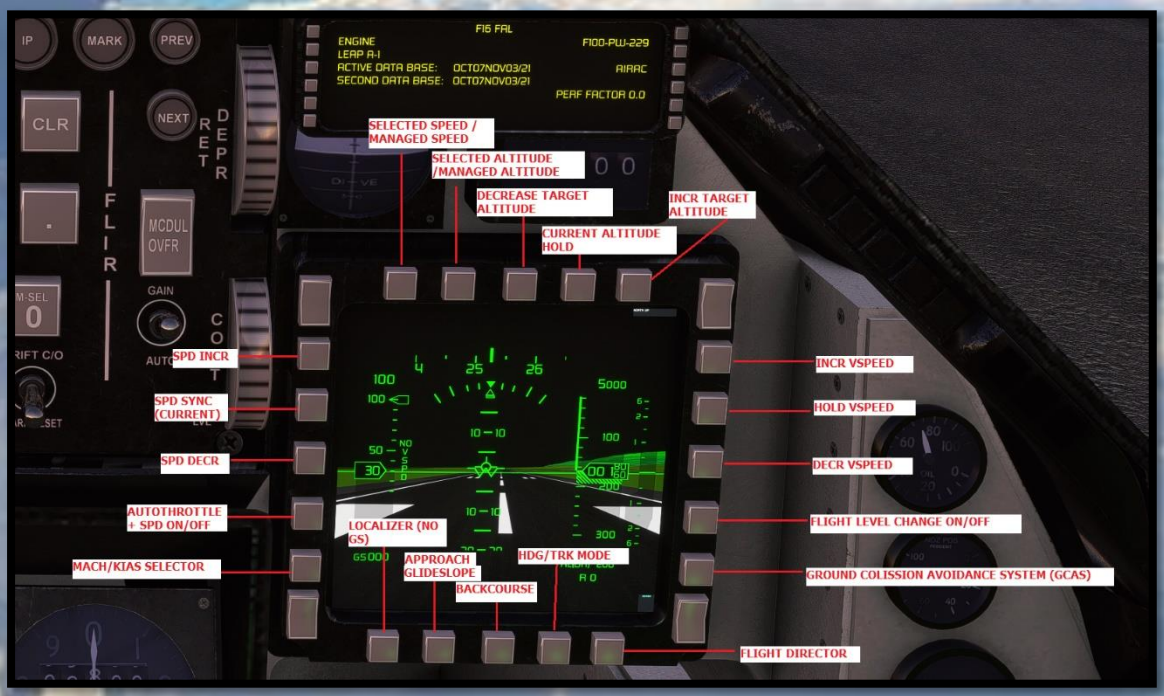
BASIC FUNCTIONS:

1. **AP MASTER:** Toggles the basic autopilot mode. Pitch attitude Hold and Bank Hold are the default modes activated by this switch.
2. **ALTITUDE HOLD:** Toggles altitude hold mode. If enabled, it will capture and maintain the current altitude.
3. **HEADING HOLD:** Toggles Heading hold mode. If enabled, it will follow the current Heading Bug selected (not the actual course the aircraft is following, so be aware before activating it).
4. **AUTO-THROTTLE + SPD:** This arms the auto-throttle and enables Speed Hold Mode. By default, it will maintain the current or a previously selected speed.
5. **APPROACH + GS:** Toggles approach hold (localizer and glide-slope). During ILS approach and if autopilot is enabled, the plane will try to head the localizer position and catching the Glideslope if succeed. During RNAV approach, it will try to follow a glidepath (however, since RNAV is a non-precision approach, in the final approach before touchdown, a manual intervention is probably required so be sure to disable the autopilot).
6. **BACKCOURSE:** During ILS approach phase, the airplane will try to head the localizer position in the opposite direction to LOCALIZER mode and without catching the Glideslope.
7. **GPS DRIVES NAV:** Switch between LNAV driven by GPS or VOR mode.
8. **ALT FLAPS:** ALT FLAPS switch has two modes: NORM and EXTEND. With the switch in NORM, the TEF's are controlled by the LG handle and airspeed. Placing the switch to EXTEND lowers the TEF's only, depending on airspeed (normally below 245 Kias). The ALT FLAPS switch does not affect the operation of the LEF's.
9. **LE FLAPS:** LE FLAPS switch has two modes: AUTO and LOCK. With the switch is in AUTO, the LEF's works as a function of AOA and airspeed, as part of maneuvering flaps system, and as part of landing configuration. Switching to LOCK, prevents LE FLAPS to be deployed.
10. **AUTOTRIM / PITCH OVERRIDE:** Allows between pitch auto trim system and pitch OVRD. When in Auto Mode, pitch trim will be automatically

controlled even without AP enabled, this will try to keep the plane leveled and artificially stable at any time as well as detect the need to increase or decrease amount of trim without pilot intervention to avoid departures, stalls or excesses of G without sacrifice maneuverability. It allows, however, to make manual corrections, but it will be re-leveled again if necessary. Auto trim in AUTO mode will be disabled during take-off and landing configuration (when LG is deployed). Pitch OVRD disables auto trim entirely but is not recommended due to the relaxed stability nature of the F-16: Doing a roll maneuver with poor trim positioning can cause a departure and deep stall due in part to the coupling of inertial forces. Use by your own risk.

11. **AP TRIM DISC/AP DISSENGAGE:** Prevents autopilot to be engaged in DISC Position.

AUTOPILOT EXTENDED FUNCTIONS



1. SEL/MNG SPEED TOGGLE: allows you to select between managed or selected speeds for use with auto-throttle. Default mode is “selected airspeed”, allowing to increase / decrease the speed manually by using the spd + spd- keys. Managed speeds

will handle the predefined speeds through the different flight phases if there is a flight plan (take off, climb, cruise, descent and approach). Avoid using managed speed during free flight. Requires ATHR enabled.

2. SEL/MNG ALTITUDE TOGGLE: allows you to select between managed or selected altitude for use with Autopilot. Default mode is "selected altitude", allowing to increase / decrease the Altitude manually by using the alt + alt- keys. Managed altitude will handle the predefined altitudes through the different waypoints if there is a flight plan (is important that a flight plan has the waypoint altitudes well defined, so the aircraft will climb or descend according the next waypoint altitude, otherwise use selected altitude to manually correct, or the aircraft will maintain the previous WP altitude). Avoid using managed altitude during free flight or in landings since it won't work like approach mode following a glideslope (use Approach + GS instead). Requires ALT HOLD enabled.

3. DECR TARGET ALTITUDE: Allows you to decrease a target altitude and the aircraft to reach it if the autopilot is on and using the ALT, VS or FLC modes. **Once the current altitude reaches the target altitude, alt hold will be activated.**

4. ALT HOLD: Activates the current altitude hold mode when AP is ON. It can be deactivated if the altitude entered is 0. Otherwise, pressing this button will synchronize the current altitude and deactivate the VS or FLC or ATT modes if they were previously activated.

5. INCR TARGET ALTITUDE: Allows you to increase a target altitude and the aircraft to reach it if the autopilot is on and during use of ALT, VS or FLC modes. **Once the current altitude reaches the target altitude, alt hold will be activated.**

6. INCR VSPEED: allows you to increase the vertical speed or flight path angle, when the autopilot is on, VS Hold is activated, and a target altitude has been defined that differs from the current altitude.

7. VSPEED HOLD: Allows you to activate the vertical speed mode when the autopilot is on. If a target altitude is defined and this mode is activated, it will be possible to

control the vertical speed ascent or descent rate in Feet per minute using vs + and vs-. During TRACK mode the Vertical Speed will switch to FPA (Flight path angle, in Degrees). **Once the current altitude reaches the target altitude, alt hold will be activated.**

8. DECR VSPEED: allows you to increase the vertical speed or flight path angle, when the autopilot is on, VS Hold is activated, and a target altitude has been defined that differs from the current altitude.

9. FLIGHT LEVEL CHANGE (FLC): If a target altitude is defined, the aircraft will establish a variable vertical speed depending on the current speed or target speed. In other words, the plane will ascend or descend maintaining a fixed speed. This speed can be managed with ATHR or manually with the throttle. Using this mode requires practice and understanding whether it is handled with an auto-throttle or manually, since not used correctly the plane can acquire a great vertical speed or none. **Once the current altitude reaches the target altitude, alt hold will be activated.** Note: By default, during a flight plan using Managed Speed in conjunction with Managed Altitude and Managed Heading will base altitude changes using FLC mode along the different flight phases but can be overridden with the other modes.

10. GACS: This is the GROUND COLLISION AVOIDANCE system used by some combat aircraft such as the F-16 and its implementation is experimental. This system by default is deactivated, but its function is to avoid collisions with the surface in occasions in which the pilot loses consciousness or it is necessary to correct a horizontal trajectory when autopilot + alt hold is enabled and when a terrain elevation is detected in the horizon. The aircraft will climb to a minimum safe altitude of 3000 feet from radio altitude.

11. SPD INCR: Allows you to increase a target selected speed (Air calibrated speed or Mach) when Auto-throttle is on. It won't by any means work in managed speed mode, only during selected speed.

12. SPD SYNC: It allows to synchronize the current speed (Air calibrated speed or Mach) before and during the use of auto-throttle.

13. SPD DCRS: Allows you to decrease a target selected speed (Air calibrated speed or Mach) when Auto-throttle is on. It won't by any means work in managed speed mode, only during selected speed.

14. AUTO-THROTTLE: It allows the activation / deactivation of auto-throttle + speed mode. As a precaution, during the approach mode enabled for ILS or RNAV landings, at a radio altitude lower than 80 feet, it will automatically disconnect itself to allow you to brake the aircraft in ground. Otherwise, deactivation must be manual by pressing this button.

15. MACH/KIAS SELECTOR: used with auto-throttle on, it will allow you to select the target speed in Mach or kias during use with spd + or spd – buttons.

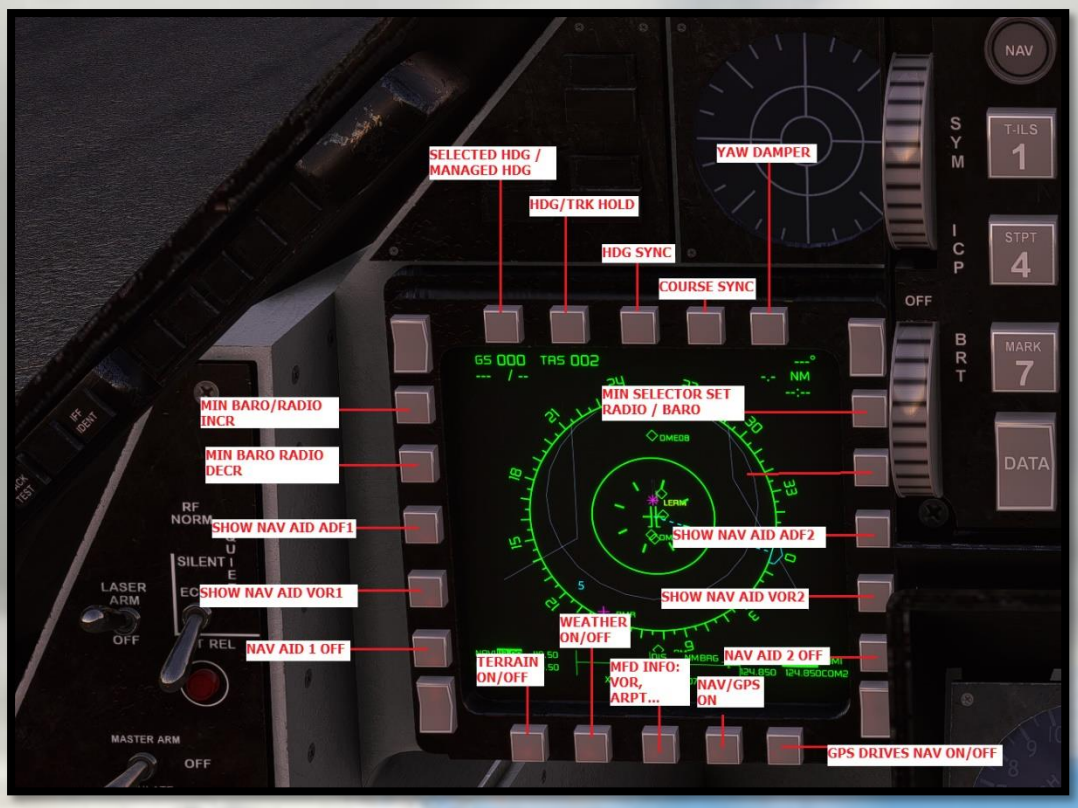
16. LOCALIZER: During ILS approach phase, the plane will try to head the localizer position without catching the Glideslope.

17: APPROACH (WITH GS): During ILS approach, the plane will try to head the localizer position and catching the Glideslope if succeed.

18. BACKCOURSE: During ILS approach phase, the plane will try to head the localizer position in the opposite direction to LOCALIZER mode and without catching the Glideslope.

19. HDG/TRK MODE: The HDG-V/S/TRK-FPA Button changes between heading/vertical speed and track/flight path angle display modes. When HDG V/S mode is selected, HDG appears in the FMA and V/S appears too when Vertical Hold is enabled. Flight director command bars can be displayed on the PFD and HUD. When TRK FPA mode is selected, TRK appears in the FMA and FPA too when Vertical Hold is enabled. Flight path vector is displayed on the PFD and HUD, and the flight path director can be displayed on the PFD.

20. FLIGHT DIRECTOR: Enables/disables the Flight Director function.



21. SEL/MNG HEADING TOGGLE: allows you to select between managed or selected Heading for use with Autopilot. Default mode is “selected heading”, allowing to follow the heading bug position controlled by the user. Managed Heading will handle the lateral Navigation through the different waypoints if there is a flight plan in a similar way that NAV driven by GPS but also allowing you to be in VOR Mode to follow the route if desired. Avoid using managed heading during free flight since there’s no route to follow. Requires HDG HOLD enabled.

22. HEADING/TRK HOLD: Allows you to activate the Heading mode when the autopilot is on. If a heading is selected prior to pulling the selector, the airplane turns in the shortest direction to the selected heading. If a heading is selected after pulling the button, the airplane turns to the new heading in the direction the selector is turned. If the button is pulled during Managed heading mode and there’s a flight plan, the plane will follow the existing Waypoints on the Route.

23. HDG SYNC: Synchronizes the heading BUG with the current heading.

24. CDI SYNC: Synchronizes the CDI BUG with the current heading.

25. YAW DAMPER: Disabled by default and below 6000ft to not interfere with pilot inputs. A yaw damper (sometimes referred to as a stability augmentation system) is **a system used to reduce (or damp) the undesirable tendencies of an aircraft to oscillate in a repetitive rolling and yawing motion,** a phenomenon known as the Dutch roll. Is recommended to enable it at higher altitudes, but not recommended during landings for example.

26. MINS SELECTOR SET (BARO/RADIO): Allow to switch between Minimum Decision Altitude or **MDA (Baro)** and Minimum Decision Height or **DH (Radio)**. The choice between selectors depends whether you were going to do a **non-precision landing (RNAV/GPS)** or a precision one **(ILS).**
More info here: Minimum Descent Altitude/Height (MDA/MDH) - SKYbrary Aviation Safety

27. MIN BARO/RADIO INCR: Allows to increase the MDA or DH value.

28. MIN BARO/RADIO DECR: Allows to decrement the MDA or DH value.

29. NAV-AIDS: Allows the pilot to display the tuned NAV1, NAV2, ADF1 or ADF2 in the MFD screen, both as information, such as the position of a VOR or ADF station on the compass. It requires having a tuned frequency as well as being within the range signal to display the information.

30. TERRAIN ON-OFF: displays terrain elevation on the MFD using color ranges.

31. WEATHER ON-OFF: displays weather information on the MFD within a distance range.

32. MFD INFO: allows you to visualize the positions on the map of the different stations, VOR / TACAN / DME, such as airports, etc.

33. LNAV: Turn lateral navigation on or off.

34. GPS DRIVES NAV: Switch between LNAV driven by GPS or VOR mode.

DED DIGITAL DISPLAY ENTRY

Since a real F-16's DED based screen is clearly out of the project scope (because basically many of the functions cannot be implemented at this current level of MSFS), as alternative a DED with FMC-based logic has been implemented instead with basic functionality and some additions. In that sense, we can visualize our longitude and latitude, as well as INS position, but we can do more things like the following:

- Manage NAV and ILS radio frequencies, as well as ADF frequencies and UHF ones (TACANs not supported yet).

- Use Direct TO mode.

- Create or edit flight plans (without forgetting that it can manage previously created or imported flight plans).

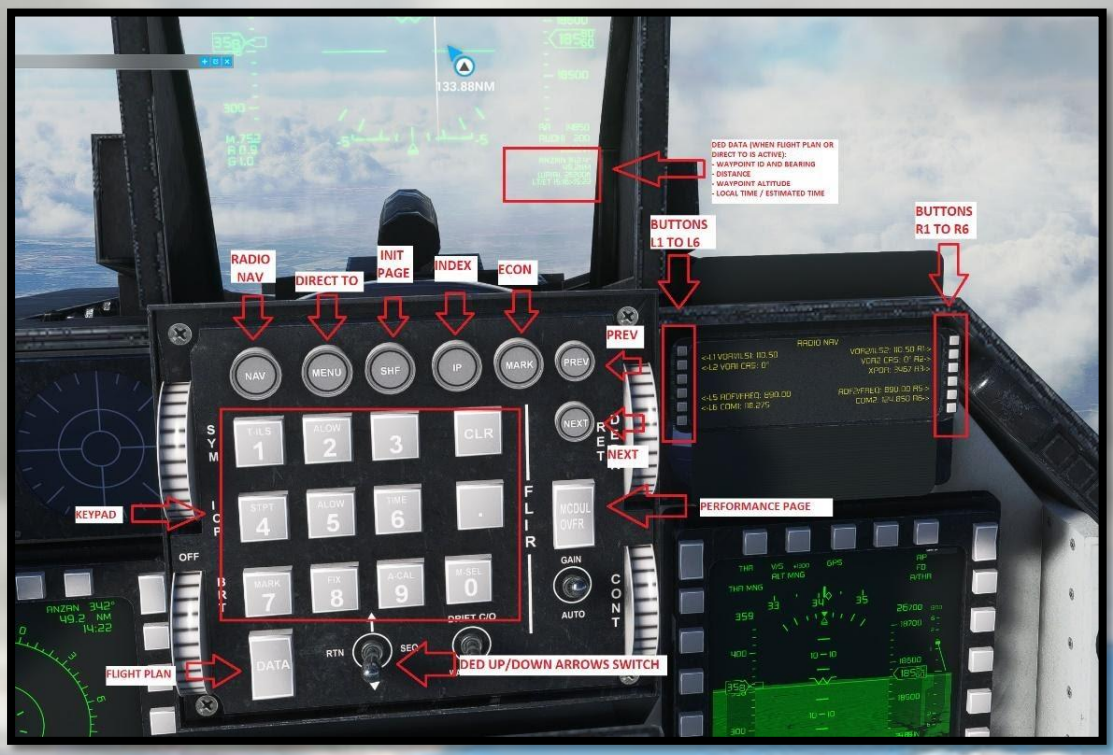
- Add or delete Waypoints, as well as perform fully automated flights with managed speed and managed altitude by following these Waypoints through LNAV driven by GPS or managed HDG (if these WPs, also called legs, were properly defined in distance and altitude), or manual or selected speed and altitude, if desired.

- Create departures and arrival procedures, as well as set and manage precision (ILS) or non-precision (RNAV) landing procedures.

- Support Lateral Navigation, as well as Vertical Navigation from the origin to the destination (although it may not work in all situations, or it may require manual intervention at some point along the route if any Waypoint is not correctly defined).

- Set cruising altitudes, set managed or selected speeds during the different flight phases. Monitor the flight phase in which we are.

KEYPAD AND BUTTONS (ICP)



Unlike the real DED, in which we use the numeric keys to navigate through the different DED menus, in this case the keypad has been provided with alphanumeric capability (like old phones alpha numerical Keypad Style) to be able to store different data into the console, from VOR/ILS or COMMS frequencies, to airport codes in ICAO format to be able to create flight plans, or simply use the direct TO mode.

Similarly, 6 + 6 side buttons have been implemented on both sides of the DED screen, numbered L1, L2 ... L6 and R1, R2, ... R6. The operation is simple: to navigate through certain sections, we will press the corresponding L or R key, indicated by the DED, in the same way, in the case of RADIO NAV, after writing a frequency, we will press the **<-L (button number)** or **R (button number)->** assigned to set it (if it is NAV1 we will press L1, if it is NAV 2, then R2 and so on).

Keypad notes: to type a frequency, example 109.90, just type it using the keys. For followed repeated numbers or characters ex: 122 or LEAA, type the number followed by a long press “.” button and keep typing. If you want the clear a character use CLR, and if you want to clear a word, long press CLR button.

DED PAGES

RADIO NAV PAGE

Radio Nav menu allows the pilot to visualize and handle active VOR / ILS, ADF, ATC (XPNDR) and COM frequencies in real time. If we want to store an active frequency, just type the active frequency that you want to use via the keypad, followed by the corresponding L or R key. Unlike the knobs on the left console, while using Radio Nav, we will overwrite active frequencies directly and not standby frequencies. Changes made using the knobs and transferred to active frequencies will be displayed here, unlike standard FMCs.

DIRECT TO PAGE

Direct TO mode allows the user to enter an Airport by ICAO format to trace the direct route from current position to a desired destination either if you have or not a created

Flight Plan. In case there is already a flight plan, you may also select a waypoint using the corresponding L Button as a temporary direct route or update your current Flight Plan. If you want to travel to an airport, type the ICAO code through the keypad and press L1 button to store it.

INIT PAGE

The Init page allows to set some basic settings such as the cruising altitude or the cost index. The cruising altitude must be typed in numerical format: if we want an altitude of 35000 feet we will enter 350, and it will be reflected as "FL350". The cost index affects the managed speeds and is a factor that defines our gross weight added by fuel or armament, so, a CI greater than 100 will decrease the default managed speeds during different flight phases to optimize fuel consumption (a range between 100 and 400 is correct, with 400 being the maximum gross weight and 200 for a weight close to half the maximum supported).

If we want to create a flight plan or overwrite the current one, it would be carried out in this section: entering the origin and destination in “ICAO / ICAO” format. In the attached capture it is done with LEAM / LECO. Once the values have been entered and the corresponding button R1 pressed, the flight plan will be created or updated, and we can manage it from the FPN menu (Data Button).

DATA INDEX PAGE

This menu basically allows us to move through other submenus using the side buttons (NOT ALL MENUS ARE IMPLEMENTED).

PERFORMANCE

Performance pages display the performance parameters for the current flight phase. They are automatically sequenced after the take-off phase.

The NEXT PHASE prompt provides access to subsequent flight phase pages.

The PREV PHASE prompt is available if the phase displayed is not active.

We use PREV and NEXT Buttons to navigate between different flight phases in Performance pages, and keypad buttons to tweak some preselected settings in each subpage.

Pilots can manually activate the approach phase by first selecting the ACTIVATE APPR PHASE prompt and then the CONFIRM APPR PHASE prompt which displays only on the current phase of flight performance page.

FLIGHT PLAN

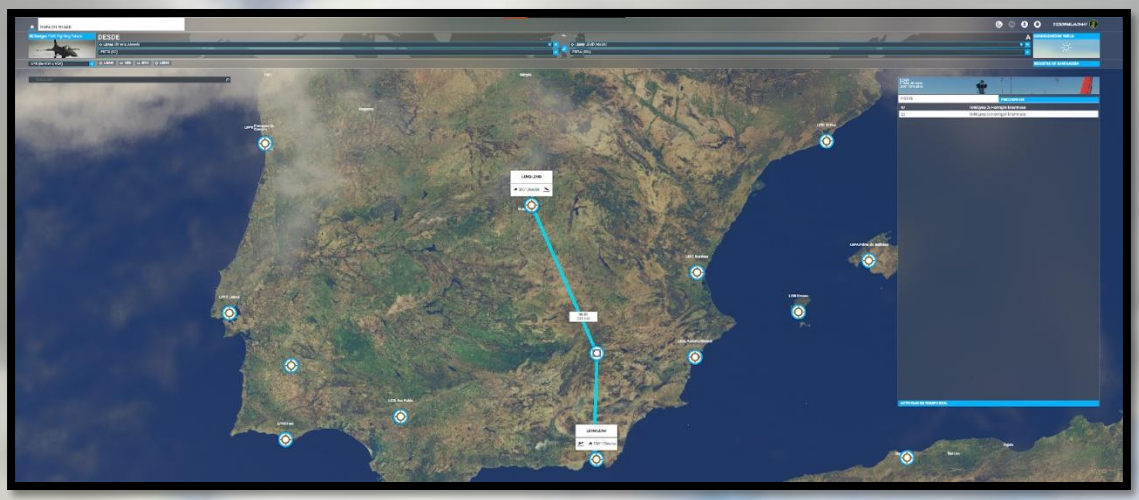
Flight Plan Page enables pilots to construct, view, or modify the active primary flight plan from the departure to the destination.

Through this page, you can modify your active FPN, by adding departure procedures and arrival procedures.

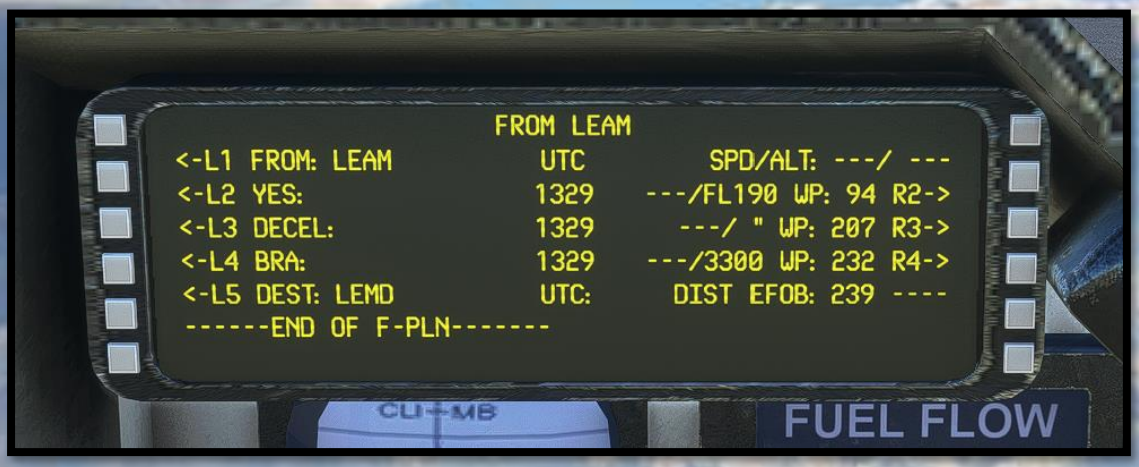
Example: In the attached capture, if you press L3 button (taking as reference <-L3 DEST: LEMD), you will access a submenu called ARRIVALS, in which you can set choose an arrival procedure, being RNAV or ILS, Set STAR or VIAS and update the Flight Plan.

EXAMPLE: DEFINING A DEPARTURE PROCEDURE:

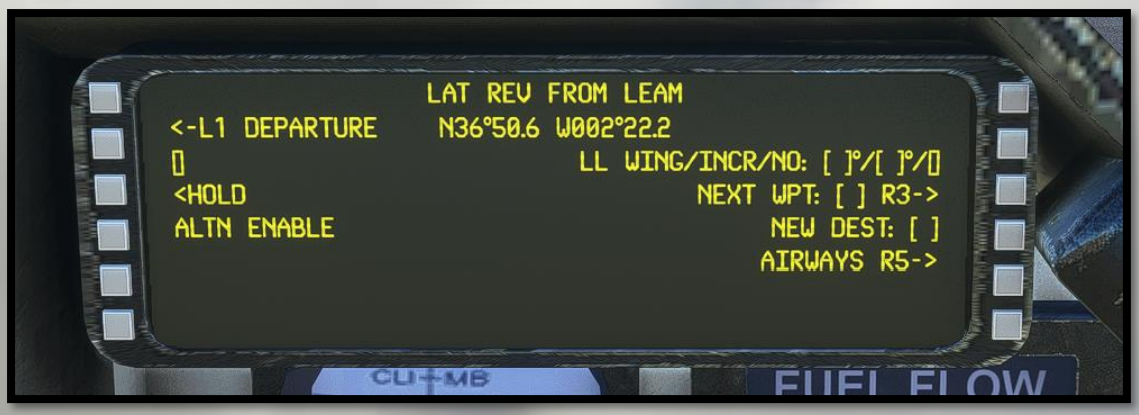
In this Example, we will create a Flight Plan from Almeria (LEAM RWY 25) to Madrid (LEMD RWY 32L) and VOR to VOR.



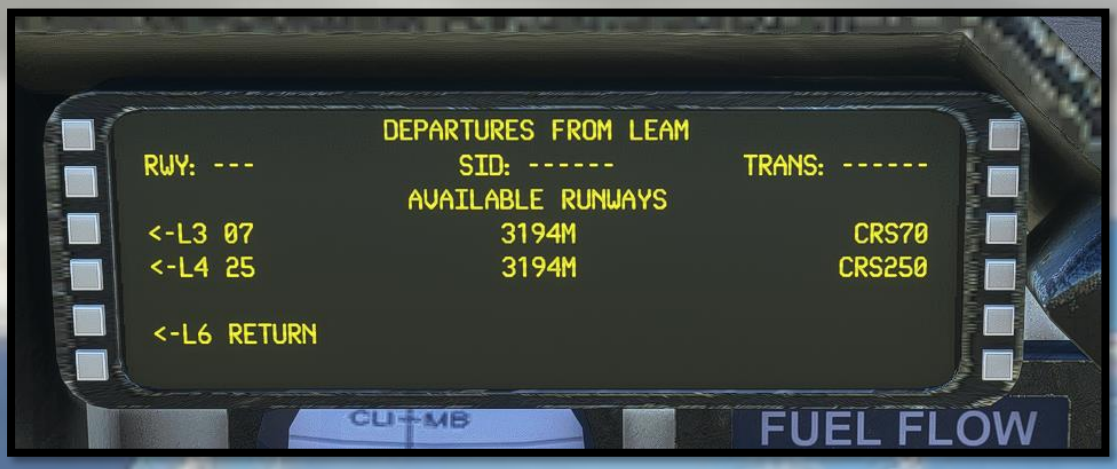
So, if we check Flight Plan, we will find FROM: LEAM and DEST: LEMD:



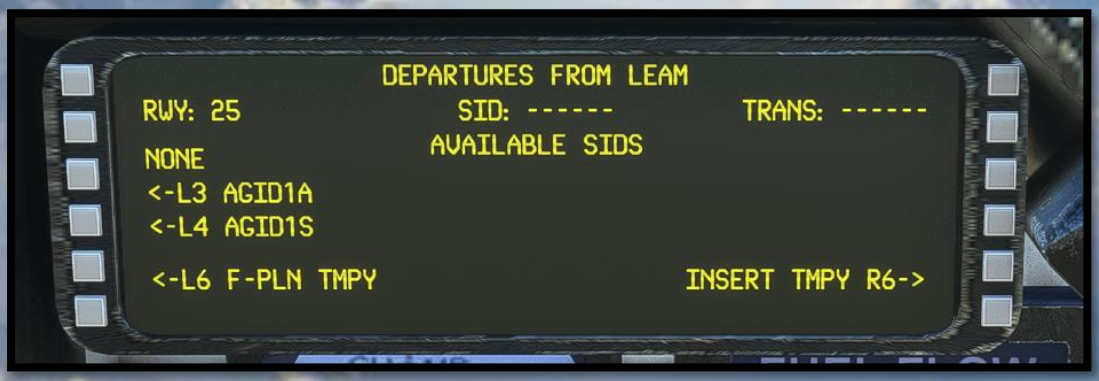
We are going to create a departure procedure by pressing L1 to access LAT REVISION PAGE:



Press on L1 again to access **DEPARTURES FOR LEAM**:



As we selected previously the RWY 25, we will press L4 button, to access to list of available departure procedures for RWY 25:



For this example, we will select AGID1A, by pressing L3 Button, we can also select SID if available, otherwise press R6 to insert the procedure and update the FlightPlan.

Our MFD is also updated:

Now if you look over the VFR Map, a departure procedure has been successfully created, and your Flight Plan has been updated with new waypoints. Anyway, if by any reason you wanted to change it for another one, just repeat the same operation by pressing on L1 again (FROM: LEAM25). You will also notice that in the HUD, the

first WP/ALT is 500ft, so if we press Altitude managed, our target altitude will be updated:

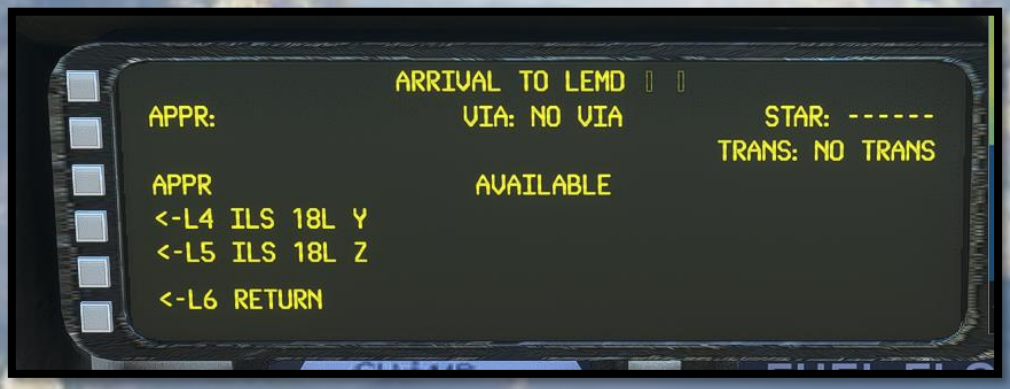
Now, in this moment, if we want to do this procedure with the autopilot, once we enabled AP in the air, we only need to enable LNAV or Managed heading for lateral navigation, and Alt Hold for vertical navigation. The aircraft will automatically follow the route and climb calculating the required vertical speed between the previous waypoint and the next waypoint. If we also connect the auto throttle with Managed Speed, then the aircraft will manage the route, altitude and speed for us. However, keep in mind that manual intervention is sometimes required if a waypoint altitude is not defined from the database, so you must correct the altitude to avoid any risk of danger (by switching to selected altitude again).

EXAMPLE: DEFINING AN ARRIVAL PROCEDURE:

Defining an arrival procedure is pretty similar to define a departure one:

Over our Flight Plan previously created, we will press L6 to access DEST: LEMD:

Press L1 to access ARRIVALS for LEMD:



Ok, if you remember, we selected RWY 32L as arrival, so by using the DED ARROW Switch, we will navigate down until find an arrival procedure for 32L, we will choose ILS 32L W:

We can also select an available VIA and STAR if desired, for this example, we will choose ASBIN as VIA, and BANE2D as STAR. After finish, we will store the procedure in the FPLN by pressing R6:

Ok, our Flight plan has been updated with an arrival procedure, as is shown in our VFR map and new waypoints on FPLN:

However, I recommend to fix a bit the procedure, in this case I will erase from the procedure the Waypoint BRA, by pressing CLR, followed by L3 to erase BRA:

Now BRA is deleted, update the FPLN by R6:

Now we have the arrival procedure created, we may also delete whatever other waypoints we don't wanted (like BANEV) for example. We may also change the arrival procedure if we don't like it. Just by entering again on DEST: LEMD32L and repeating the process.

Since we have defined an arrival procedure with ILS landing, Auto landing the plane with AP will be an option by switching to VOR Mode through NAVGPS switch, Pressing Approach + GS button, and by enabling auto throttle with managed speed.

DEVELOPER NOTES

At the time of writing the manual for this aircraft's launch, Microsoft Flight Simulator is still in many ways a work-in-progress. Features that we expect to come to the flight simulator are not yet present, many variables are not yet active, and as developers we have not yet mastered all aspects of the simulator.

As time progresses, this and our other products will be continuously updated to match further advancements of MSFS. The new simulator has, we hope, many successful future years ahead of it, and as more features come on-line we will be keen to ensure that the F-16 Fighting Falcons remain at the cutting edge of what's possible for fighter aircraft. As with all launches by our sister company, DC Designs, expect this rendition of the F-16 Fighting Falcons to get ever better as Microsoft Flight Simulator becomes more established at the forefront of flight simulation software.

CREDITS

SC Designs F-16 Fighting Falcons

Models and code	Scott Crawford
Additional code	CodenameJack447
Flight dynamics	CodenameJack447, Scott Crawford
Textures	Scott Crawford
Sounds	Sim Acoustics (WWise)
HTML code	CodenameJack447
Special Effects	Karl Derner
Testing and project support	Dean Crawford

Just Flight

Project management	Dermot Stapleton, Scott Phillips
Manual	Dean Crawford, CodenameJack447
Installers	Just Flight / Microsoft

Testers

CodenameJack447
SilentG37
Severus Aviation
Dean Crawford
Karl Derner

SOFTWARE PIRACY

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A pirate, otherwise known as a thief, makes a profit from the sale of other people's hard work. In some cases he makes more profit than the publishers and developers make from the sale of an original title. Piracy is not just the domain of the casual domestic user in his or her back room, but is also a multi-million-pound business conducted by criminals often associated with the illegal drugs trade. Buying or downloading pirated copies of programs directly support these illegal operations.

Don't be fooled by a load of old tosh about file 'sharing'. The sites that host these 'shared' files cover their backsides with the excuse that they are simply a 'gateway' to the files. In fact, they actively encourage piracy and are often funded by advertising. Most of them are illegal money-laundering operations by another name.

The people who really suffer from game piracy are the artists, programmers and other committed game development staff. Piracy and theft directly affects people and their families. Loss of revenue to the games industry through piracy means many are losing their jobs due to cut-backs that have to be made to ensure developers and publishers survive. The logical outcome of this is that eventually the supply of flight simulation programs will dry up because developers think it is not worth the hassle.

It's not just copying software that is against the law. Owning copied software also constitutes a criminal offence, so anyone buying or downloading from these people is also at risk of arrest and prosecution.