

F-14 A/B TOMCAT

OPERATIONS MANUAL



Welcome to the *DC Designs* F-14A/B Tomcats. 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-14 Tomcat is not “*study-level*”, it is significantly more complex than other DC Designs aircraft. To get the best out of the Tomcat, it is required to read this manual in full, especially when flying the F-14A, which demands attention if you’re to avoid losing an engine, and perhaps control of the aircraft all together.

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GENERAL PERFORMANCE TABLE

- Crew = 2
- Length = 62ft 9 inches
- Wingspan = 64ft 2 inches
- Height = 16ft
- Wing area = 565 sq ft / 1008 sq ft with fuselage
- Empty weight = 43,735 lbs
- Max take-off weight = 74,350 lbs
- Fuel capacity = 16,200 lbs + 2x optional external 267-gallon tanks
- Engines = (F-14A) 2 x TF-30 afterburning turbofans (20,900lbs max-thrust at sea level), (F-14B) 2x GE-F110 afterburning turbofans (23,400lbs max-thrust at sea level)
- Maximum airspeed = Mach 2.34 (at high altitude) – Mach 1.2 at low altitude
- Range = 1,600 nautical miles
- Combat Range = 500 nautical miles
- G-limits = +7.5 G, -3G

The F-14A Tomcat was the original version of the aircraft that flew throughout the type's service lifetime. Although plagued early in its life by unreliable engines prone to compressor stalls, the crews learned to "fly around" those deficiencies and the F-14A served effectively for over thirty years with the United States Navy.

In 1986, the F-14A was joined by the F-14B, which was the same airframe but with more powerful GE-F110 engines and some avionics upgrades. The new engines provided 30% more thrust throughout the flight envelope, and freed pilots from the compressor-stall issues that plagued the earlier "A" models.

AIRCRAFT FAMILIARISATION



There is no denying that the F-14 Tomcat looks the part. Built for the United States Navy as a fleet defence interceptor with air-combat capability, the Tomcat became one of the best-known aircraft of its day. Unlike most other aircraft, it also became known to millions of movie-goers, when in 1986 it featured in the *Paramount Pictures* motion picture “*Top Gun*”. The fame that it gained in the wake of the *Hollywood* movie lasted throughout the remainder of its service and beyond. The Tomcat is as legendary now as it was then, the last of the famous “*Cat*” fighters built for the United States Navy since World War Two.

The F-14A Tomcat was considered by pilots to often be quite difficult to fly, especially in the landing configuration. Combined with the temperamental engines, many were lost to accidents early in the Tomcat’s career as the cat bit back, dangerous to those unable to handle it.

The most unique feature of the Tomcat were its variable-geometry wings, designed to provide the best aerodynamic performance based on airspeed / Mach, giving high lift

at low airspeeds or a sleek profile for high-speed intercepts. Manned by a pilot and a Radar Intercept Officer (RIO), the twin-crew set-up allowed for the division of duties within the cockpit and a second pair of eyes during air-combat-manoeuving, an essential advantage when fighting in an aircraft that was literally twice the size of many of its adversaries.

With the variable-geometry wings and the high-lift capability of the fuselage, the F-14 Tomcat was a surprisingly good close-air-combat performer, able to tangle with fearsome adversaries such as the F-15 Eagle and F-16 Fighting Falcon, and therefore the very best that any other nation on earth could produce.

This is where your training begins, to see through the eyes of a pilot *something* of what it was like to fly what was perhaps the most famous fighter jet of modern times.



MAIN PANEL LAYOUT (PILOT)



The cockpit of the F-14A Tomcat is a mixture of Multi-Function-Displays common to many modern aircraft, and analogue gauges reminiscent of the aircraft's design era, the late 1960s. For its time the Tomcat was absolutely state-of-the-art, although the later-model B versions and the F-14D finally received a fully modern cockpit in the 1990s. This rendition of the aircraft sticks with the original layout, due to there being no MSFS support for a Radar Warning Receiver or similar tactical instruments.

Likewise, at the time of release, the RIO cockpit has only limited functionality, as Microsoft Flight Simulator does not yet support many of the main functions required, such as radar. Virtually all of the switches and buttons have been activated though, so should those functions become available, the Tomcats can be updated to match.



MAIN PANELS

Top Left panel: Vertical Sink Indicator, Airspeed Indicator, Radar Altimeter, Altimeter

Top Right panel: Artificial Horizon, G-Force, Gyro Compass, Radio Stack

Lower Left Panel: Nozzle/Oil PSI gauges, RPM/Turbine Inlet Temperature/Fuel Flow tapes

Lower Right Panel: Fuel Gauges, Oxygen, Clock

The upper Visual Display Unit contains a HUD repeater, along with brightness controls for the displays. The lower VDU contains a multi-mode Horizontal Situation Display for navigation purposes, as well as the Heading and Course setting dials.

The vertical “tapes” for the engines record RPM, Temperature and Fuel Flow, while the Fuel Gauge records both total quantity in tapes and in the upper “drums” at top centre, and external quantity in the lower drums. “Bingo” or minimum flight fuel for the F-14 Tomcat is set at 4,000lbs. Bingo warning lights around the HUD will alert the pilot should fuel quantity sink below 3,000lbs, signifying an immediate need to land.



PILOT'S LEFT FORWARD PANEL

Upper Panel: Emergency Jettison button, Flaps / slats / gear position indicators

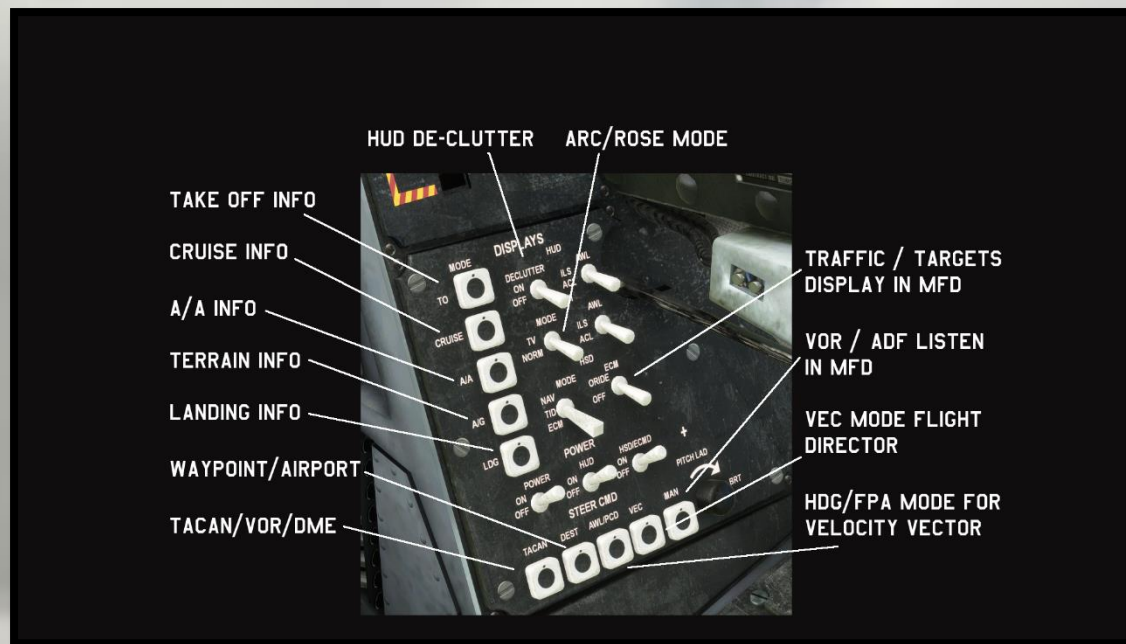
Middle Panel: Oleo Gear “Kneel” switch, Parking Brake, Landing gear lever, Direct Lift Control switch (TO = off / LDG = on)

Lower Panel: Elevator / Rudder Trim position gauges, Wing Glove Auto / Off switch (F-14A only), Refuel Probe switch, Fuel Dump switch, Anti-Skid switch

The “Oleo Kneel” switch allows the Tomcat’s nose-gear to compress ready for catapult launch from an aircraft carrier. Direct Lift Control is the Tomcat’s internal landing system that provides increased control and lift at landing airspeeds.

The Wing Gloves are small delta-wings that extend at airspeeds beyond Mach 1.3 if set to auto. (Note: These are functional only on the F-14A).

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



PILOT'S RIGHT FORWARD PANEL

Upper Panel: Arrestor Hook lever, ammunition remaining gauge.

Main Panel: HUD and navigation mode switches (DISPLAYS), POWER switches (Battery*, HUD, Avionics), Navigation switches (STEER CMD), Display brightness knob

The MODE switches provide varying displays depending on the mode selected. These small, square buttons are twisted to activate them, and provide a selection of navigation and steering cues which are connected to the aircraft's autopilot and displays.

The HUD Declutter switch selects between a simple F-14A display and a more complex, modern HUD display depending on personal preference.

***NOTE:** The F-14 Tomcat did not have an internal battery or Auxiliary Power Unit, and required a ground power supply to start its engines. As many airfields in Microsoft Flight Simulator do not have Ground Power Services, for this rendition of the F-14, a Battery Master switch has been included and also a dedicated GPU switch which activates a visual Ground Power Unit model.



HUD AND UP-FRONT CONTROL PANEL

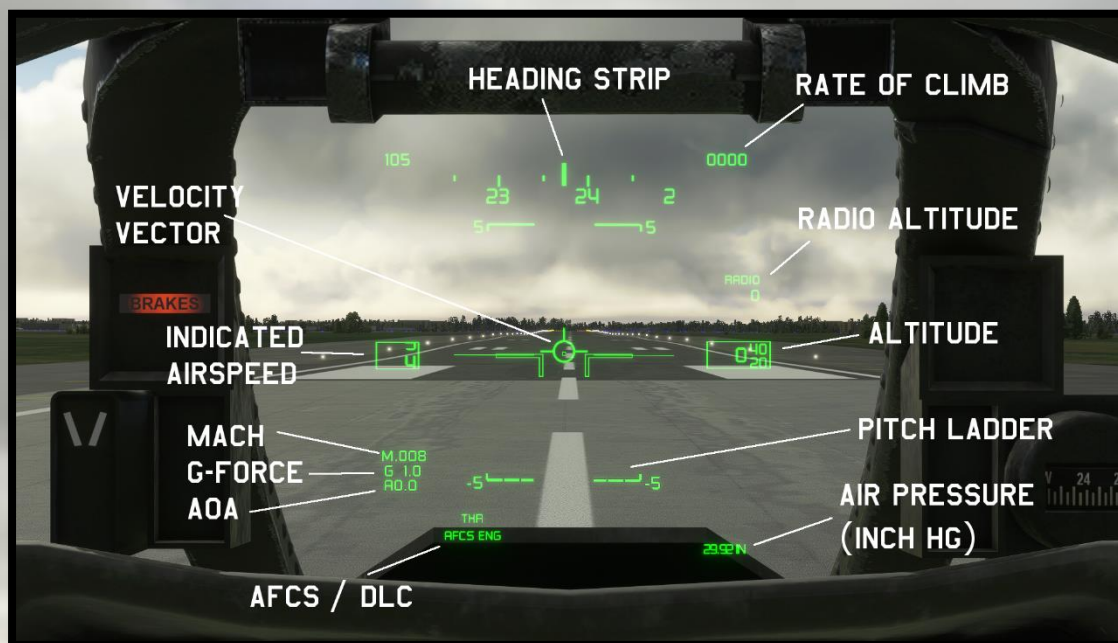
HUD and side panels: Glideslope indicator (high, on glideslope, low), port warning lights, Heads Up Display, starboard warning lights, Whiskey Compass.

UFCP: Port engine fuel cut-off lever, AOA indicator, UFCP main panel, Wing-Sweep indicator, Starboard engine cut-off lever

The Heads Up Display contains basic flight information projected digitally onto the windshield in front of the pilot. Banks of warning lights to either side alert the pilot to fuel Bingo status, undercarriage (under certain conditions), stalls, engine fire and other vital alerts.

The Glideslope Indicator shows the aircraft's glideslope position when in the landing configuration. The AOA indicator displays units (not degrees) angle-of-attack. The Wing Sweep Indicator dynamically shows wing sweep angle, and also whether the wings are in Manual or Auto mode.

Along the bottom of the UFCP are eight station-weight indicators which turn white when weapons are loaded onto the aircraft via the Payload Manager. In the centre is a turn-and-slip indicator, which depicts yaw-rate and turn angle.



F-14A HUD with “De-Clutter” switched to ‘off’.

When decluttered, only the display-centre area is illuminated, along with the heading strip.

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 centre MFD for flight information, or the analogue flight instruments, when required.



PILOT'S LEFT SIDE PANEL (forward section)

Front left panel; Inlet Ramps switches, Engine crank switches, Throttle mode switches, Air Start switch, Rudder trim control (to right of Air Start switch).

Throttle Bank: Port and starboard engine throttles, Flaps lever, Spoilers switch (on throttle, centre), Wing-Sweep-Cover, Manual Wing-Sweep control (chevron lever).

The Inlet Ramp switches govern the mode of the inlet ramps, which are required to be active to allow supersonic flight. Without them, there is a risk of compressor stall in both engines and a subsequent loss of controlled flight. Set to auto at all times unless engines are shut-down.

The AFCS panel governs the landing system that supports DLC, allowing for greater automation of the landing cycle in terms of flight surface control. It also helps to prevent the pilot from over-stressing the airframe in flight.

The Throttle bank contains the wing-sweep controls, which can be set to either manual or auto mode during flight.



PILOT'S LEFT SIDE PANEL (aft section)

AFCS Panel: Pitch, Roll and Yaw switches, Autopilot control switches, NAV/GPS switch (left and right motion)

ADF Panel: ADF digital display, ADF frequency selector knobs, VNAV selector (on / off) and VMIN selector (rotary).

The AFCS panel switches can be selected at will by the pilot to assist in maintaining control of the Tomcat during high-energy manoeuvring or at low airspeed and high angle-of-attack flight, such as the landing phase.

The autopilot switches control basic holds for height, heading and vertical airspeed, along with a master “Engage” switch. Further autopilot functions are accessible via the pilot’s right hand side panel to adjust altitude, airspeed and vertical speed.

The VNAV selector is aft of the ADF panel, with “on” and “off” options and VMIN selector knob to adjust.



PILOT'S RIGHT-SIDE PANEL

Left back panels from left of image: ACLS selector switches, HDG hold and COMP dial, lighting switches and potentiometers, Master test panel (INOP), wheel chocks, covers and tie-down chains switches.

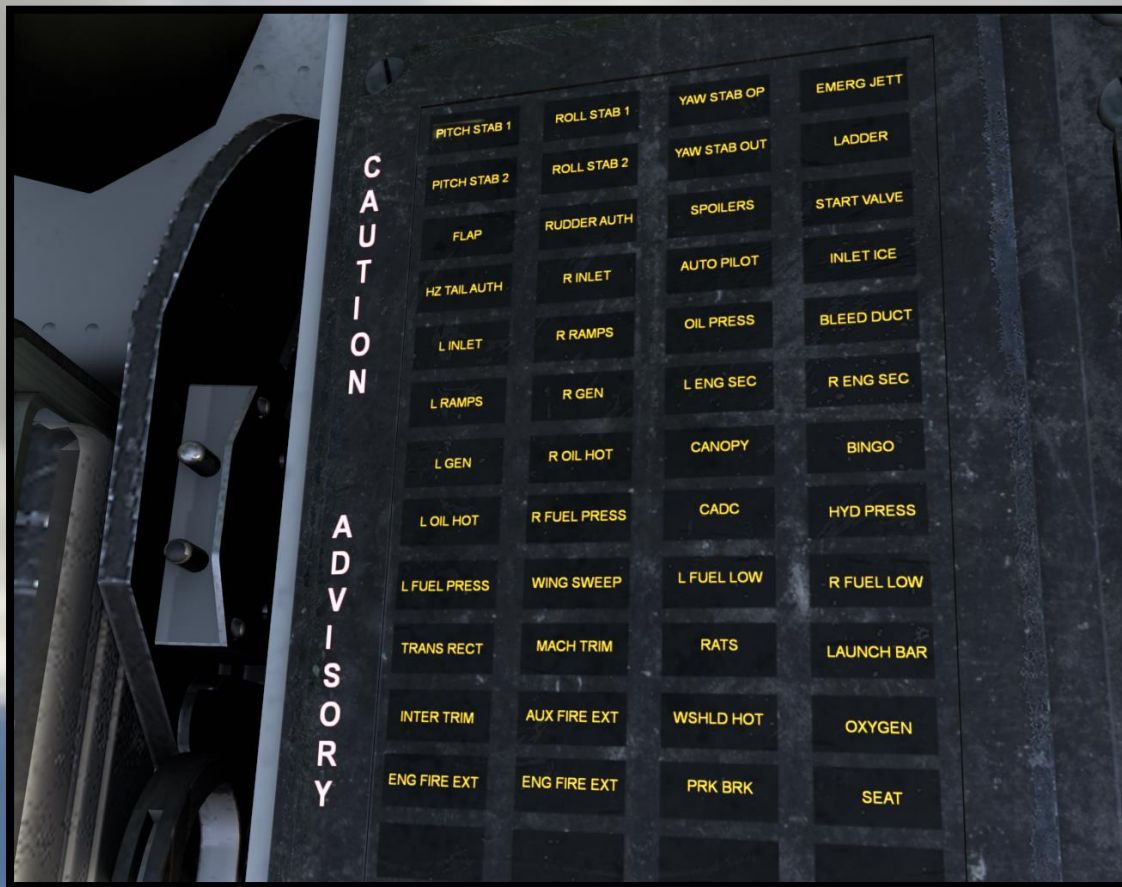
Left forward panels from left of image: Spoiler over-ride switches (red, INOP), Main Warning Annunciator Panel, Generator Switches, Air Conditioning Switches, Anti Ice switches, Pilot mask / visor / GPU switches.

The Main Warning Panel contains all annunciators and warning lights for aircraft functions, and should be unlit when in flight.

Above the side panel are the canopy controls. Canopy Lock must be deactivated in order to open the canopy itself. To the right-hand side is a single switch that will lower the boarding ladder and steps.

The switch banks to the very right of the image contains two switches that allow the user to raise or lower the crew's helmet visors, and also un-clip their oxygen masks. There are a further three switches that allow the display of aircraft covers, wheel chocks and tie-down chains used on aircraft carriers to secure the aircraft when parked. These can only

be displayed when the master battery switch is set to “off”. The final switch controls the Ground Power Unit, which can only be seen when the battery is also switched to “on”.



The Caution Advisory panel contains several banks of annunciators, each referring to a critical system that is either inoperative or in operation, depending on the system itself. It is advised that the pilot seeks to ensure that there are no warning lights illuminated prior to flight, which is part of the F-14’s normal checklist procedure prior to taking off.

Some lights, such as spoilers, will illuminate when those functions are engaged. Others, such as the PITCHSTAB1 and related lights, illuminate when those functions have not been engaged as they are considered crucial for flight safety. Familiarise yourself with the layout of this panel so that, should you need to, you will know what to do if you find one of these lamps illuminating during the course of flight operations.



RADAR INTERCEPT OFFICER'S COCKPIT MAIN PANEL

At this time, MSFS does not support much of the functionality required to fulfil the role of the RIO. Most of the switches have been activated, and we have positioned navigational displays in lieu of a true radar. This section will be updated, along with the cockpit, as soon as true functionality can be added.

To switch to the RIO's cockpit, select cameras from the simulator's main drop-down menu, then select "Pilot", and then "Co-Pilot".

The F-14 Tomcat is coded to make the respective crew members disappear when you occupy their seats. This system works only on the *default* cameras. To remove the crew from the cockpit when using *custom* cameras, set their station load weight in the drop-down Payload Manager menu to zero (pilot is Station 1, RIO is Station 2). This will only remove the interior crew models – those viewed from outside the aircraft will remain visible unless the battery is switched off.

When using the default interior cameras, you will be able to see the RIO in his seat behind you, and when in the RIO seat you will be able to see the pilot at work in his cockpit in front of you.



FLYING THE F-14 TOMCAT

The DC Designs F-14 Tomcats 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.

The F-14 Tomcat was a tricky aircraft to master, and not all pilots who earned their *wings of gold* and joined the Tomcat RAG training program were able to handle the F-14. Many washed out and were sent to fly other aircraft instead, unable to tame the big cat.

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 Tomcat would not be a Tomcat without them. A handy tip for newcomers is that the F-14A is harder to handle than the F-14B, requiring the pilot to be ever mindful of the shortcomings of its TF-30 engines.



If you're starting from cold-and-dark, on the apron, you will find that the aircraft will have its chocks and covers deployed (tie-down chains are optional for when you're operating off an aircraft carrier). The elevators will have drooped due to a lack of hydraulic power, and the starboard engine exhaust petals will be dilated while the port exhaust will be closed. This is all normal, and caused by the way in which power is derived from the left engine's power generation. The F-14 Tomcat did not have a battery or an Auxiliary Power Unit, so all power was ultimately drawn through a bleed system. To start the engines required an external AC power source, a Ground Power Unit, to be plugged into the aircraft prior to cranking the port engine.

As mentioned previously, MSFS has a ground power option, but it is only available at some airfields. Therefore, in the name of simplicity, the Master Battery Switch in the cockpit can be used for power, and when activated on the ground along with the GPU Switch, will produce the Ground Power Unit, which will remain visible until the port engine has been started and its RPM has exceeded 50%.

Remove all covers (and chains if required) from the aircraft using the cockpit selector switches, and then start with your checklists, detailed on the next page.



CHECKLISTS

The F-14 Tomcats 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 (or the Air Start switch) to quick-start the engines. Be certain to check your fuel quantity to make sure you have enough for your flight.

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.

You can select a full load of ordnance on the F-14 Tomcat, but you must then sacrifice fuel load to keep the weight below the maximum of 74,350lbs. F-14 Tomcats always took off from carriers 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.



F-14A with fuel probe extended. A guide light automatically illuminates for night-refuelling purposes.



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 AIM-7 *Sparrow* medium-range missiles, by typing

in the relevant weights as listed in the stations on the right of the menu. Total weight is 50,432lbs with 9,644lbs of fuel aboard.

At the bottom of the visible list of stores are the first of the centreline fuselage station points, which can hold four semi-recessed AIM-7 *Sparrow* missiles at 510 lbs each, or four pylon-mounted AIM-54 *Phoenix* missiles, each weighing a thousand pounds. The F-14 Tomcat was the only aircraft in the world capable of carrying these huge, Mach 5 missiles.



F-14A with Ground Power Unit displayed prior to engine start.

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, lift the wing sweep cover and set the Manual wing sweep lever to fully swept (68 degrees). Now, flick the ENG 1 Crank Switch and wait for engine one to spool up before cranking ENG 2. Alternatively, you can hit the Air Start switch, which will crank both engines for you.

With your payload set, and fuel checked, you're ready to taxi (keep your wings in manual mode, fully swept). Once on the runway, sweep your wings fully forward and then close the wing-sweep-cover to set the wings to auto. Set flaps to take off (stage 1). The F-14 can take-off without flaps in a headwind so they're not always necessary, but for the most

part they should be used for take-off, especially when carrying ordnance. When launching from a carrier, full flaps should be deployed.



The F-14A Tomcat was underpowered for its role, and therefore all take-offs required Zone-5 afterburner. The only exceptions were the very lightest payloads or touch-and-go circuits. The same applied for carrier launches, which gave rise to the iconic sight of Tomcats blasting off carrier decks with plumes of flame blazing from their exhausts.

The F-14B, with its more powerful engines, did not need full afterburner for either carrier launches or runway take-offs, unless carrying heavy payloads. This saved a *lot* of fuel, not to mention removing a great deal of danger from the business of carrier operations.

For both types, rotation was typically around 150 knots, and once cleaned up and with airspeed exceeding 250 knots, the Tomcat would come out of afterburner and maintain a shallow climb-out. Cruising airspeed for the F-14 was anywhere between 350 and 450 knots depending on mission profile. When on Combat Air Patrol, far from the parent carrier, the Tomcat would “loiter” on station at 250 knots to conserve fuel.

CARRIER OPERATIONS

At this time there is no aircraft carrier in MSFS that is fully compliant with the simulator's internal code. As soon as the new "Top Gun" DLC carrier is added to the simulator, this section will be updated with information on how to operate the F-14 Tomcat from the carrier.

There are however a small number of carrier add-ons that can be purchased for MSFS which approximate carrier operations. These come with their own instructions on how to both launch and recover to the deck. The Tomcat has been tested with these products and been found to work well with them.

The oleo "kneel" switch allows the Tomcat to "crouch" on the catapult at launch. This should be activated prior to launching off the deck, and will disengage automatically above 140 knots indicated airspeed.



F-14A Tomcat "crouching" over the catapult shuttle prior to launch.



FIGHTING IN THE F-14 TOMCAT

For many pilots early in the Tomcat's career, as much time was spent fighting the Tomcat's issues as was spent fighting other aircraft. It took time for pilots to learn how to fly around the F-14's shortcomings, which mostly concerned its engines, so they could then focus on flying against an enemy. You will need to do the same.

In real life, as per this rendition of the F-14 Tomcat, the aircraft was limited in performance in certain areas of the flight envelope. Above certain weights, the Tomcat was limited to 6.5G, for instance, and to 7.5G above Mach 1. These limitations are maintained via the ACFS system, which limits aircraft performance based on factors such as weight and airspeed. What cannot be limited easily through systems is the tendency for the F-14A's engines to suffer compressor stalls. This happens when airflow into the engine is disrupted, and the TF-30 engines were *very* sensitive to that airflow – not good in an air-combat platform.

To avoid compressor stalls, the F-14A pilot trains to understand the nature of that airflow, and will learn to “fly around” the deficiencies, even during air-combat-manoeuving. There are certain things that they must remember *not* to do, in order to maintain the engines during flight;

Excessive application of aileron and / or rudder, while at high angle-of-attack flight and at airspeeds lower than 250 knots, can trigger compressor stalls in one or both engines.

The airflow to both engines will be disrupted to some degree already in high-alpha flight at lower airspeeds, but the engines will keep turning. However, if further disruption is caused by applying hard rudder, then the inside engine will almost certainly stall as the Tomcat's long nose blocks the airflow into the engine. A safety valve will shut off the fuel flow into the stalled engine, which will then require a re-start.

The pilot must avoid high rudder and aileron inputs when at high alpha and low airspeed. Unfortunately, these conditions also occur when taking off and landing. Tomcats were routinely lost to compressor stalls in the landing phase, most often at sea but sometimes over land bases also. Crosswinds could tempt a pilot to input a boot of rudder to counteract them, or over-shooting the finals turn into the carrier approach could result in the same action, causing the stall at an altitude where recovery was problematic, if not impossible.

COMPRESSOR STALL RECOVERY PROCEDURE

To recover from a compressor stall, the first action is to retard the throttle on the dead engine. Check your RPM gauge to see which engine has failed, retard the throttle to the idle position. Check altitude and airspeed. To force the air-start:

Open fuel valve for dead engine (which would have shut-off automatically)

Throttle to 10% approx.

Crank dead engine to "Start"

Once the failed engine has recovered, resume flight. The re-start process can take up to 60 seconds, so if you're low on altitude when the engine first fails, it is recommended to climb on one engine before attempting a re-start.

If *both* engines have stalled, use the "Air Start" switch to engage the crank on both engines. A double stall can initiate if a spin is induced as a result of the first engine stall.

SPIN RECOVERY PROCEDURE

The F-14 Tomcat's tendency to compressor stalls and engine failures introduced another risk to aggressive manoeuvring – the widely spaced engines create asymmetric thrust upon one engine failing, further forcing the aircraft into a loss of control and possibly a full departure.

The Tomcat will spin readily, and not just from compressor stalls. Another important factor in avoiding loss of control is aileron inputs at low airspeed and high AOA:

Hard aileron-input when at high alpha and low airspeed, can induce a wing stall and departure into a well-developed spin.

A departure in this manner will typically involve the Tomcat “mushing in” toward one wing with high yaw, which then stalls the fuselage and plunges the Tomcat into a spin, either upright or inverted. Often, high rates of pitch and roll can be observed, with accelerations well into 6Gs and the high yaw rates are often enough to induce a compressor stall in one or both engines, compounding the problem for the crew. The only way to recover from the spin is to return airflow to the wings and fuselage. 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 Tomcat 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. Beware of compressor stalls in the F-14A resulting from high yaw rates.

AUDIO WARNING TONES

A series of automated warning tones are designed to alert the crew of the F-14 when conditions of flight are encountered that can threaten the safety of the aircraft.

1. Compressor stall warning

This warning will sound when either 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-14's high velocities)

3. Landing gear warning

If the Tomcat slows to landing airspeeds when below 10,000ft, this warning emits a continuous tone until the undercarriage is lowered.

F-14 TOMCAT HIGH LIFT DEVICES



The F-14 Tomcat's wings contain a series of high-lift devices that, in conjunction with the internal systems, allow this huge fighter to stay in the fight with adversaries half its size. This ability was partially due to the large lifting area of the fuselage, but it was also down to the manoeuvring flaps system.

Between Mach 0.4 and 0.8, the flaps automatically operate to generate further lift when the Tomcat is manoeuvring aggressively. At an angle of attack of 22 units, the slats will be at 7 degrees deployment, and the main flaps at 10 degrees. This prevents wing stalls in tight, high-G turns and preserves lift as the Tomcat's airspeed decays. Roll rate is also enhanced by the use of spoilers in the upper wing, which augment the all-moving tailerons.

During air combat manoeuvring, it is wise to try to maintain energy in the fight, so always try to ensure the Tomcat remains above 250 knots indicated. This also can help to ensure that you avoid a compressor stall when tightly engaged with an adversary, a sure sign that you will lose the fight.

Despite engine issues with the F-14A Tomcat, it remained a remarkable close-in dogfighting platform. Typically, an F-14A pilot would seek to draw an enemy combatant down to mid-level altitudes, where the Tomcat performed best, and would also seek to keep the fight in the horizontal plane. After the “merge”, a common tactic for F-14A pilots was to perform a “slice”, a maximum G-turn either into or away from the enemy to control the shape of the fight (one-circle or two-circle). Giving away altitude for turn rate and airspeed allowed the Tomcat to hold its own against a tighter-turning opponent, but if the enemy could get the fight into the vertical then the Tomcat could find itself out-classed, unless the crew could keep their airspeed up, in which case the advantage might still remain with them if the opponent had expended their energy in the move to the vertical.

For the F-14B Tomcat, this limitation was removed. The more powerful engines installed in to the F-14B (and subsequently into the F-14D) allowed it to fight with confidence in the vertical plane, staying in the fight with “energy” fighters like the F-15 Eagle and F-16 Fighting Falcon. Furthermore, the F-14B could maintain a “rate-fight” with both types, and could even out-turn the F-16 if properly flown, resulting in a platform that could dominate airspace at both visual and beyond-visual ranges, against any adversary in the world. An F-14B Tomcat, equipped with short, medium and long-range *Phoenix* missiles, became the most capable fighter aircraft in the world for its time.



F-14B Tomcat of VF-213 “Black Lions” with AIM-9 Sidewinders, AIM-7 Sparrow and AIM-54 Phoenix missiles – an almost unbeatable combination.

AIR COMBAT MANOEUVRING

The subject of ACM, and of the Basic Fighter Manoeuvres that accompany it, span volumes and there are many sources of information available on the Internet from which to gain more details. For the DC Designs F-14 Tomcats, 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 6Gs and maintain 'corner velocity' (400-450 knots). This will ensure the F-14'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 mid-altitudes

The F-14 fought best between 5,000ft and 18,000ft or thereabouts, where engine thrust was greatest and turn rates the highest. Do the same, and never fight your enemy's fight. Force them to engage on your own terms.

Switch AFCS off during dogfights

The AFCS system is there to protect you and the aircraft, but if you're going up against an F-16 you're going to need every ounce of power, G-force and AoA at your disposal. Just be careful how you wield that power, because it can bite you just as easily as your opponent.

Use the vertical, even in the F-14A.

Don't be afraid to go up and out-of-plane with your opponent if it helps you equal their turn rate and forces them to lose situational awareness. On that note, last but not least, try to keep your eyes on your opponent...

“LOSE SIGHT, LOSE THE FIGHT”

AFCS CONTROL AUTHORITY SYSTEM

The Automatic Flight Control System is a series of computer-controlled restrictors that limit the rate at which the Tomcat can pitch, roll and yaw, depending upon airspeed. The G-Limiting system is a part of the AFCS. AFCS is activated via the switch panel on the pilot's left side panel.

AFCS Roll: Limited to 125 degrees / second when DLC is engaged or when knots indicated airspeed exceeds 650 knots. When disabled, max roll-rate is governed by CADC.

AFCS Pitch: Limited to 20 degrees / second above 650 knots indicated

AFCS Yaw: Limited to 80 degrees / second when engaged. When off and at 400 knots indicated +, CADC limits rudder authority to +/- 9.5 degrees / second. Below 400 knots indicated, maximum rudder authority is 30 degrees / second

The Anti-G system operates above Mach 1, limiting the airframe to +7.5G and -4.5G via mechanical resistor linkage that forces the control surfaces to neutral should the G-limits be exceeded.

CADC

The F-14 Tomcat's Central Air Data Computer is part of the system that controlled the aircraft's swing-wing system and its control surfaces. A core chip computes altitude, airspeed, vertical speed, Mach number and other variables in order to govern the wing sweep setting in Auto Mode.

The wings have three main modes: manual, auto and over-sweep. The over-sweep function, used for parking on the crowded confines of an aircraft carrier deck, is only available in manual mode, when the aircraft is shut down. Auto mode is the main mode, and controls the wing sweep angle based on Mach airspeed.



In the above image, the Tomcat's wings are shown fully forward for low-speed flight. Note that the flaps and slats are extended for take-off.



In this image, the F-14B's wings are swept fully-aft for high speed and supersonic flight. In the F-14A, two "glove vanes" will extend from the forward fuselage above Mach 1.3. These are disabled in the F-14B as they were considered unnecessary.



F-14A at supersonic airspeeds, with glove vanes extended.

The wings will swing automatically, when in “Auto” mode, to give the best possible lift based on airspeed. They will only reach maximum sweep at Mach 0.96, just prior to breaking the sound barrier.



In the above image, the F-14A's wings are seen in their “over-sweep” position. This can only be reached when the aircraft is parked and shut down, with the wing sweep cover closed and the manual control lever fully aft.



To select the wing-sweep mode, simply look to the throttle bank and you will see a yellow-and-black chevron handle to the right of the throttle banks. This is the manual wing-sweep lever. It is beneath a clear-plastic cover – click on the cover and this will lift up, putting the wings into “Manual” mode and allowing you to move the wings forward and backwards using the chevron lever. With the cover down, the wings will go into “Auto” mode. The wing-sweep indicator to the right of the Up Front Control Panel displays both wing-sweep angle and also which mode the wings are in.

Most carrier and airfield “run-and-break” manoeuvres, where the Tomcat flies down the runway heading and then breaks into the downwind to land, are performed with the wings swept fully-aft using manual mode. The pilot then selects “Auto” mode after the break in preparation for landing, and activates ACFS and DLC modes.

MODES OVERVIEW

Oversweep: Engines shut down, wing-sweep-cover down, chevron lever fully aft.

Manual: Engines running, wing-sweep-cover up, chevron lever as required.

Auto: Engines running, wing-sweep-cover down.

DIRECT LIFT CONTROL

Direct Lift Control is a flight stability system that can be accessed by the pilot to enhance the F-14 Tomcat's stability in the landing configuration.

DLC will only operate when the pilot has selected full-flaps and the undercarriage is extended. DLC acts to compensate lift in the landing phase, and allows for finer trim control of the control surfaces when in the approach phase to landing, reducing the pilot's reliance on stick inputs, and therefore reducing the chances of inadvertently causing a compressor stall in either engine.

NOTE: Exceeding 13 degrees Angle of Attack will cause DLC to disengage.

With DLC and ACFS modes engaged, the Tomcat can achieve airspeeds as low as 115 knots (depending on aircraft weight) and remain in control. At these very low airspeeds, the Tomcat will feel "buoyant" and also be lacking in response to control authority, although the aircraft will be more stable as a result of the additional lift offered by the systems.

It is recommended that all pilots use both DLC and ACFS when in the carrier landing phase, to aid them in mastering the art of bringing a fifty-thousand-pound aircraft down onto the confined landing area of an aircraft carrier.

INTERNAL LIGHTING

The F-14 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, formation lights (sometimes known as slime lights) which are used when in combat theatre for low-intensity identification.

The Tomcat has a single, but very bright, landing light on the oleo nose gear. There are also three active lights on the nose-leg that illuminate based on angle of attack. These work in the DC Designs F-14, and are for the Landing Signal Officer to see what the aircraft’s AoA is while on approach to the carrier.

There is a final light which is attached to the in-flight re-fuelling probe. This illuminates automatically to assist with night re-fuelling.

AUTOPILOT SYSTEMS

AUTOPILOT OPERATION

The Tomcat offers a variety of autopilot functions that can be executed to assist the pilot in climb, cruise, approach, and landing operations. While they are designed to lighten the workload in the cockpit of the Tomcat, it's important that they are used properly to ensure safe and enjoyable operation of the aircraft. Please remember that just as with any other autopilot, stability is key before engaging autopilot - you should be able to fly "hands off" immediately prior to engaging AP functions, so that the transition from manual to automatic control occurs smoothly and without compromise to stability. Below you will find a brief description of some autopilot functions and their operation. It is by no means all-inclusive, but should be enough to get you started and comfortable to explore and expand your familiarity further.

AUTOPILOT ENGAGEMENT

The AP is activated with a switch on the left-side AFCS panel (Autopilot - Engage)

AUTOTHROTTLE

Auto-throttle will manage the aircraft's thrust to maintain selected airspeed. The control wheel for airspeed selection is located on the right-side panel labeled ACLS. Your selected speed will be displayed on the upper left HUD indicated above the speed-tape.

Auto-throttle can be engaged with a button located above the speed selector on the ACLS panel or a switch on the left panel right beside the throttle (Throttle Mode - Auto). Both function redundantly.

When autopilot is first engaged, it enters Pitch mode by default.

VERTICAL NAVIGATION

Altitude can be selected via a control wheel on the ACLS panel just underneath the ALT button.

There is a VERTICAL SPEED function all the way on the right of the ACLS panel (you may need to adjust your camera slightly to see it - it's located right under the bar that houses the canopy controls. This allows you to set a positive or negative vertical speed (for climb and descent respectively) and activate it.

ALTITUDE HOLD button will cause the AP to maintain current altitude (not selected, but active). It can either be activated on the right panel via a button or on the left panel via a switch.

LATERAL NAVIGATION

The F-14 AP provides several possible ways to manage your lateral navigation.

The simplest one is HEADING mode, which can be enabled via a button on the right panel or a switch on the left panel. You can dial in desired heading using the wheel to the right of the button. Your selected heading will be displayed as a dotted line on the arc.

In order to follow the programmed flight plan, enable the LOC mode on the left panel. Note that there is another switch lower on the panel labeled NAV/GPS. While flying a GPS flight plan you will want to have that switch in GPS mode, and once you are ready to intercept an ILS signal on approach, the switch can be used to enable localizer interception.



LANDING THE F-14 TOMCAT

All landings in the F-14 Tomcat are, in principal, conducted in the same way. The difference of course is between landing on a 3,000ft runway on land, or touching down on the pitching, rolling 300ft deck of an aircraft carrier at sea. Both require an adherence to procedure and an unfailing trust in the aircraft's instruments to execute a safe landing.

In real life, most aircraft carrier operations in international waters are conducted under “*zip lip*” conditions. This refers to the absence of all electromagnetic emissions from the carrier or its assets that would otherwise betray their location. As a result, a Tomcat crew finishing a two-hour Combat Air Patrol 200 nautical miles from the carrier, would then have to manually calculate the carrier's intended location and navigate there in order to join the “Marshall Stack” overhead the carrier and descend to land.

Once overhead the carrier, the Tomcat crew would lower its arresting hook, signifying the intention to land, while watching the other aircraft on the deck and in the Marshall Stack to time its descent.

To join the carrier pattern, once you have located the carrier, set wings to “Manual” mode and sweep them fully aft, and lower the tail hook. Once overhead, descend to 2,000ft

while circling the carrier, and note the carrier's heading as your turn brings you onto that same heading. Check your fuel load and all-up weight. If it's over 50,000lbs, you'll need to dump gas in order to bring the Tomcat inside its maximum landing weight.

Initiate a 360 left-hand turn while descending to 800ft. This is the altitude that the Tomcat should pass overhead and abeam to starboard of the carrier, flying on the same heading.



An F-14A Tomcat “pitches out” toward the downwind break for landing.

As you extend in front of the carrier, “pitch out” - bank hard-left and initiate a 6G turn for ninety degrees, throttling back, extending the airbrake and setting the wings to “Auto” mode. Ease the turn out as you slow down, and aim to descend to 600ft while extending the undercarriage. Select DLC mode and make sure the ACFS switches are engaged (a notification should appear in the HUD display).

Descend to 600ft, airspeed 140-150 knots. Your position should be approximately 1.3-1.4 nautical miles abeam the carrier. Double-check gear, flaps and hook are all down, DLC and ACFS engaged. Watch for the moment when you draw level with the carrier's stern.



Abeam the carrier, descending to 600ft, hook, gear and flaps down, DLC engaged.

Once roughly level with the carrier's stern, initiate a 20 degree-banked left turn, descent rate 200fpm, airspeed maintained at around 140 knots. Your timing here is crucial in order to ensure that you roll out reasonably well lined up for landing on the deck.



In the turn, descending, riding the throttle to maintain descent rate.



Approaching the roll-out point at 450 ft, astern the carrier at one nautical mile.

As you start to roll out behind the carrier, you will be only ten seconds or so away from landing. This is known as “*the groove*”, the final ride down to the deck.



F-14 in the groove; airspeed good at 127 knots, glideslope a little to the right, although AOA is a little shallow – the AOA annunciator will show a green circle when glideslope is perfect.

Maintain a steady flight path all the way down to the deck, aiming to touch down amid the four cables stretched across the deck just aft of the tower. As you think you're about to touch down, advance the throttles into full afterburner and retract the airbrakes so that if you miss the cables, you have enough airspeed to "bolter" and go around for another pass.



F-14A "in the groove" astern the carrier, lined up for landing.

For landing at normal airfields, the precise same procedure is followed. Aircraft designed to land on aircraft carriers never "flare" before touchdown, instead landing with descent rates up to and even beyond 300fpm. Do not be concerned about such high descent rates, the F-14 Tomcat has an immensely strong undercarriage designed for precisely this purpose.

Once landed successfully on the deck, retract flaps and arrestor hook, then set wing sweep to "manual" and sweep them fully aft. Vacate the landing area as soon as possible to make way for other aircraft, and taxi either to parking or to the catapults for launch.



F-14A "Fast Eagle 107" of VF-41 "Black Aces" parked on USS Nimitz's starboard elevator, with chocks, covers and tie-down chains all deployed. This was one of two Tomcats that shot down a pair of Libyan Su-22 "Fitters" over the Gulf of Sidra in 1981.

CUSTOMISING YOUR TOMCAT

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-14 Tomcats of the United States Navy were often highly customised, with pilots frequently decorating helmets with artwork and flight suits with patches, while the aircraft themselves often bore 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 or RIO as you see fit.



The above image shows a close-up of the F-14B crew in the VF-32 “Swordsmen” livery. You can see that the helmets bear the VF-132 crossed-swords logo, and the flight suit shoulder patches the Tomcat and Top Gun patches. The crew's visors have been set to the “up” position so that you can see their faces, and the canopy bears the names of the crew.



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

Simply use from the paint kit the image sheets named **F14_Pilot** and **F14_RIO** to alter the crew's faces; **Pilot_Patches** and **RIO_Patches** to alter flight suit patches and names; **DCD_F14_Text_Decals** to alter the names on the canopy; and **Tomcat_Helmets** and **WSO_Helmets** to alter the helmet artwork. In addition, it is possible to alter or remove some of the major external markings by editing the **General_Decals_F14** image sheet, for when the position or style of the default warning stencils or other markings do not match the paint scheme you wish to recreate.

For now, the best way to alter the Tomcat'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.

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-14 Tomcats remain at the cutting edge of what's possible for fighter aircraft. The forthcoming "Top Gun" aircraft carrier DLC for MSFS is one example – as soon as it's here, the Tomcats will be updated to work seamlessly with whatever features the new carrier provides for us.

For now, don your sunglasses, crack open that cheeky grin and grab your leather flying jacket, because now and for the first time ever in a truly modern flight simulator, you really can experience what it was like to *buzz the tower* at NAS Miramar in an F-14A Tomcat or to earn your coveted Wings of Gold as a naval aviator...



CREDITS

DC Designs F-14 Tomcats

Models and code	Dean Crawford
Additional code	CodenameJack447
Flight dynamics	CodenameJack447, Dean Crawford
Textures	Matt Wynn, Dean Crawford
Sounds	Sim Acoustics (WWise)
HTML code	CodenameJack447, SilentG37
WASM code	Evan Burns

Just Flight

Project management	Dermot Stapleton
Manual	Dean Crawford, Jeremy Smirnov
Installers	Just Flight / Microsoft

Testers

CodenameJack447
SilentG37
Severus Aviation
Drew Bolton
Jeremy Smirnov
Dean Crawford

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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.