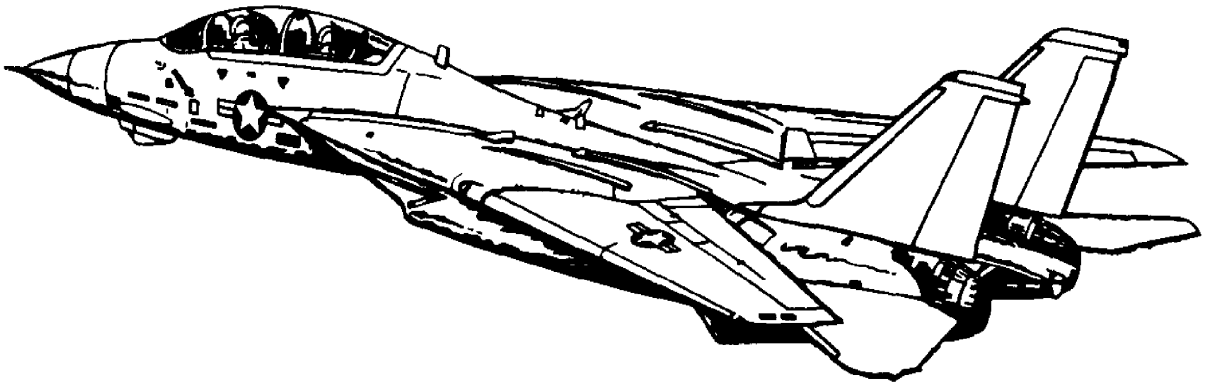
F-14 TOMCAT

FOR MICROSOFT FLIGHT SIMULATOR



INSTALLATION AND QUICKSTART GUIDE

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1. DOCUMENT SCOPE

WELCOME TO THE F-14 TOMCAT FOR MICROSOFT FLIGHT SIMULATOR!

The F-14 aircraft is a supersonic, two-place, twin-engine, swing-wing, air-superiority fighter designed and manufactured by Grumman Aerospace Corporation. In addition to its primary fighter role, carrying missiles (Sparrow and/or Sidewinder) and an internal 20-millimeter gun, the aircraft is designed for fleet air defense (Phoenix missiles) and ground attack (general purpose and precision ordnance) missions.

This rendition for Microsoft Flight Simulator is designed to be, within the limits of the simulator, a realistic and complete rendition of this iconic aircraft.

The scope of this document is to provide the user with basic installation instructions, an overview of the most peculiar functionalities and key assignments, and, where applicable, the main differences between this MSFS rendition, the DCS F-14 by Heatblur and the real aircraft.

We **strongly** recommend you read this manual before jumping into the cockpit.

1.1 REFERENCE DOCUMENTATION AND MANUALS

Given that this is package is designed to be a realistic and complete simulation of the F-14 Tomcat, most of the documentation which can be found online about the real-world aircraft or the DCS rendition applies to this MSFS version too.

This is a list of some of the resources you can find online:

- HEATBLUR DCS F-14 MANUAL: https://www.heatblur.se/F-14Manual/ (much of the information of the DCS version is applicable to MSFS)

- DCS VIDEO TUTORIALS:

  Pilot cockpit familiarization: https://www.youtube.com/watch?v=OO3IdQjAdDA

  Cold and dark start: https://www.youtube.com/watch?v=ws1GxPG2ZXw

- NATOPS NAVAIR 01−F14AAA−1 and NAVAIR 01-F14AAP-1

We are also providing a basic aircraft manual, along with this quick start guide, as a general reference.

1.2 MAIN DIFFERENCES BETWEEN DCS AND MSFS VERSIONS

In case you are an user of the DCS F-14 by Heatblur, you may notice some important differences between it and this MSFS rendition.

Obviously, MSFS not being a combat simulator, the combat systems have been removed and, while their controls are clickable, in most cases they have no function.
However there are also other differences – some are due to MSFS limitations, others may

be fixed, or mitigated, in future updates. Here is a non-comprehensive list:

Flight model: we did our best to provide a realistic flight model for MSFS, however the MSFS flight model does not lend too well to peculiar aircraft like the Tomcat. In general, however, the differences are very limited – and probably the biggest one is the absence, in MSFS, of a Mach-trim compensator.
Speed versus power setting may also exhibit minor differences.

Jester: a basic Jester implementation is present, along with its sarcastic vocal comments in case of a bad landing. However it has been vastly redesigned for MSFS, mostly to provide more navigation functions in the MSFS world

Radar: The MSFS rendition has a fully functional A/A radar, but, while it is a rather advanced simulation for this platform (including MLC and notching simulation) it has several limitations with respect to the DCS implementation.

Navigation system: In order to depict the real world Tomcat navigation system, the MSFS rendition features completely custom code which is not too far from the real deal (including INS error, CAP entries etc.). However, at the moment of the release, the Navigation System in MSFS does not use (or require) heading and speed entries during alignment, and error differences between coarse and fine alignments are not correctly calculated. Also waypoints have no associated altitude.

Autopilot: In order to maintain compatibility with standard autopilot controls, the MSFS F-14 uses the default autopilot. While the heading hold and altitude hold work correctly, the attitude hold will also constrain heading (contrary to the real aircraft and DCS).

1.3 DISCLAIMER

THIS PRODUCT IS NOT ENDORSED OR SUPPORTED BY THE REAL WORLD AIRCRAFT MANUFACTURER.

While we have tried to provide a reasonably realistic depiction of the F-14 and we have carefully studied all the publicly available information, the performance, operations and procedures shall be considered purely fictional and not representative of the performance of the real aircraft and its systems.

1.4 COPYRIGHT STATEMENT

2. INSTALLATION

IMPORTANT – IF YOU ARE MANUALLY UPGRADING YOUR PACKAGE FROM A PREVIOUS VERSION, PLEASE DELETE THE PREVIOUS VERSION FIRST!

This package is distributed on the Microsoft Marketplace, Heatblur Store, Orbx, SimMarket and other vendors.

If you have purchased the package though the Marketplace or through Orbx Central or on SimMarket (and used their respective Apps for installation), and you have followed the on-screen instructions, no further action is required from your end. The plane should be available in the aircraft selection menu as the other default planes and should be automatically updated. NOTE: in some cases you may need to restart the simulator first.

If you have purchased the package from an external vendor and the aircraft is provided as a .zip or .rar file without any installer, just unzip the content of the file into your COMMUNITY folder. The exact location of the folder will depend on your selection when you have installed Microsoft Flight Simulator. Once you have indicated where your COMMUNITY folder is, just follow the on-screen instructions.

If you have purchased the package from an external vendor and the product comes with an .exe installer, just follow the instructions on the screen. You will be asked to locate the COMMUNITY folder. The exact location of the folder will depend on your selection when you have installed Microsoft Flight Simulator. Once you have indicated where your COMMUNITY folder is, just follow the on-screen instructions.

2.1 MINIMUM HARDWARE REQUIREMENTS

Due to the high-detail model and textures, we suggest to use the F-14 on systems that meet or exceed the following requirements:

CPU: 3.5GHz quad core processor or better
GPU: at least 8Gb dedicated memory, Nvidia 2060 or better recommended
RAM: 8.0Gb minimum
Hard Disk: 8Gb required for installation

2.2 HOW TO LOCATE THE COMMUNITY FOLDER (MANUAL INSTALLATION)

If you need to perform a manual installation, and you do not know where the community folder is located, you can follow this procedure:

Go to Options / General.

1.Click on "Developers" which you will find at the bottom of the list on the left.
2.Switch Developers Mode on.
3.On the Dev Menu select Tools / Virtual File System.
4.The community folder location can be found under "Folders > Community folders"

NOTE: If copying the folder in the Community folder fails because of the fact that files names are too long you can proceed as follows:

1. Extract the package folder on your desktop or in any known and easily accessible

location.

2. Rename the package folder from “indiafoxtecho-f14” to anything short and recognizable such as “f14” or just “14”

3. Place the renamed package folder in the Community folder

Alternatively for EXPERT WINDOWS USERS ONLY, it is possible to edit the "LongPathsEnabled” entry in the Windows registry key:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\FileSystem

Once the aircraft is installed in the Community folder, it will be available in the aircraft selection menu next time you start Flight Simulator. If Flight Simulator was running during the install process, you need to close it and restart it for the aircraft to appear.

2.3 UPDATES

We will try our best to keep the product updated and squash significant bugs as soon as possible.
Updates are typically deployed as new installers/packages and will be available from your distributor – each distributor has its own method for deploying updates:

MICROSOFT MARKETPLACE → Updates will be available in the Content Manager

HEATBLUR STORE → a new full package will be provided

ORBX and SIMMARKET → updates can be obtained via the respective apps

Other distributors → typically a new full package will be provided

2.4 LICENSE RESTRICTIONS

This F-14 rendition for Microsoft Flight Simulator is provided solely for non-professional use. Please contact IndiaFoxtEcho Visual Simulations for inquiries about professional applications.

NOTICE Although this manual and the simulated aircraft closely resemble their real-world counterparts in many aspects, neither should be used as source of real-world information about the aircraft. This package is not endorsed or supported by the real world aircraft manufacturer or by any Armed Service.

3. JESTER

Naturally we could not bring the DCS F-14 to MSFS without having Jester on-board!
The MSFS Jester, however, is a much simplified version of the DCS one and a it is mostly meant to provide access to some additional functionality which is not normally found in MSFS aircraft.

In MSFS Jester will provide:
- miscellaneous comments during flight (warnings, fuel calls, altitude calls, POIs)
- voice assisted checklists
- basic controls of the navigation system, navaids, TID and radar
- change the aircraft configuration
- access to ground service and other options

Jester interface is a clickable, 3D item within the cockpit– and it is meant to be operated with a mouse (although it can also be operated with a controller)

Jester is coded entirely in XML and fully integrated in the aircraft – and therefore it does NOT require an external application to run.

However, due to MSFS limitations, interactions with Jester may be subject to a slight delay. Also, collision detection in VR is less than optimal, so you should avoid, quick multiple clicks.

3.1 ACCESS TO JESTER

To access the JESTER menu you should click on the VDI display as indicated in the figure below.
Jester will automatically disappear after a while if no option is selected.

3.2 JESTER MAIN MENU AND FUNCTIONALITIES

Upon selection, Jester defaults to the main menu – which provides access to all the pages and functionalities and sub-pages.
Clicking on the center of the wheel will always bring you to the previous page, unless you are in the MENU mode – in which case it will make the Jester menu disappear.

The functionalities provided in the menu are:

CHECKLISTS – here you can select voice-assisted start pilot checklists (if the plane is cold and dark) or command RIO to execute other checklists (e.g. landing).
Note that selecting the “landing” checklist will put Jester in landing mode (providing altitude or speed callouts depending on tailhook lever state).

NAVIGATION – this option contains the options for basic operation of the INS navigation system. You can ask jester to steer you against one specific waypoint, or designate the current location as a waypoint or home base. You can also cheat and force the INS alignment.

TACAN AND ICLS – this option allows you to select a specific Tacan Channel (although

you can obviously do that by operating the TACAN panel) or select between a list of preset Tacan stations in the USA frequently used for USN operations.
Preset channels for static carriers are also provided – selection of static carriers Tacan will also tune the proper ICLS frequency (although you will have to select the proper options in in the display control panel for ICLS to appear on the VDI and HUD).

TACTICAL INFORMATION DISPLAY (TID) – As the pilot can opt to visualize the TID on the HSD display, but has no control over it, this menu will provide access to the main TID options (such as range and symbology) without moving to the rear cockpit. WCS master switch functionality is also provided here.

RADAR – This menu provides basic controls over the radar system, such as mode selection, range selection, beam width, azimuth and elevation controls and target selection. For anything beyond basic controls you will have to move to the backseat.

RADIOS AND IFF – Basic VHF radios and IFF controls are provided here. Also, ADF controls are provided – note however that ADF will operate on NDBs (instead of UHF frequencies like in the real Tomcat).

CONFIGURATION – Here you can change the load-out of the aircraft, by selecting one of different weapon presets. NOTE: weapons will only be available for non-Microsoft Marketplace copies (but we will soon provide a mod to add-them back on PC).
Configuration can be change at any time during the flight.
Note that configuration will change the aircraft weight BUT it will not impact the drag coefficients.

MAINTENANCE – This option provides multiple commands for ground service and maintenance (some are available only if the aircraft is static and engines are off) and additional gameplay options.

3.3 COUGAR

If you are sitting in the RIO cockpit, by clicking on the center of the TID you can make the “Cougar” menu to appear. This is very similar to Jester, but, if the aircraft is in flight, it will provide access to Autopilot controls – allowing you to “fly” the plane automatically to some extent.

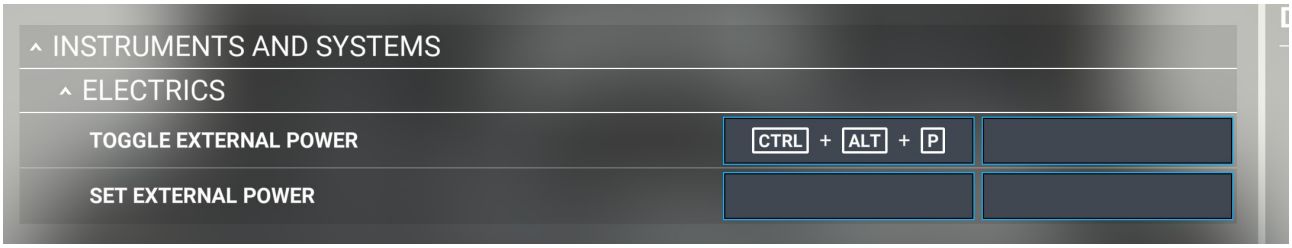
4. SPECIAL FUNCTIONALIITIES

In order to provide a realistic depiction of such a peculiar aircraft, this rendition of the F-14 for Microsoft Flight Simulator relies heavily on special functionalities and custom code. The following paragraphs will describe the most important things you need to know to fully enjoy the Tomcat.

Please keep in mind that the aircraft interface is designed for usage within a Virtual Cockpit in both pancake or VR mode.
We strongly suggest you use a mouse to interact with the cockpit.

4.1 EXTERNAL POWER CONNECTION

Like the real aircraft, the MSFS F-14 Tomcat requires external power for engine start.
To connect to external power you can either select the option in the Jester menu from the front cockpit, or assign a key binding to the TOGGLE EXTERNAL POWER command.



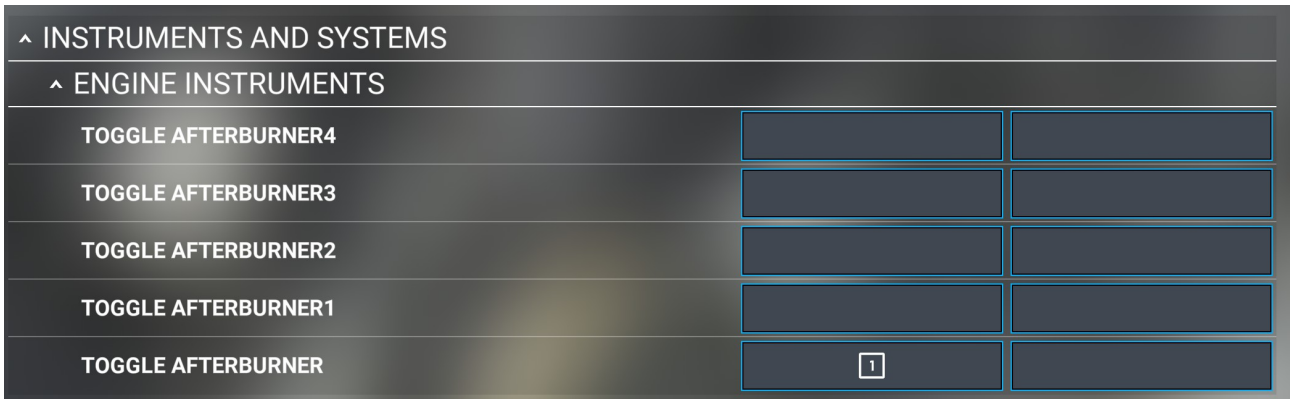
This F-14 model also includes service vehicles, which however are NOT shown by default. You can make them appear by selecting the “SERVICE VEHICLES” option in the JESTER “MAINTENANCE” menu.

The reason why the vehicles are not shown by default is not to interfere with sceneries that have ground services modeled.
The electrical cable and air hose will appear only if the services are connected. Service will automatically disconnect, and vehicles will disappear, if the aircraft is not stationary.

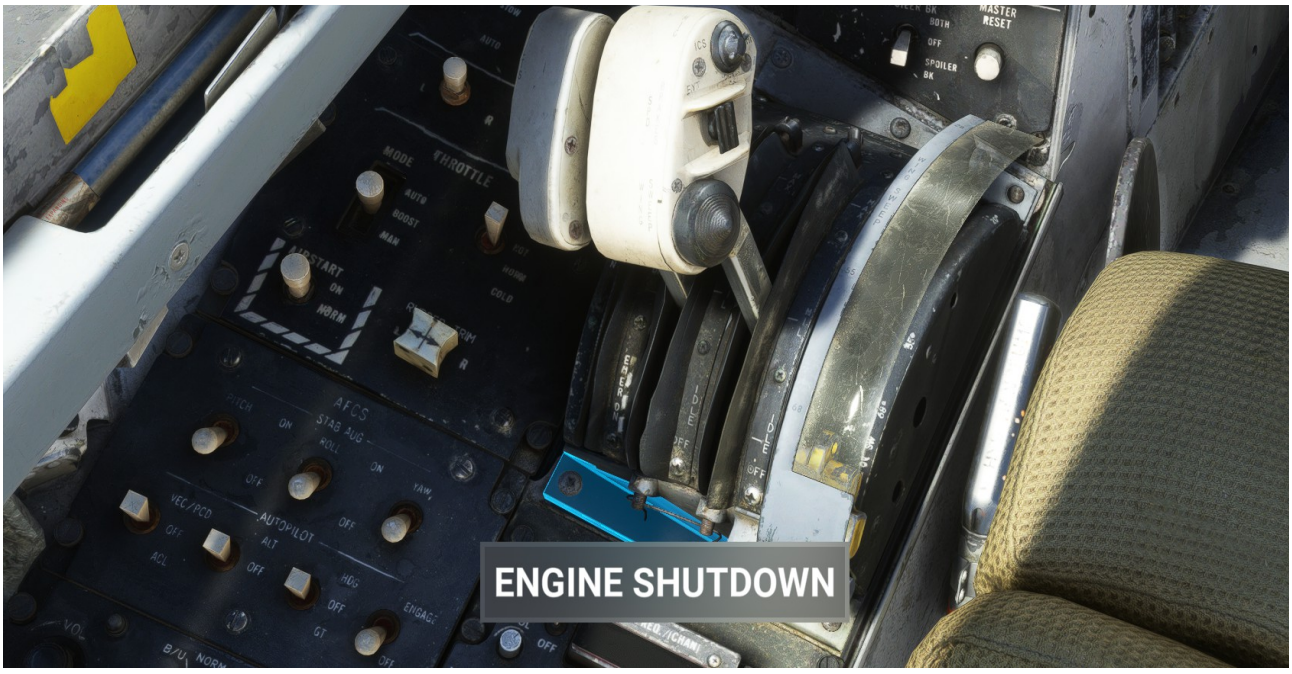
4.2 THROTTLE, AFTERBURNER DETENT AND ENGINE MANAGEMENT

Like in the real-world aircraft, about half of the throttle movement is allocated to “dry” thrust, while the other half is allocated to the afterburner.
This F-14 rendition includes afterburner toggle/detent controls. This means that, much like the default F/A-18, the afterburner will **not engage** unless the pilot actively presses a specific “toggle” button – this is done in order to mimic the afterburner detent which is present in the real world throttle lever, and it is meant to prevent an inadvertent activation from the pilot.
Also the throttle movement will be limited to 50% of the available travel, unless the afterburner detent is released.
This control is not assigned in many control presets.so you may need to add it.

If you **do not wish to to have the afterburner toggle functionality**, or you have a mechanical detent on your throttle, you can set the “TOGGLE AFTERBURNER” control to your throttle axis (as in the figure below) so that the TOGGLE is associated to throttle movement.



To shutdown the engines, there is a specific mouse interaction area located at the base of the throttle assembly – in order for this to work, throttles must be below idle.
Advancing the throttle to any other position will restore engine fuel flow and combustion.



NOTE:

The biggest difference between the F-14A and the F-14B is of course the engine.
The F-14 has two Pratt & Whitney TF30 while the F-14B has General Electric F110-GE-400.
The TF30 engine had several reliability problems in the F-14A, partially due to the air-intake design. These are faithfully modeled in this MSFS rendition – so that you can experience engine stalls in a variety of situations such as:

- high yaw rate at high AoA's

- incorrect ramp settings

- abrupt movement of the throttle at high speed, high altitude

...and more. Engine stall can be easily identified, apart from the “thump” sound effect in the cockpit (or a “bang” if you are on external views), by the specific caution light on the windshield and a rapid rise in TIT.
It can be solved, in most cases, by:

- retard the throttle to minimum

- restart the engine with the crank switch

Note also that the yaw effect due to the asymmetric thrust in this simulation is smaller than the one experienced in the real-aircraft.

4.3 WING SWEEP, FLAPS AND DLC CONTROL

The most peculiar design feature of the F-14 is probably its wing-sweep system, which comes with a relatively intricate flaps system and the Direct Lift Control.
These systems are currently not supported properly in MSFS, and, in this implementation, the DLC, flap and wing systems are interconnected and controlled by the **flap control**.

The F-14 is configured with a total of 10 flap positions:

0 (zero – corresponding to “flaps up”) → OVERSWEPT POSITION: this is only selectable if the wing sweep is in EMERGENCY mode, and will switch the mode to OVERSWP.

1 to 6 → WING SWEEP ANGLE: these are only selectable if the wing sweep is in EMERG or MANUAL mode.

7 → MANEUVER FLAPS PARTIALLY EXTENDED, MAIN FLAPS DOWN, DLC IN

8 → FLAPS FULLY EXTENDED, DLC IN

9 → (corresponding to “flaps down”) FLAPS FULLY EXTENDED, DLC OUT

Position selection may be limited by wing-sweep system mode and interlocks.

While this may seem an odd design choice at first, it provides a number of advantages such as proper drag/lift simulation for the different wing configurations.

We recommend not to use analog flap controls or levers with the F-14, and assign buttons to the FLAP INCREASE and FLAP DECREASE commands:

To operate the **EMERGENCY SWEEP LEVER** you must first to lift its safety cover – this is done by clicking on the area highlighted in the picture below:

Once the safety has been lifted, you can engage the EMERGENCY mode by extending the lever by clicking on the area in the shown in next image:

Note that lift the Emergency Sweep Lever will switch the wing sweep system to EMER mode – to return to normal modes of operation, the lever must be stowed and the **MASTER RESET** button must be pressed.

To cycle between the normal Wing Sweep modes (AUTO-BOMB-MANUAL) you should click on the WING SWEEP MODE SWITCH, and then press the **MASTER RESET** button.

The Wing Sweep modes are:

AUTO - Wing position is automatically scheduled to the optimum sweep angle for developing maximum maneuvering performance. Schedule depends primarily on the Mach number. This is the default mode, and the one you should normally use during flight.

MANUAL – Wing position can be manually controlled, unless the wing-sweep program is intercepted, at which point transfer to the auto mode is automatic. Indication of the existing mode is provided by the AUTO and MAN flags in the wing sweep indicator.

BOMB - With the switch in BOMB, the following occurs:
1. Wing-sweep indicator shows MAN flag.
2. If wing sweep is less than 55°, wings will drive to 55°
3. If wing sweep is greater than 55°, wings will not move.

As the aircraft accelerates and the auto wing-sweep schedule is intercepted, the wings will follow the auto schedule even though the switch remains in bomb mode. Upon decelerating, the wings will sweep forward to 55° and stop.

EMERGENCY - The emergency mode provides an emergency method of controlling wing sweep and bypasses the normal command path.

OVERSWEEP (75°). The wing oversweep mode allows sweeping the wings aft of 68° to 75° during on-deck operation only, thereby reducing the overall width of the aircraft for deck spotting.

The wing-sweep schedule and interlocks will behave almost exactly like in the real-aircraft, with similar schedule and constraints, with some minor deviations.
The most important limitations are as follows:

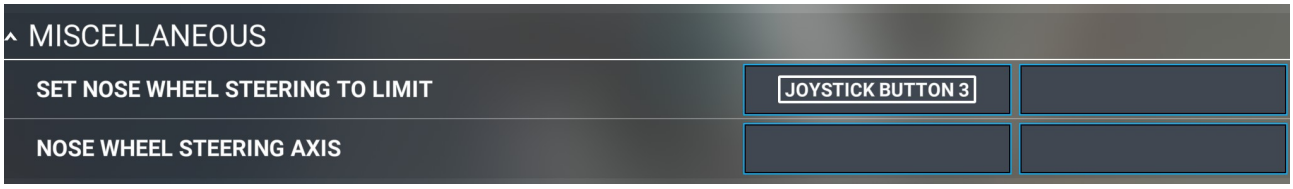
FLAPS cannot be deployed unless the wing-sweep is 20° degrees.

WING SWEEP cannot be set in OVERSWEEP position unless it is commanded in EMER mode.

4.4 NOSE WHEEL STEERING AND A/P REFERENCE

This rendition of the F-14 implements MSFS nose-wheel steering (NWS) system and associated controls.
The yellow “NWS ENGA” advisory light mounted on the windshield indicates if the system is active or not.

To associate a control to this function, you should assign a control to the “SET NOSE WHEEL STEERING TO LIMIT” command, in the MISCELLANEOUS group.



The NWS can also be operated by clicking to the AUTOPILOT REFERENCE AND NWS PUSHBUTTON on the control stick, although it is not easy to access.

Note that this control, like in the real-aircraft, also serves to engage and provide reference to compatible autopilot mode.

If an autopilot mode is selected in the virtual cockpit, the A/P REFERENCE advisory light may appear on the left side of the VDI, indicating that the autopilot mode is not yet active as it is waiting for a reference input (which the user can provide with the NWS control). Autopilot modes engaged with a default keystroke do not require that, as they will assume current aircraft status to be the reference for the autopilot.

4.5 RADAR

Unfortunately, at the moment, Microsoft Flight Simulator does not support natively a proper air-to-air radar simulation.
The F-14, however, implements a C++ SimConnect WASM module (which runs inside MSFS), that provides the basic services needed for a decent air-to-air simulation – which is then built on top on this via XML code.

This radar module, at the time of the release, suffers from three important limitations:

- works on AI objects only

- works on PC only

- it is subject to MSFS traffic generation restrictions, and may not refresh correctly in certain conditions

Also, it is an Air-to-air only radar – no ground returns (except from SimObjects).

Except from these non-negligible limitations, the radar simulation is quite detailed and goes beyond what is typically implemented in this simulation.

The different radar modes of the AWG 9 are correctly simulated with the correct symbology, true to life ranges and technology constraints including Main Lobe Cluttering and “notching”.

4.6 INS NAVIGATION

The Inertial Navigation System is simulated in some detail, and closely mimics the one of the real F-14 Tomcat, including alignment errors and procedure, and cumulative errors during flight.

With respect to the real aircraft, and its DCS counterpart, at the moment of the initial release, the biggest differences are as follows:

- the navigation system is purely a LAT/LON system: altitude is not taken in account at the moment.

- carrier alignment procedure is not simulated

- fix procedures are not supported

Note that the MSFS flight plan system is supported to some extent, but it is not the intended way to operate the system. If a MSFS flight plan was created, the system will:

- mark the last waypoint of the flight plan as HOME BASE (HB)

- load all the other flight plans waypoints* as INS waypoints* (and calculate the error)

* like the real-aircraft, the simulated F-14 has very few waypoints. The ones in a typical MSFS flight plan will easily saturate the available slots. The destination will appear in any case as the HB waypoint

** MSFS waypoints will be loaded in the following order into the F-14 memory

MSFS Waypoint 1 to 3 → F-14 Waypoint 1, 2, 3

MSFS Waypoint 4 → F-14 Fixed Point (FP)

MSFS Waypoint 5 → F-14 Initial Point (IP)

MSFS Waypoint 6 → F-14 Surface Target (ST)

MSFS Waypoint 7 to 13 → F-14 Data link point

MSFS Flight Plan Destination → Home base (HB)

The intended use of the system, however, is to use it like the real one, that is, once the system is aligned:

1) Enter the waypoints coordinates via the Computer Address Panel (CAP) as follows (data will appear in the scratchpad area of the TID):

a) select TAC DATA with the Category Knob

b) select the waypoint for which you want to enter the coordinates

c) push the LAT button and enter LATitude of the waypoint

- expected format is XX° YY.Y'

- you can use S/W and N/E button to change it to North and South

- confirm your selection with ENTER or CLEAR the scratchpad to restart

d) push the LON button and enter LONGitude of the waypoint

- expected format is XXX° YY.Y'

- you can use S/W and N/E button to change it to West or East

- confirm your selection with ENTER or CLEAR the scratchpad to restart

e) waypoint is now loaded in memory should now display in the TID (if within range of the display)

2) Navigate to that waypoint, you will have to operate the DEST selector (or ask Jester to do it). Navigation information can be displayed in the pilot cockpit by selecting MODE “NAV” and STEER CMD “DEST“

5. FORRESTAL CARRIERS AND CARRIER OPERATIONS

Of course carrier operations are extremely important for a decent F-14 Tomcat Simulation, and although the current native implementation in MSFS leaves a lot to be desired, this Tomcat implements a variety of workarounds to provide satisfactory carrier operations in a variety of different ways.
The package also includes high-detail static models for all Forrestal-class carriers.

5.1 CATAPULT LAUNCH

At the moment of the initial release, MSFS does not support natively a catapult launch system. This functionality is typically provided by third party add-ons, but the Tomcat also comes with its own, standalone launch code.

If LAUNCH BAR is deployed when the aircraft is on the ground and the throttle is advanced to 80% RPM or more and wheel brakes are engaged, the aircraft will simulate a catapult launch (once the brakes are released). This will work on any surface and any orientation as long as the plane altitude is between 50 and 100 ft (typical carrier deck altitudes).

Therefore the launch procedure is as follows:

a) get into the launch position

b) extend the launch bar (NOTE: NWS disengages, aircraft kneels in external views only)

c) either apply the parking brake or press the toe brakes

d) advance the throttle to at least 80% (NOTE: brakes are incapable of holding the F-14 still at full A/B)

e) wait for the LAUNCH BAR advisory to turn out when ready to launch

f) release the brakes

…and you will be in the air in seconds!

5.2 ARRESTED LANDING

The F-14 Tomcat supports arrested landings in two ways:

- **SDK Compliant carriers** (that is static or dynamic carriers that employ the arrestor wires system introduced in MSFS with the Top Gun package). In this method, arrestor wire dynamics are handled by the sim.

- **Non-SDK Compliant carriers** (static or dynamic carrier without SDK compliant wires). In this method, as long as the TAILHOOK is deployed, the aircraft will simulate an arrested landing on any surface (as long as the plane altitude is between 50 and 100 ft (typical carrier deck altitudes).

Both systems have their pros and cons, in the creation of a carrier scenery - however, if you intend to operate on an SDK-compliant carrier, you can disable the non-SDK arresting

method in the Jester menu if you prefer so.

5.3 CARRIER OPERATION TIPS

To get the best from carrier operations in MSFS, you may want to:

- assign key stroke to both the launch bar and the arrestor hook

- keep in mind that carriers, in real-life, are steered towards the wind to have better conditions for take-off and landing... so you may want to check the carrier orientation/route (which is typically fixed in MSFS) and change wind direction accordingly

- if you are operating from a static carrier, you may want to set the wind coming from the bow at above 25 kts.

5.4 FORRESTAL-CLASS CARRIERS

This F-14 package comes with high-detail, static models for all of the Forrestal class ships. In the initial release, these are non-SDK compliant, static models which can be used as airports, have a TACAN and an ILS, and tower and approach frequencies.

Locations are as follows:

CV-59 USS Forrestal → Near Norfolk (airport code CV59, TACAN 59X)

CV-60 USS Saratoga → Mediterranean Sea (airport code CV60, TACAN 50X)

CV-61 USS Ranger → Arabic Gulf (airport code CV61, TACAN 51X)

CV-62 USS Independece → Near Taiwan (airport code CV62, TACAN 52X)

All carrier are oriented towards EAST (true heading 090), and are equipped with two “runway spawn points” (near catapults) and one “cold and dark” spawn points – ILS frequency is 108.50.