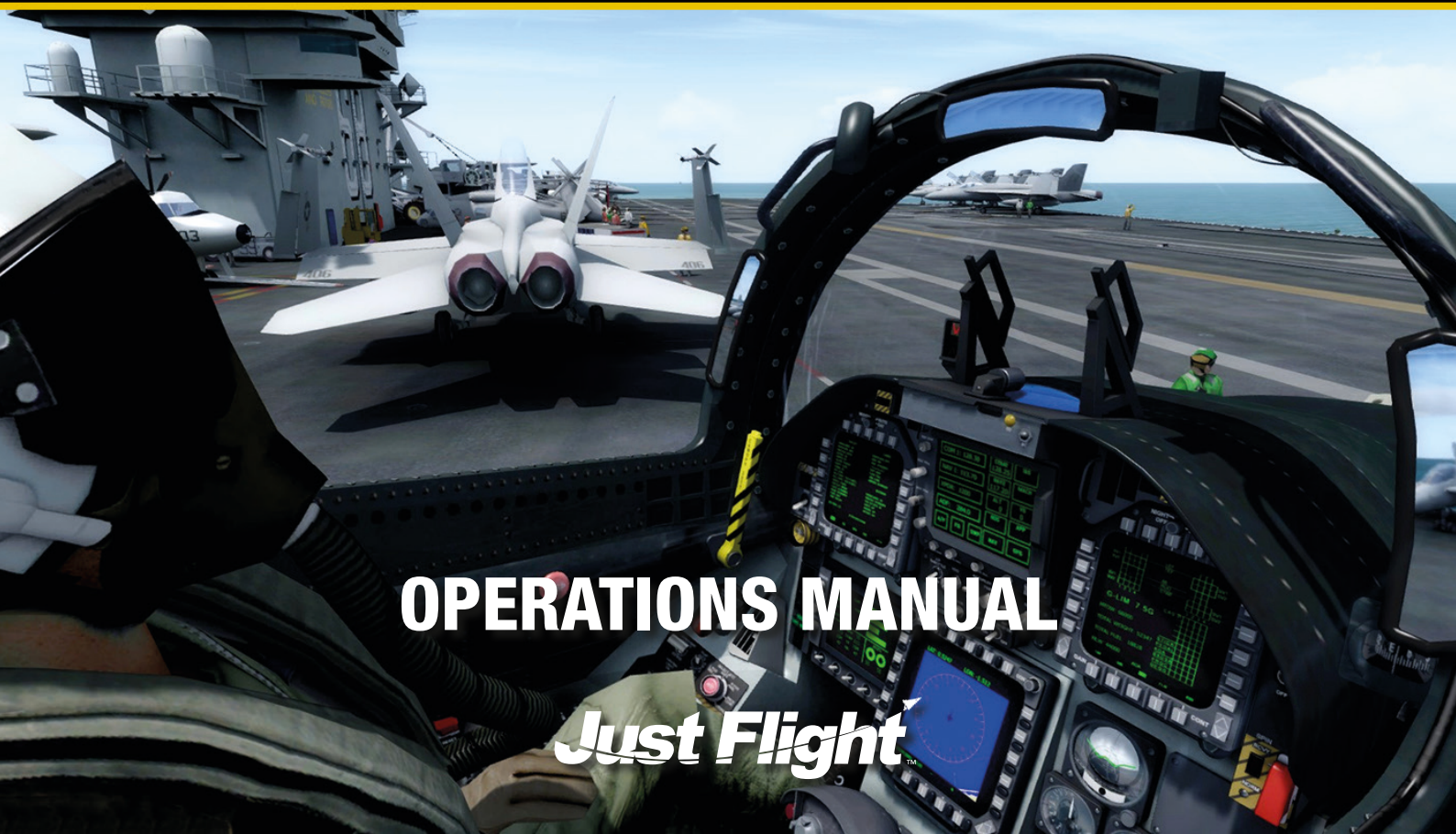
F/A-18 E, F & G SUPER HORNET



OPERATIONS MANUAL

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F/A-18 E, F & G SUPER HORNET

Operations Manual

Please note that Prepar3D or Flight Simulator X must be correctly installed on your PC prior to the installation and use of this Super Hornet simulation.

CONTENTS

INTRODUCTION

The F/A-18 Super Hornet series of fighter aircraft are the United States Navy's premier carrier-based, multi-role fighters based on the McDonnell Douglas F/A-18 Hornet. The F/A-18E single-seater and the tandem-seat F/A-18F and EA-18G variants are around twenty per cent larger than the original Hornet, and between them replaced a number of older naval aircraft in various roles, in a development designed to increase platform commonality in carrier-based aircraft. First flown in 1995, full production of the type began in 1997, with the Super Hornet entering service with the United States Navy in 1997 to begin the replacement of the US Navy's fleet of Grumman F-14A/D Tomcats.

Equipped with an internal M61 20mm rotary cannon, the Super Hornets can carry a vast array of air-to-air and air-to-ground munitions, while maintaining a higher state of readiness than preceding types, lower maintenance per flying hour, greater reliability in-theatre and with greater parts commonality than any other previous naval aviation platform. Additional fuel can be carried in up to five external tanks, giving the Super Hornet the capacity to act as an aerial tanker platform, while the EA-18G variant allows for power-projection of electronic countermeasures emitted from a combat-capable aircraft, replacing the ageing Grumman EA-6B Prowlers aboard United States aircraft carriers.

Included aircraft

FA-18E Super Hornet

- VFA-143 'Pukin' Dogs' Line
- VFA-27 'Royal Maces' CAG
- VFA-31 'Tomcatters' Line

FA-18F Super Hornet

- VFA-103 ‘Jolly Rogers’ CAG
- VFA-41 ’Black Ace’ Line
- VFA-213 ‘Black Lions’ CAG

EA-18G ‘Growler’

- VAQ-132 ‘Scorpions’
- VAQ-140 ‘Patriots’ CAG
- 6 Squadron, Royal Australian Air Force

Aircraft specifications

General characteristics

Length	60 ft 1¼ in (18.31 m)
Wingspan	44 ft 8½ in (13.62 m)
Height	16 ft (4.88 m)
Wing area	500 ft2 (46.5 m^2)
Empty weight	32,081 lb (14,552 kg)
Loaded weight	47,000 lb (21,320 kg) (in fighter configuration)
Max. take-off weight	66,000 lb (29,937 kg)
Internal fuel capacity	F/A-18E: 14,700 lb (6,667 kg), F/A-18F: 13,760 lb (6,241 kg)
External fuel capacity	Up to 4 × 480-gallon tanks, totalling 13,040 lb (5,914 kg)
Powerplant	2 × General Electric F414-GE-400 turbofans
	Dry thrust: 13,000 lbf (62.3 kN) each
	Thrust with afterburner: 22,000 lbf (97.9 kN) each

Performance

Maximum speed	Mach 1.6 (1,190 MPH, 1,915 km/h) at 40,000 ft (12,190 m)
Range	1,275 NM (2,346 km) clean plus two AIM-9s
Combat radius	390 NM (449 mi, 722 km) for interdiction mission
Ferry range	1,800 NM (2,070 mi, 3,330 km)
Service ceiling	50,000+ ft (15,000+ m)
Rate of climb	44,882 ft/min (228 m/s)
Wing loading	94.0 lb/ft2 (459 kg/m^2)
Thrust/weight	0.93 (1.1 with loaded weight and 50% internal fuel)
Design load factor	7.6 g

Armament

Guns	1× 20 mm (0.787 in) M61A2 Vulcan nose-mounted rotary cannon, 412 rounds
Hardpoints	11 total, with a capacity of 17,750 lb (8,050 kg) external fuel and ordnance
Missiles	Air-to-air missiles: • 4× AIM-9 Sidewinder • 12× AIM-120 AMRAAM Air-to-surface missiles: • 6× AGM-65 E/F Maverick • 4× AGM-84H/K Standoff Land Attack Missile Expanded Range (SLAM-ER) • 6× AGM-88 HARM Anti-Radiation Missile (ARM) • 4× AGM-154 Joint Standoff Weapon (JSOW) • AGM-158 Joint Air-to-Surface Standoff Missile (JASSM) Anti-ship missile: • 2× AGM-84 Harpoon • Long Range Anti-Ship Missile (LRASM), in the future
Bombs	JDAM, up to 10× GBU-32/35/38/54 or 4× GBU-31 Paveway series of laser-guided bombs Mk 80 series of unguided iron bombs CBU-78 Gator Mk 20 Rockeye II Mk-62/63/65 Quick Strike naval mine

INSTALLATION, UPDATES AND SUPPORT

You can install this F/A-18 Super Hornet software as often as you like on the same computer system.

To re-download the software:

1. Click on the 'Account' tab on the Just Flight website.
2. Log in to your account.
3. Click on the 'Your Orders' button.
4. A list of your purchases will appear and you can then download the software you require.

Accessing the aircraft

To access the aircraft in Prepar3D:

1. Select Aircraft > Select Aircraft from the menu bar.
2. Select the 'Publisher' filter mode and then select 'DC Designs' from the list of publishers.
3. Choose one of the Super Hornet variants and click on 'OK'.

To access the aircraft in Prepar3D v2 or later:

1. Click on 'Vehicles' in the menu bar.
2. Type 'Hornet' into the Search bar or select 'Group by Publisher' and scroll down the list to locate 'DC Designs'.
3. Choose one of the Super Hornet variants and click on 'OK'.

To access the aircraft in FSX:

1. Click on 'Free Flight'.
2. Select 'DC Designs' from the 'Publisher' drop-down menu.
3. Select 'Boeing' from the 'Manufacturer' drop-down and choose one of the Super Hornet variants.

Tick the 'Show all variations' box to see all the available paint schemes.

Uninstalling

To uninstall this product from your system, select the appropriate option for your version of Windows from the Control Panel:

- 'Add or Remove Programs' (Windows XP)
- 'Programs and Features' (Windows Vista or 7)
- 'Apps & features' (Windows 10 or later)

Select the product you want to uninstall and then select the 'Uninstall' option, following the on-screen instructions to uninstall it.

Uninstalling or deleting this product in any other way may cause problems when using this product in the future or with your Windows set-up.

Updates and Technical Support

For technical support (in English) please visit the Support pages on the Just Flight website.

As a Just Flight customer, you can get free technical support for any Just Flight or Just Trains product.

If an update becomes available for this aircraft, we will post details on the Support page and we will also send a notification email about the update to all buyers who are currently subscribed to our Newsletter and emails.

Regular News

To get all the latest news about Just Flight products, special offers and projects in development, subscribe to our regular emails.

We can assure you that none of your details will ever be sold or passed on to any third party and you can, of course, unsubscribe from this service at any time.

You can also keep up to date with Just Flight via Facebook and Twitter.

WALK-AROUND

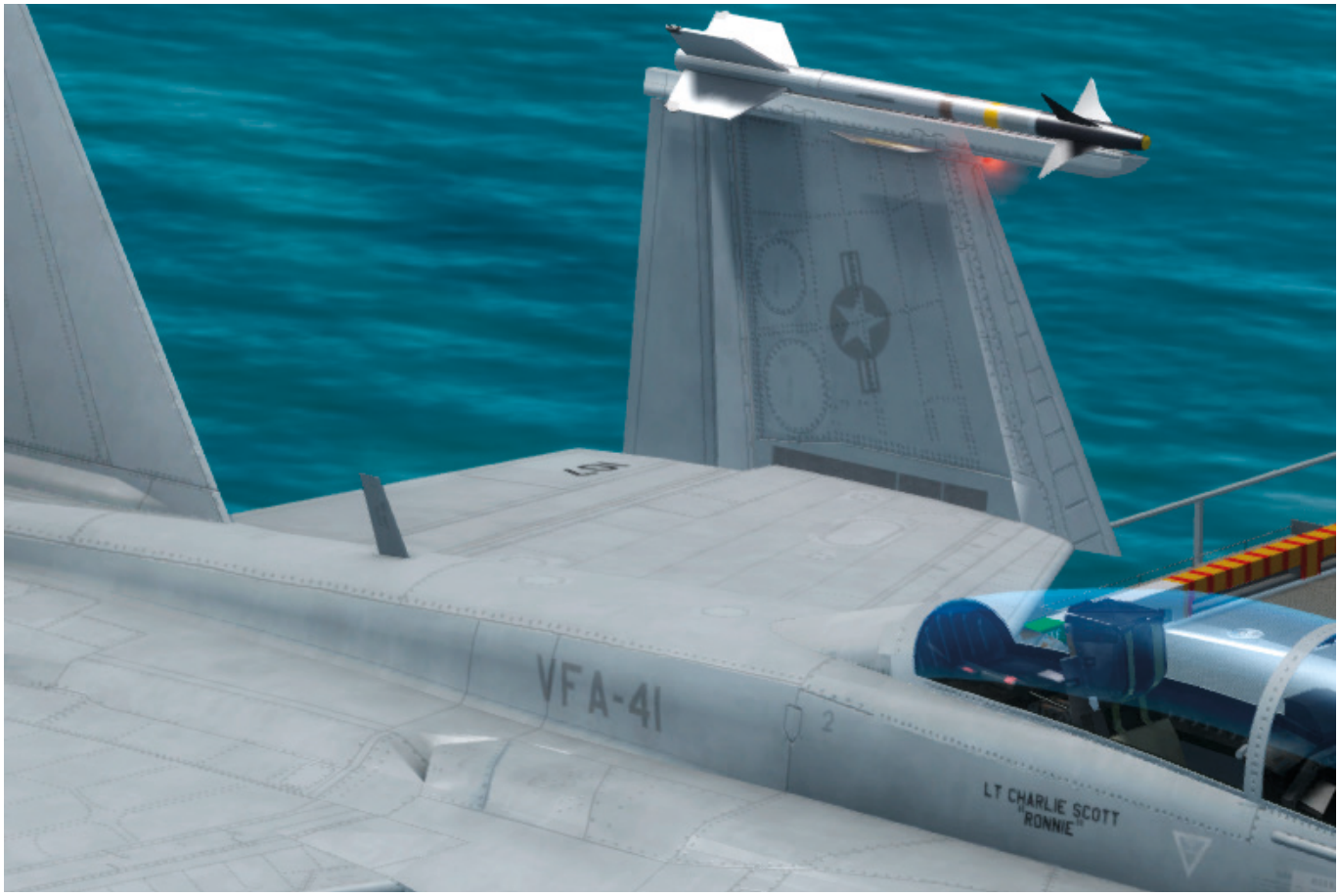
The F/A-18 Super Hornet is a thoroughly modern design, incorporating some of the latest advances in computer-controlled aerodynamics. Originally of medium size for a modern fighter aircraft, the Super Hornet is now almost as large as the Grumman F-14 Tomcat that it replaced, although it is also much lighter, able to carry almost as much fuel and possesses a much greater 'bring-back' capacity.

The nose carries the forward landing gear, several sensors, the 20mm rotary cannon and, hidden inside the cone, a powerful Hughes APG-79 radar. Operating from aircraft carriers in conjunction with Grumman E2-D 'Hawkeye' airborne early warning aircraft, the Super Hornet is able to use datalink communications to share tactical information emitted from the Hawkeye's powerful over-the-horizon radar, giving the F/A-18 crew unprecedented battlefield orientation while operating in-theatre.

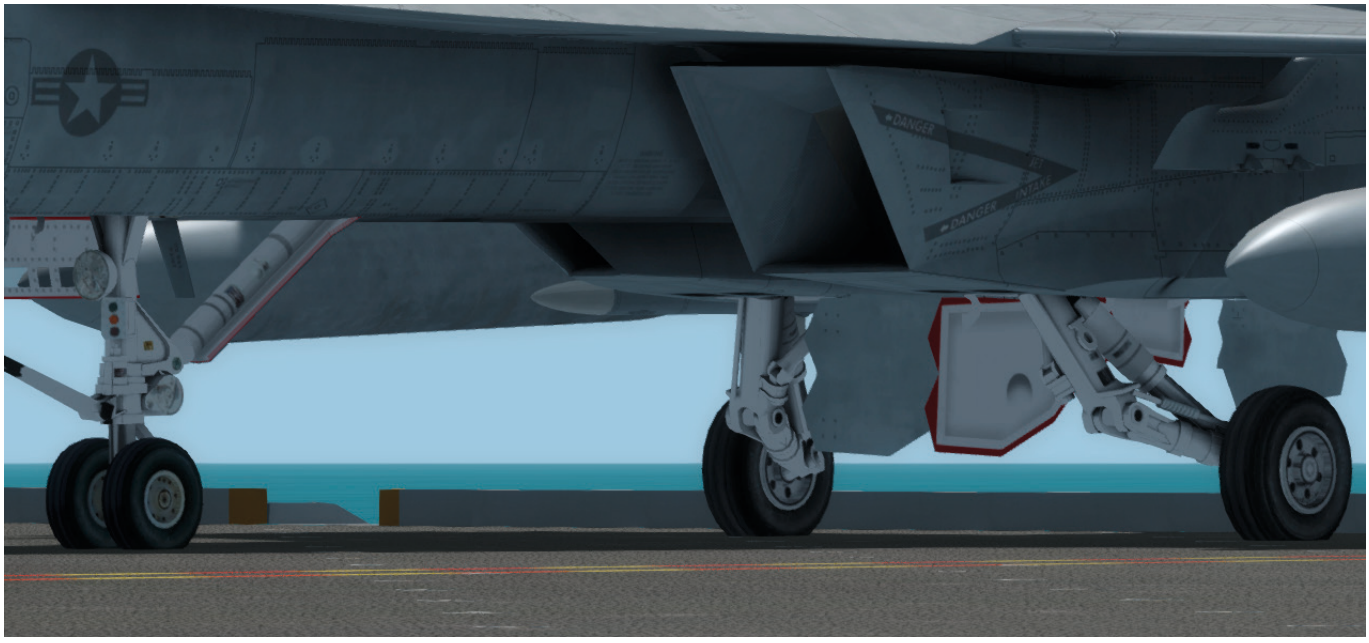
The Super Hornet's wings are able to fold up, to allow for greater storage space aboard an aircraft carrier's crowded deck. Each wing carries three hard-points for ordnance, as well as internal fuel tanks, while each of the wing-tip edges can carry a single AIM-9 Sidewinder missile.

The EA-18G 'Growler' differs slightly from the other two variants in that it carries AN/ALQ-218 sensors on the wing tips in place of the Sidewinder missiles, while the wing shape was altered with the addition of saw-tooth leading edges and wing fences to improve stability for the aircraft type's electronic warfare role. For all versions, the extensive leading and trailing edge flaps allow for extremely low-speed, high-alpha flight, especially important in the close air-combat arena.

Flaperons feature on the outer trailing edges, providing additional control during high-alpha flight when the rudders may be reduced in authority due to disrupted airflow. All flight surfaces are computer-controlled fly-by-wire and operate in concert with pilot inputs to provide the best performance possible throughout the flight envelope.



Like all naval aircraft, the Hornet's undercarriage is heavily engineered in order to withstand the extreme forces experienced during carrier launches and landings. Descent rates of 600 feet per minute at touchdown are not uncommon, and the acceleration from zero to 150 knots in two seconds during launch places enormous stresses on the airframe.



The Hornet features a twin-tail arrangement, with twin rudders above all-moving ‘tailerons’. The rudders also act as additional airbrakes and control surfaces during the landing configuration, with a variable input depending on the aircraft’s airspeed, descent rate and flap positions.

Prominent below the exhausts is the arrestor hook, designed to catch the wires on an aircraft carrier’s deck during flight operations. The immensely reliable General Electric F414-GE-400 turbofans are closely positioned, thus minimising asymmetrical thrust in the event of an engine failure and allowing for damage recovery aboard an aircraft carrier.

PANEL GUIDE

The F/A-18 Super Hornet is a complex aircraft and is equipped with several multi-function displays in order to control the flow of information to the pilot. A thorough understanding of the functions of the displays will allow the pilot to operate the Super Hornet more effectively.

The cockpit can be divided into seven main areas:

- Main Panel
- Up Front Control Panel
- Left MFD
- Right MFD
- GPS/Moving Map
- Head-Up Display
- Engine Display

The following pages will guide you through these areas.

Moving around the cockpit

To move around the cockpit, you can use the hat switch on your joystick, hold down the [Space] bar on your keyboard while moving your mouse around, and also use your keyboard keys.

Virtual Cockpit views

Press the [A] key to cycle through the various preset views and the [+] and [-] keys to zoom in and out. Pressing the [Backspace] key will reset the zoom level to the default setting, while [Ctrl]+[Space] will re-centre the viewpoint.

You can also alter your viewpoint using these keys:

[Ctrl]+[Shift]+[Backspace]	Left
[Ctrl]+[Shift]+[Enter] (Return key)	Right
[Ctrl]+[Backspace]	Forward
[Ctrl]+[Enter] (Return key)	Back
[Shift]+[Backspace]	Down
[Shift]+[Enter] (Return key)	Up

Main panel

1. Left Multi-Function Display
2. Up Front Control Panel
3. Right Multi-Function Display
4. Whiskey compass
5. Landing gear lever
6. Flap indicator lights
7. Engine parameters display panel
8. Autopilot controls
9. GPS / Moving Map display screen
10. Attitude Direction Indicator (Artificial Horizon)
11. Airspeed Indicator (knots indicated)
12. Altitude Indicator
13. Vertical Speed Indicator
14. Arrestor hook handle

Up Front Control Panel

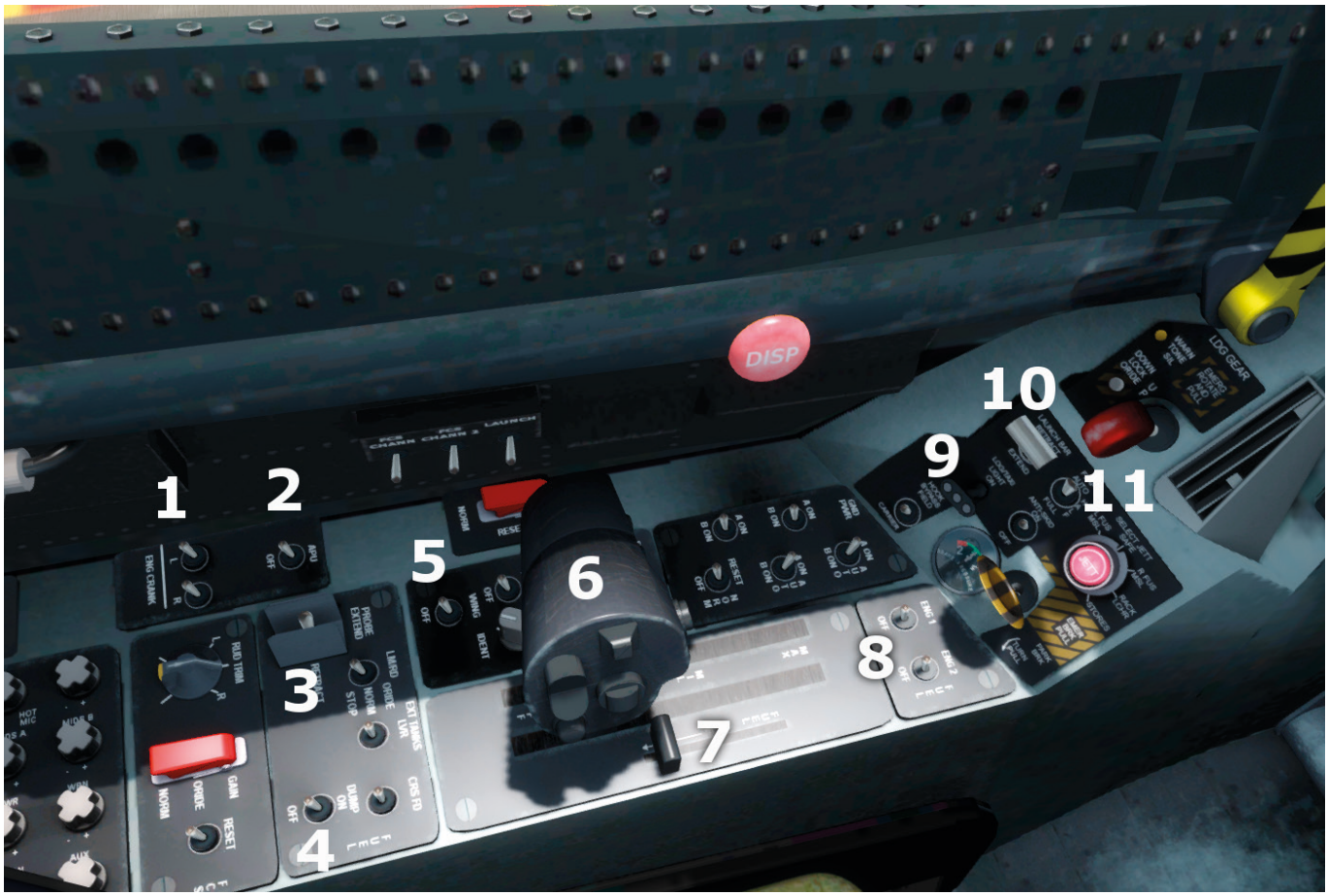
Touchscreen from top left, by rows:

1. Active COM channel
2. Stand-by COM channel
3. IAS hold autopilot selector
4. NAV 1 active channel
5. NAV standby channel
6. Mach hold autopilot selector
7. Transponder code input selector
8. Altitude autopilot hold selector
9. Vertical speed autopilot selector
10. ADF channel selector
11. Heading hold autopilot selector
12. Approach hold autopilot selector
13. Autopilot master-on selector
14. Flight Director on selector
15. NAV swap selector
16. NAV hold annunciator light
17. GPS hold annunciator light

Below the UFCP is the autopilot control panel, of which the main instruments are the dials for heading (HDG) and course (NAV/OBS). The autopilot master switch can be activated from here, or from the A/P pad on the touchscreen. Note also the square button above the NAV/OBS dial. This selects between NAV and GPS modes.

Frequencies and autopilot settings can be altered by hovering the mouse over the relevant numbers and using the mouse wheel to scroll them up and down. Alternatively, the dials surrounding the touch pad can also be used to change and swap frequencies.

Left console



1. Engine crank switches
2. APU switch
3. Refuel probe switch
4. Fuel dump switch
5. Light switches
6. Throttle
7. Engines (both) fuel cut-off lever
8. Engine (select) fuel cut-off switches
9. Landing light switch
10. Launch bar switch
11. Flaps selector switch

Right console

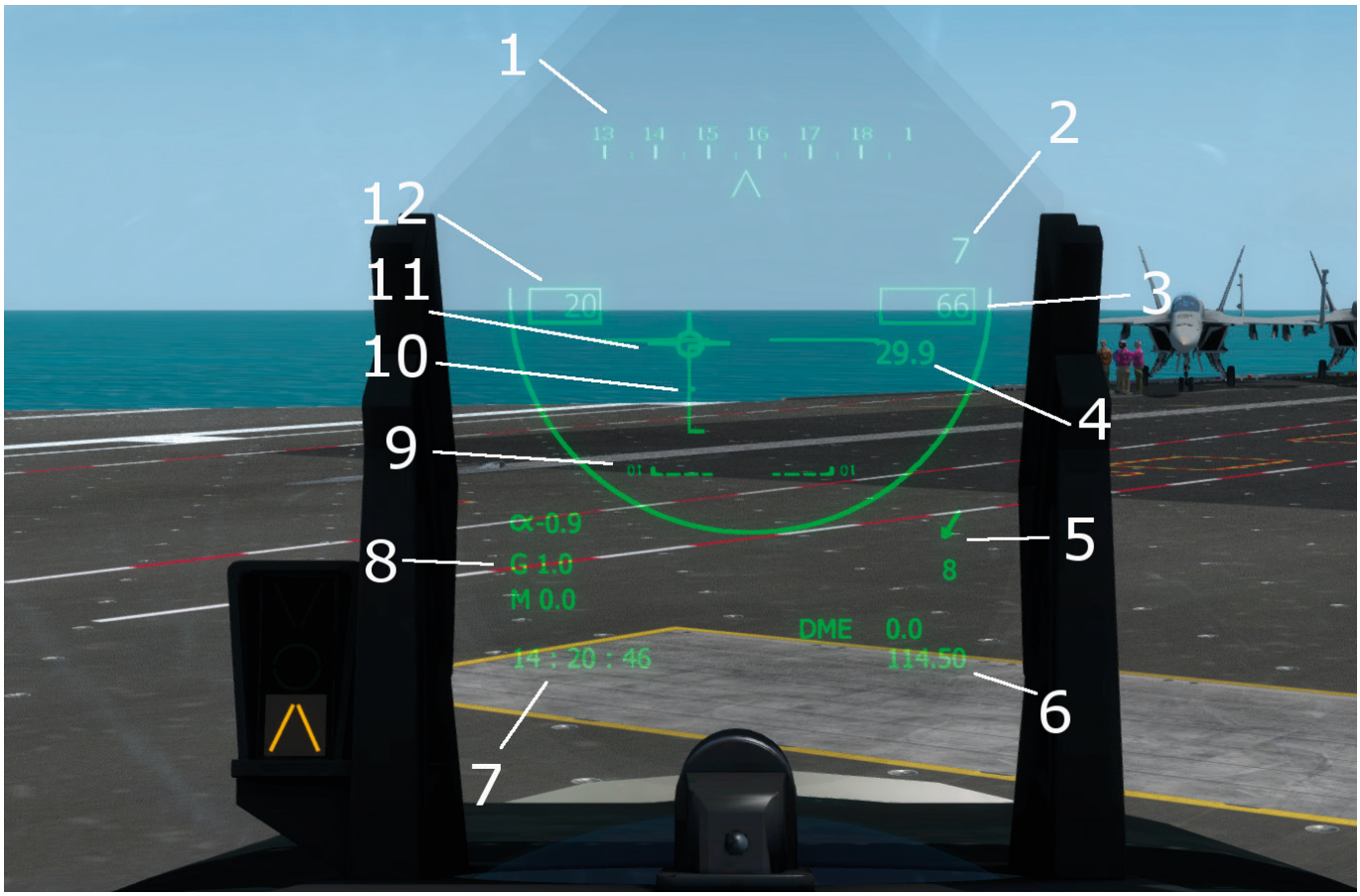
1. Arrestor hook handle
2. Wing fold handle
3. Warning lights panel
4. Battery voltage indicator
5. Seat arm / crew visible selector
6. Generator switch
7. Battery master On switch
8. Avionics master On switch
9. Pitot heat switch
10. Deck tie-down chain selectors
11. De-ice lever
12. Canopy toggle switch
13. Panel light switch
14. Formation lights switch

Engine display

From top left, going down:

1. Fuel left main quantity (pounds)
2. Fuel right main quantity (pounds)
3. Fuel exterior (pounds)
4. Fuel centre tank (pounds)
5. Engine RPM (left and right, percentage)
6. Engine exhaust temperature (left and right, degrees Celsius)
7. Fuel flow (left and right, pounds-per-hour)
8. Oil temperature (left and right, degrees Celsius)
9. Engine nozzle position (left and right, percentage)

Head-Up Display



1. Heading strip
2. Radar altitude (when below 1,000 ft)
3. Barometric altitude
4. Barometric pressure (Hg)
5. Wind speed and direction arrow
6. Active navigation frequency and DME read-out
7. Local time
8. Angle of Attack / G Force / Mach read-outs
9. Pitch ladder
10. Angle of Attack indexer
11. Velocity vector
12. Airspeed (knots indicated)

The Super Hornet's Head-Up Display is the instrument which the pilot uses the most during operational flying duties. Mounted directly in a line-of-sight position atop the glareshield, the HUD contains a large volume of information pertaining to the aircraft's flight environment, allowing the pilot to maintain flight without having to take their eyes from the world outside, immensely important during both air-to-air and air-to-ground operations.

In addition to the indicators present in the image, an Instrument Landing System indicator appears whenever the aircraft's navigation frequency detects an active ILS signal. This indicator consists of horizontal and vertical lines, which centre upon the HUD when the aircraft is correctly aligned with the ILS glideslope, to facilitate landings in low visibility or at night on an aircraft carrier in darkened-ship tactical conditions.

Left Multi-Function Display

The Super Hornet's Multi-Function Displays provide a wealth of tactical and systems information. Each screen is comprised of five displays, accessed by clicking on one of the five buttons at the bottom of the display. The options in the left MFD are:

1. Checklists (CHK)
2. Horizontal Situation Indicator (HSI)
3. Ordnance loadout selector system touchscreen (WPN)
4. Head-Up Display repeater (HUD)
5. TACAN carrier navigation system (TACAN)

Checklist screen

The Checklist screen displays a complete series of checks for start-up, take-off and landing phases. To the lower left is an elevator trim digital readout, and at bottom centre is an icon warning the pilot that the deck tie-down chains are attached.

HSI screen

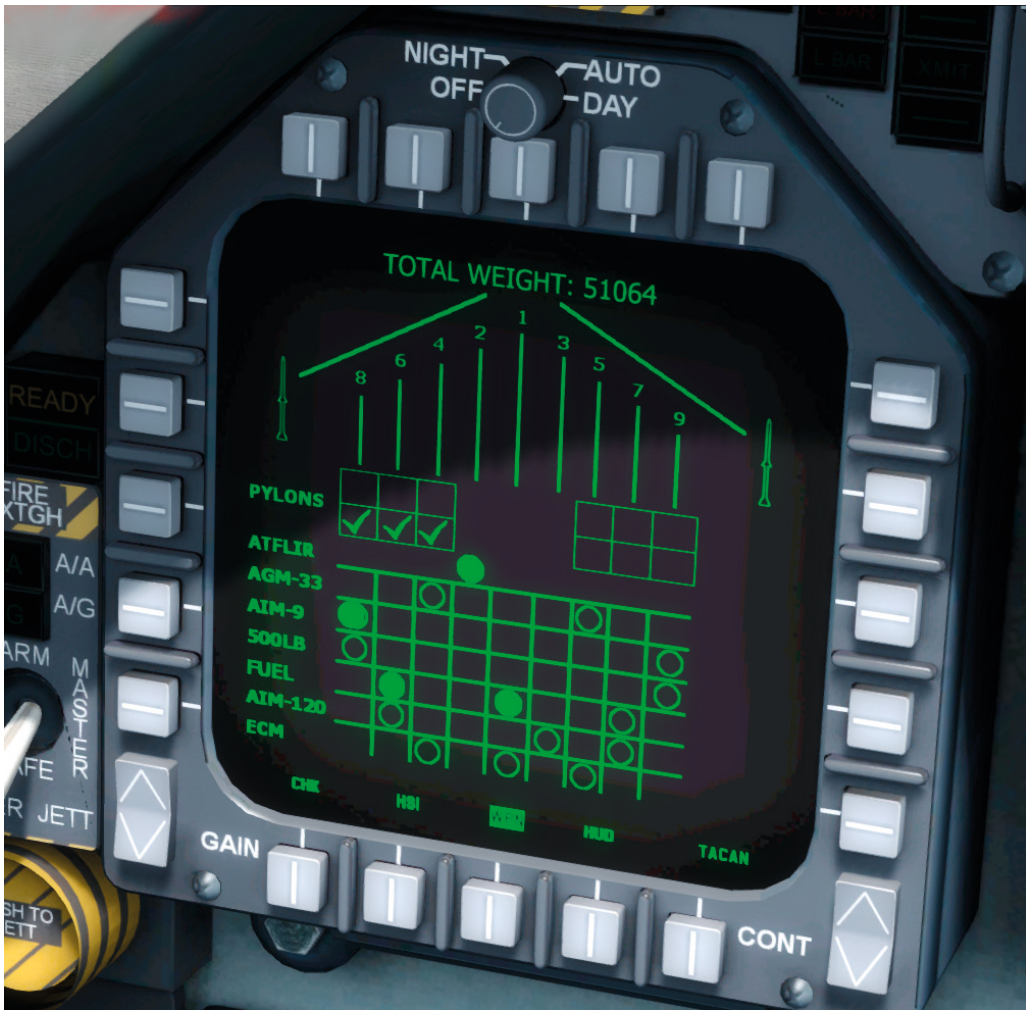
The HSI displays a compass and radio navigation suite, allowing for precision navigation in all weathers using VOR/DME, ADF and NDB aids.

Distance Measuring Equipment and selected frequencies are displayed in the lower right corner of the display, while the central arrow icon is directed using the NAV/OBS dial on the autopilot panel.

A Ground Speed (G/S) indicator occupies the lower left corner.

The dots either side of the aircraft icon represent degrees of deviation from track. When tracking a VOR or TACAN beacon, the central deviation needle should align with the arrow, and the direction marker should be a solid arrow pointing in the same direction as the aircraft icon. If you are heading directly away from your selected VOR (back-course) then a hollow arrow will appear, pointing in the opposite direction to the aircraft icon.

Weapons screen



The Ordnance Loadout Selector (WPN) screen is a touchscreen interface that allows the pilot to load whichever ordnance they wish to carry. Weapons are selected by clicking inside the empty disc positions below their respective hard-point pylons, except for the wing-tip-mounted AIM-9 Sidewinder missiles, which are activated by clicking on the missile icon on each wing tip.

Weapons can only be mounted when a pylon has been activated, which is indicated via a green tick for each respective hard point. In the image above, three pylons on the left wing have been activated and mounted with an AIM-9 missile and fuel tank. The inner pylon is active but has nothing mounted upon it. The ATFLIR pod has been mounted and also a central fuel tank. The right wing has no pylons mounted, and no weapons either. Total aircraft weight is 51,064 pounds.

Only one weapon type can be selected per pylon at any one time. Attempting to select another weapon over another already-active weapon will disable both weapon types, requiring the second to be de-activated in order to display the first.

HUD repeater screen

The HUD repeater screen (HUD) displays a de-cluttered HUD image which uses the same layout but removes several icons for a clearer display.

The barometric pressure read-out on this display is in Millibars instead of Hg, to aid in effective navigation in countries using metric systems. It reads 1013 millibars in the image.

TACAN screen

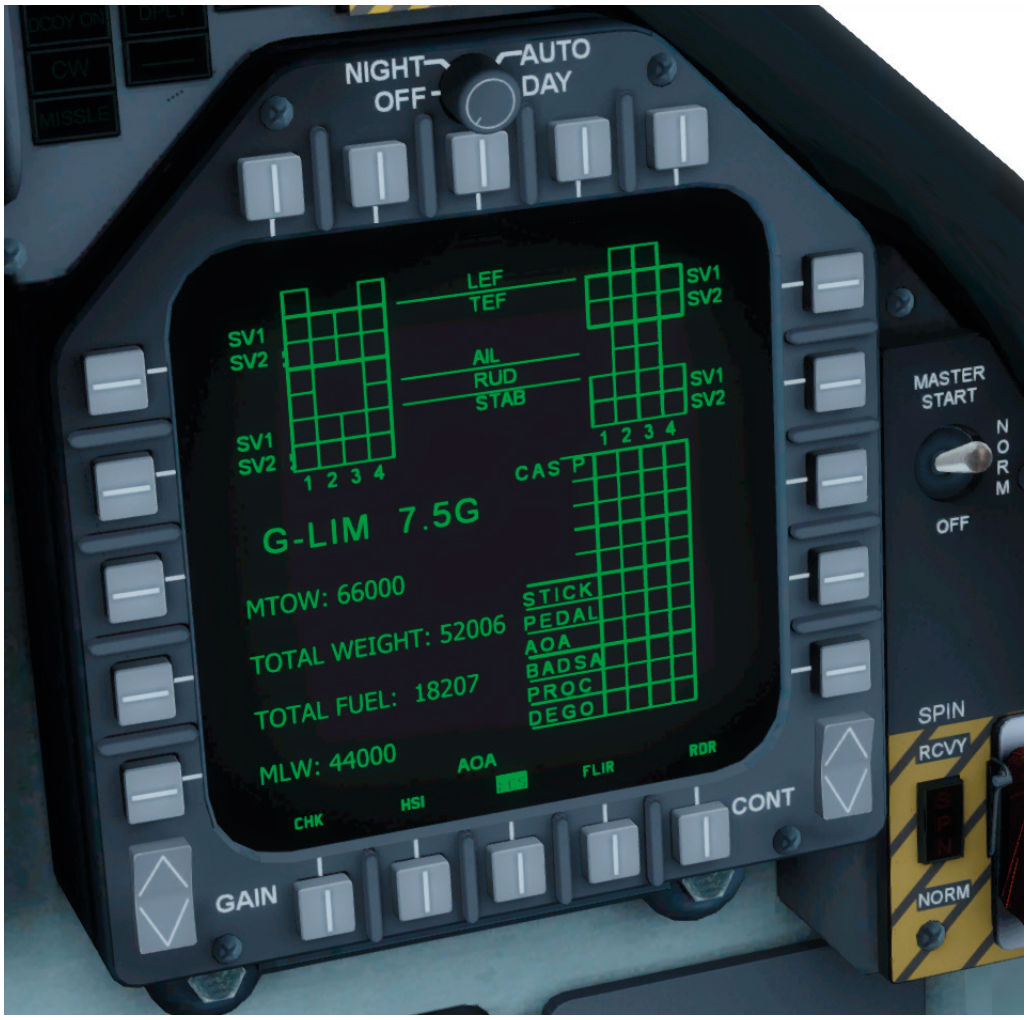
The TACAN screen (TACAN) displays a list of frequencies for aircraft carriers by SimWorks Studios, which allow the user to tune into the desired frequency and navigate to the carriers from great distances on the open ocean.

In the image below, the Super Hornet's navigation channel is tuned to 114.50, the frequency for SWS CVN-72, USS Abraham Lincoln. The data to the left of the MFD screen reveals the carrier's range as 1.2 nautical miles, on a bearing of 170 degrees. The frequency selected is repeated at the bottom of the screen. The carrier itself is visible just over the left edge of the cockpit glareshield.

Right Multi-Function Display

The first two screens on the right MFD (Check and HSI) are repeaters for those on the left MFD.

FCS screen



The third screen, FCS (Flight Control System), displays an avionics system test screen complete with maximum take-off weight (pounds), total weight (pounds) and total fuel (pounds) read-outs.

The maximum landing weight for the Super Hornet is 44,000 lb – do not attempt to land with more weight than this. Dump fuel beforehand to bring the airframe within the landing weight limit.

FLIR screen

The Forward Looking Infra-Red (FLIR) screen displays a high-resolution infra-red image of the flight path ahead of the Super Hornet.

The image is projected in wide-field to allow a broad visual spectrum threat analysis in low-light and night conditions, with hotter surfaces projected in lighter shades and cooler surfaces in darker hues.

A latitude and longitude read-out occupies the upper edge of the screen.

Radar screen

The radar (RDR) screen projects a Digital Network Connectivity Radar Display, via a Link 16 MIDS system. This combination is the result of the Super Hornet's ability to link to the long-range, over-the-horizon AN/APY-9 radar system of the Grumman E-2D Hawkeye tactical Airborne Early Warning platform. The Hawkeye's radar data is shared with the Super Hornet, providing a 'God's Eye' battlefield picture with the Hornet at the centre.

In the image above, the Hornet is tracking towards an aerial target with the callsign PAC2761, which is flying at 32,000 feet at an airspeed (measured as ground speed) of 430 knots. The range setting is at 33 miles, putting the radar track approximately 30 miles ahead of the Hornet. A second track is 20 miles out to 10 o'clock.

The pilot can select the range of the radar display using the '-' (minus) and '+' (plus) touchscreen areas immediately below the radar display.

GPS screen

The GPS / Moving Map display screen features a dynamic GPS-based orientation screen that depicts local terrain, airports, intersections and other data, with the aircraft position at the centre of the display.

A latitude and longitude read-out dominates the top of the display, while below at the bottom are two icons allowing the pilot to zoom in and out of the display.

Note: *The range/zoom function in the GPS display will also affect the radar display and vice versa.*

Weapons System Operator's position

The WSO position can be accessed using the [A] key when in the virtual cockpit. The MFD instruments featured here are all repeaters for the front-seat position, relaying information to the WSO. The large central screen contains an enlarged GPS / Moving Map display for navigation purposes, allowing the WSO to pass on radio NAV details to the pilot.

The UFCP can be operated from both the front and rear seats, allowing the sharing of duties when using shared-cockpit mode in Multiplayer, and the GPS / Moving Map display can also be zoomed in and out from the WSO's position.

SYSTEMS GUIDE

Engine start

The Super Hornet is designed to be easy to start, which is especially important in a fleet interceptor which may be launched rapidly as part of Alert flights. There are two start-up options for the pilot. The first is to use the MASTER START switch located to the far right of the main panel. This will switch on the battery, avionics, generator and APU, then crank both engines for you.

More normally, the pilot will follow the standard 'cold and dark' start-up procedure. A full list can be found on the left MFD 'Check' page and via the menu drop-down kneepad Checklists option.

1. Check gear down, parking brake ON.
2. Battery switch ON, check voltage.
3. Avionics switch ON.
4. Check the fuel gauges for sufficient supply.
5. Fuel flow switches to OPEN.
6. APU switch ON.
7. Throttle forward ONE INCH.
8. Crank engine 2. Wait for spool-up and idle RPM (55). Crank switch OFF.
9. APU switch OFF.
10. Crank engine 1. Wait for spool-up and idle RPM (55). Crank switch OFF.

With both engines spooled up, check the temperatures and pressures before going through the pre-taxi and take-off checks. Remember always to switch off the crank and APU switches once both engines are turning and providing power to the aircraft.

Airbrakes

The F/A-18 Super Hornet has two upper ventral airbrakes which are extended under the pilot's control. These are augmented by the entire control surface assembly, using a computer-controlled system that automatically adjusts to the aircraft's performance envelope, providing enormous braking power when it is required. This power builds the longer the airbrakes are extended, so use them wisely.

A small annunciator icon in the upper-left main panel will light up when airbrakes are deployed.

Flaps

The Hornet is equipped with two-stage flaps. The Super Hornet's large flap surface area means that the flaps also act both as lift-generators and spoilers, rapidly affecting the airflow and airspeed of the airframe. As a lifting body, the Hornet becomes highly 'buoyant' under the full-flap setting, requiring the pilot to maintain a close eye on airspeed, which can rapidly bleed off and induce a stall.

Flap airspeed limits:

25° – 250 KIAS

50°– 180 KIAS

The flap-position indicator lights are near the flap selector switch, on the lower left main panel, beneath the landing gear annunciator lights.

Fuel

Fuel is contained in two main tanks, one central tank, and up to three externally mounted tanks. The maximum internal capacity is approximately 14,000 lb for all three versions of the Super Hornet. The exterior capacity is three 480-gallon tanks, holding a total of 9,000 lb of fuel. Combined, this yields a maximum fuel capacity of 23,000 lb.

The Super Hornet's internal systems will automatically draw fuel from the external tanks first, then the main tanks, and finally the centre tank. The flow can be monitored using the engine panel, and is displayed both as a numerical value (lb) and also as animated 'bars' to give the pilot a quick-glance fuel-state check during operational flight.

Lighting

The switches for the lighting system can be found tucked behind the throttle. Here, controls for navigation lights, strobes and beacons can be found. In addition to these switches, on the right-hand side panel are switches for the internal cockpit panel light and formation lights, sometimes known as 'slime lights'. These are low-intensity strip lights on the exterior of the aircraft, used for tactical darkened-ship conditions and operations over enemy territory, where the use of conventional beacons would expose the aircraft's position to enemy fire.

FLYING THE SUPER HORNET

Getting started

The Super Hornet is designed to be an easy plane to fly and is highly forgiving, especially in high-alpha flight. However, it is nonetheless an extremely powerful aircraft. Following performance figures and procedures, otherwise known as 'flying on the numbers', will ensure the best possible experience, and performance, when flying this fighter.

A complete set of checklists can be found on the aircraft MFD CHK pages and also in the aircraft's checklist and reference pages, obtained via the simulator's drop-down menus.

Take-off

Tune your radios and obtain taxi clearance. Open the throttle gently, release the parking brake and taxi out to the runway. The Super Hornet produces sufficient thrust at idle to allow the aircraft to move slowly when the aircraft is lightly laden, so maintain a careful eye on throttle settings and proceed with caution.

When you reach the runway, hold your position, throttle back to IDLE and apply the parking brake. Set flaps to half and set 4.0 units of elevator trim using the Checklist screen read-out. After obtaining clearance to take off, hold the aircraft on the brakes and ease the throttle forward to full dry power. Release the brakes and, if necessary, advance the throttles into full afterburner.

Take-off speeds at a routine weight of 55,000 lb are:

- V rotate – 135 knots
- V lift off – 150 knots

When 135 knots is reached, ease back on the stick and rotate the nose to 10-15 degrees, then hold that angle. The aircraft will lift off at around 145-150 knots indicated. At higher weights the lift-off speed will be proportionately higher, but the angle of attack and climb angle should always remain the same.

Retract the undercarriage as soon as you have a positive rate of climb in both the VSI indicator and the altimeter. Retract the flaps before 200 knots indicated, trimming as you go, while accelerating to the Super Hornet's climb airspeed of 320 knots indicated.

Cruise

Once you have reached your chosen cruise altitude, level off and adjust power to maintain the Hornet's cruise speed of 360 knots. Note that as altitude increases, so air pressure decreases and so does the indicated airspeed. Remember to refer to your ground speed to calculate times of arrival at navigation beacons equipped with DME data.

Supersonic flying beyond Mach 1.0 requires the use of afterburner and more than doubles fuel consumption. The Super Hornet is capable of reaching Mach 1.6 at altitudes in excess of 35,000 ft, for short periods of time, to carry out effective intercepts of hostile targets. However, more normal operations see the Hornet's maximum airspeed as around Mach 1.2.

Stall speeds are:

- Undercarriage and flaps up – 130 knots
- Undercarriage down and flaps up – 120 knots
- Undercarriage down and full flaps – 110 knots

The Super Hornet is extremely reluctant to spin, and the real F-18 pilot training regime instructs pilots to simply take their hands off the controls and let the Hornet recover itself should a spin occur. The most likely result of a stall will be a 'mush in' of the nose, with the possible tip stall of one wing or the other. Use power to recover airspeed and pull out of the resulting dive.

Do not carry out intended stall routines below 12,000 ft altitude, in order to ensure sufficient recovery time.

Navigation

The art of radio navigation is something that all pilots must master, if they are to find their way around the world without constantly having to refer to the simulator's internal map. Reliance upon the GPS / Moving Map system results in sloppy flying, as the GPS, despite its accuracy, can only display basic trends. It cannot account for wind drift, changes in barometric pressure and other meteorological changes that occur during a typical flight.

By planning your flights and using radio navigation beacons in conjunction with the Super Hornet's HSI, you'll be able to find your way anywhere in the world, day or night, and in any weather. How else do you think you're going to find that aircraft carrier, two hundred nautical miles away, somewhere out on the open ocean?

The above picture depicts the Super Hornet's UFCP, HUD and HSI all working in conjunction to navigate towards an airfield.

The aircraft is tracking VOR 109.10, which also happens to be an ILS system. The DME reports the field as being 8.9 nautical miles away. Airspeed is 346 KIAS; ground speed is 364 knots – faster, because the aircraft is at nearly seven thousand feet in thinner, lower-pressure air. The bearing of the selected navaid is 256 degrees.

The HSI shows the aircraft to be left of the desired track (the deviation needle is to the right of the arrow), but the aircraft is heading towards the field correctly, as per the solid arrow in the top right of the HSI. In addition, an ADF beacon is being tracked (white arrow in the HSI).

The autopilot's Flight Director is switched on and is holding the aircraft's indicated airspeed (IAS). Altitude Hold is also switched on. In this configuration, the autopilot will track onto the selected course heading and fly towards the selected VOR station.

Note also that in the HUD, the ILS cross-beams are also visible. They're telling the pilot that he is left of glideslope (as per the HSI) and also above glideslope (the horizontal bar is below the small circle centred in the HUD).

Approach and landing

The Super Hornet is a military aircraft so military circuits are routine around naval air bases.

Enter the frequency of your chosen airbase and navigate towards it using the HSI. Tune COM frequency to ATIS and listen for the active runway direction, air pressure and local wind direction and speed. Set your altimeter to the local air pressure as dictated by ATIS.

Use the HSI to navigate so that you approach the airfield aiming down the active runway, at 1,000 ft altitude and at 340 knots indicated. Fly down the length of the runway and at the halfway point conduct a level 4G break towards the downwind leg, cutting the throttle as you do so.

As you turn through 90 degrees, ease out into a gentler turn and, when downwind and below 200 knots indicated, lower the undercarriage. Check for three green lights and lower stage one flaps. Trim as required.

As you draw level with the runway threshold, lower full flap, trim and set the airspeed for 150 knots indicated. As soon as you feel comfortable and the aircraft is trimmed, turn in gently towards the airfield with 30 degrees of bank and a VSI descent reading of 500 feet per minute.

Time your turn so that you roll out onto the runway heading, lined up to land. Note wind speed and direction in the HUD to counter any crosswind component.

Gradually reduce airspeed to around 130 knots indicated, trim, and maintain the centreline as you approach the threshold. Just before the aircraft is about to touch down, ease the throttles to idle. DO NOT FLARE. The Hornet is a carrier jet and so has no need to flare on touchdown.

Instrument Landing System (ILS)

The image above shows an F/A-18 Super Hornet on final approach to an airfield while using that airfield's ILS landing system. The ILS is represented within the HUD as the horizontal and vertical cross hairs, transposed over a small circle which is visible just below the velocity vector. Additionally, the HSI on the right-hand MFD shows the deviation needle to be dead-centred within the arrow. This means that the aircraft is on the correct heading to land on the runway.

However, the horizontal cross-beam in the HUD shows the aircraft to be just below the glideslope, as the horizontal beam is high on the display. To correct this, the pilot would add a little power to arrest the descent rate and re-intercept the ideal glideslope. The AOA indexer also shows the aircraft to be a little fast (too shallow an approach angle and AOA).

The solid arrow in the top right of the right-hand MFD confirms that the aircraft is tracking towards the selected navaid, which the DME is tracking as being 2.7 nautical miles away (the distance to the ILS beacon, not the end of the runway).

The PAPI lights to the left of the runway threshold are showing two green and two white, confirming that the aircraft is within glideslope limits. Were this a foggy day, only the cross-hairs in the HUD could confirm for the pilot that he was on track to land on the runway.

The above shot presents a near-perfect approach example: 127 KIAS, cross hairs aligned, just a touch above glideslope, with the AOA indexer to the left of the HUD showing the aircraft's AOA angle centred at the ideal AOA reading of 6.1 degrees.

CARRIER OPERATIONS

The capacity to operate from aircraft carriers is what sets all naval aviators apart from their fellow pilots. To be a ‘tailhooker’ is a matter of immense pride to all those who wear their wings of gold, for despite the enormous size of a modern nuclear aircraft carrier, the ship is only a tiny steel speck on the ocean when seen from altitude, and when you’re operating 500 miles from the nearest land there are no alternate fields when things get tough.

Daytime traps in good weather can almost become fun. But throw in a heavy sea, turn out the lights at night, and suddenly even the most experienced aviator is thrown into another world where the slightest error can be fatal and where the pilot’s stress pegs the needles higher than during actual combat. Flying by the numbers becomes more essential than ever.

Catapult launches

Conduct your engine start routine as normal, ensuring that your wings remain folded while on the deck of the aircraft carrier. Carry out your pre-taxi checks and make sure everything is ready before you taxi to the catapult.

Taxi slowly to the desired catapult. You’ll need to line up with the launch rail so that you’re pointing in the direction of launch, towards the carrier’s bow. The Super Hornet’s nose-wheel steering allows for 70 degrees of rotation so that the aircraft can pivot within the close confines of the crowded carrier deck. Taxi forward until the nose wheels straddle the catapult shuttle, as per the following image.

Engage your parking brake and then extend the launch bar. When it has lowered, engage the catapult using the [Shift]+[I] keys. The aircraft will now engage with the catapult shuttle and you should see the carrier blast shield raise up behind your Super Hornet.

If you're using SimWorks Studios carriers, the deck launch officer should now raise two fingers of one hand and wave them at you. This is the signal to go to full power when you're ready. (Other carriers may have different animated crew members.)

Lower your wings, set full flaps and set elevator trim at 4.0. Conduct your full and free movement checks and then, when you're ready, advance your throttles to maximum dry power (maximum thrust without afterburner). If your aircraft's weight exceeds 54,000 lb, go into full afterburner. Then hit the [Shift] + [Space] keys.

The SWS launch officer will check all points of your aircraft, then crouch and point down the deck.

A moment later, you and your Super Hornet will be propelled down the catapult as you accelerate from zero to 150 KIAS in just two seconds.

As you reach the edge of the deck, pull back on the stick to ensure a positive climb. The Super Hornet should pull away easily under thrust from the launch. Get your gear up immediately, and then your flaps before their vMax speeds are reached, and you're on your way – to your first carrier landing in the Super Hornet!

Day landings

Navigate to the carrier, aiming to arrive into the ‘holding pattern’ known as the Marshall Stack at 5,000 ft altitude, arrestor hook down and 340 knots indicated.

Carry out all cockpit checks before attempting to land.

Total weight: 44,000 lb or less

Arrestor hook: Down

Descend to a spot approximately five nautical miles behind the carrier, 800 ft altitude at 340 knots indicated, and approach the carrier on the same course on which it is sailing. Aim to fly abeam the carrier’s starboard (right) side and check the state of the deck as you pass overhead to ensure recovery operations are under way.

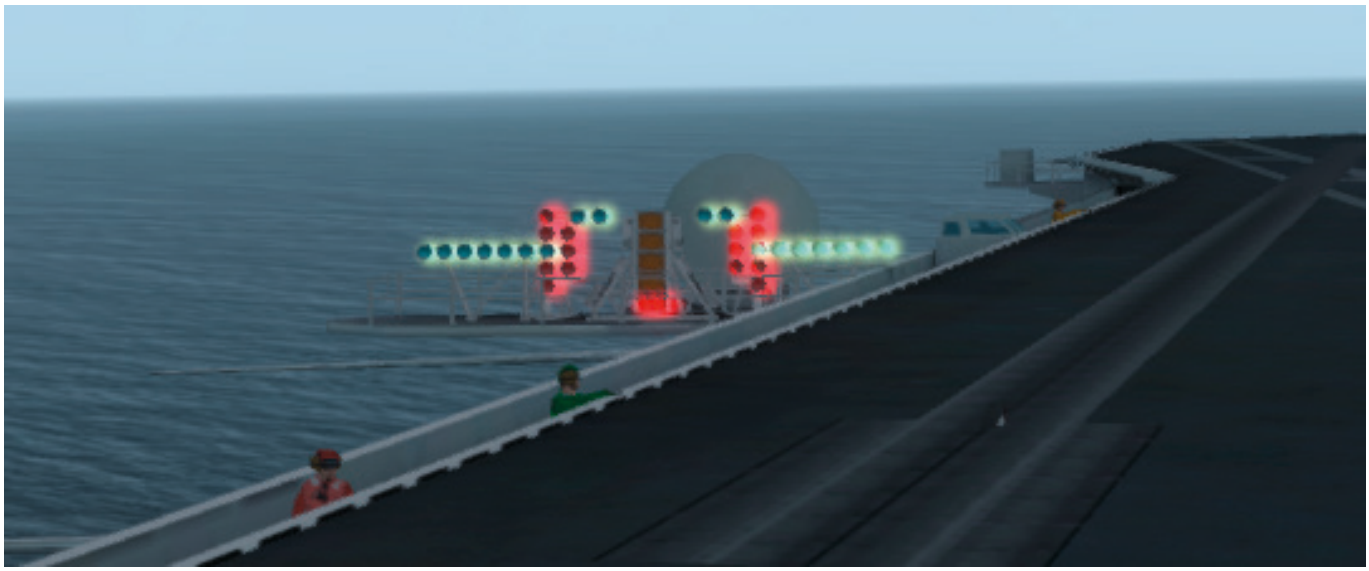
Extend a short distance ahead of the carrier, then perform a 4G break into the downwind while descending slightly and cutting the throttles back to idle. Aim to see 200 knots indicated and 600 ft (RADALT) as you level out into the downwind.

Extend undercarriage, set flaps to full and trim for 150 KIAS. Descend to 450 ft (RADALT).

When level with the carrier's fantail (stern), conduct a 30 degree-banked left turn, riding the throttle while maintaining a maximum descent rate of 500 ft per minute.

Aim to complete the turn into the final approach at an altitude of around 350 ft, approximately one nautical mile behind the carrier. You'll find that things happen quickly now, as you're within just a few seconds of landing!

As you level out, set airspeed at 130 KIAS, 6 degrees AOA, and look for the ‘ball’, the Fresnel lens landing system of lights that is located on the ship’s port deck, roughly opposite the bridge tower.



Keep the lights centred horizontally and vertically to maintain glideslope. Try not to look at the ship, but only at the ball, as you approach for landing, as the lights are designed to keep you perfectly on glideslope.

As you think you’re about to touch down, advance the throttles to maximum dry power. If you skip the wires, you’ll therefore maintain enough airspeed to fly off the deck for another pass.

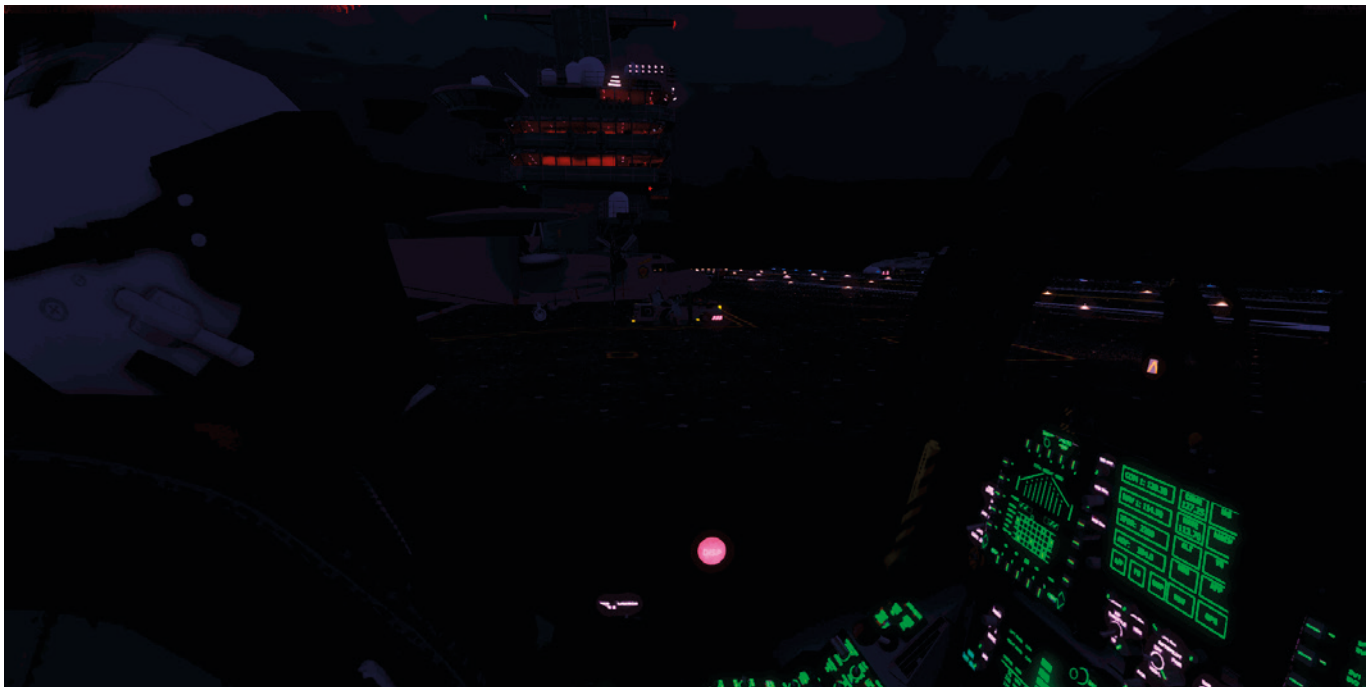
If the hook catches a wire, you'll be dragged to a halt within moments.

As soon as you're on deck and stationary, raise the hook, then your flaps, and finally set the wingfold lever to 'FOLD'. Taxi immediately to starboard, off the landing area, and search for your desired parking space, to await nightfall...

Night carrier operations

Night carrier operations are what separate the men from the boys in the world of aviation. There's no room for error – literally. The ocean is pitch black beneath an overcast sky, the deck is pitching and rolling all at once, the carrier is operating under darkened-deck conditions and you're low on gas with only enough for a couple of passes before a long swim home.

There are no alternate airfields, nothing but ocean for three hundred miles in every direction. Even in the cockpit you can barely make out the dim red tactical lights of the bridge in the darkness. What's it going to look like when you're at 5,000 feet, three nautical miles away and in dense cloud? Utter faith in your instruments is the only thing that will keep you alive. If you try to rely upon your eyes, you'll never make it back aboard ship.



Night launches follow the same procedure as day launches, with the notable difference that a night launch in full afterburner is even more spectacular than those seen during the day. An F/A-18E launching in full afterburner is a sight to behold at any time, but at night it's truly something else.

The night and low-visibility pattern follows a similar procedure to the day cases, but this time the aircraft extends the downwind leg to three miles astern the carrier and intercepts the glideslope much higher, allowing the pilot more time to line up and ensure a safe landing. The turn off downwind into final approach is also more gentle, and conducted at a fixed altitude for safety reasons.

At this range, a RADALT of 1,000 ft is appropriate on roll out for final approach, with the aircraft already at approach airspeed of 150 KIAS, ready to slow to around 130 KIAS at the deck.

Use the FLIR camera to assist your approach at range, until such time as you can see the 'ball' clearly. Refer to the 'ball' thereafter and resist the temptation to look at the FLIR or the ship itself.

If you miss a wire or an approach, climb to 1,000ft RADALT and turn downwind at 200 KIAS to set up for another pass. Don't expect to achieve perfection immediately – every naval aviator suffers their 'night in the barrel', making pass after pass, their fuel running out as they struggle with the immense psychological stress of operating in utter darkness with only their instruments and training to bring them safely home.

Achieve competence in landing the F/A-18 Super Hornet aboard a carrier at night, in tough conditions, and you'll have advanced towards achieving something that few flight simulator pilots get close to…

CREDITS

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Flight dynamics	Dean Crawford, Roy Holmes
Textures	Dean Crawford, DC Designs
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