

General Dynamics F-16 Fighting Falcon

FlightGear Flight Manual



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Contents

Introduction.....	2
F-16 Fighting Falcon.....	2
Useful links:.....	4
Manual.....	5
Home.....	5
Installation instructions.....	6
Launch F 16.....	7
Variants and their liveries.....	8
Keyboard Shortcuts.....	10
Starting the Aircraft.....	11
Takeoff and Landing.....	11
Flying.....	12
Navigation.....	13
Autopilot.....	14
Displays.....	15
HUD.....	16
MFD.....	26
RWR.....	30
DED.....	32
HMCS.....	34
Various Controls.....	35
Warnings.....	37
Tests.....	39
Combat.....	40
Weapons.....	41
FCR.....	44
TGP.....	56
Dogfight Mode.....	58
Training Scenario.....	59
Datalink.....	59
Other.....	60
FLIR.....	60
Fuel.....	60
GPS Points.....	61
Mastermode buttons.....	63
Preplanning Dialog.....	64
Radar ACM modes.....	66
Radar GM modes.....	67
Appendices.....	70
Kneeboard tags.....	70
Training Scenario Levels.....	70
RWR Symbols.....	71
Checklists.....	72

Introduction

F-16 Fighting Falcon

General Dynamics F-16 for [FlightGear](#) flight simulator

Current FGAddon version: **3.70** Suitable for: FlightGear **2020.3.x** and **2020.4.0**



The General Dynamics F-16 Fighting Falcon (nicknamed Viper by pilots) is a single-engine supersonic multirole fighter aircraft in use by the United States Air Force and exported to many countries, becoming world's most numerous fixed-wing aircraft in military service. Designed as an air superiority day fighter, it evolved into a successful all-weather multirole aircraft. The Fighting Falcon has key features including a frameless bubble canopy for better visibility, side-mounted control stick to ease control while maneuvering, a seat reclined 30 degrees to reduce the effect of g-forces on the pilot, and the first use of a relaxed static stability/fly-by-wire flight control system which helps to make it a nimble aircraft.



Includes the following Aircraft variants:

YF-16 Prototype

F-16A Block 10

F-16AM Block 20 (MLU tape 4.3)

F-16C Block 30

F-16C Block 32

F-16CM Block 40 (CCIP)

F-16CM Block 42 (CCIP)

F-16CJ Block 50

F-16CJ Block 52 (default version)

F-16E Block 60

F-16 Simplified (a simpler FDM, yet still complex)

Each Block has slight differences regarding engine specifics, FBW system, aerodynamics, cockpit layout, available liveries^[1] and payloads^[2].

Licence:

GNU General Public License v2.0

[1] Notice that the quality of liveries differ, with some being fictional.

[2] Weapons available and payload presets are mostly U.S./EU specific.



For the full list of contributors see **authors.txt**.

Useful links:

Hangar: <https://sourceforge.net/p/flightgear/fgaddon/HEAD/tree/trunk/Aircraft/f16/>

Wiki: http://wiki.flightgear.org/General_Dynamics_F-16_Fighting_Falcon (not up-to date)

Manual: <https://github.com/NikolaiVChr/f16/wiki>

GitHub: <https://github.com/NikolaiVChr/f16>

Forum: <https://forum.flightgear.org/viewtopic.php?f=4&t=2003>

Discord: <https://discord.gg/CJYTUAQ> (development server)

Manual

Home

Welcome to the Flightgear F-16 manual!

The manual will cover the F-16 downloaded from master branch in this [github](#). The F-16 you can download in the Flightgear launcher is usually some months behind with bugfixes and features.

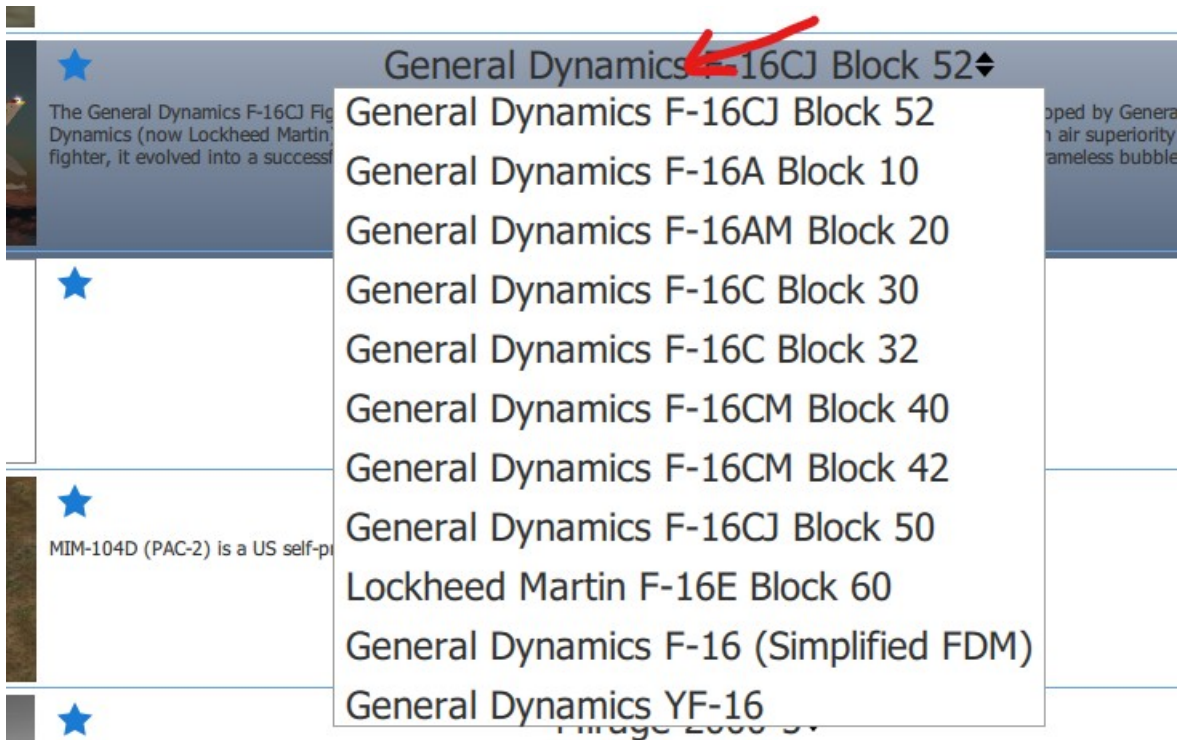
- Download and Install guide
- Starting F-16 from Flightgear Launcher
- Variants and their liveries
- Keyboard Shortcuts
- Starting the Aircraft
- Takeoff and Landing
- Flying
- Navigation
- Autopilot
- Displays
- Various Controls
- Failures, faults, cautions and warnings
- Tests
- Combat

Installation instructions

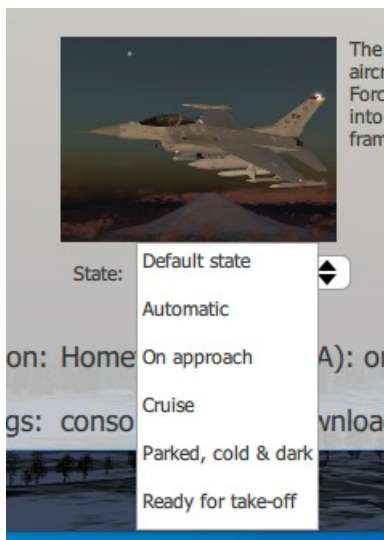
1. Download the latest [release](#)
2. Unpack it under FlightGear/Aircraft
on windows: %USERPROFILE%\Documents\FlightGear\Aircraft
on linux: ~/FlightGear/Aircraft or ~/.fgfs/Aircraft/
3. Rename the folder to f16

Launch F 16

In the list of aircraft click on F-16 title to select [variant](#).



In the summary tab, click on the dropdown box to select initial state:



Variants and their liveries

Variants

Engines and Aerodynamics

- F-16E Block 60 : 19000/32500 lbf. Large horz. tail (mod. aero data).
- F-16CJ Block 52 : 17800/29000 lbf. Large horz. tail (mod. aero data).
- F-16CJ Block 50 : 17000/29000 lbf. Large horz. tail (mod. aero data).
- F-16CM Block 42 (CCIP) : 14670/23830 lbf. Large horz. tail (mod. aero data).
- F-16CM Block 40 (CCIP) : 18330/28620 lbf. Large horz. tail (mod. aero data).
- F-16C Block 32 : 14670/23830 lbf. Large horz. tail (mod. aero data).
- F-16C Block 30 : 18330/28620 lbf. Large horz. tail (mod. aero data).
- F-16AM Block 20 (MLU 4.3) : 14670/23830 lbf. Small horz. tail (auth. aero data).
- F-16A Block 10 : 14670/23830 lbf. Small horz. tail (auth. aero data).
Engine has authentic power curves.
- YF-16 : 14670/23830 lbf. Small horz. tail (auth. aero data).
Engine has authentic power curves. The FBW in this variant has no spin, nose-slide or deep stall protection.
- F-16 Simplified : 17800/29000 lbf.
Uses custom FBW, which can be switched off, made for FG and aero data. It is a simplified version of the other versions.

The engines vary not only in thrust, but also in [fuel](#) consumption. Furthermore they differ in empty weight.

Different Blocks have different sets of cockpit panels, [MFDs](#) and HSI/EHSI, alongside other changes. There is also small changes in tail for different variants with and without braking chute.

Displays

Block 40 and 42 will have a different [HUD](#) called WAR HUD. Besides from looking different it supports [FLIR](#).

The MFDs (the two square displays) is monochrome green in block YF, 10 and 30.

Conformal Fuel Tanks

Only block 50/52 and 60 support CFTs

They are tied to certain liveries, so if you want them, select a livery that uses them.

Liveries

Variants will have different sets of liveries that can be selected. Here they are listed in alphabetical order.

Belgian Air Force (BAC): Blocks 10, 20.

Chilean Air Force (FACH): Block 50.

Royal Danish Air Force (RDAF): Block 20.

Hellenic Air Force (HAF): Blocks 30, 50/52.

Indonesian Air Force (TNI-AU): Block 20.

Israeli Air Force (IAF): Blocks 10, 40.

Italian Air Force (AMI): Block 20.

Royal Moroccan Air Force (RMAF): Block 52.

National Aeronautics and Space Administration (NASA): Block 10.

Royal Norwegian Air Force (RNoAF): Block 20.

Polish Air Force (PoIAF): Block 52.

Portuguese Air Force (PoAF): Block 20.

Republic of China Air Force (RoCAF): Block 20.

Romanian Air Force (RoAF): Block 20.

Republic of Korea Air Force (RoKAF): Block 52.

Royal Netherlands Air Force (RNLAf): Blocks 10, 20.

Turkish Air Force (TuAF): Blocks 30, 50.

United Arab Emirates Air Force (UAEAF): Block 60.

United States Air Force (USAF): All Blocks except 60.

United States Navy (USN): Blocks 20, 30.

Fictional liveries: Block 60.

Block 30 cockpit:



Keyboard Shortcuts

q ... Trigger flare release	w ... Select weapon type
Ctrl-h ... Toggle arrester hook	y ... Select next TWS radar contact
C ... Toggle canopy	Y ... Antennae level
e ... Trigger	i ... Antennae up
Ctrl-b ... Toggle speedbrakes	I ... Antennae down
b ... Hold to deploy brakes/speedbrakes	Ctrl-y ... Deselect radar contact
Delete ... Toggle Manual Pitch Override (MPO)	Arrow keys ... Move cursor on radar (if SOI)
f ... Toggle refuel door	Shift + Arrow keys ... Display Management Switch (SOI)
E ... Decrease Radar Range	I ... Cursor designate
R ... Increase Radar Range	L ... Uncage/Cage
r ... Toggles Radar Standby Mode	S ... Toggle smoke (if installed)
Ctrl-s ... Ignore selected MP pilots	o ... Deploy dragchute (if variant supports it)
Q ... Reset view	O ... Release dragchute (if variant supports it)
Ctrl-q ... Look down on right MFD	F6 ... Eject
W ... Look down on left MFD + RWR	Ctrl-1 ... GCI Picture
Ctrl-w ... Look down on HSI/EHSI	Ctrl-2 ... GCI Dope
u/U ... Seat up/down	Ctrl-3 ... GCI Cutoff
m ... Masterarm toggle	Ctrl-4 ... IFF interrogation
d ... Dogfight mode toggle	

Starting the Aircraft

MANUAL START

See Menu->Help->Aircraft Checklists

NOTE ON STARTING

Starting the engine requires pressure in one or both JFS accumulators. If they are both drained then you must go into menu configuration and recharge them if on the ground. If in air, keep gliding with the EPU on and wait for the accumulators to be charged. Remember the EPU has only hydrazine for 10 minutes of operation if gliding is too slow for significant windmilling.

Takeoff and Landing

TAKE-OFF

You can rotate around 150 kt when the aircraft is light. Be somewhat gentle on the stick if you rotate early, as you otherwise might tail-scrape.

LANDING

There is no fixed landing speed. Landing is to be performed by controlling the Angle of Attack. A little AoA bracket will appear down in the HUD, keep the flight path indicator inside the bracket. The top of the bracket is 11 and bottom is 15 deg AoA, the optimum 13 deg AoA is in the middle. To help achieve and maintain that high AoA extend the speedbrakes. This also helps keeping a three degrees approach path. Notice that it can be hard to see the touchdown point when landing with that high AoA, raising the seat with key 'u' will help.

If the runway is wet, icy or short use the dragchute (if installed, key 'o') or hook if the runway has arrestor cables.

ILS

See [Localizer in HUD](#).

HOOK

The hook is toggled with key **CTRL-h** or the cockpit control.

Make sure all 3 wheel are on the runway when you catch the wire. And also throttle in idle. Maximum 150-160 kt. Brakes off and try to hit the cable in the center.

DRAGCHUTE

Maximum recommended speed for deployment is 170 KIAS. Keys are 'o' to deploy, and 'O' to detach. Note that not all variants have a dragchute as it depends on selected liveries.

Flying

Fly By Wire

The FBW in most variant will try to protect and escape the aircraft from deep stall, nose slide and spin. Also will reduce inertia-coupling when rolling fast at high AoA. However if the deep stall is very problematic to escape, you can enable MPO (key 'del') which will allow you to semi override the FBW pitch control. With MPO enabled you can rock the aircraft up and down in bigger and bigger oscillations until the nose stays down and you have escaped the deep stall. For spins, we recommend letting go of stick and throttle back, and let the FBW save the aircraft. In the YF-16 to escape spins, apply rudder opposite of spin direction and ailerons into the spin direction while pitching down and throttle back. This will often get you into the deep stall where you will rock your way out of that. If you get close to ground in a departure use key 'F6' to eject.

LIMITS

Do not exceed Mach 2.05 or 800 KCAS. Do not roll faster than 225 kt groundspeed for the main landing gear tires, or 217 kt for the nose wheel tire. Do not operate below 200 kt with cat III [stores](#), unless for landing or take-off.

NIGHTTIME FLYING

There is flood and instrument lights that can be turned up. Furthermore with ALS graphics setting and higher shader setting there is also landing and taxi light. There is also [FLIR](#) in the HUD.

FLYING IN MP

Firstly be sure to use "Visible to 2017+", else others will not see everything working okay when they see your aircraft. For doing [combat](#) enable "Damage over MP". Use it only against opponents that have agreed to be fighting you. With this option enabled you can take and deal damage to other aircraft that also has it enabled. It can only be enabled with wheels on ground.

Navigation

Loading or creating a route

This is done in the Flightgear menu: Autopilot->Route manager

Website like skyvector.com can save routes in GPX format on your PC and you can then load them up in route-manager. GPX format can also be used to load in HSD Lines, see [Preplanning Dialog](#).

For details on route-manager see: [Wiki link](#)

Following a route

HUD

The [HUD](#) has several aids for following route.

HSD

The [HSD](#) will show the route and each steerpoint.

DED

[DED](#) has a STPT page where you can view the coordinates of each steerpoint in the route.

It also has CRUS page that will show how much fuel you will have left when reaching destination.

ICP

- ICP Rocker switch (located on ICP panel below HUD in lower-left side)
 - Up: Next steerpoint
 - Down: Previous steerpoint

HSI and EHSI


See [Various Controls#HSI](#).

Autopilot

Notice that even when A/P is enabled you can control the airplane with the stick. When you let go of stick A/P will recalculate from current situation.

The controls

- A/P (on select blocks only)
 - ON: Enable
 - OFF: Disable
- Pitch:
 - ALT HOLD: Hold current altitude
 - A/P OFF: Disable autopilot for both roll and pitch (on select blocks only)
 - ATT HOLD: Hold current pitch attitude
- Roll:
 - HDG SEL: Hold the heading selected on the (E)HSI with the HDG knob.
 - ATT HOLD: Hold current roll attitude
 - STRG SEL: Follow route if its active (on select blocks only)

For more detailed help, click the  button in top right corner of the autopilot dialog in the menu.

Conditions that will disable the autopilot or prevent it from engaging

- High AoA (Higher than 15 degrees)
- Refueling door commanded open
- ALT FLAPS enabled
- Gear down
- Manual Pitch Override (MPO) enabled
- Trim / AP DISC Switch enabled
- When low speed warning tones sound

..this section may need more details

Terrain Following

Procedure:

- Mount the AN/AAQ-13 LANTIRN Nav Pod on left fuselage pylon. (not all blocks support it)
- Make sure the aircraft is somewhat level, and that all the conditions for A/P to engage is present.
- Stick input must be neutral.
- Set A/P to ALT HOLD
- Press ADV MODE (big square button above the AP controls in some blocks)

From the ALOW page (ICP 2) you can change the altitude which it will try to keep when clearing peaks and ridges. Just edit TF ADV (MSL). Default is 500 ft.

Displays

Head up Displays

Head up display (HUD)

Head Down Displays

Multi-function displays (MFD)

Radar Warning Receiver (RWR)

Data Entry Display (DED)

EHSI (in some blocks)

Pilot Fault List Display (PFLD)

Helmet Mounted Cueing System

HUD

Head Up Display

The speed in the HUD is calibrated airspeed per default, and always when gear is commanded down. It can be switched on the HUD control panel right of the flightstick.

Text upper left side:

- Current G force.
- * symbol, meaning the HUD is sensor of interest (SOI).

Text left side:

- 'NAV' or 'ARM' depending on masterarm. But 'BRAKES' if parking brakes are on, and 'F 20 G' if --- gear is deployed, 'F' for flaps, '20' for 20 deg extended and 'G' for gears down.
- Mach number.
- Max G-Force number achieved. Can be reset using WARN RESET switch located on the ICP (center control panel with the number buttons on it).
- Selected weapon.
- Blinking FUEL if bingo fuel.
- Direction and distance to you from bullseye.

Text Right side:

- AR XXXXX is the CARA radar altimeter altitude above ground.
- CARA ALLOW. TA XX if masterarm on, XX stand for 1000s ft of target altitude, if TA is there ALLOW will be moved to above the altitude tape.
- B XX.X is slant range to steerpoint. F034.2 if masterarm on means 34.2 NM in slant range to designated target.
- When there is 3 digits like 000:05 it means 0 minutes and 5 seconds to either optimal release of weapon or till weapon impact. When 2 digits like 02:08 its ETA hr:min to next steerpoint.
- 023>2 means 23 NM to next steerpoint number 2.
- Callsign and type of target if master-arm on.

Text Center:

- LIMIT if Vne exceeded. Be careful, exceeding Vne has high chance of damaging the aircraft.
- NO RAD if the aircraft radar is off.
- FLY UP if collision with terrain is eminent.
- FUEL if bingo. This can be clicked away using WARN RESET switch located on the ICP (center control panel with the number buttons on it).

- WARN if a serious flight control issue is detected. This can be clicked away using WARN RESET switch located on the ICP (center control panel with the number buttons on it).

Text Bottom

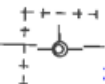
- Here DED DATA will be shown, if enabled. Or PFLD if that has been selected.

Localizer in HUD

- HSI: To enable localizer in HUD turn the mode knob on centerpanel left of the HSI.
- EHSI: To enable localizer in HUD click the 'M' knob on centerpanel EHSI to get to a PLS mode.
- It can show both glidepath and ILS, with vertical and horizontal lines.
- If a line is centered on the FPM and segmented it means it's invalid.
- If a line is not centered but segmented it means it's valid but out of range.
- If a line is not segmented, it's in range and valid.
- Keep the lines centered on the FPM to aim for the localizer beams.



ILS and GS invalid



Invalid but in range



ILS valid, GS invalid



ILS and GS valid



Landing looks good

FLIR in HUD

FLIR in HUD

HUD color is faint

If you have trouble seeing the HUD and the colors are faint and not clear, you probably have a graphics card not compatible with the glass effect.

To solve this, go into Menu -> F-16 -> Configuration -> Enable Intel compatible HUD

Controls that effect HUD

These are located on left cockpit panel except DRIFT C/O which is on the ICP panel (below the HUD).

HUD VELOCITY

Can switch the HUD scale to show true or ground speed instead of calibrated.

- GND SPD: Groundspeed.
- CAS: Calibrated.
- TAS: True.

HUD SCALES

- OFF: Switch the HUD Velocity, Altitude and Heading scales off, the digital readouts will remain though.
- VAH: Show the scales.
- VV/VAH: Show the bank angle indicator and vertical speed scale.

HUD FPM

Can switch off the ATTitude lines and/or the Flight Path Marker.

- OFF: No FPM or attitude lines.
- FPM: No Attitude lines.
- ATT/FPM: Both FPM and Attitude lines.

HUD ALT

- RDR: sets the altimeter scale to CARA whenever that is available.
- BARO: sets the altimeter scale to barometric.
- AUTO: sets the altimeter scale to thermometer CARA at low AGL and barometric at higher AGL.

HUD DED/PFL

- DED DATA: Will show the [DED](#) display content onto the HUD.
- PFL: Will copy the [Pilot Fault List Display](#) onto the HUD.
- OFF: Neither of them.
-

DRIFT C/O

- Drift cutoff will force flightpath marker and pitch ladder to stay in the middle of the HUD.

Examples

Ready for takeoff

On left side the thermometer radar altitude scale is shown, it is only shown at low altitudes. It is currently around 0 ft, the T symbol at 500 ft is the CARA ALLOW setting.

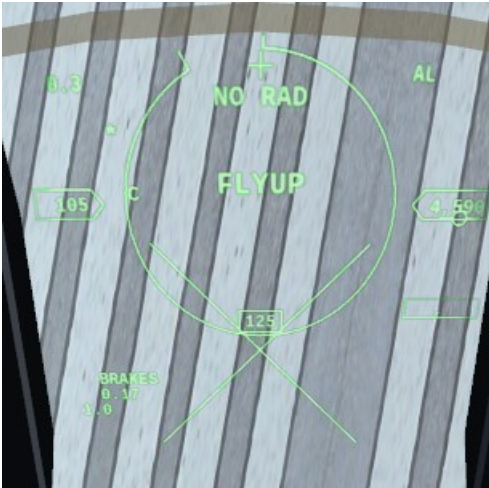
At top it is seen the magnetic heading is 145. The upper-left * means the HUD is Sensor of Interest, so you will need to switch SOI to move the radar cursor on the MFD. The horizon line is on the runway, that means the runway not level, but going upwards from us.

On left side the speed tape shows 4, that means 4 kt of wind since we are still. Upper left shown 1.0 G currently and mid-left 0.00 Mach and 1.0 G force maximum pulled. BRAKES tells us the parking brakes are on.



Nose down

The big X and FLYUP text means we are about to hit the ground. The orange peel is showing, meaning we are in **dogfight (DGFT)** mode. NO RAD means our radar is in standby mode. On the right side the empty rectangle means the CARA radar altimeter cannot measure our altitude due to our attitude. Our mach speed is 0.17 and current G is 0.3. The little C next to the speed scale means its calibrated airspeed its currently showing (default setting).



Steerpoint active

This time the rectangle has a number in it and AR, this means the CARA system, gives us a radar altitude of 11900 ft. There is also a small symbol in upper right side, that is the great circle steering cue, often shortened to the tadpole. It shows the direction to current steerpoint and follows the FPM up and down in the HUD. The FPM is located approx 3 degrees below the bore-cross, that is estimated by looking at the pitch ladder, so this means we are flying with 3 degs angle of attack (AoA or alpha).

On right lower side we see B 34.9, that's the slant (direct through the air, ignoring earth curvature) distance to the steerpoint in NM. 0.04 means we will be there in 4 minutes if we fly straight towards it at current speed. 34>1 means 34 NM to steerpoint number 1 (along the earth's curvature). BRAKES means the parking brakes has been activated while in air, not so well done.



EEGS

Here we have activated master-arm and cannon is selected. The funnel is called EEGS, read more about that in [Weapons](#). Notice there is an **R** next to altitude tape, that denotes that I have set it to show radar altitude instead of barometric. At the bottom the data from the [DED](#) panel is showing, as I have set it to show on the HUD. 510 means 510 rounds left on cannon.



CCIP

Here CCIP bombing aim is showing, when I release the bomb(s) they will hit where the round pipper is on the surface. Look at speed tape, is has a little **G** which means its in groundspeed. The ground collision X is forming too, so its soon time to pull up. DED data is still showing but on a different page. 2 B82 means 2 MK-84 bombs is selected.



ASEC

The big circle is called ASEC, its shown when AIM-120 or AIM-7 is armed. There is a little arrow on it, that the targets aspect, its about 10 o'clock on the ASEC meaning he is flying towards our 4 o'clock. The square is the radar designation on the target. The diamond with the spikes is where the missiles seeker head is looking. The **Air Shuttle..** is the callsign of the target, only shown when master arm is in SIM or ARM. 2 AMM means 2 advanced medium range missiles is selected (2 AIM-120).

Just left of the altitude tape there a Dynamic Launch Zone indicator (DLZ) that guides you to when to shoot, read more about that in [Weapons](#).



Locator line

At the bore-cross it says 18 and a line points to somewhere outside the HUD. The line is the locator line, it shows the direction to designated radar target when its not in the HUD area, and 18 degrees is the distance from the bore-cross. TA 18 means the target is at angels 18 (18000 ft). F030.1 means the slant distance to target is 30.1 NM. 2 SRM means 2 short range missiles selected (AIM-9).



TGP outside HUD area

The T next to the speed tape means its showing in true airspeed. The little crossed out square is the direction to the TGP lock since its not the HUD area.



CCRP

The vertical line in the middle is the CCRP bomb fall line. There is two small horizontal lines on it, when its nearly time to release the weapons the upper line will fall down and almost touch the bottom line, that when we release. GB12 means GBU-12 bombs. Read more in [Weapons](#).

000.03 means 3 second till optimal release time.



MFD

Multi Function Displays

The BRT and CON switches on the MFD mount corners can be used to adjust brightness and contrast.

GAIN is only used in [FCR GM mode](#).

Main Menu

If you click on the button for the page you are already in, you get into the main menu.

SMS Page

Clicking on button (OSB) next to a station will select Store Management System page. Each station has 2 or 3 lines of text, that details pylon mounted, rack/rail mounted on pylon and weapon(s) mounted on the rack or directly on the pylon. J-S will jettison the selected station. Not all payload types can be jettisoned, same for racks. If CAT shows greater than 1, then you should set the flightcontrols to CAT III on left panel and opposite.



FCR Page

See [Radar](#)

HSD Page

Horizontal Situation Display. Shows [route](#), aircraft on [datalink](#), bullseye, [threat-circles](#), [mark points](#) and [radar](#) target that has ground-track info.

- DEP: Depressed ownship in display.
- CEN: Centered ownship in display.
- CPL: Range will follow radar distance so that entire radar range is within the HSD.
- DCPL: Range can be set independently of radar range by clicking on the up/down arrows.

In F-16 menu you can load Lines 1 (full drawn) and Lines 2 (segmented) in [Preplanning Dialog](#). Those will also be shown on the HSD.



WPN Page

Details about current selected weapon(s), see more info on its details in the [Weapons](#) section.



TGP

See [TGP](#)

SWAP

Swap what is shown on the displays from left to right and opposite.

SOI

The Sensor of Interest (SOI) is selected using DMS (Shift + Arrow Key). DMS Forward selects HUD as SOI. DMS Aft selects the left MFD as SOI, and further DMS Aft toggles between left / right MFD. The SOI may then be manipulated with the cursor (only enabled for FCR as of now).

RWR

Radar Warning Receiver and EWS suite

The display

The round display above left MFD display is a Radar Warning Receiver.



It works by sorting the threats to you.

- Close to center : high threat
- Close to edge : threat
- Diamond : highest threat
- Upper semicircle : new threat (750Hz tone)
- Full blinking circle : hostile launch (2000Hz tone)
- Hat above designation : airborne

For something to show up in the RWR at all these conditions must be met:

- Be a threat.
- Having an active radar pointed your way, or having transponder enabled and not be too far away

Numbering scheme is usually it uses the aircraft designation numbers. For example:

- F-15 will be shown as 15.
- Mig-29 will be shown as 29
- SA-2 will be shown as 2
- Patriot is shown as P
- etc etc

Notice that the RWR can sometimes pick up threats much further away than your radar is capable of.

It will also show detected radar missiles homing in on you.



Audio

- If someone is locking you up (STT or similar), you will also hear a buzz sound constantly, until you no longer are locked up, also if a friendly locks you up. This buzz can vary depending on for example which kind of SAM is locking you up. It's normal procedure if you think a wingman has locked you up, to call out 'Buddy spike' over the comms. If he says he has not, then you know it's perhaps a hostile lock. AIM-9 IR locks with radar off will not give you any warning before launch.
- Betty might call out **Missile missile** if there is an incoming radar guided (fox 3) missile. (MAW system)
- The missile launch warning (MLW) system might warn you if there is a nearby ignition from a launch. It does not discriminate between hostile and **datalink** launches, so be sure to call out Fox 1/2/3 when you release, to not panic your wingmen.

Counter-measures

Press **q** to release 1 flare and 1 chaff (at same time). Or set the setting to AUTO on the knob on the EWS panel.

Betty will say **Chaff Flare** at successful release.

DED

Data Entry Display

The DED is the small display above the right color MFD or just right of the HUD. The ICP (the panel below the HUD) can control the DED. The DED can also be brought up on the HUD, set the switch on the left side of the flightstick to DED DATA.



FLIPPING PAGES

There are three ways of accessing pages. The COMM pages can be accessed by depressing COM1 or COM2 on the ICP. Similar for IFF page. The primary set of pages is accessed only from the CNI page. That is the default DED page. To return to the CNI page no matter which page you are on, flip the RTN-SEQ switch to RTN. Notice that the numpad on the ICP has also letters on them, these are the pages that button will show when pressed when on the CNI page. The secondary set of pages is accessed by depressing LIST on the ICP. Then click the number on the ICP numpad to select the page wanted. On the secondary page list depressing '0' brings up another miscellaneous page list.

INPUTING VALUES

On some pages, values can be input. A value that is selected and ready to be changed is shown with * symbols around it, for example *1256*. If a page has more than one value that can be input, click on the small up-arrow just above the RTN-SEQ switch to go to the next input (see image below).

If the input are letters, use 0 on ICP to cycle the value. If the input are numbers, use the numpad on the ICP to enter the number, then depress ENTR.



HACK Timer on TIME page

The DED has a built-in stopwatch. To access this, use key 6 ("TIME") on the ICP to select TIME page. Then use the up arrow button on the ICP to start the HACK timer. The up arrow button toggles the timer while the down arrow button resets it.

M3 and M4 on IFF page

M3 is the civilian transponder. M4 is a military IFF transponder. Other modes are not implemented.

Laser code on LASR page

The page can be found on the miscellaneous page list. The laser code must be from 1111 to 2888.

HMCS

Helmet Mounted Cueing System

This is basically a HUD on the helmet visor.



Turning it on

For the blocks that support HMCS there is a SYMBOLOGY-INT knob below the EWS panel on left side of the cockpit. Turn it clockwise to enable the display.

You will not see it when you look at HUD or down into cockpit.

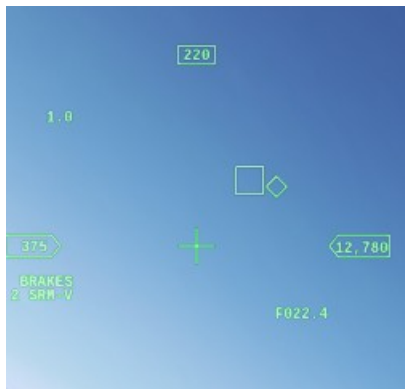


Slaving radar

You can use the HMCS to direct where the radar should look, by being in ACM-BORE mode in the FCR.

Slaving AIM-9L and AIM-9M

To enable this (optionally set the radar to standby with key **r**) select a sidewinder. Master-arm ON or SIM.



Various Controls

BITCHING BETTY

That's the nickname of the annunciation voice. :) The control INTERCOM on left panel controls her volume.

CARA ALOW

Combined Altitude Radar Altimeter Automatic LOW altitude Warning. This is a radar altitude warning from Betty when you get below that. The CARA must have view of the ground for this to work. This can be entered on the [DED](#).

MSL FLOOR

Mean Sea Level altitude advisory Floor. This is when you want Betty to remind you to switch to/from QNH/standard baro pressure. This can be entered on the [DED](#).

BINGO

The fuel level where the system and Betty will warn that the fuel is low. This can be entered on the [DED](#).

EMER STORES JETTISON

This button will jettison all A/G ordnance and other payloads like fuel tanks that is not A/A. It will NOT jettison wingtips. This cannot be done on the ground unless GND JETT is set to ENABLE.

ALT FLAPS

When set to extend this will deploy flaps as if the gear were extended. They will still retract at higher speeds though. If this is enabled the [A/P](#) wont engage.

Navigation Aids

HSI

The Horizontal Situation Indicator is located at the bottom of the center console in some blocks. Its mode is controlled by the knob on the left. In NAV mode this can be used to navigate steerpoints. In TCN mode to navigate TACAN, and in ILS mode it can be used to fly an ILS approach.

EHSI

The Electronic Horizontal Situation Indicator is located at the bottom of the center console in some blocks. Use the M button to switch modes. This can be used to navigate steerpoints if it is in NAV mode. It can be used to navigate TACAN if it is in TCN mode, and VOR/ADF if in VOR mode. PLS stand for Precision Landing System and in that mode it can use ILS. It stores the CRS between modes, PLS modes have their own and non-PLS modes have their own stored. The CRS knob (radial course) and the HDG knob (captains bars) can be turned faster by holding in Shift. It works mostly as a normal HSI. When the course deviation CDI is invalid it will be a segmented line, and a red bar will appear. If the distance indicator is invalid then a red bar will appear above the NM distance.

Warnings

FAILURES, FAULTS, CAUTIONS and WARNINGS

MAIN INDICATORS

The caution panel is located just forward of the flightstick on right side of the cockpit. The Pilot Fault List Display (PFLD) is located just above the caution panel. The electrical caution panel is located close to the throttle. Once a problem is detected the following indications may appear:

- WARN displayed blinking in the center of the HUD.
- [Intercom voice](#) saying 'Warning', 'Caution' or certain tones.
- Various warning lights on right eyebrow right of HUD.

MAIN CONTROLS

To acknowledge a caution indication the following controls are available:

- Master caution light/button, located on left eyebrow (just left of the HUD on the edge of the panel).
- F-ACK button, located on left eyebrow (just left of the HUD on the edge of the panel).
- CAUTION RESET, located on the electrical caution panel.
- WARN RESET switch, located on the ICP (the panel below the HUD).
- Menu Configuration panel repair button.

Main/Elec Caution system

The caution panel lights can light up at failures or various misconfigurations. When that happens, the master caution pushbutton will also light up. Press it to acknowledge the caution, except for ELEC SYS. It has its own caution reset button and master caution will continue to be lit until that is pressed.

Fault system

On the pilot fault list top it will either say nothing, ENG, AV or FLCS. Or more at once. ENG is engines fault(s), FLCS is flight control system fault(s), AV is aviation faults. It will show up to three faults at the same time, and if they are really serious a warning will be issued on the HUD and by voice (to stop that click WARN RESET switch).



To acknowledge the three shown faults, click F-ACK. If there are more than three faults, it will then show the next three and so on. If all faults have been acknowledged and F-ACK is clicked again, all faults will return to the display. The display content can also be shown on the HUD. To do that set the switch on the left side of the flightstick to PFL. The fault system right now is separate from the Caution system. In the real jet they have some overlap, but that is not modeled.

Failures in general

Failures typically happens when hitting something at speed or being hit by a weapon with weapon discharge enabled. Failures can be repaired in the configuration menu, unless weapon discharge is enabled, in which case it can only be done while resting on gear on the ground. Selecting an airport from the menu to relocate to will also repair the aircraft.

Specific fault: Gears

If the gears will not extend due to missing hydraulic pressure, pull the ALT GEAR handle, to extend. The ALT GEAR handle is located a little in front of the throttle on left side. This can only be done once.

Specific caution: STORES CONFIG

This means your CAT setting is not aligned to what payload you have mounted. Consult the MFD, page SMS, to check what it should be.

Specific caution: SEAT NOT ARMED

On the left side of the chair you can arm the ejection seat.

Tests

SYSTEM TESTS

Several systems can be tested from the TEST panel on the left hand console. These tests cause the specific warning and caution lights to come on, together with the master caution light. Other test features are controlled from their respective panels.

FIRE & OHEAT detect

This test causes the fire and overheat monitors to be tested. Both ENGINE FIRE warning on the right eyebrow and OVERHEAT caution on the caution panel will illuminate.

OXY QTY

This test causes the oxygen quantity gauge to disconnect and when reaching zero causes the oxygen low caution light to come on.

MAL & IND LTS

This test causes all caution and warning lights to illuminate and Betty to announce all warnings and cautions. This can be used to check for any malfunctioning lights and intercom volume.

PROBE HEAT

This test causes the probe heat monitor system to be tested. The PROBE HEAT caution light on the caution panel will blink.

EPU/GEN

This test causes the EPU to engage for the supply of electrical and hydraulic pressure. This test only works with a running engine, and since the use of hydrazine on the ground is to be prevented, enough engine power (approx 80%) should be set before performing this test in order to prevent electrical power drops. This test also causes the flight control surfaces power to be tested. This will illuminate the FLCs PWR lights for both channels on the left and righthand side.

FLCS TEST

This test causes the flight control surfaces power to be tested. This will illuminate the FLCS PWR lights for both channels on the left and righthand side.

ANTI-G TEST

This test causes the G-suit to inflate to check the proper connection of hoses, etc.

AVTR TEST

This test function can be found on the AVTR panel itself. It causes the two control lights to illuminate.

FUEL QTY

This test function can be found on the FUEL SELECTOR panel. It causes a fixed amount of fuel to be indicated by fuel gauge hands and counter, as well as illuminate both low fuel caution lights.

Combat

After learning the basics of flying, you can start to think about combat.

Concepts you should become familiar with:

[Weapons](#)

[HUD](#)

[MFD](#)

[FCR](#)

[TGP](#)

[Dogfight Mode](#)

[Training Scenario](#)

[Datalink](#)

Weapons

Loading up weapons

There is two options

- Menu->F-16->Payload Presets
- Menu->Equipment->Fuel and Payload

When MP damage is enabled you cannot load stores in air.

Selecting weapons

Use [Mastermode buttons](#) or key [w](#). You can also select weapon on MFD WPN page top button on right side.

Master-arm switch

It has 3 settings

- OFF - Weapons will not work.
- ARM - Weapons armed and ready if selected.
- SIM - Weapons simulate, they will not fire. But the aiming will be active.

The keyboard shortcut is [m](#).

Aiming the cannon

EEGS

Once you have selected cannon and master-arm switch is ON and the MFD WPN page is set to EEGS, a timer will start and after around two seconds you will get the Enhanced Envelope Gun Sight (EEGS) funnel on the [HUD](#). Keep you targets wingtips so that they touch the sides of the funnel, and keep your aircraft attitude movement stable for around one second, then fire a burst. This will give you the best chance of hitting. The sides of the funnel is computed for a 35 ft wingspan, so if you are aiming at a larger or smaller aircraft you need to compensate for that. The 35 ft wingspan can be changed on the MAN page in the [DED](#).

STRF

Once you have selected cannon and master-arm switch is ON and the MFD WPN page is set to STRF, fly near ground to get a pipper aim on the HUD, for prediction of where your rounds will hit.

Releasing A/G ordnance

First mount some armament. Secondly make sure masterarm (key 'm') is enabled. Thirdly select the arm (use 'w' key or click buttons 'A-A' or 'A-G' under the HUD). Fourthly make sure a target is designated, unless you want to use unguided bombs in CCIP mode, then a target is not needed.

Bombs

- For GBU-12 and GBU-24 make sure laser is armed.
- Release mode can be set with WPN page, options are CCIP and CCRP.
 - CCRP: When getting close to target a vertical line will appear in the HUD. Align flight path indicator on the line, when a small horizontal line on that line starts dropping down and reaches another line then it's time to release (key 'e' or 'trigger').
 - CCIP: A line from FPM to a round pipper is displayed when close enough to the ground, maneuver the pipper to be over the target and release (key 'e' or 'trigger').
- SGL or PAIR mode can be set on WPN MFD page.
 - SGL: single release.
 - PAIR: double release.
- RP (ripple release) can be set on WPN MFD page.
 - The number is how many subsequent releases should be done.
 - If RP is greater than 1, then you can also in same MFD page set distance in feet between releases.
- AD (arming delay) can be set on WPN MFD page.
 - The number is delay in seconds, and when changed will be applied to all loaded bombs of same type as currently selected.



AGM-154A JSOW (Joint Standoff Weapon)

- Long range guided glide bomb. Can be launched by either inputting GPS coordinates in the "Program Target" dialog for a desired spot, or against a TOO (Target Of Opportunity) with a [targeting pod \(TGP\)](#) lock. Operational range varies from 70 NM max with GPS to about 34 NM max with TGP lock. Optimal release envelopes are as follows:
 - GPS lock: Release at or above FL420 with speed at or above M1.6 (70 NM and closer).
 - [TGP](#) lock (TOO): Release at or above FL340 with speed at or above M1.3 (34 NM and closer).

A/A missiles

These are AIM-7 (Fox 1), AIM-120 (Fox 3) and AIM-9 (Fox 2).

When a target is in or nearly in maximum range a DLZ indicator will show up on the [FCR](#) and [HUD](#). The number with the [>](#) symbol is the closing rate in kt. The triangle is the maximum range. The DLZ is below that divided into zones. From the triangle down to the first horizontal line is the zone where there is almost no chance the missile will hit. From that line and down to the rectangle you have a chance especially if the target does not evade. The rectangle is the zone where even if target evades there is a good chance it can hit. Below the rectangle is the minimum zone, where the target is too close for the weapon.



AIM-7

The Fox 1 AIM-7 require you to keep the target locked (STT) during its entire flight.

AIM-120

The AIM-120 if fired without a lock (MADDOG mode), will lock onto anyone it sees in its flightpath.

AIM-9

AIM-9 is fire and forget its whole flight. It can also be launched visually in BORE mode when radar is off. Just place the target within the big cross on the HUD and it will get an IR lock or look at the target with [HMCS](#).

AIM-9 has greater range if it is cooled, that can be done on the [MFD WPN](#) page. Coolant fluid don't last for longer than 1:30 hours though, so do this some minutes before you expect a "Within Visual Range" fight.

On the WPN page, SPOT can be toggled to SCAN. It will then perform a circular SEAM scan around where its seekerhead is directed to look until its uncaged. Note that SEAM Scan will reduce the seekerheads range.

Uncaging is normally automatic when it gets a solid track on the target, but it can be switched to manual by toggling TD to BP.

TARGETING POD

See [TGP](#)

FCR

Fire-control Radar

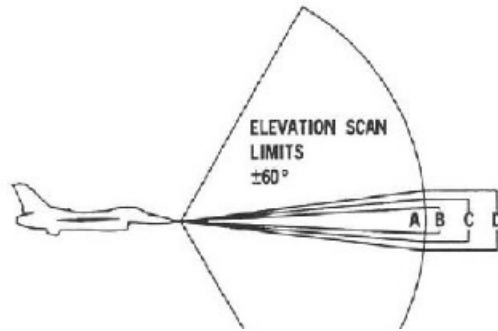
If the display is [sensor of interest \(SOI\)](#) you can move a cursor around to find and lock hostiles. To make a display SOI, use Shift-arrow keys on keyboard. To move the cursor use arrow keys and 'I' to designate or set those in the joystick config dialog.

CZ: Cursor zero will reset cursor position.

Note 1: The radar when started up goes through a Built In Test (BIT) for a couple of minutes.

Note 2: The radar is deactivated when nosewheel on ground.

BARS and AZ



ELEVATION SCAN OPTIONS

- 1 BAR VERTICAL COVERAGE (A)
- 2 BAR VERTICAL COVERAGE (B)
- 3 BAR VERTICAL COVERAGE (C)
(AVAILABLE IN TWS ONLY)
- 4 BAR VERTICAL COVERAGE (D)
MANUAL POSITIONING WITHIN SCAN LIMITS

Imagine you are using 4 bars

That's the **D** on the picture

But you are flying low and want to scan higher

Then the antennae knob (key **i** and **l**) can lift the entire 4 bar scan pattern up

The pattern is normally centered on the horizon, even if you pitch up (to certain degree)

But unless the target you want to scan is very close, most of the time you don't even need 4 bars or full azimuth sideways coverage of +/- 60 degs. 2 bars with 30 degs sideways coverage is often enough.

With the cursor you can move the sideways coverage (when you are not in full 60 degs mode [which is called A6 on the display])

So 4 bars will scan double as much (vertically) than 2 bars. But 2 bars scans faster, because the disc don't have to move through all 4 bars, only 2.

So in the picture below, I have set it to A2 (which is 25 deg to each side of the cursor). 3B which is 3 bars.

Where the cursor is, the pattern covers from -8000ft to 17000ft. That's indicated right of the cursor.



In the above picture notice the 2 T one at bottom and one at left side. Those represent the radar disc movement, sideways and up/down.

Switching Modes

Click button above main mode to switch master mode.

Click on the submode to switch submode.

Bleps

White when the radar hit return comes in, then it fades to black.

On the CNTL page you can set how many history bleps of that kind it should show (the TGT HIS option)



IFF

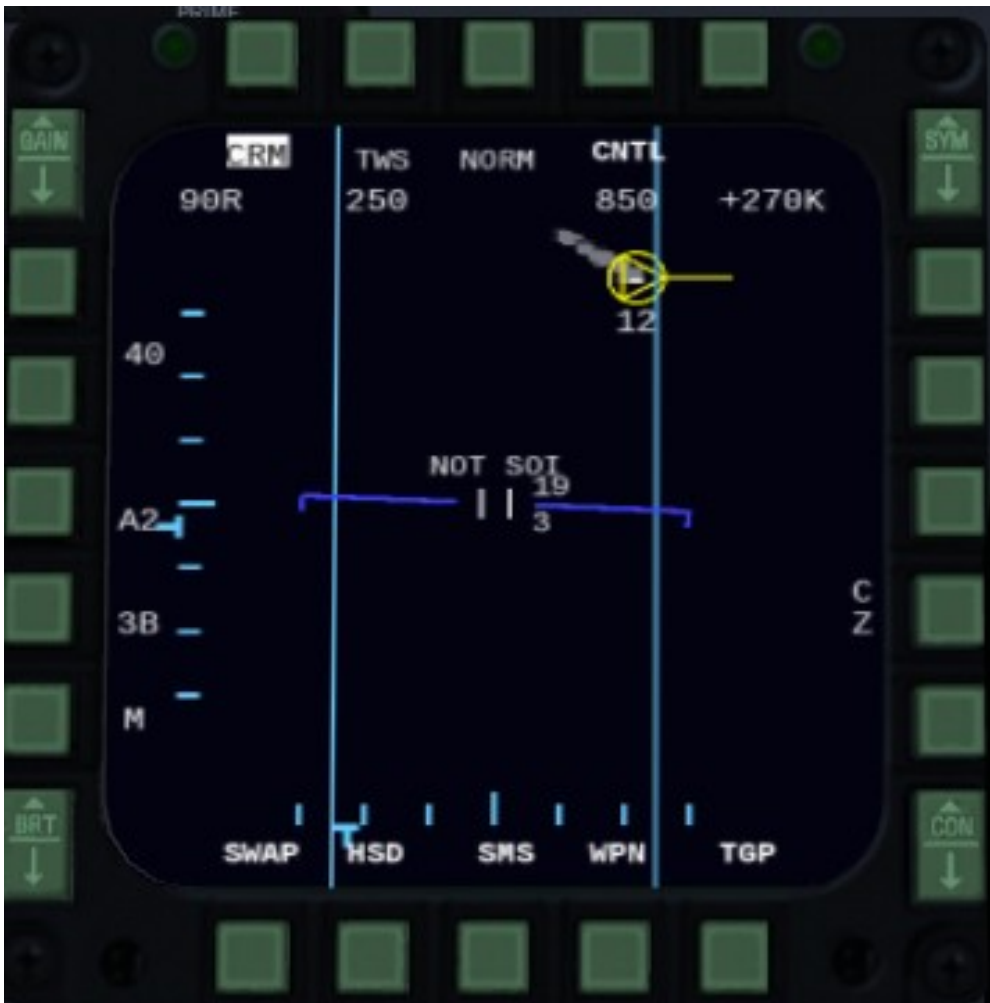
Identification Friend or Foe system can show on the FCR how contacts identify. Click **IFF** button on left eyebrow panel, and look at FCR page where bleps will be replaced by squares and circles to indicate IFF

- Yellow: Not identified as friendly
- Green: Friendly

Your M4 IFF code can be entered in the [Preplanning Dialog](#), make sure all friendlies use the same code.

Chaff

You can sometimes see chaff on the radar. It will produce bleps often seen as a trail after the releasing aircraft blep. To designate the aircraft using chaff, just lock up the blep at the head of the chaff trail.



Ground-track and intercept point

When you have designated something and it shows ground-track (heading of target) then you might get a little + also. That's where you should aim for if you want to intercept the contact. If your speed is too slow to intercept it will not show, also it might be outside the scope, then you also not see it.



STT and FTT modes

Single Target Track and Fixed Target Track.

This is commonly referred to as having locked up a target. Or hard lock.

The radar will scan very aggressively around the target to be sure its not lost.

To enter these modes click **L** when cursor is over a blep. Note that for RWS/LRS you have to do it twice, as you first go into SAM mode, and then into STT.

At the top are four numbers when in STT; Target aspect, and L/R for which wing is closest to ownship. Target Heading. Target speed (kt). Closing speed (kt).

STT mode will alert the contact's **RWR** that you have locked him up.

To exit STT or FTT use key **L** again while cursor is not over any designation or blep.

Carrying designation over to another radar mode

If you have something designated in a mode, and you switch modes, often the designation can be carried over. For example lock something up into RWS-SAM mode, switch to TWS, and it will still be designated.

Notching

You can hide in ground clutter if you fly perpendicular to the F16 with some luck.

CRM - Combined Radar Mode

CRM is the Air to Air modes.

Contacts is shown as B-scope radar display: Horizontal is relative bearing to targets, vertical is distance.

- Ax: How much azimuth the radar shall cover, A6 is max (60 degs to each side).
- xB: How much vertically the radar shall cover, 4B is max (around 15 degs). A small plus sign when something is locked is the point to aim for if you want to intercept the locked target.

It has some submodes:

RWS

Range while Search is used for finding targets. Its the default submode in CRM mode.

Once you lock something up with **L** you will enter RWS-SAM submode.

SAM - Situation Awareness Mode

This mode you enter from RWS when locking something up (once). Its called RWS-SAM. It will show your lock but also search targets around it. Note that it will still only say RWS, not RWS-SAM, you have recognize that its in SAM mode by the fact that a target is circled.



If you lock the lock up once more you get into STT mode, where the radar will super focus only on the target. (AIM-7 needs that). (AIM-120 just need the SAM lock)

TWS

TWS can show headings of multiple targets at once. This mode require 2 scans per target to get the heading. And has max of 80nm.

It can track up to 10 like that.

Looking at the pic below, the target at the left is seen because the radar beam has some degrees coverage itself so can track a couple of degrees outside the boundaries.

So beside showing heading, this is very similar to RWS-SAM mode.

Key y is for TWS mode only. To switch between the 10 trackable targets.



The one with circle around is the target that the missile will go after:

LRS

Same principles as RWS, but with slower scan rate and more sensitive, so can pick up smaller RCS.

Also has a SAM submode like RWS.

VSR

Velocity Search. Even more sensitive than LRS.

Up/down in the MFD display is the closing speed. Note the speed indicator ticks appearing in right side of display. 1000 kt is at top, 0 kt at bottom. Sideways is angle like the other CRM modes.

Targets have to be scanned twice to appear. Notice every second time the scan goes slower (alert scan) and then faster (confirm scan).

Since this mode can detect targets further away than STT its not sure that you can lock up far away targets from this mode. You can try, but might not work.

ACM Mode

Mainly for [Combat](#) within visual range.

More info: [Radar ACM Modes](#)

SEA mode

Contacts is shown as PPI display. So like a top-down look on the radar field.

This mode will only search for ships/boats.

GM Mode

Contacts is shown as PPI display. So like a top-down look on the radar field.

More info: [Radar GM Mode](#)

GMT Mode

Contacts is shown as PPI display. So like a top-down look on the radar field.

This mode will only search for moving surface contacts.

FAQ

How do I know when TWS is about to lose a track?

The track will start to blink.

How do I lock up in RWS or LRS mode?

With key **I**, except that will designate it (and go into SAM sub mode) not fully lock it up. Click the key on the target a second time to get the full Single Target Track lock (but this will also warn the target that you are locking him).

How do I designate a track in TWS without triggering RWR system in the target aircraft?

If you lock with key **I** in TWS it will alert the target, but you need that if you are going to fire AIM-7, its also the most stable form of tracking (STT). Otherwise click key **y** to cycle between the tracks.

What is difference between the SAM sub-modes and TWS?

They are very similar, they both keep track of a designated target while scanning an area left, right up and down around it. What mainly differs is that TWS can show ground track of more than 1. Ground-track is when you get a triangle with a velocity vector instead of just a grey-scale blep. In TWS mode once a target has been scanned twice within a certain time, the ground-track will be available.

In RWS-SAM or LRS-SAM modes I cannot change AZ

Nope, that mode auto sets the AZ depending on range.

Why did TWS or SAM mode auto switch my designation to STT?

That will happen when it gets closer than 3 nm.

Which CRM mode can see a target furthest out?

- 1 - VSR
- 2 - LRS
- 3 - RWS
- 4 - TWS

Which ACM mode should I use?

If your in dogfight in same turning circle as your opponent and you wingman is not on same circle, use ACM 60, that will lock up anything it find in a narrow band from your HUD up the the max gimbal limit of your radar. Else use ACM 20 in the dogfight, that will lock up basically anything it finds near/in your HUD. If you want to be careful to lock up the correct bandit or want to use [HMCS](#) use ACM BORE. That's my personal opinion, use what you find works for you

What does A2 mean?

That is only available in TWS, it means +/-25 degs.

Why does my radar tilt knob setting not take effect?

In the SAM modes as well as TWS with something designated, radar tilt is force centered on your designation. In ACM modes the coverage is fixed to the aircraft axes, so can also not be changed.

In the SAM modes, what happens if I move the radar AZ coverage away from the designated target?

They are special in that regard, they will try to slip over and scan the designation every time a regular scan pattern finishes. That way an attempt is made to not lose the target even though its outside the regular scan area. This can not be done in TWS, the radar coverage not follow cursor if it means it goes away from the designation.

I designated a target in TWS, why can I not switch to A6 or B4?

TWS does not allow that when something is selected.

TGP

Target Pod

There are various target pods that can be mounted on right fuselage hardpoint.

To use it you must be airborne, click on TGP on one the [MFDs](#). You need to wait some minutes for timeout after mounting it.

Firstly, click on STBY.

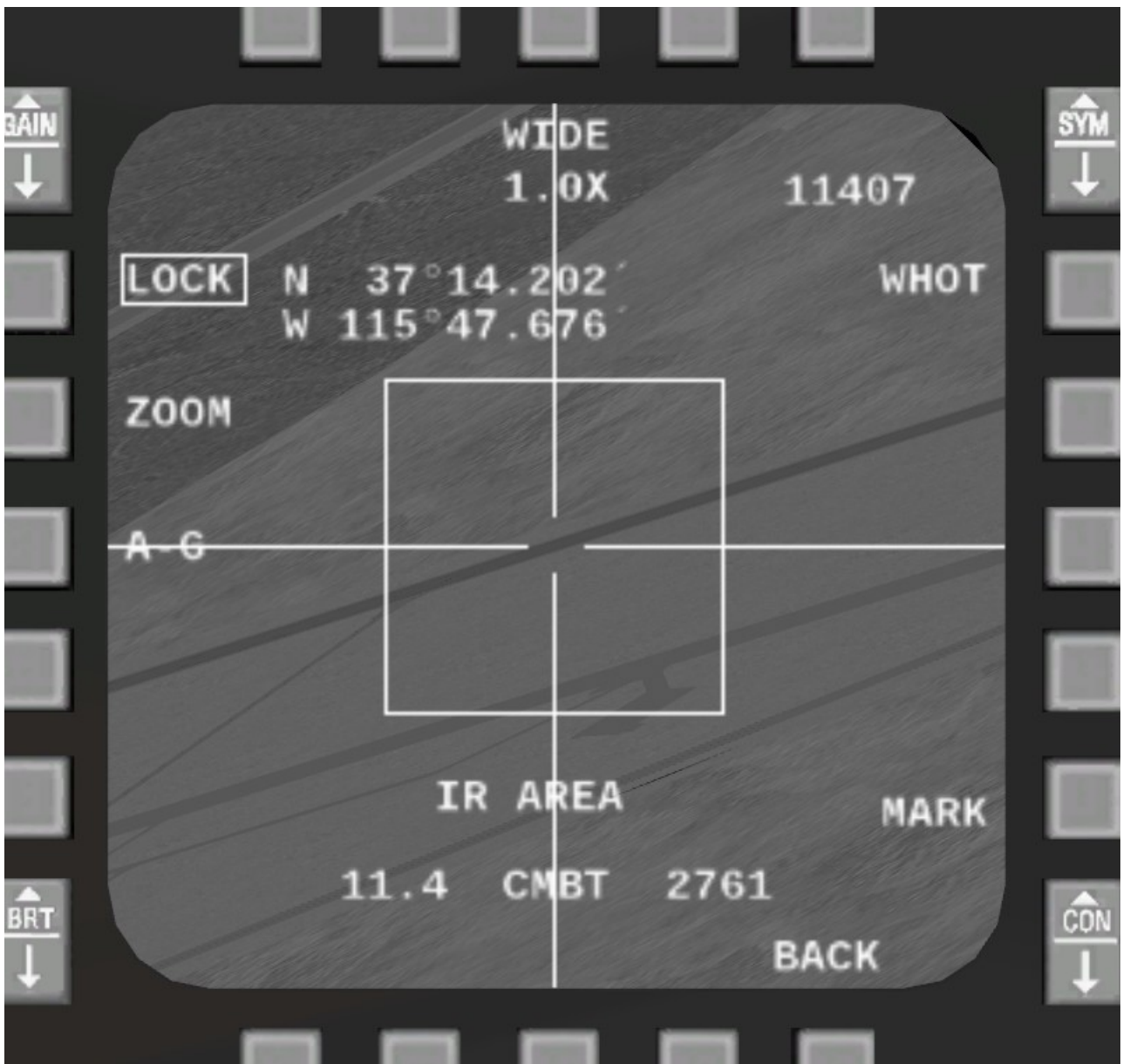
Then just like on [FCR](#) page, you can use the cursor keys to move the TGP around, and likewise you can use key **L** to lock up.

Per default its pointed towards next steerpoint. If something is selected on radar it will point to that though if the distance is not too large.

You will notice in the TGP view on the MFD that a radar lock is not very accurate. So after selecting a radar target, use the TGP buttons (LEFT, RIGHT, UP, DOWN) or the cursor controls (Arrow keys) to aim better and click LOCK or 'L'. This will now make released ordnance hit more accurate. There is also keys to ZOOM and switch from narrow to wide field of view.

The WHOT or TV, tells if you have selected thermic or visual spectrum.

The MARK shows when you have locked something. Clicking on that makes a TGP mark at the lock position, read more in [GPS Points](#).



Dogfight Mode

DOGFIGHT MODE

Using the FCR cursor to lock up an hostile while you are in turn fight can be next to impossible. So you can press **d** to toggle dogfight mode.

THIS WILL HAPPEN WHEN ENTERING DOGFIGHT MODE

- Radar will be set to standby if you didn't have any target designated, and have to be enabled if desired by using the **r** key.
 - Radar will be force limited to 10 NM range since [Air Combat Mode](#) will be forced in the [Radar](#). The initial selected ACM mode will be ACM-20.
 - Radar will autolock anything it sees (as that is part of how [ACM](#) works). You can use key **CTRL-y** to de-select target if you lock up the wrong target.
- HUD will be decluttered and orange peel arc will become visible.
- Cannon will be selected, but you can still cycle to other weapons.
- Countermeasure page will be displayed on the [DED](#).
- Left MFD will be set to [FCR](#) page.
- Right [MFD](#) will be set to WPN page.
- If cannon is set to STRF, it will be set to EEGS.
- FPM will be decluttered.
- Airspeed indicator will be calibrated.
- Altitude indicator will be barometric.

ORANGE PEEL

This is an arc showing in the [HUD](#). The filled portion of the arc will always point towards the ground and the ends are parallel to the horizon. When you pitch up the arc will cover less degrees, and pitch down it will cover more degrees. So full circle means you are headed straight down.

THIS WILL HAPPEN WHEN EXITING DOGFIGHT MODE

- Radar mode will be set back to what it was when entering dogfight mode. If the radar is off when exiting dogfight mode, it will however not be enabled automatically.

Training Scenario

DOGFIGHT SCENARIO

- Bring this up in the menu.
- Select a difficulty.
- Aim with the '+' bore symbol in HUD on a enemy for 1 second to score a kill.
- Friendly fire is off. Its meant to be use without using missiles to simulate gun fight, but if you find it hard we recommend you practice on setting 0 with AIM-9. Some of the settings will give you a wingman. To view the AI flying, switch to missile view and click the arrows in lower left corner.

Datalink

Link-16

Connecting

The datalink system in the F-16 is called Link-16.

To connect to your buddies, all should enter the same datalink code in the [DED](#) panel on DLNK page.

Make sure your opponents do not know the code you are using.

The DLNK page will show the callsigns of those that on your datalink network.

Datalink on FCR and HSD pages

Furthermore datalink friendlies will be shown on [FCR](#) and [HSD](#) pages (blue color) even though you don't see them on your radar. They will also show the targets they have locked up (red color), even if you do not have that target picked up on your radar.

Transmit steerpoints/bullseye/threat circle locations/GPS/markpoints to datalink network

On the ICP panel (the panel under the HUD), click the [WX](#) button, or [PLRT](#) in Blocks 10-32, while DED is on STPT, BEYE or MKPT page. The coordinates will be transmitted, and received by all on the datalink as a markpoint (#450 to #454 on STPT DED page). When this happens they will get a notification in their HUD and the markpoint will also be shown on their HSD page. See [GPS Points](#) for more info on what they can use this for.

Other

FLIR

Forward Looking Infrared in HUD

To use FLIR you must fly block 40 or 42. You must also load up the LANTIRN Nav Pod.

On the ICP the 2 right-most wheels will control brightness and Contrast.



Fuel

EXT FUEL TANKS

After you have mounted or dismounted an external fuel tank in the fuel and payload dialog, you might have to close the dialog and reopen it to see that change proper, and to be able to set the level.

Conformal Fuel tanks

See [CFTs](#)

AIR TO AIR REFUELING

You can refuel with both AI or MP compatible tankers which operate a boom system. To perform aerial refueling set the AIR REFUEL switch to open (or press **f**) and get within the boom engagement zone of the tanker. Notice that this will also change how the fly-by-wire reacts to your stick inputs, so that you can make minute corrections more easily when close to the tanker.

GPS Points

GPS Locations and Steerpoints

In the DED you can find all these points in the STPT page. They are numbered like this:

- #000 to #099 reserved for route (read-only). Only the [Route-manager can write to them](#)
- #100 to #199 are HSD lines 1 (read-only). Only the [Preplanning Dialog](#) can write to them.
- #200 to #299 are HSD lines 2 (read-only). Only the [Preplanning Dialog](#) can write to them.
- #300 to 305 are for threat circles.
- #350 to #359 for pilot mnemonics.
- #400 to #404 are own OFLY/TGP marks.
- #450 to 454 are for DLNK marks.
- #500 is WPN program GPS coords.
- #555 is Bulls-eye.

Markpoints

There are two ways to create a new markpoint.

ICP Panel

When DED is on page CNI (the default page), click **7** on the ICP panel. The new OFLY mark will be located where you were when clicking the button.

Target Pod

When you have locked up something or somewhere with the TGP click **MARK** in the TGP view, and a TGP mark is created where the lock is.

Datalink Markpoints

See [Datalink](#) for how to transmit a point.

Pilot mnemonics

You can store anything you like here. They are not used for anything, but can be viewed sort of like a scratchpad.

Steerpoints and route

See [Navigation](#) for more info.

HSD Lines

They are shown on the [MFD HSD](#) page. Lines 1 is full drawn and Lines 2 is segmented.

Use [Preplanning Dialog](#) to load them in.

Weapon GPS coordinates

This is mainly used for standoff [weapons](#), but can also be used by GPS weapons such as GBU-31.

See [Menu->F16->Program Target](#) in the sim.

HSD Threat circles

These can be programmed in the [Preplanning Dialog](#), or the DED STPT pages #300 to #305. Or you can copy another point in their STPT address.

They are shown on the HSD, typically used to warn pilot of ground based danger, like SAMs or AAA.

Bulls-eye

You normally define it before your flights take off. Then when you talk over radio you don't say 10nm south of this and that town, you say 15nm NW of Bullseye. Since enemy don't know where you put bulls eye they wont know where you talk about even if they listen in.

If also just so all have common place to reference things in comparison to.

When defined, it is shown on the FCR and HSD displays. The easiest way to define it is through the [Preplanning Dialog](#). But you can also edit it on the DED STPT page with point number #555.

Setting any point as current steerpoint

Click the rocker switch on the left side of the IPC panel (the panel under the HUD) while [DED](#) is either in a STPT, BEYE or MKPT page. The point shown in the page will be the point assigned as steerpoint.

Copying GPS points

This can be done from the menu in the [Preplanning Dialog](#).

Mastermode buttons

These buttons on the ICP panel below the HUD will select a A/A or A/G ordnance or if none present it will select cannon.



They will also change radar mode and cannon aim setting.

If pressed again, they will cycle weapons of that mode. (set to change in future)

Preplanning Dialog

MISSION PREPLANNING

This menu item will bring up a dialog where you can load in threat circles for the MFD HSD page, input bullseye position, load lines for HSD (using GPX or flightgear's own route fileformat) and DTC.

Mission Preplanning

Data Transfer Cartridge settings

Load DTC Save DTC

0 From STPT 0 To STPT Copy STPT over

Input coordinates (Lat, Lon and Rad in NM) to display threat or friendly circled areas on HSD page, STPT #300 to #305.

0	Lat	0	Lon	0	Radius		RED	Apply
0	Lat	0	Lon	0	Radius		RED	Apply
0	Lat	0	Lon	0	Radius		YEL	Apply
0	Lat	0	Lon	0	Radius		YEL	Apply
0	Lat	0	Lon	0	Radius		GRN	Apply
0	Lat	0	Lon	0	Radius		GRN	Apply

Bullseye designation, STPT #555

37.2 Lat -115.6 Lon Apply

Identification Friend and Foe and Tactical Data Link

85 IFF M4 Channel Clear

3086 Link-16 Channel Clear

DTU preloaded HSD Lines

Load Lines 1 Load Lines 2

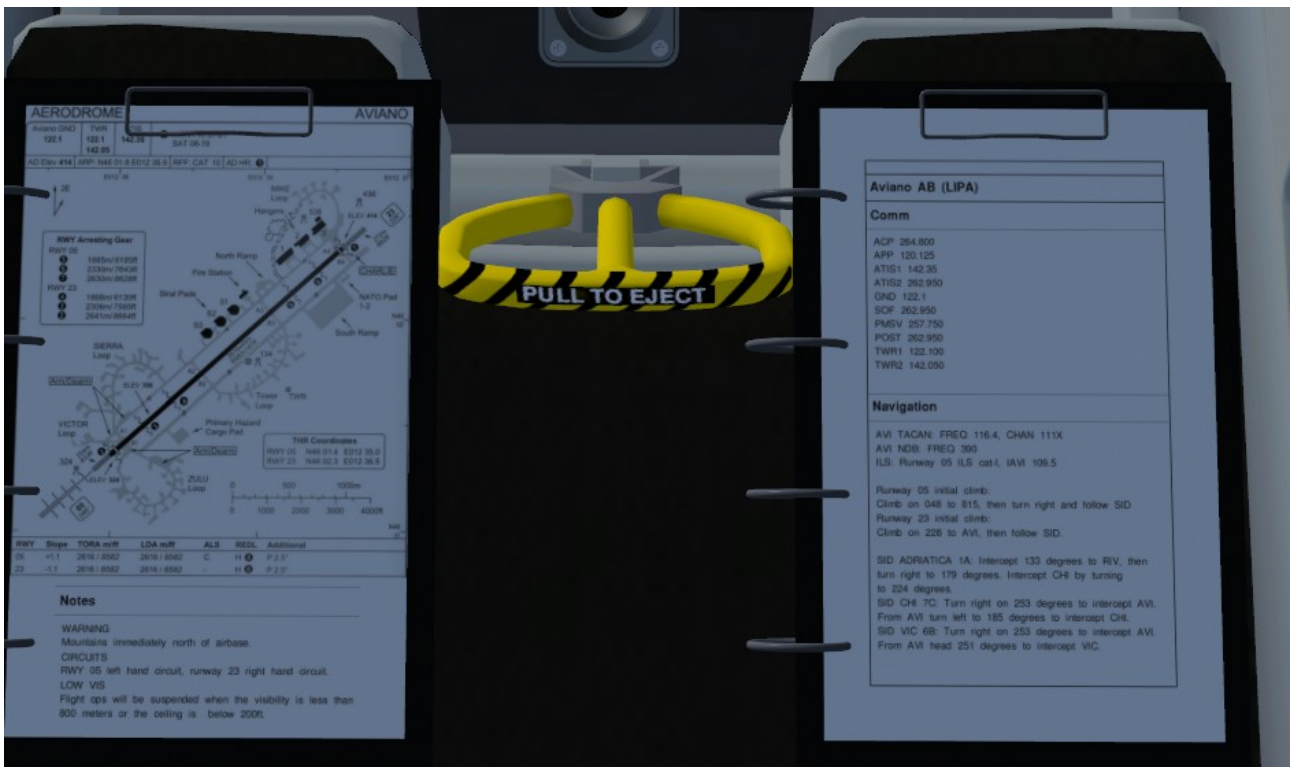
Load .fgfp or .gpx route file to enable lines on HSD page. (Lines 1 solid, Lines 2 dashed).

Kneeboards

Load Left MDC Visible Load Right MDC Visible

Kneeboards

You can also load kneeboards. For example kneeboards, look in the f16 folder under Kneeboards.



Data Transfer Cartridge

You can save/load DTC data in this dialog. There following are stored:

- All [points](#). But not route or HSD lines.
- COM frequencies
- IFF M4 and [Datalink](#) channels.

Radar ACM modes

Radar Air Combat Modes

None of the ACM modes are horizon stabilized, you pitch up or turn or whatever, the radar follows.

Radar will be force limited to 10 NM range.

Radar will auto-lock anything it sees. You can use key `CTRL-y` to de-select target if you lock up the wrong target.

ACM 20

The radar will scan a 20 x 30 degree area around the HUD.

ACM 60

The radar will scan a 10 x 60 degree narrow area from the HUD and upwards.

ACM Bore

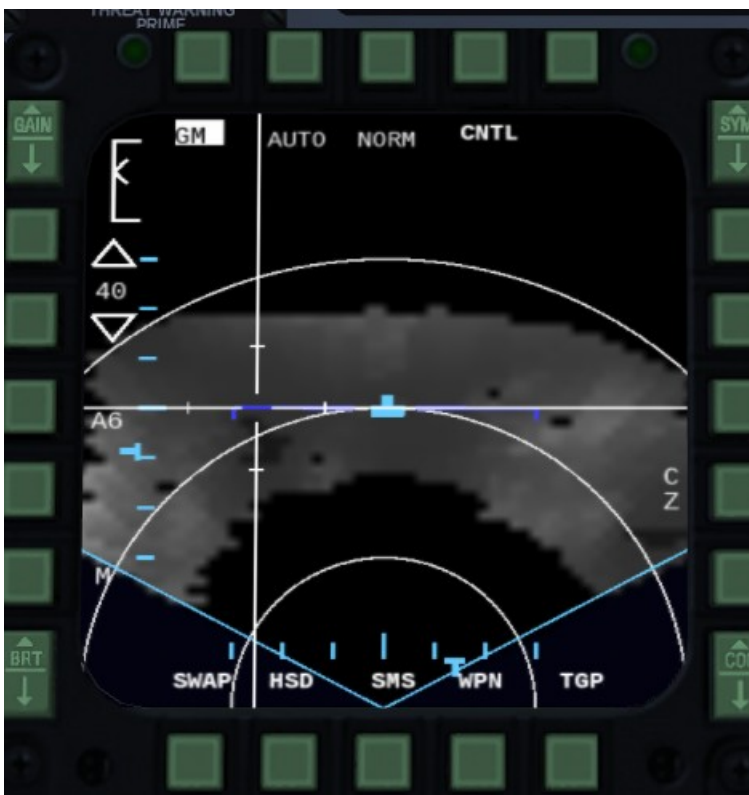
With this mode you can precisely lock up the target straight ahead of you. You can also use the [Helmet Mounted Cueing System](#) to direct where the radar should look just by turning your head.

Radar GM modes

Radar

Ground Mapping Mode

First thing to know is where to point your radar antennae. If you do not tilt it (tilt = 0) and you have a steerpoint selected, then it will focus on that steerpoint. If you tilt it, you might not see anything on the display, or the display appears frozen, this is most likely because you need to increase or decrease the range, or the tilt is so high that there is no terrain.



Know that it will scan about 2.25 degrees above and below the tilt you select, and the tilt is in relation to the horizon.

The cursor has two settings in ground radar modes. AUTO and MAN. AUTO will automatically change range when you move it to top of display and again if moved into the lower 40% of the display. MAN will not cause cursor to change range.

GAIN rocker switch on the MFD mount can be used to adjust how terrain is color mapped onto the display. The setting will show in the display in upper-left corner (gain gauge).

When you look at the radar picture you can see various features. High radar returns will be brighter and low returns will be darker. Also higher terrain elevation tend to be brighter. Here you can see some rough idea of how much return you get from ground:

Type of Surface	Strength of Echo
Water	Weak
Terrain	Medium
Cultural	Strong

But black area does not only mean water, it can also be something shadowed. Here are some examples of how shadowing works and how it looks:

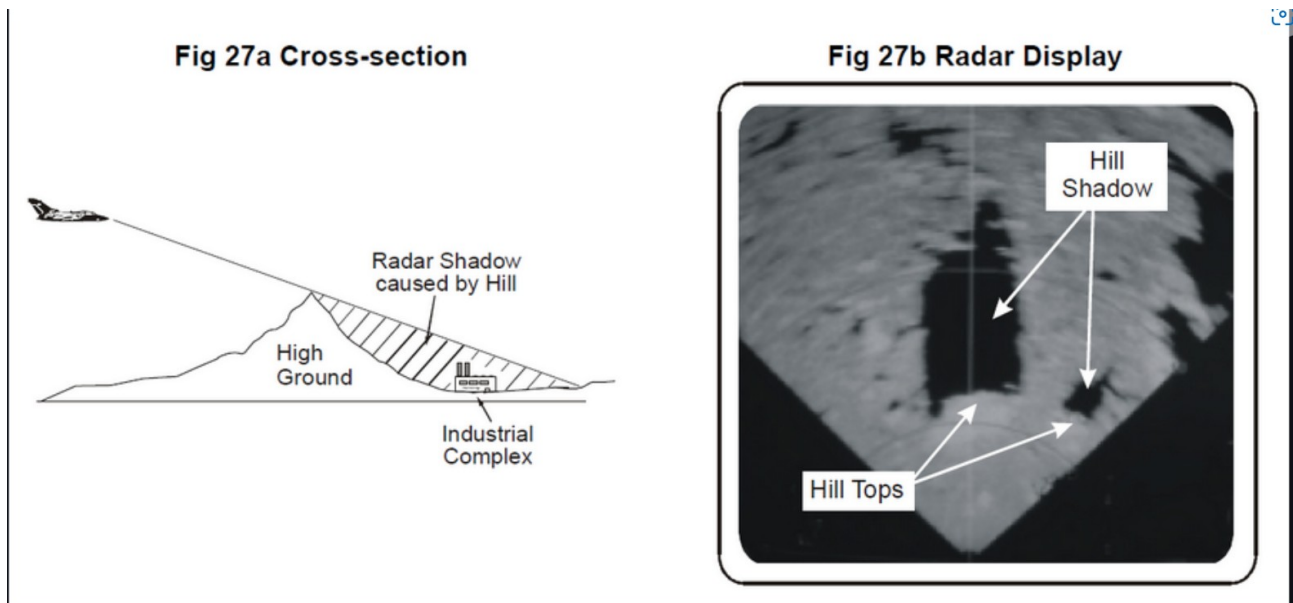


Fig 28a Simplified Cross-section

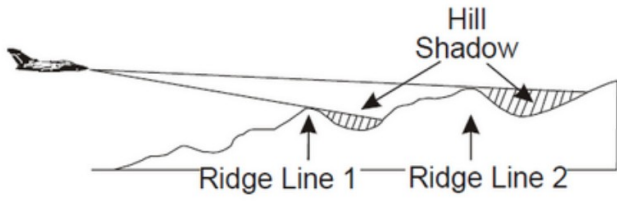


Fig 28b Radar Display

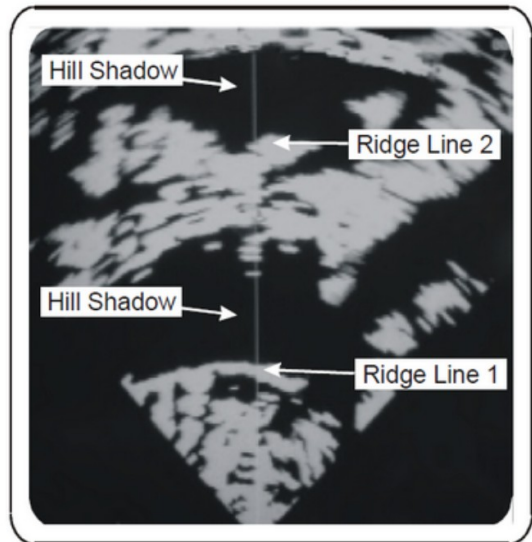


Fig 29a Cross-section

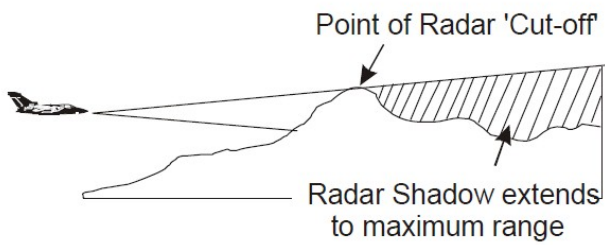
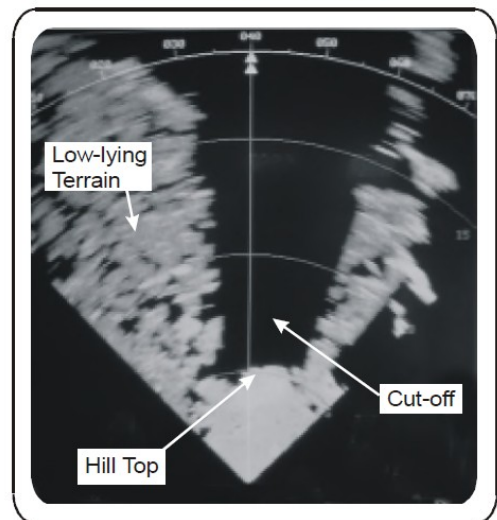


Fig 29b Radar Display



Appendices

Kneeboard tags

#	comment
*	draw an border around whole page
text	just text
text text	text with vertical center line
+text	bold text
=	fat line
-	thin line
!img.png	load image (only one per kneeboard; max size 1280x2048)

Training Scenario Levels

0 (BFM)	One bandit, one wingman (beginners)
1 (BFM)	One bandit (beginner)
2 (BFM)	One bandit (experienced)
3 (BFM)	One bandit (veteran)
4 (ACM)	Two bandits (beginners)
5 (ACM)	Two bandits (veterans)
6 ACM)	Three bandits, one wingman (veterans)

RWR Symbols

AIRCRAFT

- 16 : F-16
- 10 : A-10
- 14 : F-14
- 15 : F-15
- 18 : F/A-18
- 21 : MiG-21
- 27 : Su-27, J-11A
- 28 : Training scenario opponent
- 29 : MiG-29
- 35 : F-35
- 37 : J-37 Viggen
- 71 : SR-71
- EF : Eurofighter
- F4 : F-4
- F5 : F-5
- HA : Harrier
- JA : Jaguar
- M2 : Mirage-2000
- RF : Rafale (brsq)
- TO : Tornado

ASSETS, OTHER

- 2 : SA-2 (S-75, SAM)
- 11: : SA-11 (BUK M2, SAM)
- 20 : SA-20 (S-300, SAM)
- A : Shilka (ZSU-23-4, Anti-Aircraft Artillery)
- AI : AI scenario
- P : Patriot (MIM-1004D, SAM)
- S : AWACS, GCI or Recon
- SH : Frigate/Carrier/Ship
- UK : Unknown threat

Checklists

Normal Procedures

Config

Fuel and Payload	Load stores and fuel as needed
MP discharge messages	As required
External power	As needed and available
Auto ordnance view	As required
Flightplan	Load or create as needed

Cockpit check

ENG FEED knob	NORM
EPU switch	NORM
CUTOFF (black switch on throttle)	LOCK
LG handle	DN
HOOK switch	UP
MASTER ARM switch	OFF
LE FLAPS switch	AUTO
GND JETT switch	OFF
AIR COND TEMP knob	AUTO
AIR SOURCE knob	NORM

Before starting engine

Canopy	As desired
MAIN PWR switch	BATT
FLCS RLY light	LIT
FLCS PWR TEST switch	HOLD
FLCS PWR light	ALL LIT
FLCS RLY light	UNLIT
ACFT BATT TO FLCS light	LIT
FLCS PWR TEST switch	RELEASE
FLCS PMG light	LIT
MAIN PWR switch	MAIN PWR
ELEC SYS light	LIT

HYD/OIL PRESS warning light	LIT
FLCS RLY light	LIT
ENGINE light	LIT
EPU GEN and EPU PMG lights	Confirm off

Starting engine

JET FUEL	START 2
Wait for JFS RUN light	LIT
Wait for RPM	N2 20%
CUTOFF (black switch on throttle)	RELEASE
Wait for engine	Ready
FLCS RLY light	UNLIT
ENGINE light	UNLIT
HYD/OIL PRESS warning light	Off
FUEL FLOW	PPH 500-1500
OIL pressure	Minimum 15 psi
NOZ POS	Minimum 80%
RPM	Around 60%
FTIT	625c deg or less
HYD PRESS A & B	Psi 2850-3250

After engine start

MAL and IND LTS	ON
Check warning and indicator lights	ON
INTERCOM VOL	ADJUST
MAL and IND LTS	OFF
INS knob	ALIGN NORM
FCC/MMC	FCC/MMC
SMS/ST STA	SMS/ST STA
MFD	MFD
UFC	UFC
GPS	GPS
DL	DL
OXYGEN lever	ON

LEFT HDPT switch	OFF, unless required
RIGHT HDPT switch	As desired
FCR	FCR
RDR ALT	RDR ALT
WHEEL down light	Three green
EPU FUEL	At 95-102%
MPO	Check
Move controls	Verify they respond
EW MWS switch	ON
EW JMR switch	ON
EW RWR switch	ON
EW DISP switch (Block 20/60)	ON
EW MODE knob	MAN
COMM 1 knob	ON
COMM 2 knob	ON
Before taxi	
Canopy	Close and lock
Altimeter	Set and check
Exterior lights	As required
Interior lights	As required
INS knob	NAV
HUD SYM knob	ON
TAXI	
Breaks and nosewheel steering	Check
Heading	Check
Before takeoff	
RADAR	ACTIVE
ALT FLAPS switch	NORM
Speedbrakes	Closed
Canopy	Closed and locked
FUEL QTY knob	NORM
STORES CONFIG switch	As required

Arm ejection chair	Armed
OIL pressure	Check psi
ALOW MSL FLOOR Data	Check
All warning and caution lights	Check

Descent/Before landing

Fuel	Check quantity
Landing light	ON
Altimeter	Check setting
TGP	STBY

Landing

Speed	Fly initially at 300 KT
Throttle	Reduce
Speedbrakes	Enable as needed
Speed	Below 300 KT
LG handle	DN
WHEEL down light	Three green
AoA	Slow down till 11 to 13 AoA
Check speedbrakes	ON for final
At 100 KT	Put nosewheel on ground
Decelerate	Smoothly brake to decelerate to taxi speed

After landing

Speedbrakes	Closed
Ejection safety lever	Safe
LANDING TAXI lights	As required
Canopy handle	Up

Engine shutdown

CUTOFF (black switch on throttle)	LOCK
JFS RUN light	UNLIT
MAIN OWR switch	OFF

Emergency Procedures

Arrestor hook landing

Latest 1500ft before cable	Lower hook
----------------------------	------------

Nose gear
Throttle
Hitting cable

Make sure its on ground
IDLE
Engage close to center