F-16 Manual

Copyright Notice

Copyright © 1997 by Interactive Magic, Inc., and Digital Integration, Ltd. All rights reserved.

This manual and the computer programs on the accompanying CD-ROM are copyrighted and contain proprietary information. No one may give or sell copies of this manual or the accompanying CD or other works of Interactive Magic, Inc., to any person or institution, except as provided for by written agreement with the copyright holder. Disassembly, reverse compilation, and any other form of reverse engineering of the programs on the CD are unauthorized. No one may copy, photocopy, reproduce, translate this manual, or reduce it to machine-readable form, in whole or in part, without prior written consent of the copyright holder. Any person/persons reproducing any portion of this program, in any media, for any reason, shall be guilty of copyright violation and criminal liability as provided by law, and shall be subject to civil liability at the discretion of the copyright holder.

Limited Warranty

Interactive Magic warrants that the CD-ROM on which the enclosed program is recorded will be free from defects in materials and workmanship for a period of 60 days from the date of purchase. If within 60 days of purchase the CD proves defective in any way, you may return the CD to Interactive Magic, 215 Southport Drive, Suite 1000, Morrisville, NC, 27560, and Interactive Magic will replace the disk free of charge.

INTERACTIVE MAGIC MAKES NO OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE CD OR THE SOFTWARE PROGRAM RECORDED ON THE CD OR THE GAME DESCRIBED IN THIS MANUAL, THEIR QUALITY, PERFORMANCE, MERCHANTABILITY, OR FITNESS FOR ANY PARTICULAR PURPOSE. THE PROGRAM AND GAME ARE SOLD "AS IS." THE ENTIRE RISK AS TO THEIR QUALITY AND PERFORMANCE IS WITH THE BUYER. IN NO EVENT WILL INTERACTIVE MAGIC BE LIABLE FOR DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECT IN THE CD, PROGRAM, OR GAME EVEN IF INTERACTIVE MAGIC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. (SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF IMPLIED WARRANTIES OR LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.)

Contents

1. Quickstart

If you want to get airborne as quickly as possible, select the **Quickstart** option on the Main screen.

Next you need to choose between **Air Combat** or **Ground Attack**.

Main Screen menu page

Quickstart menu page

Air Combat: Your flight begins in hostile airspace on the tail of an opponent, but don't expect him to sit in your sights for long. He'll soon be joined by reinforcements, all hungry for the kill. Your aircraft will be armed with both short and medium range air-to-air missiles, plus your internal gun for when the dogfight gets in really close.

Ground Attack: Your flight begins low over hostile territory. Air defenses are thick around you. Your task is to destroy anything on the ground that moves, and just for good measure, anything that doesn't! Your aircraft will be armed with a variety of ground attack weapons, including Maverick air-to-ground missiles.

Finally, select your combat zone—**Israel**, **Korea,** or **Cyprus**. Click on the corresponding screen button to make your selection. Your flight begins immediately. Target acquisition on the radar is automatic. Press the Spacebar (or joystick fire button) to launch your weapons. Don't fly in a straight line for too long—the air is likely to get thick with incoming missiles!

Throughout **Quickstart,** you will have unlimited weapons and unlimited fuel. You will be awarded a score depending upon how many targets you destroy during your flight. If your score qualifies for entry into one of the **Top Ten Best Score** tables (Air Combat or

Ground Attack), your pilot's name will be included. Your flight will end when you are shot down or when you crash into the ground. You can abort your flight by pressing Ctrl-Q.

If you prefer to defy death completely, select the **Invincibility** option. You will be immune to both enemy fire and crashing into the ground, but no score is awarded when you fly with Invincibility selected.

Have fun!

To summarize:	
At Main screen select:	**Quickstart**
Click on:	**Air Combat** or **Ground Attack**
Choose combat zone:	**Israel, Korea,** or **Cyprus**
To launch weapon:	**Press** Spacebar
To select different weapon:	**Press** Enter
To quit game:	**Press keys** Ctrl **and** Q **together**

2. Flight Options

Summary

*i*F-16 includes three combat zones: **Cyprus**, **Israel,** and **Korea**, plus training missions based at **Nellis Air Force Base** in the USA. Here are your flight options:

Quickstart:	Air-to-air combat or ground attack
Training:	20 training missions
Combat:	30 single combat missions—10 per combat zone
	3 multimission campaigns—one per combat zone
Two Player:	Two-player options on all single combat missions
	Head-to-head option
Network:	Death Match for up to 16 players
	"Capture the flag"—team A versus team B (up to 8 per team)

Most menu screens feature a row of "shortcut" buttons that enable you to move easily to a number of additional screens such as Preferences, Pilot's Log, etc. These buttons are described in Chapter 3, "Other Options."

Main Screen

Your flight options begin at the Main screen with a choice of:

Main Screen menu page

Quickstart—described in chapter 1

Training—Click here to display the list of training missions. Training takes place at Nellis Air Force Base, with missions covering aircraft handling, navigation, weapons delivery, and combat techniques. Click on any of the mission titles to see a description of the mission. On

training missions you can enable or disable Free Fire for infinite weapons and No Crashes by clicking on the appropriate button. Click on Commit when you have chosen your mission. You will now proceed to Mission Briefing (see chapter 4).

Combat—click here to select the Combat screen.

Combat Screen

Combat screen

Single—Click here if you want to fly a single, self-contained combat mission. After selecting your combat area (Cyprus, Israel, or Korea), you will be presented with a list of combat missions. Click on each title to see a mission description, the number of aircraft involved, airfield name, your targets and weapons to be used, your takeoff time, estimated flight time, and weather conditions. Click on **Commit** when you have chosen your mission. You will now proceed to Mission Briefing (see chapter 4).

Campaign—Click here to embark upon a multimission campaign. Next, select a scenario (Cyprus, Israel, or Korea). At the beginning of your campaign, you will be given a briefing on the overall situation, and you will be given a situation update before each flight. Click on **OK** when you are ready to proceed to Mission Briefing (see chapter 4). Your success or failure on each mission will determine how the campaign progresses. You can leave the campaign after any flight by clicking on **Exit**, and continue later. Your pilot's log will show the status of each campaign. The campaign scripts are based upon topical and historical information. The political and military tactics portrayed are fictitious.

Network—Click here to select the multiplayer network options.

Death Match—A game for up to sixteen players in a fight for survival.

Capture the flag—This option pitches two teams against each other with the objective of destroying the other team's headquarters.

A detailed description of the network games may be found in chapter 9.

Two player—All two player games can be played by using modems or a direct serial cable link between the two computers, or they can be played across a network. Click here for the following options:

Combat—Allows you to fly head-to-head against a friend.

Single missions—Allows you to fly cooperatively with another player on any of the single combat missions.

Details of how to set up the two player games can be found in chapter 9.

Scenario Selection

You have a choice of three scenarios—Israel, Cyprus, and Korea. The regions were chosen because they are areas of continued tension in the modern world. Although the geographical representations in this simulation use real terrain data, political or military tactics are not necessarily portrayed accurately.

Scenario selection menu page

Israel

A number of significant events over recent months has made the likelihood of an Israeli-Syrian conflict very real. In August 1996, Iran joined Iraq and Syria in a tripartite "joint command," declaring a common interest in war against Israel. In September, Egyptian armed forces conducted their largest military exercise since 1970, simulating a deep strategic offensive into Israel. In the same month Palestinian authorities signed a new military agreement with Syria, promising an escalation of terrorist activity in return for weapons and training. The PLO leader, Yasir Arafat, has recently ordered the construction of numerous command centers and weapon storage facilities throughout the Gaza strip. In October 1996, Egypt, Iran, Iraq, and Jordan met to discuss the coordination of a military blockade of Israel from the north, east, and south. Meetings with

Lebanon followed to complete the "circle of confrontation" with Israel. Despite the US-inspired "peace process," western diplomats are predicting the inevitability of war between Israel and Syria. Attention is focused upon the Golan Heights, captured by Israel in the Six Day War (1967) and annexed by Israel in 1981. Withdrawal from the Golan Heights remains a major obstacle to negotiations between Israel and Syria.

The campaign scenario is based upon the anticipated invasion of Syria in order to reclaim the Golan Heights.

Cyprus

Forcibly partitioned by the Turks in 1974, Cyprus is split into two zones, one Greek (59%) and one Turkish (37%), which are separated by a United Nations buffer zone (4%). The "Turkish Republic of Northern Cyprus" has been declared by the United Nations as "legally invalid" and is recognized only by Turkey.

The Greek Cypriot zone is an independent sovereign republic and a member of the United Nations. Its closest ally is Greece, which, in the event of further Turkish aggression, has promised full military support under the terms of the Joint Defense Doctrine agreement.

The Turkish army in northern Cyprus maintains a state of full alert and overwhelming military superiority with support from mainland Turkey. The Turkish air force regularly violates Cypriot airspace by flying over the capital, Nicosia. In an attempt to improve its defensive capability, Cyprus has recently agreed to purchase the Russian S-300 air defense missile system at an estimated cost of half a billion dollars. Turkey has threatened to attack Cyprus if the defense system is deployed.

The campaign scenario is based upon the Turkish response to the deployment of the new defense system.

Korea

Korea has been divided into North and South since the Second World War. Restoration has been difficult for both sides since the Korean War ended in 1953. With the assistance of Western nations, the South has concentrated upon economic growth and has continued to prosper, with democracy established in 1987. North Korea became a closed and secretive society under the tyrannical

rule of Kim Il Sung. Recent strained relations with China, the North's traditional ally, have lead to even greater isolation for President Kim Jong-il.

A permanent peace treaty between North and South has never been signed, and the North has publicly declared that it remains dedicated to invading the South. Recent floods and a shortage of food have pushed North Korea into requesting aid and financial assistance. With military tension mounting, Western experts believe that an invasion by North Korea is inevitable, and the border zone is recognized as one of the most dangerous in the world.

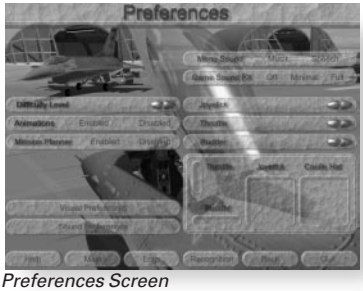
The campaign scenario is based upon the predicted invasion by North Korea.

3. Other Options

Most menu screens feature a row of shortcut buttons that enable you to move easily to and from other menu screens. Click on the required button to move between screens. The number and choice of buttons will vary between screens, depending upon context.

Preferences

A number of program features are user-selectable, and these are collectively known as the Preferences. Depending upon your hardware configuration, you can adjust or select from the following items to fine-tune how the program runs on your computer.



Preferences Screen

Sound card (DOS users only)—Clicking on this button will enable you to select from a number of different sound cards and also to specify the sound card address, interrupt, DMA, and volume setting. Additional guidance for configuring your sound card may be found in the Installation Guide. If you are running the program under Windows 95, use the Control Panel to make sound card adjustments.

Visual—The visual detail complexity will determine how smoothly the program runs on your computer. Clicking on the Visual button will take you to the Visual Options screen, where you can select from a number of visual features:

	Also selectable in flight using key
Visual range	Alt with keys 1 to 7
Shading	Alt and key F1
Textures	Alt and key F2
Shadows	Alt and key F3
Object visual range	Alt and key F4
Clouds	Alt and key F5

Smoke lifetime	Alt and key F6
Smoke density	Alt and key F7

Difficulty level—Select from 1 to 10 by clicking on the + and − buttons. As the difficulty level increases, the awareness and aggressiveness of the enemy increases.

Mission Planner—With the Mission Planner enabled, the Map Tool Box appears on the Briefing screen. This offers a number of additional features for studying and changing your flight plan prior to takeoff. See the Mission Briefing chapter for more details.

Animations—A number of animated scenes are presented throughout the program to add atmosphere. If you do not want the animations to be played, click on Disable.

Sound—Speech and Music may be selected on or off. **Speech** refers to the narrated briefing prior to each mission. **Music** refers to compositions played during the game.

Effect—Various in-flight sound effects are selectable as off, minimal or full. The full setting includes in-cockpit radio chatter.

Controls—Click here to select the type of device that you wish to use to fly your F-16. The options Joystick, Rudder, and Throttle support a number of popular devices. See the Installation Guide for further details.

Logs

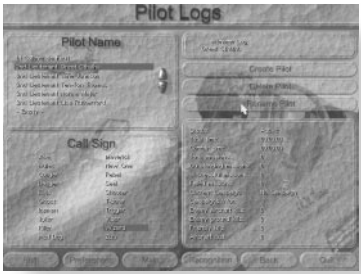
Click here to view the logs of all existing pilots by rank, callsign, and status. At the top left of the screen, you will see a list of pilot names. The first in the list is Colonel de Fault—a pilot with unique indestructible qualities. If you fly as Colonel de Fault you need not worry about crashing or getting shot down. He always lives to fight another day, and you cannot delete or rename his log.

To select an existing pilot's log, click on the name. If you cannot see the name in the list, click on the scroll button to display further names. There is no limit to the number of pilot logs that may be stored.

If you want to start a new log, click on **Create new pilot**. After typing in your name, you will be given the default callsign "Viper." You can choose from a selection of 20 predefined names by clicking on the callsign of your choice.

If you want to rename a pilot, select the name to be changed, click on **Rename pilot,** type in your new name. You can also change your callsign.

If you want to delete a pilot, select the name to be deleted and click on **Delete pilot**. You will be asked to confirm your selection. Type Y to delete the unwanted log.



Pilot's log screen

Each log will display information unique to its pilot's name and callsign:

Status

Active—Only pilots with "active" status can fly.

POW (prisoner of war)—If you eject over enemy territory, there is a chance that you will be captured. You will no longer be able to fly if captured.

KIA (killed in action)—When you crash or you get shot down on a combat Single mission.

KIT (killed in training)—When you crash on a training mission.

Total time—Total number of hours airborne on all types of missions.

Combat time—Total number of hours airborne on combat missions.

Total missions—Total number of Single missions flown.

Outstanding missions—Total number of Single missions on which you have achieved "outstanding" performance.

Successful missions—Total number of Single missions on which you have achieved "successful" performance.

Failed missions—Total number of Single missions failed.

Campaigns—Lists which of the three campaigns are in progress.

Campaigns won—Names of completed campaigns.

Enemy aircraft kills—Number of enemy aircraft shot down by this pilot.

Enemy ground targets destroyed—Number of ground targets destroyed by this pilot.

Friendly kills—Number of inadvertent allied kills by this pilot.

Aircraft lost—Number of planes lost by this pilot.

Promotion

You will be promoted through the ranks in accordance with how many combat missions are successfully completed.

	No. of missions completed
2nd Lieutenant	0
1st Lieutenant	5
Captain	15
Major	30
Lieutenant-Colonel	40
Colonel	50

Medals

Bronze Star:

Awarded after successful completion of two campaigns or one campaign and ten single missions.

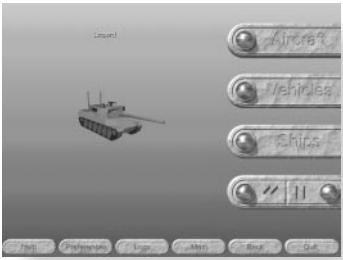
Distinguished Flying Cross:

Awarded after successful completion of all three campaigns or two campaigns and twenty single missions.

Medal of Honor:

Awarded after successful completion of all three campaigns and thirty single missions.

Recognition



Recognition Screen menu page

To help familiarize you with the various military vehicles represented in this simulation, we have included a Recognition option that enables you to view all of the aircraft, ships, and vehicles. Take some time to study each of them carefully. Being able to distinguish between enemy and allied forces is a necessity for all combat pilots. When both sides use common equipment, nationality is distinguished by color.

Animations

This option allows you to preview the animated sequences that are shown throughout the product. The animations are selected at random from those already viewed within the context of the simulation. You can abort the animation by pressing any key.

Back

Click here to return to the previous menu screen.

Quit

Click here if you want to leave the simulation. On the Quit screen you will be asked to confirm that you want to quit. Click on Quit to exit the game or Back to return to the previous menu screen.


Quit screen

4. Mission Briefing

After selecting your mission, you will arrive at the Briefing screen. Here you will see your flightplan superimposed upon the map of the chosen combat area. On the briefing screen you can:

- Study your flightplan and mission objectives
- Modify your flightplan
- Explore the map or preview areas of your flightplan
- Study known locations of enemy defenses
- View and change your weapon payload

Mission Selection screen

Click on the Briefing button to open a window with a full description of your mission. Maximize or minimize the window by clicking on the button in the top right corner of the window. Click and drag on the slider bar on the left side of the window in order to scroll down to see more text if necessary. Close the window by clicking again on the Briefing button or by clicking in the top left corner of the window.

The flightplan for your mission has already been created for you and is displayed on the map. It is a series of lines connecting labeled circles and triangles. The flightplan consists of waypoints and legs. Waypoints are fixed reference points in the flightplan (A, B, C, and so on) and a leg is the path between one waypoint and the next.

There are several waypoint types:

Departure—Always waypoint A, shown by a square box. This is your takeoff point.

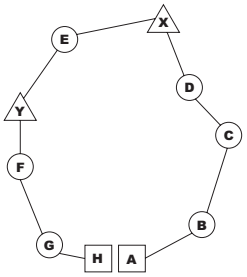
Turning—Points in the flightplan where you change course. These are the most common type of waypoint. They are labeled with capital letters B, C, D, and so on and are enclosed by a circle.

Initial point—The turning point prior to a target waypoint. This marks the beginning of an attack run. They are labeled in the same sequence as turning points.

Target—Location of planned target. Labeled with letters X, Y, or Z in sequence and enclosed by a triangle.

Reconnaissance—Transmit reconnaissance data when you reach this waypoint by pressing key [T]. Labeled with letters X, Y, or Z in sequence and enclosed by a triangle.

Approach—The waypoint that marks the beginning of the approach to landing. It is labeled in the same sequence as turning points.



Waypoint	Type
A	Departure
B,C,F	Turning
D,E	Initial points for X & Y respectively
X	First Target
Y	Second Target
G	Approach
H	Landing

Diagram of flightplan

Landing—The last waypoint in the flightplan, usually at the same airfield as your takeoff point.

Click on Takeoff when you are ready to leave the Briefing screen. You will proceed to the cockpit, with your aircraft armed and fully refueled. The control tower will give you clearance to take off.

Ending or aborting your flight

After touchdown, you can stop on the runway or taxi to a location of your choice. As soon as you become stationary, you will be asked whether you want to end your mission. Press [Y] to confirm or [N] to continue. You can abort your mission at any time by pressing [Ctrl]-[Q]. If you abort a flight, you will not be able to save the mission in your pilot's log.

Debriefing

At the end of your flight, you will return to the Briefing screen for a debriefing. Your flightpath will be displayed for comparison with your flightplan and your mission effectiveness described as

Success, Outstanding, or Failure. Click on **Exit** to leave the debrief. After a Single mission, you will be asked whether you want to log the mission. Select **Yes** to record the mission in your pilot's log. Select **Retry** if you want to fly the mission again immediately without updating your log, or select **No** to return to mission selection.

Note: If your pilot died during the mission as a result of crashing or getting shot down, you will no longer be able to fly as that pilot if you log the mission. If you want to continue flying under the same pilot's name, *do not log the mission.*

The option of whether to log a mission is not available during a campaign. Completion or failure to complete a campaign are recorded in your pilot's log.

Mission Planner

If the Mission Planner is enabled in the Preferences (see chapter 3) you will see the **Map Tool Box** in the upper right corner of the Briefing screen. The tool box offers a number of functions that enable you to study and modify your flightplan, change the appearance of the Briefing screen, alter your weapon payload, and request a weather report. To select a function, click on its name.

Map tool box

Zoom—Use this function to magnify an area of interest. After selecting the zoom function, the pointer will change to the shape of a magnifying glass. Click and hold the left mouse button while dragging the mouse diagonally to define the area to be magnified. Upon releasing the mouse button, the specified area will be rescaled to fit the screen. Alternatively, clicking once with the left mouse button will zoom to a higher detail level at the position of the pointer.

Rotate—Use this function to rotate the map around the center of the screen. After you select the Rotate function, the pointer changes to a rotate symbol. Click and hold the left mouse button and drag forward or backward to rotate the map. This function can be useful for orienting yourself during the mission briefing.

Way—Click on this button to open the W in your flightplan are listed in sequence, beginning with your departure point A.

Waypoint Info. window

To display information about any waypoint click on that waypoints button, then click on **Info**.

The Information window displays the following:

Waypoint window

Position: x, y map coordinates and altitude

Type: waypoint type—Turning, Target etc. as described previously

Speed: the planned speed to the next waypoint, in knots

Time to this waypoint: estimated time in hours, minutes, and seconds

Clicking on any waypoint button (except the Departure point or the Landing point) will cause the Insert and Delete buttons (**Ins** and **Del**) to appear in the Waypoint window. To insert a waypoint in between two existing waypoints, first select the waypoint at the end of the leg to be modified, then click on **Ins**. A new waypoint will appear at the midpoint of the leg, and the waypoints will be renamed. To remove a waypoint, first click on the waypoint button, then click on **Del**. To move a waypoint, click and hold on the waypoint symbol on the flightplan and drag the pointer to the required location. The first and last waypoint in any flightplan cannot be moved.

The x, y position, altitude, and speed at any waypoint can be adjusted by clicking on the tiled digits in the Information window. Blank tiles will appear above and below the digit. Click above to increase and below to decrease. The Waypoint Information window is closed by clicking in the top left corner.

Disable—Click here to disable the left mouse button. We recommend that you use this feature before clicking on the **3D** button. This will prevent activation of other functions (such as zoom) while you are using the mouse to click on points of interest on the map.

Back—Click to return to previous zoom level.

Fit—Clicking on any point on the map with the right mouse button will center the map at the new position. Click on the Fit button to centralize your flightplan on the map.

Key—Click here to display the map key. Click on the Key buttons to turn the following elements on or off:

Grid lines—Scaled depending on zoom level

Waypoints—Displays flightplan

Compass—Displays compass symbol

Allied AAA—Displays location and range of allied antiaircraft artillery (AAA)

Allied SAM—Displays location and range of allied surface-to-air missile sites (SAMs)

Enemy AAA—Displays location and range of enemy AAA

Enemy SAM—Displays location and range of enemy SAMs

Sides—Applies shading to indicate division of allied/enemy territory

Close the Key window by clicking in the top left corner.

Met—Click here to display weather information: wind speed, wind direction, and visibility. Note that the wind blows from the specified direction.

3D—Click on the Disable button before using this function. Clicking on 3D will open a small window containing a 3D visual display of the terrain. You can preview any location on the map to familiarize yourself with the terrain and buildings.

Note: This option does not reveal the location of ground vehicles. The window can be resized by dragging the lower right corner and closed by clicking the top left corner. The window has three modes, selected by clicking on Fly, Point, or Sat:

Fly—Click on any point on the map after selecting this function. The 3D visual window will now travel to that location. If the left mouse button is held, the 3D view will fly to and follow the location of the pointer.

Point—Click on any point on the map after selecting this function. The 3D visual in the window rotates about that point, looking down at the ground.

Sat—Click on any point on the map after selecting this function for a static vertical "satellite" view of the ground at that point.

Pay—Click here to view the Payload screen. Weapons appropriate to your mission will already be loaded, together with full internal fuel. Move the mouse pointer to each loaded weapon to display its name. To remove weapons from the aircraft, click on the loaded weapon or click on Clear to remove all weapons.

To load a weapon, first click on an empty pylon. The pylon will be highlighted with weapons that may be loaded at that position. Weapons that cannot be loaded at the chosen pylon are grayed out. Move the pointer to each available weapon to see its name and weight. Clicking on the weapon will either load the weapon or display how many of the weapons may be loaded at that pylon. Select the required number to load multiple weapons on the pylon. Weapons will be loaded symmetrically.

When you have finished loading your weapons, click on Accept. Weapons with a variable salvo size will then be listed. You can adjust the number of weapons in each salvo at this point or later in flight by using keys Alt and Enter to increase or keys Shift and Enter to decrease salvo size.

Your total aircraft weight is displayed on the Payload screen together with the maximum permitted G force for the chosen weapon payload. See chapter 8 for a detailed description of weapons and how to use them.

Payload screen

Point—Click here to open the Point window. Position your cursor anywhere on the map to display ground height (in feet), ownership of territory (enemy or allied), and the type of object (for example, a building or TV mast).

Task—If you have modified your flightplan, you will probably want to modify the flightplan of each wingman on your mission. Click here to open the Task window and click on each aircraft in the list to

highlight its flightplan. You can modify each flightplan in turn. Use the Save button if you want to save each new flightplan to your hard disk.

Save—If you have made changes to your flightplan, click on Save to save the flightplan to your hard disk. When you select the mission again, your modified flightplan will be loaded instead of the one supplied.

Restore—Click here to restore the original flightplan. This will erase your modified flightplan.

Mission Tips

You must execute the required task given in your mission briefing and land at an allied base for a mission to be successful. Performance over and above the mission requirements may earn an outstanding rating for the mission.

You can change your weapon payload during your mission briefing if you prefer a different weapon selection. You will need to enable the Mission Planner in order to access the payload screen (see Preferences, chapter 3).

The internal 20mm gun has a very high rate of fire, so use it in short bursts.

If activity is low along a particular part of your flight route, you can compress time by using the time compression key Tab. Cancel time compression by pressing key Esc.

Training missions

Free Fire—Clicking on **Free Fire** will ensure that you will not run out of weapons during your flight.

No crashes—Click on **No crashes** if you want the game to ignore any crashes that would normally be fatal. We recommend that you use this option until you are familiar with your aircraft.

Watch out for other aircraft—The airfield at Nellis is a busy place. You will not be the only F-16 pilot undergoing training, so be prepared for other rookie pilots flying to and from the airfield.

Don't shoot the allies—All vehicles, aircraft, and buildings around Nellis Air Force Base are allied. Valid targets are located only at target waypoints (waypoints X, Y, and Z). Firing weapons at any other vehicles or buildings will result in mission failure. There are no enemy forces to contend with.

Logging your flight—As you leave the debriefing screen after your flight, you will be asked whether you want to log the mission. If you click on **Yes,** the mission will be recorded in your pilot's log.

Note: The log will become inactive if you crashed and died during the mission.

If you click on **No,** the outcome of the mission will be discarded and not recorded in your log. Click on **Retry** if you want to fly the mission again. Clicking on **Retry** will discard the outcome of the mission just flown. This option is not available on Campaign missions.

Combat missions

Self-defense—When faced with an incoming missile or enemy antiaircraft artillery, you are advised to change direction frequently (jink) and deploy chaff and flares. Flying low will decrease the likelihood of SAMs, particularly if you make use of terrain masking (that is, keeping below the horizon).

Crossing a battlefield—Armored formations engaged in battle occur frequently along the front line. These forces are accompanied by air defense equipment (for example, SAMs and AAA). If you are fired upon, take out the air defenses first.

Reconnaissance—You will be expected to transmit reconnaissance data when flying a reconnaissance mission. Press key T as you fly past each target waypoint. A confirmation message will appear if reconnaissance is successful. If you press key T at the wrong point in your flightplan, you will be advised that the reconnaissance has failed.

Formation flying—There will always be at least one other F-16 accompanying you on a combat mission. The nearest F-16 to you at takeoff is your wingman. Use Ctrl 1 to Ctrl 4 to issue commands to your wingman only. If you wish to issue commands to the entire formation use Shift 1 to Shift 4. Wait for clearance to take off. Your formation will typically take off a few seconds before you.

If your wingman or the formation comes under fire during the flight, they may depart from the flightplan and retaliate. Try not to fly ahead of the formation if this occurs, or you will lose any defensive cover that they are able to provide when you reach the target area. Use the formation message "Resume flightplan" (Ctrl and 4) if the formation is distracted for too long.

Remote target designation—In this type of mission, your target for laser-guided bombs will be designated by allied infantry. As you approach the target area, you will receive confirmation that the target is being illuminated. In a coordinated attack of this nature, your time of arrival at the target is important. You are free to turn away from the target area as soon as you release your weapons.

ECM (electronic countermeasures)—Switching on your ECM pod (key E) will make it more difficult for early warning radars and air defense systems to track you. We advise that you switch the system on as you approach the target area and switch it off again when there are no threats depicted on your Threat Warning display.

Readme file—Be sure to check the Readme file on the CD-ROM for further tips and details that are not included in this manual.

Flying a campaign—You are allowed to crash or to get shot down twice within any campaign. If you "die" a third time, the campaign will be lost. You will, however, be able to continue flying with the same pilot's log.

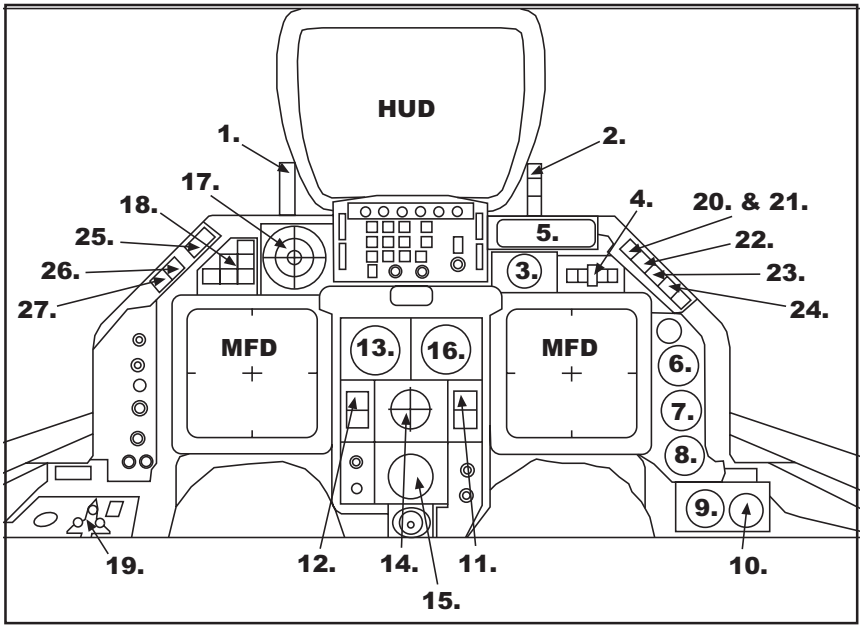
Wingman & Formation Control

During flight, you can issue the following commands to your wingman or to the entire formation. Your wingman is always the second F-16 on the Task list when the Mission Planner is enabled.

	Wingman	Formation
Go home	Ctrl and 1	Shift and 1
Follow me	Ctrl and 2	Shift and 2
Attack my target/help me	Ctrl and 3	Shift and 3
Resume flightplan	Ctrl and 4	Shift and 4

5. Cockpit

Instrument Panel



1. Angle of Attack Indexer
2. BRK/NWS/Disc Indicators
3. Standby Attitude Indicator
4. Fuel Flow Indicator
5. Data Entry Display
6. NOZ POS Indicator
7. Engine RPM
8. Engine Temperature (FTIT)
9. Mechanical Compass
10. Fuel Gauge
11. Vertical Velocity Indicator
12. Angle of Attack Indicator
13. Airspeed/Mach Indicator
14. Attitude Director Indicator
15. Horizontal Situation Indicator
16. Altimeter
17. Threat Warning display
18. Threat Warning lights (to left of Threat Warning Display)
19. Gear status
20. ENG FIRE
21. ENG
22. HYD/OIL PRESS
23. Dual FC and CANOPY
24. TO/LOG CONFIG
25. MASTER CAUTION
26. ALT LOW
27. OBS WARNING

Multifunction displays (MFD)

Two multifunction displays offer a number of selectable modes as described below. Press key [or] to cycle through the modes on the left or right MFD respectively. Press Shift and [or] to reverse cycle. Three of the modes use common keys for zoom control or target selection. If two of these modes are in use simultaneously select the current display by pressing key A. The letters CUR confirm which display is current.

MFD modes:

Flight information

Weapons Management

Moving Map

Aircraft fault status

Radar
- ground
- air

LANTIRN FLIR

MAV—IR Maverick seeker head

Flight Information

This mode shows primary flight information, such as speed and heading. Information displayed is dependent upon the gear status:

Gear down:

Indicated airspeed

Radar altitude

Angle of attack

Vertical velocity

Engine rpm

Fuel remaining

Heading

Flight Info MFD mode

Gear up:

Indicated airspeed

True airspeed

Barometric or radar altitude

Endurance (flight time remaining at present fuel consumption)

Fuel remaining

Heading

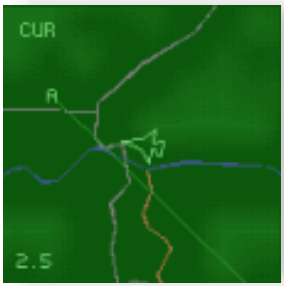
Weapons Management

This mode shows the type and quantity of weapons loaded at each pylon on the aircraft, salvo size, the number of rounds remaining for the internal gun, and the remaining number of chaff and flares. Press key [↵Enter] to cycle through air-to-air weapons or air-to-ground weapons. The selected weapon is highlighted. Press key [Pg Dn] to switch between air-to-air and air-to-ground. Refer to this display mode if a PYLON fault occurs. The inoperative pylon will be grayed out.

Weapon Management MFD mode

Moving Map

This mode shows a scrolling map with your present position oriented at the center of the display. Superimposed upon the map are your flightplan and current heading. The scale of the map is selectable with keys [<] and [>] and is displayed in the lower left corner. Enemy and allied installations are distinguished by color (enemy is orange, allied is blue).



Moving Map MFD mode

Aircraft fault status

Select this MFD mode to display any subsystem faults. The corresponding mnemonic will be highlighted.

Fault Status MFD mode

BRAKE Airbrake failure

FLAPS Flap failure

GEAR Gear is jammed

ENG Engine damage

FIRE Engine fire

BURN Afterburner failure

PRES Cockpit pressurization system failure

HYD Hydraulic system damage

GUN Gun damaged or jammed

PYLON Weapon release mechanism failure

FUEL Fuel low or fuel system damage

ECM ECM pod damaged

OXY Oxygen system failure

TWAS Threat warning azimuth system failure

RADAR Radar damaged

RADIO Radio damaged

ELEC Main generator failure

HUD Head up display damaged

AUTO Autopilot failure

TF Terrain following system failure

HUD F HUD forward-looking infrared (FLIR) system damaged

TGT F Low altitude navigation and targeting system for night (LANTIRN) FLIR targeting system damaged

LASER laser designator damaged

RECON Reconnaissance pod damaged

See chapter 7 for a description of emergency procedures following the above failures.

Radar

In reality, the F-16's radar has a bewildering number of modes. For the purposes of this simulation, we have implemented two air-to-air modes and two air-to-ground modes.

Press key [R] to switch the radar on. This is confirmed by the "Radar on" light to the left of the Threat Warning display.

IMPORTANT: If an air-to-air weapon is already selected, the radar will switch on in air-to-air Track While Scan mode. If an air-to-ground weapon is selected, the radar will switch on in air-to-ground mode. You can toggle between air-to-air and air-to-ground modes by pressing key [Pg Dn].

Air-to-air modes:

Track-While-Scan (TWS)

TWS radar mode

Track While Scan mode is capable of automatic identification and tracking of up to ten airborne targets up to a maximum range of 35 nautical miles (n.m.). The display represents a fan-shaped plan view showing what is ahead of your aircraft.

The letters TWS in the top left corner of the display confirm Track While Scan mode is selected. Targets are displayed as triangles, with range in nautical miles (n.m.) below each target. The triangle will point down if the target is flying towards the player and will point upwards if flying away from the player. Enemy targets are shown in red, allied targets in green, and unknown targets in yellow. Multiple targets flying in close formation are shown as a solid triangle. By default, the radar will automatically designate the closest enemy aircraft flying towards the player, superimposing crosshairs on the target triangle. You can select a

different target by pressing Backspace to cycle through available targets or by pressing key Alt together with cursor keys (or joystick).

At the top of the display, you will see the altitude of the designated target, in hundreds of feet, the target type, and its bearing in degrees. At the lower right side of the display you will see your closing speed (+ or -) relative to the designated target. The speed of the designated target is displayed beneath this. Only the nearest 10 targets will appear as triangles. Other unknown targets are shown as yellow crosses without range information.

On the left side of the display, you will see confirmation of the radar scan mode as range, azimuth and bar numbers. Superimposed at the center of the display is the horizon reference line.

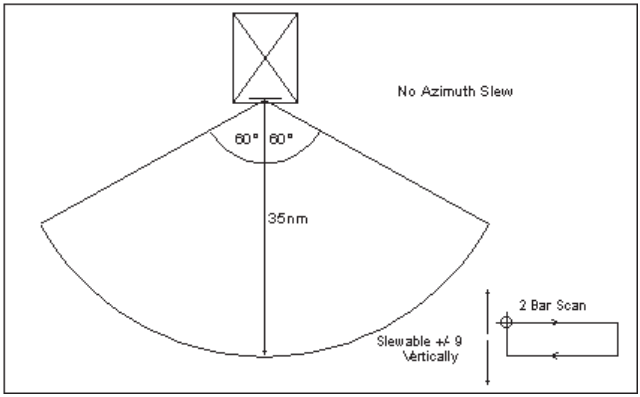
If the designated target on the TWS display is a formation of aircraft (shown as a solid triangle) you can zoom in and designate individual targets. This feature is called **Raid Cluster Resolution (RCR)**. Press key H to toggle between TWS and RCR. The radar will now display only the formation and will designate a target within the formation. You can select a different target by using the keyboard (Alt and cursor keys) or the joystick or by pressing Backspace to cycle through targets within the formation.

MFD RCR mode

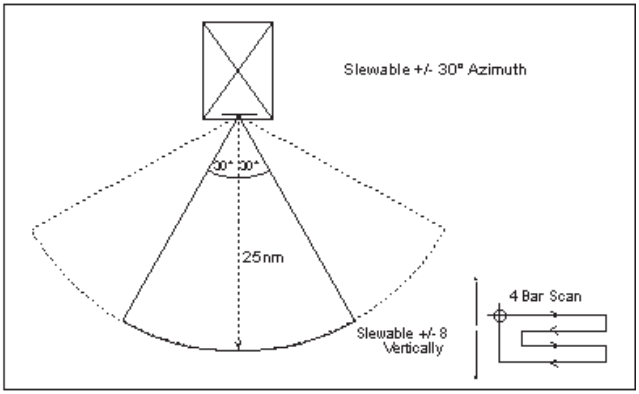
Advanced users can use the three scan modes available in TWS mode. Depending upon the mode selected, the radar scan pattern can be slewed both horizontally (azimuth) and vertically (bar setting) in order to point the radar at the area of interest. Any horizontal and vertical slewing of the radar is indicated by slew markers.

You can cycle through the radar scan modes by pressing key < or >, after ensuring that the MFD displaying the radar is selected as current.

Scan mode 1: 120 degrees azimuth, 2 bars (3 degrees) vertically, 35 n.m. range. In this mode, the radar sweeps through 120 degrees laterally and 3 degrees vertically. The radar cannot be slewed horizontally in this scan mode, but it can be slewed up or down by 9 bars (press key Ctrl and cursor keys up or down).

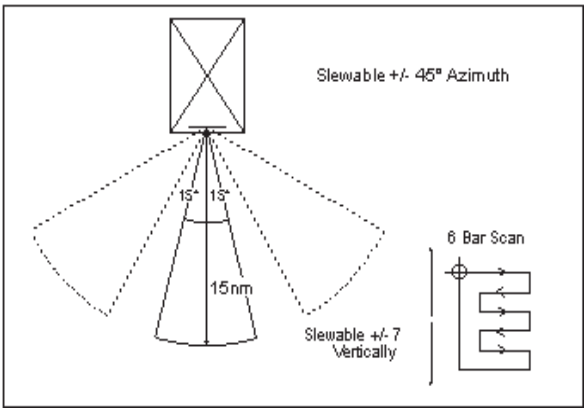


Scan mode 2: 60 degrees azimuth, 4 bars (6 degrees) vertically, 25 n.m. range. The radar may be slewed ±30 degrees laterally (press key Ctrl and cursor keys left or right) and up or down by 8 bars (press key Ctrl and cursor keys up or down).



Scan mode 3: 30 degrees azimuth, 6 bars (9 degrees) vertically, 15 n.m. range. The radar may be slewed ±45 degrees laterally (press key Ctrl and cursor keys left or right) and up or down 7 bars (press key Ctrl and cursor keys up or down).

Note: A joystick can be used instead of the cursor keys.



Air Combat Mode (ACM)


ACM mode

The other air-to-air radar mode is Air Combat Mode. Select this mode by either pressing key K (switches radar on in ACM mode and arms air-to-air missiles simultaneously) or by pressing key D to toggle between TWS and ACM mode. ACM provides automatic detection, designation, and tracking of a single target. The system will select the nearest threat, automatically switching between scan modes and adjusting the slewing angle to keep the target central on the display. The three scan modes are:

Scan mode 1: 10 degrees azimuth, 40 degrees vertical, 10 n.m. range. Slewing is limited to ±55 degrees in azimuth.

Scan mode 2: 30 degrees azimuth, 20 degrees vertical, 8 n.m. range. Slewing is limited to ±45 degrees in azimuth and ±10 degrees vertically.

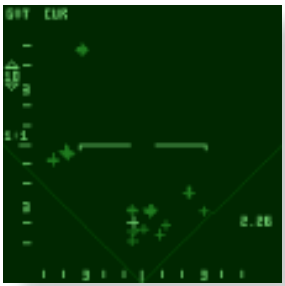
Scan mode 3: 60 degrees azimuth, 20 degrees vertical, 6 n.m. range. Slewing is limited to ±30 degrees in azimuth and ±20 degrees vertically.

Use the position of the target designator box on the HUD to determine which way to turn to acquire the target.

Air-to-ground modes

Ground Vehicle Track (GVT)

If the radar is in air-to-air mode (TWS, RCR, or ACM), press key [Pg Dn] to switch to air-to-ground mode. You can toggle between the two air-to-ground radar modes by pressing key [D]. The first mode, Ground Vehicle Track, represents a plan view of the area ahead of the aircraft, showing ground vehicles only. With the display selected as current (press key [A] if CUR is not on the display), you can change the scale of the display by pressing key [<] or [>]. Maximum range is 10 miles.



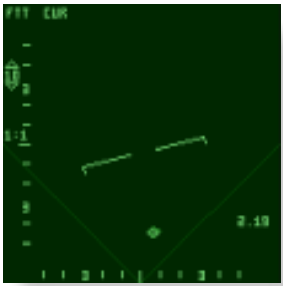
GVT mode

With the exception of radar-equipped enemy vehicles, the ground radar is not capable of distinguishing between allied and enemy equipment. However, if your Threat Warning system detects enemy radar transmissions (for example SAM, AAA, or mobile EWR), this information is used to prioritize target designation on the radar display. If the target type is known, its name will be confirmed at the top of the display. For vehicles such as tanks, trucks, and armored personnel carriers, visual confirmation is recommended with the LANTIRN FLIR display before firing a weapon.

If you are within 10 nautical miles of a target waypoint, the radar will designate the target nearest the waypoint. You can select a different target using the keyboard ([Alt] and cursor keys) or the joystick. Press key [Backspace] if you want to cycle through available targets. Range to the designated target is given on the right side of the display.

Freeze the radar picture by pressing key [H] (Hold). This is confirmed by the letters FRZ in the top left corner of the display. This turns off the radar. The display will remain static, and a dotted line will appear to show your position relative to the target. This feature enables you to approach the target with your radar switched off. Press key [H] again to return to normal operation.

Fixed Target Track (FTT)



FTT MFD mode

The second air-to-ground radar mode is similar to Ground Vehicle Track, but targets displayed are restricted to buildings and bridges (fixed targets).

Note: It is not possible to have an air-to-air radar mode on one MFD and an air-to-ground radar mode on the other MFD simultaneously.

LANTIRN FLIR (Forward Looking Infrared)

LANTIRN FLIR MFD

This MFD mode is available only when the LANTIRN pods are fitted. It provides a steerable infrared view with targeting sight and zoom control (keys [<] and [>]). LANTIRN is capable of automatic recognition and designation of ground vehicles. It is also used for manual precision target designation, because the laser designator in LANTIRN is slaved to the FLIR image. With the MFD selected as cu toggle between automatic and manual targeting.

Automatic Targeting mode (FLIR AUTO)

This mode gives automatic recognition and designation of ground vehicle targets. It is used primarily for ripple firing of Maverick missiles against armored vehicles. By pressing key [Alt] together with a cursor key (or using the joystick), you can steer the view toward the area of interest. Vehicles lying within the Target Designator box will automatically be assessed and designated. You can cycle through available targets by pressing [Backspace]. Range to target is given at the top right corner of the display. If the FLIR view is steered beyond the acquisition envelope for the selected weapon, the designator box will be omitted, leaving just the crosshairs of the sight.

Manual Targeting mode (FLIR MAN)

Manual targeting is used primarily for laser-guided bombing of targets such as buildings. You designate the target manually by using the zoom facility to position the targeting sight. By pressing

key [Alt] together with a cursor key (or using the joystick) the view may be steered to position the Target Designator sight onto a chosen ground target. The sight is locked onto the target by pressing key [Alt] together with [Spacebar] (or the joystick fire button). Range to target is given at the top right corner of the display. If the view is steered to look behind your aircraft, the targeting box is omitted. This is to indicate that the bombs may not have time to descend to the target before the targeting system reaches its steering limits.

Note: If the FLIR display is used simultaneously with the ground radar, the two systems are linked. For example, if a target is designated on the ground radar, the FLIR image and laser designator will automatically be directed at the same target. Press key [A] to select the current MFD for target selection.

IR Maverick seeker head (MAV)

If you are carrying AGM-65G IIR Maverick missiles and you do *not* have LANTIRN fitted, this MFD mode will give a view from the seeker head of the missile (MAV). Target acquisition is similar to that in the Manual Targeting mode for LANTIRN, except that the view does not have zoom control and steering is limited. If the ground radar is switched on, targets will automatically be designated by the radar.

Other instruments

The following numbers correspond to the numbered callouts in the figure on page 29.

1. Angle of Attack Indexer

Used during approach to landing, this shows whether the Angle of Attack is above or below the ideal value (see chapter 7).

2. BRK/ NWS/ DISC Indicators

BRK illuminates when the airbrake is in use.

NWS illuminates when nose wheel steering is active.

DISC illuminates when wheel brakes are on.

3. Standby Attitude Indicator

Otherwise known as the artificial horizon. This instrument shows the pitch and roll attitude of your aircraft *relative* to the ground. For example, pitch up, and the artificial horizon will fall. Roll right, and the artificial horizon will roll to the left.

4. Fuel Flow Indicator

Shows the rate of fuel flow.

5. Data Entry Display

Top line: In-flight messages.

Middle line: Airfield name and ILS frequency.

Bottom line: Next waypoint ID, planned speed to waypoint, planned altitude of waypoint.

6. NOZ POS Indicator

Exhaust nozzle position indicator. This is used to display the amount of reheat selected, from zero ("max. dry") to full (full military power) in five stages.

7. Engine RPM

Shows engine rpm, from idle (approximately 60%) to "max. dry" (100%).

8. Engine Temperature (FTIT)

Indicates engine turbine temperature.

9. Mechanical Compass

Backup magnetic compass showing heading of your aircraft. This instrument can only be seen by moving the virtual cockpit down and to the right (keys F3 and F4).

10. Fuel gauge

Shows total quantity of fuel remaining. The red needle represents external fuel tanks and the white needle represents internal fuel. This instrument can only be seen by moving the virtual cockpit down and to the right (keys F3 and F4).

11. Vertical Velocity Indicator

Used during approach to landing, this "tape" scale shows your climb/descent rate, in hundreds of feet per minute. Dramatic rates of climb or descent will exceed full scale deflection.

12. Angle of Attack Indicator

This "tape" scale shows your angle of attack (AoA) in degrees. During your approach to landing, the value should be approximately 13 degrees. During combat maneuvers, the AoA is limited to 25 degrees.

13. Airspeed/Mach Indicator

This dual scale instrument shows indicated airspeed, up to 800 knots (outer scale), and Mach number (your true airspeed expressed as a fraction of the local speed of sound).

14. Attitude Director Indicator

This instrument is the main artificial horizon. It shows the pitch and roll attitude of your aircraft relative to the ground. This instrument also includes localizer and glideslope needles for use with the Instrument Landing System (see chapter 7 for a detailed description).

15. Horizontal Situation Indicator

This instrument consists of a rotating compass rose showing your aircraft heading at the 12 o'clock position. The compass needle indicates direction to the next waypoint. The range and bearing to the next waypoint are shown at the top left and right-hand corners of the instrument. This instrument can only be seen by moving the virtual cockpit down (key F3).

16. Altimeter

This instrument shows your barometric altitude, or height above sea level, as a numeric display. Each revolution of the large needle represents 1,000 feet.

17. Threat Warning display

Sensors positioned around your F-16 are used to detect transmissions from enemy aircraft, incoming missiles, air defense units and early warning radar sites. Above the left MFD is the Threat Warning display, which shows the relative direction of any such

threat. The display represents a plan view with your aircraft positioned at the center of the display, facing the 12 o'clock position.

The Threat Warning display consists of an inner circle and an outer circle. Symbols appearing in the inner circle are considered high-priority threats that deserve your immediate attention (for example, incoming missiles and air defenses within firing range). Potential threats will appear in the outer ring. Unarmed radar transmitters (for example, early warning radars) will only appear in the outer ring. Enemy aircraft will appear on the Threat Warning display when the enemy's radar is tracking your F-16. If several threats are close together (for example, SAM or AAA defenses at an EWR site), the highest threat will be displayed. If you are carrying antiradiation HARM missiles, you will be able to designate a target on the Threat Warning display by pressing Backspace to cycle through the targets.

The following symbols are used to distinguish the type of threat:

 Aircraft

 Early warning radar

 AAA radar

 SAM radar

 Missile—radar guided

 Missile—IR guided

 AWACS

 Shipborne radar

— Multiple radar emitters (line over symbol)

I I Priority/Designated target

18. Threat Warning lights (to left of Threat Warning Display)

Top light:

AIR RAD—enemy aircraft radar tracking player

2nd row:

IR MSL—incoming IR-guided missile

RAD MSL—incoming radar-guided missile

3rd row:

RAD ON—player's radar on

ECM ON—player's ECM pod on

GND RAD—enemy ground radar tracking player

19. Gear status

3 greens—gear down and locked

Lights off—gear up

This instrument may be seen by moving the virtual cockpit down and left (keys F3 and F1).

Master Warning Lights

The *right side* of the panel has the following lights:

20. ENG FIRE

If you find yourself unfortunate enough to have an engine fire, you have approximately 30 seconds to activate the fire extinguisher by pressing keys Alt and F together. An engine fire will inevitably result in a loss of power. If the problem reoccurs, your only option is to eject (press keys Ctrl and E together).

21. ENG

Engine malfunction—you only have one engine so it's decision time! You may be lucky and find that you have enough residual power to limp home. However, if the outcome is a total engine failure, your two options are to attempt a "dead stick" (engine off) landing, or to eject.

22. HYD/OIL PRESS

Indicates loss of hydraulic oil pressure. You need to land as soon as possible and be sure to check that the gear goes down.

23. DUAL FC and CANOPY

Not used.

24. TO/LDG CONFIG

Takeoff/Landing configuration warning. Illuminates if all of the following conditions are true: altitude is less than 10,000 feet, airspeed is less than 190 knots, rate of descent is greater than 250 feet per minute, and gear is up.

The *left side* of panel has the following lights:

25. MASTER CAUTION

Illuminates after any subsystem failure. See the section on the Aircraft Fault Status MFD mode to determine which system has failed. Press key [M] to turn off the Master Caution light.

26. ALT LOW

Low altitude warning. Illuminates if you are too close to the ground with the gear up.

27. OBS WARNING

Obstruction ahead of aircraft.

When flying at night, we recommend that you switch on the instrument lights (key [L]).

Head Up Display

The Head Up Display (HUD) is mounted centrally above the instrument panel. All HUD modes are selected automatically. You may wish to adjust the contrast of the HUD display for certain light conditions by pressing key [I]. When LANTIRN is fitted you may select night vision mode by pressing key [V].

HUD modes

Weapons unarmed:

NAV	Navigation
ILS	Instrument landing system

Air-to-ground weapon armed:

STRF	Gun
CCIP	Continuously computed impact point

LAY	Laydown bombing
LOFT	Loft bombing
EO	Electro-optical (laser designation)
ARM	Antiradiation missile
RCKT	Rockets

Air-to-air weapon armed:

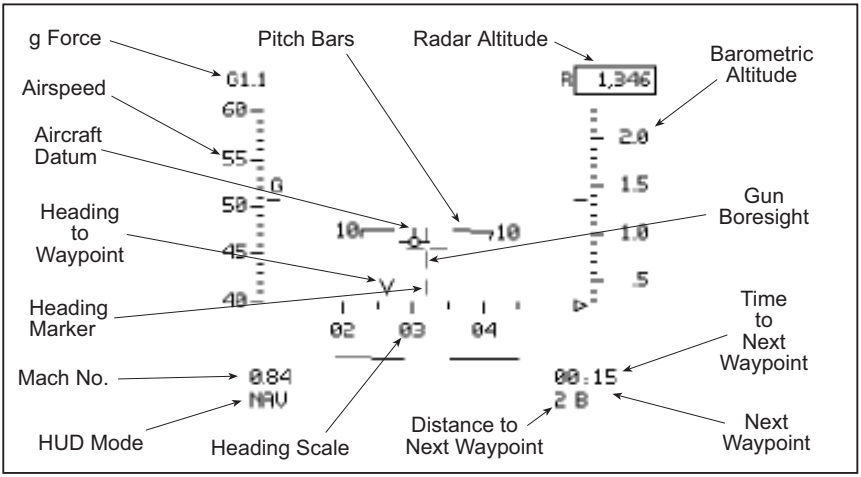
SRM	Short range missile
MRM	Medium range missile
EEGS	Gun

NAV mode

This mode is active whenever weapons are unarmed (press keys Ctrl and ↵Enter) and the gear is up.

Pitch Ladder

Bars showing your aircraft pitch and roll attitude relative to the ground, calibrated every 10 degrees. The bars will always remain parallel with the horizon with their inner ends pointing at the ground. Bars above the horizon are solid; bars below the horizon are broken.



HUD symbology in NAV mode

Heading

At the center of this scale is your current heading. The scale is annotated every 10 degrees (for example, 270 degrees is shown as 27) and calibrated every 5 degrees. A heading of 00 corresponds to your aircraft flying due north.

Waypoint Bearing

The pointer on the heading strip shows the bearing of the next waypoint. If the bearing is off scale, the pointer will remain at full deflection on the appropriate side of the heading strip. When the V is centrally positioned on the heading scale, you are flying directly toward the next waypoint.

Airspeed

The vertical scale on the left side of the HUD shows your indicated airspeed.

Altitude

The outermost vertical scale on the right side of the HUD shows your barometric altitude in thousands of feet (height above sea level). Immediately above the scale is a digital display of your radar altitude (height above the ground).

G force

The present G force acting upon your aircraft is displayed at the top left corner of the HUD. This will vary from 1 (when flying straight and level) to a maximum of 9 (during aggressive maneuvers).

Mach Number

Displayed at the lower left corner of the HUD, your Mach number is your present true airspeed, expressed as a multiple of the speed of sound at your present altitude. The speed of sound decreases from 661 knots at sea level to 573 knots at 36,000 feet and above.

Gun Boresight

Fixed at the center of the HUD is your gun boresight. The position of this symbol relative to the HUD pitch ladder indicates the aircraft's attitude (that is, nose up or down).

Aircraft Datum

This symbol indicates the velocity vector of your aircraft.

In the lower left corner of the HUD:

Mach number

HUD mode, NAV

In the lower right corner of the HUD:

Time to next waypoint

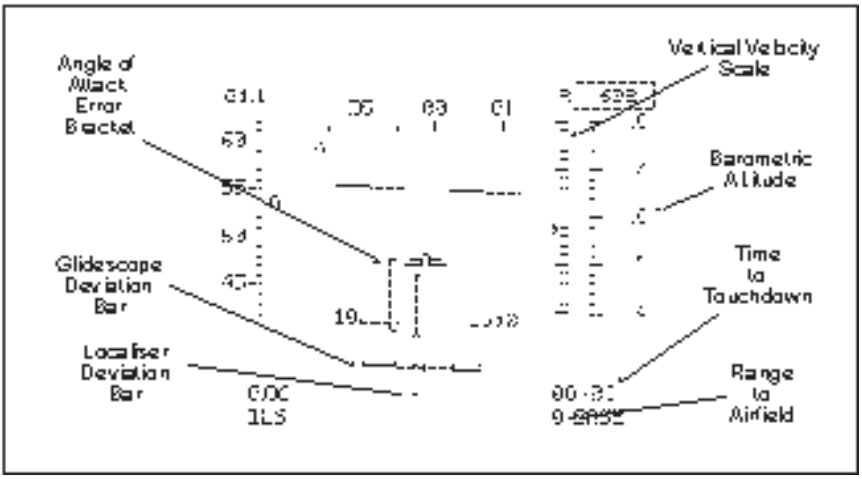
Range to next waypoint, n.m., and waypoint letter

ILS mode (Instrument Landing System)

This mode is activated when the gear is down. The following additional symbology appears in ILS mode.

ILS Deviation Bars

When you are aligned with the runway centerline and descending on the correct glideslope, the deviation bars will be centralized. If you are left of the centerline, the vertical localizer bar will drift to the right and vice versa. If you are above the glideslope, the horizontal glideslope bar will drift down and vice versa. The deviation bars are dashed if you are outside the ILS beam. See chapter 7 for a detailed description of how to use the ILS system.



HUD in ILS mode

Angle of Attack Indicator

When this symbol is central on the aircraft datum symbol, your angle of attack is correct. If the aircraft datum symbol is in the upper half of the AoA indicator, your angle of attack is too low and you need to decrease speed. If the aircraft datum symbol is in the lower half of the AoA indicator, your angle of attack is too high and you need to increase speed.

Vertical Velocity

Adjacent to the altitude scale on the right side of the HUD is the Vertical Velocity scale. The triangular marker rises or falls to indicate your rate of climb or descent. Full scale deflection corresponds to 2,000 feet per minute. At a typical landing weight, your descent rate should be approximately 700 feet per minute.

Command Steering cue

Symbol used for steering guidance into the ILS beam. Turn towards the steering cue until it overlays the aircraft datum symbol. This symbol disappears when you are inside the ILS cone.

See chapter 7 for more information.

In the lower left corner of the HUD:

Mach number

HUD mode, ILS

In the lower right corner of the HUD:

Time to touchdown

Range to next waypoint, n.m.

STRF mode (Strafing)

This mode is activated when the gun is selected for ground target strafing.

Target Designator Box

This is a projection of the ground target position onto the HUD.

Gun Aiming Pipper

Maneuver your aircraft to superimpose the Gun Aiming Pipper and the ground target designator box. Fire your weapon when the range is less than 1 n.m.

In Range Cue

This short horizontal line descends as you approach the target and touches the Gun Aiming Pipper when the target is in range.

In the lower left corner of the HUD:

Number remaining and weapon type

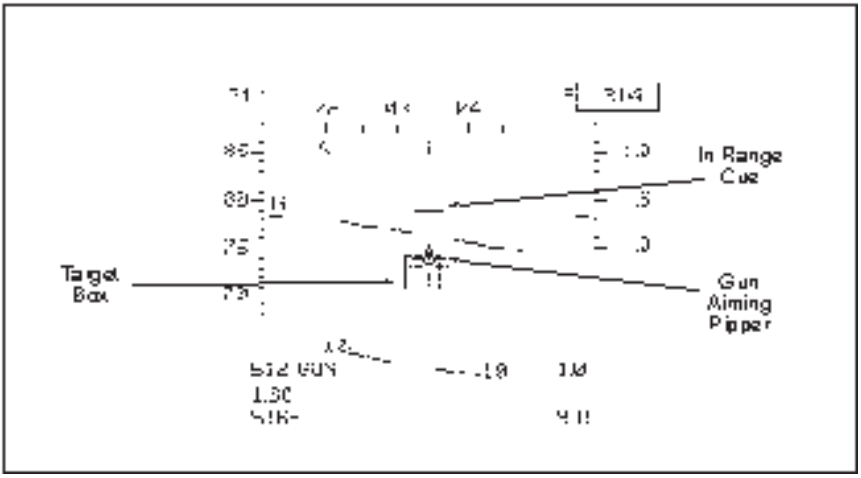
Mach number

HUD mode, STRF

In the lower right corner of the HUD:

Target range in n.m.

Range to next waypoint, n.m., and waypoint letter



HUD in STRF mode

CCIP mode (Continuously Computed Impact Point)

This mode is used for manual aiming and release of freefall unguided bombs, such as the Mk82.

IMPORTANT: The radar must be switched off—if it is not, a ground target will be designated automatically, and bomb release will be computer-controlled. The CCIP mode shows a bomb fall line and computed impact point.

Bomb Fall Line

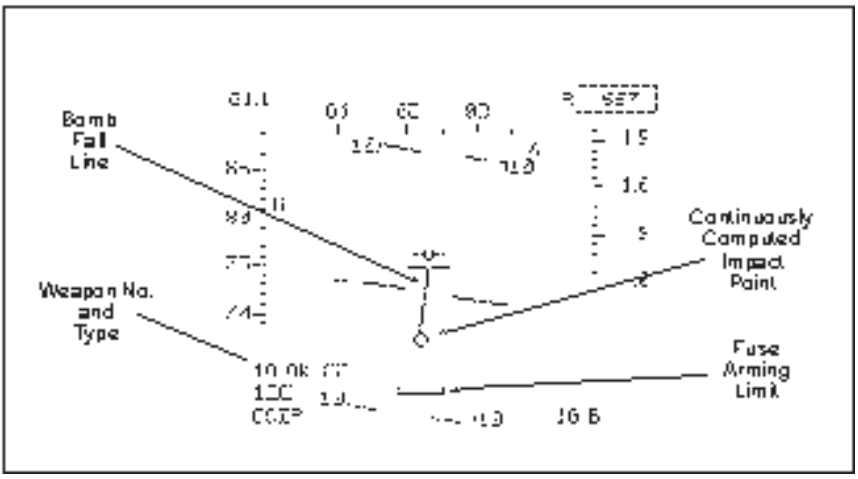
Line extending from the aircraft to the computed impact point of the bomb. This line represents the path of the bomb if released immediately.

Computed Impact Point

The small circle at the end of the bomb fall line depicts the computed impact point.

Fuse Arming Limit

This marker must be below the computed impact point at the time of weapon release; otherwise, you risk damage from bomb debris.



HUD in CCIP mode

In the lower left corner of the HUD:

Number remaining and weapon type

Mach number

HUD mode, CCIP

In the lower right corner of the HUD:

Range to next waypoint, n.m., and waypoint letter

LAY mode (Laydown bombing)

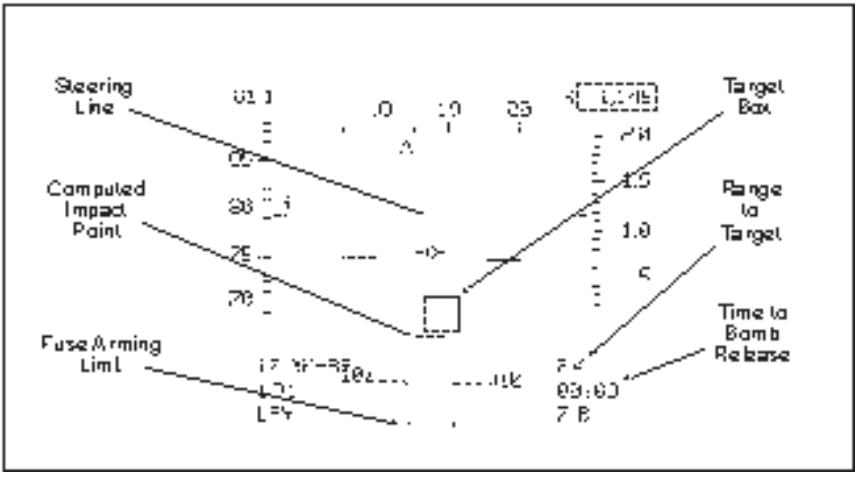
The Laydown attack is suitable for general purpose bombs, retarded bombs, and cluster bombs. When a ground target is designated, either with the radar or the LANTIRN, the HUD mode changes from CCIP to Laydown mode (LAY) to give steering cues for lining up with the target. The pilot commits to weapon release by holding down the Spacebar or joystick fire button. The moment of weapon release is determined automatically.

Approach Path Steering Line

This vertical line must pass through the center of the aircraft datum symbol as the bomb is released. Turn towards the steering line if it is off center.

Target designator box

This is a projection of the ground target position onto the HUD.



HUD in LAY mode

Computed Impact Point

This short horizontal line crosses the Approach Path Steering Line at the computed impact point. This should coincide with the target designator box at the moment of bomb release.

In the lower left corner of the HUD:

Number remaining and weapon type

Mach number

HUD mode, CCIP

In the lower right corner of the HUD:

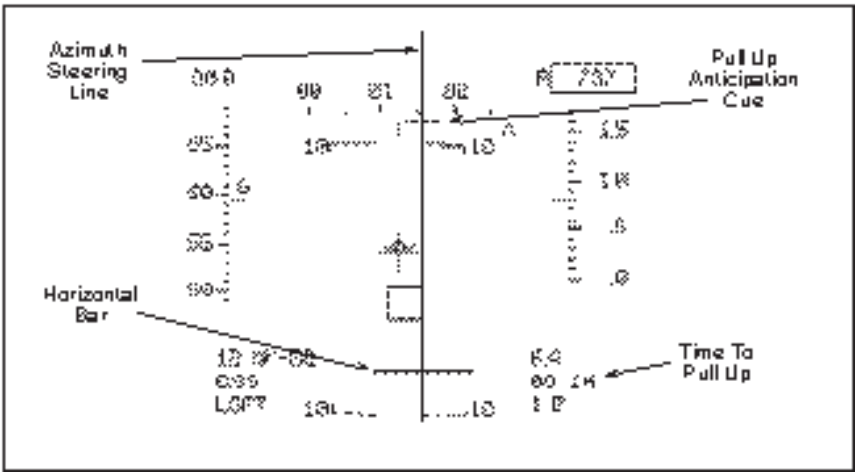
Target range in n.m.

Time to go before weapon release

Range to next waypoint, n.m., and waypoint letter

LOFT mode (Loft bombing)

Select this mode if you are carrying Mk82, Mk83, or Mk84 general purpose bombs. When a ground target is designated, either with the radar or the LANTIRN, the HUD mode changes from CCIP to Laydown mode (LAY) to give steering cues for lining up with the target. Pressing key [↵Enter] once will change the HUD to LOFT



HUD in LOFT mode, stage 1

mode. Symbology on the HUD is presented in two stages: countdown to pull up, and pull up and countdown to weapon release.

Stage 1: Countdown to pull up

Approach Path Steering Line

This vertical line must pass through the aircraft datum symbol as the bomb is released. Turn towards the steering line if it is off center.

Target designator box

This is a projection of the ground target position onto the HUD.

Pull up anticipation cue

The pull up anticipation cue travels down the approach path steering line as the pull up point approaches. The distance between the pull up anticipation cue and the aircraft datum symbol is an indication of the time remaining before commencing the pull up.

Horizontal bar

The horizontal bar travels up the approach path steering line as the pull up point approaches. The distance between the horizontal bar and the aircraft datum symbol is also an indication of the time remaining before commencing the pull up.

In the lower left corner of the HUD:

Number remaining and weapon type

Mach number

HUD mode, LOFT

In the lower right corner of the HUD:

Target range in n.m.

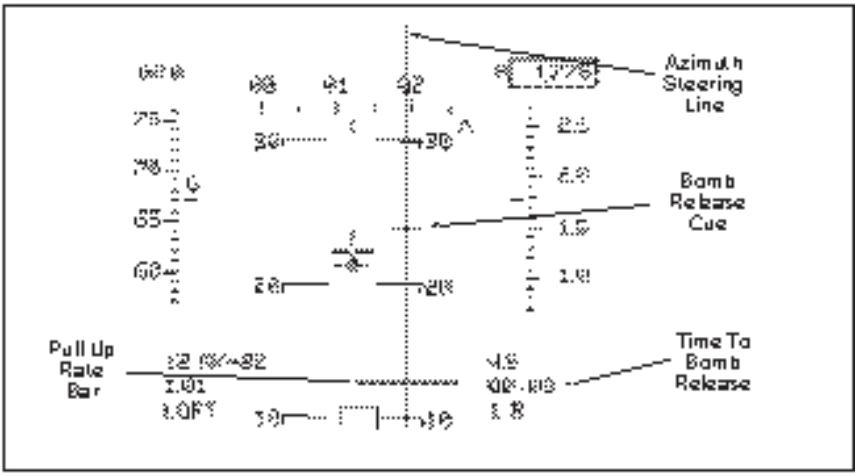
Time to go before pull up

Range to next waypoint, n.m., and waypoint letter

Stage 2: Pull up and countdown to weapon release solution cue

After the pull up point has been reached the pull up anticipation cue is replaced by the bomb release cue at the top of the approach path steering line.

The bomb release cue travels down the approach path steering line as the weapon release point approaches. The distance between the bomb release cue and the aircraft datum symbol is an indication of the time remaining before weapon release.



HUD in LOFT mode, stage 2

Pull up rate bar

The pull up rate bar should coincide with the aircraft datum during pull up. If the pull up rate bar is below the aircraft datum symbol, you are pulling up too quickly. Conversely, if the pull up rate bar is above the aircraft datum symbol, you are pulling up too slowly.

Both the bomb release cue and the Pull up Rate bar disappear to confirm weapon release.

In the lower left corner of the HUD:

Number remaining and weapon type

Mach number

HUD mode, LOFT

In the lower right corner of the HUD:

Target range in n.m.

Time to go before weapon release

Range to next waypoint, n.m., and waypoint letter

EO mode (Electro Optical)

This mode is activated when you arm a guided air-to-ground missile such as the AGM65E.

Weapon Seeker Crosshairs

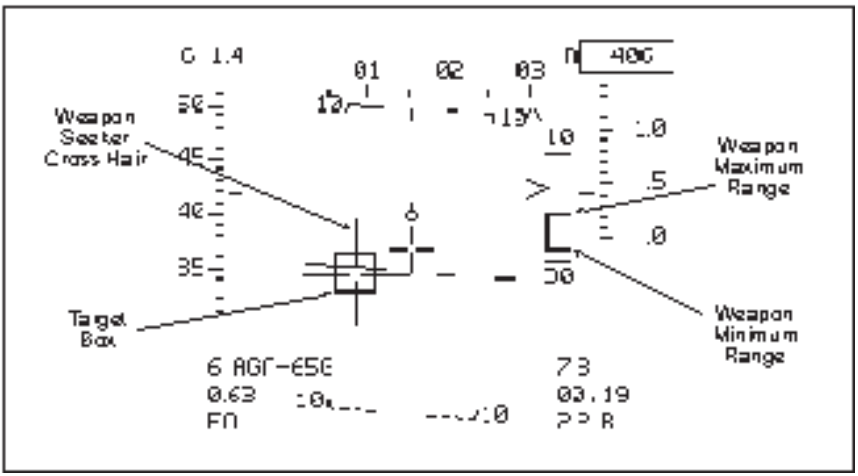
This symbol must overlay the target designator box at the time of weapon release.

Target designator box

This is a projection of the ground target position onto the HUD.

Missile Range Scale

On the right of the HUD display is the Missile Range scale. Currently selected radar range is shown at the top of the scale, and at the lower end is an estimate of missile flight time to target, in seconds.



HUD in EO mode

In the lower left corner of the HUD:

Number remaining and weapon type

Mach number

HUD mode, EO

In the lower right corner of the HUD:

Target range in n.m.

Time to target

Range to next waypoint, n.m., and waypoint letter

ARM mode (Antiradiation missile)

This mode is activated when you select the HARM antiradiation missile. Symbology is identical to EO mode (see above).

RCKT mode (Rockets)

This mode is activated when you select the HYDRA rocket pods. Symbology is similar to STRF mode.

Rocket Boresight

This symbol must overlay the target at the time of weapon release.

A target designator box and missile range scale will also be displayed if a target has been designated.

In the lower left corner of the HUD:

Number remaining and weapon type

Mach number

HUD mode, RCKT

In the lower right corner of the HUD:

Target range in n.m.

Range to next waypoint, n.m., and waypoint letter

SRM mode (Short Range Air-to-Air Missile)

This mode is activated when you arm the short range AIM-9M Sidewinder missiles in preparation for air-to-air combat. The following symbology appears in SRM mode:

Missile Boresight Circle

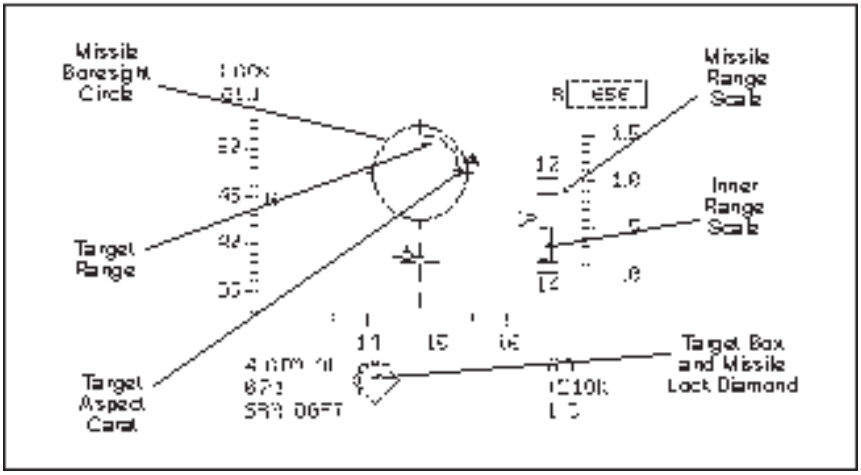
A circular symbol used as a frame of reference for the Target Range Circle and the Target Aspect Caret.

Target Range Circle

A circular scale inside the missile boresight circle, which "unwinds" counterclockwise as range to target decreases. It is calibrated for weapon release when the range marker passes the 3 o'clock position.

Target Aspect Caret

This pointer moves around the missile boresight circle to indicate the aspect of your air target. When the caret is at the 6 o'clock position you are following your target (on his "six"). With the caret at the 12 o'clock position you are approaching your target head on, flying towards each other.



HUD in SRM mode

Missile Range Scale

On the right of the HUD display is the Missile Range scale. Currently selected radar range is shown at the top of the scale and at the lower end is an estimate of missile flight time to target, in seconds. If the target is maneuvering, the inner range scale should be used.

Target Designator Box

This small square indicates where your air target will appear when in visual range.

Seeker Head Diamond

This indicates where the missile seeker head is looking. When the air target has been acquired by the missile, the diamond will coincide with the target designator box.

In the lower left corner of the HUD:

Number remaining and weapon type

Mach number

HUD mode, SRM

In the lower right corner of the HUD:

Target range in n.m.

Target closure (+) or opening (-) rate in knots

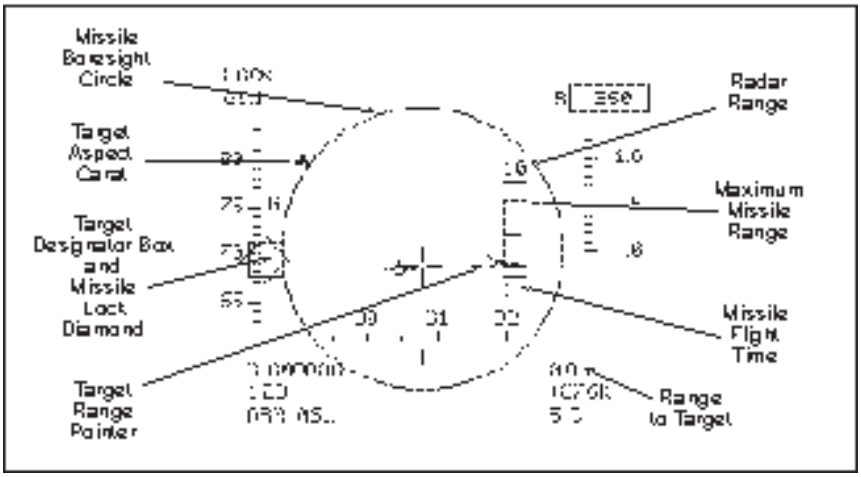
Range to next waypoint, n.m., and waypoint letter

MRM mode (Medium Range Air-to-Air Missile)

This mode is activated when you arm the medium range AIM-120 AMRAAM missiles.

Missile Boresight Circle

Before the missile can lock onto the target, the target designator box must lie within the Missile Boresight Circle. See description of SRM mode above for other symbols.



HUD in MRM mode

In the lower left corner of the HUD:

Number remaining and weapon type

Mach number

HUD mode, MRM

In the lower right corner of the HUD:

Target range in n.m.

Target closure (+) or opening (-) rate in knots

Range to next waypoint, n.m., and waypoint letter

(I) EEGS mode (Enhanced Envelope Gun Sight) for air-to-air guns

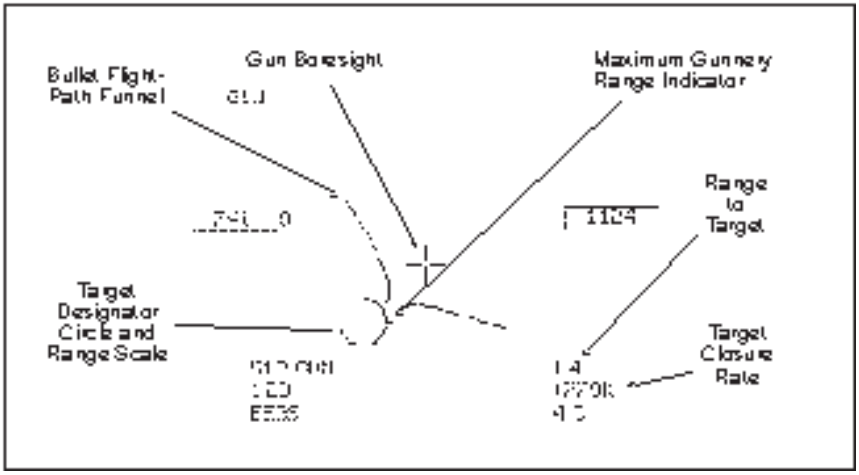
This mode is activated when you select the M61 gun in preparation for air-to-air combat.

Target designator and range circle

Overlays the target position projected onto the HUD. The range circle unwinds anticlockwise from the 12 o'clock position (12,000 ft). Target range should be less than 3,000 ft (indicated by the dot at the 3 o'clock position).

Bullet flight path funnel

Position the target at the narrowest end of the funnel in order to compensate for relative position and velocity of the target.



HUD in EEGS mode

6. Viewing Modes

Internal Cockpit View

Select the forward-looking view from the pilot's cockpit by pressing Home or key F5. You may rotate your view continuously through 90 degrees left or right by pressing keys F1 and F4. The view may be moved up or down with keys F2 and F3. The view is centered by pressing key End. We refer to this feature as our "virtual cockpit."

When carrying LANTIRN pods at night, enhance your view from the cockpit by pressing key V to activate the LANTIRN infrared HUD display.

External Views

Tracking view

Press F6 to view your aircraft from the Tracking viewpoint. Rotate the position of the viewpoint around the aircraft using key Alt together with the cursor keys (or the joystick), zoom in with key >, and zoom out with key <.

Weapon view

Press F7 to view the weapon most recently launched. Rotate and zoom controls are the same as in the Tracking view.

Target view

Press F8 to view an incoming weapon from behind the target.

Target lock view

Press F9 to look towards your locked target from outside your aircraft. When you are heading directly towards your target, you will be viewing yourself from the rear.

Remote view

Press F10 to fix your viewpoint at the current location of your aircraft. The view rotates to track your aircraft as you maneuver.

Spectator view

Press F11 to fix your viewpoint at the current viewpoint location. Rotate and zoom controls are the same as in the Tracking view.

Drone view

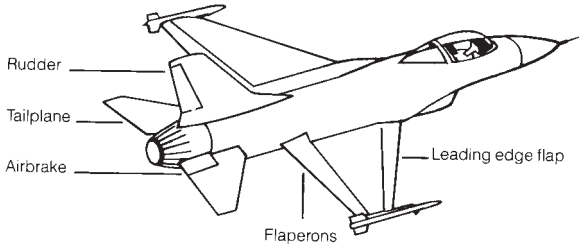
Press F12 to cycle your viewpoint through various computer-controlled "drones." Rotate and zoom controls as above. Press ⇧Shift and F12 to reverse cycle.

When LANTIRN is fitted, press the key V to infrared enhance all external views at night.

7. Flying the F-16

Flight Controls

The F-16's flight controls consist of a sidestick for pitch and roll control, and rudder pedals for yaw control. Unlike conventional controls, hand and foot movement is minimal, and the pilot simply applies control pressure to maneuver the aircraft. The computerized "fly-by-wire" system automatically ensures that the pilot cannot overstress the airframe or execute a maneuver that would lead to a dangerous flight condition (for example, a spin). Let's take a look at the control surfaces:



Airframe & control surfaces

Flaperons—A control surface with the combined function of flaps and ailerons. Pressing left or right on the sidestick will drive these surfaces differentially (one up, one down), and the aircraft rolls in the appropriate direction. Also, depending upon the aircraft's speed and angle of attack, the flaperons operate automatically to change the effective camber of the wing for takeoff, landing, combat, and cruise conditions.

Tailplane—The F-16 has an "all-flying" tailplane, which means the whole control surface rotates. Pulling back on the sidestick moves both tailplane surfaces up in unison, the resulting effect being to pitch the nose of the aircraft upwards. Pushing on the sidestick has the opposite effect. At higher speeds, the tailplane is used for roll control by driving the surfaces differentially in response to lateral sidestick pressure.

Rudder—With the automatic coordination of controls, you will use the rudder pedals infrequently, except for fine heading adjustment during approach to landing. In fact, during extreme maneuvers, the rudder is locked out from the pilot to prevent sideslipping into a spin.

Airbrake—Situated either side of the tail fin, this control is an efficient means of reducing airspeed.

Flying Training

Taxiing

Although your missions begin at the runway threshold and end when you halt on the runway after landing, you can taxi to a different location on the airfield.

Press key + until the rpm reaches 65 to 70 percent. You should now find that your aircraft accelerates gently. Reduce rpm if your speed exceeds 20 knots. You can steer left or right by using rudder controls (keys Z and X). Do not exceed 30 knots if you taxi across the grass; otherwise, extensive gear damage will result. Reduce throttle (press key -) and apply the brakes (key W) when you reach your desired position.

Note: The brakes are on when the W key is held down, and off when the W key is released.

Takeoff

By pressing keys Shift and + you will select maximum dry thrust, or 100 percent rpm. Press keys Shift and + again to select full reheat. As you begin to accelerate down the runway, keep an eye on the airspeed scale on the left side of the HUD. At a typical combat weight, you can begin to pull the stick back at approximately 100 knots (shown as 10 on the airspeed scale). The nose will rise as the aircraft continues to accelerate. Do not pitch up more than about 13 degrees before leaving the ground.

Depending upon your takeoff weight, your F-16 should become airborne at about 150 kts to 160 kts. Watch the altitude scale on the right side of the HUD. As soon as you are airborne, press key G to raise the gear. Make sure that you do this before the aircraft reaches 300 knots, or gear damage will result. Continue your climb

until you have reached a suitable altitude (5,000 feet). Level out by pushing the stick forward, and cancel reheat by pressing keys Shift and -.

As mentioned previously, operation of the flaperons is totally automatic. All you need to remember is to raise the gear before reaching 300 kts and to cancel reheat when you level out.

Maneuvering

Having reached a suitable altitude, try a few gentle turns to get the feel of the aircraft. Remember to keep an eye open for other aircraft as you maneuver. As you bank your aircraft, the G force required to sustain the turn will increase. If you do not pull back on the stick as you roll, your aircraft will slip into the turn and the nose will fall slowly. Gentle back pressure on the stick will sustain the turn, and you will see a corresponding increase in G force at the top left corner of the HUD.

Once you become confident, try a few 360 degree rolls and tight turns. When maneuvering at lower speeds, the angle of attack is automatically limited to 25 degrees. This is the fly-by-wire system preventing the aircraft from approaching conditions where it may stall or spin. Similarly, at higher airspeeds, the pitch rate is automatically limited to prevent overstressing the airframe. The F-16 will allow you to pull up to 9 Gs (provided that your all up weight is less than 27,000 lbs), but don't expect to hold such high positive G force for long or you will black out temporarily, with potentially catastrophic results if you are at low altitude. Pushing on the stick creates negative G force and the effects of this can be even worse. The F-16 is cleared to -3 Gs but sustained negative G force leads to "redout" and loss of consciousness.

During a sustained turn, the wings need to generate extra lift if the aircraft is not to lose altitude. This extra lift is generated by increasing the wing incidence, which in turn creates extra aerodynamic drag. So, in a sustained turn, you will notice that a reduction in speed if you do not compensate by increasing engine thrust.

During air-to-air combat, you will be working hard to get into a suitable position from which you can fire your weapons. Your aircraft's ability to execute tight turns is dependent upon your speed, your altitude, and your aircraft weight. As your speed increases, so will your G capability and maximum turn rate. This

continues until you reach what is referred to as the "corner velocity" where the best values of G, turn rate, and turn radius coincide. For the F-16, this is in the region of 500 kts, but this will vary with aircraft weight. Above this speed, you will suffer a degradation in maneuverability, so don't make the mistake of thundering into a dogfight at supersonic speed—you will suffer the consequences. You must also remember that your maximum sustainable G will decrease at higher altitude.

Approach to landing

A good landing usually follows a good approach. Throughout the exercise of setting up your approach, give yourself plenty of margin for error, and keep flight path corrections small. Save "turning on a dime" for air shows when you've had more practice.

In simulations, landing is probably what causes most pilots the greatest headache. Having achieved your mission objectives and returned to base, there is nothing worse than screwing up the landing. In reality, landing is one of the most demanding tasks to perform well, and it is made even harder when you have the limited field of view of a computer screen.

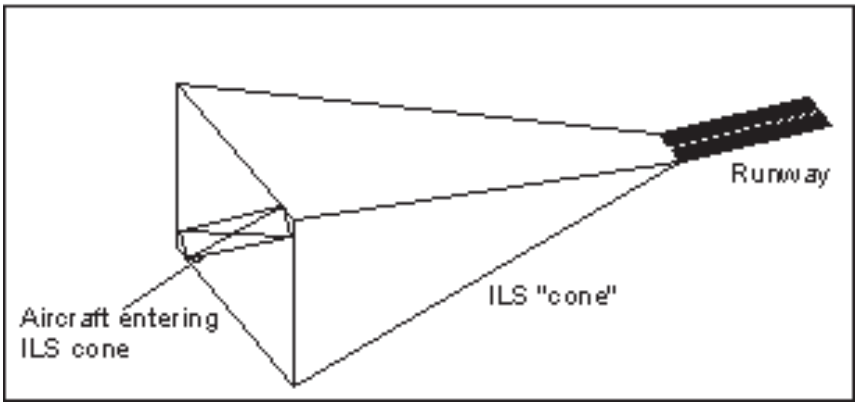
After deciding at which airfield you want to land, press key [7] until the airfield name is confirmed on the message panel. The runway to be used will be confirmed. For example, to the runway 27, you will approach the airfield from the east with a heading of 270. ILS will only be available on the specified runway at the selected airfield.

Using the Instrument Landing System

Provided that you take the time to practice, you should be able to make perfect landings every time.

Your main landing aid is the Instrument Landing System (ILS). Let's take a look at how the ILS system works.

The ILS system consists of two beams transmitted from the runway. The *localizer* beam is oriented vertically to help you line up with the runway centerline, and the *glideslope* beam is oriented horizontally to provide guidance for adjusting your rate of descent during your approach. Together, the beams can be visualized as a wedge shape, or ILS cone. The base of the cone is perpendicular to the ground at approximately 12 miles from the runway, and the



Schematic of ILS cone

apex of the cone is at the touchdown point on the runway. In your aircraft, the two beams are used to drive ILS *deviation bars* on your HUD and Attitude Direction Indicator.

So, how do you position yourself within the ILS cone? In this simulation, only runways oriented north-south or east-west have ILS, and it will be normal practice to land at the airfield from where you took off. If you are following the planned flight route, you will be positioned within the ILS beam as you arrive at the Approach waypoint (the last waypoint before touchdown). If you have departed from the flightplan, select any waypoint on the HUD and rejoin the preplanned route. But what if you want to land at a different airfield?

First, select the frequency of the airfield where you want to land by pressing key [7]. The name of the airfield selected and the active runway will be shown on the data entry panel. If 27 is displayed, you are tuned to the aircraft you selected and runway 27 is to be

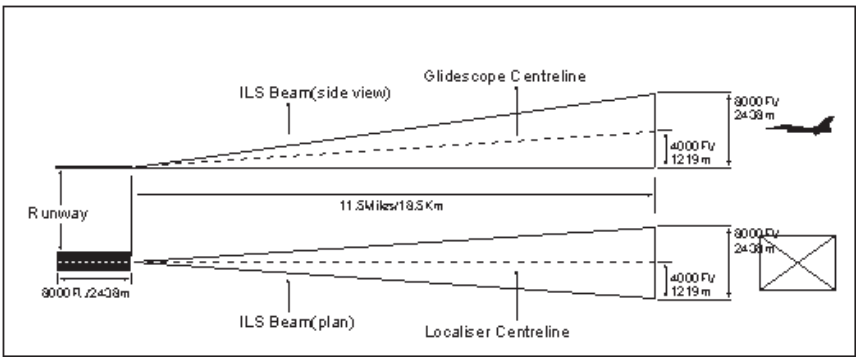
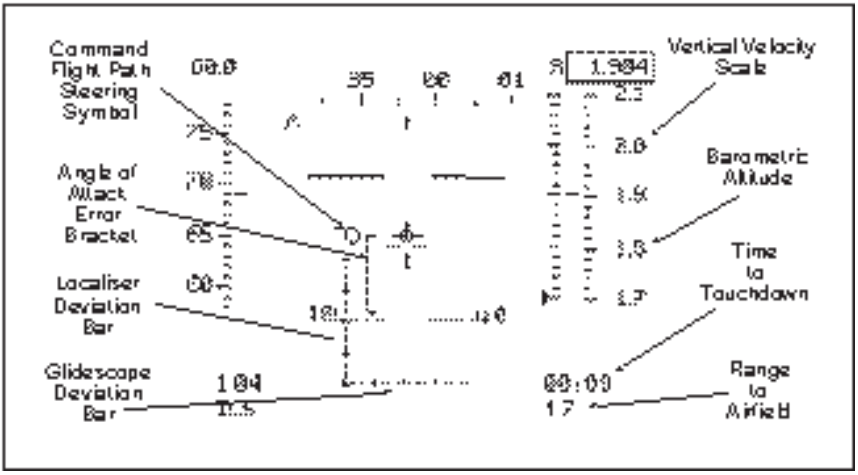


Diagram of ILS System

used. Next, descend to an altitude of approximately 2,000 feet. This corresponds to the glideslope altitude at approximately 7 miles from the runway threshold.

Adjust your speed to approximately 250 kts and lower the gear. Your HUD will now switch to ILS mode, which shows the localizer and glideslope deviation bars. The bars will probably be dashed at first, indicating that you are outside the ILS cone.



HUD in ILS mode with Command Steering cue

When you are within approximately 12 miles of the airfield, you will see the Command Steering cue appear on the HUD. This symbol shows which way you need to turn in order to intercept the ILS cone. In the example given, the steering cue is displaced to the right of the aircraft datum. Turning right until the steering cue overlays the aircraft datum will put you on the correct heading to intercept the ILS cone.

As you fly into the ILS cone you will notice the localizer and glideslope deviation bars change from dashed to solid lines, confirming that the bars are now valid. If you are to the left of the runway centerline, the localizer deviation bar (vertical line) will be displaced to the right, and vice versa. As you continue on your present course, the localizer deviation bar will drift towards the center of the HUD. As it approaches the center mark on the glideslope bar (horizontal line), you should turn to line up with the runway centerline; for example, heading 270 if landing on runway 27. If the localizer bar drifts from center, you should turn a few

degrees in the direction of the offset, hold that course until the bar returns to center, then turn to line up again with the runway. In our example using runway 27, if you are displaced to the right of the centerline you should turn left a few degrees (to say 265), wait for the localizer to become central, then turn back onto heading 270 degrees. Corrections should be smooth, and control inputs small.

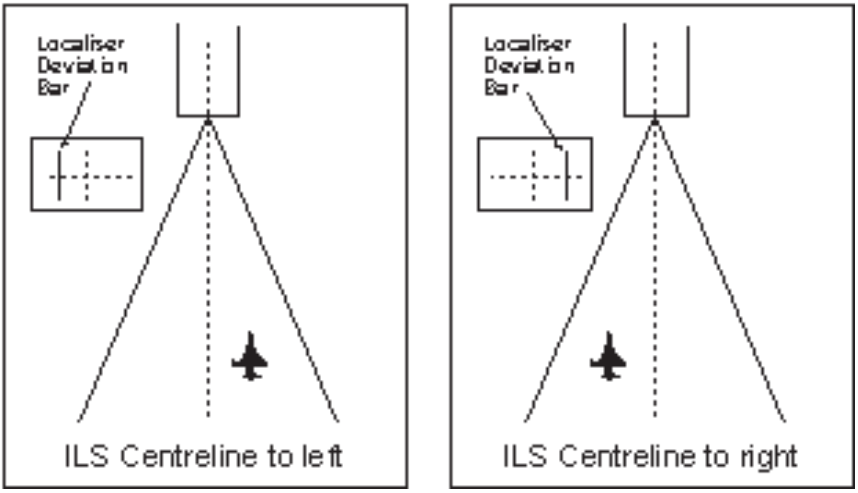


Diagram showing approach to runway and ILS display at each stage

Now, we must consider the glideslope. It is important to understand that your aircraft must be descending steadily in order to remain on the glideslope. If your aircraft is below the glideslope (shown by the glideslope deviation bar being above the center of the localizer bar), maintain your present altitude as you continue your approach, and you will eventually intercept the glideslope. You must now begin your descent in order to remain on the glideslope. If you are above the glideslope, (shown by the glideslope deviation bar being below the center of the localizer bar), you need to increase your rate of descent until you see the glideslope bar rising. As it approaches the center mark on the localizer bar, decrease your rate of descent slightly.

By keeping the localizer and glideslope indicators centered you will be flying an ideal approach for a touchdown just beyond the runway threshold. During the last few seconds before touchdown, it is better to ignore the ILS display and judge your touchdown visually. Errors are magnified just before touchdown because the ILS transmitter is not actually in the middle of the runway.

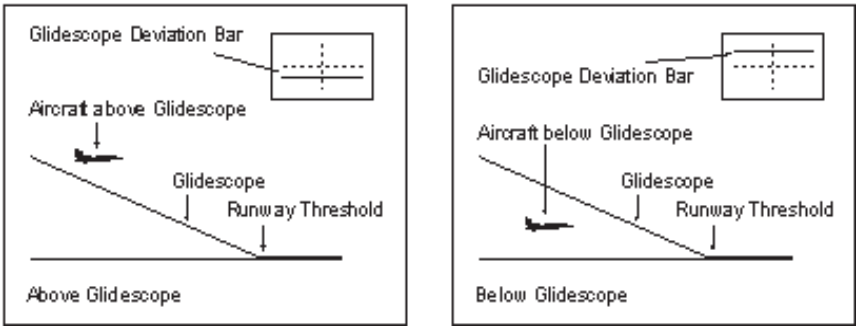


Diagram showing above and glideslope

During the approach, your speed should be between 120 knots and 160 knots, your pitch attitude approximately 10 degrees nose up, and your rate of descent should be between 640 and 850 feet per minute. Throttle setting will probably be around 75 percent. However, all of these figures will depend upon your aircraft weight. In practice, an F-16 pilot is more interested in the angle of attack (AoA) than the actual speed or pitch angle. To the left of the HUD is the AoA indexer that the pilot will be monitoring while looking ahead to the runway. It is normal practice to execute the approach at 13 degrees AoA. When this condition is met, the center of the AoA indexer is illuminated. If the AoA is too low, the approach speed is too high and the up arrow will illuminate. If the AoA is too high this means that the approach speed is too low and the down arrow will illuminate.

It is normal to adjust your rate of descent by using the throttle and to adjust your speed by raising or lowering the nose of the aircraft. This may seem incorrect if you are not familiar with landing an aircraft, but this technique is actually easier than the reverse. For example:

AoA correct but you are below the glideslope:

> Increase the engine rpm three or four percent. As your airspeed begins to increase, raise the nose slightly to hold the correct speed. The result is that you will be descending more slowly but still at the correct speed. As you intercept the glideslope, decrease the engine rpm one or two per cent and lower the nose very slightly.

AoA correct but you are above the glideslope:

Reduce engine rpm slightly. Lower the nose of the aircraft as the airspeed drops in order to maintain speed. The result is that you will be descending more quickly but at the same speed.

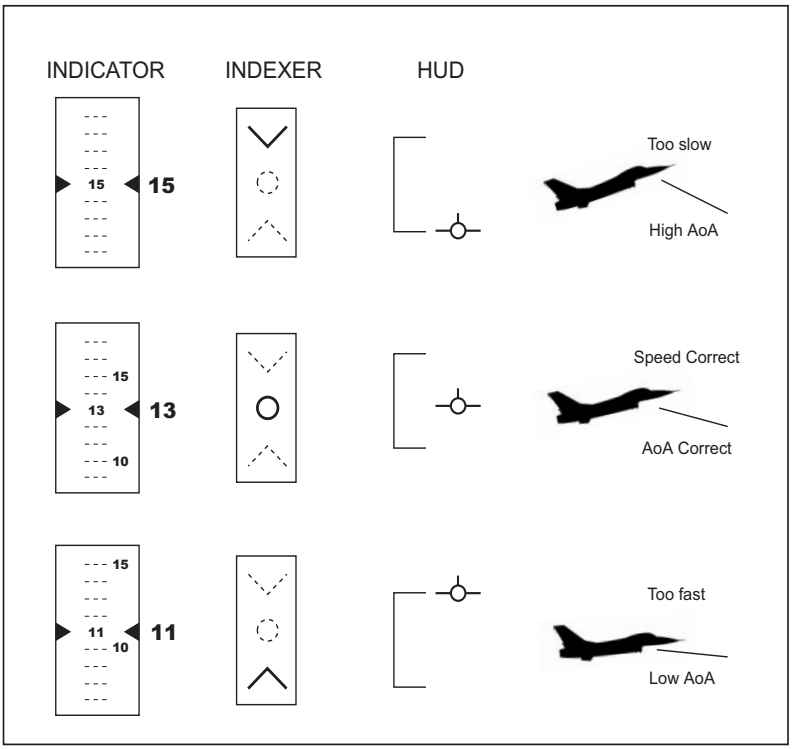
On the glideslope but AoA high:

Lower the nose slightly. As the speed reaches the desired figure, raise the nose again a little.

On the glideslope but AoA low:

Raise the nose a little until the speed starts to fall. Lower the nose very slightly when the desired speed has been attained.

In the final few seconds before touchdown it is best to focus your attention on the runway. As you descend to 50 feet, pull back on the stick gently to raise the nose of the aircraft a little, and touch down



Flight manual showing F16 and AoA indexer

with a descent rate of less than 300 feet per minute. Close the throttle as soon as you touchdown (press keys Shift and - together) and apply the wheel brakes by pressing and holding key W. Use rudder control to steer the aircraft. Be prepared to taxi off the runway immediately if other aircraft are on the approach.

Emergency procedures

Airbrake failure

Your airbrake may fail as a result of combat damage. If it fails in the closed position, allow more time to decelerate as you rejoin the airfield circuit prior to landing. If it fails in the open position, you will require a higher engine rpm to overcome the extra drag.

Flap failure

If you incur flap failure as a result of combat damage, you must execute your approach and landing at a higher angle of attack or a higher speed.

Gear failure

If you exceed 300 kts with the gear down, gear damage occurs, and you will not be able to raise the gear. The consequences of this are reduced aircraft performance and control rates. If the gear fails in the closed position, your options are to execute a gear-up landing or eject. If you decide to eject, make sure it is over allied territory. If you decide to stick with your aircraft, your descent rate at touchdown should be less than 200 feet per minute for you to survive a controlled crash.

Engine damage

If you incur engine damage as a result of combat, you will immediately experience a degradation in thrust. The engine will probably fail completely. Your best option is to land as soon as possible at the nearest allied airfield or to eject.

Fire

If you suffer an engine fire, you have a very limited time in which to activate the fire extinguisher and limit the damage to a partial loss of thrust. If the fire starts again, your options are to eject (press

keys Ctrl and E together), or shut down the engine (keys Shift and - together, at least twice). You will then be faced with executing a "dead stick" landing. The procedure is described below.

Cockpit pressurization

Loss of cockpit pressurization will eventually lead to oxygen failure. You are advised to reduce altitude to less than 12,000 feet.

Hydraulic system failure

The effects of hydraulic failure are a reduction in control effectiveness and the possibility of the gear not functioning. The chances of this happening increase with time as pressure in the hydraulic system is lost.

Oxygen failure

Flying above 12,000 feet will lead to hypoxia (lack of oxygen to the brain) and ultimately loss of consciousness. The amount of time to before you black out will vary with altitude.

Main generator failure

If you incur failure of the main electrical generator, there will be a momentary loss of control, followed by normal operation for a limited period of time before the auxiliary power unit dies. Fortunately, the ejection seat will still be functional.

Ejection

If you are faced with the decision whether or not to eject, first make sure that you are over allied territory. If you are not, there is very little chance of surviving.

"Dead stick" landing

If you lose your one and only engine your first action must be to jettison all external weapons (keys Alt and J together). Having minimized your weight, you can start to think about how to get down in one piece. Look around for a suitable airfield or road and start a gentle turn.

For a fixed wing fighter, the F-16 is pretty efficient at gliding, with a typical altitude loss of 750 feet for every nautical mile flown. Adopting a slightly nose down attitude, maintain an indicated airspeed of 170 kts to give an optimum glidepath. Your descent rate should be about 2,200 feet per minute. Do not put your gear down yet—you cannot afford the extra aerodynamic drag. As you descend through 250 feet lower your gear. Five seconds to touchdown…

As you pass 100 feet, pull gently on the stick to reduce your rate of descent to less than 600 feet per minute. Touch down with about 10 degrees nose up pitch. With practice, you will be able to execute this maneuver safely and with confidence. You can simulate an engine failure by throttling back to idle rpm and using the landing practice training mission.

8. Weapons

Air-to-air	HUD name	HUD mode
AIM-9M Sidewinder	AIM9M	SRM
AIM-120 AMRAAM	AIM120	MRM
Internal M61 20mm gun	GUN	EEGS
External 30mm cannon pod	GEPOD	EEGS
Air-to-ground		
M151 high explosive rocket	M151	RCKT
M247 antitank rocket	M247	RCKT
AGM-65E laser-guided Maverick	AGM65E	EO
AGM-65G IIR Maverick missile	AGM65G	EO
AGM-88A HARM antiradiation missile	AGM88A	ARM
CBU-15 Durandal antirunway bomb	DUR	CCIP
Mk82 500 lb general purpose bomb	MK82	CCIP, LAY or LOFT
Mk83 1000 lb general purpose bomb	MK83	CCIP, LAY or LOFT
Mk84 2000 lb general purpose bomb	MK84	CCIP, LAY or LOFT
Mk82 RET 500 lb retarded bomb	MK82 RET	CCIP, LAY or LOFT
Mk83 RET 1000 lb retarded bomb	MK83 RET	CCIP, LAY or LOFT
Mk84 RET 2000 lb retarded bomb	MK84 RET	CCIP, LAY or LOFT
GBU12 500 lb laser-guided bomb	GBU12	CCIP, EO
GBU16 1000 lb laser-guided bomb	GBU16	CCIP, EO
GBU10 2000 lb laser-guided bomb	GBU10	CCIP, EO
CBU-87B cluster bomb	CBU87B	CCIP, LAY
CBU-89B mine dispenser	CBU89B	CCIP, LAY
Internal 20mm gun	GUN	STRF
External 30mm cannon pod	GEPOD	STRF

The F-16 Fighting Falcon is capable of carrying a wide variety of weapons. Familiarize yourself with the strengths and limitations of each weapon and the relevant delivery techniques.

Your aircraft will be loaded with appropriate weapons before each mission. If you want to view or change the weapon load before takeoff, enable the Mission Planner (see Preferences in chapter 3). You can then access the payload screen by clicking on the **Pay** button in the Map Tool Box (see chapter 4, Mission Planner).

During flight, you can display your weapon load on either MFD by selecting the Weapon Management mode (press key [[ ] or [ ]] to cycle through MFD modes). Use key [↵Enter] to cycle through your weapon load.

IMPORTANT: When the radar is switched on, key [↵Enter] will cycle through air-to-air weapons *or* air-to-ground weapons, depending upon the radar mode. Toggle between air radar and ground radar by pressing key [Pg Dn]. Use [Spacebar] to fire a weapon. Weapons cannot be fired when you are on the ground.

Other equipment:

LANTIRN navigation and targeting pods

ALQ-131 ECM pod

Reconnaissance pod

External fuel tanks

Chaff and flares

Weapon Types

Guns

Internal M61 20mm gun

This weapon is used for both air-to-air combat and for ground attack against unarmored targets. Mounted internally on the port side, this six-barrel high velocity gun can be used in either free fire mode or in conjunction with the weapon aiming computer. The rate of fire is 6,000 rounds per minute, and the ammunition drum holds 512 rounds, giving just over 5 seconds of use. The gun is always fully reloaded prior to takeoff.

External 30mm cannon pod (GEPOD)

This weapon can be used for air-to-air combat, although its primary use is for ground attack. With a 30mm caliber and a fire rate of 2,400 rounds per minute, this is a very capable antitank weapon. The pod carries a maximum of 353 rounds.

Air-to-air missiles

AIM-9M Sidewinder

This short range all-aspect missile has an infrared guidance system, a top speed of Mach 2.5, and a maximum range of 11 n.m. These missiles are usually carried on the wing tips.

AIM-120 AMRAAM

This medium range missile uses its own active radar seeker in the final stage of flight. It has a maximum speed of Mach 4, and a quoted range of 40 miles in a head-on attack and 12 miles for a stern attack. Although heavier than the AIM-9M, these missiles can also be carried on the wing tips.

Air-to-ground missiles

LAU-3A rocket pod

This pod holds nineteen Mk66 2.75in. Hydra 70 rockets. Effective range is from 0.25 n.m. to 4.75 n.m., although accuracy is poor at long range because the weapon is unguided and will be affected by wind and gravity. Two types of warhead are implemented:

M151 High explosive warhead

M247 Antitank warhead

Maverick missile

Two types of Maverick missiles are available:

Laser-guided AGM-65E

The AGM-65E version uses a laser tracker, allowing target designation by ground infantry, other aircraft, or by the launch aircraft. Laser guidance gives this weapon incredible accuracy (less than 5 feet), and it is less susceptible to countermeasures than its infrared equivalent. The 300 lb warhead makes it an effective weapon against a wide variety of targets. Unless the

target is being laser-designated by ground troops or another aircraft, the launch aircraft must continue to fly towards the target until the missile reaches the target.

Imaging Infrared (IIR) AGM-65G

The IIR AGM-65G is the latest version of this air-to-ground missile with infrared guidance. It can be used to destroy hardened tactical targets such as bunkers and aircraft shelters, as well as tanks and other armored vehicles. Unlike the laser-guided Maverick, the infrared version is "fire and forget" (that is, the pilot can turn away from the target as soon as the weapon is launched.

Range for both types: approximately 3 miles without LANTIRN, 10 miles with LANTIRN (see below for description of LANTIRN system).

AGM-88A HARM AntiRadiation Missile

This missile is designed for use against ground transmitters such as tracking radars. The weapon has its own broadband seeker head capable of detecting all radars likely to be encountered. The missile will continue to home in on its target even if the transmitter is shut down. Maximum speed is in excess of Mach 3, and effective range is quoted as over 40 miles.

Bombs

CBU-15 Durandal

Designed specifically as an antirunway weapon, the Durandal can be released down to 200 feet at speeds between 350 knots and 550 knots. After release, the bomb deploys a brake chute, which pitches the nose down. Having reached the desired angle of descent, the chute is released and a thrust rocket motor ignited. This accelerates the weapon to a speed at which the forged steel warhead can penetrate up to 15.75 inches of concrete. After a one second delay, the warhead detonates under the runway, resulting in extensive damage.

The objective is to drop several Durandal bombs in quick succession along the length of the runway, and, for maximum effectiveness, one at the intersection of two runways. For this reason, the weapon should be released using the "manual" delivery technique.

Mk82 500 lb General Purpose Bomb

This unguided iron bomb is effective against light armored vehicles and small buildings. By fitting it with a BSU-49B tail fin, it can be converted into a retarded bomb (MK82 RET) for low level, high speed delivery. It can also be fitted with the Paveway II laser seeker nose, converting it into a laser-guided weapon, designated GBU12.

Mk83 1000 lb General Purpose Bomb

This unguided iron bomb is effective against a wide variety of targets including larger buildings, bridges, and industrial sites. By fitting it with a MAU-91A/B tail fin, it can be converted into a retarded bomb (MK83 RET) for low level, high speed delivery. It can also be fitted with the Paveway II laser seeker nose, converting it into a laser-guided weapon, designated GBU16.

Mk84 2000 lb General Purpose Bomb

This unguided general purpose bomb should be used against hardened aircraft shelters, bunkers, power stations, and other well protected targets. By fitting it with a BSU-50B tail fin, it can be converted into a retarded bomb (MK84 RET) for low level, high speed delivery. It can also be fitted with the Paveway II laser seeker nose, converting it into a laser-guided weapon, designated GBU10.

Cluster Bombs

CBU-87B Combined Effects Munition

This multiweapon dispenser is designed for use against armor, vehicles, personnel, and supplies. The weapon can be used at any altitude over 200 feet and at speeds up to 700 kts.

During the bomb's descent it spins up to 2,500 rpm, setting a dispersal pattern for 202 bomblets that are released by the ground proximity detector. The impact area will vary according to aircraft speed at the time of weapon release.

CBU-89B

This is a 700 lb mine dispenser containing 72 BLU-91/B antitank mines and 22 BLU-92/B antipersonnel bomblets. The weapon can be released at any altitude above 200 feet. The submunitions are armed upon hitting the ground.

How to use each weapon

There are several training missions designed specifically to illustrate how each weapon is used. Take time to complete each training mission—chances are you'll stay alive a lot longer when it comes to combat.

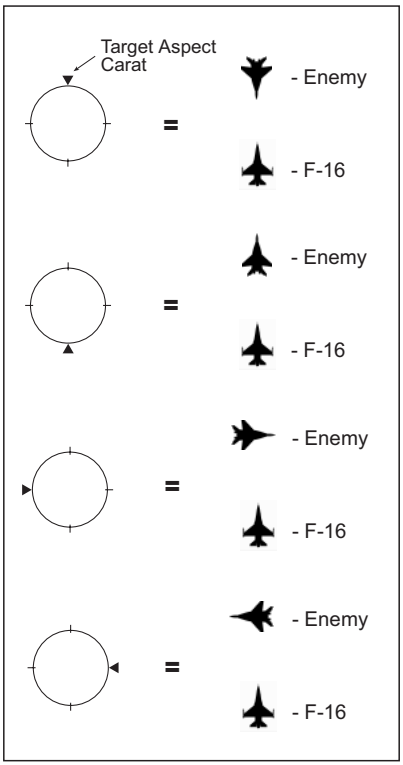
Press key [↵Enter] to select and arm weapons. Remember that if the radar is on, pressing [↵Enter] will cycle through air-to-air weapons *or* air-to-ground weapons depending upon whether the radar is in air mode or ground mode. Press key [Pg Dn] to toggle between air and ground radar mode. Press keys [Ctrl] and [↵Enter] to unarm weapons.

Air-to-air missiles

AIM-9M Sidewinder

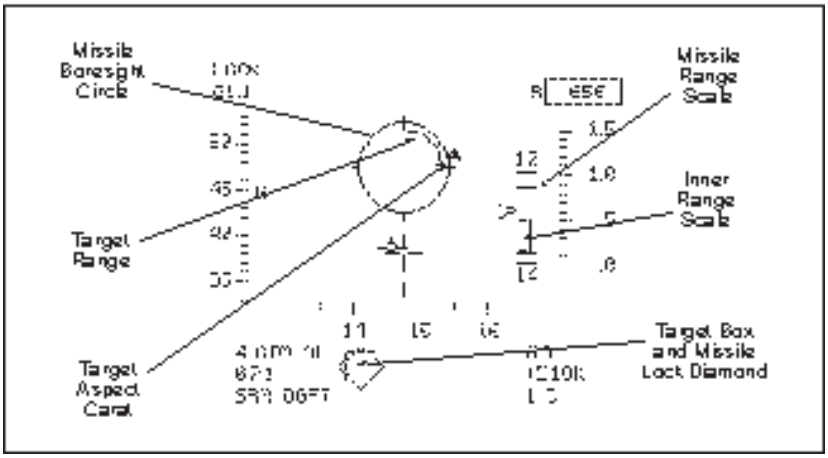
Press key [↵Enter] repeatedly until selection of weapon AIM9 is confirmed on the HUD. The HUD will now be in SRM mode with the Sidewinders selected and armed. Switch on the radar (key [R]) if it is not already on. The radar will now be in Track While Scan (TWS) mode and will automatically designate a target, if available. The target designator box will appear on the HUD at the position where the target will appear as it comes within visual range.

You should now consider the aspect of the target (that is, in which direction is the target flying relative to yourself). Look for the target aspect caret on the circumference of the missile boresight circle. If the caret is at 12 o'clock, you are flying head on towards your target. Be prepared for him to launch a missile in this case! With the caret at 6 o'clock you are following your target (on



Head on approach vs. tail on approach & caret position

its “six”). If the caret is at 3 or 9 o’clock, the target is flying across your field of view in the direction in which the caret is pointing. Although the AIM-9M is an “all-aspect” version of the Sidewinder, a head-on or tail-on shot is always preferable because the missile will find it easier to track the target.



HUD in SRM mode

Make sure that the closing speed, shown in the lower right corner of the HUD, is positive. This means that you are getting closer to the target. As the range to target decreases you will see the target range circle unwind counterclockwise. When it passes the 3 o’clock position, your missile is within its optimum range. With the radar active, the seeker head of the weapon is slaved to the radar, and the seeker head diamond will superimpose the target designator box. When the missile confirms IN RANGE on the HUD, you can press the Spacebar to release the missile. You can turn away from the target immediately after weapon release.

For your next target, press key K (for Kill) to select Combat Mode. This simultaneously switches the air-to-air radar on, selects Air Combat mode (ACM) on an MFD, and arms air-to-air missiles. If you get intercepted by fighters, this is the quickest way to respond. Target acquisition and tracking is automatic as before. Release your weapon when the target is at a suitable aspect and range.

AIM-120 AMRAAM

Press key [↵Enter] repeatedly until selection of weapon AIM-120 is confirmed on the HUD. The HUD will now be in Medium Range Air-to-Air Missile (MRM) mode with the AMRAAM missiles selected and armed.

The procedure for launching an AIM-120 AMRAAM is very similar to the AIM-9M Sidewinder. The missile boresight circle for the AIM-120 is much larger. You need to ensure that the target designator box lies within the boresight circle before launching your weapon. The advantage of using an AIM-120 is its superior range compared to the AIM-9M. However, it is a much heavier missile and far more expensive.

Missile effective range

Most air-to-air missiles are powered by solid-fuel rockets, which provide only a few seconds of thrust. Thereafter, the missile coasts, slowing down due to aerodynamic drag and the effects of gravity. Air density decreases as altitude increases, so a missile's range will increase with altitude due to lower drag. At sea level, where the air density is relatively high, a missile's effective range is considerably shorter. Another major factor to consider is the aspect of the target. If your engagement is head on, then your missile and the target will be flying towards each other, effectively increasing the missile's range. However, if your target is retreating, the opposite is true. If the target is crossing your field of view, the missile will have to maneuver continuously to track the target, slowing down due to the additional aerodynamic drag. To summarize, the effective range of a missile varies with its launch altitude and the aspect and speed of the target. We have quoted approximately 30 miles range for the AIM-120 and 11 miles for the AIM-9M. These figures should probably be halved at sea level and reduced even further if your target is retreating.

Air-to-ground missiles

AGM-65E laser-guided Maverick

Press key [↵Enter] repeatedly until selection of weapon AGM65E is confirmed on the HUD. The HUD will now be in Electro-Optical (EO) mode with the laser-guided Maverick missiles selected and armed. Targets can be designated by using the air-to-ground radar in

conjunction with LANTIRN, by using the LANTIRN target designator on its own, or by using or laser designation from an external source such as ground troops. Effective range is approximately 10 miles.

Using the ground radar to designate a target

This is the simplest method because targets are acquired automatically by the ground radar. Switch the radar on (key R), and select Fixed Target Track (FTT) mode (key R). If you are approaching a target waypoint, the radar will give priority to preplanned targets. To view the target, select LANTIRN FLIR mode on the other MFD to see an infrared image from the LANTIRN targeting pod. On the right of the HUD, you will see the target range scale and estimated missile flight time. The laser designator will be slaved to the ground radar, and it will already be illuminating the target. Weapon LOCK and IN RANGE cues will appear on the HUD. Press Spacebar to launch your weapon. Once the weapon is launched, your radar will automatically switch to the next suitable target. After a few seconds, you can launch another Maverick. This will fly initially towards the previous target, but as soon as that target is destroyed, the laser designator will lock onto the new target being tracked by the radar, thereby redirecting the second Maverick. You can "ripple fire" Mavericks in this manner and strike several targets on a single pass of the target area.

Using the LANTIRN FLIR/laser designator without radar

To avoid detection by enemy defenses, you can approach the target area with the radar switched off and rely upon LANTIRN to designate targets.

If the target is a vehicle then you should select the automatic FLIR mode (FLIR AUTO). This gives automatic recognition and designation of ground vehicle targets. It is used primarily for ripple firing of Maverick missiles against armored vehicles. The view may be zoomed with keys < and >, provided that the display is selected as current (press key A if CUR is not on the display). You can cycle through available targets by pressing Backspace. Range to target is given at the top right corner of the display. Press Spacebar to launch your weapon. Allow a few seconds before launching the next Maverick. It is not necessary to wait for the previous Maverick to reach its target. As soon as the target is destroyed, LANTIRN will point the laser designator at the next target and the second missile will change course accordingly. You can ripple fire Mavericks in this

way, provided that you allow few seconds between each launch. However, you must continue flying towards the target area until all weapons launched have reached their target.

If the target is not a vehicle, you will need to use the manual FLIR mode (FLIR MAN). This mode is used primarily for laser-guided bombs, but if you want to use laser-guided Mavericks to destroy targets other than vehicles, use the manual FLIR mode. Zoom the views using keys [<] and [>], and steer laterally and vertically using the [Alt] key together with cursor keys (or the joystick). Once you have the target area inside the target designator box, press key [Alt] and [Spacebar] (or the joystick fire button) to lock the sight. You can zoom a little nearer to the target and make fine adjustment to the sight position. Range information is presented on the MFD display. Estimated time to impact is displayed below the range scale on the HUD. Press [Spacebar] to launch your weapon. As soon as the missile has reached its target, you can steer the Target Designator sight onto a new target if time is available.

Laser designation by ground troops

If you are not carrying LANTIRN, you will need assistance from ground troops in order to use laser-guided Mavericks. In a coordinated attack, the ground forces will illuminate the required target with a laser designator. Make sure that your radar is switched off, or it will designate its own choice of target. As you approach the target area, arm the AGM65E Maverick, and target LOCK will be confirmed in the HUD as soon as the weapon detects the laser beam. When the weapon confirms IN RANGE on the HUD, press [Spacebar] to launch weapon.

AGM-65G IR-guided Maverick

Press key [↵Enter] repeatedly until selection of weapon AGM65G is confirmed on the HUD. The HUD will now be in EO mode with the IR-guided Maverick missiles selected and armed. Targets can be designated using radar, LANTIRN, or the seeker head in the missile itself.

Using the ground radar to designate a target

This is an easy method to use because targets are acquired automatically by the ground radar. Switch the radar on (key [R]) and select Fixed Target Track FTT (key [D]). If you are approaching a target waypoint, the radar will give priority to preplanned targets. To view an infrared image of the target on one of your MFDs, select

LANTIRN FLIR mode if you are carrying LANTIRN, or select the Maverick seeker head view (MAV) if you are not carrying LANTIRN. On the right of the HUD, you will see the target range scale and estimated missile flight time. The weapon will be slaved to the ground radar. Weapon LOCK and IN RANGE cues will appear on the HUD. Press Spacebar to launch your weapon. Once the weapon is launched, your radar will automatically switch to the next suitable target and you can launch the next Maverick immediately. You can ripple fire Mavericks in this manner and strike several targets on a single pass of the target area.

Using LANTIRN FLIR to designate a target without radar

The method of operation is very similar to the description for AGM-65E ("Using the LANTIRN FLIR/laser designator"). Both manual and automatic modes of the FLIR can be used. One important advantage of the infrared Maverick is that it is fire-and-forget. It is not necessary to wait a few seconds between launches, because each Maverick is launched at a different target. As soon as the last weapon has been launched, you can turn away from the target area.

Using the IR seeker in the weapon to designate a target

If you are not carrying LANTIRN, you can designate targets by using the image from the IR seeker head in the missile itself. The view has a fixed magnification. When selecting the MFD mode, the display will show MAV instead of FLIR.

Hydra 70 rockets

Press key ↵Enter repeatedly until selection of weapon M151 or M247 is confirmed on the HUD. The HUD will now be in RCKT mode with the Hydra rockets selected and armed.

If you do not want to designate a target with the radar or laser designator, enter a shallow dive, place the rocket aiming sight over your chosen target, and open fire when the estimated range is less than three miles. In practice, it is difficult to use rockets with any accuracy at ranges over 0.5 n.m.

If you choose to designate a target using either the ground radar or the laser designator, you will see the target designator box and target range information on the HUD. Overlay the rocket sight with the target designator prior to launching the weapon.

AGM-88A HARM

Press key [↵Enter] repeatedly until selection of weapon AGM88A is confirmed on the HUD. The HUD will now be in ARM mode with the HARM missiles selected and armed.

Because this missile contains its own broadband seeker head, it is unnecessary to use the ground radar to designate suitable targets. The weapon operates in conjunction with your Threat Warning Azimuth Indicator, automatically locking on to the transmitting radar and identifying the source for the pilot. If there are several transmitters, such as SAM and AAA defenses adjacent to an Early Warning Radar site, then you can cycle through the threats on your Threat Warning display using key [Backspace].

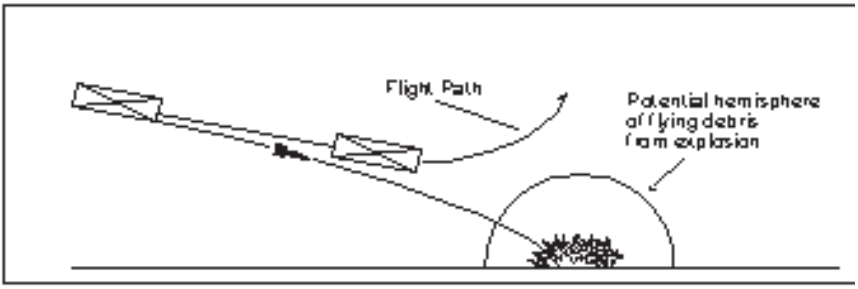
Once the weapon detects a transmitter, the weapon seeker crosshairs on the HUD will move to overlay the target, and weapon LOCK is confirmed. Range and estimated missile flight time are displayed on the HUD. Press [Spacebar] to launch the weapon after confirmation of IN RANGE. A countdown to impact is displayed below the missile range scale.

Bombs

There are four methods by which bombs can be delivered.

Manual Delivery

This is the simplest technique, with weapon aiming and release entirely manual. Because of the manual judgment involved, this technique cannot be considered precision bombing.



F16 in shallow dive over target

First, check that the radar is switched off. This will ensure that there is no target designated. Press key [↵Enter] repeatedly until the selection of chosen weapon is confirmed on the HUD (for example, MK82). The HUD will now be in CCIP mode with the Mk82 general purpose bombs selected and armed. The HUD will show the bomb fall line and the computed impact point of the bomb. Bombs released now will land at the computed impact point.

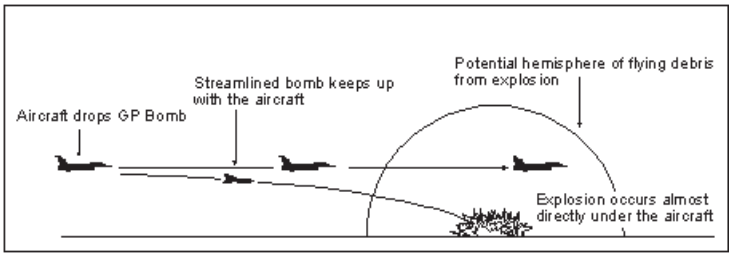
For manual delivery, you must not designate a ground target. To aim the bomb, maneuver your aircraft to superimpose the computed impact point on the target. Ensure that the Fuse Arming Limit symbol is below the computed impact point at the time of weapon release; otherwise, you risk damage from bomb debris. Press [Spacebar] to release the weapon.

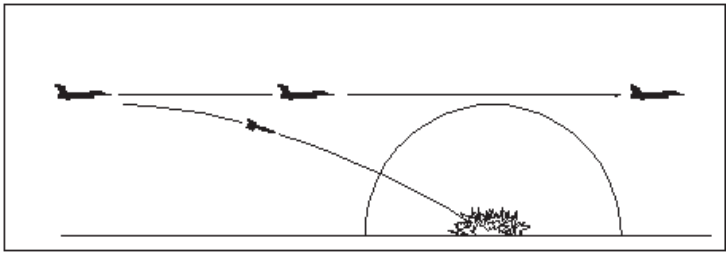
Manual delivery can be used for general purpose bombs, Durandals, retarded bombs, and cluster bombs.

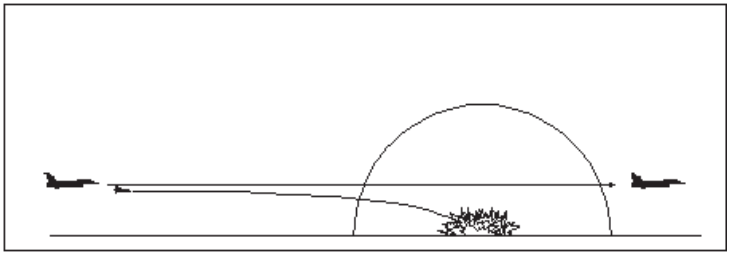
Laydown Attack

For a laydown attack, the target must be entered into the weapon aiming/navigation system, either before takeoff (as a target waypoint) or during flight using the ground radar or LANTIRN. The HUD shows the target designator box, azimuth steering line, and computed impact point. With the pilot committing to weapon release by pressing and holding the fire button, the exact moment of weapon release is automatically computed.

For example, let's assume that you wish to attack a static ground target (for example, a building). First, switch on the radar (key [R]) and select air-to-ground mode (key [Pg Dn]). If the radar is not in Fixed Target Track (FTT), press key [D]. The radar will automatically designate a target. If you are approaching a target waypoint, the

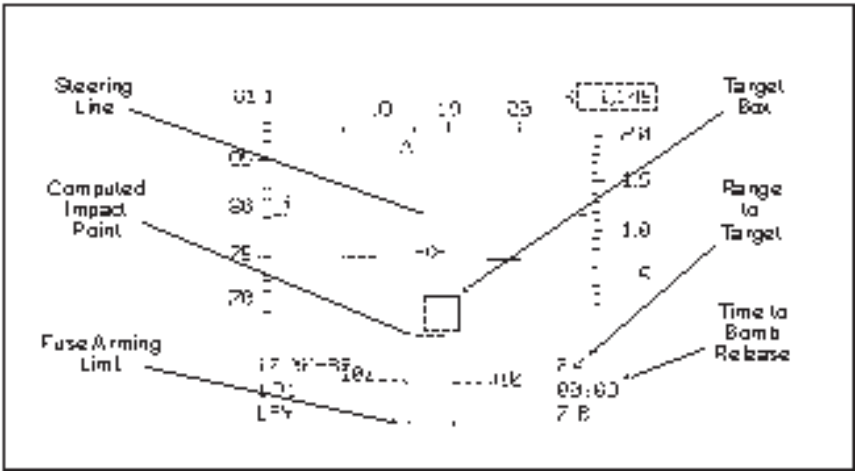






radar will designate the target that was specified when planning the mission. You can select a different target by pressing Backspace or using Alt and the joystick.

With a target designated, the HUD will be in LAY mode. The ground target designator box overlays the target and the azimuth steering line appears. This vertical line shows any offset from being lined up



HUD in LAY mode

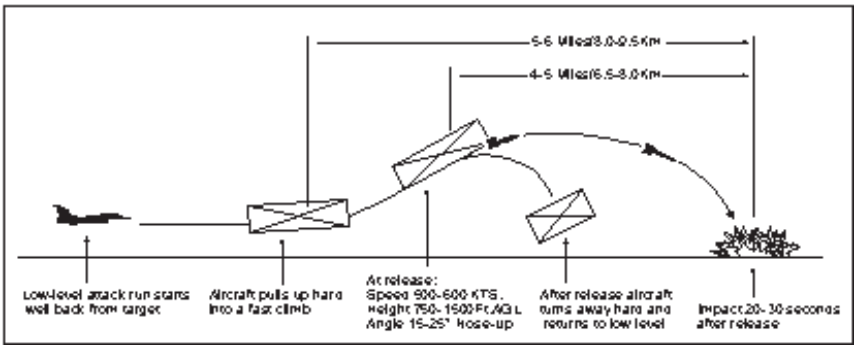
with the target. For example, it will be displaced to the left if you are to the right of the target and vice versa. When the azimuth steering line is centered on the HUD, you are lined up with the target. If the azimuth steering line is not at the center of the HUD, turn towards it.

The computed impact point of the bomb is shown as a short horizontal line across the steering line. This will move down the steering line as you get closer to the target. Commit to weapon release by pressing and holding the Spacebar. A countdown to weapon release is shown in the lower right corner of the HUD. When the computed impact point superimposes the target designator box, the weapon will be automatically released. Remember that Fuse Arming Limit symbol must be below the computed impact point when you release the weapon. If it isn't, you are too low and risk being damaged by bomb debris.

The laydown attack is suitable for general purpose bombs, retarded bombs, and cluster bombs.

Loft Bombing

This type of attack is also called "toss bombing" because the bombs are thrown rather than dropped. Targets for loft bombing must be entered into the weapon aiming/navigation system either before takeoff (as a target waypoint) or during the flight using the ground radar. The attack begins 5 or 6 miles from the target with the pilot pulling the aircraft into a climb. The bombs are released in the climb, and the aircraft turns away from the target as the bombs fly on, rising and then falling onto the target in a trajectory similar to an artillery shell. Weapon release is automatic, provided that the

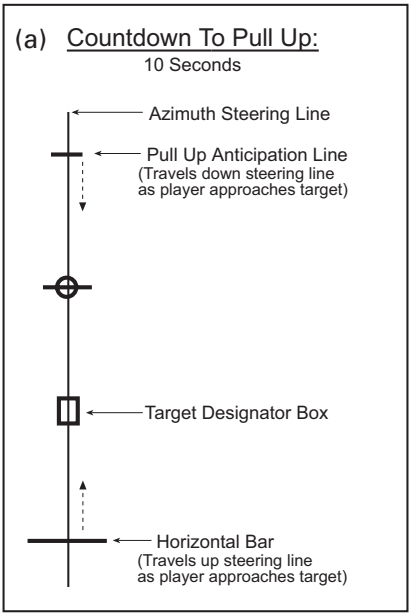


pilot commits by pressing and holding the fire button. The technique can only be flown manually. Only Mk82, Mk83, and Mk84 bombs are used for this technique.

First, check that a ground target is designated in the radar. Press key [↵Enter] repeatedly until selection of the chosen weapon and delivery mode is confirmed on the HUD (for example, Mk82 LOFT). The HUD will now be in LOFT mode with the Mk82 bombs selected and armed. The ground target designator box overlays the target and the azimuth steering line provides your steering cue for lining up with the target. When the azimuth steering line is centered on the HUD, you are lined up with the target. If it is not central, adjust your heading slightly in the direction of the offset, wait until the steering line is central, and then make a corresponding adjustment of heading in the opposite direction. As with any attack, you must line up exactly on the target before weapon release, but because the bombs travel so far in a loft attack any directional error will result in you missing the target. If you can see any heading error at all, you must correct it before releasing the bombs.

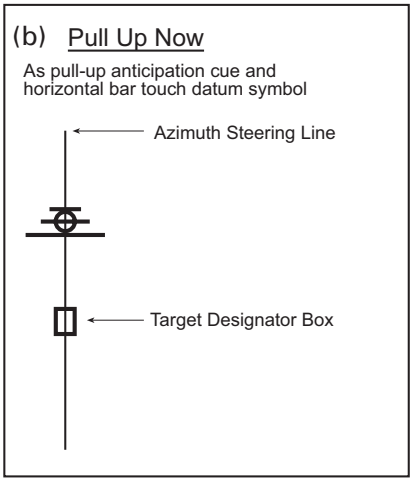
The loft procedure consists of three stages: countdown to pull up, pull up and countdown to weapon release, and recovery from the maneuver.

Ten seconds before pull up begins, two markers appear on the azimuth steering line. At the top of the line you will see the pull up anticipation cue and below the aircraft datum symbol you will see a horizontal bar (see fig. (a)). As you approach the pull up point these two markers move towards the aircraft datum symbol. The moment that both symbols touch the aircraft datum symbol (see fig. (b)), you should begin your pull up into a climb of between 15 to 25 degrees.

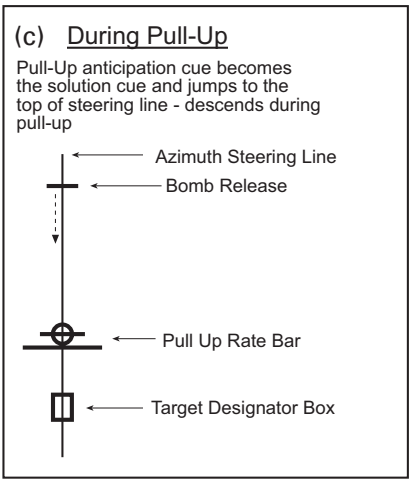


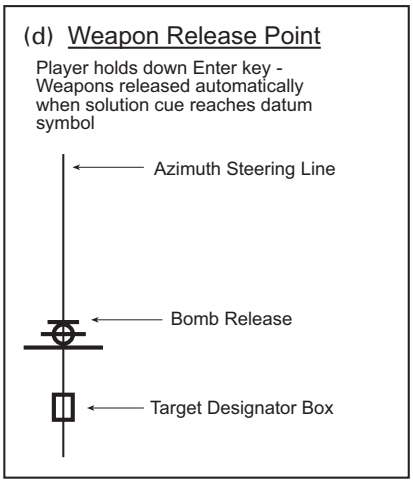
The second stage of countdown to weapon release now begins. The pull up anticipation cue is

replaced by the bomb release cue at the top of the steering line and the horizontal bar is replaced by the pull up rate bar (see fig. (c)). During the climb, the bomb release cue marker travels down the steering line to indicate time to weapon release. The pull up rate bar should coincide with the aircraft datum symbol. If it is above, your pull up is too slow. If it is below, your pull up is too fast. Having established a steady climb, release the joystick and commit to weapon release by holding down the Spacebar. The bomb will be released automatically when the solution cue reaches the aircraft datum symbol (see fig. (d)).



After weapon release, you are free to turn away from the target. By this stage, you will be fairly high and exposed to enemy defenses. The best technique for recovery from a loft attack is to roll inverted to 135 degrees and pull hard. This will stop the climb and turn you away from the target area simultaneously. As your nose passes below the horizon, reduce your roll angle to 90 degrees. Continue to pull hard until you are heading in the desired direction and roll out to wings level.





An important factor in loft bombing accuracy is the aircraft pitch rate just before weapon release. If your pitch rate is high, there will be higher probability of missing the target. If you stop pulling on the stick as the release point approaches, the accuracy of the delivery will increase significantly.

Laser-guided bombing

Laser-guided bombs are normally released in level flight at an altitude of approximately 20,000 feet, allowing the pilot to designate the target by using ground radar or the LANTIRN targeting pod. After release the bomb steers itself towards a laser-illuminated spot on the target with incredible accuracy.

Assuming that you are carrying GBU16 laser-guided bombs, press key [↵Enter] repeatedly until selection of weapon GBU16 is confirmed on the HUD. The HUD will now be in CCIP mode with the GBU16 bombs selected and armed. Targets can be designated using the ground radar, LANTIRN, or ground troops.

Using the ground radar to designate a target

Switch the radar on (key [R]) and select Fixed Target Track FTT (key [D]). Target acquisition and designation is automatic. The HUD will now change from CCIP to EO mode. If you are approaching a target waypoint, the radar will give priority to preplanned targets. You can select a different target by pressing key [Backspace]. Select LANTIRN FLIR mode (FLIR AUTO) on the other MFD to see a Forward Looking Infrared (FLIR) image from the LANTIRN targeting pod. Use keys [<] and [>] to zoom this image, but first make sure that the MFD is selected as current by pressing key [A] until CUR appears on the display.

With the radar switched on, the FLIR image and laser designator are slaved to the ground radar, so the target will already be centered on the FLIR display and illuminated with the laser. On the right of the HUD, you will see the target range scale and estimated time to target. Press [Spacebar] to release the weapon. Once the weapon is released, your radar will automatically switch to the next suitable target. After a few seconds, you can release another bomb. This will drop initially towards the previous target, but as soon as that target is destroyed, the laser designator will lock onto the new target, thereby redirecting the second bomb. Providing that you allow sufficient time between each bomb release, it is possible to strike several targets on a single pass of the target area. From an altitude

of 20,000 feet, it will be at least 20 seconds before the bomb reaches the ground. For closely spaced targets (for example, hardened aircraft shelters), a delay of 4 seconds between each bomb release is sufficient. If the targets are widely spaced, you will need a longer interval between releases.

Using the LANTIRN FLIR/laser designator without radar

To avoid detection by enemy defenses, you can approach the target area with the radar switched off. First, select LANTIRN FLIR manual mode (FLIR MAN) on one of the MFDs. The laser designator is slaved to this infrared view. Press key [Alt] together with cursor keys or joystick to slew the view so that it is looking down and ahead of your aircraft. Once you have the target area centered in the display, use key [>] to zoom closer to the target. When the sight is centered on the required target, press the [Alt] key together with the [Spacebar] (or the joystick fire button) to lock the sight onto the target. This is confirmed by the word LOCKED appearing on the MFD. If necessary, zoom a little closer to the target and make any fine adjustments by using [Alt] key together with cursor keys. Now press key [<] to zoom out from the target.

Range information is presented on the HUD. Press [Spacebar] to launch your weapon. Estimated time to impact is displayed below the range scale.

If the target passes behind your aircraft, the target designator box disappears, leaving just the crosshairs. This is a warning that the bomb may not have sufficient time to reach the target before the limits of the sighting system are exceeded.

Guns

Air-to-air combat

Press key [↵Enter] repeatedly until selection of weapon GUN and mode EEGS DGFT are confirmed on the HUD. You are now ready to engage in what is perhaps the most difficult type of aerial combat—the dogfight. Effective range of the gun is short, with range to target normally well under 3,000 ft. With both aircraft flying at speeds of between 450 kts to 500 kts the engagement is likely to be over in a few seconds, and only one of you is going home…

Shooting without computer assistance would be very unlikely to score a hit. For this reason, the F-16 has the Enhanced Envelope Gun Sight, which takes the guesswork out of when and in what direction to open fire. The sight consists of two lines drawn on the HUD to form the "aiming funnel." When the target is at the narrow end of the funnel and the range circle shows distance to target as less than 3,000 feet (indicated by the dot at the 3 o'clock position), you are in range and on target. When this condition is met, the gun will fire in short bursts, under computer control, with the pilot pressing the fire button. If the target is not positioned correctly in the funnel, the gun will not fire. As you maneuver, notice that the funnel distorts to allow for the relative velocity and position of the target.

Air-to-ground strafing

Press key [↵Enter] repeatedly until selection of weapon GUN and mode STRF are confirmed on the HUD. For air-to-ground strafing, the gun can be used in free-fire mode or under computer control. If you do not want to designate a target with the radar or LANTIRN, enter a shallow dive, place the gun aiming reticle over your chosen target, and open fire when the estimated range is less than one mile. This is referred to as free-fire mode. Alternatively, you can designate a target with either the ground radar or the laser designator. Press the [Spacebar] (or joystick fire button) when the gun aiming reticle overlays the target. The gun will open fire when the range to target is less than one mile.

The GEPOD 30mm external cannon pod is a more powerful weapon for ground attack. Select GEPOD and HUD mode STRF. The mode of operation is identical to the M61 gun.

Other Equipment

LANTIRN (Low Altitude Navigation and Targeting Infrared system for Night)

The LANTIRN system consists of two modules, the Navigation pod and the Targeting pod. The pods are always carried together and are loaded on special attachments on either side of the engine intake. The Navigation pod houses the Forward Looking Infrared (FLIR) systems. The Targeting pod houses FLIR equipment for target acquisition and tracking, a boresight correlator for automatic missile hand-off, and a laser designator and range finder. The system provides day and night automatic target identification and acquisition, automatic target hand-off for multiple launch of Maverick missiles, autonomous laser-guided bomb delivery, and precision laser ranging. At night, a FLIR image is projected onto the Head Up Display, giving the pilot a clear view ahead of the aircraft.

ALQ-131 ECM pod

Electronic countermeasures (ECM) are an essential tool for jamming radar tracking equipment. This pod is able to disrupt a wide range of threats across all frequencies used by current antiaircraft missile systems. It can only be fitted to the centerline pylon.

Reconnaissance Pod

Mounted on the centerline of the F-16, this pod houses advanced electro-optical and infrared sensors for day and night operation at low and medium altitudes. Information captured can be relayed back to base in real time by secure digital data transmission (key [T]).

Fuel tanks

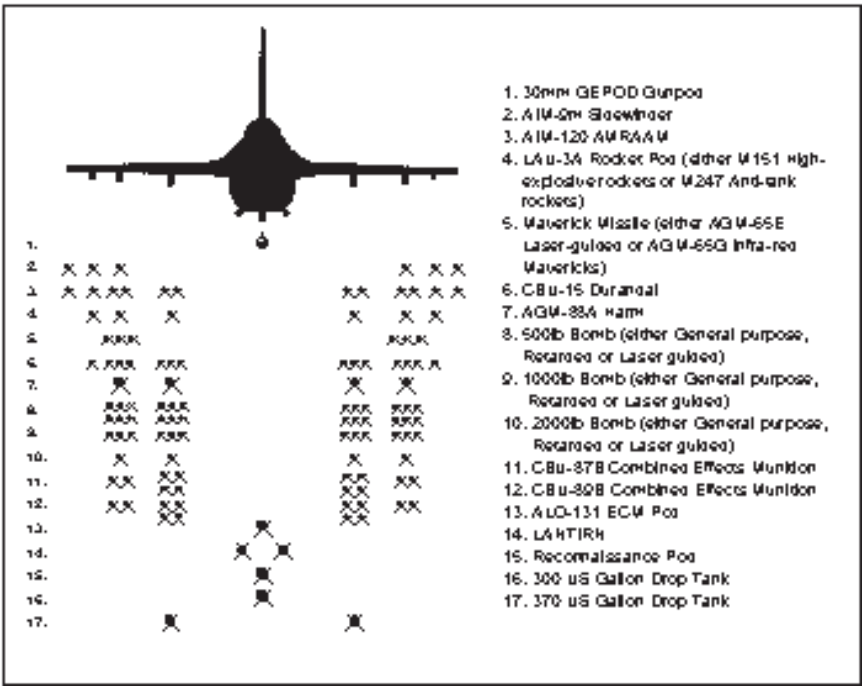
External fuel tanks can be carried on the inner wing pylons (370 gal. each) or a single centerline drop tank (300 gal.). Fuel is consumed equally from each tank prior to switching automatically to the internal supply. Jettison external tanks by pressing key [J].

Chaff & flares

Your aircraft is fitted with an internal ALE-40 Chaff & Flare Dispenser. Quantities remaining are displayed on the weapon management MFD.

Flares are used to decoy heat-seeking missiles. Although modern infrared missiles are far more discriminating than they used to be, a brightly burning flare may distract it sufficiently for you to maneuver out of the missile's field of view. Remember that you begin with 15 flares, and each flare will only be effective for a few seconds. Flares are dispensed by pressing key [F].

Chaff consists of radar-reflecting strips dispersed in a cloud to decoy radar-guided missiles or air defense tracking radar. Your aircraft is loaded with 30 rounds of chaff, each round dispensed by pressing key [C]. As with flares, chaff will be ineffective if you continue to fly in a straight line. The best tactic is to deploy chaff or flares at irregular intervals and maneuver aggressively.



Weapon configurations

9. Multiplayer Options

Two player games

Select this option if you want to link two computers via modem, direct cable link, or network, so you can fly with a friend. You will need a copy of *i*F-16 on both computers. Set up the two player games are accessed as follows:

1. At the Main screen, select **Combat.**
2. At the Combat screen, select **Two Player.**

Two player options

Combat—A simple head-to-head dual. Combat will always take place in Korea. Scores will be displayed at the debriefing between flights. Either player can select weather conditions, time of day, and whether crash detection is on or off. One user must select Player One, and the other Player Two.

Single missions—With this option, you will both be flying F-16s as leader/wingman on single missions in any combat area. One user must select Player One, and the other Player Two. Player One will select the mission. Both players will then be briefed prior to takeoff.

Note: Two player games are not saved to the pilot's log.

Setup for two player games

Connection via modem

The modem interface supports any Hayes-compatible modem (AT commands) that is capable of at least 2400/2400 baud (V22 bis 2400) but we recommend a V32 modem (or better) with a serial port baud rate of at least 19200. If you run at a baud rate of less than 19200, the game may slow down.

To use a modem for two player games, proceed as follows:

1. Connect a modem to any serial port (COM 1 to COM 4) and select the port by clicking on the appropriate screen button.

2. If a nonstandard port IRQ is used, select the appropriate button.
3. Select a baud rate. We recommend playing at 19200 if you have a 14400 modem, or 38400 if you have a 28800 modem. If your PC uses an 8250 IC, we recommend 19200 baud. Selecting very high baud rates may cause data errors, and there is no benefit in using higher speeds with current modems.
4. Select your modem type.
5. Click on the Modem button to enable the modem controls. The dialog box will display "Initialize modem" followed by initialization messages and OK if successful. If a problem occurs you will see a message (for example, "transmission error" or "no reply, rest modem and retry"). Further explanation on fault finding is given below.
6. Click on Game Mode for two player options (Combat Single Missions or Leader/Wingman). Select each player's function—one player must select the left button and the other player the right button.
7. Decide which player will be the caller. The other player will be the receiver.
8. To dial a number, the caller should click on the Phone No. button and enter the number (see your modem manual for any special command characters), and press [↵Enter].
9. Select Tone or Pulse dialing and then click on the Dial button. The dialog button will display "Dialing number" followed by "Connect *nnnnn*" if successful, where *nnnnn* is the baud rate.

Possible errors:

"No dial tone"—Check that your modem is connected to the phone line.

"Busy"—Line is busy.

"No answer"—Receiver not responding.

"No carrier"—Receiver's phone is answering but the modem is not responding.

See below for other error messages.

10. The receiver can use either auto-answer or manual answer. For auto-answer, click on the auto-answer button and wait for the phone to ring. The dialog box will display "Awaiting call", followed by "RING" and "CONNECT *nnnnn*" when the phone has rung and the connection has been established. Alternatively, if you want to use manual answer, click on the manual answer button when the phone rings.

11. As soon as communication between the two computers is established, the dialog box displays "Testing link," then "Machines linked," "Menu data sent," "Received other machines menu data," followed by further instructions.

12. The game will begin at this point if the link is successful. If an error occurs when testing the link, determine the cause of the error and try again by pressing the Start Game button.

13. At the end of the game, you will return to the Two Player Set Up screen. If you want to send a message to your opponent at this point, click on the Message button (which has replaced the Command button) and then type in the required text. Press Start Game to begin again.

14. To end a call once a connection has been made, click on the Hangup Mode button. The dialog box will confirm this by showing "Hang up phone," followed by OK if successful.

15. The Command button is used to send commands to the modem to reconfigure it, check its status, etc. To send a command, click on the button, enter the command, and then press [↵Enter]. Clicking on the button again will abort entry and the command will not be sent. Once the two computers are connected, the Command button is relabeled Messages and is used to send message strings between the two players. To send a message, click on the button, type the message, and press [↵Enter].

16. The port number, interrupt, baud rate, modem type, and phone type are all saved in the file PREFS.CFG so that the program is already configured when you next use it. The phone book section allows you to save up to six frequently used numbers, entered as follows:

    Type in the phone number (see 8 above).

    Press the Phone Book Set button.

Click on the phone book button where you want to save the number.

Enter the text string and press ↵Enter. The phone number is now saved on this button.

Fault finding when using a modem

Modem messages are the same as the standard Hayes messages with the following additions:

"Checksum error"	Data corruption
"Unexpected reply"	Expecting OK but got a different response
"Transmission error"	Serial communication problem
"Timeout error"	No response from modem

All errors described below for direct link operation also apply.

Problems

If the modem is not responding:

Check all connections and check that the modem is switched on.

The modem may be in "quiet" mode. Try canceling this mode by sending the ATQ0 command.

Communications error when Testing link:

Both users should try to re-establish the link by clicking on the "Start Game" button.

Have you selected a baud rate that is compatible with your modem?

Try using a lower baud rate.

Did you dial the wrong number? Select "Hang up" and retry.

Have you selected the right COM port? Check to see which port your cable or modem is plugged into.

Are you clear about who is the "caller" and who is the "receiver"? If you both try to be "caller," you will get nowhere.

If your phone has call waiting, this may disrupt the modem connection during the game. Disable this feature temporarily before starting your game.

Direct link using null modem cable

If you intend to use a direct cable link, a null modem cable must be connected into a serial port on each computer. The plugs on the ends of your null modem cable must match the ports of both computers. The ports will either be 9-pin or 25-pin and will probably be male (pins).

If you do not have a null modem cable, you can buy one at any computer supply store. Check the ports on both computers before buying your cable. As the diagram shows, there are three possible configurations for your cable.

You do not need a modem in order to use a null modem cable. Just plug one end of the cable into a serial port on one of the computers and plug the other end into a serial port on the other computer. The length of cable will limit how far apart you can place the computers, up to a maximum of several hundred feet.

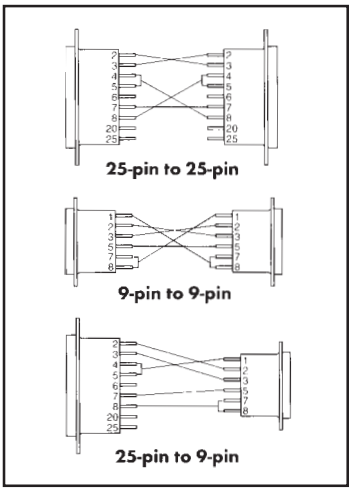


Diagram of pin to pin connection

Proceed as follows:

1. Specify the baud rate, interrupt number, and serial port that you want to use. The same baud rate must be used on both computers. If you run at a baud rate of less than 19200, the game may slow down.
2. Select Game mode (Combat, Single Missions, or Leader/ Wingman).
3. Click on Start Game button.
4. The dialog box will display “Testing link,” followed by “Machines linked,” “Menu data sent,” and “Received other machines menu data,” followed by further instructions.

Fault finding when using direct link

Are the pin connections correct on your cable? Check the diagram.

Have you both selected the same baud rate?

Has each player selected Player 1 or Player 2?

Error messages

Timeout—one or both computers are not receiving data. The possible causes are:

Computers are not connected to each other.

Cable connected to the wrong serial port or incorrect serial port selected.

Faulty cable.

Different baud rates selected.

More than 5 seconds had elapsed between both players selecting Start Game.

Transmission error

This is caused by data corruption, possibly due to an excessively long cable or an electrically "noisy" environment. Try re-routing the cable.

Checksum error

See Transmission error.

Error both players must pick combat or leader/wingman

Players have selected different game modes. One player must change so that the game mode selected on both machines is the same.

Error—Both Player 1 or both Player 2

Both players have selected the same option. One player must change.

Connection across a network

Two player games can also be played using a network to connect the two computers. Proceed as follows:

1. Select Network on the Two Player screen.
2. Select game mode: Combat, Single Missions, or Leader/Wingman.
3. Both players must select a common channel number that is different from any other players on the network.
4. Click on the Start Game button.

Sending in-flight messages in two player games

A number of predefined messages may be transmitted between players when both flying in an F-16 on single missions. The messages will be audible or printed on the message panel below the HUD. Press Ctrl and key F1 to F10 to send the following messages:

Leader/Wingman

Ctrl - F1 Break left.

Ctrl - F2 Break right.

Ctrl - F3 Break off.

Ctrl - F4 Slow down.

Ctrl - F5 Fly faster

Ctrl - F6 Turn left

Ctrl - F7 Turn right

Ctrl - F8 Straight ahead

Ctrl - F9 Going round again.

Ctrl - F10 Let's go home.

You can also send a message of your own choice to your wingman. Press keys ⇧Shift and M together, then type in your message. The message will be sent to your wingman when you press ↵Enter.

Network Games

Up to sixteen players can compete across an IPX network. Access to the network games is as follows:

1. At the Main screen, select **Combat.**
2. At the Combat screen, select **Network.**

Note: Details of network games are not saved to the pilot's log.

There are two network games:

Death Match—A game of survival, either for individuals or teams

Capture The Flag—A game where your objective is to destroy the enemy's headquarters.

F-16 will automatically detect if it is connected across the network. If so, the players in the network game are split into teams.

Once you reach the Network Setup screen, you will see a list of up to sixteen players. Click on the Enter Name button, type in your name (up to eight characters) and press ↵Enter. Your name will be added to the list. Preferences listed onscreen should also be set or reset.

Click on Takeoff when all players are present on the list. Your start position is set randomly. During the game a player may repair damage or re-arm with weapons by landing. Press Ctrl Esc to exit the game. If you are shot down in either game, you will be re-initialized at an appropriate position so that you can continue in the game.

10. Vehicle Inventory

Allies

Fixed wing aircraft

A10 Thunderbolt
Boeing 707
C130 Hercules
E3 AWACS
F14 Tomcat
F15 Eagle
F16 Fighting Falcon
F18 Hornet

Helicopters

AH1W Supercobra
AH64C Apache
UH60 Blackhawk

Air defense

M163 Vulcan AAA
Patriot SAM launcher

Armored vehicles

Challenger tank (Cyprus)
Leopard tank (Cyprus)
M1A1 Abrams tank (Korea, Cyprus)
M113 Armored Personnel Carrier
Merkava tank (Israel)
Warrior Armored Personnel Carrier (Cyprus)

Artillery

M109 self-propelled Howitzer
MLRS AFV

Infantry Weapons

M16 rifle
M2 heavy machine gun
M47 Dragon antitank guided weapon
Stinger antiaircraft missile
M37 82mm Mortar

Ships

Cargo ship
Landing craft
LHA Tarawa assault ship
Lifeboat
Mine layer
Mine Sweeper
Oil tanker
OHP Class frigate
Pontoon raft
Supply barge
Tug

Other

Diesel locomotive
Fuel bowser
Giraffe mobile radar
HMMWV multipurpose wheeled vehicle
Leopard Biber bridgelayer
Leopard AEV/ARV
Military truck

Enemy

Fixed wing aircraft

A-50 Mainstay AWACS (Korea, Israel)
An-12 Cub-A (Korea, Israel)
Boeing 707 (Cyprus)
C130 Hercules (Cyprus)
E3 AWACS (Cyprus)
F16 Fighting Falcon (Cyprus)
MiG-21 (Korea, Israel)
MiG-27 Flogger (Korea, Israel)
MiG-29 Fulcrum (Korea, Israel)
Su-24 Fencer-D (Korea, Israel)
Su-25 Frogfoot (Korea, Israel)
Su-27 Flanker (Israel)

Helicopters

AH1W Supercobra (Cyprus)
UH60 Blackhawk
Mil-17 Hip
Mil-24 Hind-E (Korea, Israel)

Air defense

GDF SPAAG AAA Cyprus)
SA-8 Romb SAM (Korea, Israel)
SA-9 Gaskin SAM (Korea, Israel)
SA-13 Strela SAM (Korea, Israel)
Tracked Rapier SAM (Cyprus)
ZSU-23 Shilka AAA (Korea, Israel)

Armored vehicles

BMP2 Armored Personnel Carrier (Korea, Israel)
BRDM2 Armored Personnel Carrier (Korea, Israel)
BRDM2 + Sagger Armored Personnel Carrier (Korea, Israel)
Leopard tank (Cyprus)
M113 armored personnel carrier (Cyprus)
MT-LBU Command Armored Personnel Carrier (Korea, Israel)
T62 tank (Korea, Israel)
T80 tank (Korea, Israel)
Warrior armored personnel carrier (Cyprus)

Artillery

BM21 MLRS (Korea, Israel)
D30 Howitzer (Korea, Israel)
M109 self-propelled Howitzer (Cyprus)
MAZ543 SCUD (Korea, Israel)
MLRS AFV (Cyprus)

Infantry Weapons

AK-47 Rifle (Korea, Israel)
M16 rifle (Cyprus)
DSHK-38 Heavy machine gun (Korea,Israel)
M2 heavy machine gun (Cyprus)
M47 Dragon antitank guided weapon (Cyprus)
RPG-7 Rocket propelled grenade (Korea, Israel)
SA-7 Antiaircraft missile (Korea, Israel)
Stinger antiaircraft missile (Cyprus)
M37 82mm Mortar

Ships

Cargo ship
FPB57 patrol boat (Cyprus)
Landing Craft
Lifeboat
Meko 200 class frigate (Cyprus)
Mine layer
Mine sweeper
Oil tanker
OSA missile boat (Korea, Israel)
Pontoon raft
Romeo submarine (Korea, Israel)
Submarine type 209 (Cyprus)
Supply barge
Tug

Other

Diesel locomotive
Fuel bowser
Giraffe mobile radar (Cyprus)
HMMWV multipurpose wheeled vehicle (Cyprus)
Leopard Biber bridgelayer (Cyprus)
Leopard AEV/ARV (Cyprus)
Long track mobile early warning radar (Korea, Israel)
Military truck
MT-BUS jamming vehicle (Korea, Israel)
UAZ469 jeep (Korea, Israel)

11. Abbreviations

AAA	antiaircraft artillery
AAM	air-to-air missile
ACM	air combat mode
AFV	armored fighting vehicle
AGM	air-to-ground missile
AoA	angle of attack
APC	armored personnel carrier
ARM	antiradiation missile
CAP	combat air patrol
CCIP	continuously computed impact point
ECM	electronic countermeasures
EEGS	enhanced envelope gun sight
EO	electro-optical
EU	European Union
EWR	early warning radar
FLIR AUTO	forward looking infrared, LANTIRN “automatic” mode
FLIR MAN	forward looking infrared, LANTIRN “manual” mode
GCA	ground control approach
GEPOD	external gun pod
GTT	ground target track
GVT	ground vehicle track
HAS	hardened aircraft shelter
HUD	head up display
IIR	imaging infrared
ILS	instrument landing system
LANTIRN	Low Altitude Navigation and Targeting System for Night

MFD	multi function display
MLRS	multiple launch rocket system
MRM	medium range missile
NAV	navigation mode
n.m.	nautical mile
NWS	nose wheel steering
POL	petrol, oil and lubricants
RCKT	rocket
RCR	raid cluster resolution
RPM	revolutions per minute
SAM	surface to air missile
SRM	short range missile
STRF	strafe
TF	terrain following
TWD	threat warning display
TWS	track while scan
UN	United Nations

12. Credits

Digital Integration

Project directors	David Marshall Rod Swift
Project manager	James Baker
Design team	Charles Blair Andy Carr Laurie Dobson Simon Hegarty Grant Hewlett Shahid Malik Paul Martin Nick Mascall Lee Mills Mark Sinclair Matthew Thomas Simon Warner
Manual	David Marshall
Manual layout, graphics, & artwork	Michael Tang Jamie Young Wendy Christoforato
Production	Rod Cobain Stephanie Burnett
Marketing	Beverly Gardner Amy Curtin
Testing & product	Russell Alcock
Support	Damian Bradbury Paul-Jon Bowron

Interactive Magic

Producer	Paul Potera
Vice President, External Development	Ray Rutledge
Quality Assurance	David Green
Internal Testing	Marc Racine (Testing Coordinator) Joe Allen Brian Davis Joe Myers Carlin Gartrell Becky Starling Mike Pearson Jason Sircy Chris Gardner James Cowgill Adam Turner Ted Wagoner Greg Young Anthony Lazaro
External Testing	Dean Robb Jim Pedicord Les Nowak Joe Kartychak David Cobb Eric Berns Joe Anstett Buddy Knight Dan Osturlund Mark Wilson Gary Newcomb Peter Pelka Walter Raif Debbie Keefe
Manual Editing & Layout	Sarah O'Keefe and Alan Pringle of Scriptorium Publishing Services, Inc.

13. Customer Support

What to Do If You Have a Defective CD

Should you have a defective CD, please return the CD only (keep all other parts of the game) to our Customer Support Department, along with a note describing the problem you have encountered. A replacement CD will be provided upon our receipt of the defective CD.

Always make sure to include your name, address, and daytime telephone number with any correspondence.

Questions or Problems

If you have difficulties with this game and cannot find the solution in this booklet, please call our Technical Support Line at (919) 461-0948, 9 a.m. to 9 p.m. EST Monday through Friday, and a member of our support staff will assist you. We will be best able to help you if you are at your computer when you call.

You can also obtain customer service online. We can be reached as follows:

Email: techsupport@imagicgames.com

Web: http://www.imagicgames.com

Interactive Magic and the Interactive Magic logo are trademarks of Interactive Magic, Inc. All other companies or products mentioned herein are the property of, and may be trademarks of, their respective owners.

Index

N

P

Q

R

S

T

V

W

Keyboard Controls

Primary Flight Controls

Gear up/down	G
Rudder left	Z or Ins
Rudder right	X or Del
Air Brake on/off	B
Select Next Waypoint	N
Select Previous Waypoint	⇧Shift + N
Stick Forward	↑
Stick Left	←
Stick Back	↓
Stick Right	→
Increase thrust	+
Decrease thrust	−
Maximum thrust (reheat off)	⇧Shift + +
Minimum thrust (reheat off)	⇧Shift + −
Full reheat (engine at 100%)	⇧Shift + +
Reheat off (engine at 100%)	⇧Shift + −
Engine startup	Alt + +
Engine shutdown	Alt + −

Cockpit controls

Wheel brakes on	W
ECM on/off	E
Transmit reconnaissance data	T
Flares	F
Chaff	C
Fire Extinguisher	⇧Shift + F
Jettison fuel tanks	J
Jettison all but air-to-air weapons	Ctrl + J
Jettison all	Alt + J
Combat mode (radar on, ACM MFD, arm air-to-air missiles	K
Instrument lights	L
Night vision on/off	V
Master warning light off	M

MFD Controls

Radar on/off	R
HUD contrast adjust	I
Cycle left MFD	[
Reverse cycle left MFD	⇧Shift + [
Cycle right MFD	]
Reverse cycle right MFD	⇧Shift +]
Change MFD “current” controls	A
Radar mode display/ LANTIRN mode toggle	D
Ground radar freeze/air radar RCR mode	H
Radar air/ground toggle	Pg Dn
Active MFD zoom in	<
Active MFD zoom out	>
Radar/LANTIRN designate up	⇧Shift + ↑
Skew radar up	Ctrl + ↑
Radar/LANTIRN designate left	Alt + ←
Skew radar left	Ctrl + ←
Radar/LANTIRN designate down	Alt + ↓
Skew radar down	Ctrl + ↓
Radar/LANTIRN designate right	Alt + ↓
Skew radar right	Ctrl + ↓
Radar target priority on/off	O

Weapons Controls

Fire weapon	Spacebar
Next target	Backspace
Previous target	⇧Shift + Backspace
Arm & select weapon	↵Enter
Unarm weapon	Ctrl + ↵Enter
Decrease salvo size	⇧Shift + ↵Enter
Increase salvo size	Alt + ↵Enter
Air/Ground weapon toggle	Pg Dn
Laser Designate toggle	Alt + Spacebar

Cockpit View Controls

Pilot's view	Home or F5
Recenter view	End
Virtual cockpit left	F1
Virtual cockpit up	F2
Virtual cockpit down	F3
Virtual cockpit right	F4
Snap view left	1
Snap view up	2
Snap view down	3
Snap view right	4
Snap view center	5

External View Controls

F-16 tracking view	F6
Weapon view	F7
Weapon target view	F8
Target lock view	F9
Remote view	F10
Spectator view	F11
Drone view (next)	F12
Drone view (previous)	⇧Shift + F6
Drone view left	Alt + ← or F1
Drone view right	Alt + → or F4
Drone view up	Alt + ↑ or F2
Drone view down	Alt + ↓ or F3
Zoom in	<
Zoom out	>

Player Wingman Messages

Custom message	⇧Shift + M
"Break left"	Ctrl + F1
"Break right"	Ctrl + F2
"Break off"	Ctrl + F3
"Slow down"	Ctrl + F4
"Fly Faster"	Ctrl + F5
"Turn left"	Ctrl + F6
"Turn right"	Ctrl + F7
"Straight ahead"	Ctrl + F8
"Go around again"	Ctrl + F9
"Let's go home"	Ctrl + F10

Computer Wingman Messages

Wingman go home	Ctrl + 1
Formation go home	⇧Shift + 1
Wingman follow me	Ctrl + 2
Formation follow me	⇧Shift + 2
Wingman attack my target/help me	Ctrl + 3
Formation attack my target/help me	⇧Shift + 3
Wingman resume flightplan	Ctrl + 4
Formation resume flightplan	⇧Shift + 4

Visual Detail

Maximum shading (low/medium/high)	Alt + F1
Textures on objects on/off	Alt + F2
Shadows on/off	Alt + F3
Object visual range near/far	Alt + F4
Clouds on/off	Alt + F5
Smoke lifetime short/long	Alt + F6
Smoke density (min/average/max)	Alt + F7
Visual range level 1	Alt + 1
Visual range level 2	Alt + 2
Visual range level 3	Alt + 3
Visual range level 4	Alt + 4
Visual range level 5	Alt + 5
Visual range level 6	Alt + 6
Visual range level 7	Alt + 7

Miscellaneous Controls

Quit mission/Main menu/ Quit game	Ctrl + Q
Recenter joystick	Ctrl + Y
Pause/Resume	P
Select airfield ILS	7
Increase time compression	Tab
Reduce time compression	Ctrl + Tab
Cancel time compression	Esc