

The First Fighter Simulation To Include Squadron Strategy

F/16

COMBAT PILOT



THREAT
DEGRADE

THREAT
ANALYSIS

SAVE

RANGE &
BEARING

REPORT

FETCH

EL
PAR

A/N FORMAT

TERRAIN

CLEAR

MSN DATA

FRAME



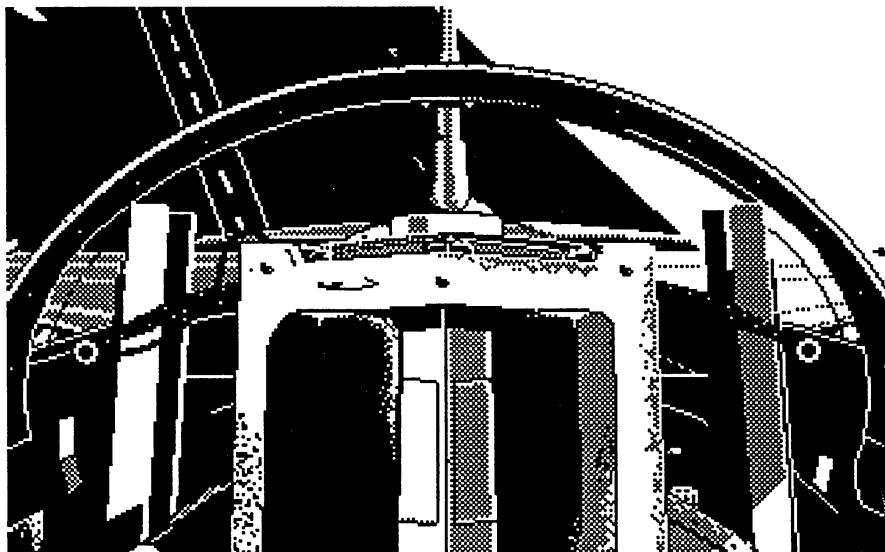


QUICKSTART

Are you desperate to get airborne? Immediately after viewing the title screens, you'll go to the squadron crewroom. Move the pointer over to the pilot and go for it!

Briefing

- You're assigned to the Tactical Fighter Training Squadron.
- Your aircraft is fully fueled and in the air.
- Your aircraft is armed with a "general purpose" weapons mix.
- Your flight controls are listed on your Pilot Kneepad.
- No mission selection necessary.
- No preflight briefing.
- No adverse weather conditions.
- No pilot's log active.





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FOREWORD

Most of us are kids at heart, with a streak of the Walter Mitty as well. Modern simulation techniques allow us to be almost anybody we wish to be, and for a considerable proportion of the world's population, there's nothing more exciting than being a fighter pilot. There's a certain satisfaction in being manager of a vehicle costing 20 or 30 million dollars. There's certainly a rich reward in knowing that you can manage such a high-tech bit of a kit with true professionalism. But perhaps the ultimate satisfaction is knowing that your life depends on it, and that in air combat if you don't get him, he'll get you!

Perhaps it's worth emphasizing that this is much more than just a video game. It's the nearest approach to turning you into a real fighter pilot. You probably already know that today's fighter jock, even if he has a big moustache and polka-dot scarf, is highly disciplined and totally professional. If he was otherwise he would never be allowed into the cockpit of an F-16.

Why an F-16? Chiefly because, of all today's fighters, the General Dynamics F-16 most completely typifies the traditional concept of a fighter. Some modern fighters—mostly bigger than the F-16 and usually crewed by two men working in partnership—are called interceptors. They have great range and endurance, and can kill from a distance of up to 100 miles whether it's day or night, or whether there's a snow blizzard or thick fog. Such conditions would make life hard for the F-16. Unlike the big interceptors, the F-16 is designed to come to close grips with its enemies. It's designed to

win in a traditional dogfight, using missiles and an internal gun.

It can also navigate with great accuracy through hostile airspace and plant ordinary 'iron bombs' on a point target. This has been proved in reality. On June 7th, 1981, eight Israeli F-16s flew to a target about 600 miles—almost 1,000 km—away. The target was the Iraqi nuclear reactor at Osirak. They dropped sixteen Mk 84 2,000 lb bombs in a single high speed pass over the target, and all sixteen bombs appear to have hit the reactor dome. That attack was made easier by the fact that the F-16s were coming out of a clear blue sky, and the pilots could see the target from a distance of about twelve miles. Where you really earn your money is when you have to use radar and such extra night or bad-weather aids as LANTIRN pods in order to drop bombs accurately in the winter weather on northern Europe.

The F-16 can also fly reconnaissance missions, but for this task it needs to carry an external pod that houses infrared linescan sensors. It also needs a secure digital data link to send the outputs back to the Command and Control Center in real time.

Bill Gunston is a former RAF pilot. He is also the Technical Editor of "Flight International" and Assistant Compiler of "Jane's All The World's Aircraft".



OVERVIEW

Welcome to the world of the F-16 fighter pilot. You are about to join an elite group of pilots envied the world over. The F-16 Fighting Falcon is a truly remarkable aircraft. Originally designed as a highly maneuverable dogfighter, it developed into an awesome multi-role combat aircraft. Every thrilling aspect of the F-16 is in this simulation, including many features just recently made available to front line squadrons.

F-16 Combat Pilot is the first in a new generation of strategic flight simulations. In this simulation you will:

- Fly on a variety of training missions.
- Join an active front line squadron responsible for each role of the F-16.
- Participate in a strategic global conflict, involving real-time interaction between aircraft, ground forces, military installations, and essential services.

Throughout your flying career, Tactical Air Command (TAC) will monitor and log your successes and failures. They are well aware of every pilot's ambition to fly with the supreme squadron. Competition to make it into this elite rank is intense; you will have to prove you are the best to be with the best.

You begin each assignment in the squadron crewroom. In that room you can access a variety of information: aircraft controls, aircraft data, weapon data, pilot log, etc.

Your first assignment is to train in your aircraft. Once you become adept at handling it,

you are ready for a mission. There are six missions, five of which are specialized to a particular aspect of piloting an F-16 in combat. You may be assigned to fly over designated areas and transmit data back to HQ; you may be assigned to destroy enemy vital support installations and supply links; or you may be assigned to intercept and destroy hostile aircraft.

The sixth mission, Operation Conquest, is *the* combat pilot's mission. You will need the experience from the other five missions to complete this. In fact, TAC will not allow you to attempt the sixth and final mission until you've completed the other five.

Operation Conquest is a multi-mission scenario. The overall objective is to force the enemy to surrender by reducing his fighting ability and morale. You'll experience the passing of night and day, variable weather conditions, the damage and repair of strategic installations, and the deployment of tanks and mobile ground forces. The duration of this operation can vary significantly.



SQUADRON CREWROOM

Your day begins in the squadron crewroom. Before getting airborne, take a look around. Choose any item by selecting the object.



Squadron Crewroom

QUICKSTART (PILOT)

This is for all you fighter jocks intent on getting off the ground without doing your homework. While this isn't recommended as serious pilot training, it'll give you a taste of things to come. See the Pilot Kneepad for a list of your flight controls.

DEMONSTRATION (WINDOW)

For a dramatic flying display, take a look out the window!

CONTROLS (DESKTOP COMPUTER)

You can fly your aircraft using only the keyboard, but you are strongly advised to use a joystick or a mouse to get a feel for the controls. Select this to set your control configuration.

AIRCRAFT DATA (AIRCRAFT POSTER)

This lets you access the technical data on your aircraft and information on all likely adversaries. Knowing your enemy's capabilities is essential if you are to succeed in air combat.

WEAPON DATA (WEAPON POSTER)

This lets you access the technical data on all weapon systems. Familiarize yourself with each weapon; know when and how to use it.

RECALL GAME (PILOT'S FLIGHT CASE)

If you take R & R during Operation Conquest, select this option to continue the campaign.

PILOT'S LOG (FILING CABINET)

This is your personal record of your experience as an F-16 pilot. Select your log by opening the cabinet and giving your name. A new log is created automatically if the name given is not on file.

- **NAME**—Enter your name, up to eight (8) characters.
- **CALLSIGN** — Enter your callsign, up to ten (10) characters. This will be used for air-to-ground communications.
- **SQUADRON**— Your flying career begins in the Wildcatters squadron. You'll be offered a transfer to a new outfit each time you succeed in Operation Conquest.
- **FLYING HOURS**— Your total number of flying hours.
- **KILL RECORD** — The total number of enemy aircraft you've destroyed, the total number of ground targets you've destroyed, your Mission Effectiveness ratio (in all missions to date), your Kill Ratio (in



all missions to date), and your pilot rating.

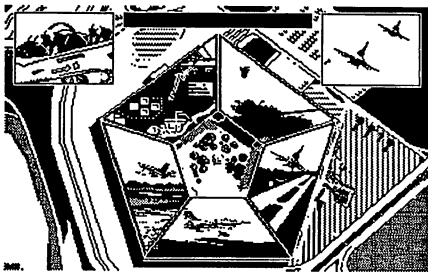
Mission Effectiveness (ME) ratio =
number of assigned targets destroyed
 total number of assigned targets

Kill Ratio (KR) =
number of assigned targets destroyed
 number of weapons used

PILOT RATING — This is determined by your ME ratio. Note: During your debriefing you'll be given ME and KR ratings for that particular mission. These should not be confused with the overall ratios recorded in your log.

MISSIONS (DOOR)

Move on to mission selection by leaving the crewroom via the door. Upon leaving the crewroom you'll arrive at the Mission Selection screen.



Mission Selection

- In the top left corner is a two-seat F-16D. Select this to join the **Tactical Fighter Training Squadron**. You can practice flying, landing, or any of the five front line missions.

- The five sides of the US Pentagon represent the five missions (clockwise from the bottom left):

Scramble — Air-to-air interception

Watchtower — Reconnaissance

Tankbuster — Battlefield close air support

Hammerblow — Offensive counterair operations

Deepstrike — Interdictor strike

You will find complete details on these missions in Chapter 4, *Front Line Operations*.

- The center of the pentagon, used for choosing **Operation Conquest**, can't be selected until you've satisfied Tactical Air Command that you're capable of commanding a squadron on such a mission. To do this, your pilot's log must show that you have flown at least one successful mission in each of the above categories during front line duty. You will find complete details on this mission in Chapter 4, *Front Line Operations*.
- In the top right corner are two dog-fighting F-16s. Select this to choose **Gladiator**, the two player mode.



TRAINING SQUADRON

To get assigned to the Training Squadron, select **Missions** (Door) in the squadron crew-room, and then select **Training** (Two-seat F-16D).

The Tactical Fighter Training Squadron offers training in all aspects of flying the F-16 in order to prepare you for front line duty. Select the area you want to practice: Free Flight, Landing Practice, or one of the five mission scenarios.

If you are unfamiliar with your flight instruments, refer to Chapter 5, *Flight Instruments* for descriptions.

Free Flight is a good place to start if you're low on flying hours. Don't forget to register your pilot's log — paperwork is important if you ever expect to command a squadron.

Free Flight

Your flight begins with a fully serviceable aircraft, loaded with a "general purpose" weapon configuration. Refer to your Pilot Kneepad for a list of flight controls.

Take a look around to make sure all's clear. Now open the throttle. Engine rpm will rapidly reach idle level (60%). Holding the wheel brakes on, open the throttle to 80%. Release the brakes, and open the throttle to 100%. Release the throttle, then apply it again to full reheat (afterburners). At a typical combat weight, this bird accelerates from 0 to 125 knots in about ten seconds.

As your speed passes through 125 knots, pull back gently on the sidestick to raise the nose. You'll become airborne at roughly 150 knots with your speed continuing to increase even if you pull up to a vertical climb (providing your All Up Weight is not greater than 26,000 lb or so). A normal climb from an airfield is at about 60 degrees.

Retract the undercarriage immediately—you'll stress the retraction mechanism if you exceed 300 knots with the wheels down. Flaperon configuration is totally automatic; the fly-by-wire system continually adjusts the leading and trailing edges for optimum wing lift.

Once you reach about 5,000 feet, pull the throttle out of reheat. Try a few gentle turns to get a feel for the aircraft's response. Remember to keep an eye open for other aircraft. When you bank your aircraft, the g force required to sustain the turn increases. If you don't pull back on the sidestick as you roll, your aircraft will start to slip into the turn and the nose will slowly fall. Momentary back pressure on the sidestick will "trim" the aircraft by increasing your angle of attack, and you'll see a corresponding increase in g force (top left corner of the Head Up Display).

Try a few 360 degree rolls and tight turns. Notice how the maximum roll rate increases with forward speed. When maneuvering at low speeds, your fly-by-wire control system limits your angle of attack to 25 degrees. This is a design feature that prevents you from stalling or spinning. If the aircraft finds that it can't generate enough lift, the nose will be lowered to increase the airspeed.



Similarly, at high speeds the pitch rate is automatically limited to avoid overstressing the airframe. The F-16 lets you pull up to 9g (within its combat speed range), but don't expect to hold this for very long. Holding a 9g climb too long makes your blood rush to your feet which will eventually make you black out. A sustained 9g dive makes your blood rush to your head which eventually results in "red-out." The effects of blackout and redout are only temporary, but they could be fatal at low altitudes.

During a sustained turn, the wings need to generate extra lift for the aircraft to maintain its altitude. This extra lift is generated by increasing the wing incidence, which in turn creates extra aerodynamic drag. Therefore, your speed decreases during a turn if you don't compensate by increasing the engine thrust.

During Free Flight, you can fly to any of the designated ranges for target practice. You won't be subjected to dummy SAM alerts or drone interceptor aircraft since you already have your hands full at this point.

To land your aircraft, look at your Up Front Control Panel for range and bearing information on the airfield. Turn to the displayed bearing and your Inertial Navigation System displays your Estimated Time to Arrival. Try to begin your approach from 15 miles out at an altitude of 4,000 feet at about 125 knots. Request clearance from the tower by transmitting your callsign. If you want the tower to talk you down, request a Ground Control Approach (GCA). If you're having trouble lining up with the runway, and you just want to

practice your landing technique, ask an instructor to position the aircraft on the approach by requesting Landing Practice instead of Free Flight prior to takeoff.

Landing Practice

Your instructor will hand over control when your aircraft is lined up with the runway, 10 miles out at an altitude of 2,500 feet. At a typical approach speed of 125 knots, you'll have approximately four minutes before crossing the runway threshold. During your approach you can either (a) select the autopilot, (b) receive a GCA talkdown, (c) proceed without assistance, or (d) perform a dead stick landing. Option (a) will show you how a landing should be done, option (b) will give you some assistance, option (c) is your ultimate goal, and option (d) is for those who must land without engine power.

Contact the airfield control tower by transmitting your callsign. Be prepared for the response on your UHF Communications Transceiver. For example:

ROGER callsign
STATUS GREEN <airfield combat status>
CLEAR TO LAND

Use your Instrument Landing System (ILS) to ensure that you maintain the correct glideslope during your approach. Lowering the undercarriage reduces the aircraft's response. Be ready to adjust the throttle slightly to overcome the extra drag. Aim to touch down a few hundred feet beyond the runway threshold, flaring (pulling up the nose slightly) just before touchdown to reduce your rate of



descent. After your main gear touches down, close the throttle. Apply your wheel brakes after the nosewheel touches the runway. After you stop, look for the nearest hangar, open the throttle slightly, and taxi into it.

(a) Autopilot

Your aircraft is fitted with a landing aid which links the autopilot with the ILS to give you a fully automated landing. This can only be used if your ILS equipment is functioning, and if ILS is available on the selected runway. The autopilot can be selected whenever the "ILS is in range" light on the Up Front Control Panel is on. This light will only appear once you are lined up with the runway, so you might want to use a Ground Control Approach until your localiser needle appears on your MFD in ILS mode. Control is fully automatic until touchdown, after which you must manually close the throttle and apply the wheel brakes.

(b) Ground Control Approach

The ground controller will give you verbal instruction during your approach. This is intended primarily for bad weather conditions, but it can be helpful while you practice your landing technique. Request a Ground Control Approach (GCA) after you are cleared to land. For example:

Request GCA

ROGER callsign

STARTING GCA

TURN LEFT TO 180 <adjust your heading to 180>

DESCEND TO 1500 FT <adjust your altitude>

HEADING GOOD <lined up OK>
ADJUST VSI TO -8 <adjust rate of descent>
FINAL APPROACH <on finals>
WELCOME TO BASE <after touchdown>

(c) Manual Approach

Checklist (all values vary with aircraft weight):

- Undercarriage down
- Throttle 81%
- Speed 125 knots
- Altitude 2,500 feet
- Angle of attack (AoA) 13 degrees
- Vertical speed indicated (VSI) -11 feet per second
- Pitch +8 degrees
- Distance to touchdown 10 miles

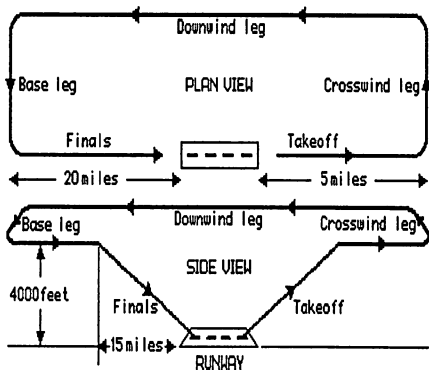
(d) Dead Stick Landing

If you must perform a "dead stick" landing (gliding in after engine failure), first jettison all external stores. The F-16 is very efficient at gliding, with a typical altitude loss of 750 feet for every nautical mile flown. Adopt a slightly nose-down attitude, and maintain an indicated airspeed (IAS) of approximately 170 knots for the optimum glidepath. Your VSI should be about 40 feet per second. Don't put your undercarriage down during the approach — you can't afford the extra drag. As you approach the runway threshold, lower your undercarriage and flare to reduce your rate of descent to about 5 to 10 feet per second. Once you safely land and bring your aircraft to a standstill, the ground crew will be along shortly to bring your aircraft back to the hanger.



Because landing your aircraft is not a trivial exercise, it's important to practice your take-offs and landings, referred to as "circuits and bumps." The idea is to remain within the airfield "circuit," getting familiar with landmarks, perspectives, and aircraft handling.

The following illustration is a suggested circuit pattern with distances and altitudes that should give you plenty of room to correct for errors. You'll soon be able to stay much closer to the airfield, perhaps performing "airshow style" tight turn approaches.



Circuit Pattern

It's vital that you perfect the technique of landing your aircraft safely! The only good landing is one you can walk away from, with your aircraft in one piece.

Mission Training

During mission training, you can practice executing the same assignments as those in the front line operations. (See Chapter 4, *Front Line Operations* for a description of each mission.)

- Scramble** — Air-to-air interception
- Watchtower** — Reconnaissance
- Tankbuster** — Battlefield close air support
- Hammerblow** — Offensive counterair operations
- Deepstrike** — Interdictor strike

You will also be subjected to simulated surface-to-air missile (SAM) warnings and hostile drone aircraft to maximize the realism of your training. Although there is no danger of getting shot down, you'll be notified if you wouldn't have survived the mission.

Your ground crew will ensure that your aircraft is fully fuelled, serviced, and armed with a weapon mix appropriate to your mission.

After you choose your mission, you'll get a pre-flight briefing.



Preflight Briefing



Electronic Strategic Display

The Electronic Strategic Display shows the current tactical situation across the combat zone (in this case the training combat zone), highlighting all airfield locations, your current position, and major geographical features. Your documentation comes with a map of the training area showing the region reserved for training sorties. Become familiar with the layout — it could save your life.

On your display are the information and planning keys:

- **COMMAND** — Aircraft assignments (Operation Conquest only)
- **MISSION** — Mission objectives
- **TARGETS** — Target display selector
- **REPORT** — Intelligence update
- **WEATHER** — Meteorological report
- **WAYPOINT** — Flight plan programmer
- **WEAPONS** — Weapon selection
- **MET** — Meteorological configuration
- **TAKE OFF** — Start the mission

These options let you access various computerized functions necessary for planning your mission. Select the appropriate key to change the mode of the text area beneath the strategic display.

MISSION

With the exception of Operation Conquest, you'll have selected your mission category prior to this meeting. TAC will release the details of your objectives when you select **Mission**. Your objectives are **CONFIDENTIAL** and for your eyes only.

TARGETS

The default display shows only airfield locations and major non-strategic geographical features. Selecting **Targets** illuminates eight target selector keys in the text area. The categories are:

- Command Centers
- Military bases
- Tank battalions
- Surface-to-Air Missile (SAM) sites
- Early Warning Radar (EWR) sites
- Fuel depots
- Power stations
- Factory complexes

Select the appropriate key to display or remove the target category. In the case of mobile targets, you will get the last known positions reported by TAC reconnaissance flights.



REPORT

Operators at the Command Center have been compiling rumors and hard facts to give you their best advice for your flight. For the latest update, select **Report**.

WEATHER

For a brief summary from the meteorological office, select **Weather**. Weather conditions can change during your flight.

WAYPOINT

As an F-16 pilot, you don't have the luxury of having a navigator in the back seat, but you do have the latest programmable navigation computer to give you in-flight guidance on your Up Front Control Panel (UFCP).

A flight plan can be as simple as a direct route from A to B, or as complex as a multi-target hi-lo-hi profile over enemy territory. After selecting **Waypoint**, your present position is marked on the strategic display at the intersection of two red lines. In the text area is your set of five waypoints (initially set to 000,000) and the coordinates of your desired target(s). To the left are the coordinates of your crosshair.

To set a waypoint, move the crosshair to the desired coordinates and press **Select**. Your proposed flight route is automatically plotted. You can set up to five waypoints. To cancel a waypoint, place the crosshair over the point to be erased and press **Cancel**, and your flight route is replotted accordingly. To cancel all waypoints, select **Clear All Waypoints**.

Plan your route carefully to avoid enemy SAM

sites and other threats to your aircraft. During your flight you can use your UFCP to select range, bearing, and estimated time to arrival information for each waypoint.

COMMAND

(Only available for Operation Conquest)

As squadron commander, you can now instruct additional aircraft to execute missions in addition to your own. Select **Command** to determine the number of serviceable aircraft available at each allied airfield.

To dispatch an aircraft, first contact the airfield by selecting that airfield symbol in the text area. If an aircraft is available, you can assign it target coordinates by positioning the crosshair on the target and pressing **Select**. The aircraft's flight route is plotted as visual confirmation. To cancel an assignment, place the crosshair back in the text area on the appropriate airfield symbol and press **Cancel**. You can assign one aircraft per airfield, up to a maximum of four at any time. Note: Once an aircraft is airborne, it can't be given new instructions.

WEAPONS

Select **Weapons** to go to the hanger and meet the ground crew. They have already refueled your aircraft, reloaded the internal gun, and completed the sub-system ground checks.

Your F-16 has 9 external hardpoints capable of carrying a wide variety of weapons, including the latest laser-guided smart missiles and the new AMRAAM "beyond visible range" air-to-air missile. You have also been cleared to use the first production LANTIRN night vision



and target acquisition pods, which can be attached on either side of the engine intake. These pods will revolutionize night attack capabilities.



Weapon Selection

Once you decide on your weapons configuration, check the stock record files for their availability. Weapons are loaded (in pairs) by indicating to the ground crew your chosen hardpoint for the weapon file that's open. Weapons can be loaded and unloaded as often as you want by pressing **Select** and **Cancel**.

Be aware of loading restrictions (see Chapter 6, *Weapon Loading Restrictions*). Keep an eye on your All Up Weight (AUW). The ground crew won't let you exceed the specified maximum for each hardpoint, but remember that increasing the weight of your aircraft reduces its maneuverability. If you exceed 9g stress loads, your F-16 automatically reduces its maximum g capability. If your AUW gets uncomfortably high, your ground crew may reduce the amount of fuel you're carrying, or they might unload some rounds from your internal gun. (Your fuel state and ammunition level are displayed above your aircraft.)

For your convenience, the stores officer will keep a temporary record of up to three preferred configurations to speed up the turnaround time between missions. To store a weapon mix, load your preferred weapons, then select **Store** at one of the three configuration stations. The next time you need to load that weapon mix, you can simply select **Load** at that configuration station. Also, you can ask your ground crew to suggest a weapon mix appropriate to your mission.

MET OFFICE

With the exception of Operation Conquest, TAC will let you to take off in the weather conditions of your choice. Select **Met Office** and then indicate your preferences. The meteorological (MET) office will do their best to comply with your wishes; however, they can't guarantee that conditions will remain stable throughout your flight.

TAKE OFF

When you're fully briefed and your aircraft is armed, it's time to get airborne. Select **Take Off** to start your mission. Good luck!

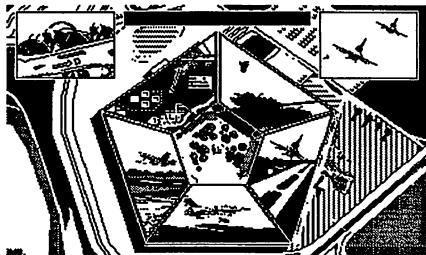
"You fight like you train."

— Motto, U.S. Navy Fighter Weapons School (TOPGUN)



FRONT LINE OPERATIONS

Warning! Attempting these missions without proper training could be deadly.



Mission Selection

Missions are assigned by Tactical Air Command (TAC) and are grouped into the five primary roles of the F-16 (clockwise from bottom left):

- Scramble** — Air-to-air interception
- Watchtower** — Reconnaissance
- Tankbuster** — Battlefield close air support
- Hammerblow** — Offensive counterair operations
- Deepstrike** — Interdictor strike

And finally...

- Operation Conquest** — Multi-mission campaign

TAC doesn't allow novice pilots to command Operation Conquest. You'll receive your own command only after you have completed a successful mission in each of the primary roles.

Once you make your selection, you are taken to the preflight briefing for target details and weapon loading.

MISSION TACTICS

Scramble — Air-to-air interception

Objective: Intercept and destroy hostile aircraft.

Hostile aircraft are approaching! Your ground crew have fueled and checked out your aircraft. Don't forget your pre-flight briefing.

To explain fully the principles of air combat would take a book in itself, so here is a brief look at the five basic elements involved:

1. **Detection:** Early Warning Radar can help if the target is not flying too low. Locating and tracking the target is best done with your air-to-air radar, but remember that it's a transmitter and will alert the enemy of your approach. The most important factor with detection is "the earlier the better," so you have time to plan your attack and to select the right weapon.
"He who sees first, lives longest."
— Unknown
2. **Positioning:** Your most effective weapon is surprise, so planning your approach is vital. A wide sweeping turn to a position above and behind your enemy gives you maximum "energy" and the upper hand as you begin your attack.
3. **Attack:** Choose your weapon and commit to the attack. Speed is very important in maintaining the element of surprise. Watch for the launch window of your weapon, and then go in for the kill.



4. **Engage:** Unless you catch your target completely off guard, expect him to make dramatic evasive maneuvers. Put him on the defensive by firing the first shot, then maneuver your aircraft onto his tail as quickly as possible. If the enemy gets on *your* tail, use violent, uncoordinated turns to throw him off. It pays to be unpredictable.
5. **Break off:** The key to success in a dogfight is to remain as aggressive as possible. But if you suffer extensive damage or run low on fuel, it's time to break off from the dogfight. Speed and height are what you really need now; select full afterburner and head for home. Expect to make evasive maneuvers if your opponent chases you.

Watchtower — Reconnaissance

Objective: Fly over designated areas and transmit data back to HQ.

For TAC to plan and coordinate its operations, it's essential that they are kept up-to-date on the movement of enemy ground forces. Despite the advent of spy satellites, reconnaissance missions remain a vital source of intelligence. Present techniques involve two different approaches: (a) high speed, high altitude sorties typical of the SR-71 Blackbird, and (b) high speed, ultra-low level sorties for which the F-16 is perfectly suited.

TAC has recently received the very latest high-tech reconnaissance pod: ATARS (Advanced Tactical Air Reconnaissance System). With ATARS mounted on your centerline weapons

pylon, you can transmit information in real time via relay stations to give HQ a strategic and tactical update.

A vitally important aspect of any reconnaissance mission is to keep the enemy unaware of where you've been and what you've learned about his movements; therefore, remember to switch on your ATARS transmitter only when you're over the target area, so as not to draw attention to your activities. Plan your route carefully, and keep yourself as light and maneuverable as possible with a minimum self-defense capability.

Warning: Your ATARS pod is the very best that technology can offer. Don't let it fall into enemy hands.

Tankbuster — Battlefield close air support

Objective: Assist your ground forces in clearing the area of all enemy armored vehicles, SAM launchers, and hostile aircraft.

Your first priority is to down any patrolling aircraft, so fire AMRAAMs to clear the air before you arrive. Use your air-to-air radar in Track-While-Scan mode to search during your approach. Your next priority is to wipe out any mobile SAM launchers, so keep an eye on your passive warning radar. If you find yourself illuminated, send a HARM anti-radiation missile down its tracking beam.

Bring LANTIRN with you if it's available. LANTIRN gives you automatic target acquisition and long range missile guidance for both infrared and laser-guided Maverick missiles. If you are unable to secure a LANTIRN pod,



laser-guided Mavericks can still be used from long range, as long as allied infantry equipped with laser target designators are in the area. As a last resort, aim your AGM-65D IIR Mavericks by "visually" locking-on through the infrared zoom lens of the missile. Without LANTIRN, however, this can only be done at relatively close range.

Hammerblow — Offensive counterair operations

Objective: Destroy assigned enemy military installations to reduce the enemy's ability to strike back. Targets include:

- Airfields — Runways, hangars, grounded aircraft, control towers
- Military bases — These control the deployment of mobile ground forces
- C-cubed centers — Responsible for intelligence and EWR coordination
- Early Warning Radar (EWR) installations
- SAM and Anti-Aircraft Artillery (AAA) sites

TAC will select your target and brief you with the necessary details prior to takeoff. You can even get a few words of advice about potential hazards in the target area, so be ready to take notes.

Your ground crew has fueled your aircraft and will recommend a suitable weapon configuration if you request. Don't forget to take at least a couple of air-to-air missiles in case you encounter enemy interceptors.

The most important aspect, as in any mission,

is surprise. Here are some tips on how to give the enemy as little warning as possible:

- Don't fly directly to a target, or the enemy can anticipate your objectives and prepare its defense. A common tactic is to plan your flight path with a drastic change of direction prior to arriving at the target.
- Flying low minimizes the possibility of being tracked by enemy Early Warning Radar. This reduces the likelihood of enemy interceptors appearing.
- Maintain radio and radar "silence" as much as possible. Transmitting to an airfield or using your radar makes the enemy aware of your presence.
- Unless directed to attack an SAM or EWR site, it's best to avoid these installations.

"Fly low, hit hard!"

Deepstrike — Interdictor strike

Objective: Destroy assigned enemy vital support installations and supply links. Targets include:

- Fuel depots — Control fuel supply to airfields and military bases
- Power stations — Provide power to factories
- Factories — Provide essential repairs and supply replenishment
- Bridges — Supply route choke points

Penetrate enemy airspace, avoid ground defenses, strike your assigned target(s), and get home as quickly as possible. Organize your flight plan carefully, and get familiar with your route and any possible landmarks that you can use on the way. It's also a good idea to



estimate your time to each waypoint — you might need fuel reserves if you have to divert to an alternative airfield or get lost.

You can select your own weapons configuration, or the ground crew will recommend a suitable one if you request. Keep an eye on your Threat Warning Panel, and be prepared for the arrival of enemy interceptors.

Gladiator — Two-player dogfight

Gladiator lets you engage in head-to-head battle. Your mission begins on the runway with an air combat weapon load. (No preflight briefing necessary; no pilot log active.) Intelligence will inform you of your opponent's starting location, and EWR will track him if he strays above 500 feet. (See TO on the UFCP.) A new mission will begin after each kill. (See your Pilot Kneepad for details.)

"When you engage, you know that only one of you is going home..."

Operation Conquest

/ITX 23291XX(TAC)+ 15:37:06
FROM: TACTICAL AIR COMMAND
SECURITY: * TOP SECRET *
RED ALERT! HOSTILE FORCES ENGAGED.
ACTIVATE "OPERATION CONQUEST".
YOU HAVE BEEN SELECTED AS SQUADRON
COMMANDER.
REPORT FOR INTELLIGENCE UPDATE IMMEDIATELY.
OBJECTIVE OF ENGAGEMENT — ENEMY
SURRENDER.
GOOD LUCK!

The enemy offensive consists primarily of low flying ground attack aircraft and highly mobile tank battalions. Their priorities are unknown, but many of our military installations and strategic support services are threatened. The situation should become clearer as you learn more about the enemy's movements through reconnaissance missions. The enemy is currently enjoying air superiority; you *must* change that.

Unlike your other front line duties, Operation Conquest tests your leadership and flying skills in a conflict you hoped would never happen. Day and night, regardless of weather, the enemy advance will continue. Without air support, the allies will suffer heavy losses, and morale will fall. Every ounce of experience will be needed to prevent the enemy from fulfilling their objective — the total defeat of the allies.

As squadron commander, it's your responsibility to anticipate the enemy's intentions, consider the consequences, and act decisively. Under your command is a squadron of allied aircraft capable of flying missions in addition to your own. Assignment of targets and the effective use of these aircraft is your responsibility during the pre-flight briefing (using the Command selection). Your ground crew will do everything possible to support your mission, but be prepared for a shortage of weapons and spare parts.

Study your Electronic Strategic Display carefully during your preflight briefings. Watch out for any weak links. Essential strategic installations can be repaired given time and spare parts, but don't rely on either! Your priorities must remain flexible. TAC has pre-



pared the following brief to assist you in formulating your strategy:

TACTICAL AIR COMMAND OPERATION CONQUEST — TARGET BRIEF COMMANDER'S EYES ONLY

Airfields — These range from minor airstrips with limited support capability to major front line stations. Airfields are heavily defended with SAM launchers, anti-aircraft artillery, and defensive interceptor aircraft. Your priorities here will include destroying any visible aircraft on the ground and putting the runway(s) out of action.

Military bases — Military bases control the deployment of mobile ground forces, including tank battalions and SAM launchers. Destruction of these bases reduces military coordination and effectiveness. They are heavily defended.

Factories — Factories supply weapons, spare parts, and new military equipment (tanks, aircraft, etc). They also provide essential repair services for all damaged installations. Factories are considered relatively "soft" targets (not heavily defended), but not all sites are of strategic importance.

Power stations — Power stations provide power to factories. Because of their strategic importance they are very heavily defended. Output will cease only if all cooling towers are destroyed.

Fuel depots — Fuel depots supply fuel for aircraft and mobile ground forces. These targets are soft, but numerous. Their destruction

leads to fuel shortages and reduced mobility for all military vehicles.

SAM & AAA sites — These are major ground defense installations offering long range, wide area defense against air attack. Avoid them if possible, or destroy them from a distance. Don't confuse them with mobile SAM and AAA vehicles or shoulder-launched SAMs, which offer short range cover.

Early Warning Radar sites — EWR sites are responsible for tracking intruder aircraft and scrambling enemy interceptors. Avoid detection by flying below 500 feet and take advantage of any "blind spots" midway between stations. Damage reduces their effective range, but expect the enemy to give high priority to repairs. Any area without radar cover is vulnerable to air attack, so EWR sites are heavily defended.

Command, Control, and Communication centers — These centers are responsible for producing intelligence reports, in-flight updates, and for coordinating air and land forces. They are heavily defended.

Tank battalions — Tank battalions are responsible for offensive ground attack on strategic installations. They are highly mobile, and they are protected against air attack by SAM launchers and/or aircraft. They are capable of limited self defense.

Bridges — Bridges are usually referred to as "supply choke points." The destruction of bridges has a detrimental effect on the supply of spare parts, weapons, and fuel.

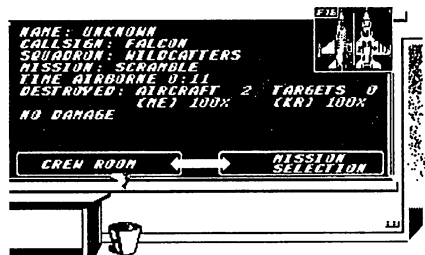


Note: Your experience during Operation Conquest is recorded in your personal log under commanding hours and successful campaigns. As commander, you won't personally embark on any mission, but instead you'll fly as a squadron pilot, under your own callsign. If this pilot is killed in action, you'll continue flying as another pilot, subject to the availability of aircraft. After successfully completing a campaign, you'll be offered the opportunity to transfer to a squadron of higher status.

DEBRIEFING

After landing, whether during a mission or Operation Conquest, proceed to the nearest hangar where you'll be met by the ground crew. They'll give you a full damage report later. Please observe airfield speed restrictions when taxiing.

Now it's time to assess the mission. TAC will be waiting to give you a full debriefing.

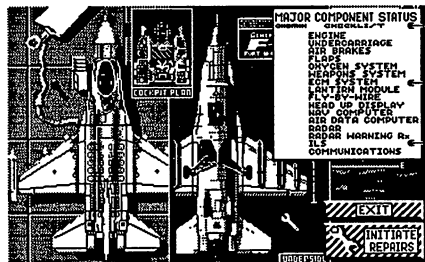


Debriefing

For all "primary role" missions, you'll be given your Mission Effectiveness (ME) ratio and your Kill Ratio (KR) for that particular flight. These will not necessarily agree with your

overall ME and KR values, which are cumulative and are recorded in your pilot's log. For Operation Conquest, your debriefing between flights includes information on squadron strength, allied ground forces, and morale.

It's time to take a look at the damage report. Do so by selecting the F-16 schematic in the upper right corner of your debriefing screen.



Damage Report

Your ground crew will give you a report on major component status, and they'll do their best to get your aircraft back into shape as soon as you initiate repairs.

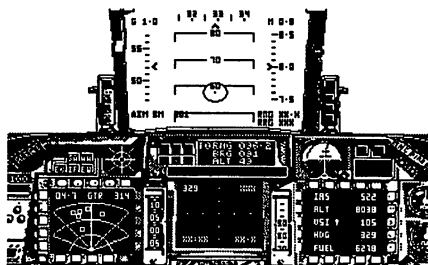
If you're in the middle of Operation Conquest and fatigue sets in, select **R & R** to take some well-earned leave. You can resume the campaign by selecting **Recall Game** in the squadron crewroom.

If you've just returned from a successful Operation Conquest, TAC will offer you a voluntary transfer to a new squadron of higher status. The choice is yours. Completion of Operation Conquest in the top level squadron takes a very special kind of pilot. Few have achieved this distinction.



FLIGHT INSTRUMENTS

This chapter covers all the flight instruments of the F-16C.



F-16C Cockpit

For a diagram detailing the placement of these instruments in the cockpit, see your Pilot Kneepad.

Multi-Function Displays (Sperry)

Your aircraft comes equipped with three Multi-Function Displays (MFDs), which were introduced as part of the MSIP avionics update program. This layout was first evaluated in the AFTI F-16 technology demonstrator.

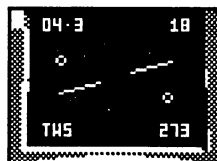
The major advantage of the MFD is its flexibility. There are eight different functions you can view on any MFD, and you decide which to use for radar, weapons status, moving map, etc. All functions are available on each display, giving you the choice of what to display and where you want it. Below are the eight functions and an explanation of each. Refer to your Pilot Kneepad for mode selection.

AN/APG-68(V) Multi-Mode Radar (Westinghouse)

Here are the short range modes available on this state-of-the-art radar.

Air-to-Air modes

Track-While-Scan (TWS)



Used for air-to-air search for hostile aircraft. The display represents a cross-sectional view of the pilot's field of vision, pointing in the direction of the nose of the aircraft. Effective range is approximately 30 nm.

The radar displays all aircraft within its field of view and is capable of tracking up to ten targets simultaneously. Using the Target Select key, you can track any one displayed target (identified by a different color — see Pilot Kneepad for details), with range (top left corner), altitude (top right corner), and bearing (bottom right corner) information calculated by your weapons computer.

Single-Target-Track (STT) mode

Pressing the Designate key switches the radar to STT mode. The selected target is now displayed as a diamond, with all others removed from the screen. You'll



also see the target designator box appear on the HUD, showing the position of your target relative to the nose of your aircraft, together with the LOCK discrete. Return to TWS mode by either pressing the Designate key again or destroying the target. Note: If your designated target leaves the radar's field of view, the display will automatically return to TWS mode.

Air Combat Scan (ACS) mode

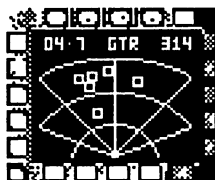
Pressing the Dogfight selector on your throttle control puts your radar in ACS mode. Target symbology is the same as STT mode (a single diamond) but your weapons computer automatically locks onto the target of greatest threat. its effective range is approximately 10 nm. Return to TWS mode by pressing the Designate key.

Superimposed on all modes is the Roll Orientation bar to assist you when looking down into the cockpit.

Air-to-Ground modes

Not to be confused with your Global Positioning System, the radar air-to-ground mode is used for ground target tracking.

Ground-Target-Ranging (GTR) mode



This is equivalent to the air-to-air mode Track-While-Scan. This display is a forward-looking plan view that shows all fixed installations and mobile ground targets. Using the Target Select key, you can track one displayed target (identified by a different color — see Pilot Kneepad for details), with range and bearing information shown on the HUD and MFD. Effective range is 10 nm.

Ground-Target-Track (GTT) mode

Pressing the Designate key switches the radar to GTT mode. The chosen target is now highlighted, with all others removed from the screen. You'll also see the target designator box appear on the HUD, showing the position of the target relative to the nose of your aircraft, together with the LOCK discrete. Return to GTR mode by either pressing the Designate key again or destroying the target. The display automatically returns to GTR mode if the designated target leaves the radar's field of view.

Moving Map Display



Linked to the tri-service Global Positioning System, this display uses your inertial navigation computer and various external classified sources to pinpoint your exact position within



the combat zone. The symbolic digital display highlights airfields, hills, towns, waypoints etc., relative to your aircraft at the center of the MFD.

Weapon Status



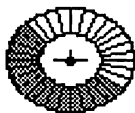
This mode gives a symbolic presentation of your external weapon count on each of the nine hardpoints. Having chosen your weapon type (shown on the Head Up Display), the weapons computer automatically selects the hardpoint. Also shown are the number of remaining rounds of ammunition, plus the number of remaining chaff and flare cartridges. The currently selected weapon is highlighted. Consult this display if you get a "weapon failure" warning.

Digital Artificial Horizon

This is a new concept in artificial horizon design. A multi-segment circular strip is used to portray the attitude of your aircraft relative to the ground.



Climb



Roll

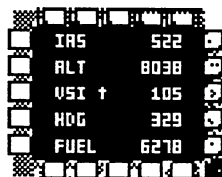


Dive

Pitching the nose of the aircraft up gives an impression of flying over a hill while diving creates a valley effect. The proportions of sky and ground remain constant as the aircraft rolls. The distinct advantage of this new British design is that, unlike the conventional spherical artificial horizon, the pilot is always aware of his aircraft's orientation.

Primary Flight Data

This direct output from the air data computer replaces the old analog airspeed and altitude indicators that were once mounted in the central console. This display is particularly useful in the event of HUD failure.



- IAS — Indicated airspeed in knots
- ALT — Altitude in feet
- VSI — Rate of climb in feet per second
- HDG — Aircraft heading in degrees
- FUEL — Fuel supply in pounds

There are three types of airspeeds you need to know: true airspeed, indicated airspeed, and ground speed. True airspeed is simply the speed of your aircraft through the air. This differs from indicated airspeed which is the value presented in the cockpit on your MFD or your HUD. This value is derived from air pressure acting upon a small open-ended Pitot tube mounted on the nose of the aircraft. As air pressure decreases with increasing



altitude, your indicated airspeed will also decrease. Because of this, *your minimum indicated flying speed is always the same, independent of altitude.*

Note: Aircraft weight has a significant effect on your minimum flying speed. Here are some typical values:

Aircraft weight	Minimum indicated airspeed
17,500 lbf	93 knots
25,000 lbf	106 knots
37,500 lbf	123 knots

Ground speed is your effective speed with respect to the ground. When flying straight and level, your ground speed is equal to your true airspeed. In a climb or dive, however, your ground speed is equal to the horizontal component of your true airspeed, reaching zero for vertical flight. Your air data computer uses ground speed to calculate your Estimated Time to Arrival (ETA).

An additional form of speed readout is your Mach number. This is your true airspeed expressed in units of the speed of sound at your present altitude. The speed of sound spans from 661 knots at sea level to 573 knots at 36,000 feet (the tropopause), and it remains constant above this altitude (the stratosphere).

Zoom Thermal Image, with IIR Maverick and/or LANTIRN



When carrying Maverick AGM-65D (Imaging Infra Red) missiles and/or the LANTIRN pods, you can select a miniature thermal image on any MFD, similar to looking through a telephoto lens. Without LANTIRN, you're effectively viewing the world through the homing head of the missile, restricted in this case to "hot" targets such as tanks and mobile SAM launchers. The image enhancing capabilities of LANTIRN enable you to identify and track any potential target within the capabilities of the selected weapon. (See Chapter 6, *Weapon Management*.)

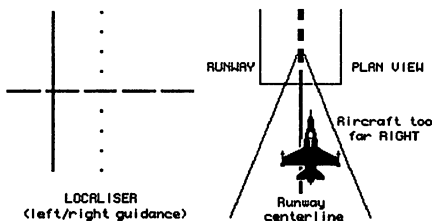
Instrument Landing System, AN/ARN-108 (Collins)

This display is your primary landing aid. The Instrument Landing System (ILS) consists of two radio beams transmitted from the airfield to help you (a) line up with the runway centerline and (b) descend to the airfield along the correct glidepath. The equipment on board your F-16 uses the two beams to drive your display.

(a) Localiser: The localiser beam helps you line up with the runway center line. As



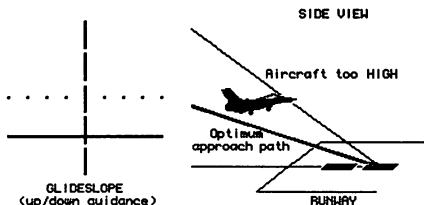
you deviate from alignment with the center line, the vertical needle on your display will drift in the opposite direction; e.g., drifting to the left makes the vertical needle drift to the right, and vice versa.



Deviation from the Centerline (ILS)

To correct any error, you must turn *toward* the needle. Make a corresponding turn in the opposite direction as the needle centralizes to ensure that you finish on the correct heading. It will help if you have your Up Front Control Panel navigation display set to the airfield for range and bearing information.

(b) Glideslope: The glideslope beam provides guidance for adjusting your rate of descent. The ideal glidepath leads to touchdown a few hundred feet beyond the runway threshold. Approaching too high will make the glideslope needle go below the center of the display and vice versa. To maintain the correct descent rate during your approach, keep the glideslope needle central. Respond if necessary by flying *toward* the needle; i.e., increase your rate of descent if the needle is low; decrease your rate of descent if the needle is high.



Deviation from the Glideslope (ILS)

When in the vicinity of an ILS system, availability is confirmed by the ILS In Range light on your Up Front Control Panel. The landing aid is effective up to an altitude of 5,000 feet at its maximum range of approximately 15 miles. Note: Not all runways have ILS transmitters.

Other Instruments

Radar Warning Receiver, AN/ALR-69 (Dalmator)



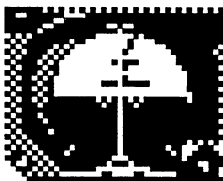
This is your passive Radar Warning Receiver. Sensors positioned around your F-16 are used to detect radar transmissions from enemy aircraft, radar guided missiles, and enemy Early Warning Radar installations. Used in conjunction with your Threat Warning Panel, it's possible to determine the source and direction of the threat.

It's interesting to note that an enemy aircraft using his air-to-air radar will be detected by



your Radar Warning Receiver before he's aware of your presence. This is because your radar reflection will initially be too weak to be seen by the enemy radar. This illustrates the importance of maintaining "radar silence" wherever possible.

Attitude Director Indicator (Clifton Precision)



This instrument shows the pitch and roll attitude of your aircraft. It is also known as the standby artificial horizon.

Angle of Attack indicator (Gull Airborne)



The angle of attack is defined as the angle between the wing and the on-coming airflow. For stability reasons, the angle of attack is automatically limited to 25 degrees by the fly-by-wire control system. A typical value during landing is 12 to 13 degrees.

Vertical Speed Indicator



Calibrated in feet per second, this scale shows your rate of climb and descent. This instrument is particularly useful during landing, but dramatic rates of climb/descent will go off the scale.

Engine rpm Indicator

On the far left side of the instrument panel, below the Master Caution light, is the digital engine rpm indicator and the afterburner indicator. The old analog engine rpm indicator is in the usual place, over your right knee.

Your aircraft is equipped with a General Electric F110-GE-100 engine, rated at 27,000 lbf maximum thrust. On power up, the engine control system will adjust the idle rpm to 60%.

The throttle lever by your left hand adjusts engine rpm up to 100% and then, after passing a detent, moves through into reheat by pushing the control further forward. The amount of reheat selected is indicated by a red bar appearing on the afterburner indicator. A second digital rpm display is mounted next to the throttle control on your left cockpit panel.

Fuel Gauge

The gauge has two needles; one for the internal fuel supply, and one for the external fuel supply. Fuel is consumed from the external tanks first.



Internal: FULL
External: IN USE

Internal: IN USE
External: EMPTY

Internal: EMPTY
External: EMPTY

For a given throttle setting, fuel consumption *decreases* as you gain altitude. Optimum performance is reached at the normal cruise



altitude of around 35,000 feet where fuel consumption is roughly a quarter of the rate at sea level. This gives an approximate flight duration of two hours and a tactical radius of 500 nm on full internal fuel. Using reheat, however, consumes fuel very rapidly giving a total duration with maximum reheat at sea level of less than ten minutes.

Up Front Control Panel

The Up Front Control Panel (UFCP) houses essential Communications, Navigation, and Identification (CNI) functions:



CNI Datalink

The largest portion of the UFCP is dedicated to a three function datalink display. Airfield and waypoint navigation data is derived from your Inertial Navigation System LN-39. Tracking data for enemy aircraft is obtained via datalink with allied Early Warning Radar stations. Use the UFCP mode selector to cycle through the following modes:

Airfield — Range, bearing, and ETA information is available on all allied airfields. Select the required airfield using the UFCP channel selector. For example:

A3 RNG 89 (Airfield 3 — range 89 miles)

BRG 245 (Bearing 245 degrees)
ETA 9:13 (Estimated Time to Arrival 9 mins 13 secs)

Waypoint — Range, bearing, and ETA information is available on all waypoints defined prior to takeoff. Select the required waypoint using the UFCP channel selector. For example:

W1 RNG 26 (Waypoint 1 — range 26 miles)
BRG 172 (Bearing 172 degrees)
ETA 2:41 (Estimated Time to Arrival 2 mins 41 secs)

Tracking — Each known airborne enemy aircraft is allocated a channel on your UFCP. Select the required channel for range, bearing and altitude data on aircraft currently being tracked by EWR. Range and bearing is relative to your own aircraft. For example:

T2 RNG 90 (Bogey — range 90 miles)
BRG 018 (Bearing 18 degrees)
ALT 35 (Altitude 35,000 feet)

Note: To fly towards your selected target, adjust your heading to match the target bearing. The ETA is correct assuming you maintain your present speed.



System Control Functions

To the left of the datalink display are six indicator lights:



ATARS
pod is on



LANTIRN
pod is on



RADAR
is active



ILS is in
range



Autopilot
engaged



UHF transmission
in progress

UHF Communications Transceiver, AN/ARC-164 (Magnavox)

CLEAR FOR TAKEOFF

Mounted along the bottom of the UFCP is your UHF communications display. This is used for receiving in-flight messages from airfields, command centers, and EWR installations.

Data Entry Panel



A request for your IFF security code will appear on your UHF communications display.

Once you correctly enter your response into your Data Entry Panel, you'll receive security clearance. See your Pilot Kneepad for more information.

Threat Warning Panel

This consists of five warning lights, each designed to bring your attention to a particular type of threat.



SA — Launch of a surface-to-air missile detected. The threat will appear on your Radar Warning Receiver if it's radar guided; otherwise, you can assume it's infrared guided. Respond by releasing chaff or flares. Maneuver to deplete missile energy and maximize tracking errors.

AA — Launch of an air-to-air missile detected. The threat will appear on your Radar Warning Receiver if it's radar guided; otherwise, you can assume it's infrared guided. Respond by releasing chaff or flares. Maneuver to deplete missile energy and maximize tracking errors.

EC — Enemy is transmitting Electronic Countermeasures in an attempt to defeat your tracking radar or air-to-air missile.

IF — You are being tracked by the radar of an enemy aircraft. Consult your Radar Warning Receiver to determine its approximate bearing.



EW — You are being tracked by an enemy Early Warning Radar installation. Consult your Radar Warning Receiver to determine its approximate bearing.

Airborne Self Protection Jammer (ASPJ, AN/ALQ-165, Westinghouse/ITT)

This should automatically attempt to break any radar tracking beam, but don't rely on it too heavily. Once the enemy is aware of your approach they won't give up trying to track you; even worse, you can expect to be met by enemy interceptors. To break the lock, fly as low as possible and alter your course.

Warning Lights

ALERT — Master caution light. This comes on when any "subsystem" fails. Consult your Failure Status Panel on your right cockpit panel to determine the precise failure.

ENG — Engine failure. Your only engine is dead. Given sufficient altitude and a nearby airfield, you should be able to execute a dead stick landing.

FIRE — Warning of an on board fire. If you are very close to an airfield you can risk a rapid touchdown before losing control. Your only other option is to eject.

FUEL — Fuel low warning. Flashes when fuel low. Stays lit when out of fuel.

EXT — External fuel tanks empty. This light confirms that your external tanks are empty if you want to jettison them.

Other Lights

Undercarriage — On the extreme left of the instrument panel, three green lights indicate that the undercarriage is down; three red lights indicate that the undercarriage is up.

Jettison — This is below the undercarriage light. You can jettison the external tanks, or you can jettison all external loads with the exception of missiles fitted to the wingtips. The light illuminates to confirm the operation.

Wheel brakes — Illuminates when wheel brakes are on.

Air brakes — Illuminates when air brakes are on.

Eject handle — This is below the center MFD. When all else fails, pull the "loud handle" as a last resort. Don't use it at low altitude when inverted; this could kill you instead of save you.

Left Cockpit Panel

Look to your left to see the throttle grip, which is used to control engine rpm and reheat in the normal manner — forward to increase, backward to decrease. You'll probably notice a slight delay between your throttle movement and the change in engine rpm. This is normal and is due to the inertia of the engine's rotating blades. Once engaged, your engine control system will prohibit a deliberate shut down of the engine.

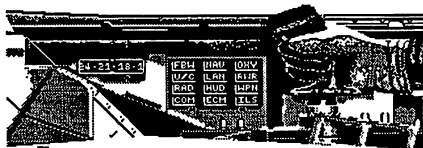
Typical engine rpm at the idle setting is 60%. The power curve of the engine gives a gradual



increase in thrust up to about 90% rpm, above which you'll experience a rapid thrust increase up to 100% rpm. This is the maximum "dry" thrust, or full military power. Further engine thrust is achieved by engaging the afterburners, called "reheat." The principle operates on spraying additional fuel into the engine exhaust, where it ignites to provide a significant increase in thrust, e.g. from 16,000 lb to 27,000 lb. Reheat is selected by moving the throttle grip through a detent, beyond which you have linear control up to maximum thrust. To select reheat, push the throttle until you reach 100% rpm, release the throttle momentarily, and then continue to push to the required reheat level as indicated next to the rpm readout.

Note: Engine rpm does not increase with the selection of reheat. Reheat will dramatically increase your fuel consumption. Use it sparingly!

Right Cockpit Panel



Right Cockpit Panel

Look to your right to see the sidestick controller. Instead of a conventional control column, your F-16 is fitted with a force-sensitive sidestick. Movement is minimal, with pitch and roll rates being proportional to the pressure

applied. The sidestick also offers a nose wheel steering facility when moving on the ground at speeds below 95 knots.

A mechanical compass is positioned further forward, calibrated every 10 degrees, e.g. 09 = east, 18 = south, 27 = west, 36 = north

Also on the right cockpit panel is the Failure Status Panel. Consult this panel when you see the Master Caution light illuminate.

FBW — Failure of fly-by-wire channel. Results in reduced aircraft agility. Control system gains are halved.

U/C — Undercarriage failure. If you can't lower your undercarriage, you'll have no option but to do a "wheels up" landing. One of the early prototypes managed it and only scraped the paint — it is possible.

RAD — Radar failure. All radar modes lost.

COM — Failure of communications transceiver. GCA option no longer available.

NAV — Failure of the INS. All navigation aids on your UFCP will cease to function.

LAN — Failure of LANTIRN night vision pod or targeting pod. Automatic target selection will be lost. Enhanced night vision will be lost.

HUD — Failure of the Head Up Display. Loss of all weapon aiming functions and Head Up flight data: speed, altitude, etc.

ECM — Failure of ASPJ ECM jammer. This makes you more susceptible to radar tracking.



OXY — Oxygen system failure. Flight above 8,000 feet will lead to impaired vision and loss of consciousness.

RWR — Failure of Radar Warning Receiver. Detection of enemy radar tracking beams will cease.

WPN — Weapon failure. Consult weapon status display on an MFD to determine precise failure.

ILS — Failure of Instrument Landing System. Automatic landing will no longer be available since the autopilot uses the ILS system.

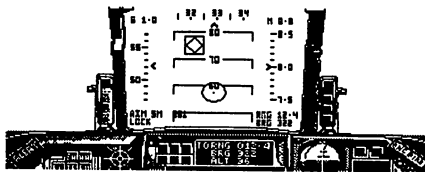
Rear View

Your F-16 offers excellent all around vision from the cockpit. This is essential during combat maneuvers. Make sure that you periodically look out each side and the rear to check for hostile aircraft.

“One peek is worth a thousand radar sweeps.”

— Unknown

Head Up Display (GEC Avionics UK)



Head Up Display

Superimposed upon your view ahead is a projection of symbolic and alphanumeric information. Essential information such as airspeed, heading, altitude, and weapon aiming symbology are presented, enabling you to focus outside the cockpit (“head up”) for the majority of the time. The display also has the ability to present a “daylight” infrared image when used in conjunction with LANTIRN for night flying.

Aircraft Heading — Your magnetic compass heading is across the top of the display, incremented left to right, divided in units of 10 degrees, calibrated every 5 degrees, with resolution of 1 degree. The central marker is your present heading.

Indicated Airspeed — The vertical scale on the left side of the display shows your IAS. It's incremented from bottom to top, divided in units of 50 knots, calibrated every 10 knots, with resolution of 2 knots. The central marker shows your current IAS.

Altitude — The vertical scale on right side of the display shows your altitude. It's incremented from bottom to top, divided in units of 500 feet, calibrated every 100 feet, with resolution of 20 feet. The central marker shows your present altitude.

Flight Path Ladder — Pitch bars show your aircraft's pitch and roll attitude relative to the ground. The ends of the bars point downward when climbing, and they point upward when diving. They are divided into units of 10 degrees. The present value intersects the center of HUD.



g Force — At the top left corner of the HUD is a readout of g force (weight multiplying factor) currently acting upon you and your aircraft.

Mach Number — Your speed is shown at the top right corner, expressed in multiples of the speed of sound at your present altitude.

Range — The uppermost figure at the bottom right corner of the HUD is the distance, in miles, to your current target.

Bearing — Immediately below the range is the target bearing. Adjust your heading to this value in order to fly directly towards the target.

Weapon Symbolology — Selecting a particular weapon will be confirmed on the HUD by its abbreviation, called a "discrete." Here is a list of the weapon discretely:

M61A1	Internal gun
AIM9M	Sidewinder
AIM120	AMRAAM
DUR	Durandal
AGM88	HARM
MK84	2,000 lb bomb
MK83	1,000 lb bomb
AGM65D	IIR Maverick
AGM65E	Laser Maverick
MK82	Snakeye bomb

The discrete is followed by the number of that weapon type remaining.

LOCK	Radar locked on target
IN RNG	In range cue for selected weapon

Ranging Reticle — After designating a target on your radar, the ranging reticle will appear at the center of the HUD. This symbol provides a dynamic visual cue of the range to your target. As an example, if you arm an AMRAAM, which has a range of 30 miles, and you have a target just over seven miles ahead of you, 25% of the ranging reticle will be light-colored to tell you that the target is at 25% the maximum range for the selected weapon.

Target Designator — This small box gives you an indication of where your target will appear on the HUD when it comes into visual range.

Lock-on Diamond — Once the launch parameters of your chosen weapon are met, the homing head will confirm lock-on by superimposing a diamond over the target.

Continuously Computed Impact Point — To ensure accurate delivery of unguided bombs, your weapons computer offers a Continuously Computed Impact Point (CCIP), displayed on the HUD for the appropriate weapons. Place the displayed "impact point" over the desired target at the point of release.

"Know and use all the capabilities of your airplane. If you don't, sooner or later, some guy who does will kick your ass."

— Lt. D.Pace, U.S.
Navy FWS Instructor



WEAPON MANAGEMENT

For safety reasons, all weapons are disarmed until you take off.

Air-to-Air Missiles

Sidewinder AIM-9M

Infrared (IR) guided

Min. range 0.5 nm

Max. range 11 nm (3.7 nm at sea level)

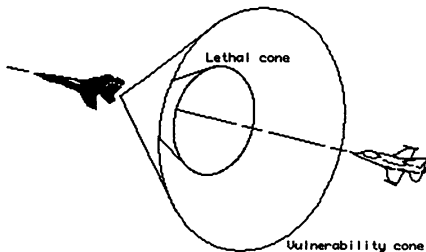
AMRAAM AIM-120A

Radar guided

Min. range 0.5 nm

Max. range over 30 nm (10 nm at sea level)

Both of these missiles are "fire-and-forget," which means you can turn away from your target after weapon release. Although modern technology gives these missiles an "all-aspect" capability, they are most lethal when fired at a target either head-on or from astern.



Vulnerability Cone and Lethal Cone

The missile is armed using the weapon

selector to bring the AIM9M or AIM120 discrete onto the Head Up Display (HUD). The number remaining is also shown. In the center of the HUD is the ranging reticle, calibrated to approximately 30 nm.

Your attack begins once you locate the target on your air radar in Track-While-Scan mode. When you lock on to your chosen target with the Designate command, the LOCK discrete appears at the bottom left corner of the HUD, and the target designator box overlays the target if it's within the HUD field of view. If the target is out of visual range, use the designator box as a steering cue. Look at the bottom right corner of the HUD for target range and bearing information. As you get closer to the target, the ranging reticle in the center of the HUD "unwinds" counter-clockwise. Once you are within range for the selected weapon, the IN RNG discrete appears on the HUD, and the weapon will confirm its own lock-on by superimposing a diamond over the target as soon as its launch parameters are satisfied. Maneuver until the target is reasonably centered on the HUD, and launch your weapon.

In the case of the AMRAAM, your radar passes tracking information to the homing head up to point of launch. Guidance is automatic thereafter, partly inertial, partly by its own radar. Be prepared for an ECM warning (see Threat Warning Panel), indicating that your target is trying to confuse the missile with electronic countermeasures. This light will turn off if either your on-board ASPJ (Airborne Self Protection Jammer) or the AMRAAM's



internal ECCM (Electronic Counter-Countermeasures) manage to counter the ECM defense.

The Sidewinder homes in on infrared (heat) emissions from the target—a glowing afterburner is a particular favorite. Don't get confused by the LOCK cue from your radar. The Sidewinder is *not* receiving radar guidance — *you* are. The missile confirms its own lock-on with the usual diamond symbol. After launch, the missile follows the strongest heat source, and that could be decoy flares if the enemy pilot has realized what's happening. Be ready for sharp evasive maneuvers — he may just pass through your gun sights. Also, the missile's inability to distinguish one infrared source from another makes it unwise to use when allied aircraft are close by or engaged in the same dogfight.

Another point worth noting is that infrared guidance systems don't work well in clouds, so don't waste your Sidewinders if you're above the cloudbase. Likewise, zooming for cloud cover may save your life if an IR missile is heading for your tailpipe.

Don't forget that all missiles have a minimum range as well as a maximum. When launched, the missile accelerates very rapidly to its maximum speed and may overshoot the target if you're too close. If you find yourself staring down his tailpipe, arm your M61 internal gun and fire point blank.

Air-to-Ground Missiles

HARM AGM-88A

Radar guided

Effective range 4 nm

HARM (High speed Anti-Radiation Missile) is a highly effective missile for use against any form of ground radar emitter, like Early Warning Radar stations and radar-guided SAM installations. HARM is smart enough to find its target even if the target is switched off after launch. Your Threat Warning Panel includes a radar tracking warning light (labeled **EW**) which illuminates whenever you are being tracked by ground-based air defense radar. Assuming that you have HARM on board, proceed as follows:

Use your weapon selector to arm the AGM-88 (confirmed on your HUD) and select Ground Target Ranging radar mode on one of your multi-function displays. Working in conjunction with your radar, your weapons computer will now restrict displayed targets to ground radar installations, and the radar will automatically select the offending site shown on your Radar Warning Receiver. Lock on to the target using the Target Designate command. The operation of HUD symbology for radar LOCK, target designator box, ranging reticle, IN RNG cue, and the weapon lock-on diamond is the same as for air-to-air weapons.



MAVERICK AGM-65

The weapon stores inventory includes the two most popular versions of this highly effective air-to-ground missile:

AGM-65D

Imaging Infra Red (IIR)

Effective range: variable

AGM-65E

Laser guided

Effective range: variable

Both types can be slaved to the LANTIRN target acquisition system to greatly enhance their range, accuracy, and ease of use. Above 30,000 feet the weapon becomes unstable.

AGM-65D use without LANTIRN

The AGM-65D is by far the most common version. Use the weapon selector to arm the missile, confirmed on the HUD by AGM65D. Next, put one of your MFDs in Thermal Image mode (a blank screen when no targets are in range). Target acquisition is accomplished with the imaging infrared seeker in the nose of the missile; it is used to generate a zoom thermal image on an MFD in your cockpit. Any hot target (i.e. tank or mobile SAM launcher) within the missile's field of view can be identified beyond visual range, up to approximately 3 miles.

Having identified your target to verify that it's hostile and not allied, "pickle" the weapon to lock the homing head to the

target. The lock-on diamond now appears and tracks your target, within the constraints of the HUD.

The ranging reticle is calibrated to approximately 10 nm. Maneuver your aircraft to bring the target close to the center of your HUD, and release your weapon. Note: Selecting and designating a target on your ground tracking radar won't necessarily correspond to the pickled target. Your weapon is locked on to the target surrounded by the diamond symbol; you can still have a different target designated for tracking purposes on your radar. The LOCK and IN RNG discretes refer to the radar-tracked target only.

To summarize:

1. Approach the target area, preferably using your Up Front Control Panel (UFCP) in Waypoint mode. The enemy can detect your approach if you use your ground radar.
2. Arm an AGM65D, with an MFD in Thermal Image mode.
3. As soon as you identify a hostile hot target, pickle the weapon to lock on, and fire!
4. Repeat step 3 during your approach, but don't stay immediately over the target area — you will be less vulnerable if you fly out and then make a second pass.
5. Once launched, the missile is self-guided.



AGM-65E use without LANTIRN

The AGM-65E version uses a tri-service laser tracker, allowing target designation by ground infantry, another aircraft, or by the aircraft carrying the weapon. The missile effectively rides a laser beam reflected from the chosen target, making it more accurate and less susceptible to countermeasures than its infrared equivalent. The missile's biggest advantage is that it's not restricted to hot targets. In the absence of LANTIRN, you must rely on ground infantry to illuminate the target using a portable ILS-NT200.

Operation is similar to the AGM65D, but lock-on is automatic once the weapon detects an illuminated target. This is confirmed by the diamond tracking symbol appearing on your HUD. Advantages include not having to pick the target manually, and knowing immediately that the acquired target is hostile. You don't, however, get a thermal image of the target. Your effective range is approximately 3 miles.

AGM-65 use with LANTIRN

Adding LANTIRN changes the process somewhat. As well as providing night vision capability, LANTIRN lets you identify and designate targets via your ground radar, both manually and automatically.

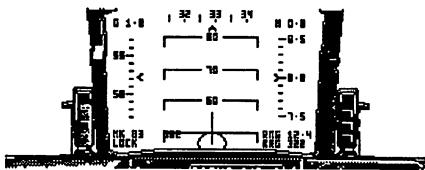
The targeting pod contains both infrared and laser target designators, allowing the system to be used with both types of Maverick, but the infrared type is still re-

stricted to hot targets. Having armed the required weapon (AGM65D or AGM65E), and confirmed that the LANTIRN pod is active (see UFCP), select your ground track radar on one MFD, and select thermal mode on another. LANTIRN automatically scans for hostile targets and designates the most appropriate on your ground radar display. You can manually override this and designate a different target.

Range and bearing information is displayed on the HUD, together with the target designator box overlaying the target. Weapon lock-on is confirmed with the tracking diamond. After firing your weapon, LANTIRN immediately locks on to the next target, so you can release another weapon. You'll soon appreciate the enormous advantages of automatic target recognition and designation when you see how many targets you can destroy in a single pass. Your effective range is now that of the missile, approximately 11 miles.

Note: Bombs can't be released at roll angles greater than 60 degrees.

The "concrete dibber" is by far the most effective weapon for putting runways out of action. It's an unguided bomb incorporating a brake chute and an internal rocket motor. Selecting this weapon puts the HUD into CCIP mode (Continuously Computed Impact Point) and is confirmed by the discrete "DUR."



HUD in CCIP Mode

Release the weapon when the aiming reticle is over the desired point of impact, preferably at the intersection of two runways. Although this sounds simple, the best technique of bomb release requires practice:

1. Approach the airfield at approximately 500 knots, below 500 feet.
2. Pull up into a climb, to about 2,000 feet.

3. Roll inverted, pulling the nose down to position the aiming reticle at the required impact point.
4. Roll to level flight, release the weapon, light the afterburners, and get OUT of there, releasing chaff and flares as you go.

Both types are simple free fall "iron" bombs, capable of destroying a large area. Again, use CCIP mode on the HUD with a release technique as described above.

Mk 82 Snakeye

This particular free fall bomb is fitted with retarding fins that flick open immediately upon release. Dropped at high speed and low altitude, their primary purpose is to shake off unwanted pursuing aircraft by exploding in their flight path.

M61A1 Vulcan 20mm cannon

The F-16 reigns supreme in the close-up dogfight, and this is where your choice of weapon will be the internal 20mm cannon. When selected, the ranging reticle (calibrated to 6,000 feet) is positioned to show bullet trajectory.

Maneuver your aircraft to position the reticle over the enemy aircraft, and get as close as possible. Open fire with a short burst. Its range can be up to 3,000 feet, but it is only really effective up to 1,500 feet. At typical combat speeds of 450 to



550 knots, things happen very fast, so keep your wits about you. A dogfight rarely lasts for more than a few seconds.

Mounted internally on the port side, this six-barrel, high velocity gun fires 100 rounds per second. Remember you have only 500 rounds to begin with, so your magazine can be emptied in five seconds! The technique is to fire in short controlled bursts, and only when the enemy is in your sights.

Other Equipment

ATARS (Advanced Tactical Air Reconnaissance System)

This new high tech pod provides near-real-time reconnaissance capability. Electro-optical sensors replace conventional photographic technology. Images are digitally processed and transmitted back to HQ via relay stations for immediate interpretation. To operate it, simply switch on the pod (confirmed on your UFCP) to scan the area beneath you, simultaneously transmitting the data back to HQ. Remember that any continuous transmission will eventually reveal your position to the enemy, so don't leave the system on longer than necessary. Minimum transmission time is 5 seconds; transmit less than that and data will be lost.

Note: *Do not jettison an ATARS pod!* This would result in the enemy decoding our secure transmission algorithms and steal-

ing the technology.

External Fuel Tanks

These can be carried on either the centerline or the inner wing pylons. Fuel is consumed equally from the external tanks prior to switching automatically to the internal supply. TAC regards external tanks as expendable on combat missions, but the stores officer is always grateful if you bring them back. External tanks will be fitted only after your internal tank is full.

Chaff and Flares

Your F-16 is fitted with internal chaff/flare dispensers (ALE-40). The number of chaff and flare cartridges remaining is shown on your Weapon Status Display. Unlike your weapons, chaff and flares don't have to be selected prior to firing.

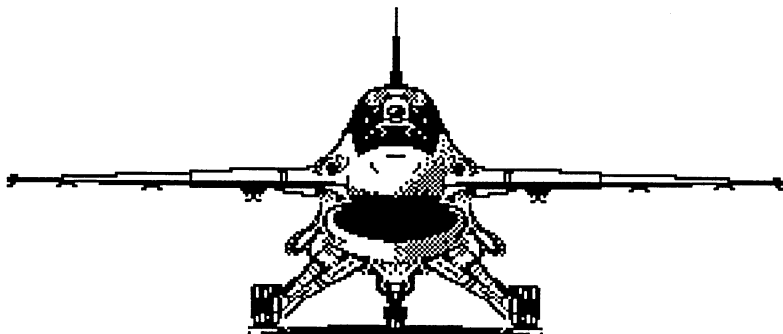
Chaff is a simple but effective means of self defense against radar-guided weapons and tracking stations. Deploy chaff when you see a threat appear on your Radar Warning Receiver.

Flares are self-defense decoys used to fool infrared homing missiles. Use them when you see the AAM or SAM warning on your Threat Warning Panel, but no indication on your Threat Warning Receiver. To be safe, dispense both chaff and flares and start to maneuver aggressively.



Weapon Loading Restrictions

There are nine weapon loading stations (or hardpoints) on the F-16; two at the wingtips, a centerline station underneath the fuselage, and six underwing hardpoints. Maximum loads for each station are as follows:



A	B	C	D	E	D	C	B	A
Hardpoint		9g max	lbs	kg	5.5g max	lbs	kg	
A			425	193		425	193	
B			450	204		700	318	
C			2,000	907		3,500	1,587	
D			2,500	1,134		4,500	2,041	
E			1,250	567		2,200	998	

You won't be permitted to exceed these limits. The fly-by-wire control system will automatically impose the 5.5g restriction when necessary. Additional hardpoints on either side of the engine intake are used for carrying LANTIRN and other types of laser/night vision pods.





GLOSSARY AND ABBREVIATIONS

AAA	Anti-Aircraft Artillery
AAM	Air-to-Air Missile
ACS	Air Combat Scan
ADI	Attitude Director Indicator
AFTI	Advanced Fighter Technology Integration
AGM	Air-to-Ground Missile
A I M	Advanced Intercept Missile
ALT	Altitude
AMRAAM	Advanced Medium-Range Air-to-Air Missile
AoA	Angle of Attack
ASPJ	Airborne Self-Protection Jammer
ATARS	Advanced Tactical Air Reconnaissance System
AUW	All Up Weight (aircraft total weight)
BRG	Bearing (heading required to fly to target)
C-cubed	Command, Control, and Communications
Callsign	Nickname used for radio transmissions
CCIP	Continuously Computed Impact Point
Cloudbase	Altitude at which you will enter cloud
CNI	Communications, Navigation, and Identification
Combat zone	Designated flying area
Dead stick	Flight after engine failure
Discrete	Head Up Display symbology
ECCM	Electronic Counter-Countermeasures
ECM	Electronic Countermeasures
ETA	Estimated Time to Arrival
EWR	Early Warning Radar
FBW	Fly-By-Wire
Flaperon	Combination flap and aileron
flaring	Increasing the angle of attack of the aircraft when landing
FWS	Fighter Weapons School
g	Weight multiplying factor in units of gravity
GCA	Ground Control Approach
Glideslope	Up/down ILS beam
GTR	Ground-Target-Ranging
GTT	Ground-Target-Track
Hardpoint	Weapon loading station
HARM	High speed Anti-Radiation Missile
HDG	Heading



HQ	Headquarters
HUD	Head Up Display
IAS	Indicated Airspeed
IFF	Identification Friend or Foe
IIR	Imaging Infrared
ILS	Instrument Landing System
IR	Infrared
Jock	Pilot
KR	Kill Ratio
LANTIRN	Low Altitude Navigation and Targeting Infrared for Night
lbf	Pounds force
Localiser	Left/right ILS beam
Mach	Unit of the speed of sound
ME	Mission Effectiveness ratio
MET	Meteorological
MFD	Multifunction Display
MSIP	Multi-national Staged Improvement Program
n m	Nautical Mile
Pilot's log	Personal flying record
R & R	Rest and Recuperation
RAF	Royal Air Force (Great Britain)
Recce	Reconnaissance
Reticle	Weapon aiming and ranging symbol
RNG	Range or distance to target
rpm	Revolutions per minute
RWR	Radar Warning Receiver
SAM	Surface-to-Air Missile
Sidestick	F-16 equivalent to conventional control column
Sortie	Flight or mission
STT	Single-Target-Track
TAC	Tactical Air Command
TAS	True Airspeed
Trim	Increase AoA to maintain altitude during a turn
TWS	Track-While-Scan
UFCP	Up Front Control Panel
UHF	Ultra-High Frequency
Undercarriage	Landing gear
VSI	Vertical Speed Indicated
Waypoint	Pre-planned destination on flight route



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