FALCON®
MC
Macintosh Color

Spectrum HoloByte

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Spectrum HoloByte
2490 Mariner Square Loop
Alameda, CA 94501
(510)522-1164
(510)522-3587 FAX

America Online: SPHERE
CompuServe: 76004,2144
GEnie: HOLOBYTE
Internet: 76004.2144@compuserve.com
Prodigy: TKNJ33A

Gilman G. Louie
Spectrum HoloByte, Inc.

FALCON® *MC*

FLIGHT MANUAL

Spectrum HoloByte

Credits

Original *Falcon* Concept and Design by:	Gilman "Chopstick" Louie
Falcon MC Concept and Design by:	Mark "Foxwere" Blattel, Kyle "Bulldog" Brink, Robert "Spaceman" Giedt and Eric "Gweep" Johnston
Lead Programmer:	Mark "Foxwere" Blattel
Programmers:	Brian "Blue Dragon" Lewis and Eric "Gweep" Johnston
3-D Programmer:	Kuswara "Porkchop" Pranawahadi
3-D World Builder:	Anthony "FuGuaHead" Chiang and Brian "Blue Dragon" Lewis
Art Director:	Gary "Rabid Weasel" Winnick
Lead Artist and Poster Artwork:	Jim "Two Five India" Voytilla
Artists:	Anthony "FuGuaHead" Chiang, Kathleen "Flare" Thornton, Lawrence "Guzzler" Kevin and Eric "Eveready" Grotke
Sound Director:	Paul "Moggy" Mogg
Sound Effects by:	Brian "Blue Dragon" Lewis and Bogas Productions
Sound Driver by:	Halestorm, Inc.
Executive Director of R&D:	A.J. "Red Dog" Redmer
Director of Simulations:	Daron "Splitta" Stinnett
Product Manager:	Steve "Scorpion" Blankenship
Testing Department Manager:	Kurt "Goat Killer" Boutin
Lead Test Engineer:	Jeffrey "Mikuni" Love
Test Engineer:	Evan "Baron" Birkby

Documentation Credits

Researcher and Writer:	Kyle "Bulldog" Brink
Editor:	Marisa "No. 19" Ong
Designer and Layout Artist:	Carrie "Ethyl" Galbraith
Technical Illustrators:	Chuck "Bunhead" Butler and Carrie "Ethyl" Galbraith
Photos Courtesy of:	Department of Defense, General Dynamics and Gilman Louie

Special Thanks

Customer Support

If you have any questions about *FALCON MC* or any of our other products, please contact Spectrum HoloByte Customer Support at:

Spectrum HoloByte
2490 Mariner Square Loop
Alameda, CA 94501
ATTN: Customer Support

☎ (510)522-1164
9:00 AM to 5:00 PM Pacific Time
Monday through Friday

America Online:

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Internet:

You can send electronic mail to Customer Support at 76004.2144@compuserve.com.

Prodigy:

You can post and read messages in the "Flight Simulators" topic in the Game Club bulletin board. You can also send electronic mail to Customer Support at TKNJ33A.

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INTRODUCTION

Falcon MC is the most realistic combat flight simulator for the Macintosh. It effectively and accurately reflects the performance and capabilities of the General Dynamics F-16 Fighting Falcon within the limitations of a personal computer. This game is the result of years of development and research which started with the plane itself.

A History of the F-16 Fighting Falcon

After World War II, the trend in U.S. fighter design was towards speed and stand-off missile capability at all costs. The usual cost was size and price.

The Vietnam-era F-4 Phantom II is a prime example of this philosophy. Called "the Rhino" by pilots who flew it, it sacrificed maneuverability for speed and electronics. The F-4 proved the theory that, given enough power, a brick can fly.

Air losses over Vietnam against MiG-17s, MiG-19s and MiG-21s showed that while the F-4 was the better aircraft plane-for-plane, it was at a huge disadvantage on a dollar-for-dollar basis. Pilots of the far cheaper, more agile MiGs took full advantage of the rules of engagement (which required visual identification of bandits before engaging) to dogfight their way to a mere 3 to 2 loss ratio.

The next generation of American fighters was the F-14 Tomcat and F-15 Eagle. While more agile than the F-4, these expensive birds cost over $20 million each. Not only were they more expensive, they were bigger. The top-of-the-line avionics and missile systems, coupled with the twin engines and fuel needed to push these beasts past the sound barrier, brought the total weight to over 20 tons each, unloaded.

Meanwhile, the Eastern bloc was continuing to crank out cheap, maneuverable MiG designs at a phenomenal rate. The huge replacement costs for the Tomcat and Eagle, plus their maintenance problems (only 56% were flight-ready at any one time), meant that the air power gap was widening. It was 1974, and then-Secretary of Defense James R. Schlesinger wanted answers.

At that time, a lightweight fighter program had been going on for two years. It was, up to that point, an academic study to see what use could be made of a cheap, maneuverable daylight-only fighter. The program had already narrowed the field to two contestants, the Northrop YF-17 and the General Dynamics YF-16.

Schlesinger saw his answer. He upgraded the project to the air combat fighter program (ACF) in April. It was no longer just a research exercise.

The new charter called for a production fighter with true multi-role capability and the latest radar and avionics. The final selection date for the prototypes moved up to January 1975.

Based on performance and dogfighting tests, the Air Force selected the YF-16. (The YF-17 was selected by the Navy, and went on to become the F/A-18 Hornet.) Shortly thereafter, the YF-16 far outperformed its European rivals at the Paris Air Show on June 7, 1975. Even Marcel Dassault, manufacturer of the competing Mirage F1, admitted to the YF-16 pilot, "You have a fine airplane." The European NATO members at the show ordered 348 Fighting Falcons that same day.

While the U.S. Air Force developed the F-16 largely as a response to the Warsaw Pact's air power design and philosophy, the Fighting Falcon, in turn, helped trigger a design revolution in the Eastern bloc. The number of F-16s that could be built meant that numbers would no longer be on the Warsaw Pact's side; therefore, Mikoyan-Gurevich designers now valued quality over quantity. The MiG-29 is one result of this new design theory.

One of the Fighting Falcon's first real combat tests was in June of 1981, when Israel directed a tactical strike on the Iraqi nuclear power plant near Baghdad. Eight F-16s, accompanied by six F-15s for cover, went in. Each Fighting Falcon dropped its two Mk84 2,000-pound bombs on target with no collateral damage. All planes returned safely.

The attack caused an international outcry, and the U.S. stopped shipping F-16s to Israel for almost a year. But the effectiveness of the Fighting Falcon in a precision deep-strike role was proven beyond doubt.

In Desert Storm, the F-16 logged more sorties than any other aircraft, delivering laser-guided and television-guided "smart" weapons on all-weather and long-range missions. By the end of hostilities, 249 F-16s had flown approximately 13,500 sorties while keeping 95.2% of the craft mission-capable.

While the Fighting Falcon saw very little air combat during the conflict, it did display impressive strike versatility and overall durability.

Constant upgrades to the weapons systems, electronics and structure have kept it in the forefront of modern combat aircraft technology. The F-16 continues to form the backbone of the USAF with over 1,500 in service.

A History of Falcon, the Simulator

In 1984, Gilman Louie and Les Watts wrote *F-16: The Real Dogfight Simulator* for the MSX, a Japanese computer. From the outset, Gilman wanted players to be able to compete against each other in aerial combat. Les wrote the communications code to allow this.

On October 14, 1985, Gilman (CEO of Nexa Corporation, a software development firm) and a handful of other programmers began work on a two-year project to create the most realistic flight simulator to date on a personal computer. Meanwhile, Nexa merged with Colorado-based software distributor Spectrum HoloByte. The project resulted in the 1987 release of the revolutionary *Falcon* for the IBM and Macintosh personal computers.

Falcon did what was thought not to be possible: it combined good speed, graphics and realism in a combat flight simulator on the Macintosh Plus. One year later, in 1988, Spectrum HoloByte released *Falcon 2.0*, a free upgrade which added head-to-head play and other new features.

As soon as the first version of *Falcon* was released, work was begun on *Falcon AT* for the IBM PC, which was to be a significant upgrade from *Falcon*. *Falcon AT* would take advantage of the new EGA graphics and faster computing speeds to provide true 3-D graphics and more realism. At the same time, in England, Rowan Software was converting *Falcon* for the Atari ST and Amiga computers. All three versions of the game were completed in 1988.

In 1989, military contractor Perceptronics was developing a low-cost military training simulator and enlisted the aid of the *Falcon* team to provide the software. The Advanced Situational Awareness Trainer (ASAT) was completed in November 1989.

The last three years have seen a great leap in personal computing power, setting new speed standards and bringing VGA to IBM owners and color to Macintosh owners in all price ranges. *Falcon 3.0* for the IBM, released in December 1991, takes full advantage of the new IBM technology. Now *Falcon MC* brings speed, realism and color to your Macintosh.

How to Use this Manual

Don't be distressed by the heft of this book. *Falcon MC* is a complex game, and requires a thorough discussion of its features. But it doesn't require a thorough reading of the entire manual to play.

After installation, you could just take the quick reference card in hand and go. I would. But if you want to know what's going on, you should at least read *Two: Instant Action*. It will give you a quick rundown of all the major cockpit instruments and aircraft systems, as well as a brief set of instructions on how the controls work.

Install *Falcon MC* according to the instructions on the Installation sheet.

As you fly around blowing things up, you may be curious about just what it is you're supposed to be doing. *Three: The Falcon World* explains who your pilot is, what you're fighting for (and against) and what you have to do to accomplish the various missions.

If the instructions in the second chapter seem a little thin and you're looking for more complete explanations of the controls, instruments and weapons systems, open up *Four: The Fighting Falcon*. It contains complete descriptions of every readout, dial and control in your cockpit and how to use them.

Of course, knowing what all the little lights and needles are does not mean you can fly the plane. *Five: Flight School* has eight lessons which will take you step by step through all the major jobs facing a Falcon pilot. It also tells you how to land.

After you have this plane pretty well mastered and under control, turn to *Six: Tactics*. It's full of tips, advice and techniques for pilots who want to improve their performance. A couple of the suggestions are even useful.

Seven: Features is a good section to leave a bookmark in. It explains all the various menus and options you can use to customize your game.

If you want to take advantage of the head-to-head option to fight a real opponent instead of the computer, *Eight: Head-to-Head* is vital. It tells how to set up communications, how scoring works and what to do if various communications difficulties arise.

Once you have a good working knowledge of the game, you can browse through *Nine: Reference* for additional information to amuse and aid you. It includes a full glossary and technical specifications for all the planes, weapons and opponents in the game.

Think of this manual as a reference book: too big to be worth reading all at once, but good to keep handy for when you need it. Now let's get started.

TWO
INSTANT ACTION

If you want it quick and dirty, Instant Action is your game. One click and the dogfight begins immediately. There's no overall strategy or mission to follow, just pure adrenaline. The only ways out of this one are to get shot down, eject or just plain quit.

The *Controls* section briefly explains how to fly and fight. The *Cockpit* section gives you a few details about the major instruments and systems of the F-16 — just enough to let you slug it out with the bad guys. If you want a complete explanation of all the systems and tactics tips on how to use them to your best advantage, go to *Four: The Fighting Falcon* and *Six: Tactics*. But even if you plan to read the really detailed stuff later, this chapter will still get you up and flying fast.

The first step is installing the program. Refer to your installation card for instructions. After the opening title screens, you will see the Duty Roster screen. Just click on **Instant Action** and you'll be airborne.

The default difficulty setting is Easy. If you find it too hard, select **Set Difficulty...** from the **Options** menu. Choose **Training** in the Difficulty screen that follows, then click **OK**. These settings are all discussed in *Seven: Features*.

Controls

To fly and fight, you need to understand the four basic control systems on the F-16: the stick, throttle, rudder and, of course, the weapons systems.

Stick

The stick is the basic control device for the aircraft. Push forward, the plane dives; pull back, it climbs. Moving the stick to either side causes the plane to roll in that direction; to turn, roll to the side you want to go to and pull back on the stick.

You cannot be shot down at the Training level. Type ⌘ E or select **End Mission** from the **File** menu to end your game.

The four directions for the stick are represented by the four arrow keys; I, J, L and M; and 2, 4, 6 and 8 on the numeric keypad.

```
      forward                    forward
        I                          8

left        right          left        right
 J    K      L              4    5      6

      back                       back
        M                          2
```

Numeric Keypad

Throttle

The throttle controls how much fuel the engine gets, which in turn determines its thrust. More fuel, more speed. The RPM gauge (the round dial on the right) shows how much thrust is being applied as a percentage of maximum thrust (so 80 means 80% thrust). Keep the throttle above 65% or so in order to stay airborne; 80% or so is good for maneuvering and dogfighting. Use − and + to decrease and increase throttle.

Lighting the afterburner essentially dumps fuel straight into the exhaust of the engine, creating a tremendous amount of acceleration (but it eats up fuel at a voracious rate). The after-burner can give you that extra boost you need to gain altitude fast or close on an escaping foe. But be careful of using it too much; at high speed, your turning radius is poor at best, so the enemy can outmaneuver you. Worse, the huge flame from an afterburning turbofan engine is a magnet for heat-seeking mis-siles. Hit / (or * on the numeric keypad) to turn the after-burner on or off.

Firing the afterburner will automatically increase your thrust to 100%.

Rudder

The rudder is a way to turn without banking or rolling the plane. It is a very slow way to turn, however, and only works at low airspeeds. To use the rudder, first slow down to below 400 knots (about 70% throttle). Then [and] will turn your plane gently left or right. The rudder is not too useful for dog-fighting but works well for lining up on ground targets.

Mouse Controls

If you want to use the mouse to control your plane, there are two options: button-centering and auto-centering. In both cases, the mouse is the flight stick; pushing the mouse forward is like pushing the stick forward, pushing it to the side is like pushing the stick to the side, and so forth.

Dive

Roll Right

Roll Left

Climb

The difference is that with button-centering, the stick will not center until you click the mouse button. With auto-centering, the stick centers as soon as the mouse stops moving (unless you are holding down the mouse button).

Flying with the MouseStick

If you are using a Gravis MouseStick, it acts just like a flight stick. The thumb button is the trigger and the two base buttons are for air-to-air and air-to-ground weapons selection.

Dive

Roll Right

Trigger

Roll Left

Climb

Air-to-Air
Weapon
Select

Air-to-Ground
Weapon Select

If you are using a second MouseStick, the forward and back directions will control the throttle, the thumb button will change target locks and the two base buttons will dispense chaff and flares. The left and right directions will control the rudder.

Throttle

Switch Targets

Rudder

Flares

Chaff

MouseStick II

The MouseStick II has more buttons and consequently more control features. The first stick still behaves like the flight stick, but the buttons are different. The thumb buttons now control the weapon selection, and the base buttons now control the flares and chaff.

A-A Weapon Select

A-G Weapon Select

Trigger

Dive

Roll Right

Roll Left

Climb

Flares

Chaff

A second MouseStick II will be the throttle control, much as the second MouseStick was. The forward and back directions are still the throttle, the left and right directions are still the rudder and the base buttons switch between the radar modes. The trigger now controls target selection, and the thumb buttons now control the speed brakes and flaps.

Special Note about MouseSticks

When using two MouseSticks, sometimes the Gravis software gets them switched (the stick becomes the throttle and vice versa). If this happens, just type ⌘ T to swap them back.

Here's the easy way to kill MiGs:

- Press A. That engages the autopilot, which will now chase down the MiG for you.
- Press Enter until you see the "9AIM120" on the panel in the bottom left corner of your screen. You now have a lot of missiles ready.
- When you hear the high-pitched buzz and a flashing diamond is inside the circle on the center of your screen, press Spacebar. That fires a missile.
- Press Spacebar some more, just to be sure.
- Wait for the explosion. Good job!

Not satisfied? Fine, if you want to do it the hard way, then leave the autopilot off and go after them yourself. Here's how.

Weapons Systems

All weapons are fired by pressing Spacebar.

The guided weapons, air-to-air and air-to-ground, work in the following fashion:

- An aiming point is shown on the Head-up display (HUD). This can be represented by a cross hair or reticle.
- Move to a position where the aim point is over the target and the target is in range.
- Lock the weapon on target. Air-to-air missiles lock on automatically; others must be locked on by pressing the trigger once.
- Press the trigger to fire or release the weapon.

The unguided weapons are operated similarly:

- Place the aiming point on the target and press the trigger to lock on.
- Place the impact point (shown on the HUD) over the target.
- Press the trigger to fire or release the weapon.

To find a MiG you can't see, look at the round radar screen on the left. You're at the center, so if a blip is on the right, turn right.

The guided weapons are the AGM-65B Maverick, GBU-15 guided bomb and the AIM-9P, AIM-9M and AIM-120 missiles.

The unguided weapons are the M61A1 cannon, Mk84 bomb and BLU-107/B Durandal.

All the weapons systems display information on the HUD, a special clear screen which sits directly in front of you. Just below this, down among the cockpit controls, is the radar/electro-optical display (REO), a multi-purpose video screen which provides additional weapons information.

Air-to-air

Whenever you select an air-to-air weapon (use Return to choose among the air-to-air arms), the air-to-air HUD is activated. When this is active, there are two aids to help you spot a bandit. First, if the locked target is in the HUD, a box (called the target designator) will mark its position. Second, if the enemy is out of the HUD, a line at the top of the HUD will extend towards the bandit to show you which way to turn to line up on it.

Missiles

When a missile is selected, a stationary circle will appear in the center of the HUD. This is the aiming reticle. When the target is within this circle, the missile has a good chance of locking on to the target and, if fired, is likely to hit. When the missile's seeker has locked onto a target, a flashing diamond will appear on top of the target designator box and you will hear a lock-on tone. Fire immediately.

Locator Line Extends from Here

Aiming Reticle

Target Designator

Cannon

The 20mm M61A1 internal cannon is more than adequate to tear apart the light materials used to build a modern fighter. The computer-assisted aiming system makes your job easier by computing where the bullets will go and displaying it on your

HUD. Your cannon's aiming reticle moves about the HUD depending on where the bullets will fall. The line which trails from the reticle shows the approximate path the bullets will take.

Bullet Path

Aiming Reticle

In the lower right of your HUD, the words "IN RNG" will appear when the target is within the cannon's range. When the MiG is in range and in the reticle, fire.

Air-to-ground

Once you've got the MiGs off your back, you can go for some extra points by taking out ground targets. Or shut down those pesky SAM sites so you can concentrate on dogfighting. Hit [Delete] to choose among the air-to-ground arms.

Smart Weapons

The AGM-65B Maverick missile and GBU-15 guided bomb are "smart" weapons; that is, they guide themselves into the target, so you spend a minimum of time setting up your approach and getting the aim just right.

Target Designator

Lock Indicator

Target Image

Both of these weapons are video-guided. They have a camera in the nose, which hooks up to your REO display. To use them, line up your target in the cross hairs on the REO and press [Spacebar] once. This locks the weapon onto the image of that target. A target designator will appear on the HUD on top of the target's position. In the lower left of the HUD, the notation "LOCK" or "IN RNG" will appear, depending on whether the target is in range yet or not. If it says "LOCK," get closer until it says "IN RNG."

Once your target is locked up and in range, press [Spacebar] again to release the weapon. The words "IN RNG" will be replaced by "REL," meaning the weapon has been released. Assuming the target is vulnerable to the weapon you've fired, you're done. Switch to air-to-air for dogfighting or use [X] to break the lock and start lining up on another target — the weapon will proceed to the target without any more work from you.

Unguided Armament

The Mk84 bomb, BLU-107 anti-runway bomb and M61A1 cannon are unguided, which means it takes a little more work from you to hit the target. But with the help the computer gives you, the workload is not that much greater.

CCIP Bomb Sight

All these weapons have the CCIP (continuously computed impact point) bomb sight displayed on the HUD. The bomb sight is where the weapon will hit if fired or released at that time. To hit a ground target with unguided weapons, put the cross hairs at the center of the HUD on the target and press

Spacebar once. The word "LOCK" will appear in the lower left. When you are in a position where the weapon can hit the locked target, a vertical line will appear with a small cross hair at the bottom. This cross hair represents the bomb sight.

When the bomb sight at the bottom of the vertical line is on the target, hit Spacebar again to fire or release the weapon. If your timing is right, the target should be destroyed.

For the cannon, the aiming point is marked with a cannon reticle instead of a cross hair, but the technique for strafing is the same. When the target is in the reticle, fire.

Cockpit

The first thing you see when you drop into Instant Action is the cockpit. Nearly as complex as a real F-16, the array of lights and sounds can be confusing and disorienting at first. What's worse, the first thing you hear above the engine noise is a radio message about an incoming bandit!

Okay. Relax. Hit Q to get a breather (⌘ R will return you to the action). Now look at what's on the screen.

Falcon MC

BULLDOG, THIS IS TOP HAT
BANDIT INBOUND

Radio Messages

HUD

TWI

RPM Gauge

Stores Control Panel

Status Indicators

REO   Chaff/Flare Indicators

Forward View

This is where most of your instruments and displays are visible, which makes sense since that's hopefully the way you'll be looking most often while flying.

Radio Messages

In the upper left of the screen you'll see the radio message from your Airborne Warning And Control System (AWACS) if you paused fast enough. This is a printed version of the spoken message you just heard. You'll receive radio messages from three different sources throughout the battle. These messages can help quite a bit, if you pay attention to them. The three friendly broadcasters are Home Plate (your base), Top Hat (the AWACS plane) and Groundhog (ground-based reconnaissance). For now, you only need to worry about messages from Top Hat; while useful, the others are really important only in the campaign scenario and missions.

The Top Hat messages you'll hear will usually refer to enemy aircraft ("bandits"). The message "bandit inbound" is especially important to listen for.

Head-up Display (HUD)

The HUD has two combat modes and one landing mode. Since landing is not part of Instant Action, we'll skip it. The two other HUD modes correspond to the two general types of weapons available. When an air-to-air weapon is selected, the HUD automatically shifts to air-to-air mode. When an air-to-ground weapon is selected, the HUD goes into air-to-ground mode.

Airspeed Scale

Pitch Ladder

Altitude Scale

5-Mile Ranging Scale

Heading Scale

The Air-to-air HUD

In air-to-air mode, the HUD shows information relevant to air combat and displays it in such a way that it won't block your view of the opponent.

Your **airspeed** is shown on a sliding scale on the left side in tens of knots true airspeed (so 30 means you're flying 300 kts). The center mark shows your speed on the scale.

Your **altitude** in thousands of feet is shown on the sliding scale on the right, again with your exact altitude indicated by the center mark. If the mark is at 1.0, you're flying at 1,000 ft.

The **pitch ladder** is the sliding scale in the center of the HUD, and it shows your angle to the ground in tens of degrees. Negative numbers mean you're diving, while positive numbers show a climb.

Your **heading** in tens of degrees is shown by the sliding scale along the bottom of the HUD; your heading is indicated by the center mark.

The **five-mile ranging scale** will appear if you have a missile selected. It is a short sliding scale on the right between the pitch ladder and the altitude scale. The scale shows you how close a locked target is. When it is within five miles, a pointer will appear at the top of the scale, sliding downward as the bandit gets closer.

The center of the HUD is taken up by weapons targeting systems. A different aiming reticle is used for each weapon, as described in *Weapons Systems*, above.

The little pointer on the heading scale indicates where your waypoint is. Waypoints only matter in the campaign, so ignore it.

Clockwise Around the HUD

The number of Gs you are currently pulling is shown in the upper left. Gs are a measure of how much force is being exerted on yourself and the plane by your maneuvers. If, for example, it reads 3.5, you and the plane are feeling three and a half times the force of gravity.

In the top center of the HUD is the target locator line. This line extends from the small cross hairs at the top towards the enemy. This shows generally which way to turn to get the bandit in your sights.

In the lower right, the distance to your mission waypoint is shown. Ignore this. Just below it, however, is your precise altitude in feet. Do not ignore this.

In the lower left corner are four notations, two abbreviations and two numbers. They provide information about the selected weapon and aircraft performance. Don't worry about them for now.

The Air-to-ground HUD

In air-to-ground mode, the HUD shows information useful to ground targeting and presents it in such a way that your view of the target is unobstructed. The information displayed is largely the same as in the air-to-air HUD, with a few differences.

Heading Scale

First, the heading scale is at the top of the HUD instead of the bottom. The advantage of this is clear as soon as you try lining up on your first target — it's out of the way. Second, some of

the targeting aids for air-to-air combat are removed. The five-mile ranging scale is removed, as is the target locator line at the top of the HUD.
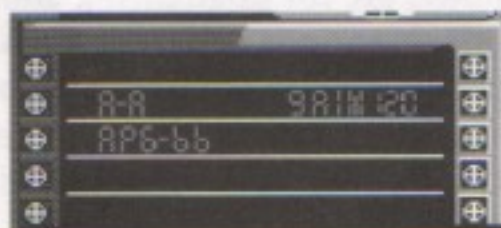
Threat Warning Indicator (TWI)

About two-thirds of the way down the left side of the screen is the threat warning indicator (TWI). It looks like a small round radar screen. Enemy planes will show up on this screen as diamonds. Radar-guided missiles will appear as smaller diamonds, and SAM sites will be shown as small squares. Use this to tell if they are in front of you, behind you or to either side. Your plane is in the center of the TWI; bandits in front of you will be in the top half, those behind you will be in the bottom half and enemy planes to your left or right will be on the corresponding side of the TWI.

For example, the following diagram shows a bandit in front of you to your right and one directly behind you.

Bandits

Stores Control Panel

Just below the TWI is a display which shows a number of abbreviations and other written information. This is the stores control panel, and it gives you information about the status of whichever armament you currently have active. You can ignore all the information here except for two notations: the mode and weapon.

In the upper left corner of the stores control panel is the mode information. It will show "A-A", "A-G" or "SRF" mode. The

first means you have an air-to-air weapon ready, the second means you have an air-to-ground weapon ready and the third mode is only used for strafing ground targets with the cannon. No air-to-air weapon can be used effectively against ground targets, and air-to-ground weapons are hopelessly inaccurate for use against high-speed air targets.

The weapon notations are right next to the mode information and begin with a number. This number is how many rounds for that weapon remain. In the campaign and missions, armament can be limited; in Instant Action, however, armament is unlimited, so every weapon always has 9 rounds remaining (except for the cannon, which always has 999). After the number is a stores designation, which tells you which weapon is ready. These designations are as follows:

AIM9P	rear-aspect heat-seeking missile
AIM9M	all-aspect heat-seeking missile
AIM120	all-aspect radar-guided missile
M61	20mm cannon
BLU107	anti-runway bomb
AGM65	video-guided air-to-ground missile
MK84	2000-lb bomb
GBU15	video-guided 2000-lb bomb

Radar/Electro-optical Display (REO)

To the right of the TWI and stores control panel is the radar/electro-optical display (REO). This is a multi-purpose display with four different settings: boresight radar, tracking radar, map and camera.

The Radar Modes

The two radar modes are for dogfighting and are only active when an air-to-air weapon is selected. Square blips on the screen indicate enemy aircraft; the currently locked target will be marked by a diamond framed by bars. The line across the center of the REO shows the relative position of the horizon.

Both radar modes show the target's altitude in the upper right (in thousands of feet), along with the notation "AIR," which means the REO is in air-to-air mode. On the lower right, three

numbers show the locked target's heading in degrees, its current airspeed in knots and the aspect angle. The number on the very bottom of the screen is the closure rate, in knots; this is how fast you and the MiG are approaching each other.

Target
Distance

Radar in boresight scan mode

The boresight scan radar shows enemy targets as though looking down the sight of a gun; targets in the center of the display are directly in front of your plane. Since this does not show how far away they are, the locked target's distance in miles is shown in the upper left corner.

Scan Range

Locked
Target

Your Position

Radar in tracking scan mode

The tracking radar shows bogies as if you were looking down on the engagement. Your plane's position should be thought of as at the bottom center of the display. Bandits at the top of the display are farther away than those at the bottom, and those to the left or right sides of the REO are to the left or right side of your plane's path. The locked target's bearing (its compass direction from the F-16) is shown in the lower left, followed by the distance to the target in miles. For example, if it read "5° 2," the target is five degrees to the right of you and two miles away. The scan range is shown at the top of the display; this is the distance, in miles, from your plane to the top of the REO. In tracking radar, the scan range is adjusted automatically to accommodate the targets.

Your Position

Map and Camera

The map and camera modes use the REO as a television screen. The map mode displays your position in the world on a simplified map which scrolls as you move. Cross hairs show your position.

Aim Point

Camera mode is used when aiming the two video-guided weapons, the AGM-65 Maverick missile and GBU-15 guided bomb. Each of these weapons has a camera in its nose. Switching to camera mode lets you look through this camera to aim the weapon. A close-up of the area the weapon is aimed at is displayed; cross hairs show the exact aim point.

Chaff/Flare Indicators

To the right of the REO are two numbers marked CHAFF and FLARE. These show how many flares and chaff charges remain. Flares are used for fooling heat-seeking missiles while chaff is used for spoofing radar-guided weapons. The usual technique when a missile is on your tail is to turn hard while dropping chaff and flares, hopefully tricking the missile into chasing one of these decoys.

Status Indicators

To the right of the chaff/flare indicators are the status indicators. These show the status of various aircraft systems. If the light is lit, that system is in use. Damage to some systems may make them impossible to turn off. The flaps and speed brakes, for example, can be damaged and frozen in whatever position they are in (whether activated or not). The systems which are really important here are ECM, BRAKES and AUTOPILOT.

In Instant Action, your plane is equipped with an ECM pod (in the campaign, a pod is not always available). The ECM pod can help fool enemy radar and missiles by jamming their signals. The pod is broadcasting when the ECM light is on. The only disadvantage to using the pod is that it makes it difficult to hide. While the signals make it hard for missiles to home in on you, it is like shining a spotlight on someone to blind them: your position is obvious.

Your plane turns tighter when it is moving slower. To quickly reduce speed for a hard turn, activate the speed brakes. The BRAKES light will light if the speed brakes are engaged. Don't leave them on too long; a slow plane, while maneuverable, is also an easy target.

Falcon MC's autopilot does a few things that a real F-16's doesn't. When you activate it, the AUTOPILOT light comes on. The autopilot will immediately lock onto the nearest MiG and chase it down at whatever speed you have the throttle set to. It will not fire, but it will set up such an easy shot that all you have to do is touch Spacebar to down the bad guy. Obviously, the autopilot is not a particularly honorable way to fight, but until you get the hang of flying, it will show you how things work. It can also recover from a bad aerial position (within reason; a Mach 2 nose dive at 200 feet is pretty hard to undo).

RPM Gauge

Just above the status indicators is the RPM gauge. This shows what percentage of maximum thrust you are using. Firing the afterburners will give even more thrust and automatically bring the throttle to 100% power.

Other Cockpit Views

Okay, now that you've got an idea of what the main instruments are, return to the game for a moment by pressing ⌘ R. Now take a look around by pressing 4, 5 and 6. Those are the left, right and rear views. You can return to the front view by pressing 3.

Left View

In the left view, you'll see five indicators. They're not important to you right now, but they are the fuel gauge, backup compass, backup airspeed gauge, the landing gear status lights and the backup altimeter. Since you can't land or run out of fuel in Instant Action, and you're dead in the air if your HUD goes out, you can ignore all these gauges. But you can use the left view to spot your enemy visually by pressing 4 (or 7 on the numeric keypad).

Just to stay aloft, the F-16 needs around 65% throttle.

The cockpit views are also accessible from the numeric keypad:

7	left
9	right
1	front
3	rear

Caution Lights

Right View

Looking to the right, you'll see 14 caution lights. Each of these corresponds to an aircraft system. If that system is damaged, you will hear a "Warning. Warning." message from the Voice Message System (VMS) until you press ⑤ (or ⑨ on the numeric keypad) to look at these caution lights and see what is damaged. The lights and the damage they indicate when lit are:

FLAP	The flaps are frozen in place.
STORES	No external stores can be used except AIM-9M and AIM-9P.
BRAKES	The speed brakes are frozen in place.
GUN JAM	The 20mm cannon is inoperable.
NWS	The nose wheel steering is out.
WEP ARM	All weapons but the cannon are out.
ECM	The ECM pod is damaged.
BURNER	The afterburner is inoperable.
RADAR	The radar does not function.
ENGINE	The engine is damaged.
HUD	The HUD is no longer operable.
FUEL SYS	A fuel leak has started.
NAV	The navigational system is out, which means that both the map and autopilot are inoperable.
OXY LOW	Low pressure due to canopy damage will cause blackout if you fly above 27,000 ft.

MiG

Rear View

Pilots use the term "check six" to mean "look behind you," because six o'clock is to the rear of the plane. No gauges or lights are positioned here, but you can visually keep track of the enemy if they get behind you. Press 6 to check six (or 3 on the numeric keypad).

The End

Eventually, a MiG or SAM will catch up with you and you'll buy the farm. If you did well enough, you'll get a chance to put your name on the High Scores screen; even if you didn't do that well, you'll get to see the top 10 scores. If you want, you can erase them by using the **Erase Scores** option on the **File** menu.

Scoring

The basic point values for the various enemies and targets are as follows:

MiG-29	10 to 30 (depending on how many you fight at a time)
Rail bridge	10
Armory	10
Cooling tower	10
Factory	10
SAM site	8
Runway	7
Tank	5
Road bridge	4
Train	3
Truck	3
Landing craft	3
Oil tank	1

These values are adjusted by your difficulty level to determine your final score. Difficulty levels are explained in *Seven: Features*.

THREE
THE FALCON WORLD

The *Falcon MC* campaign takes place in an imaginary world. You play a pilot involved in a border conflict which must be resolved quickly or the aggressor nation will overrun your base and conquer its weaker neighbor, whom you are protecting.

To complete this campaign, Tactical Air Command has outlined a series of missions and prioritized the targets for you. If you successfully complete all the missions, you will have stopped the invaders and will likely get a promotion.

Besides the military obstacles you will have to overcome in the cockpit, you will have to deal with supply shortages, aircraft loading limits and other such on-the-ground difficulties.

Pilots

In *Falcon MC*, you play a fictional pilot whose name, face and callsign you select. This pilot, through your skill and luck, may complete many successful campaigns, earn medals and even get promoted.

The Duty Roster screen shows a list of the available pilots. The four buttons to the right of the roster are used to create and view pilot information.
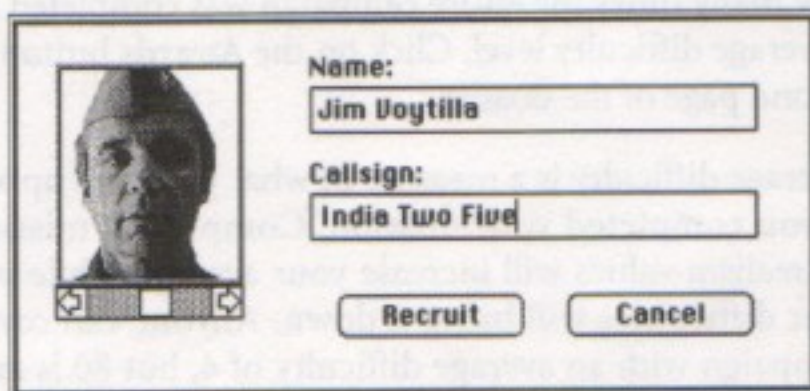

New Pilots

To create a new pilot, click on **Recruit Pilot**. A window will pop up with blanks for the pilot's name and callsign, and a scroll bar at the bottom left. Enter the new pilot's name (don't include a rank, just a name), then tab down to the callsign

blank and type in what you want your radio handle to be. Use the scroll bar to select your pilot's photograph. When you're all done, click on **Recruit**.

Name:

Jim Voytilla

Callsign:

India Two Five

◄ ☐ ►   Recruit   Cancel

Your new First Lieutenant is ready to fly.

Retiring Pilots

The Duty Roster can only hold 10 active pilots at a time. If you want to create a new pilot when the roster is full or you just want to get rid of a pilot, simply retire him or her. To retire a pilot, first select the pilot you want to remove, then click the **Retire Pilot** button. A window will pop up, asking for confirmation; just click **Retire** to remove that pilot from the roster.

Dossiers

Your pilot's history, medals and other information is kept on file in his or her dossier. To view a pilot's dossier, just select **Dossier** on the Duty Roster screen. Your pilot's file will appear.

1st Lt. Dave Speth   Status: Active
Crusher   Total Points: 42

Overall Average Difficulty: 4

7 MiGs downed   6 targets bombed

Mission   Times Completed   Average Difficulty
Rolling Thunder   1   4
Duck Shoot   0
Route 66   0
Iron Snake   0
Wild Weasel   0
Serpent's Jaw   0
Serpent's Tail   0
Hornet's Nest   0
Fireball   0
Sledgehammer   0
Black Out   0
Grand Slam   0

Campaign   0

AWARDS   DUTY ROSTER   SIERRA HOTEL

The first page of the dossier shows your pilot's mission history. At the top is an overall difficulty rating, along with a count of how many ground and air targets you've nailed as that pilot.

All the missions in the campaign are listed next, along with the number of times each mission has been completed and what the average difficulty was. At the bottom of this list, you can see how many times the entire campaign was completed and at what average difficulty level. Click on the **Awards** button to see the second page of the dossier.

The average difficulty is a measure of what you were up against when you completed your mission. Completing missions at higher realism values will increase your average, while playing at lower difficulties will bring it down. Anyone can complete the campaign with an average difficulty of 4, but 80 is another matter!

The second page shows snapshots of your achievements and decorations. A picture of your current rank insignia is displayed, along with pictures of all the medals your pilot has earned. Two types of stamps on this page show graphically how many kills your pilot has racked up; each bomb is one ground kill and each star is one air-to-air kill. To the right, your pilot's mission ribbons (earned by completing missions) are shown, along with how many times each was earned.

At the top of both pages is your pilot's name, callsign, rank, photograph, current status and total points. Promotions are earned by completing missions and campaigns. Your pilot's status is always "active" unless he or she is killed (KIA), captured (MIA), retired or court-martialed (busted). Points are earned based on your mission performance and difficulty levels.

Capture can occur when you eject over enemy territory with **Enemy Capture** active or if your base is overrun in the campaign. Your pilot can be busted for crashing or ejecting from an undamaged plane (thus causing it to crash, destroying several million dollars' worth of equipment).

If your pilot ever becomes inactive due to these circumstances, he or she will not be able to fly again. But if the pilot's performance was good enough to earn a place on the Sierra Hotel list, you can still see his or her dossier from the Sierra Hotel screen.

Sierra Hotel

The Sierra Hotel is where the top 10 greatest pilots of all time are recorded, ranked by total points. If your pilot does well enough, he or she will be recorded for posterity on this screen. Even if a top 10 pilot is inactive due to a heroic death, capture in the line of duty or other, less glorious events, the dossier is still accessible in the Sierra Hotel archives. You can return to the Duty Roster when you're finished viewing the pilots on this screen.

The Campaign

Your pilot is faced with a difficult tactical situation, and little time or resources to handle it. The Air Force has a small base on the border of a minor nation in the backwaters of the Third World. Primarily a reconnaissance base, only one wing of combat aircraft is stationed here, and equipment stores are limited.

The neighboring nation has been building its military capabilities for years on the pretense of self-defense. Using money from its extensive oil production, it has purchased state-of-the-art Russian military technologies. A modern armored vehicle production facility was recently completed, and new tanks are rolling off the line every day. More oil money was spent on building a rapid rail system linking the factory complex with the docks near the border, where a fleet of transport craft has been assembled over the past three months. But perhaps most importantly, a nuclear power plant has been operational for nearly a year now, providing all the power the military and industrial improvements could need.

With all the other, seemingly more important world conflicts, this region has received little attention from the superpowers. Conventional wisdom holds that any potential border crossings will be deterred by the fact that a U.S. squadron is stationed in the way. Conventional wisdom was wrong. Early in the morning, the first T-80 tanks were deposited on the near shore by Lebed-class transport hovercraft. All down the length of the border, MiG-29s are swarming the skies and ground troops are on the move.

It is the first day of the conflict. Reinforcements will not arrive in time; it is up to your squadron to make the difference. Your squadron mates are doing their best to slow the enemy advance in other sectors, but the toughest job falls to the best pilot: you.

Your air base is within striking distance of all four of the enemy's major military strengths: the tank factory, without which the enemy have no reinforcements; the armory, where all the reserve weaponry and munitions are stored; the nuclear power plant, which supplies the entire area with power; and the oil reserves, which pay for the war. Tactical Air Command has given your squadron commander permission to carry out counterstrikes against the aggressors, but there simply aren't the aircraft or the manpower to spare. Only heroics can turn this dismal situation around.

The Goal

The only way to win this war is by destroying the enemy's oil reserves, tank factory, power station and arsenal. The squadron commander and reconnaissance team have put together a package of missions which, if carried out, would achieve these goals and end this conflict once and for all.

Your job is to do the impossible: not just stop the advance, not just paralyze the enemy's entire transportation system, not just disable their air defenses, but take the fight to their home ground. Not just win this war, but end the enemy's ability to make war.

By yourself.

Missions

Click on **Select Mission** to look over your mission briefings. This will bring up the Missions screen.

To select a mission, click on the mission title. A map showing the target area and an on-screen mission briefing will appear. To look at another mission, just click on it. The map and briefing for the newly selected mission will appear.

When you have decided on a mission, you can click **Armament** to go load up. But first, you should know what you're getting into.

The campaign's 12 missions are grouped into three operations. The first, Battlefield, is primarily intended to end the enemy threat to your air base. The second, Deep Strike, is a series of counterstrike missions to disrupt enemy transportation systems and disable air defenses. The Final Four missions are against the four major enemy installations. If all four are out of commission, the war ends with enemy surrender.

Operation Battlefield: Missions 1-4

Your squadron's presence is a major thorn in the side of the aggressor nation's offensive. Constant airstrikes and air superiority patrols have severely hampered the enemy's advance. As a result, they are eager to remove your squadron entirely — and maybe get some F-16s for themselves — by overrunning your air base with T-80 tanks. They are using every means possible to move these armored units up to the front and across the water.

Operation Deep Strike: Missions 5-8

Once the enemy's advance has been slowed enough, some counterstrikes can be made to hamstring their transport system and cripple their air defenses. These strike missions are fairly hazardous, but if successful will pave the way for a series of raids that will finish this war for good.

Operation Final Four: Missions 9-12

With enemy ground forces halted, their transportation system paralyzed and their air defenses in disarray, the time has come to finish the job. The Final Four are missions aimed at the four main cogs in the aggressor's war machine: the oil reserves, the tank factory, the nuclear power plant and the arsenal.

Mission Briefings

The mission briefings which follow contain useful information and should be read before you go on a mission. At the end of each briefing, the base commander has added some personal tips to help you succeed. After the Colonel's advice is a reconnaissance summary which gives you an idea of what you'll be up against.

A map at the top of each briefing shows you a close-up of the target area. Significant features and targets are indicated by call-outs. Designations such as "Golf 1" and "Alpha" refer to SAM sites. All targets are identified on the campaign map included in this box.

The waypoint is a navigational aid. The waypoints for each mission are stored in the plane's computer. The heading scale on your HUD has a caret which shows the proper heading to follow to the waypoint. The waypoint for each mission is set beforehand. If, in the middle of one mission, you want to try another, you can change the set waypoint. Pressing Ⓤ will increment the waypoint, say from D3 to D4; Ⓨ will decrement it. Your air base is at waypoint D0.

Your current waypoint is printed in the lower right of the Head-up display (HUD) in your front cockpit view. See the discussion of the heading scale in the HUD section of *Four: The Fighting Falcon.*

Waypoint Caret
Waypoint Indicator

When looking at the distance to the target, remember that the F-16's internal fuel tank gives you about 200 miles of travel (that's 100 miles each way) under optimum conditions (flying at high altitude with no external stores). Dogfighting, afterburning and high-drag weapon loads can cut that range to as little as 50 miles, so pay attention when a mission briefing recommends external fuel.

The recommended arms listed at the end of the recon summary are not necessarily the only weapons which will work, but are probably the best choice.

Landing Point

Path of
Armored
Advance

Mission Briefing: Rolling Thunder

The enemy has dispatched a group of tanks to destroy the air base and halt the squadron's activities. Your mission is to thwart that advance.

Three T-80 tanks have been sighted on shore 22 miles from base. They are traveling on a more or less straight path from their landing point to our air base. Waypoint D1 is approximately where we expect you to intercept them.

Tips from the Colonel: Use Mavericks on these guys. Attack from directly in front or directly behind them to cut down on relative motion. If you stay near the base, our air defenses can take care of a lot of the MiGs for you. If you have leftover armament (Mavericks or cannon shells), try to pick off some of the landing craft while you're up.

Reconnaissance summary

Air cover:	light
SAMs:	SA-7 only
Target:	3 T-80 tanks, moving
Location:	waypoint D1
Distance:	12 miles
Recommended arms:	AGM-65B Maverick

Landing Craft Route

Mission Briefing: Duck Shoot

Three Lebed-class transport hovercraft are bringing armored reinforcements to this shore. Your mission is to destroy these transports before they can bring their cargo to the beach.

They are traveling southwest across the lake towards the same landing point they used before to drop off the last group of tanks. Be careful; this group of ships is likely to be guarded by MiG-29 interceptors.

Tips from the Colonel: Bring Mavericks. If you can, though, sink these ducks with your cannon and use the Mavericks on any tanks they may have dropped off since your last mission. You'll be outside our air base's anti-aircraft perimeter, so any bandits are all yours.

Reconnaissance summary

Air cover:	light to moderate
SAMs:	SA-7 only
Target:	3 Lebed landing craft, moving
Location:	waypoint D2
Distance:	27 miles
Recommended arms:	AGM-65B Maverick
	M61A1 20mm cannon

Bravo 1 & 2

Bravo 3 & 4

Truck Route   Bridge

Mission Briefing: Route 66

A convoy of heavy transport trucks is headed for the landing craft launching point carrying disassembled tanks and their crews. Reconnaissance reports maintenance teams waiting at the docks to assemble the T-80s and load them aboard new transport craft.

Stop those trucks. Your waypoint for this mission is the location of the last confirmed sighting of the convoy. The actual position of the convoy is likely to be closer. If you arrive too late to stop one convoy, follow the road north and intercept the next one.

Tips from the Colonel: These trucks are definitely cannon bait, but if the air cover gets hairy, use Mavericks from a distance. You may have to take out Bravo 3 and Bravo 4 at the south end of the road to protect your attack run. Use approach headings of 0° or 180°; this will place you either directly in front of or directly behind the convoy. A spotter at the road bridge will let you know if the convoy crosses.

Reconnaissance summary

Air cover:	moderate
SAMs:	SA-2, SA-6 and SA-7
Target:	truck convoy, moving
Location:	waypoint D3
Distance:	76 miles maximum
Recommended arms:	AGM-65B Maverick
	M61A1 20mm cannon

Railroad Track

Mission Briefing: Iron Snake

Intelligence reports a high-speed train loaded with munitions, tank parts and landing craft parts is headed towards the lake shore. If it reaches its destination, it will mean a new wave of attacks.

Your mission is to derail that train. As with Route 66, caution is advised. You will be in enemy-patrolled airspace and there are SAM sites in the general area. There are very few SAM sites close to the railroad tracks, however, so a carefully planned flight path will keep you out of trouble from most ground fire.

Your waypoint is at the location of the last confirmed sighting of the train.

Tips from the Colonel: You only need to destroy one car of the train to cause a major wreck at the speed it's traveling. Cannon fire will be sufficient. Set up a head-on or from-behind approach so that the train's speed does not become a problem for aiming. Conserve fuel by following the railroad track from the near end so as to intercept the train in the shortest possible time and distance.

Reconnaissance summary

Air cover:	moderate
SAMs:	SA-2, SA-6 and SA-7
Target:	high-speed train
Location:	waypoint D4
Distance:	106 miles maximum
Recommended arms:	AGM-65B Maverick
	M61A1 20mm cannon

The small dots are SAM sites. Strike any four.

Mission Briefing: Wild Weasel

The next few mission objectives are going to be in heavily protected areas of enemy territory. The density of SAM sites make them virtually invulnerable to air strikes.

That's where this mission comes in. Load up on Mavericks and go in low and fast. One missile should take out the radar set at the center of the SAM installation. Without that radar, the launchers cannot track or fire.

You may have to repeat this mission to keep those SAMs off your back. The repair crews are very efficient; you will probably only have a one- to three-day window to conduct strike missions before the damaged radar sets are repaired or replaced.

Tips from the Colonel: Bring an ECM pod if we have any. Almost any weapon will take out the radar set, but the safest is probably a well-aimed Maverick from a respectable distance. Pick which sites you want to kill based on where you'll be going in the next couple of missions.

Reconnaissance summary

Air cover:	moderate to heavy
SAMs:	SA-2, SA-6 and SA-7
Target:	4 SAM sites
Location:	varies (including waypoint D5)
Distance:	varies
Recommended arms:	AGM-65B Maverick
	M61A1 20mm cannon

Bravo 1 & 2

Alpha

Suspension Bridge

Mission Briefing: Serpent's Jaw

Vital supplies and reinforcements are trucked to the front from the arsenal along the western roadway. Without the air power to constantly attack road traffic directly or to destroy the entire roadway, there is only one way to halt the flow of equipment and arms: take out the suspension bridge.

SAM sites right next to the bridge and on the approach will make this a difficult mission, unless a Wild Weasel mission in this area was successful. Air cover is expected; a high-speed approach is recommended to minimize enemy response time.

Tips from the Colonel: Do not try this mission without running a Wild Weasel mission first! A good way to approach this target is from the west. Use Mavericks. One well-placed missile mid-span will do the trick. If you plan to afterburner your way there, bring some extra fuel so you can come back home.

Reconnaissance summary

Air cover:	moderate to heavy
SAMs:	SA-2, SA-6 and SA-7
Target:	suspension bridge
Location:	waypoint D6
Distance:	59 miles
Recommended arms:	AGM-65B Maverick
	GBU-15 guided bomb
	Mk84 2000-lb bomb

Cantilever Bridge

Mission Briefing: Serpent's Tail

The high-speed train brings tank parts to the factory and new landing craft to the lake shore. The rate at which equipment can be moved by rail is staggering.

It is critical to shut down this transportation artery. Since we cannot run strike missions every time a train leaves the station, the cantilever bridge must be destroyed. This is sturdier than the suspension bridge since it must support a train, so you will have to use the largest bombs to crack it.

Tips from the Colonel: You'll have to carry some heavy ordnance on this one, and it's fairly distant. That means extra fuel. Between the fuel tanks, heavy bombs and air-to-air load, you'll be one fat, slow target. Burn fast and hard to target, deliver your ordnance (GBUs if you can get them) and jettison those tanks ([Option] [T]). It'll be touch and go with the interceptors, but at least you'll be maneuverable once you've dumped the heavy stuff.

Reconnaissance summary

Air cover:	moderate to heavy
SAMs:	SA-2, SA-6 and SA-7
Target:	cantilever bridge
Location:	waypoint D7
Distance:	62 miles
Recommended arms:	Mk84 2000-lb bomb
	GBU-15 guided bomb

External fuel tank recommended

Golf 5 & 6   Enemy Airfield

Mission Briefing: Hornet's Nest

One hazard which has impeded all missions so far is enemy air cover. If the enemy landing strip could be disabled, even temporarily, the enemy's assets would be exposed to air attack.

You will have to fly right into the hornet's nest and drop Durandal anti-runway bombs on both runways (or one precision hit right at the intersection). Regular weapons will not work; repair crews can fill the craters inside of an hour. The Durandal's burrowing and buckling effect is the only way to do lasting damage.

But even with both strips out of action, MiGs will be flown in from bases deeper in enemy territory (though fewer and farther between than before) — so watch your six.

Tips from the Colonel: Bring at least four air-to-air missiles. If you can, bring six or eight. A Wild Weasel mission against the SAM sites in the swamp and just south of the airstrip will give you a clear flight path. If you want to do it all at once, you can bring both Mavericks and Durandals and hit the SAM sites on the way in.

Reconnaissance summary

Air cover:	very heavy
SAMs:	SA-2, SA-6 and SA-7
Target:	both airfield landing strips
Location:	waypoint D8
Distance:	83 miles
Recommended arms:	BLU-107 Durandal

External fuel tank recommended

Golf 2
Golf 1
Golf 3
Golf 4
Oil Refinery

Mission Briefing: Fireball

Oil money pays for the enemy war effort. Without it, they will be unable to mount another offensive for quite some time.

Their huge oil reserves are currently being stored in three massive tanks at a refinery far to the northeast. Guarded by SAM sites and situated near the airfield, the position is strategically very sound. If previous missions have been successful, particularly Wild Weasel and Hornet's Nest, this position is now very vulnerable. Beware of SAM sites and interceptors en route, however.

Tips from the Colonel: Under no circumstances is this mission to be undertaken unless the Hornet's Nest and Wild Weasel missions have been successful in the area. With that said, the internal cannon is more than enough to blow those tanks sky-high. Bring plenty of air-to-air missiles and at least two external fuel tanks. This will be a long, hard flight.

Reconnaissance summary

Air cover:	heavy (light if airfield disabled)
SAMs:	SA-2, SA-6 and SA-7
Target:	3 petroleum storage tanks
Location:	waypoint D9
Distance:	98 miles
Recommended arms:	M61A1 cannon
	AGM-65B Maverick
	GBU-15 guided bomb
	Mk84 2000-lb bomb

External fuel tank recommended

Mission Briefing: Sledgehammer

The new tank factory has been churning out armored vehicles ever since it was built. Without it, the enemy has no real source of reinforcements or spare parts for their front-line units except for what has been stockpiled at the arsenal.

The factory is built in such a way that the destruction of one of the four main buildings will not halt production. Duplicate assembly lines and the distribution of key components make it necessary to destroy at least two of the structures.

The concrete buildings will require heavy weaponry to destroy; even a Maverick will barely scratch this bunker-like plant.

Tips from the Colonel: The heavy weapons and external fuel you'll be carrying mean you will have no real ability to dog-fight or hunt SAM sites. As a result, the Wild Weasel and Hornet's Nest missions should be run before you try this one. The Wild Weasel mission should focus on the SAM sites to the west of the factory to make a clean approach corridor for you to lumber through with your GBUs or Mk84s.

Reconnaissance summary

Air cover:	heavy (light if airfield disabled)
SAMs:	SA-2, SA-6 and SA-7
Target:	2 of the 4 factory buildings
Location:	waypoint D10
Distance:	79 miles
Recommended arms:	Mk84 2000-lb bomb
	GBU-15 guided bomb

External fuel tank recommended

Mission Briefing: Blackout

Every major installation and transport system is powered by the nuclear power plant which operates around the clock in its heavily guarded compound by the mountains.

Approach routes are limited, and SAM sites are strategically placed to intercept incoming strike aircraft. If Hornet's Nest and Wild Weasel have been successful, however, this mission is largely a question of bombing precision rather than weaving through air defense networks.

The massive concrete cooling towers are the only above-ground part of this plant. The reactor can still operate (albeit at reduced capacity) with one tower, but destroying both will shut it down completely.

Tips from the Colonel: Do this like the rail bridge and the factory. Clear the SAMs first with a Wild Weasel mission, then burn to the objective, deliver the ordnance and jettison those tanks (Option T). GBUs are preferred, if you can get them.

Reconnaissance summary

Air cover:	heavy (light if airfield disabled)
SAMs:	SA-2, SA-6 and SA-7
Target:	both cooling towers at power plant
Location:	waypoint D11
Distance:	77 miles
Recommended arms:	Mk84 2000-lb bomb
	GBU-15 guided bomb

External fuel tank recommended

Nuclear Power Plant

Mission Briefing: Grand Slam

For months, the enemy has been building up an extensive inventory of arms and munitions for this offensive. The heavy, reinforced concrete bunkers of the arsenal are where it is all stored. If at least two of the storage bunkers can be taken out or collapsed, munitions and parts shipments from the arsenal will stop cold.

If this stockpile is destroyed or made inaccessible, and the factory is out of commission, there is no source of reinforcements or resupply for the assault. If the power plant and oil reserves are gone as well, the enemy will be forced to surrender.

Tips from the Colonel: Be sure you've suppressed the SAM sites on the approach before you try this one. Head due north and stay to the west of the road. You'll have no room at all for error this time. If you miss the target on the first pass, the interceptors will be on your slow, fat behind like a pack of wolves. Once again, burn on the way in, deliver that bomb load quick, and dump those tanks (Option T).

Reconnaissance summary

Air cover:	heavy (light if airfield disabled)
SAMs:	SA-2, SA-6 and SA-7
Target:	2 of the 4 arsenal bunkers
Location:	waypoint D12
Distance:	75 miles
Recommended arms:	Mk84 2000-lb bomb
	GBU-15 guided bomb

External fuel tanks recommended

Reconnaissance and Reports

While you may not have any allies in Falcons by your side, you do have some assistance. Reconnaissance teams and aircraft provide you with more or less accurate information about the status of enemy positions and targets. Click on **Enemy Report** to view this information. Also, when you're out there on a mission, useful radio reports will come in from your base, ground reconnaissance and the AWACS plane.

Reading the Enemy Report

The enemy report lists all known enemy targets and positions, starting with the locations of tanks and transport craft. Each installation is then listed, followed by its status. The various status notations and their meanings are:

OPERATIONAL	target functional
DISABLED	target damaged, repair date unknown
EDR	target damaged, estimated date of repair follows
NO DATA	information for this target unavailable

Radio Reports

You will hear messages from three different sources while out on a mission: your base, the AWACS plane and ground reconnaissance.

Your base's callsign is Home Plate. Any messages from this source should be given topmost priority.

The AWACS plane provides wide-ranging radar coverage for the area and is aware of incoming bandits well before you are. Further, their excellent detection systems can confirm a kill almost as fast as it happens — which is especially useful if you're in a one-on-three dogfight and can't always see your kills. Pay attention to messages from callsign Top Hat; it could save your life.

Members of your base's special forces recon team are already out in the field. Trained observers and infiltration experts, they provide much of the information in your enemy reports and mission briefings. They have spotters stationed at virtually every strategic point on the battlefield. You get up-to-the-moment intelligence from callsign Groundhog.

What They Mean

Here are some of the radio reports and what they mean to you:

"Bandit inbound." Enemy planes are in your area.

"Splash one MiG." You shot down an enemy plane.

"Enemy landing craft have reached the shore." Tanks have been deposited on the near shore by landing craft; you will see them next mission.

"Truck convoy reported crossing the bridge." The truck convoy, headed south, has passed the suspension bridge.

"Train reported crossing the river." The high-speed train has passed the cantilever bridge.

"Ground target destroyed." You have eliminated one ground target. This does not necessarily mean you have completed your mission.

Armament

When you know your mission, the last step before takeoff is to visit the ordnance sergeant. Sarge is a veteran and really knows his stuff.

Next to each weapon are an up arrow and a down arrow. Click the up arrow to ask Sarge to load that item onto your plane. Click the down arrow to have Sarge unload that item from your plane. Just tell Sarge what you want, and his boys will load it up for you — if it's in stock. Some of the more expensive munitions are in short supply, but keep trying; resupply shipments are trickling in.

Sarge has been doing this for so long, he can tell you if your load is going to be too heavy just by looking at it. Listen to his advice; it's worth it. If Sarge says the bird's overweight, you can expect some sluggish performance up there.

To help you choose a proper load for a mission, here is a chart showing which weapons can be used to complete each mission. These are not necessarily the best weapons for a given mission; these are just the ones which can destroy the target you're after. For example, a Mk84 bomb will wipe out a tank (if it hits), but since they are so heavy and are dropped in pairs, it would be foolish to choose them for Rolling Thunder.

Be sure to bring some air-to-air missiles if you can afford the weight. When you fire the last, you'll wish you'd had Sarge slap just one more Sidewinder under your wing before you left.

Mission	Target	Weapon
Rolling Thunder	tanks	Maverick, GBU-15, Mk84
Duck Shoot	landing craft	Maverick, GBU-15, Mk84, cannon
Route 66	trucks	Maverick, GBU-15, Mk84, cannon
Iron Snake	train	Maverick, GBU-15, Mk84, cannon
Wild Weasel	SAM sites	Maverick, GBU-15, Mk84, cannon
Serpent's Jaw	road bridge	Maverick, GBU-15, Mk84
Serpent's Tail	rail bridge	GBU-15, Mk84
Hornet's Nest	runways	Durandal
Fireball	oil tanks	Maverick, GBU-15, Mk84, cannon
Sledgehammer	factories	GBU-15, Mk84
Blackout	cooling towers	GBU-15, Mk84
Grand Slam	armory	GBU-15, Mk84

Loading Configurations

So that you can plan your armament loads better, here is a chart showing where weapons can be loaded on the F-16. It also shows how many can be carried of each (which can be very important, especially if you have several targets in mind). You may have to unload some weapons to make space for others if you want a certain configuration. Most stores are loaded in pairs to maintain symmetrical drag and weight distribution, so plan accordingly.

Air-to-Air Missiles
AIM-9P Sidewinder
AIM-9M Sidewinder
AIM-120 AMRAAM

Air-to-Ground Missiles
AGM-65B Maverick

Air-to-Ground Bombs
Mk84 - 2000lb
BLU-107/B Durandal
GBU-15 Guided Bomb Unit

Other Stores
Fuel Tank
ALQ-131 ECM Pod

Once you're loaded up, just click **Take Off** at the Armament screen to begin the mission.

After the Mission

When you finish your mission, whether it's by landing or using
⌘ E, you'll see the Debriefing screen.

At the top of the screen is the pilot's name and the mission. A
series of snapshots follow, showing what happened on that
mission.

You have died. Your squadron mates fly the "Misssing Man" in memory.

You were rescued after parachuting.

Your base was overrun by the enemy.

You have been court-martialed.

The enemy captured you and took you prisoner.

You crash landed, damaging your plane.

Your plane crashed
and burned.

You ejected.

Your plane caught
fire and went into a
spin.

A missile struck your
plane.

Your mission has
been aborted.

Your mission was
successful.

Your mission was
unsuccessful.

You parachuted
safely to the ground.

You went
unconscious.

You landed safely.

The bottom of the screen has a brief synopsis of events and a listing of how many of each type of target you hit that mission. The points earned are shown at the bottom right.

Points

The points shown are broken down into two types: mission and technical. Mission points are awarded based on which mission you just completed. The values of the various missions are:

	Rolling Thunder	100
	Duck Shoot	110
	Route 66	130
	Iron Snake	120
	Wild Weasel	180
	Serpent's Jaw	190
	Serpent's Tail	170
	Hornet's Nest	180
	Fireball	200
	Sledgehammer	160
	Blackout	140
	Grand Slam	150

Technical points are awarded based on the type of targets destroyed and on certain actions deserving of reward (or punishment). Some targets are more difficult to destroy than others, and certain actions are more difficult to perform. These technical successes are therefore worth more points. The technical points values are as follows:

MiG kill	10, 20 or 30 (depending on the maximum number of MiGs allowed by the difficulty settings)
Safe landing	10
Rail bridge	10
Arsenal	10 per building
Factory	10 per building
Power plant	10 per cooling tower
SAM site	8
Enemy airfield	7 per runway

Tank	5
Road bridge	4
Train	3
Convoy	3 per truck
Landing craft	3
Oil tank	1
Ejecting	-10 if plane undamaged

To determine the total points earned, the mission and technical points are adjusted by the realism value (determined by the difficulty settings).

Medals

The point total is then used to determine whether your pilot is eligible for a medal. Six medals are possible. Note that most medals require not only a certain minimum score but also a minimum realism value. And, just as in reality, the fact that you have earned a medal does not mean you will receive it.

Award	Points	Realism
Air Medal	100	none
Distinguished Flying Cross	200	20
Silver Star	250	40
Air Force Cross	300	60
Medal of Honor	400	80

The Purple Heart is awarded only to pilots injured or killed in battle.

Air Medal

Distinguished Flying Cross

Silver Star

Air Force Cross

Medal of Honor

Purple Heart

Promotions

A running total of the points earned on each mission are kept in your pilot's dossier. This permanent total is used to decide if your pilot has earned a field promotion. If you complete the campaign, a bonus of 1,000 points will be added to your pilot's running total. Like medals, each rank requires a certain minimum amount of points to qualify; also like medals, making this minimum does not guarantee promotion.

Rank	Total Points
Captain	1,000
Major	3,000
Lt. Colonel	5,000
Colonel	7,000

Generally speaking, you will probably have to finish the campaign to get promoted, but an expert MiG hunter could earn his or her captain's bars sooner.

Captain

Major

Lt. Colonel

Colonel

FOUR
THE FIGHTING FALCON

The F-16 Fighting Falcon's greatest strength is its versatility. Equipped with a broad array of the finest avionics and weapons systems, it is equally capable in air superiority and strike roles.

A machine with such capabilities takes months to learn and years to master in the real world, but with this reference in hand (plus the ability to pause the action and look at your manual), you'll be a top Falcon jockey in just a few short hours.

Don't try to tackle all this information at once. First, read the *Controls* section below. Then:

- Open *Falcon MC*.
- At the Duty Roster screen, pull down the **Options** menu and select **Set Difficulty....**
- When the Difficulty screen appears, click the **Training** button and then choose **OK**.
- Back on the Duty Roster screen, click the **Instant Action** button.

With your keyboard chart and the *Controls* section handy, experiment with each flight control until you feel comfortable with using it. Press Q, P or Esc to pause your game to refer to the manual (⌘ R will resume the action).

When you're ready for the *Cockpit* section, pause the game. As you read, use your cockpit in the game for reference by hopping back and forth with the pause feature. When you have a good handle on what all the cockpit components are and what they do, you're ready for *Five: Flight School.*

Controls

The basic tools for flying the F-16 are the stick and throttle. Secondary controls such as the speed brakes, flaps and rudder allow you to fine-tune your flight with great precision.

Flight Stick

The flight stick is the primary directional control for the Falcon. Push forward, it dives; pull back, it climbs. Pushing the stick to either side rolls the plane in that direction. To turn, roll the plane to the side you want to go to and pull back on the stick. Simply rolling the plane in a given direction will cause it to sideslip gently to that side; this effect is especially noticeable at slower speeds.

The flight stick is represented by the arrow keys (←, ↑, ↓ and →); I, J, L and M; and 2, 4, 6 and 8 on the keyboard. Pressing two of these keys at a time will simulate a diagonal pressure on the stick.

Numeric Keypad

If you have a Gravis MouseStick, you can use it as the flight stick for greater control. Choose **Set Controls...** from the **Options** menu and select **Gravis MouseStick**.

The MouseStick II works much the same as the MouseStick; the only difference is the button assignments:

As a third option, you can fly using the mouse. Choose **Set Controls...** from the **Options** menu. You can choose either **Auto-center Mouse** or **Button-center Mouse**. Auto-center mouse means that as soon as the mouse stops moving, the stick will center unless the button is held down. Button-center mouse means the stick will center only when you click the mouse button.

In the real Fighting Falcon, the stick is not hydraulic; rather, it is electronic. The triply-redundant flight computer interprets the signal from the stick and the plane reacts accordingly. As a result, the stick can move no more than a quarter inch in any direction. In *Falcon MC*, this translates to a very sensitive stick. You can adjust this sensitivity by using **Set Controls...** on the **Options** menu.

Throttle

As any experienced fighter pilot will tell you, "speed is life." The throttle controls the amount of fuel the engine receives, which in turn determines how much thrust is applied and, therefore, how much acceleration is achieved. More fuel, more speed.

The throttle is represented by a pair of keys, one for increasing and one for decreasing thrust. There are three such pairs spread around the keyboard, as shown below. Use whichever feels most natural to you.

Top Row   **Top Row**   **Numeric Keypad**

A second MouseStick can be used for throttle control. Follow the directions on the Installation card to set up your MouseStick.

If a pair of MouseStick IIs are used, the second becomes the throttle control. This works just like the MouseStick, but with slightly different button assignments.

Speed Brakes   Flaps

Switch Targets

Throttle

Rudder

Tracking
Radar

Boresight
Radar

The RPM gauge (located on the upper right of the forward cockpit instrument panel) shows what percentage of maximum thrust the engine is providing.

As you open the throttle, the needle moves toward 100%. So when you run across the term "90% throttle," it means the throttle is open enough to provide 90% of maximum thrust.

Afterburner

Afterburning is a technique used to dramatically increase the thrust of a jet engine. With the throttle all the way open, fuel is sprayed into the exhaust flame. The resulting controlled explosion essentially turns the jet into a rocket for as long as the afterburner is lit.

To light the afterburner, press ☐ (or ☀ on the numeric keypad). The throttle will automatically be opened to 100%, if it is not already, and the afterburner will be engaged. This will

accelerate the plane very rapidly, but consumes vast amounts of fuel. This can be a lifesaver in a dogfight if you need to regain lost airspeed after a tight turn, or if you're looking to disengage from your foe.

Use of afterburner is not without its hazards. In addition to rapid fuel consumption, afterburning carries two other very serious drawbacks in air combat. The first is that faster planes turn slower, so if you afterburn too much, your opponent can outmaneuver you. The second problem is that an afterburning turbofan engine creates a great deal of heat, which is a beacon to heat-seeking missiles. You can disengage the afterburner by pressing ⁄ again or by cutting back on the throttle (by pressing – or 1).

If you're dodging a missile, DO NOT USE THE AFTER-BURNER. Your maneuverability will drop, and your heat signature will increase.

Secondary Flight Controls

The rudder, speed brakes and flaps can be used to make fine adjustments to your speed and heading. These are particularly useful in landing and ground attack, but they have their uses in a dogfight (especially the speed brakes).

Speed Brakes

The speed brakes, engaged and disengaged by pressing B , are an effective way to bleed off excess airspeed. The best times to do this are when you need to make an especially tight turn or when you are landing.

Flaps

The flaps are also used to reduce airspeed, but to a lesser degree. If you want a more gradual slowing, press F to activate or deactivate the flaps. They can be used together with the speed brakes for maximum deceleration.

Flaps are useful only if you have **Normal Engine** selected on the Difficulty screen. See *Seven: Features* for details.

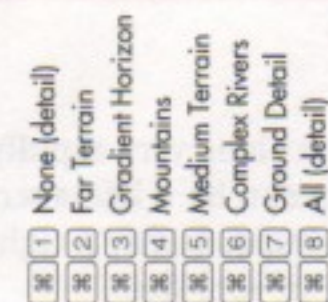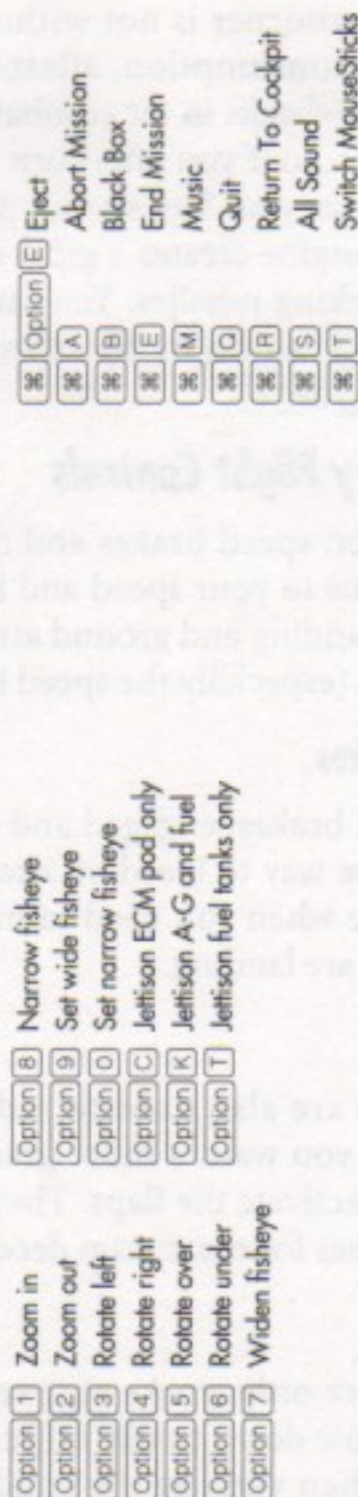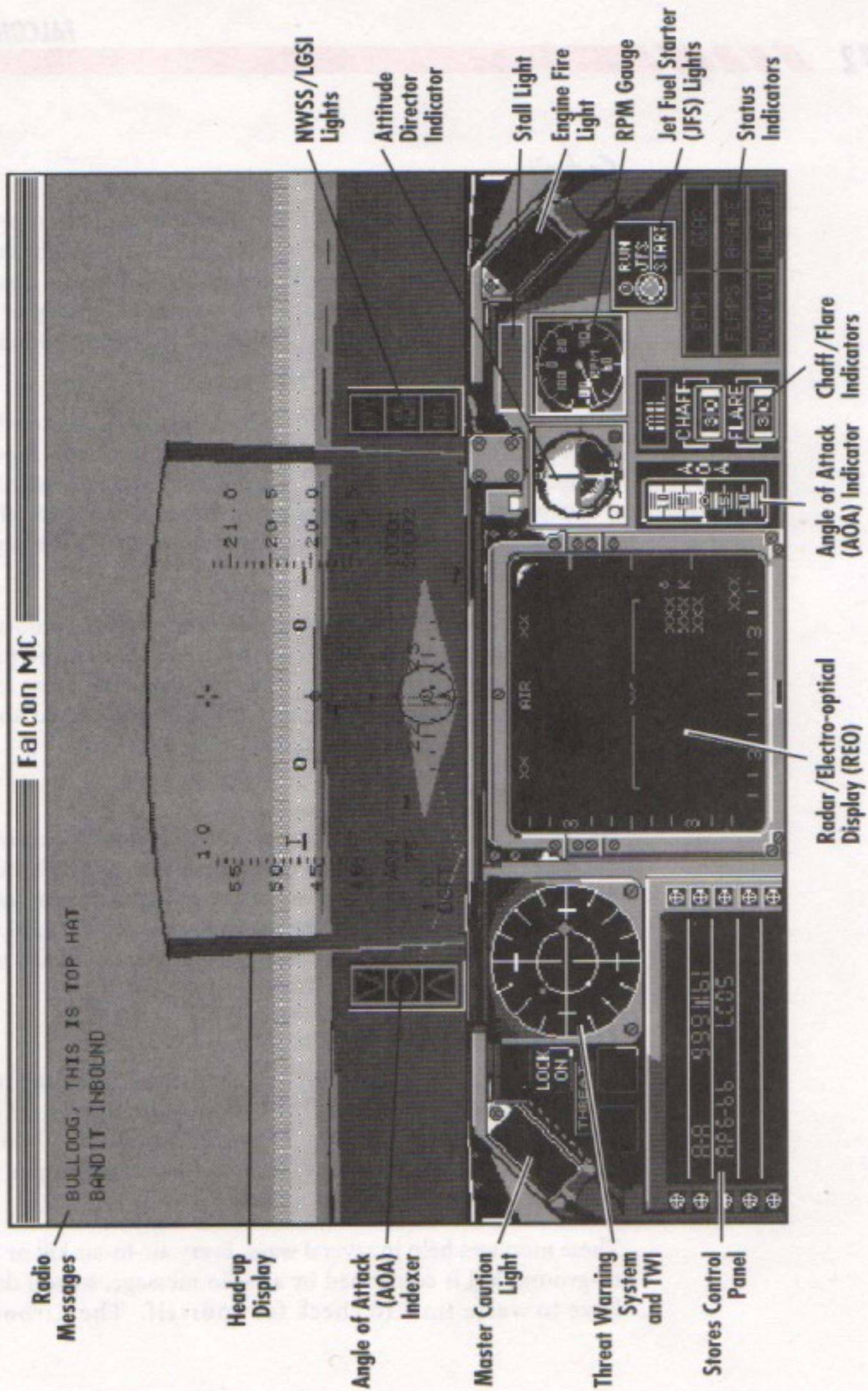### Rudder

The rudder only works at speeds below 400 knots, so you'll have to slow down to use it (perhaps with the speed brakes or flaps). When you use the rudder to turn, the plane will not bank or roll. The advantages of this in ground attack and landing are immediately obvious. Left and right rudder are [and] . The left and right directions on a second MouseStick control the rudder as well.

Keyboard Command Reference

Function keys:

- esc — PAUSE
- F1 — ZOOM IN
- F2 — ZOOM OUT
- F3 — ROTATE LEFT
- F4 — ROTATE RIGHT
- F5 — ROTATE OVER
- F6 — ROTATE UNDER
- F7 — WIDEN FISHEYE
- F8 — NARROW FISHEYE
- F9 — SET WIDE FISHEYE
- F10 — SET NARROW FISHEYE
- F11
- F12

Number row (main keyboard):

- ` ~ — FLARES
- 1 ! — DECREASE THROTTLE
- 2 @ — INCREASE THROTTLE
- 3 # — FRONT VIEW
- 4 $ — LEFT VIEW
- 5 % — RIGHT VIEW
- 6 ^ — REAR VIEW
- 7 & — TRACK VIEW
- 8 * — CAMERA VIEW
- 9 (— CHASE VIEW
- 0) — MISSILE VIEW
- - _ — DECREASE THROTTLE
- = + — INCREASE THROTTLE

tab row:

- tab — CHAFF
- Q — PAUSE
- W — WHEEL BRAKES
- E — ECM
- R — RADAR
- T — SELECT TARGET
- Y — DECREMENT WAYPOINT
- U — INCREMENT WAYPOINT
- I — FORWARD STICK
- O — LCOS
- P — PAUSE
- [{ — LEFT RUDDER
-] } — RIGHT RUDDER
- \ | — ILS HUD

home row:

- caps lock
- A — AUTOPILOT
- S — SOUND
- D — DISPLAY OUTSIDE VIEW INFO
- F — FLAPS
- G — LANDING GEAR
- H — TWI MODE
- J — LEFT STICK
- K — BACK STICK
- L — RIGHT STICK
- ; : — CHAT
- ' " — CHAT
- return — SELECT AIR-TO-AIR WEAPON

shift row:

- shift
- Z — CLEAR TARGET LOCK
- X — CLEAR TARGET LOCK
- C — MAP/REO TOGGLE
- V — VIEW STORES
- B — SPEED BRAKES
- N — TRIGGER
- M — BACK STICK
- , < — BORESIGHT RADAR
- . > — TRACKING RADAR
- / ? — AFTER-BURNER
- shift

bottom row:

- control — CHAFF
- alt/option
- ⌘
- space — TRIGGER
- ⌘
- option
- control

Numeric keypad:

- clear — CLEAR TARGET LOCK
- = — SELECT A-A WEAPON
- / — SELECT A-G WEAPON
- * — AFTER-BURNER
- 7 — LEFT VIEW
- 8 — FORWARD STICK
- 9 — RIGHT VIEW
- - — DECREASE THROTTLE
- 4 — LEFT STICK
- 5 — RIGHT STICK
- 6 — RIGHT STICK
- + — INCREASE THROTTLE
- 1 — FRONT VIEW
- 2 — BACK STICK
- 3 — REAR VIEW
- 0 — TRIGGER
- . — CHAFF
- enter — FLARES

Detail levels:

- ⌘ 1 — None (detail)
- ⌘ 2 — Far Terrain
- ⌘ 3 — Gradient Horizon
- ⌘ 4 — Mountains
- ⌘ 5 — Medium Terrain
- ⌘ 6 — Complex Rivers
- ⌘ 7 — Ground Detail
- ⌘ 8 — All (detail)

Command options:

- ⌘ Option E — Eject
- ⌘ A — Abort Mission
- ⌘ B — Black Box
- ⌘ E — End Mission
- ⌘ M — Music
- ⌘ Q — Quit
- ⌘ R — Return To Cockpit
- ⌘ S — All Sound
- ⌘ T — Switch MouseSticks

Option keys:

- Option 8 — Narrow fisheye
- Option 9 — Set wide fisheye
- Option 0 — Set narrow fisheye
- Option C — Jettison ECM pod only
- Option K — Jettison A-G and fuel
- Option T — Jettison fuel tanks only

- Option 1 — Zoom in
- Option 2 — Zoom out
- Option 3 — Rotate left
- Option 4 — Rotate right
- Option 5 — Rotate over
- Option 6 — Rotate under
- Option 7 — Widen fisheye

Falcon MC

BULLDOG, THIS IS TOP HAT
BANDIT INBOUND

NWSS/LGSI Lights

Attitude Director Indicator

Stall Light

Engine Fire Light

RPM Gauge

Jet Fuel Starter (JFS) Lights

Status Indicators

Chaff/Flare Indicators

Angle of Attack (AOA) Indicator

Radar/Electro-optical Display (REO)

Radio Messages

Head-up Display

Angle of Attack (AOA) Indexer

Master Caution Light

Threat Warning System and TWI

Stores Control Panel

RUN JFS START

CHAFF FLARE

AOA

LOCK ON

THREAT

Cockpit

Situational Awareness, or SA, is the state of being fully aware of where everything is, how it is moving and what it might do in the near future. This can be likened to the ability of a professional athlete to know where the ball is without looking or the knowledge an alert driver has of where all the other traffic is in relation to his or her own vehicle.

In the high-speed, three-dimensional world of air combat, pilots achieve SA through the use of instruments. A pilot cannot see everything, and his or her other senses are useless in a cockpit. Knowing the plane's instruments well enough to read and interpret the information instinctively is the key to situational awareness.

The Falcon cockpit is designed to put as much of this information as possible into the small space in front of the pilot without obstructing his or her view. Consequently, there are a large number of gauges, screens and indicators arrayed about the cockpit. We'll go through them one by one.

Forward View

Hopefully, forward is the way a pilot will be looking most of the time. As a result, most of the information is displayed in the forward view area. Refer to both your cockpit in the game and the cockpit diagram on the previous page as you read this section. The components are addressed in a counterclockwise order, starting at the top left.

Radio Messages

At times, the jumble of multiple radio messages coming in at the same time, or the intensity of your concentration, or just plain static, make it hard to understand broadcasts. To make things easier, radio messages are printed in the upper left corner of the screen as well as spoken.
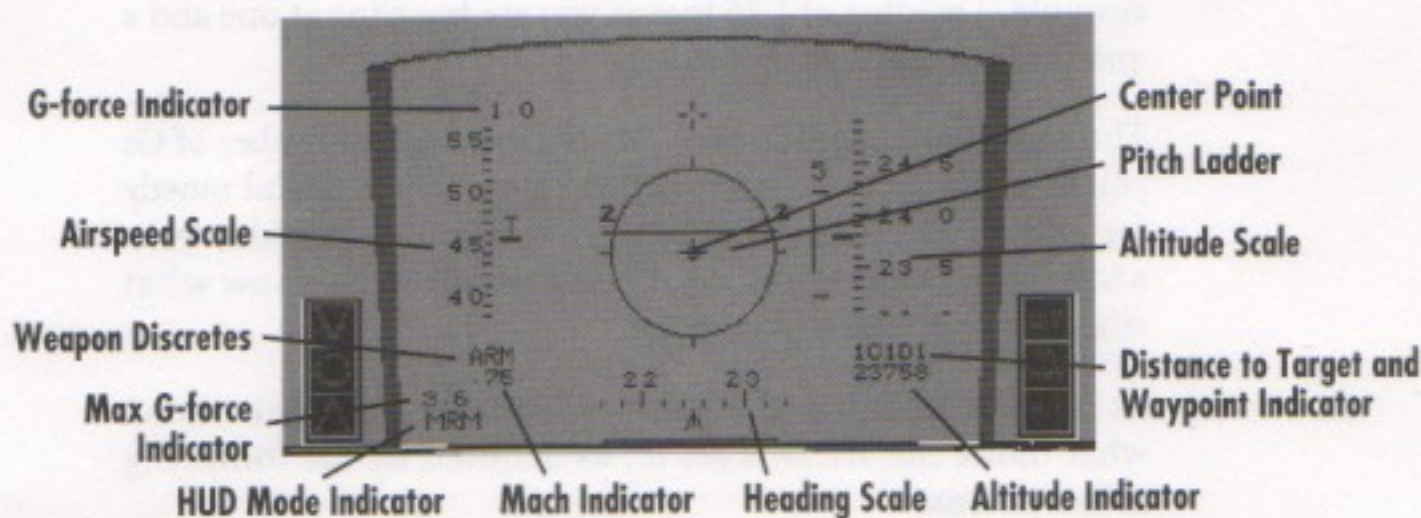
These messages help in several ways. Every air-to-air kill or air-to-ground kill is confirmed by a radio message, so you don't have to waste time to check for yourself. The Airborne

Warning and Control System (AWACS) spots incoming MiGs and warns you. Your base will radio you if it is threatened, and various reconnaissance reports come in periodically from field spotters which help you hunt down enemy targets. The call-signs you will hear from are:

Top Hat	AWACS plane
Home Plate	your air base
Groundhog	ground-based reconnaissance

The Head-up Display (HUD)

The HUD is the clear screen which takes up the center of the forward cockpit view. It is designed to present a great deal of changing information and targeting aids without blocking your vision. There are three basic modes for the HUD: air-to-air, air-to-ground and Instrument Landing System (ILS). Each HUD mode has specialized information to display, but there are some things which appear on every HUD.

Around the HUD

Starting at the upper left corner and proceeding counterclockwise, here is what you will see on every HUD:

The **G-force indicator** in the upper left shows how many Gs you are currently pulling. One "G" is equal to the force of gravity, so if you are pulling 7.0 Gs, you and the plane are feeling seven times the force of gravity.

The **airspeed scale** shows your speed in tens of knots on a sliding scale on the left side of your HUD. The center mark shows your current speed. So, if the mark is next to 45, you are traveling at 450 knots true airspeed.

The **weapon discretes** are just below the bottom of the airspeed scale. These abbreviations indicate the status of your current weapon. The possible discretes and their meanings are:

ARM   The weapon is armed.
LOCK   The weapon is locked onto a target.
IN RNG   Guided air-to-ground weapon is in range of a locked target. (Air-to-air guided weapons can only lock on if they are already in range.)
REL   Air-to-ground weapon released.

The **Mach indicator**, right under the weapon discretes, shows your current speed as a multiple of the speed of sound. For example, a reading of 1.25 means you are traveling at one and a quarter times the speed of sound.

The **max G force indicator** shows the maximum number of Gs you have pulled since starting this flight. This is useful mostly for reference in *Falcon MC*, but in a real world situation, technicians on the ground would be interested to know what stresses the aircraft had endured.

At the bottom left is the **HUD mode indicator**. This shows what mode the HUD is set to, as denoted by the following abbreviations:

DGFT   Air-to-air cannon mode
SRM   Air-to-air Sidewinder missile mode
MRM   Air-to-air AMRAAM missile mode
STRF   Air-to-ground cannon mode
CCIP   Air-to-ground unguided weapon mode, showing continuously computed impact point
E-O   Air-to-ground guided weapon mode, using electro-optical aiming
ILS   Instrument landing system mode

The **heading scale** runs across the bottom of the HUD and shows your heading in tens of degrees on a sliding scale. The center mark indicates your present heading. A caret points to the correct heading to take to your waypoint.

An **altitude indicator** in the bottom right corner of the HUD shows your exact altitude in feet.

Above the altitude indicator is the **distance to target and waypoint indicator**. This is a distance in miles, followed by a "D" for "Destination" and then by a waypoint designation. The distance is how far it is to that waypoint. Thus, if it says 15D3, you are 15 miles from waypoint D3.

The **altitude scale** runs along the right edge of the HUD. It shows your altitude in thousands of feet on a sliding scale. The center mark shows your altitude. If, then, the mark is next to 2.5, you are approximately 2,500 feet above ground.

In the center of the HUD is the **pitch ladder**. This is a wide sliding scale which shows climb or dive angle in tens of degrees. Positive numbers indicate a climb, while negative numbers mean the plane is diving. As another visual cue, the pitch ladder uses dotted lines to mark negative (dive) angles. So, if your pitch ladder shows a dotted line marked with a -3 at either end in the middle of your HUD, you are diving at approximately 30° (a 90° dive is straight down).

A stationary **center point** marks the center of every HUD. This is valuable both as an aiming point for weapons and to get an immediate idea of where your plane is headed.

Air-to-air HUD

The air-to-air HUD is automatically activated when an air-to-air weapon is selected. You can choose an air-to-air weapon by pressing [Return] (or [=] on the numeric keypad). The HUD will look something like this.

Target Locator Line extends from here

Aiming Reticle

5-Mile Ranging Scale

Target Designator

IN RNG Indicator

The circle in the center is called the **aiming reticle**. When an air-to-air target is within this circle, you have a good chance of hitting it if it is within range.

The **target designator** is a box which will appear on top of the locked target and follow the target whenever it is visible in the HUD. It is a visual aid to help you keep track of your opponent. If the locked target is out of the HUD but still acquired by radar, a diamond with an X through it will replace the target designator.

A **target locator line** extends from the top center of the HUD, showing what direction the locked target is in when it is out of the HUD but still locked onto by the radar.

In the bottom right of the HUD is the **in range indicator**. The words IN RNG will appear when the locked target is within range of whatever weapon you have selected.

The **5-mile ranging scale** on the right side of the HUD shows the target's distance from the F-16 on a sliding scale from 0 to 5 miles.

Air-to-ground HUD

The air-to-ground HUD comes up whenever an air-to-ground weapon is selected. Press Delete (or / on the numeric keypad) to select an air-to-ground weapon. There is a different HUD for guided and unguided air-to-ground weapons, but two things are common to both.
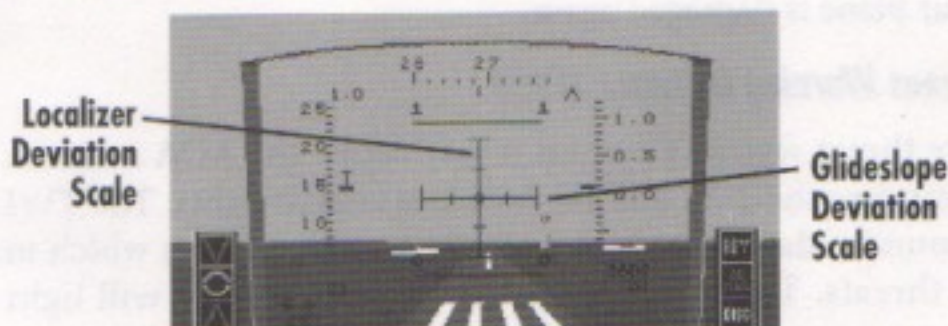
The **target designator** marks the locked target. Air-to-ground weapons are locked on by placing the center point on the target and pressing the trigger once. The trigger is Spacebar (or 0 on the numeric keypad).

The **distance to target** is displayed in the lower right. This shows the range in feet to the locked target, taking altitude into account.

Instrument Landing System (ILS) HUD

The ILS HUD is used for landing. When it is engaged (by pressing \ ), all weapons targeting information is removed from the HUD to give a clear view for landing. Two sliding bars take up the middle of the HUD.

The horizontal bar is the **glideslope deviation scale** and is used to make sure your altitude is appropriate for landing.

The vertical bar is the **localizer deviation scale** and is used to make sure your position is appropriate for landing.

Lock Light

Master Caution Light

Launch Light

AOA Indexer

Threat Warning Indicator (TWI)

Stores Control Panel

Angle of Attack (AOA) Indexer

Left of the HUD is a vertical row of lights, two triangles and a circle. This is the AOA indexer, another landing aid. When making your landing approach, look at the AOA indexer to determine if your angle of attack is correct for landing. If the upward-pointing triangle is lit, reduce airspeed; if the downward-pointing triangle is lit, increase airspeed. If the circle is lit, your angle of attack is good. The AOA Indexer is active only when the HUD is in ILS mode.

Master Caution Light

The voice message system (VMS) will also warn you when you have been hit by saying "Warning. Warning." until you check the secondary caution lights.

In the upper left of the front panel of the cockpit is the master caution light. This will come on any time damage has occurred to the plane. Check the secondary caution lights in the right view by pressing ⑤ (or ⑨ on the numeric keypad) to see which systems are damaged. Once you've checked the secondary caution lights, the master caution light goes out until your plane is damaged again.

Threat Warning Indicator (TWI)

The threat warning system is just below the AOA indexer. It comprises the TWI and the lock and launch lights. The TWI is a round radar screen which displays radar sources which may be threats. The lock light is the upper light and will light if

someone has a radar lock on you. The launch light is the lower light and will light if a missile has been fired at you.

The TWI has two modes, one of which is only accessible if you have not checked **Normal TWI** on the Difficulty screen.

Bandits

Normal TWI

The normal TWI detects only those threats which are actively using radar. If a MiG pilot turns off his radar, he will not appear. MiGs show up as diamonds, SAM sites show up as small squares and radar-guided missiles appear as smaller diamonds. The TWI does not show distance, only general direction to the threat. Your plane is at the center of the TWI, pointing up. Threats in front of you will be at the top, those behind you at the bottom, and those to the right or left will be on the corresponding side.

Bandit within 3 miles

Bandit 14 miles away

Ranging TWI

The ranging TWI is only available if you have not checked **Normal TWI** on the Difficulty screen. To activate or deactivate the ranging TWI, press [H]. Threats 25 miles away will be at the edge of the TWI, those 15 miles away will be on the rim of the middle ring and those within a mile will be in the center.

Stores Control Panel

The stores control panel displays a variety of information, primarily related to your plane's weapons and other stores. In the upper left, it shows the HUD mode; below that, radar status; on the right, information about the selected weapon; and below that, targeting system information.

The various abbreviations and their meanings are:

A-A	The HUD is in air-to-air mode.
A-G	The HUD is in air-to-ground mode.
ILS	The HUD is in instrument landing system mode.
SRF	The HUD is in air-to-ground strafing mode.
APG-66	The APG-66 radar is turned on and functioning.
3AIM9P	The selected weapon is an AIM-9P Sidewinder missile, and three remain.
1AIM9M	The selected weapon is an AIM-9M Sidewinder missile, and one remains.
7AIM120	The selected weapon is an AIM-120 AMRAAM missile, and seven remain.
5AGM65	The selected weapon is an AGM-65B Maverick missile, and five remain.
6BLU107	The selected weapon is a BLU-107/B Durandal bomb, and six remain.
4GBU15	The selected weapon is the GBU-15 guided 2,000-lb bomb, and four remain.
378M61	The selected weapon is the M61A1 20mm cannon, and 378 rounds remain.

2MK84	The selected weapon is the Mk84 2,000-lb bomb, and two remain.
LCOS	The lead-computing optical sight for the cannon is active.

The stores control panel can also be used to get a quick view of your total stores situation. Hold down [V] to view a list of all stores on the aircraft, including fuel tanks and the ALQ-131 ECM pod if you're carrying any.

The Radar/Electro-optical Display (REO)

The radar/electro-optical display has four modes, two for radar display and two for video display. The two radar modes are used in air-to-air combat, the camera mode is for targeting video-guided weapons and the map mode is a navigational aid.

The Radar Modes

The REO will have the notation "AIR" at the top center when in one of the radar modes. The two radar modes are designed to give you a good idea of enemy positions and movement. Each shows the situation in a different way so that, taken together, they provide a three-dimensional view of the combat. Both modes have several things in common. Switch to bore-sight scan by pressing [<] or change to tracking scan by pressing [>].

The **waterline** marks the horizon's position for reference.

The **target location** for the locked target is marked by a diamond with bars on either side. Other detected targets appear as squares. Pressing [T] will cycle through multiple targets.

The **target altitude** is shown in the upper right corner. It measures the locked target's altitude in thousands of feet.
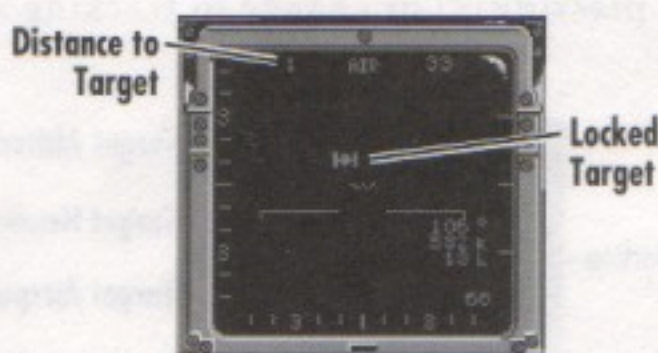
The **target heading**, in degrees, is shown on the lower right.

The **target airspeed**, in knots, is shown just below the target heading.

The **aspect angle** is in the lower right, just below the target airspeed. This is an angle measured by drawing an imaginary line through your plane's centerline and the target's centerline. So, if the angle is 180, you are heading directly towards each other. A heading of 0 means you are behind the bandit, and a heading of 90R would mean you are flying perpendicular to the MiG, pointing at its right side (90L would be the same, but pointing at its left side).

At the bottom on the right is the **closure rate**, in knots. This is how fast you and the MiG are approaching each other. If it is negative, you are separating.

Boresight scan mode shows radar information as though looking down the barrel of your gun. Your plane's position is in the center of the display, so targets at the top are above you and those to the left of you are on the left.

Distance to Target — Locked Target

The **distance to target**, in miles, is how far apart you and the locked target are. It is shown in the upper left corner.

Tracking radar mode shows opponents as though looking down on the combat, with your plane's position at the bottom center of the display. Blips shown at the top of the display are those farthest from you and those to the left or right are to the left or right of you, as appropriate.

Aspect angle is covered more thoroughly in *Lesson Two: Dogfighting* in the next chapter and in *Six: Tactics*.

Tracking scan mode shows the relative distance of targets at a glance, and is therefore good for spotting primary threats.

Scan Range

Target Bearing and Range

Your Position

The **scan range**, in the upper left, shows how far it is from your plane to the top of the REO. If, for example, it was 20, then targets shown at the top would be 20 miles away while those halfway down would be just 10 miles away. The scan range adjusts automatically to accommodate the locked target.

The **target bearing and range** is shown in the lower left. This is the compass direction from you to the target in degrees and the distance in miles from you to the target. Thus, a notation of 300°12 means the target is 60 degrees left of you (since 360° is straight ahead) and 12 miles away.

Map Display

A scrolling video map of the campaign area has been programmed into your F-16's computer. Call up the map by pressing C in any REO mode. Turn the map back off by pressing C again.

Your Position

Your position is shown as a black cross hair in the center.

Camera Mode

The television-guided weapons, the Maverick and GBU, have cameras in their noses. While the weapons are still on the plane, their cameras are tied to the REO. The camera view is activated automatically when one of these weapons is selected. If no such weapons remain on board, you cannot use the camera view.

The cross hairs in the middle of the REO show where the weapon's exact aim point is. When the weapon is locked on, the image of that location is remembered by the weapon's guidance system. Then, when it is released, the weapon homes in on that spot.

Techniques for using the Maverick and GBU are taught in *Five: Flight School*.

NWSS/LGSI

Attitude Director Indicator (ADI)

AOA Indicator

Chaff/Flare Indicators

Stall Light

Engine Fire Light

Jet Fuel Starter (JFS) Start/Run Lights

Status Indicators

Angle of Attack (AOA) Indicator

Just to the right of the REO is the AOA indicator. This shows, in degrees, what your angle of attack is. The white half shows positive AOA, while the black half shows negative AOA. The angle of attack, loosely, is the angle between the way your plane is pointing and the way it is moving. An AOA of 5°, for example, means that the plane is pointed five degrees above its direction of motion. AOA is explained more fully in *Landing* later in this chapter.

Chaff/Flare Indicators

The chaff and flare indicators are to the right of the REO and the AOA indicator. As you expend chaff and flares to evade missiles, these counters will show how many charges remain. Chaff charges create clouds of foil strips which can fool radar-guided missiles, while flares give off great heat to spoof heat seeking missiles. Dump chaff by pressing ⌨Tab (or ⌨. on the numeric keypad). Drop flares by pressing ⌨' (or ⌨Enter on the numeric keypad).

Status Indicators

The six status indicators in the lower right corner of the cockpit inform you when those systems are active. When the indicator is lit, that system is engaged. Note that some systems, such as the flaps and speed brakes, can be damaged in the active position, making it impossible to disengage them.

ECM

The ALQ-131 electronic countermeasures (ECM) pod, if installed on your plane, can jam enemy radar. SAM sites and MiGs alike will have greater difficulty locking on to you when it is active. Turn ECM on and off by pressing ⌨E.

FLAPS

The flaps, when activated, decrease your speed gradually. This can be useful for fine-tuning an attack approach or, more importantly, when landing. Note that their effect is negligible at higher airspeeds. Engage and disengage the flaps by pressing ⌨F. You can use flaps in combination with the speed brakes to rapidly slow down your F-16.

AUTOPILOT

The autopilot in *Falcon MC* does more than the one in the real F-16. In the real plane, the autopilot will make only slight, gradual guidance changes designed to safely take the plane from one airborne waypoint to another. This autopilot, however, will aggressively hunt MiGs if engaged (although it only controls the flight stick; you still control all other flight controls and weapons systems). If there are no MiGs in the area,

the autopilot will fly to the waypoint and circle it. Activate and deactivate the autopilot by pressing Ⓐ.

GEAR

The landing gear must never be deployed at speeds above 300 knots. The sudden huge drag is likely to throw the plane into some uncomfortable maneuvers, and the gear will be badly damaged. Lower the gear before touching down and raise it when taking off by pressing Ⓖ.

BRAKE

The speed brakes are a more drastic means of reducing speed than the flaps. The two can be combined for very rapid deceleration, if you wish, or used singly for more precise adjustments. Engage and disengage the speed brakes by pressing Ⓑ.

WL BRK

The wheel brakes are only used to stop the plane when it is taxiing at speeds of 100 knots or less. If you try to taxi without releasing the wheel brakes or apply them when you are going too fast, the voice message system will warn you by saying "caution." Release the wheel brakes before you take off and engage them after you touch down by pressing Ⓦ.

Jet Fuel Starter (JFS) Start/Run Lights

The two round lights just above the six status indicators are the JFS start and run lights. When the engine is off, both lights are green. When the engine is running, the top light is red.

During ignition, as the throttle is increased from 0 to 60%, the JFS is used to ignite the fuel. The JFS start light is red during this time, to show that the starter is active. Once the throttle gets above 60%, the engine is self-sustaining and the starter disengages. The JFS start light will show green when it is disengaged.

If the top light, the one marked "run," ever goes green, your engine has died. You can try to restart it by opening the throttle, but if that fails, bail out as soon as possible by pressing ⌘ Option Ⓔ to eject.

RPM Gauge

At the top right of the instrument panel is the RPM gauge. This shows what percentage of maximum thrust the engine is providing. As the throttle is opened and more fuel goes to the engine, thrust increases and the needle will go clockwise towards 100%.

The plane needs around 65% throttle to sustain an airspeed of 250 knots, which is about the minimum necessary to maintain level flight. The throttle controls are ①️ and ②️ on the main keyboard, or ⊟ and ⊞ on both the main keyboard and the numeric keypad, to decrease and increase thrust.

Attitude Director Indicator (ADI)

Sometimes called the "level ball," the attitude director indicator shows the plane's position relative to the ground. It is just to the left of the RPM gauge on the forward instrument panel. The black half of the ADI represents the ground, while the white half represents the sky. It is primarily intended as a backup in case the pilot gets disoriented.

Engine Fire Light

The engine fire light is above and to the right of the RPM gauge. It only comes on if there is a fire in the engine. The one thing pilots have always feared is an engine fire. If your engine is damaged by enemy fire, there is a chance a fire will start. If it does, you should eject immediately (⌘ Option E).

Stall Light

If your airspeed gets too low or you fly too high, the engine will not receive enough oxygen to run and will stall out. If that happens, the stall light (just above the RPM gauge) will light. If your engine has stalled, give it full throttle and keep the plane as close to level as you can until you regain enough airspeed to come out of the stall.

NWSS/LGSI

On the right side of the HUD are three lights arranged vertically. This is the nose wheel steering system/landing gear status indicator, called the NWSS/LGSI for short. The three lights, and their meanings, are:

RDY   The landing gear and nose wheel steering system are deployed and functional.

AR/NWS   The NWSS is active, so the plane can be steered on the ground.

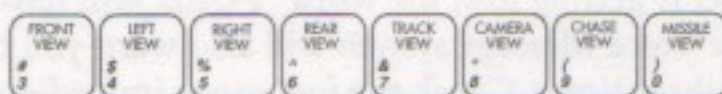DISC   The NWSS has been disconnected, since the gear is no longer touching the ground.

Whenever the gear is down, the RDY light will be lit. As you taxi for takeoff, the AR/NWS light will come on, indicating that the plane can be steered with the nose wheel. When the plane reaches 70 knots ground speed, the NWSS is locked (but still active), so the AR/NWS light goes out. When the gear is down in flight, the DISC light indicates that the NWSS is entirely disconnected (since the plane is no longer on the ground).

Other Cockpit Views

The other three cockpit views allow you to look around as you fly. This is fairly useful for spotting enemies and ground targets, but the main benefit of the left and right views is the additional instrumentation placed there. The rear view is also useful as a way to visually confirm a ground kill by simply pulling back on the stick and looking over your shoulder.

The outside views serve two equally important purposes. First, they let you watch the action from several interesting angles, which is a lot of fun. Second, they give you the 360° vision a real Falcon pilot has, which is critical to some of the advanced fighter tactics we'll get to later.

All the views are accessible from the top row of the keyboard; the cockpit views are also accessible from the numeric keypad.

Left View

The left view is activated by pressing ④ (or ⑦ on the numeric keypad). In the left view you will see your pilot's hand on the throttle, the outside world and five gauges.

Fuel Gauge
Landing Gear Lights
Compass
Backup Airspeed Gauge
Backup Altimeter

Fuel Gauge

The fuel gauge in the upper left shows your remaining fuel in hundreds of pounds. There are two needles, one for your internal tank and one for all external fuel tanks. Your internal tank can hold around 7,000 pounds of fuel; each external tank holds around 2,000. So, when you first begin a mission, one needle should be right around 70. If you had two external fuel tanks, the second needle would start around 40.

External fuel is always used up first. When it runs out, or if you need maneuverability right now, press ⟨Option⟩ ⟨T⟩ to jettison all external fuel tanks.

If your fuel is getting low, the word "FUEL" will flash in your HUD. The Voice Message system will also warn you by saying "caution" three times. Check the fuel gauge immediately if you receive these warnings.

Landing Gear Lights

The landing gear lights in the upper right will show green if the landing gear is extended and undamaged. The lights will go out when the gear is up. If you try to deploy the landing gear and it is damaged, those wheel struts which are damaged will not deploy, and their lights will not come on. Just to be sure, when you put down your gear, check these lights to make sure all your gear came down.

Compass

The backup compass in the lower left shows your magnetic compass bearing. This is primarily useful if your HUD is inoperative due to damage.

Backup Airspeed Gauge

The airspeed gauge in the lower right is intended as a backup in case the HUD is out. It is marked in tens of knots, so 40 is 400 knots.

Backup Altimeter

A digital altimeter below the other four gauges shows your exact altitude. This is yet another backup in case of HUD failure.

Right View

Press ⑤ (or ⑨ on the numeric keypad) to check out the right side of your cockpit. You'll see the outside world, your pilot's right arm on the flight stick and 14 caution lights.

Caution Lights

Caution Lights

Each of these lights corresponds to one of your Falcon's systems. When one is lit, it means that system is damaged or inoperable. The lights and the damage they indicate are:

FLAP	The flaps are frozen in place.
STORES	No external stores can be used except the AIM-9M and AIM-9P.
BRAKES	The speed brakes are frozen in place.
GUN JAM	The cannon will not fire.
NWS	You cannot steer when taxiing.
WEP ARM	The weapons (except for the cannon) will not arm and therefore will not fire.
ECM	The ECM pod will not work.
BURNER	The afterburner is damaged.
RADAR	The radar systems are inoperable.
ENGINE	The engine has been damaged and may be on fire.
HUD	The Head-up display is dead.
FUEL SYS	A fuel leak has started.
NAV	The autopilot and REO map display are useless.
OXY LOW	Canopy damage will cause the pilot to black out at altitudes above 27,000 feet.

Rear View

The phrase "check six" means "look behind you." Pilots use clock points to quickly describe directions, with twelve being dead ahead. So "three o'clock low" indicates a direction straight to your right and below you, and "six o'clock" means directly behind you. Press ⑥ to check your six (or use ③ on the numeric keypad).

Reason for Parachute

Parachute

In the rear view, all you see is your harness straps, your parachute (comforting sight) and anyone behind you (not a comforting sight). The view is restricted somewhat, but it is useful for a quick glance over the shoulder. It is also a good way to check your handiwork after a bombing run.

When you've dropped your bombs and are pulling up and away, look over your shoulder. If you are climbing steeply enough, you should be able to see where your bombs struck. Besides being personally satisfying, this view of your bombing accuracy can help you improve your aim for next time without having to take an extra pass over the target area to look.

Outside Views

The outside views allow you to do what no real pilot can: step outside your plane in midair to have a look around. The four views, track, camera, chase and missile, show the action from distinctly different viewpoints. The view control keys are used to manipulate these outside views to suit your needs.

Not all view control keys work in every outside view. These restrictions are included in the description of each view.

Display
Information

When you are in an outside view, the name of the view you are
in (i.e., track, chase, etc.) is shown in the upper left corner,
along with your heading, airspeed and altitude. This display
can be turned on and off by pressing D.

View Controls

There are a number of things you can adjust when you're in
one of the outside views. The view control keys are F1
through F10. If your keyboard does not have function keys,
you can use Option 1 through Option 0.

F1 and F2 are the zoom keys. F1 zooms in on whatever
you're looking at, and F2 zooms out.

F3 and F4 rotate your viewpoint around the subject in the
horizontal axis. Press F3 to rotate your viewpoint counter-
clockwise or press F4 to rotate it clockwise.

F5 and F6 rotate your view in the vertical axis. F5 swings
the viewpoint over the subject, while F6 moves the viewpoint
under it.

F7, F8, F9 and F10 control the "fisheye lens" effect. To
get the most in view at once, the outside views often distort the
image of the world, much like looking through a fisheye lens.
To reduce this effect, making the subject larger at the expense
of peripheral view area, narrow the fisheye by pressing F8.
Press F7 to widen the fisheye view again. F9 jumps the
fisheye to a wide position, while F10 jumps it to a narrow
fisheye view.

Track View

Press �7 to activate the track view. This view keeps the F-16 in sight, while also doing its best to keep the currently selected target in view. Think of this view as looking through your plane at the MiG.

The only view control keys which will not work in track view are the left and right rotation keys (F3 and F4).

Camera View

Press ⑧ to activate the camera view. This view keeps the F-16 in sight but otherwise is completely adjustable. All view control keys work in camera view.

Chase View

Activate the chase view by pressing ⑨. This view follows the Falcon with a slight lag, as if it was being seen from a chasing plane.

Only the fisheye lens controls, F7 through F10, will work in chase view.

Missile View

Press ⓪ (zero) to switch to missile view. The missile view follows the first weapon fired and will not follow unguided weapons. To switch between multiple weapons in the air at once, press ⓪ again. The view will cycle through the various weapons in flight.

When a weapon hits, the view will stay set to that stationary point, whether it be in the air or on the ground. If you like, you can use this vantage point to look around the Falcon world for a bit or switch to any other view (cockpit or otherwise).

If there is no weapon in flight, missile view will be the same as camera view.

All view control keys will work in missile view.

Weapons Systems

Knowing how to fly the plane is nice, but you won't win the battle with fancy maneuvers alone. It takes a few 20mm slugs or even a missile up the tailpipe to convince a MiG-29 pilot to hang up his helmet. And tanks will shrug off anything lighter than a Maverick missile.

M61A1 20mm Cannon

Aiming the F-16's cannon is made easier by the computer-assisted targeting aids displayed on the Head-up display (HUD). The impact point is calculated and shown in both air-to-air and air-to-ground modes. The way this information is displayed and interpreted is dependent on which mode the HUD is in.

Air-to-air

With the M61 cannon selected in A-A mode, the HUD will look something like this:

Retide

IN RNG Indicator

The **reticle** marks the point on the bullet path closest to the target. Thus, if the target is in the bullet path, the reticle will be right on top of it. When the MiG is in the circle, shoot. A white line will appear around the inside of the reticle when the target is within 12,000 feet. The line will shorten counterclockwise as the target gets closer. Each clock point is equal to 1,000 feet. So, if the white line extends to about 8 o'clock, the target is about 8,000 feet away.

The **bullet path** will be shown if the lead-computing optical sight (LCOS) is turned on. This path is sometimes called the "snapshoot" because anything along that weaving line has a fair chance of being hit, so you can try a quick burst any time a target crosses it.

The **LCOS** tries to predict what the target will do based on what it's just done. A black line will extend out from one side of the target designator box to show where the LCOS predicts the target might go. A light gray line extends out the other side of the target designator box to show where the target's been.

The **IN RNG indicator** in the lower right will tell you when the target is in range of the cannon. The M61A1 20mm cannon has an effective range of just under two miles.

Air-to-ground

The cannon HUD for strafing ground targets is quite different from the dogfighting HUD.

CCIP Reticle

Distance to Target

The **CCIP** shows the continuously computed impact point of shells fired at that moment. This operates in a similar fashion to the air-to-air cannon reticle.

The **distance to target** in feet is displayed once a target is locked up.

To strafe a target, first lock on to the target by placing the center point over it and pressing the trigger (Spacebar) once. The target designator box will appear on the target, and a line will connect the CCIP reticle with the target designator. Adjust your flight so that the target is in the CCIP reticle and press the trigger again to fire.

AIM-9P, AIM-9M and AIM-120 Missiles

All three of these missiles use the air-to-air missile HUD, which comes up automatically whenever one of them is selected.

Lock-on Diamond

Aiming Reticle

Target Designator

5-Mile Ranging Scale

The **target designator** marks the locked target.

The flashing **lock-on diamond** will appear on top of the locked target if the missile has locked on. Once this appears, the missile will home on the target if it is fired immediately.

The **aiming reticle** shows the area within which the selected missile is likely to lock on to its target. A locked target in the reticle, if it is within range of the missile, is likely to be hit. When the target is within 12,000 feet, a white line appears around the inside of the reticle. This line will move counterclockwise as the target gets closer; each clock point is equivalent to 1,000 feet. So if the white line is at 4 o'clock, the bandit is about 4,000 feet away.

A caret on the outside of the reticle indicates what aspect angle you are at. The caret shows the target's direction of travel as it relates to yours. Think of your flight path as being a vertical line through the reticle.

The **five mile ranging scale** appears when a locked target is within five miles of your plane. It shows graphically how close the target is; the pointer starts at the top and slides down the scale as you close with your opponent.

When a Sidewinder (AIM-9P or AIM-9M) is selected, you will hear the growl of the missile's seeker head. The AIM-120's seeker does not have an audio cue when it is active. When any of these three missiles lock on, you will hear a higher-pitched growl. This lock-on tone means the seeker has acquired its target and you should fire now.

Bombing: BLU-107/B Durandal and Mk84 Bomb

The unguided air-to-ground bombs, the Mk84 and Durandal, work in the same fashion. When either is selected, the bombing HUD comes up.

The **target designator** appears on a target after you lock on to or "pickle" it.

The **distance to target** in feet, taking altitude into account, is displayed once a target is pickled.

The **bomb sight** shows where the bombs will hit if released at that time.

The **release cue** is used for pop-up or "fling" bombing, where the bombing plane begins pulling up before release. When the release cue reaches the center point of the HUD, release the bombs to hit the pickled target.

The **displayed impact line** is an aid to staying on course once a target has been pickled. If the displayed impact line remains vertical, you are on course.

For a complete lesson in bombing techniques, see *Five: Flight School.*

"Smart" Weapons: AGM-65B Maverick and GBU-15 Guided Bomb

These weapons use both the HUD and REO for targeting. When either weapon is selected, the HUD goes into E-O mode and the REO goes into camera mode.

Using the HUD in E-O Mode

A large cross hair takes up the center of the HUD. The center of this cross hair is where the weapon you have selected is aimed. Maneuver so that the target is roughly in the center of this cross hair.

Target Designator

Distance to Target

The **target designator** will mark the locked target, if any.

The **distance to target** in feet, taking altitude into account, is displayed after lock-on.

Pressing the trigger once will lock the weapon on to the spot at the center of the cross hairs. Pressing it a second time will release the weapon, which will then home on that spot. *Five: Flight School* gives a complete explanation of how to use these TV-guided weapons.

FIVE

FLIGHT SCHOOL

Now that you have a general understanding of the controls and systems of the aircraft, it's time to learn the basics of using it. Instant Action can give you plenty of dogfighting practice, but it won't prepare you for the campaign. The skills you will need to complete the campaign include taking off, dogfighting, setting up a good attack run, bombing, strafing, using guided weapons, dodging SAMs and landing. Once you can do all these things, only time, luck and practice stand between you and victory in the campaign — at the easier difficulty levels.

To win the war at the top difficulty levels will take more than basic skills; you'll need strategies and tactical advice on how to apply those skills. That's when you turn to *Six: Tactics*. But for now, let's get the basics down.

Fair warning: these lessons are going to refer to the systems discussed in *Four: The Fighting Falcon,* with the assumption that you are familiar with their locations and how to read and use them. If you aren't sure, read the *Cockpit* section of that chapter again, then have it handy as you go through the following lessons.

To prepare for each lesson, do the following:

- At the Duty Roster screen, recruit a new pilot for practice. This is important, as *Falcon MC* creates a fresh campaign world for each new pilot. To save Duty Roster space, retire the old practice pilot.

- At the Duty Roster screen, pull down the **Options** menu and select **Set Difficulty…**.

- On the Difficulty screen, select **Training**, then select **OK**. MiGs can appear at this level, but since they cannot shoot, you can ignore them.

- Back on the Duty Roster screen, click on **Select Mission**.

- At the Mission Select screen, choose any mission (it doesn't matter which) and then click the **Armament** button.

- At the Armament screen, just click on **Take Off**.

Each lesson will begin with an explanation of what it is about, any special information you need to know before the lesson begins and any additional preparations you must make for that lesson, if any. Read through the lesson once, then set it up and try it. Pause by pressing P, Q or Esc to refer to the manual whenever you want.

While each lesson assumes you have completed the previous ones, it is not absolutely necessary. The only lessons which really should be completed before going on are *Takeoff* and *Setting Up an Attack Approach*, as the techniques taught in these two lessons are used throughout the chapter.

At the end of each lesson is a brief discussion of the purpose of the lesson, what you should have learned and some general advice on how to use the skills taught in that lesson.

When you have completed a lesson, return to the Duty Roster by pressing ⌘ A to abort the mission. If you are comfortable with your performance, choose **Easy** on the Difficulty screen and try it again. Then try **Medium**. Once you can do these lessons at Medium difficulty, you've mastered the basics.

If you don't select the **0** button by **Number of MiGs** on the Difficulty screen when practicing above Training level, your lessons may be rudely interrupted by MiGs.

Lesson One: Takeoff

The obvious first step in any mission is taking off. It's not particularly hard, but should be well understood. This lesson will get you off the ground.

As you start the mission, you should be sitting on the runway. Your screen looks something like this:

Start the engine. Fire up your engine by pressing ⊕. It may be necessary to press ⊕ again if the engine fails to start the first time. The needle on the RPM gauge should come around to about 60%, and you'll hear the engine come alive.

Release the brakes. When the JFS start light goes green, release the wheel brakes (press Ⓦ) and give it some more throttle. The plane will slowly begin rolling forward, and the AR/NWS light will light.

AR/NWS Light

JFS Start Light

Hit the burner. Now's the time to punch it (press [/]). The RPM gauge should climb all the way to 100%, and the plane will roll forward much faster.

Lift off. Watch the airspeed scale on your HUD and the AR/NWS light. The AR/NWS light will wink out when you exceed 70 knots. When your airspeed passes 200 knots (20 on the airspeed scale), pull back gently on the stick until the pitch ladder shows about a 20° climb.

Retract the gear. Press [G] to raise the landing gear before you get past 300 knots. Congratulations, you're airborne! You can kill the afterburner now (press [/]).

Lifting Heavy Birds

At higher difficulty settings, your armament and stores will have a significant effect on your weight and drag, which in turn will decrease your acceleration.

While the engine you are flying with in this lesson could probably get you off the ground without going above 90% throttle, learning to take off using the afterburner will serve you well when you're trying to lift a heavy bird.

Lesson Two: Dogfighting

This lesson will teach you the basic purpose of dogfighting: getting the MiG where your weapon can hit it.

Take off. Once you are airborne and have leveled off, fly north (heading 00, the same direction you took off in) for about two minutes. This will get you into enemy airspace, so your base's air defenses don't interfere.

Prepare your weapons. Press Return until the stores control panel shows AIM-9Ms as the selected weapon.

Enemy to Left

AIM-9M Selected

Spot the enemy. Wait until Top Hat informs you that a bandit is inbound (which may have already happened). Then look at your TWI. Your plane is at the center. Note the enemy position, marked by a diamond.

Face the enemy. If the diamond is to the right, turn right; if the target is to the left, turn left. As you bring the MiG into view, you will see the target locator line pointing the way to the bandit and a "diamond X" on the MiG's estimated position at the edge of your HUD. Follow these guides to bring the MiG into your HUD.

Diamond X — MiG — Target Locator Line

Bring your weapons to bear. Bring the enemy into the circle in the center of your HUD. Don't be afraid to pull Gs; you'll have to out turn that MiG to get him where you want him. Wait until the flashing diamond appears on the MiG and you hear the lock-on tone (a high-pitched buzz).

Lock-on Diamond

Aiming Reticle

IN RNG Indicator

If you don't lock on and the target is within the circular reticle, there are a couple of range possibilities. If the target is in range of the missile, the IN RNG indicator in the bottom right will be lit; if this light is not lit, the target is out of range. If the target is within the missile's minimum range (about one mile), then it will not lock either. If you are too close for missile lock, switch to guns (see the section at the end of this lesson on using the cannon).

If you get dangerously close to a midair collision, a large X will appear in the center of your HUD as a warning.

Shoot. Fire a missile by pressing ⌷Spacebar⌷. Watch it in missile view (press ⓪) to see if it hits. You can also fire another missile immediately, if you want to be sure. If the MiG does not dodge in time, you should hit it. If it does dodge, fire again if the MiG has not left your HUD. If it has left your HUD, maneuver it into position again.

That's it. Dogfighting is largely a matter of getting the enemy in front of you and in range. The weapons do the rest. There are a couple of air-to-air weapons that operate slightly differently, however; these are the AIM-9P Sidewinder and the M61A1 cannon.

The AIM-9P and Aspect Angle

Unlike the AIM-120 and AIM-9M, the AIM-9P is a rear-aspect missile. This means the AIM-9P can only lock and track from behind its target. The other two missiles can lock and track from any angle.
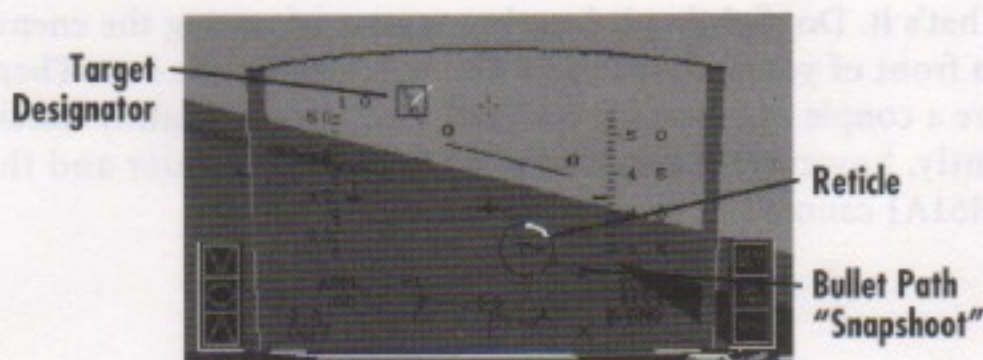
"Rear aspect" refers to the concept of aspect angle, which is covered in depth in *Six: Tactics*. The short definition of aspect angle is the relation between your position and the MiG's heading. It is used to describe the relative position of planes in aerial combat. A rear-aspect missile, then, must be behind, or in a rear aspect angle to, its target to be effective.

The upshot of all this is that you must be behind the MiG when using AIM-9Ps or else they will not lock on. You can tell if you are behind your target by looking at the aspect angle caret on the outside rim of the aiming reticle. If this caret is at the bottom of the circle, you are behind the MiG; if it is at the top, you are facing the bandit head on.

The M61A1 Cannon in Air Combat

The HUD for the cannon in air-to-air mode is slightly different than that used for missiles. The primary difference is in the reticle.

The cannon reticle and other aiming aids are part of the lead-computing optical sight (LCOS). This system computes where the bullets fired at a given instant will go and then puts the reticle on the closest point along that path to the MiG.

Target Designator

Reticle

Bullet Path "Snapshoot"

This way, you don't have to worry about how much to lead the bad guy because the LCOS shows you where your shots will go. Just put the MiG in the circle, check the IN RNG light and fire, just as you would with a missile (though the gun does not need to lock on and has no minimum range). Remember the gun's maximum range is just under two miles.

The bullet path which snakes out behind the reticle is called the snapshoot because a snap shot at a bandit crossing the bullet path has a fair chance to score.

The LCOS also predicts where the bandit is going based upon previous performance. A black line indicates historical flight path of the MiG, while the lighter line shows the predicted flight path.

Lesson Three: Setting Up an Attack Approach

This lesson will guide you through the steps to set up a good attack run. The goal of a good attack run is to give you enough time to take aim and deliver your ordnance while maintaining a steep enough dive to give you a good shot at the target.

This is not a ground-attack lesson; rather, it is a drill to practice the skill of rapidly setting up a good attack approach. In a real combat situation, you won't have time to be fiddling with flight controls trying to line up on the target.

Take off. Level out the plane when the altitude scale shows about 10,000 feet.

Proceed to target. Hit ⊍ (increment waypoint) or ⓨ (decrement waypoint) until the waypoint indicator says D10. That's the tank factory, our "target" for this lesson. Turn until the waypoint pointer on the heading scale is centered, which means you're on course. Your heading should be between 80° and 90° (8 and 9 on the heading scale). Level out and hit the afterburner by pressing ⑦.

Waypoint Caret Centered

10,600 ft

Waypoint Indicator Shows DIO

Reduce speed. When the distance to target and waypoint indicator reads 20D10, cut the afterburner (press ⑦). Bring the throttle down to about 70% (hold down ⊟). Engage the speed brakes (press Ⓑ) to decelerate still more, until the airspeed scale reads about 300 to 350 knots. Then disengage the speed brakes by pressing Ⓑ again.

Nose down. A good profile for most air-to-ground weapons targeting is a dive angle of about 10°. Nose down until you are pointing at the factory area, which should now be in view. If your angle is steeper than 20° (check the pitch ladder), then you need to lose altitude. Dive and drop a thousand feet or so and then bring the nose up again. Work on it until you have about a 10° dive and you are pointing at the buildings.

Ready arms. We won't actually drop any bombs (that's for later), but you should get used to this step. Hit [Delete] until the stores control panel says "9MK84."

Pitch Ladder Shows 15° Dive

310 KTs Airspeed

Center Point on Target

Kick rudder. With your airspeed below 400 kts, you can use the rudder ([and]). It's perfect for lining up on those buildings. With gentle adjustments, the center point on your HUD should be on the buildings soon.

Pickle the target. Press the trigger once. This will lock on to the spot you're pointing at (hopefully the factory buildings).

Locking on to the target is also called "pickling" the target.

Gauge distance. The distance to the locked target is shown in the very bottom right corner of your HUD. At this speed and altitude, a Mk84 is accurate to about 10,000-15,00 ft.

Target Designator

Range to Target

Press ⌘ A to abort and try this lesson again. Try getting a lock on the factories at distances of 100,000 ft, 50,000 ft and 10,000 ft with little or no time spent waiting for the range to close up.

Why the Emphasis on Distance?

It's important that an in-range lock-on be achieved as fast as possible so that you can deliver as quickly as possible. You've probably noticed that your TWI has been beeping insistently at you for some time now, telling you a MiG's after you. At this difficulty, he can't shoot you down, but at any other level, that bandit on your six is a real concern.

The reason for the three ranges is because each air-to-ground weapon has a different range. Mavericks, for example, can go 8 miles (around 50,000 ft), while the range of free-fall bombs such as the Mk84 depends entirely on your altitude and speed. If you can consistently drop out of cruising height and speed at just the right time to achieve an in-range lock-on, you can reduce your loiter time (which increases your survival time).

Low, Fast and Blind: Minimizing Enemy Reaction

This was done at such an easy difficulty level that enemy reaction was minimal (even the MiG that showed up couldn't hurt you). But in an actual campaign, you'll probably be playing with higher difficulty settings, where SAMs and interceptors are a real problem.

To evade enemy SAMs and radar, you must fly low and turn off your radar (press R) until you need it. If you stay below 500 feet all the way to target with your radar off and afterburner blazing, you'll probably have enough time to pop up, set up an approach, pickle and deliver before they can scramble the MiGs to intercept. But any SAM sites near the target will have to be taken out before you pop up, or they will cheerfully nail you as you delicately maneuver into position.

Try this lesson with a 400-foot approach altitude and no radar. You'll have to climb a bit at the end in order to get a good dive angle for your aiming and pickling phase. When you can pop up and get that in-range lock-on regularly and quickly, you're ready to start delivering some ordnance.

Lesson Four: Guided Air-to-ground Weapons

This lesson will teach you how to use the GBU-15 and AGM-65B Maverick missile, both of which are television-guided. But before we begin the lesson, there are a few things you need to know about TV-guided arms.

The television-guided weapons are used quite differently than any of the other weapons. The TV-guided munitions use both the HUD and REO for targeting. When either the Maverick or GBU-15 is selected, the HUD goes into E-O mode and the REO goes into camera mode.

Using the HUD in E-O Mode

"E-O" mode means that the HUD is tied to the electro-optical (television) display.

A large cross hair takes up the center of the HUD when it is in E-O (electro-optical display) mode. The center of this cross hair is where the weapon is aimed. To aim the weapon, the pilot maneuvers so that the target is roughly in the center of this cross hair.

Using the REO to Aim Guided Weapons

The REO is connected to the camera in the nose of each of these guided weapons. It displays a close-up of what the camera, and therefore the weapon, is aimed at.

The cross hairs show where, exactly, the weapon is pointed. This screen is where the pilot looks while fine-tuning his or her flight path to aim the weapon.
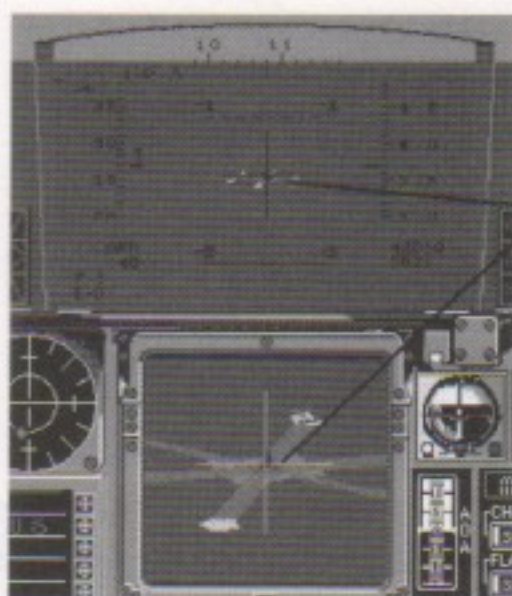
Delivering the Goods

Take off. Get up to around 10,000-15,000 ft. Level off and press ⓤ (increment waypoint) or ⓨ (decrement waypoint) until the waypoint indicator says D10. That's not actually our target, but it gives us a good way to measure location.

Heading Scale
Shows 110°

SAM Site

Waypoint Indicator
Shows DIO

Set up. When you get to about 57 miles from D10, turn right to a heading of about 110 (11 on the heading scale). You should see a black area out in the open. That's Foxtrot 3, a SAM site. Select Mavericks by pressing ⌈Delete⌉ until the stores control panel shows "9AGM65." Prepare an attack approach as you learned in lesson three.

Check the REO. Just because the target's lined up in the cross hairs on the HUD doesn't mean it's perfectly aligned. Using the rudder and flight stick, maneuver the plane so that the target is centered in the cross hairs on the REO.

Remember that you must hit the radar set at the center to disable a SAM site.

Target Centered
in HUD and REO

Lock on. Press Spacebar once to lock the weapon on target. The weapon discretes in the lower left of your HUD will show the words "LOCK" or "IN RNG," and a target designator will mark the locked target on your HUD.
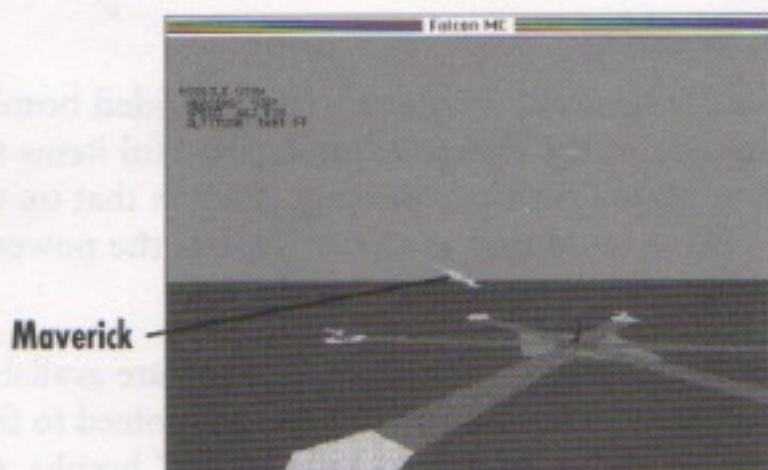

Target
Designator

Discretes
Show IN RNG

Launch when in range. Press it again to release the weapon, which will home onto that spot. Check the weapon discretes on the HUD before releasing to be sure they say IN RNG.

Break the lock. Unless you break the lock by pressing X or by changing your selected weapon, any weapon fired will still home onto that designated point. Therefore, if you lock on to one spot and then move without breaking the lock, the weapon is still going to home on that original spot. This is good for fire-and-forget attacks, but can cause trouble. If you forget to break the lock after a successful attack and then press the trigger to lock onto a new target, the weapon will release and home on the old target.

Maverick

Confirm the kill. There are several ways to confirm a ground kill: 1) Groundhog will radio you every time you take out a ground target. 2) You can switch to missile view to watch it go in personally (level out first). 3) You can overfly the target, pull up into a steep climb, and look over your shoulder (press 6).

More Practice

There are two more SAM sites right after this one, all in a nice row. You can take them out as well, if you'd like. Try switching to GBU-15 (by pressing Delete until "GBU15" shows on the stores control panel). Since GBUs are unpowered glide bombs, they take significantly longer to reach their targets. They are, however, much more powerful than Mavericks.

Benefits of Fire-and-Forget Weapons

The main benefit of using these weapons is speed of aiming and thus speed of delivery. Once the target is in the cross hairs and locked up, there is no need to continue pointing at the target at all. The weapon will stay locked until the target is no longer in front of your plane at all or until you break the lock.

This means that once you lock on, you can pull up, drop down below radar, hit the afterburner — in short, just about anything. When the IN RNG light comes on, just release the weapon and it will be on target.

In the case of the Maverick missile, the fact that it is a missile means that it reaches the target much faster than any bomb would. As a result, you can assess your kills faster and compensate appropriately. It also doesn't hurt that you can carry six at a time.
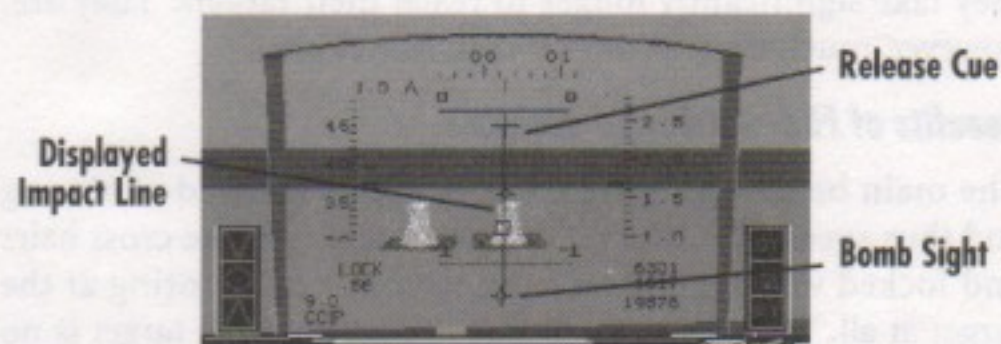
Lesson Five: Bombing

The original air-to-ground weapons were unguided bombs. They remain as one of the cheapest, most powerful items the plane can carry. With a guidance package, such as that on the GBU-15, the cost is no longer as attractive, but the power is still impressive.

Unfortunately, expense often dictates what stores are available. As a result, about the only weapons you are guaranteed to find on any air base are the unguided, so-called "iron" bombs, the air-to-ground staple. Plus, if you want to hit a runway, the Durandal is also an unguided weapon. Every attack pilot will have to use these munitions at some time or another, so it's time you learned.

The Bombing HUD

The HUD mode for bombing is called CCIP, which stands for "continuously computed impact point." Essentially, what the HUD does for you in this mode is display the point where the bombs will hit if released at this time.

As you close on the locked target's position, the **displayed impact line** connects the **bomb sight** and the **release cue**. The bomb sight shows where bombs released at that time will strike. Bombs released at the moment the release cue passes through the center point of the HUD will strike the locked target.
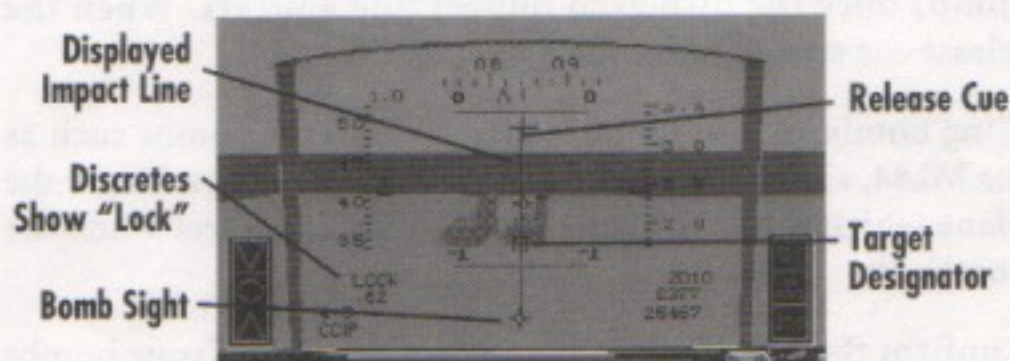
CCIP Bombing in Action

Take off. Climb to about 10,000 ft, fire the afterburner by pressing ⌐/⌐, and set your waypoint to D10 (the tank factory) by pressing ⌐U⌐ or ⌐Y⌐ to cycle through the waypoints. This time we're going to hit it with a couple pairs of Mk84 2,000 lb bombs.
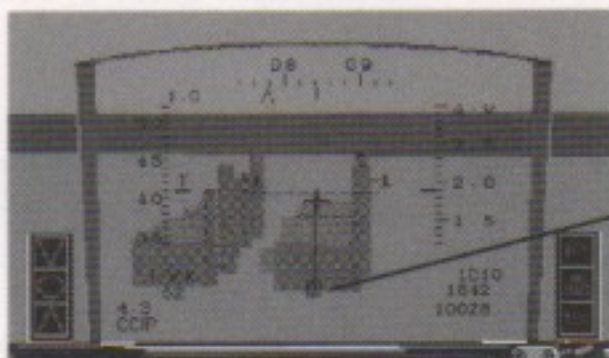

Waypoint Caret Centered

Waypoint Indicator Shows DIO

Set up. When you get to about 10 to 15 miles out, cut the burner, throttle down to about 70% (both can be done by pressing ⌐−⌐) and prepare a good attack approach. Press ⌐Delete⌐ until the stores control panel shows "9MK84."

Pickle the target. Using the stick and rudder, line up the center point of the HUD over the target and press the trigger (⌐Spacebar⌐) once. The target designator, a small square, will appear on the target. The discrete in the lower left of the HUD should say LOCK.

Displayed Impact Line

Release Cue

Discretes Show "Lock"
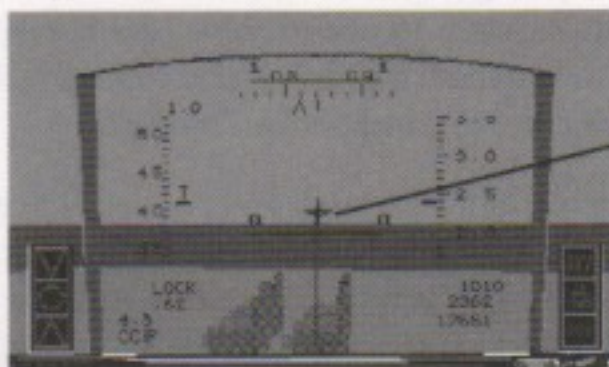
Bomb Sight

Target Designator

Release. Wait for the displayed impact line, bomb sight and release cue to appear. Press the trigger at the appropriate time to release the bombs. There are two ways to do this: dive bombing and fling bombing.

Bomb Sight on Target; Release Now

In dive bombing, you keep the bomb sight in view as you approach the target. When the bomb sight touches the target, release the bombs.
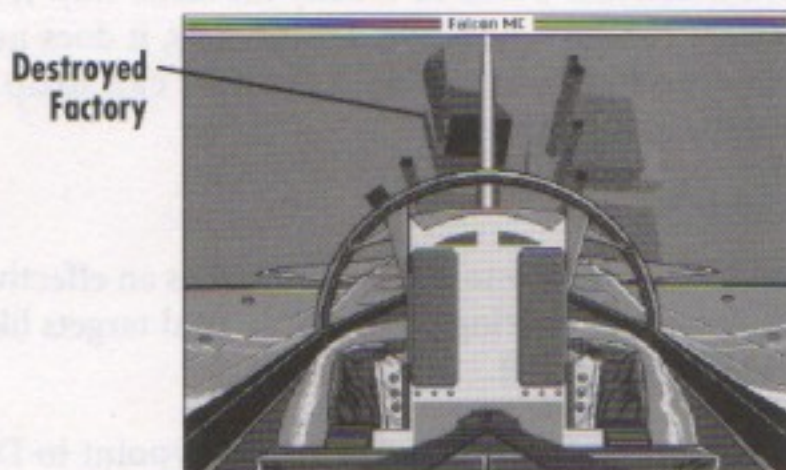

Release Cue at Center Point; Release Now

In fling bombing, you pull up (slightly, not more than a 10° climb) once the displayed impact line appears. When the release cue crosses the center point, release.

You are in no danger of blast damage at the Training difficulty level.

Fling bombing is used more often with large bombs such as the Mk84, since the blast from such weapons can endanger the plane which dropped them if it's within 2,000 feet when the bombs hit.

Confirm the kill. Groundhog will inform you if your bombs destroyed anything, or you can switch to camera view (press 8), rotate over your plane (press F6) and watch the bombs hit. A third way to visually confirm the kill is wait until you

have passed over the target, then pull into a steep (60° or more) climb and look over your shoulder (press 6).

Destroyed
Factory

If everything went as planned, you should see a blasted-out ruin where the factory building used to be.

Repeat Passes

It will be necessary, against some targets, to make a second pass. An example is the tank factory we just hit. To disable it you must destroy at least two of the buildings. The best way to do this, if you are not in immediate danger from SAMs or MiGs, is to go past the target by at least 10 miles and then come around and set up a new attack approach. The waypoint and distance to target indicator will show how far you are from the target.

If you do not have much time, you can try this rather risky method:

- Engage the afterburner.
- Go out three or four miles and haul back on the stick.
- When your plane passes the vertical (90° climb), cut the afterburner and hit the speed brakes.
- When you are level (though upside-down), keep pulling until you are in a 30° inverted dive.
- Roll over and nose down steeply.
- You should be diving almost directly down onto the target area. Pickle and release immediately and then pull up.

Needless to say, this rapid turnaround method is only for experienced pilots and even then should only be used in emergencies when there is no time for anything else.
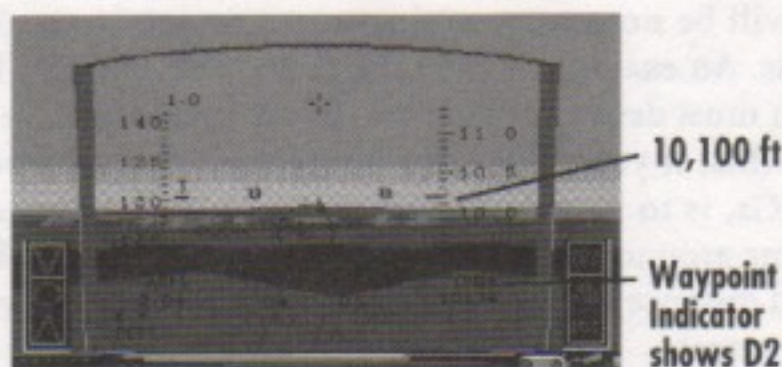
Other Unguided Bombs

The BLU-107/B Durandal works in exactly the same way. It is only useful against runways, however. Fortunately, it does not have the blast area that a Mk84 does, so you can drop a Durandal safely from any altitude.

Lesson Six: Strafing

This lesson will teach you how to use the cannon as an effective air-to-ground weapon for tearing up "soft" ground targets like trucks, trains and landing craft.

Take off. Level off around 10,000 ft. Set your waypoint to D2 by pressing either [U] or [Y] to scroll through the waypoints. Line up the waypoint caret and go. This waypoint is the landing craft, a perfect strafing target.

10,100 ft

Waypoint
Indicator
shows D2

Set up. When you get to about 10 to 15 miles away, start an attack approach. Press [Delete] until the stores control panel says "999M61" and "A-G." You should see the landing craft soon. They appear as light dots on the water, lined up in a perfect strafing row.

Lock on. Place the center point of your HUD on the first landing craft and press the trigger ([Spacebar]) once. This places a target designator on the locked target, and a displayed impact line, similar to that found on the bombing HUD (see above), will connect the cannon reticle with the target.

Line up. Adjust your flight so that the target is in the circular reticle. Also note the distance to target information in the

lower right corner of the HUD. The gun has a range of about two miles (a little over 12,000 ft), so be sure the target is within that range.

Landing Craft

Target Designator

Aiming Reticle

Fire. Triggering several short bursts is usually best, unless you're dead sure that that first burst will be enough.

Pull up. Strafing often brings you closer to the earth than you really want to be. Always remember to pull up as soon as the target is hit or if your altitude gets dangerously low.

Notes on Strafing

Two problems come up fairly often with strafing: crashing into things and running out of bullets.

One way to avoid the former is to turn off **Collisions** and set **Landing** to its easiest setting on the Difficulty screen. The other way to avoid crashing is to actually steepen your dive angle in your attack run so that you still have some altitude left after the target is hit. The steeper your dive, however, the faster you lose that altitude, so the timing will be a little closer than before.

The ammunition problem is a little trickier. The natural inclination is to lean on the trigger until the target's a smoking hulk. When your armament is limited (as it will be at the higher difficulty levels), you should instead use carefully judged short bursts. Stop as soon as the target is destroyed so you waste no ammo. Although 500 rounds may seem like a lot, it's less than eight seconds at the maximum rate of fire the M61 gun can maintain.

Lesson Seven: Evading Surface-to-air Missiles (SAMs)

All missile dodging is similar, but SAMs are perfect for practicing with because you know exactly where they will be launching from.

This is one of the hardest lessons, yet it is crucial to survival at higher difficulty levels. It includes a rapid sequence of maneuvers which must be accomplished back-to-back in a very short period of time. Hopefully, with practice, this sequence will become automatic.

To prepare for this lesson, go to the Difficulty screen (from the **Options** menu at the Duty Roster screen) and select the second level of SAMs. Now they will launch and track, but cannot damage your plane.

Take off. Go up to about 10,000 ft and set your waypoint to D10 by pressing Ⓨ or Ⓤ to cycle through the waypoints.

Slow down to maneuver. When your distance to target indicator says "50D10," cut the throttle back to 80% (press ⊟).

Lock Light — LOCK ON
Launch Light — EAT / LAUNCH LAUNCH
SAM site

Watch the TWI. Somewhere between 45 and 40 miles from waypoint D10, you should hear a lock-on warning (a constant "beep-beep-beep") and see a small square appear on your TWI screen. That's Foxtrot 3, a SAM site, and they've got you locked up on radar.

Listen for the launch. When a SAM site launches, you will usually hear a warning tone. Also, watch the launch warning light by the TWI. As soon as the launch happens, pause the game and read the rest of the lesson before proceeding.
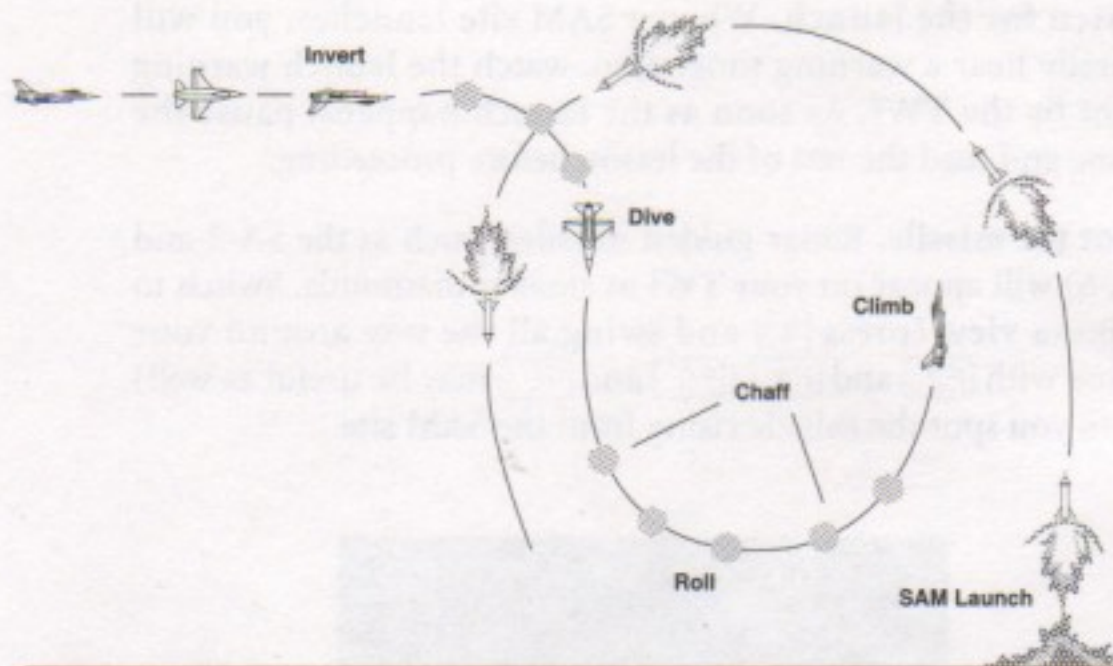
Spot the missile. Radar-guided missiles (such as the SA-2 and SA-6) will appear on your TWI as smaller diamonds. Switch to camera view (press [8]) and swing all the way around your plane with [F3] and [F4] ([F5] and [F6] may be useful as well) until you spot the missile rising from the SAM site.

F-16

Missile

SAM Site

Turn toward the missile and invert. It sounds suicidal, but it's good advice. Really. Bring your plane around to face the missile. Roll your plane upside down, but do not pull back or push forward on the stick yet. Staying in camera view helps here.

Dive. Chaff. Roll. Chaff. Climb. When the missile reaches the top of its arc, it will slow down as it acquires you, then race towards you. Wait as long as you can stand, then haul back on the stick. This will make you dive, because you're inverted. Immediately begin dropping chaff and flares (press [`] and [Tab]). When you reach a 90° dive, do another half-roll and pull up, still dropping confetti.

Be liberal about dispensing the countermeasures. Flares and chaff are practically free, compared to the cost of you and your plane.

Invert

Dive

Climb

Chaff

Roll

SAM Launch

By combining a steep dive with a head-on aspect angle and chaff and flares, you have maximized your chances of spoofing that SAM. The missile, not being as agile as the F-16, will as likely hit the ground as be fooled by the countermeasures.

If all goes well, the SAM should have missed you cleanly. If the missile looks like it went through you, you need to practice some more. To test yourself, try this lesson with SAMs set to the third level on the Difficulty screen. If you get shot down, you need more practice.

Air-to-air Missiles

Dodging air-to-air missiles works similarly, although you do not always have the luxury of casually glancing around to see where they are coming from. If you cannot turn to face the missile, the inverted dive followed by the half-roll and climb is still effective.

Lesson Eight: Landing

Landing is a tricky business. You're taking a few tons of steel moving at a several hundred miles an hour and trying to set it on a strip of pavement about 50 feet wide. Safely.
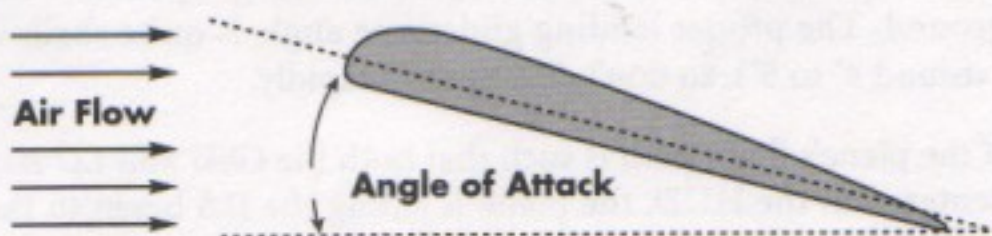
This lesson will seem very easy at the Training level. That's because at the Training level you cannot crash. Period. You could fly nose-down into the control tower at full afterburner and be just fine. The purpose of the lesson at Training level is to teach you how to set up a good landing without the frustration of wrecking and dying over and over.

Once you feel you can do it, step up to Easy difficulty and prove yourself wrong. Then practice some more until you can land at Easy fairly regularly. Medium has about the tightest landing restrictions, so if you can land at Medium, the tougher levels will be no worse.

Before we get into the lesson, there are a couple of important points to cover.
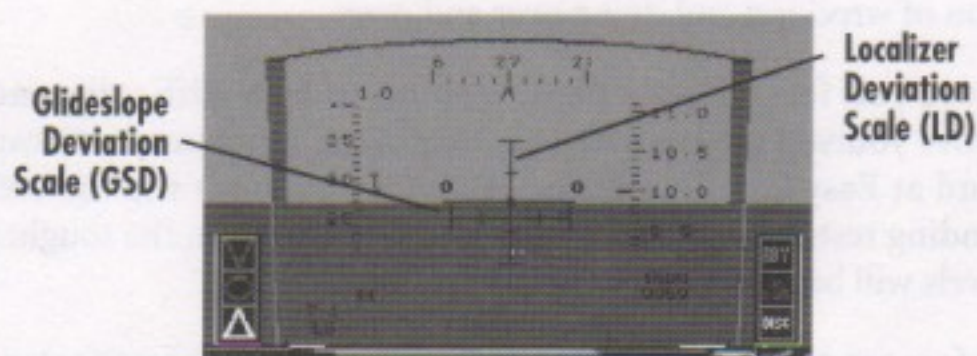
Angle of Attack

Angle of attack, or AOA, is the angle measured between your plane's movement vector and its attitude. Simply put, AOA is the difference between where your plane is pointing and where you're going.

Air Flow

Angle of Attack

To land, you must have a positive angle of attack, which means your nose must be pointing up relative to the direction of motion. Further, this angle cannot be too steep or too shallow; it must be between 5° and 8°. You can adjust your AOA by controlling your airspeed. Reducing speed will steepen your AOA, while increasing speed will lessen it.

Using the Instrument Landing System (ILS)

The ILS is a special system designed to help pilots bring their birds in safely. A series of transmitters sets up a beam which the ILS can detect. This beam is the perfect approach path to the ILS-equipped runway. The east-west runway at your base is equipped with ILS transmitters. Approach from the east to pick up the ILS beam. The ILS will then show you where to go to stay on that beam. Press ⟨ \ ⟩ to activate the ILS.
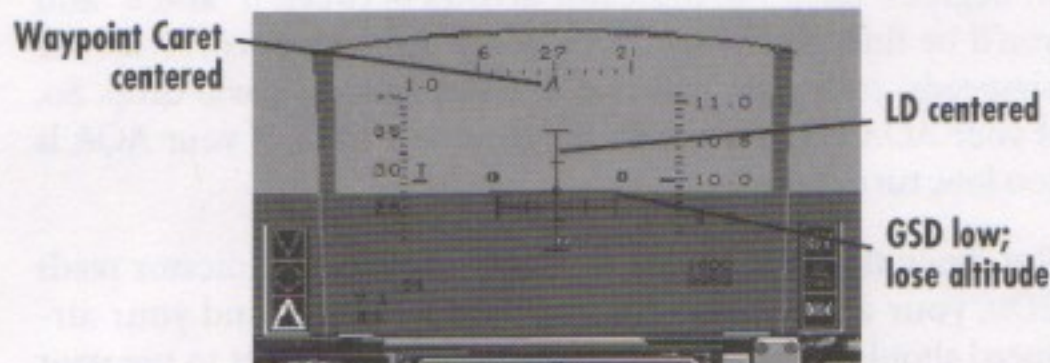

Glideslope Deviation Scale (GSD)

Localizer Deviation Scale (LD)

The vertical bar, called the **localizer deviation scale** (LD), shows what heading to take to line up with the runway. When the LD is centered in the HUD, the plane is lined up properly.

The horizontal bar, called the **glideslope deviation scale** (GSD), guides the pilot to the correct glideslope. The glideslope angle is measured between the plane's flight path and the ground. The proper landing glideslope angle is quite shallow (around 4° to 5°), so don't descend too rapidly.

If the plane's flight path is such that both the GSD and LD stay centered in the HUD, the plane is riding the ILS beam to the runway.

Landing

Take off. Set your waypoint by pressing ⟨U⟩ or ⟨Y⟩ until the waypoint indicator says D10. Turn your F-16 until the waypoint caret is centered on the heading scale.

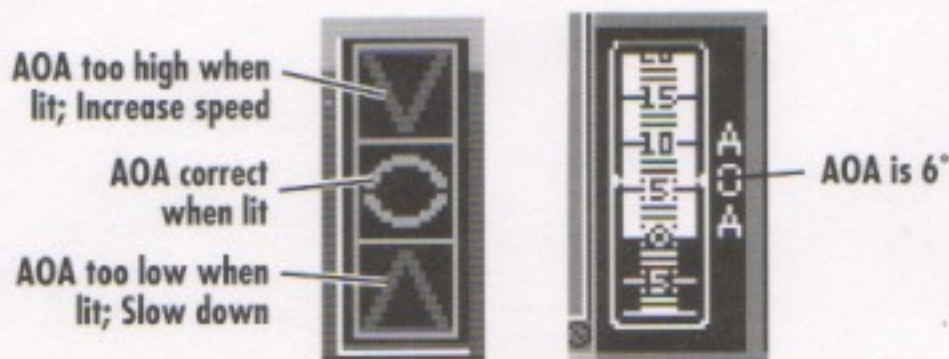**Waypoint Caret centered**

LD centered

GSD low; lose altitude

Prepare to approach. Fly until your distance to target and waypoint indicator says 60D10. Press U or Y until your waypoint indicator says D0 (your air base). Turn until the waypoint caret is again centered.

Engage ILS and reduce speed. Press \ to activate the ILS. Cut your throttle to 70%. The LD and GSD should be visible in your HUD now.

Keep your speed above 100 knots at all times.

Adjust approach. Using the rudder and stick, try to get both bars centered and keep them centered. When you're 5 miles out, you should be at about 2,000 feet.

Adjust AOA. This is one of the hardest parts. The AOA indexer to the left of the HUD tells you whether you have to bring your nose up or down, or if your AOA is good. The circle means a good AOA, the up arrow means the nose has to come up, and the down arrow means your nose has to come down.

AOA too high when lit; Increase speed

AOA correct when lit

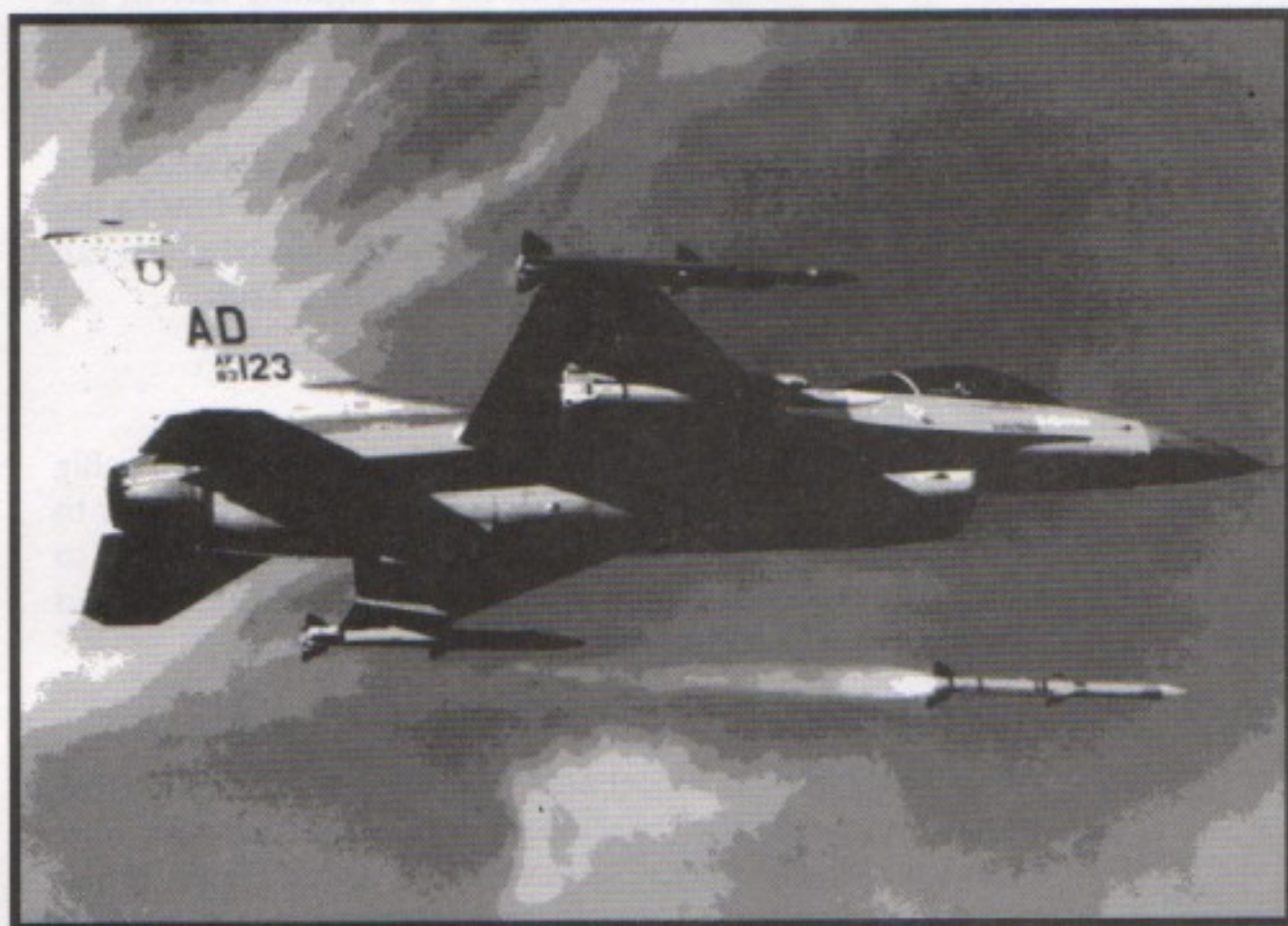**AOA too low when lit; Slow down**

AOA is 6°

The AOA indicator on the lower right shows your exact AOA in degrees. Keep the indicator arrows between 5° and 8° and you'll be fine. To change AOA, adjust your airspeed. At slower airspeeds, your nose will rise; at faster speeds, it will drop. So, if your AOA is too high, up the throttle a little. If your AOA is too low, turn it down.

Put down the gear. By the time your waypoint indicator reads 2D0, your altitude should be around 800 feet and your airspeed should be well below 300 knots. Don't forget to use your speed brakes and flaps to adjust your airspeed. It's safe to put down the gear now. (Press G).

Touch down. Be sure your speed is below 150 knots. Use the rudder to line up with the runway. If all is well, you should hear the pleasant screech of tires on tarmac. Turn down the throttle to 0% and put on the wheel brakes (press W). You can either take off and try again, or just end the mission now by pressing ⌘ E.

SIX
TACTICS

This chapter is intended for experienced pilots. It assumes that you not only already understand how the cockpit and controls work, but that you have mastered (or at least understand) the maneuvers taught in *Five: Flight School.*

While the previous sections have primarily dealt with the basic skills and knowledge necessary to use the Fighting Falcon, this section is intended for those who already have a good grasp of how to fly and fight and are looking for ways to improve.
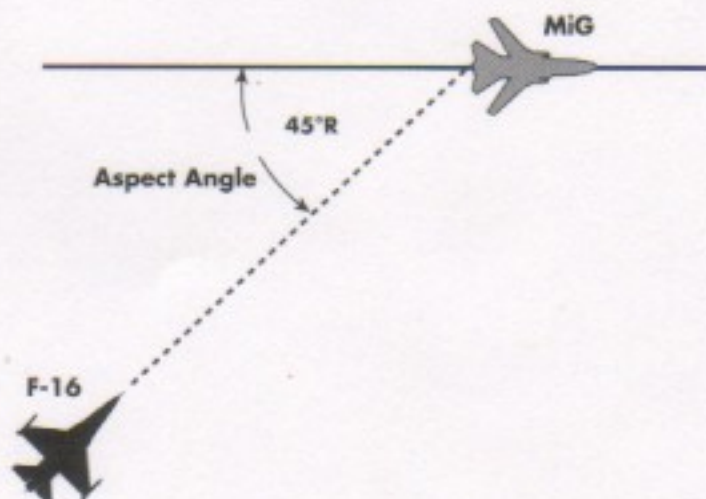
The tactical advice is divided into two major parts, dogfighting and airstriking. The last part of this chapter shows how to use the Black Box, a flight recorder which experienced pilots can use to analyze their performance and hone their skills.

Dogfighting

The key to dogfighting is getting the bad guy in your sights. Big surprise. But there are other concerns as well, such as how to fight multiple bandits, effective ways to maneuver and how to maximize your advantage in order to minimize the time and ammo it takes to down a MiG.

Aspect Angle

An understanding of aspect angle is critical to achieving situational awareness. The aspect angle is the angle between your plane's position and the opponent's flight vector. Simply put, if you draw a line from your plane to the opponent, the aspect angle is the angle at which that line meets the opponent's flight path.
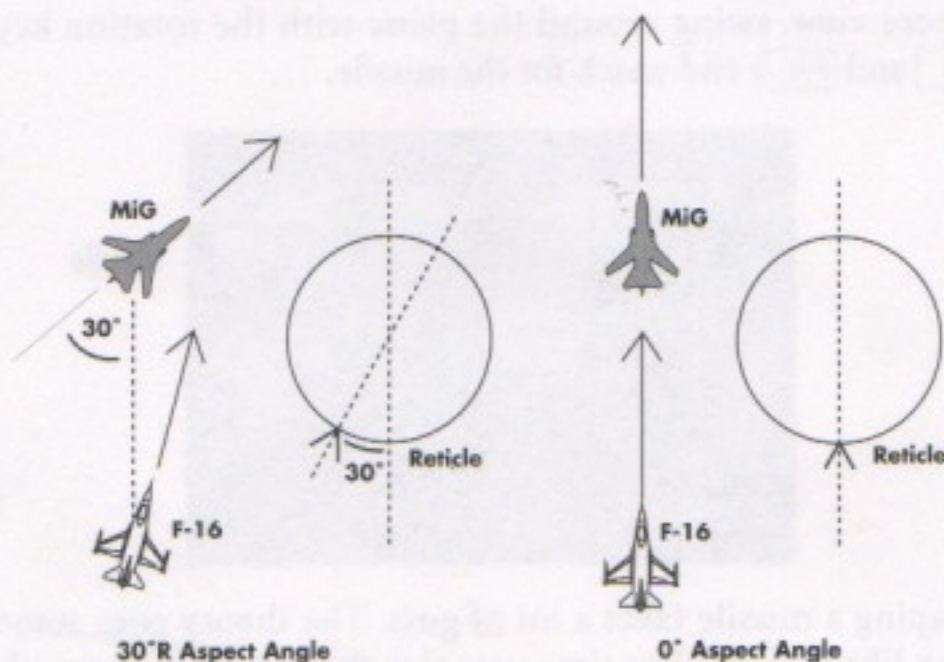
If you are following the bandit, the aspect angle would be 0°, since the line through your plane exactly matches the MiG's flight path. If it were a head-on encounter, the aspect angle would be 180°, since the line from your plane is exactly opposite to his direction of motion. If you were headed perpendicular to one another, the aspect angle would be 90°, since the line from your plane meets his flight path at a right angle.

This raises an important point. Assuming you cannot see the bandit and are getting this aspect angle information from your instruments, a reading of 90° requires more clarification. It could mean the bandit is headed directly to the right or directly to the left. As a result, aspect angle measurements are always given with an "L" or "R" (for "left" or "right"). This notation indicates which side of the target you are on.

Thus, a notation of 30°R means you are on the right side of the bandit, whose flight path is just 30° different than the intercept line between you.

The aspect angle caret on the rim of the air-to-air missile reticle gives aspect angle information in a graphic way which is often faster to assimilate and use than numbers from the REO.

30°R Aspect Angle   0° Aspect Angle

Generally speaking, the lower the aspect angle, the closer you are to being behind the bad guy.

Aspect Angle and Missiles

Missiles always have an easier time tracking their targets if they can run them down from behind. Since they have smaller control surfaces, missiles cannot turn as sharply as planes; this is made worse if the plane is already moving perpendicular to the missile's flight path.

As a result, the lower the aspect angle, the better chance the missile has of scoring. While AIM-9Ms and AIM-120s are all-aspect missiles, it would only take a slight twitch to dodge them coming head-on. A tailchaser such as the AIM-9P cannot even lock on unless it is in a rear aspect angle.

Evading and Spoofing Missiles

If you've got a missile after you, it takes priority over just about anything. When the launch light comes on and you hear that tone, everything else goes right out the window.

First, you've got to spot the incoming missile. If it's a radar-guided missile, you can spot it on your TWI as a small diamond. To dodge it, though, you need visual contact. In a real F-16, you've got 360° vision out of the canopy. Here, your best bet is the outside camera view (press 8). Once you're in the camera view, swing around the plane with the rotation keys (F3 and F4) and watch for the missile.
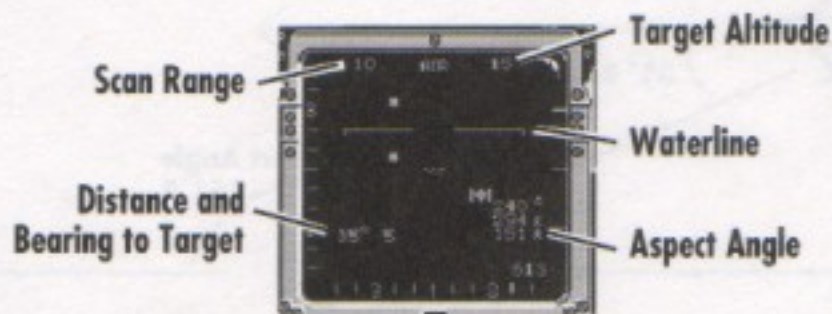

— Missile

Escaping a missile takes a lot of guts. The theory goes something like this: the less time you give the missile to react, the better chance you have. Therefore, to maximize your chance of survival, wait as long as possible before making your move.

When the missile comes in, break hard and dump the party favors. Chaff and flares are cheap. It doesn't really matter which way you break, but a half-roll followed by a sharp inverted dive is about the fastest turn you can pull.

Using Radar Information

The radar gives you a wealth of information. If you can learn to assimilate it instinctively, you'll have much better situational awareness (SA for short).

This display, for example, gives enough information to visualize almost an entire one versus three engagement.

The 10-mile scan range shows that all three opponents are within 10 miles, because all are on the screen.

In tracking scan radar, your position is at the bottom of the display. All targets are in front of the Falcon, because all are on the screen.

Two are to the Falcon's left, because they are on the left side of the screen. The locked target is to the right, because it is on the right side of the screen.

The distance and bearing notation "35°5" shows that the locked target is 35° to your right and 5 miles away. Since bearing is measured in 360°, with 0° being 12 o'clock, 35° is to your right.

The aspect angle of 151°R means that you are 29° to the right of the locked target because:

- The line between the planes meets the MiG's flight path at a 151° angle. Since 180° would put you directly in front of the MiG, 151° puts you 29° off to one side.
- You are to the MiG's right, based on the "R" notation.

All this information forms a fairly complete picture of the situation, as illustrated below.

The MiG is at a much lower altitude than the Falcon. The waterline shows the MiG below the horizon relative to the Falcon, and the 15,000 foot altitude reveals just how far below (the F-16 in this example was cruising at 60,000 ft).

A glance at this radar should be at least as informative as someone saying "MiG at one o'clock low, five miles out." It is that instinctive feel for what the radar means that creates situational awareness.

Once the position of these planes is understood, maneuvers can be executed to take advantage. For example, the F-16 pilot could roll right and down, pull a few Gs and be diving down on the flank of that MiG, which will not be able to match the speed the Falcon will gain dropping down from 60,000 feet.

Experience is the only way to get that kind of instinctive understanding of the tactical situation. But a good grasp of what the numbers mean is an essential first step.

Jettisoning Stores

Empty fuel tanks are the obvious example of heavy stores you want to dump. But there will be other times when the decision to jettison stores can be a lifesaver. It might cost you the mission, but a live pilot can always come back to try again.

Press Option T to dump all fuel tanks or press Option K to dump all air-to-ground stores and fuel tanks. Jettisoning all air-to-ground stores and tanks is an attractive option when you've already hit the target and are deep in enemy territory. Those leftover bombs are just ballast now, and the faster you can get out of there, the better.

The ECM pod can only be jettisoned if you specifically order it by pressing Option C.

Techniques and Maneuvers

The most basic of air combat maneuvers is the simple engagement. This is the maneuver even novice pilots understand, where the object is simply to stay pointed at your opponent. But the best situation is one in which you can shoot and not be shot in return.

To get into such advantageous positions consistently requires three-dimensional thinking. Just because the tail chase you're in is going into a climb doesn't make it a three-dimensional fight. True three-dimensional thinking and maneuvering involves using all three axes: altitude, heading and speed.
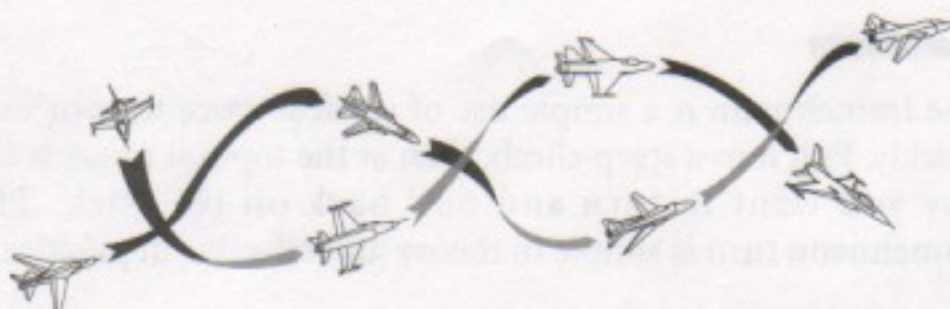
Immelmann

The Immelmann is a simple use of vertical space to turn very quickly. Pull into a steep climb, then at the top roll towards the way you want to turn and pull back on the stick. The Immelmann turn is simple in theory and effective in practice.

The trick here is that at the top of the turn, you have very few reference points to help you know which way you want to roll. Use the pitch ladder and heading scale to help.

Rolling Scissors

The rolling scissors is a three-dimensional braid of flight paths. Each pilot tries to cut back on the other, reducing speed and turning sharply only to regain speed right after the turn. The constant jockeying for position can literally go on until fuel runs low, if the pilots keep outguessing each other.

If you find yourself in a rolling scissors, you'll be able to tell because the opponent will be constantly crossing and recrossing your HUD, but never long enough for a shot. The best way to break out of the rolling scissors is to think three-

dimensionally. Instead of braking and banking left or right, try up and left. Or down and right. Once the pattern is broken, it's an open field.

Be careful, though; the reason a rolling scissors lasts so long is because whoever goes vertical first runs the risk of losing position and getting shot in the back.

Braking Maneuvers

The braking techniques are related to the rolling scissors. While speed is life in a dogfight, it can be quite advantageous to very suddenly slow down, as the overzealous hunter now becomes the hunted. Braking maneuvers may include the actual use of the speed brakes, but the usual way to rapidly bleed off speed is to pull into a sharp climb. This is not only a more rapid deceleration, it also preserves the plane's energy. From the higher altitude, the pilot who performed the braking maneuver can dive down on the overshooting opponent, regaining speed almost immediately.

Multiple Bandits

It will take everything you've got to win what fighter jocks call a "1 v. many" engagement. The dynamics of air combat prevent a set sequence of maneuvers from working, but there are some general theories and priorities to follow.

Avoid Target Fixation

Never, never, never get fixated on one target to the exclusion of others. Pay attention, yes. Concentrate, yes. Fixate, no.

Be aware of where your target's buddies are and what they are up to while you line up for the kill. Break off if you are in danger. It is not an even trade if you get one of them and they get you. In fact, in a one versus many situation, you're ahead if you get none of them and live.

Assess Threats

The first thing you have to do in a multiple-opponent situation is determine the primary threat. There is bound to be one aircraft which is more dangerous to you than all the others.

Look at your radar in tracking mode, cycle through the locked targets with ⊤, then switch to boresight mode. In tracking mode, you can immediately see which foe is nearest to you and lock on, then you can use boresight to hunt him down.

The TWI is also critical for identifying primary threats. Keep track of which MiGs are maneuvering behind you and which ones just plain overshot and passed you.

Use Arms Effectively

Do not waste your ammunition on poor targeting solutions. Likewise, do not miss a good opportunity waiting for a perfect one. A common tactic is for one plane to lure you along, almost but not quite giving you that one sweet shot, while his big ugly partner steps up behind you and slugs you one.

Whenever you have a missile lock in a rear aspect, fire. That includes angles as wide as 80° or even 90°, as long as you are far enough away for the missile to make the turn.

If your only shot is in the forward aspect, think twice. It is not a bad idea to try to even the odds at the start of the engagement with a quick first head-on shot, but if you miss, you'll wish you had it back. Even eight missiles (the maximum load) run out mighty fast against three MiG-29s.

And obviously, if it is a head-on aspect angle, and you can hit the bad guy with your guns, he can hit you. Do not play chicken with a MiG-29.

Group the Foe

Perhaps the most important piece of advice in a multiple-bandit engagement is keep the enemy in a group and in front of you as much as you can. If you can manage that, you'll stand a fair chance of winning.

One risky but effective means of doing this is to extend (put distance between you and the foe) by accelerating rapidly. The risk here, of course, is that while they are now all grouped, they are also all behind you. But if you don't catch a missile as you race off revealing your rear, you can pull a fast turn (like an

Immelmann) and put them in your sights. Even so, you're now head-on against multiple MiGs. Not great, but it sure beats being surrounded.

Knowing When to Quit

The most important thing in a real dogfight is to stay alive. In a computer game, you can afford to be grim and stick to your guns until they scatter you over the countryside. But when the tactical situation becomes untenable, get out of there. The best escape technique is to drop under 1,000 feet and open the throttle. When you extend, you only need to worry about missiles, and you know what direction they'll be coming from.

There are times, however, when you should punch out. Press ⌘ Option E to pop the canopy and bail out.

Eject if your engine is out or your fuel is gone; there's nothing you can accomplish without thrust to keep you aloft and maneuvering. In a dogfight, if all your weapons are gone or empty, try to escape. But keep your hand on the eject lever; a missile hit doesn't give you much time to react.

Ejecting in Instant Action is admittedly pointless, but in a campaign, especially if you've built up a good score and are beating the enemy back, ejection is a far better alternative than death. If your pilot is killed, you'll have to start all over again with a new pilot.

Airstriking Techniques

The techniques for airstriking effectively are almost as diverse as the techniques for effective dogfighting. We'll just go over a few here.

Evading Radar

One of the most important parts of conducting a successful strike mission is getting there in one piece to deliver your ordnance. The best way to do this is to keep from being seen by the enemy's air defense network. If you stay below 500 feet, no radar will pick you up from among the ground clutter. And turn off your radar (by pressing R). If you're not broad-

casting, they won't pick you up. By flying low, fast and blind, you can only be detected by visual contact, which buys you valuable time to conduct your strike and get out of there.

Moving Targets

Moving targets present a special problem. They move. This presents two problems: aiming and leading.

It is difficult enough to aim at a stationary target with bandits and SAMs harassing you. Moving targets make aiming that much trickier. The best way to handle this is to reduce relative motion. If the target's path is parallel to yours, the target will not seem to be moving as much and will be easier to draw a bead on. Still better is to attack from directly behind moving targets. This reduces relative motion to its absolute minimum.

The most important thing to remember with moving ground targets is to lead them. With every weapon except the Maverick, the aim point must actually be in front of the target. The timing of the release is critical; the weapon and target must reach the same point at the same time. Gauge where the target will be by the time the weapon arrives and aim at that point. Aiming at the target's current location is a guaranteed miss unless the target does not move (like a SAM site) or the weapon is very fast (like bullets).

In the case of Mavericks, leading is not a problem. If your aim is accurate, when you lock on, the Maverick will track moving targets both before and after release.

Grouped Targets

Grouped targets often end up shielding each other from weapons fire. Getting the first hit on a cluster of structures is easy; trying to snake subsequent weaponry through the wreckage to hit other buildings is another matter.

If you have the time, another run is the simplest answer. But time over target is at a premium, especially at the higher difficulty levels.

The tactic for such situations is to have an unusually steep dive angle when setting up your attack run. This, of course, requires some extra altitude. You won't have much time, but hopefully you'll be able to lock and release all your ordnance in one run.
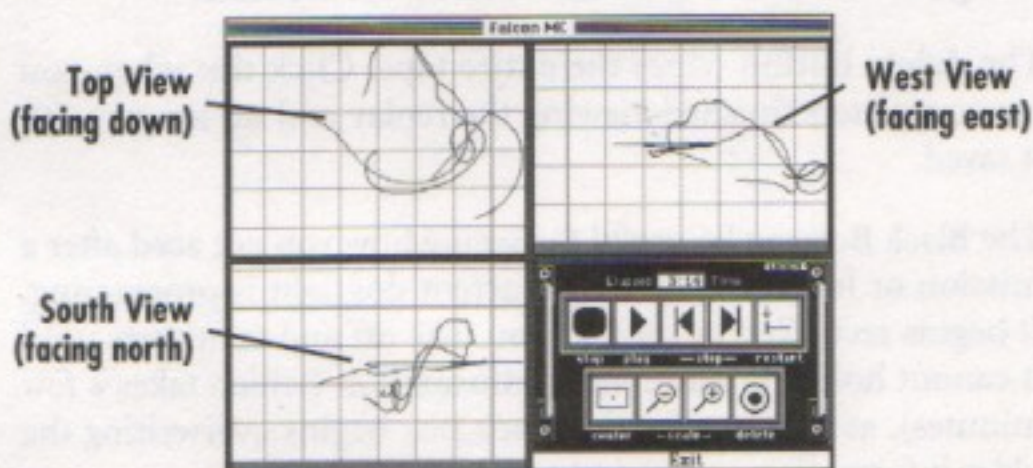
SAM Sites

SAMs must be approached very carefully, because they shoot back. Set up a very shallow attack dive, say around 5°, and come in below 1,000 feet. Use Mavericks; being missiles, they have a longer range and a shorter time from release to impact than any of the bombs or the cannon.

The Black Box

As a reviewing tool, the Black Box is invaluable to an advanced pilot. The recordings show how well certain maneuvers were executed, or just where that bandit came from anyway.

The Black Box is a kind of flight recorder built into *Falcon MC*. It records your flight path history and those of any MiGs which show up. You can view these historical flight paths from within the simulation or from the Debriefing screen right after a mission. To use the Black Box from within the simulation, pause the game first. Press ⌘ Ⓑ or select **Black Box** from the **File** menu to look at the flight paths.

Top View (facing down)

West View (facing east)

South View (facing north)

The historical flight paths are shown from three sides, in order to give the most complete view of the three-dimensional maneuvers. The grids are marked in 4,000 ft increments. The grid in the top left corner shows the flight paths from above. North is up on this grid, and east and west are right and left.

The grid in the lower left shows the flight paths from the south (as if facing north). East and west are right and left, and the vertical axis is altitude.

The grid in the top right shows the flight paths from the west (as if facing east). North and south are right and left, and the vertical axis is altitude.

To view the tape, click the **play** button. Your plane's path is the black line. MiG paths are shown in blue, green or brown.

The **stop** button will halt the replay. When the replay stops, your position is marked with a red square and MiG positions are marked with blue squares.

The **step** keys allow you to gradually step through the replay, forward or backward. When going backward, all the MiG trails are a lighter shade. Your reverse trail is red.

To skip back to the beginning of the tape, click the **restart** button.

The **center** button clears the grids and centers your plane's position on all of them.

The **scale** buttons zoom in or out. There are seven zoom levels. The grids are cleared every time you adjust the scale.

The **delete** button wipes the entire tape. Click this when you are completely finished viewing the replay and no longer wish it saved.

The Black Box can be useful for seeing how you got aced after a mission or for seeing how the current dogfight is progressing. It begins recording as soon as you take off and continues until it cannot hold any more flight information (which takes a few minutes), at which point the Black Box begins overwriting the older information.

SEVEN
FEATURES

There are a number of features available for customizing the game to suit your needs. The detail, difficulty levels, controls and sounds can all be adjusted from the menu bar.

About Falcon MC...

On the Apple menu, you can select **About Falcon MC...** to view the credits screen, where all the people who worked on this game are listed.

File Menu

The **File** menu contains options for exiting the game, calling up the Enemy Report and Black Box and for accessing the Instant Action high scores.

```
┌──────────────────────────────────┐
│ File  Edit  Detail  Optio        │
├──────────────────────────────────┤
│ Return To Cockpit        ⌘R      │
│ Abort Mission            ⌘A      │
│ End Mission              ⌘E      │
├──────────────────────────────────┤
│ Enemy Report                     │
│ Black Box                ⌘B      │
├──────────────────────────────────┤
│ Instant Action Scores            │
│ Erase Scores                     │
├──────────────────────────────────┤
│ Quit                     ⌘Q      │
└──────────────────────────────────┘
```

Return To Cockpit — ⌘ R

This will return you to the simulation if the game is paused. If you are in the simulation part of *Falcon MC*, you must pause the game to run another program under MultiFinder or System 7. Pause by pressing P, Q or Esc.

Abort Mission — ⌘ A

If you want to end a mission without recording anything that occurred, use **Abort Mission**. In Instant Action, this will take you back to the Duty Roster screen without recording your score. In the campaign, this will return you directly to the

Duty Roster and everything is reset to how it was before you started the mission.

If you change your mind about starting a mission, you can use this option to return to the Duty Roster with no harm done. **Abort Mission** works in the simulation, the Armament screen and the Mission Select screen.

End Mission — ⌘ E

When your mission is over, or you want to declare it so, select **End Mission**. This will take you to the Debriefing screen. In fact, this is the only way to end your mission. Even after you have landed your plane, you still must select **End Mission**.

If you have checked **Must Land** on the Difficulty screen, the campaign game treats **End Mission** differently. If you end your mission in this mode without landing or ejecting, you will be busted. If your plane is so badly damaged that you cannot land, eject (⌘ Option E) to end the mission.

Enemy Report

The Enemy Report screen can be called up any time from the cockpit, Mission Select screen or Armament screen. It is also available any time you have a pilot selected. The Enemy Report will display information about the campaign associated with that chosen pilot. See *Three: The Falcon World* for information about the campaign.

Black Box — ⌘ B

The Black Box is a flight recorder that you can use to review your flight history. It is accessible only from the cockpit or the Debriefing screen. See *Six: Tactics* for a description of its controls and features.

Instant Action Scores and Erase Scores

From the Duty Roster, you can view the top 10 Instant Action scores. Once the High Scores screen comes up, you can choose the **Erase Scores** option to wipe out all the old high scores.

Quit — ⌘ Q

This quits *Falcon MC*. It is available from everywhere in the game.

Detail Menu

The **Detail** menu controls the amount of detail shown in the simulation. The simulation world is made up of several elements, each of which adds realism at the cost of processor time. If you want to speed up your game, turn off some of the detail options. If you don't mind the slowdown, or your machine can handle it, turn on more detail to increase the realism. *Falcon MC* will remember your detail selections from game to game.

Detail	Options
None	⌘1
✓Far Terrain	⌘2
✓Gradient Horizon	⌘3
✓Mountains	⌘4
✓Medium Terrain	⌘5
✓Complex Rivers	⌘6
✓Ground Detail	⌘7
All	⌘8

None — ⌘ 1

This turns off all optional detail. Only targets and areas close to you (within one quadrant) will be shown, and the only terrain will be bodies of water (the lake, rivers and swamp).

Far Terrain — ⌘ 2

When **Far Terrain** is checked, you will be able to see areas beyond the nine-quadrant campaign area. Note that this does not include the areas covered by **Medium Terrain**, below.

Gradient Horizon — ⌘ 3

When this is checked, gradient shades of white are visible along the horizon, representing the optical effect of dust, moisture, etc. scattering the light.

Mountains — ⌘ 4

When this is checked, the mountain ranges appear.

Medium Terrain — ⌘ 5

When this is checked, the nine-quadrant campaign area is visible. When combined with **Far Terrain**, above, the entire world is visible.

Complex Rivers — ⌘ 6

When this selection is checked, the rivers will curve and bend instead of being straight lines and right angles. **Complex Rivers** is only available if **Medium Terrain** is already checked.

Ground Detail — ⌘ 7

When **Ground Detail** is on, smaller details on the ground will be visible at low altitudes. This can help you visually gauge your speed and altitude better.

All — ⌘ 8

This selection activates all the detail settings.

Options Menu

The **Options** menu selections control the game sounds, controls, difficulty settings and communications setup.

```
Options
✓ All Sound          ⌘S
✓ Music              ⌘M
✓ Engines
✓ TWI
✓ Sidewinder Growl
✓ UMS/Radio

  Set Control...
  Switch MouseSticks  ⌘T

  Set Difficulty...
  Comm Setup...
```

All Sound — ⌘ S

This turns all the sound effects and music on or off. If you have disabled a few of the individual sounds or the music, those settings will be remembered. So, if you have **TWI** and **Music** unchecked, and you turn **All Sound** off and then later turn **All Sound** back on, the music and threat warning indicator beep will remain disabled.

Music — ⌘ M

When this is checked, the music will play.

Engines

If this is checked, the engine noise will be audible in the cockpit.

TWI

The threat warning indicator (TWI) has an audible cue when you've been acquired by enemy radar. If this is checked, you will be able to hear this warning tone.

Sidewinder Growl

If this is checked, the audio cue for the Sidewinder missile's seeker head and the missile lock-on tone will be audible.

VMS/Radio

If this is checked, the voice message system (VMS) and the radio messages will be audible.

Set Control...

This will bring up the control dialog box.

```
Control:
  ◉ Keyboard
  ○ Gravis MouseStick
  ○ Auto-center Mouse
  ○ Button-center Mouse

Sensitivity:
  (low) ◁▦▦□▦▦▷ (high)

  [ OK ]    [ Cancel ]
```

Selecting the top button, **Keyboard**, will cause the keyboard to control the flight stick.

Choosing the second option, **Gravis MouseStick**, will disable the keyboard stick controls and give flight stick control to the MouseStick. Even with a second MouseStick as the throttle, however, the keyboard throttle controls will still work.

The **Auto-center Mouse** selection gives flight stick control to the mouse. Every time the mouse stops moving, the flight stick will center (unless the mouse button is held down).

The last choice, **Button-center Mouse**, also gives flight stick control to the mouse. In this setup, however, the flight stick will only center when the mouse button is clicked.

The **Sensitivity** scroll bar adjusts how sensitive the plane is to the flight stick's movements. Greater sensitivity makes the plane more responsive, but if it seems too "jumpy" you can reduce the sensitivity.

Switch MouseSticks — ⌘ T

There is a special situation which comes up when flying with two MouseSticks. When you pause the game and return, the Gravis software sometimes becomes confused as to which MouseStick is the throttle and which is the flight stick. If the two get swapped, just type ⌘ T or pull down the **Options** menu and select this choice to swap them back.

Set Difficulty...

Selecting this option brings up the difficulty settings screen. Use this screen to customize the game to fit your skills.

```
┌─────────────────────────────────────────────────────────────┐
│ ☒ Limited Fuel      Number of MiGs:   ○ 0  ○ 1  ● 2  ○ 3      │
│ ☒ Limited Arms                                               │
│ ☒ Limited Flares        MiG Skill:  (low) ○ ● ○ ○ ○ (high)   │
│ ☒ Normal Engine         SAM Level:  (low) ○ ● ○ ○ ○ (high)   │
│ ☐ Collisions                                                 │
│ ☐ Stalling         F16 Flare Effect: (high) ● ○ ○ (low)      │
│ ☒ Black Out/Red Out  Weapon Effect: (high) ● ○ ○ (low)       │
│ ☐ Normal TWI                                                 │
│ ☒ F16 Vulnerable         Landing: (easy) ○ ● ○ (hard)        │
│ ☐ Risky Eject                                                │
│ ☒ Enemy Capture        Enemy Info: (high) ● ○ ○ (low)        │
│ ☒ Must Land                                                  │
│                    [Training] [Easy] [Medium] [Hard] [Expert]│
│                                                              │
│       Current Difficulty: 50          [ OK ]    [Cancel]     │
└─────────────────────────────────────────────────────────────┘
```

If **Limited Fuel** is checked, your fuel supplies can run out. All the fuel limitations discussed in *Three: The Falcon World* and in *Four: The Fighting Falcon* will apply.

If **Limited Arms** is checked, you suffer the loading restrictions and stores limits discussed in the *Armament* section of *Three: The Falcon World*.

With **Limited Flares** checked, your chaff and flares can run out (30 maximum).

If **Normal Engine** is checked, your engine is susceptible to drag, gravity and the other inconveniences of aerodynamics

and physics. If this is unchecked, you have a "super engine" which has incredible amounts of thrust and ignores such trifles as the laws of ballistics and gravity.

When **Collisions** is checked, it is possible to run into things: mountains, buildings, MiGs, explosions and so forth. Otherwise, you can fly right through them.

If **Stalling** is checked, your plane suffers the usual risks of stalling at low airspeeds and high angles of attack (AOA).

With **Black Out/Red Out** checked, you can black out from pulling too many positive Gs or red out from pulling too many negative Gs.

When **Normal TWI** is chosen, your TWI will only detect those threats which are actively using radar. At higher levels of MiG skill, they will often turn off their radar once they spot you, which means they may not show up on the TWI at all. If this is not checked, threats will always show up on radar regardless of their radar usage, and the ranging TWI becomes available.

If **F16 Vulnerable** is checked, you can be damaged or shot down by enemy fire. Otherwise, you are bullet- and missile-proof.

When you eject, if **Risky Eject** is on, there is a chance of a canopy opening failure or other malfunction which could prove fatal. But given the alternative in an eject situation, the risk is worth taking.

With **Enemy Capture** active, you can be captured (and therefore become MIA) if you eject in enemy territory. Again, though, the risk is better than the alternative of going down with your plane.

If **Must Land** is checked, you will face a court-martial and be busted if you end the mission without landing the plane first (unless you were shot down and ejected).

The **Number of MiGs** limits the maximum number of MiGs that you will encounter at one time.

MiG Skill determines what the MiGs are allowed to use for armament and how skilled they are. The meanings of the five skill levels are:

level one (low)	Unskilled pilot, will not use chaff or flares, no weapons allowed.
level two	Average pilot, will not use chaff or flares, only guns allowed.
level three	Competent pilot, will use chaff and flares occasionally, guns and rear-aspect missiles allowed.
level four	Good pilot, will use chaff and flares regularly, guns and all heat-seeking missiles allowed.
level five (high)	Excellent pilot, uses chaff and flares liberally, all weapons allowed.

SAM Level determines what SAMs are available to the enemy and how quickly their crews can lock on to you and launch missiles.

level one (low)	No SAMs will lock or fire.
level two	SAMs will lock and fire, but cannot injure your plane. Good for practice at dodging SAMs.
level three	SA-2 only. Crews will lock on and launch fairly rapidly.
level four	SA-2 and SA-7. Crews will respond quickly.
level five (high)	SA-2, SA-6 and SA-7. Crews will lock on and launch almost immediately. Note that shoulder-launched SA-7s can launch from open countryside and can lock on at any altitude up to 12,000 ft.

F16 Flare Effect controls how effective your flares and chaff are against enemy missiles.

Weapon Effect determines how effective your weapons are. At the high setting, you just have to get close to your target; at the low setting, you have to be dead on.

Landing sets how difficult it is to land the plane. At the easiest setting, you can literally land anywhere at any speed; the ground cannot kill you. At the medium setting, you can land anywhere flat as long as you come in with gear down at the proper AOA and speed (and it's even a little lenient on those requirements). At the hardest setting, you must land on the runway using all the proper landing techniques.

Enemy Info determines how much you know about the enemy status. This is reflected in the Enemy Report screen. At the high setting, you get complete information about the enemy status, with estimated dates of repair for all damaged targets. At the middle setting, you will get information on tanks, landing craft and operational status of major targets. At the low setting, you will only get information about tanks and landing craft.

If you want, you can use the preset skill levels. These are the five large buttons along the bottom, from **Training** to **Expert**. Choosing one of these automatically sets all the other difficulty settings, as shown in the following chart.

	Training	Easy	Medium	Hard	Expert
Limited Fuel	No	Yes	Yes	Yes	Yes
Limited Arms	No	Yes	Yes	Yes	Yes
Limited Flares	No	No	No	Yes	Yes
Normal Engine	No	No	Yes	Yes	Yes
Collisions	No	Yes	Yes	Yes	Yes
Stalling	No	No	Yes	Yes	Yes
Blackout/Redout	No	No	Yes	Yes	Yes
Normal TWI	No	No	No	Yes	Yes
F16 vulnerable	No	Yes	Yes	Yes	Yes
Risky Eject	No	No	Yes	Yes	Yes
Enemy Capture	No	No	Yes	Yes	Yes
Must Land	No	No	Yes	Yes	Yes
Number of MiGs	1	1	1	2	3
MIG Skill (and arms allowed)	Low; disarmed	Fair; guns only	Average; guns and Atolls	Good; guns, Atolls, Aphids	Ace; guns and all missiles
SAM Level	No SAMs	SA-2 only, harmless	SA-2 only	SA-2 and SA-7	SA-2, SA-6 and SA-7
F16 Flare Effect	High	High	Medium	Low	Low
Weapon Effect	High	High	Medium	Low	Low
Landing	Easy	Medium	Hard	Hard	Hard
Enemy Info	High	High	Medium	Low	Low

The **Current Difficulty**, also called the realism value, is displayed at the bottom of the screen. This is a measure of how difficult or how realistic the settings are. A value of 100 is fully realistic, and as hard as it gets. Some selections have more of an effect on this total than others. This realism value determines your score for a mission both in the campaign and in Instant Action.

Comm Setup...

Use this to select your communications setup prior to a head-to-head session.

○ AppleTalk Network
○ Modem
○ Direct Connect

Okay   Cancel

A dialog box will pop up, where you can choose between AppleTalk Network, Modem and Direct Connect. See *Eight: Head-to-Head* for more information.

EIGHT
HEAD-TO-HEAD

Dogfighting against the computer can get old. After a while, you get to know all its tricks. But a human opponent, in a plane fully as capable as your own, is a far more entertaining challenge. The head-to-head option in *Falcon MC* lets you duel against a real pilot. And if the pilots are mismatched, you can pick different difficulty settings and armament loads for each (see *Rules of Engagement* later in this chapter).

Setup

To prepare for a head-to-head session, you should make sure that each computer has its own registered copy of *Falcon MC* and that you have all the hardware necessary.

For network play, both computers must be hooked up to the same network and in the same network zone.

For modem play, both computers must have working modems which are hooked up to phone lines.

For direct connect, hook the two computers together with a standard AppleTalk cable or ImageWriter cable.

When you're ready to play, have both computers run *Falcon MC*. Both players should select **Comm Setup...** from the **Options** menu.

In the setup dialog box, both players should choose the appropriate communications type (AppleTalk network, modem or direct connect). For modem and direct connect, you should also select which port you are using (modem or printer).

When both players are ready, click the **Head-to-Head** button on the Duty Roster screen. The Armament screen will appear, just as in the campaign. Select whatever arms you want to bring into the duel, then click on **Take Off**.

AppleTalk Network

If you have selected **AppleTalk Network** in the communications setup dialog box, when you click the **Take Off** button on the Armament screen you will see the network play dialog box.

```
┌─────────────────────────────────────────────┐
│                                              │
│  Select an opponent:          ┌───────────┐  │
│                               │ Challenge │  │
│     1LT Love                  └───────────┘  │
│                               ┌───────────┐  │
│                               │Next Player│  │
│                               └───────────┘  │
│                                              │
│  You have been challenged by: ┌───────────┐  │
│                               │  Accept   │  │
│     1LT Love                  └───────────┘  │
│                               ┌───────────┐  │
│                               │  Cancel   │  │
│                               └───────────┘  │
└─────────────────────────────────────────────┘
```

Other players on the network who are waiting to play will be listed at the top left. Scroll through the available players one at a time by choosing **Next Player** until the opponent you want to duel is shown, then click **Challenge**. If someone challenges you, that pilot's name will show up at the bottom left. Choose **Accept** to begin the fight, or **Cancel** to return to the Duty Roster screen.

Modem

If you have selected **Modem** in the communications dialog box, when you click **Take Off** from the Armament screen you will see the modem setup dialog box.

```
            FALCON Modem Setup

Number to dial:  5221164              Baud Rate

⊠ Visual checksum                     ○ 1200
                        ◉ Tone        ◉ 2400
☐ Auto answer                         ○ 4800
                        ○ Pulse       ○ 9600
☐ Manual setup

          [  OK  ]  [ Cancel ]
```

If you are going to be the caller, type in the number to dial in the space provided.

Both players should agree on what baud rate to use. The higher the baud rate, the faster the communications will go. Both players should select the same baud rate from the list at the right (1200, 2400, 4800, 9600).

If your phone line can handle Touch-Tone, select **Tone**. If not, select **Pulse**.

If you check **Visual checksum**, the menu bar will flash if *Falcon MC* detects line noise which could disrupt play.

If you are going to be the answerer, check **Auto answer**. The other player should now call you. If you are going to be the caller, be sure this box is not checked.

Check **Manual setup** if your modem is not Hayes-compatible or if you want to type commands directly to the modem. If this is checked, when you click **OK** the manual setup dialog box will pop up.

```
            FALCON Modem Setup

Baud Rate    ○ 1200    ○ 4800
             ◉ 2400    ○ 9600

Command to send:  [ ATDT 5221164 ]

⊠ Visual checksum

              [ Cancel ]  [ Connected ]
```

Select whatever baud rate you are going to use from the list.

Type whatever command you want to send to your modem in the box provided.

The **Visual checksum** performs the same function here as it does on the previous dialog.

When the two modems are connected, click the **Connected** button.

To play, just click **OK** when all selections are satisfactory. You will then see a dialog which will inform you of the status of the communications attempt. Your modem setup selections will be saved automatically.

Modem Troubleshooting

First, make sure that:

- The baud rates are the same and both modems are capable of the selected speed.
- The answerer has selected **Auto answer** and has already clicked **Take Off** when the caller calls.
- The phone number entered in the modem dialog box is correct.
- Both modems are properly connected to the modem port and the phone line, and are turned on and warmed up.

If your modem doesn't dial when you are the caller, try entering the following Hayes-compatible commands from the manual setup:

        AT&F
        AT&CO
        AT&W

This will set the modem to its default factory settings, force the carrier detect on, and save these settings to non-volatile RAM. Restart *Falcon MC* and try again.

Direct Connect

When the AppleTalk or ImageWriter cable has been plugged in to both computers, play will begin as soon as both players have clicked the **Take Off** button on the Armament screen.

Playing Head-to-head

Your opponent will be flying a Falcon, just as you are. The only differences between you are your difficulty settings, your armament and whatever rules you have agreed on.

Difficulty Settings

All difficulty settings from the Difficulty screen are applicable to the player who selected them. The only things which are fixed in the head-to-head duel are **F16 Vulnerable** (so you can be shot down) and **Collisions** (so you can run into each other).

Armament

If you have selected **Limited Arms** on the Difficulty screen, you will be under all the usual loading limitations (see *Three: The Falcon World* for armament loading restrictions). The only difference here is that you never have to worry about supply shortages.

Rules of Engagement

The rules of engagement are whatever you and your opponent decide upon before play. With the handicapping ability provided by the Difficulty settings and Armament screen, you can allow for a large difference in skills.

Some common rules of engagement:

1) No firing until after the first head-on pass.
2) No AMRAAMs allowed.
3) Only rear-aspect missiles allowed.
4) Only guns may be used.
5) No autopilot usage.
6) The better pilot must play with normal engines while the handicapped pilot may use super engines.

You can make up whatever rules you wish. Some rules can be game-enforced (such as difficulty and armament limitations), while others are totally voluntary (like rule #1).

Chat Messages

You can type a message to your opponent during the duel by pressing ⬚. The game will pause for both players and a window will pop up for you to type your message and send it.

```
          Message to send:

  Prepare to eat lead, evil one!


               Send
```

Type your message, then click **Send**. When the message has been sent and read, play will resume.

Ending the Duel

When one of you has been shot down, or if you ran into each other, that duel ends. You will see a dialog box which shows the running score of all duels this session and gives you the choice to go again or end the session.

```
+---------------------------------------------+
|         You have been shot down.            |
|                                             |
|            Ready to go again?               |
|  Total victories                            |
|  Your Pilot: 0          [ Yahoo! ] [ No Way ]|
|  Opponent: 1                                |
+---------------------------------------------+
```

If you click **Yahoo!**, you will go to the Armament screen to re-arm for the next duel. If you click **No Way**, the head-to-head session will be terminated and you will return to the Duty Roster.

NINE

REFERENCE

Technical Specifications
Aircraft

F-16 Fighting Falcon

Length:	47 ft 8 in	**Made by:**	General Dynamics
Wingspan:	31 ft	**Engine:**	Pratt & Whitney F100
Min. weight:	14,567 lb	**Top speed:**	Mach 2
Max. weight:	36,079 lb	**Ceiling:**	70,000 ft

Armament: General Electric M61A1 20mm cannon and two wingtip air-to-air missiles; seven additional hardpoints for carrying up to 15,200 lbs of other stores.

The General Dynamics Fighting Falcon is considered by many to be the most agile modern fighter. Less than half the weight of the F-14, it carries a heavier payload; less than one-fourth the cost of the F-15, it has superior maneuverability. In addition, advanced avionics and electronics give it excellent air-to-ground precision. The F-16 can deliver a crippling ground strike and still maintain a credible air threat.

The Falcon's versatility is still being explored. The variety of stores it can carry and the wide range of missions it can undertake with great effectiveness are staggering. The F-16 has proven itself equally capable of air superiority, SAM suppression, strike and reconnaissance missions without any structural modifications. The simple addition of the proper external pods or ordnance is all that is required.

The Fighting Falcon forms the backbone of the USAF with over 1,500 in service. Due to its cost-effectiveness and versatility, many U.S. allies and clients also fly the F-16.

MiG-29 Fulcrum

Length:	50 ft 10 in	**Made by:**	Mikoyan
Wingspan:	39 ft 6 in	**Engine:**	2 Tumansky R-33D
Min. weight:	18,000 lb	**Top speed:**	Mach 2.3
Max. weight:	36,000 lb	**Ceiling:**	75,000 ft

Armament: 30mm cannon plus six to eight air-to-air missiles or fuel tanks on six external hardpoints.

When U.S. aircraft philosophy turned towards maneuverability and cockpit visibility after Vietnam, the designers at Mikoyan-Gurevich saw that existing Soviet aircraft were in trouble. During the Yom Kippur War, when Israeli F-15 and F-16 pilots wiped out over 80 Syrian MiGs with no air-to-air losses, this performance gap was glaringly obvious.

Enter the MiG-29. As agile as the F-16, with a higher top speed and the latest radar, it has proven to be Mikoyan-Gurevich's most dangerous air-to-air threat. Advanced avionics, leading-edge root extensions for better maneuverability, unusual materials and the latest in air-to-air weaponry make for an extremely tough customer. Wherever it is encountered, the Fulcrum should be treated with the respect due a primary air threat.

Engaging multiple MiG-29s is not advised under any circumstances.

The constant need for hard currency in the former Soviet Union has led to the sale of this formidable craft to virtually any state willing to pay the price. As a result, it can be found patrolling the skies of more than a dozen nations.

Weapons and Stores

The following are the various weapons and other stores available for the F-16, followed by specifications for the enemy weapons and SAMs. A few notes about the specifications:

The warhead notation "frag" indicates a blast fragmentation warhead, "HE" denotes a high-explosive warhead and "shaped" means that weapon has a shaped-charge warhead.

Weights and drag indices are given for individual weapons. Remember that most stores are loaded in pairs when figuring the actual weight and drag your plane will bear. Where stores can be loaded in multiple positions, the drag index for the different placements is given. For example, the AIM-9P's drag index is listed as "4 (10 inboard)." This means that the missile has a drag index of 4 if loaded on the wingtip rails, but drag increases to 10 for AIM-9Ps which are loaded on inboard pylons.

AIM-9P Sidewinder

Type:	Rear-aspect IR	**Length:**	9 ft 11 in
Warhead:	22 lb frag	**Diameter:**	5 in
Speed:	Mach 2+	**Weight:**	238 lb
Range:	6 miles	**Drag index:**	4 (10 inboard)

The best of the second generation of Sidewinders, the AIM-9P has a good record when fired under the conditions for which it was designed: from relatively close range and from the rear. It is easily outperformed by the modern AIM-9M and AIM-120, but is far more readily available.

AIM-9M Sidewinder

Type:	All-aspect IR	**Length:**	9 ft 7 in
Warhead:	22 lb frag	**Diameter:**	5 in
Speed:	Mach 2+	**Weight:**	264 lb
Range:	6 miles	**Drag index:**	7 (13 inboard)

The Sidewinder missiles have served the U.S. Air Force for many years, going through many revisions and upgrades. The AIM-9M is one of the latest generation of Sidewinders to reach mass production and distribution.

The improved infrared seeker head in the 9M allows it to acquire its target from any angle, though it is still most effective from the rear. It is also less susceptible to countermeasures than the 9P. It is usually available, though in limited quantities.

AIM-120 AMRAAM

Type:	All-aspect radar	**Length:**	11 ft 9 in
Warhead:	40 lb HE	**Diameter:**	7 in
Speed:	Mach 4+	**Weight:**	388 lb
Range:	18 miles	**Drag index:**	12 (18 inboard)

The AIM-120 is the latest in U.S.-built air-to-air weaponry. It grants BVR (beyond visual range) capability to any plane which carries it, and its all-aspect active radar homing makes it possible to lock onto a target from any angle.

The high-yield warhead and long range make for a very big missile, but it is well worth the extra weight and drag to knock out your opponent without risking a dogfight.

While the AMRAAM is still technically an experimental missile, its wide distribution for battlefield testing means it is occasionally available to F-16 pilots.

AGM-65B Maverick

Seeker:	Television	**Length:**	8 ft 2 in
Range:	8 miles	**Weight:**	464 lb
Warhead:	125 lb shaped	**Drag index:**	13

The AGM-65B Maverick is a "fire and forget" air-to-ground missile useful against vehicles, radar stations and other non-hardened (or soft) targets.

It is television-guided, which means it homes in on an image when it is fired. The pilot selects the target by looking through the Maverick's camera nose, placing the cross hairs on the desired image and touching the trigger once. The second touch fires the missile.

When one is fired, the cockpit screen switches to the next Maverick's input, and the pilot can select a new target, engage in a dogfight, leave the area or whatever is appropriate. The Maverick will continue to its target regardless.

Mk84 bomb

Type:	Free-fall bomb	**Length:**	12 ft 9 in
Warhead:	945 lb HE	**Weight:**	1,970 lb
		Drag index:	26

The Mk84 is the largest so-called "iron bomb." Dropped in pairs, this general-purpose weapon is well up to the task of cracking hardened bunkers, buildings and bridges.

As it is unguided, it is relatively cheap to produce and is therefore readily available.

GBU-15 Guided Bomb Unit

Type:	TV-guided bomb	**Length:**	12 ft 10 in
Warhead:	945 lb HE	**Weight:**	2,313 lb
Range:	10 miles	**Drag index:**	32

The GBU-15 is a guided version of the Mk84. It has the same warhead and hitting power, but is a "smart" weapon. In other words, it will take itself to the target once released, freeing the pilot for other tasks.

The guidance system is similar to that of the Maverick: the pilot places the cross hairs (on the HUD) onto the target and locks on. As long as the lock is maintained, the GBU-15 can be released any time thereafter. The seeker head is locked onto the target's TV image, and the glide fins will guide the bomb in.

Accuracy, striking power and the fire-and-forget capability make this the weapon of choice for precision strikes, hardened targets or bombing runs in heavily-patrolled areas. Unfortunately, it is expensive and popular and therefore difficult to obtain.

BLU-107/B Durandal

Type:	Anti-runway bomb	**Length:**	8 ft 2 in
Warhead:	330 lb HE	**Weight:**	450 lb
		Drag index:	14

This is a runway killer. Most bombs will just leave a crater in a runway, which is relatively easy to repair given enough cement and gravel. The Durandal, however, burrows deep beneath the pavement before exploding — buckling up to 200 square meters of runway.

The damage from a Durandal is therefore much harder to repair and covers more area than a simple crater. Unfortunately, the same buried-explosion effect which is so effective against pavement makes it practically useless against other targets. As a result, it is only carried for anti-runway missions.

ALQ-131 ECM pod

Type:	Electronics pod	**Weight:**	718 lb
Length:	8 ft	**Drag index:**	29

This electronic countermeasures pod broadcasts a noise signal with deception modulation to prevent lock-on and jam SAM guidance systems. This signal also sometimes jams the missile radar of enemy planes, though not consistently.

Fuel Tank

Type:	300 gallon	**Weight:**	2,304 lb
Length:	13 ft	**Drag index:**	38 (41 on wing)

For long-range missions, the extra stamina provided by these external fuels tanks can be critical. But the weight and drag penalties can be severe — even fatal, in a dogfight.

Enemy Weapons

AA-2 Atoll

Type: Rear-aspect IR	**Speed:** Mach 2+
Warhead: 13 lb frag	**Range:** 6 miles

The Atoll is a copy of the Sidewinder and is virtually identical in performance. It is cheap and plentiful, as missiles go; just about every MiG carries at least a couple of these. If the bandit gets behind you, the Atoll is the cheapest way to ground you (except for cannon fire).

Like the AIM-9P, however, the Atoll is susceptible to flares; keep the throttle low, drop flares, and jink hard to lose it.

AA-7 Apex

Type: All-aspect radar	**Speed:** Mach 3.5
Warhead: 88 lb frag	**Range:** 25 miles

The Apex is big, fast and difficult to evade. Worse, it can be fired from beyond visual range — so the first warning you have of an enemy lock-on may be an AA-7's active radar seeker. The huge warhead may seem like overkill, but it actually improves accuracy. With 88 pounds of fragmentation explosive, it only needs to get close.

The good news about the Apex is its high cost and low availability; only the top pilots are issued this weapon. The bad news is, only the top pilots are allowed to fly MiG-29s.

Shaking the Apex is difficult, but not impossible. Low altitude, high-G maneuvers coupled with generous chaff usage may do the trick, with a bit of luck. The ALQ-131 ECM pod is also partially effective at breaking the AA-7's radar lock.

AA-8 Aphid

Type: All-aspect IR	**Speed:** Mach 2+
Warhead: 18 lb frag	**Range:** 5 miles

The Aphid is a widely-distributed all-aspect air-to-air missile common to air forces equipped by the former Soviet Union. It can be

fitted with either a semi-active radar or infrared seeker, but the IR is by far the more common of the two.

Be alert: the Aphid, like the AIM-9M, can acquire its target from any aspect angle. It is also less likely to get spoofed by a flare than the Atoll.

MiG-29 pilots demand the best air-to-air weapons, and this is one of them. It is a virtual certainty that a well-equipped foe will carry a pair or more of Aphids.

SA-2 Guideline

Guidance:	External	**Range:**	up to 31 miles
Warhead:	287 lb frag	**Altitude:**	3,000–50,000 ft

In service since 1958 in various forms, the Guideline is an aging but dangerous weapon. Relatively cheap (and therefore available), it is huge and not very mobile. The missile itself is 35 feet long, weighs two and a half tons, and rides on a special articulated trailer when it must be moved. The launcher travels separately.

In field use, the Guideline is usually set up in locations where mobility is not a necessity. It depends on a separate radar set for guidance information, and is in fact controlled by instructions from the ground. It has tremendous range and acceleration, and is quite lethal. While using a 5,000-pound missile to down a jet may seem like using a bus to hunt deer, it is effective (especially if you are the deer).

SA-6 Gainful

Guidance:	Radar	**Range:**	2 to 30 miles
Warhead:	176 lb frag	**Altitude:**	3,000–47,000 ft

The Gainful is a common anti-aircraft missile system. While it is mobile and can fire on the run, it has no radar of its own. It relies on a separate radar tracking vehicle or station to detect and lock on to targets.

A common tactic is to have one radar station with several SA-6s rolling or parked nearby. Thus, several targets can be engaged at once, and the expensive radar equipment is used to its maximum benefit. The best tactic for taking out such a formation is to eliminate the radar. Without it, the Gainful is no threat.

SA-7 Grail

Guidance: Infrared **Range:** 1 mile
Warhead: 5 lb frag **Altitude:** 100–12,000 ft

The Grail is a shoulder-launched short-range SAM. Its limited range and small warhead mean it is only effective against low-flying targets. Unfortunately, as it requires only one man to carry and operate, it is also undetectable until it is airborne.

The best way to avoid SA-7 interception is to fly above its operating altitude unless absolutely necessary. Flares and hard turns are the only real options once it's on to you. Fortunately, the SA-7 has a miserable record against flare-equipped planes, as it is reportedly easily spoofed by such countermeasures.

Glossary

AA-2 — Rear-aspect infrared-guided air-to-air missile, NATO designation Atoll.

AA-7 — All-aspect radar-guided air-to-air missile, NATO designation Apex.

AA-8 — All-aspect infrared-guided air-to-air missile, NATO designation Aphid.

A/B light — Light by the RPM gauge in the forward instrument panel indicating the afterburner is lit.

ADI — Attitude director indicator, also called the "level ball."

Afterburner — A system in modern jets by which a plane can achieve greater than normal thrust by spraying fuel into the exhaust flame of the engine. Very costly in fuel consumption.

AGM-65B Maverick — A version of the air-to-ground Maverick missile which is television-guided.

AIM-9M — An all-aspect version of the Sidewinder infrared-guided air-to-air missile.

AIM-9P — A rear-aspect version of the Sidewinder infrared-guided air-to-air missile.

AIM-120 — An all-aspect, radar-guided medium range missile, also called the AMRAAM (advanced medium range air-to-air missile). Still in the field testing stage.

Air Force Cross — The Air Force version of the Distinguished Service Cross, granted to any person serving in the U.S. Air Force for "extraordinary heroism not justifying the Medal of Honor" in combat.

Air Medal — Medal given to any member of the armed forces who has "distinguished himself by meritorious achievement while participating in aerial flight."

Airspeed — The velocity of an aircraft relative to the air around it.

Aiming reticle — On the HUD, a visual aid displayed to improve accuracy. If a target is

within the circular reticle, the weapon selected has a good chance of hitting that target.

All-aspect — A weapon which can acquire and track its target from any angle.

AMRAAM — Advanced medium range air-to-air missile, designated AIM-120. The AMRAAM is an all-aspect radar-guided weapon.

ALQ-131 ECM pod — Jamming pod which helps prevent opponents from locking on. See *ECM* and *Jamming*.

Angle of attack — The angle formed by an aircraft's flight path and its longitudinal axis. Positive angles of attack indicate the plane is pointed above its flight path, while negative AOA indicates the plane is pointed below its flight path.

AOA — Angle of attack.

AOA indexer — Vertical column of three lights to the left of the HUD. The upper light indicates an angle of attack too high for landing, while the bottom light indicates an AOA too low for a safe landing. The center light indicates a correct AOA for landing.

AOA indicator — Vertical sliding scale on the instrument panel showing exact angle of attack in degrees.

Apex — Soviet-built all-aspect radar-guided air-to-air missile.

Aphid — Soviet-built all-aspect infrared-guided air-to-air missile.

AR/NWS light — Part of the NWSS/LGSI. The AR/NWS light indicates that the air refueling/nose wheel steering system is active, which means the flight stick only controls the nose wheel steering.

Aspect angle — The angle created by the intersection of the opponent's flight path and the line connecting your plane to the opponent.

Atoll — Soviet-built rear-aspect infrared-guided air-to-air missile.

Attitude director indicator (ADI) — Sometimes called the "level ball." The ADI is a sphere marked half white and half black. As the plane dives or climbs, the ADI rolls to show relative position to the horizon.

Autopilot — Feature of the flight computer allowing automated flight control. In *Falcon MC*, the autopilot also engages enemy aircraft and dogfights, although it does not have control of the weapons systems.

Avionics — The electronic systems of an aircraft.

AWACS — Airborne warning and control system. AWACS aircraft are large planes with on-board radar and extensive electronics and detection gear. The AWACS coordinates all aerial operations in a given area and provides early warning information to allied pilots.

Bail out — Eject.

Bandit — Aircraft identified as hostile.

Bank — Roll the plane slightly in either direction, left or right. See *Roll.*

Bearing — The difference (from 0° to 359°, clockwise) between your current heading and the heading which would point at your opponent.

Black box — The F-16's cockpit flight recorder.

Blackout — Loss of consciousness due to positive Gs. Usually occurs around 9 Gs.

Blast fragmentation warhead — Type of warhead which relies on a large quantity of shrapnel propelled outward by explosives to eliminate the target.

BLU-107/B Durandal — Anti-runway munition which buries itself below the pavement before exploding to cause maximum damage.

Boresight radar — Radar mode which displays opponents' positions as though looking down the barrel of a gun.

Bogey — Unidentified radar contact.

Callsign — Personalized code name for a particular pilot or other radio operator.

CCIP — See *Continuously computed impact point.*

Center point — On the HUD, a visual cue indicating where the plane is pointed.

Chaff — Packages of foil strips used to fool radar-guided arms. The cloud of foil can be mistaken for a larger object, distracting the weapon.

Climb angle — The positive pitch angle between an aircraft's flight path and the ground. A negative pitch indicates a dive. See *Pitch.*

Closure rate — The rate at which two planes are approaching each other, in knots. If the closure rate is negative, the planes are separating.

Continuously computed impact point — Displayed on the HUD, a point calculated by the computer to be the spot where unguided munitions fired or released at that time will strike.

Countermeasures — Methods for defeating enemy detection and weapons systems.

Court-martial — Military court which judges members of the armed forces by the UCMJ (Uniform Code of Military Justice). Those found guilty of violating this code can be discharged.

DGFT — Abbreviation for dogfight. On the HUD, DGFT means the HUD is in air-to-air cannon mode.

Diamond X — A mark showing the estimated point on the HUD where a locked target outside the HUD would likely reenter.

Difficulty rating — Also called realism value, measures the difficulty of the game on a scale of 1 to 100.

DISC light — Part of the NWSS/LGSI. The DISC light indicates that the nose wheel steering system has been disconnected from the flight stick because the plane is airborne.

Discretes — In the lower left corner of the HUD, notations indicating the status of the selected weapon.

Displayed impact line — On the HUD, line connecting the release cue and the bomb sight which shows the approximate fall path of bombs released at that time.

Distinguished Flying Cross — Award given to U.S. military personnel showing "heroism or extraordinary achievement while participating in an aerial flight."

Dive angle — The negative pitch angle between a plane's flight path and the ground.

See *Pitch.*

Dogfight — An aerial combat.

Drag — The decelerating effect of wind resistance.

Drag factor — A measure of the amount of drag created by adding a given store to the aircraft. Higher drag factors indicate greater wind resistance.

Durandal — Anti-runway weapon. See *BLU-107/B Durandal.*

Duty roster — A crew chief's list of available pilots.

ECM — Electronic countermeasures.

Electronic countermeasures — Jamming and other electronic means of countering enemy weapons systems and radar. The ALQ-131 ECM pod is capable of electronic countermeasures. See *Jamming.*

Engage — Basic fighter maneuver where the pilot simply tries to bring the enemy into his forward weapons fire area.

Extend — Increase speed to separate from the foe.

Fire and forget — A weapon which is self-guiding once released.

Flares — Magnesium-based packages which ignite upon being released. The heat is meant to trick heat-seeking missiles into tracking the flare instead of the intended target.

Flight stick — Directional control device for most aircraft, including the F-16.

Fulcrum — NATO designation for the MiG-29.

Gs — A measure of the force being applied to a plane and its pilot. One G is equal to one times the force of gravity. Thus, a 4G turn is one which subjects the plane and pilot to four times the force of gravity. See *Negative Gs* and *Positive Gs.*

Gainful — NATO designation for the SA-6 radar-guided SAM.

GBU-15 — Guided version of the Mk84 bomb equipped with glide fins and a TV guidance package.

Glideslope — The downward path to follow to safely land.

Glideslope deviation scale — On the HUD in ILS mode, the horizontal bar showing whether the F-16 is above, below or right on the glideslope.

Good landing — One you walk away from.

Grail — NATO designation for the SA-7 shoulder-launched infrared SAM.

Groundhog — Callsign for your ground-based reconnaissance forces in the *Falcon MC* campaign.

Growl — Audio cue produced by Sidewinder missiles indicating that the seeker head is armed and searching for targets.

GSD — Glideslope deviation scale.

Guideline — NATO designation for the SA-2 radar-guided SAM.

Head-up display — Also called the HUD, the glass screen in front of the F-16 pilot on which targeting and navigation information is displayed.

Heat signature — The image of a plane or other object in the infrared spectrum.

Home Plate — Callsign for your air base in the *Falcon MC* campaign.

HUD — Head-up display.

ILS — Instrument landing system.

ILS beam — A composite radio beacon marking the correct landing approach to a runway.

Infrared guidance — Type of weapon seeker system which homes on the heat signature of the target.

IN RNG — Abbreviation of "in range." When IN RNG appears on the HUD, it means that the selected weapon is in range of its target.

Instrument landing system — Combined radio beacon and instrument system designed to aid in landing. The glideslope deviation scale and the localizer deviation scale are displayed on the HUD and guide the pilot along the ILS beam to a safe landing.

Immelmann — Maneuver which uses a steep vertical climb to turn in a very small amount of horizontal space.

IR — Infrared.

Jamming — Method of ECM which confuses enemy radar and weapons by broadcasting a great deal of radar "noise" in the proper frequencies.

Jet fuel starter — System which warms up and ignites the turbofan engine of the F-16.

JFS start/run lights — Instrument panel lights indicating whether the engine is running, is being started, or is completely powered down.

Kts — Knots.

Knots — A measure of speed. One knot is one nautical mile per hour. A nautical mile is approximately 6,076 ft, so one knot is about 1.15 statute (normal) miles per hour.

LCOS — Lead-computing optical sight.

LD — Localizer deviation scale.

Lead-computing optical sight — Also called the LCOS, a targeting system for the cannon which computes the closest point on the bullet path to the target and where the target is likely to be and displays this information on the HUD.

Localizer deviation scale — On the HUD in ILS mode, the vertical bar which shows the proper heading to take to follow the ILS beam.

Lock on — To acquire a target on radar and feed this information to a weapons system in preparation for firing.

M61A1 cannon — The 20mm rotary gun in the F-16.

Mach — Measure of speed as it relates to the speed of sound. Mach 1 is equal to the speed of sound, Mach 2 is double the speed of sound, and so on.

Mach indicator — On the HUD, an indicator showing the F-16's speed in Mach numbers.

Maverick — Nickname for the AGM-65 series of air-to-ground missile.

Medal of Honor — The highest award in U.S. military service, given to officers and enlisted men for "gallantry and intrepidity at the risk of their lives, above and beyond the call of duty, in action involving actual combat with an armed enemy of the United States."

MIA — Missing in action. Usually refers to pilots captured by the enemy or downed and not rescued.

MiG — Designation indicating an aircraft built by the Mikoyan design bureau. Also stands for the aircraft itself, as in "MiG at six o'clock!"

MiG-29 — Russian-built fighter, NATO designation Fulcrum. Very recent design and equipment.

Mikoyan — Russian aircraft design bureau, formerly Mikoyan-Gurevich and formerly Soviet.

MIL — Standard military power. MIL is used a measure of thrust, usually seen as "80% MIL" or the equivalent. On the forward instrument panel of the F-16, the MIL light indicates that the engine is providing normal thrust only and is not afterburning.

Missing man formation — Formation flown in memory of a deceased comrade, where one pilot breaks out of formation and departs, symbolizing the dead pilot's departure from the squadron.

Mk84 bomb — Standard 2,000-lb high-explosive unguided free-fall bomb. Pronounced "mark 84."

MRM — Medium range missile; abbreviation for the AMRAAM HUD mode.

Negative Gs — The force you would experience if swung in a circle by your ankles. Usually felt by pilots who maneuver by pushing forward on the flight stick.

NWS — Nose wheel steering.

NWSS/LGSI — Nose wheel steering system/landing gear status indicator. The NWSS/LGSI is a vertical column of lights on the right side of the HUD comprising the RDY, AR/NWS and DISC lights.

Pickle — Lock on to a ground target; usually associated with bombs (as opposed to missiles).

Pitch — The angle of the plane's longitudinal axis to the ground. Positive pitch indicates a climb, while negative pitch indicates a dive.

Pitch ladder — On the HUD, a sliding scale showing pitch angle. Dotted lines and negative numbers indicate a dive angle, while solid lines and positive numbers indicate a climb angle.

Pop-up — A pre-attack maneuver where the pilot climbs sharply from a low-altitude approach just prior to initiating the attack run.

Positive Gs — The force you would feel if swung in a circle by your wrists.

Punch out — Eject.

Purple heart — Award given to any member of the U.S. armed forces injured or killed in the line of duty.

Radar — Radio detection and ranging. A common electronic means of detecting and tracking targets, terrain and opponents.

Radar/electro-optical display — The screen in the middle of the forward instrument panel. This screen is used for radar and video (electro-optical) displays.

Radar guidance — A type of tracking system where radar is used to detect the target.

RDY light — Part of the NWSS/LGSI. The RDY light indicates that the landing gear is deployed and functional.

Realism value — See *Difficulty rating.*

Redout — Loss of consciousness due to negative Gs. Usually experienced around -2 Gs. Redout refers to the effect of blood rushing to the eyes just before loss of consciousness, causing a red haze to impair vision.

Release cue — On the HUD, a targeting aid showing when to release an unguided bomb in order to hit the pickled target. When the release cue passes the center point, drop the bomb.

REO display — Radar/electro-optical display.

Reticle — see *Aiming reticle.*

Roll — Rotate the aircraft about the longitudinal axis. Usually done to orient the plane so that pulling back on the stick will turn the plane in the desired direction.

Rolling scissors — Dogfighting maneuver where two opposing pilots cut back and forth on each other, trying to force the other to overshoot.

RPM gauge — Dial on the right side of the forward instrument panel showing percentage of maximum thrust now being applied.

Rudder — Vertical control surface used to turn the plane without banking or rolling.

SA — Situational awareness.

SA-2 Grail — Russian-built radar-guided SAM for use against medium- to high-altitude targets. The non-mobile SA-2 was designed in 1956 and is not particularly hard to spoof.

SA-6 Guideline — Russian-built radar-guided SAM for use against medium-altitude targets. The SA-6 was designed in 1967 and is both accurate and mobile.

SA-7 Gainful — Russian-built shoulder-launched infrared SAM. Only effective against low-flying targets, and susceptible to spoofing by flares.

SAM — Surface-to-air missile.

Shaped charge warhead — Type of warhead where the explosive is shaped to maximize blast in one direction. Usually used in air-to-ground and surface-to-surface weapons.

Sidewinder — Nickname for the AIM-9 series of heat-seeking air-to-air missiles.

Silver Star — Award given to members of the U.S. military, serving in any capacity, who are cited for "gallantry in action against an enemy of the United States while engaged in military operations involving conflict with an opposing enemy force."

Situational awareness — The state of being cognizant of the positions and movements of all participants (including missiles) in an aerial engagement.

Six o'clock — Directly behind you. Twelve o'clock is straight ahead, three o'clock is to your right, and so on.

Snapshoot — Another name for the weaving bullet path shown by the LCOS. Sometimes called the "snake" because of its writhing motion.

Speed brakes — Control surfaces designed to increase drag (and thus reduce speed) when used.

Spoof — Fool an incoming missile.

SRM — Short range missile. SRM is a HUD notation indicating a Sidewinder is the selected missile.

Stall — An out-of-control condition caused by low airspeed or radical maneuvering at high altitudes.

Stick — See *Flight stick.*

Stores — Any armament, additional equipment or cargo on an aircraft.

Stores control panel — Display showing information about the stores, radar and HUD mode, located on the lower left of the forward instrument panel.

Strafe — To attack a ground target with guns.

STRF — Strafe. An abbreviation for air-to-ground cannon HUD mode.

Target designator — Box which is displayed over the locked target on the HUD.

Target locator line — Line at the top of the HUD in air-to-air modes showing approximate enemy location when the target is out of the HUD.

Television-guided — Relies on television images for targeting. The TV-guided weapon is equipped with a camera in its nose. The weapon's seeker locks onto a given video image and homes on it.

Threat — Armed, hostile opponent.

Threat warning indicator (TWI) — Part of the threat warning system on the left side of the F-16's forward instrument panel. The TWI is a round screen on which radar-emitting threats are displayed. Relative position of threats is shown, with the Falcon's position at the center.

Threat warning system — Complete system comprising the lock and launch lights and the threat warning indicator; located on left of the forward instrument panel.

Top Hat — Callsign for your squadron's AWACS.

Tracking radar — Radar mode in which contacts are displayed as from a top-down view of the situation with your Falcon at the bottom center of the radar screen.

TV-guided — See *Television-guided.*

TWI — Threat warning indicator.

UCMJ — Uniform Code of Military Justice. The UCMJ is the legal system governing the conduct of all members of the U.S. military.

Video-guided — See *Television-guided.*

Waterline — Line shown on the REO in the various radar modes to show the relative position of the horizon.

Waypoints — Navigational positions pre-programmed into the Falcon's flight computer, usually target locations.

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