F117A

F-117A NIGHTHAWK STEALTH FIGHTER 2.0

POWERPLUS

MICRO PROSE

NIGHTHAWK
F-117A™
STEALTH FIGHTER 2.0
TECHNICAL SUPPLEMENT
for IBM & compatible computers

MICRO PROSE
ENTERTAINMENT • SOFTWARE

Contents

Your *F-117A Stealth Fighter 2.0* should contain a manual, this technical supplement folder, two high density 5 1/4" disks or three 720K 3 1/2" disks, keyboard overlays, a registration card, and a backup disks order card.

Required Equipment

Computer: This simulation runs best on 16 MHz (or better) machines (usually a 386) or a computer 100% compatible. The machine must have at least 640K of RAM.

Controls: The game can be run entirely from the keyboard, or with a joystick and keyboard. A MicroSoft mouse (or compatible) may also be used for various functions. A joystick greatly improves the realism of the simulation, and is highly recommended; a mouse is also very convenient.

Display: The simulation requires a VGA monitor with an MCGA or VGA graphics system.

DOS: You must have IBM or MicroSoft DOS, version 3.0 or higher.

Copy Protection

F-117A has no disk copy protection. This means you can install the game files from the original disks however you like: onto other floppy disks or onto a hard drive. The game will start and run from any of these.

However, the program will ask you to identify a combat aircraft after you boot up; use the illustrations in the back of the manual to answer this question.

We regret that continued software piracy necessitates this hindrance to you, but we've done our best to design the protection to minimize intrusion upon legitimate owners.

Installation

Before you play the game we strongly recommend that you install the game onto other floppies or onto your hard drive. You may play from the original disks if you want, but no information will be saved onto them.

You can install the game files in any way you see fit: you may simply use the DOS COPY command to move the files from one location to another (see your DOS manual for details), or you can use the INSTALL program provided on disk "A", which transfers all game files from the original disks onto other floppies or onto a hard drive.

Using the INSTALL Program: Place disk "A" into your floppy drive A and type "A:" followed by the return/enter key. Then type "INSTALL" followed by return/enter. After this, just follow the prompts.

If you are installing onto a hard drive the program creates a directory entitled "MPS" (if one already exists, a new one is not created, but used instead). It also creates a subdirectory called "F117". Finally, it creates a batch file called "F117.BAT" in the MPS directory. Feel free to move or modify this batch file as you see fit. None of the files are copy protected and may be erased, moved, backed up, or reinstalled as desired.

Loading from Floppy Disks

1. Boot your machine using DOS (version 3.0 or higher).

2. Insert Disks: When the ">" prompt appears, insert the *F-117A* disk "A" into the A drive.

3. Load Program: Type "A:" followed by the return/enter key. Then type "F117"; the game should begin loading.

4. Other disks: During loading you may be asked to insert additional disks; follow the screen instructions.

Loading from a Hard Disk

1. Boot your machine: Turn on the computer and wait for the ">".

2. Load the game: go to the "MPS" directory (or wherever you have put the game files), using the DOS "CD" command. Then type "F117" to start the game.

Memory Considerations

Like many recent simulations, *F-117A* requires large amounts of RAM. VGA/MCGA graphics use the most memory. Of the sound options, IBM sound requires the least while AdLib and Roland use significantly more. Joystick control requires no additional memory.

DOS 4 operating systems require significantly more RAM than DOS 3; version 5 requires the least, if you have at least 1 meg of RAM and it is set properly.

Never use terminate and stay resident (TSR) programs, such as RAM disks, notepads, network drivers, and so on, while running F-117A.

🚫🗑️ **Don't Trash!**

Your Official Proof-of-Purchase is located on the reverse side.

The official proof-of-purchase is required when ordering a backup copy of your game, and when participating in most MicroProse promotions!

Problems?

The latest notes regarding this program can be found on disk, in an ASCII file named "READ.ME" You can read this file using standard DOS commands, such as "TYPE".

If the program does not load or run correctly, turn off your entire machine and restart it. Make sure DOS and *F-117A* are the *only* programs loaded into memory.

If you continue to have trouble, try the original *F-117A* disks. Your copies may be bad. If the originals don't work, try the original *F-117A* disks in another machine. If the disks work in another machine, then your machine has compatibility problems (i.e., some aspect is not entirely IBM compatible).

If you have trouble loading on other machines as well as your own, you may be one of the tiny percentage with a defective disk. In such cases, contact MicroProse Customer Service in Tetbury at (0666) 504326, Monday through Friday, 9am-5pm . Please have a pencil and paper handy when you call.

F-117A ™

KEY CONTROL CARD

KEY CONTROLS SUMMARY

Controller   Joystick, mouse, arrow keys, or numeric key pad
Selector   Joystick button 1, left mouse button or return key

Action desired	Joystick	Cursor Keys	Keypad
pitch down	forward	up arrow	8
roll right	right	right arrow	6
roll left	left	left arrow	4
pitch up	back	down arrow	2
dive right	forward/right	-	9
dive left	forward/left	-	7
climb right	back/right	-	3
climb left	back/left	-	1
stick sensitivity	Ins key (tiny, small and medium stick movement)		
max stick movement	fast double-press of the key		

Throttle

Maximum power	Shift +
Increase throttle	=
Decrease throttle	-
No power	Shift -

Weapons Controls

Select Weapon	Spacebar
Fire Weapon	Return/Enter or joystick button 2
Fire Cannon	Backspace or joystick button 1

Defenses

Drop Flare	1
Drop Chaff	2
IR Jammer on/off	4
ECM on/off	4
Drop Decoy	5

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Equipment Controls

Gear up/down | 6
Autopilot on/off | 7
Bay open/closed | 8
Flaps in/out | 9
Brakes on/off | 0
Eject | Shift F10

Display Controls

HUD Modes | F2
HUD de-clutter | V
Maps | F3
Day/night HUD | F4
Ordnance | F5
FLIR on/off | F6
ILS on/off | F9
Mission orders | F10

Tracking Camera Controls (right MFD)

Cam ahead | /
Cam rear | >
Cam right | <
Cam left | M
Designate new target | N
Select target | B

INS (Inertial Navigation System)

Select waypoint | F7
Change waypoint | F8
Reset waypoint | Shift F8
Last waypoint | PgUp*
Next waypoint | PgDn*
Move waypoint up | Up arrow or numeric keypad 8*
Move waypoint down | Down arrow or numeric keypad 2*

Move waypoint left | Left arrow or numeric keypad 4*
Move waypoint right | Right arrow or numeric keypad 6*

*(*shift if not using joystick)*

From-the-Cockpit Viewing

Cockpit view | F1
View ahead | Shift /
View rear | Shift >
View left | Shift <
View right | Shift M

Out-of-Plane Viewing

Slot view | Shift F1
Chase plane | Shift F2
Side view | Shift F3
Missile view | Shift F4
Tactical view | Shift F5
Inverse tactical view | Shift F6

View Control Keys

Zoom view | Z
Unzoom view | X
View angle view | C

Other Controls

Accel time | Shift Z
Norm time | Shift X
Pause | Alt/P
Unpause | Any key
"Boss" hide game | Alt/B
Quit | Alt/Q
Resupply (training) | Alt/R
Volume adjust | Alt/V cycles through all 4 levels sound level 3 = all sounds

sound level 2 = all sounds except
engine background noise
sound level 1 = firing and explosions
only (no warning sounds)

Detail adjust   Alt/D cycles through all 4 levels
detail level 3 = exceptional detail (for
average 386 and above)
detail level 2 = moderate detail (for
slow 386 and fast 386)
detail level 1 = limited detail (for
average 286)
detail level 0 = limited detail (for
anything else)

Special Controls

Go to Training (Alt/T): Tapping this key converts your
current mission into a training mission. This means
that henceforth enemy weapons do not damage, and
that Resupply (Alt/R) is now available. A mission
converted to training cannot be converted back. Note
that you score nothing for a training mission.

Teleport (Alt/cursor keys): These keys function only in
training. Tapping the key "teleports" your aircraft in that
direction. The distance you're "teleported" varies with
the current zoom/unzoom scale of the satellite map.

Day/Night (Alt/N): This key functions only in training.
Tapping it will switch the current time of day from night
to day, or day to night. Once this key is used, it will be
permanently day or night for the duration of the
mission.

Resupply (Alt/R): This key functions only in training.
Tapping it will re-fill your fuel tanks and weapon bays.

DISPLAY COLOURS SUMMARY

HUD Colours

Black rectangle	Ineffective weapon (day)
Maroon rectangle	Ineffective weapon (night)
White rectangle	Effective weapon
White oval	Effective weapon, locked on target
Red oval	Highly effective weapon, locked on target

EMV Scale Colours

Red bar	Enemy ground radar
Pink bar	Enemy ground radar - poor detection
Yellow bar	Enemy ground radar - good detection
Light blue bar	Enemy aircraft radar
White bar	Enemy aircraft radar - good detection

Satellite Map (Left MFD)

Flashing white dot	Your aircraft
Red dot	Other aircraft
Black dot	Ground radar
Yellow dot	Missile
Dotted line	Pulse radar (the colour matches EMV colours)
Solid line	Doppler radar (the colour matches EMV colours)

Tactical Display (Left MFD)

Grey squares	16km grid
Green radar dish	Ground radar
Blue boat	Warship radar
Solid grey rectangle	Airfield
Red crossed circle	Other ground targets
Blue airplane	Your F-117A/other friendly aircraft
Grey outline	Decoy
White dots	Chaff
Red/yellow burst	Flare
Yellow plane	Enemy plane - higher altitude
Light red plane	Enemy plane - similar altitude
Dark red plane	Enemy plane - lower altitude
Yellow line	Radar-guided missile
Red line	IR-guided missile
White line	Visually guided missile
Flashing item	Your objective
Grey-boxed item	Current target
Colour-boxed item	Source of enemy radar signal

INS Waypoints Fuel Bar

Black region	Fuel consumed
White region	Fuel for flight to current waypoint
Blue regions	Fuel for flight to other waypoints
Green region	Reserve fuel

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MADE IN THE UK

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TABLE OF CONTENTS

1 F-117A TUTORIAL

YOUR FIRST MISSION

FLYING TO THE TARGETS AND BACK

This tutorial guides you through your first stealth mission. You'll fly from an aircraft carrier in the Mediterranean Sea into Libyan airspace. There you'll destroy a surface-to-air missile (SAM) radar installation. This mission is a practice run, and flying it is not required; it's purely a convenient way to help you learn to use your F-117A. If you prefer to study the aircraft before you fly, go directly to Chapter 2, page 27.

Before you start, install the game onto either floppy disks or a hard disk (see "Installation" in the Technical Supplement for details). You can run the game without installation, but no information is saved. Now load the installed game into your computer (see "Loading" in the Technical Supplement for details).

Terminology

Each key control has a name in *italics*, and is followed by a parenthesized label, indicating which key is referred to by the name. The italicized names used in this manual also appear on the keyboard overlay.

Controller refers to the pointing device you use. This may be a joystick, mouse, or cursor keys. We strongly recommend you use a joystick to fly the aircraft, and a mouse to make selections on the starting screens. Only a joystick or the keyboard may be used to fly the airplane; however, any of the above may be used to make selections from the starting screens.

Selector refers to the Left Mouse Button, Joystick Trigger, Return key, or Enter key, depending on your hardware setup. When the manual says to press the *Selector*, this means to press the button (or Return key) of whatever hardware you're using.

Preflight Briefing Options

Answer the Aircraft Identification Quiz: Check pages 164-172 of this manual to see which aircraft is illustrated.

Pilot Roster: After answering the quiz, you are shown the Pilot Roster, where you must enter a name. Use the *Controller* to move the arrow cursor over the name you want to erase (note that the names highlight as the cursor moves over them). Press the *Backspace* key to erase the highlighted name, type your own name, and press the *Selector*.

A form now appears to the right of the screen, on which you can set some difficulty level options. Since this is your first mission, accept the default options, by selecting "Form Complete" at the bottom. Then select "Exit" from the lower right of the screen.

Ready Room: You now find yourself in the pilots' Ready Room, where pilots wait to be given orders. Notice that there are several doors which you can enter. But for now, simply move the arrow to the Briefing Room door and tap the *Selector*.

Intelligence Briefing: When you enter the Briefing Room, you are automatically assigned a mission. The briefing map shows the general topography of the area, your takeoff point (T), your primary (P) and secondary (S) targets, and your landing point (L). To the right is a menu of options. Select "Mission Brief" to read a detailed description of what you are expected to accomplish. Then press the *Selector* again to see the remainder of the summary, which describes your flight plan and the rules of engagement under which you are operating. Now press the *Selector* again to return to the briefing map.

You may wish to investigate the other options on this map. If so, see "Briefing Room" on page 33 for details. When you are finished studying your mission assignment, choose "Select Weapons" from the menu.

Arming Room: Next you are shown the weapons your crew chief suggests you use for this mission. You could override his decisions and take different weapons, but for this training exercise, take his advice and choose "Go To Hangar" from the menu at lower right.

Hangar: You're now in the Hangar, where your F-117A is being fueled and loaded for the mission. Select "Yes" from the requestor that asks if you're ready.

The Cockpit Console and HUD

Place the appropriate overlay on your computer keyboard. It shows all the controls for your F-117A.

The Cockpit Console: The lower half of your screen represents the cockpit console of the F-117A. The various elements are described on pages 40-54. We suggest you toggle through the various displays on the Multi-Function Displays (MFDs) to get familiar with them.

The left MFD has two map displays. Tap *Maps* (F3) to toggle between them. The right MFD displays either a camera view of the outside world or a data screen. The data displays include:

Weapons (F5): The weapons currently in your weapons bays.

Select Way Pt (F7): A list of the current INS waypoints, including the one you're currently being steered toward.

Change Way Pt (F8): A list of the four INS waypoints, which you can change on the satellite/radar map (on the Left MFD).

Reset Way Pt (Shift F8): resets waypoints to the initial defaults.

Mission (F10): A brief summary of your mission orders.

The Tracking Camera views also appear in the right MFD and show a zoom TV image of a target, with its name, range, and bearing superimposed. The camera is limited to a range of 80-100 kilometers (km). You have these viewing options:

Cam Ahead (/): Aims the camera at the nearest standard target ahead.

Cam Rear (>): Aims the camera at the nearest standard target behind.

Cam Left (<): Aims the camera at the nearest standard target to your left.

Cam Right (M): Aims the camera at the nearest standard target to your right.

Select Target (B): Cycles through all standard targets in the current direction.

Designate New Targ (N): Aims forward camera at nearest target (any type) ahead.

For more information on the target tracking-camera system, see page 45.

The HUD: The upper half of your screen represents the transparent HUD (heads-up display), through which you can see the world beyond. The various symbols and numbers are described in Chapter 2, on pages 40-44.

The HUD has three operating modes: NAV for navigation, AIR for aerial combat, and GND for ground attacks. Tap *HUD Modes* (F2) to cycle through the three settings. Note that in AIR and GND modes the symbols that appear depend on the currently selected weapon. Tap *Select Weapon* (Space Bar) to cycle through your weapons. If you're unsure of what weapons you have on board, tap *Weapons* (F5) to see a display of your four weapons bays, and what they contain.

Hints

To get the most out of this tutorial, remember three things:

There is no danger: Since this is a training mission, enemy weapons are harmless. You've chosen the "No Crash" option, so you can't crash into the ground. Further, you have an automatic radar altimeter that keeps you above 200'. However, it only makes mild corrections, and is helpless against truly wild maneuvers.

Use the "Pause" Key: To best use this tutorial, pause the game – tap *Pause*, (Alt/P) – and read the next few paragraphs, then "un-pause" (tap any key) and resume the action. Whenever you're confused, pause and consult the manual for help.

Resupply if you need it: In training missions, you can get an infinite supply of fuel and ammunition. Each time you tap *Resupply* (Alt/R), your fuel tank is filled and your ammunition is increased to the maximum possible level.

Preflight Checklist

Check the Inertial Navigation System (INS). Tap *Maps* (F3) until the satellite/radar map is displayed on your left MFD. Next tap *Select Way Pt* (F7) to display the INS waypoints list on the right MFD. Look up on the HUD and note on the horizontal heading scale (along the top of the HUD) the location of the INS cursor (blue triangle). You must fly in this direction to reach the first waypoint (see page 53 for details).

Check Armament: Tap *Weapons* (F5) to display the weapons in your bays on the right MFD. As you use *Select Weapons* (Space Bar) to cycle through the weapons, note the active weapon message in the lower left corner of the HUD.

Extend the Flaps: Tap *Flaps* (9). Note the "FLAPS" indicator light in the upper right section of the console. Flaps give you more lift during takeoff.

Check the Catapult: When launching from an aircraft carrier, as you are now, the brakes must be set. This represents the aircraft's attachment to the carrier's catapult system. If the "BRAKE" light is not illuminated on the console, tap *Brake* (0) to set the brakes and engage the catapult.

Start the Engines: Turn on your engines by tapping *Max Pwr* (Shift +). Notice the digital throttle power readout increase to 100 in the lower right of the console (this represents 100% power).

Activate Catapult: When the throttle readout shows 100% power, tap *Brake* (0) to release the brakes and catapult your F-117A off the deck.

Accelerate Past Stall Speed: As you zoom down the deck, watch the speed scale (left side of the HUD) carefully. A bar on that scale will gradually drop down. This is the Stall Speed Indicator. When the Stall Speed Indicator bar drops below the center tick on the scale your plane is past stall speed and you're travelling fast enough to climb into the sky.

Climb: Once you're flying more than 10 knots (kts) faster than stall speed, pull back on the stick to point your nose skyward, then release the stick. Watch the altitude scale on the right side of the HUD; you'll start climbing. Don't climb so steeply you lose sight of the horizon because you may stall. You must start climbing by the time you reach the end of the carrier deck, or you may get wet.

Retract Landing Gear: Once airborne, immediately tap *Gear* (6) to retract your landing gear. Don't leave the gear down – high speeds can rip it off.

Retract Flaps: Tap *Flaps* (9) to retract your flaps. You no longer need extra lift.

Flight to the Primary Target

A Light Touch: Use a light touch on the *Control Stick*. The most common pilot error is a "ham fist" on the stick, throwing the plane wildly around the sky. Use small motions on the stick; the F-117A is very responsive.

Chasing the Gauges: When you roll an aircraft left or right, pitch it up or down, change the throttle, the flaps, or the brakes, it takes a moment for the plane's new situation to be reflected by the gauges. Good pilots fly by making a change, then wait a few seconds to see the results. If you don't, you'll just "chase gauges" that are still changing.

Level Flight: Once airborne, try to achieve level flight. Push the control stick forward or back until the horizon is level across the middle of the HUD and the Flight Path Indicator (see page 42) rests on the horizon. Then make fine adjustments until you're neither gaining nor losing altitude.

Since this is a stealth mission, you want to fly between 500' and 1,000'. Look at the altimeter (vertical scale on the right side of the HUD). If you're above the "1k" mark (1,000') you're too high. Push the nose down into a gentle dive until you reach the desired altitude. Then level out and again place the Flight Path Indicator on the horizon.

Flying on Course: Look at the heading scale across the top of your HUD, find the INS cursor (the small, bright triangle above the top), and turn toward it. As you turn the triangle will move toward the center of the heading scale; when the triangle is in the center of the scale you're "on course" to the first waypoint.

To turn, gently pull the stick left or right. The plane will bank. Release (center) the stick when the bank angle is about 45°. To increase the rate of turn you can pull back on the stick a little. As you do this, watch your speed (on the left of the HUD) and altitude (on the right). A turn with back pressure can slow your plane and cause it to lose altitude, so don't pull back too much. *Minimum safe altitude* is about 200'. However, in this training mission stay at 500'.

Minimum safe speed varies with the current status of your aircraft. The Stall Speed Indicator bar rises from the bottom of the speed scale when you travel too slowly. If this bar reaches the center tick-mark of the scale, your plane is stalling (the "STALL" light will flash and you'll hear an alarm). A stall causes the plane to fall out of control, so try not to stall the plane. If you do, lower your nose to regain airspeed, then pull out into level flight.

Autopilot: If you're confused about which direction to fly, and how to do it, tap *Autopilot* (7). It takes over immediately, turning you onto the correct course. If you're below 500' the autopilot will climb to that altitude. If you touch the control stick the autopilot automatically turns off.

Enjoy Yourself: Once on course, enjoy yourself by trying out all the views.

You can see out the front, rear, and sides of the cockpit canopy using *View Ahead* (Shift /) *View Rear* (Shift >), *View Left* (Shift <), and *View Right* (Shift M). These views assume you are inside the cockpit looking out.

You can also "step outside" your aircraft and watch it using *Slot View* (shift F1), *Chase Plane* (shift F2), and *Side View* (shift F3). Bank the plane left and right to observe the difference between the chase plane and slot views. *Missile View* (Shift F4), *Tacti View* (Shift F5), and *Invrs Tacti View* (Shift F6) are used in combat situations. See page 36 for more detailed description of these options.

You can return to the cockpit at any time; just tap *Cockpit* (F1).

Passing the First Waypoint: When you reach the first waypoint a message appears on the HUD: "Waypoint 1 Reached." Your INS system immediately switches to the next waypoint (the INS cursor jumps to the new heading), which is your primary target. If you have changed the waypoints, tap *Reset Way Pt* (Shift F8) to reset the waypoints to the default settings.

Extra Fuel: You'll notice that one of the four items in your weapons bay is an extra fuel tank. This is because the mission from CV *America*, to Tripoli, and then to Sigonella in Sicily, is a very long trip.

To see your fuel status, tap *Select Way Pt* (F7). The bar gauge across the bottom shows the fuel on hand. The black area at right represents fuel already consumed. The four color-coded bands in the middle represent the amount of fuel needed to reach each of the four waypoints (fuel calculation is based on your current altitude and speed). The final band to the left represents the amount of reserve fuel available.

Your engines cannot draw fuel directly from the extra tank in your bay, so you must pump it from the extra tank into the main tank. To accomplish this, tap *Select Weapons* (Space Bar) until extra fuel is the current "weapon" ("EXTRA FUEL" appears in the lower left corner of the HUD). Now tap *Fire Weapons* (Return key) to "fire" the fuel from the spare into the main tank. If you tap *Select Way Pt* (F7) again, you'll see the fuel status has changed.

Accelerated Time: You can speed the passing of time by tapping *Accel Time* (Shift Z). This doubles the rate at which time passes. To return to normal time, tap *Norm Time* (Shift X). If you forget to return to normal time, don't worry; combat activity or lowering your gear returns you to normal time automatically.

Attacking the Target

Once you're well past the first waypoint and the coast of Libya is on the horizon, it's time to start thinking about hitting your primary target.

Check the Tactical Situation: Switch your left MFD to the gridded tactical map by tapping *Maps* (F3). Your target is a radar site, so look for a radar symbol on this map.

Acquire the Target: Switch your HUD to GND (Air-Ground) mode by tapping *HUD Modes* (F2) until the GND light below the HUD illuminates, then tap *Cam Ahead* (/). If your target does not appear in the right MFD, tap *Select Target* (B) until it does. If you cycle through all possible targets and still don't see the primary target, you're either too far away for your targeting system to see it, or you're somehow flying in the wrong direction.

Select your Weapon: Tap *Select Weapons* (Space Bar) until the message "2 Maverick" appears in the lower left of the HUD.

Wait for Missile Lock: When you've acquired the target, you'll see a box on the HUD. This is the "Tracking Box;" the radar site that appears on the right MFD is in the center of this box.

Missile Lock: When you get within missile launch range, this box changes to an oval; in addition, the red "LOCK" light on your console begins flashing, and a box (the "Lock Box") appears in the middle of the right MFD.

Optimal Missile Lock: If you wait longer, the Tracking Oval turns red and the "LOCK" light ceases flashing and becomes solid; the Lock Box in the right MFD will begin to collapse repeatedly. These indicators signal that "Optimal Launch Range" has been reached and that the missile should be launched immediately.

Launch Altitude: If you launch a weapon while flying too low, you may be caught in the blast area, or a missile may hit the ground before its motor can power it up and away. A simple rule to get you started is that missiles and retarded bombs require at least 500' altitude, free-fall and laser bombs 3,000'.

Launch: When you reach "Optimal Launch Range," open the weapons bay by tapping *Bay Doors* (8), then launch the missile by tapping *Fire Weapon* (Return). After launching, turn away slightly, since flying through an exploding target could damage your aircraft.

Shortly thereafter the missile should hit the target. A successful hit causes a fire and sends a cloud of smoke up into the sky. You get a report on your HUD (sent from an observing AWACS) about the success of the attack.

The Secondary Target: You can now fly to the secondary target (use the INS cursor as a guide) and attack it as well, using the same procedure. Or, if you wish, call it quits and head for home.

The Return Trip

Setting the INS to the Landing Point: Tap *Reset Way Pt* (Shift F8) to insure the default waypoints are loaded in your INS (inertial navigation system), then tap *Select Way Pt* (F7). Now examine the list of waypoints on the right MFD. There are four waypoints listed. If the fourth one is not highlighted, tap *Next Point* (Keypad Shift 3) until it is highlighted. This switches the INS to that point. The last point on the default list is always your return base.

Flying Home: You can either use the autopilot or manually fly home. As before, guide yourself using the INS cursor. When the INS cursor is lined up on the center of the heading scale, you're on course.

If you look at the map (Tap *Maps* (F3)) until the Satellite map appears on the left MFD), you'll notice there's a small island (Malta) just south of Sicily. You should steer just east (to the right) of Malta. As you near Malta, tap *HUD Modes* (F2) to change your HUD to NAV mode, then tap *Cam Ahead* (/). If the Sigonella airbase comes up on the right MFD, fine; this is your destination! However, it's likely that Halfar airfield on Malta will appear instead (it's closer). Tap *Select Target* (B) until Sigonella appears.

Landing at Sigonella Airbase

Level Flight: About 50 km from Sigonella, start lining up your landing approach by achieving level flight at 500' to 1,000' altitude.

ILS: Turn on the Instrument Landing System (ILS) by tapping *ILS* (F9). A horizontal and vertical bar appear on your HUD, representing your position relative to the "glide slope." The glide slope is an imaginary line extending out and up from the runway. First you'll line up beneath this glide slope then follow it down onto the airbase. For more details, see page 54.

Line Up Your Approach: If the vertical bar is left or right of your Nose Indicator, turn in that direction until the bar starts moving toward the center. You want to get back onto a heading of 000° just as the bar centers on the Nose Indicator. Don't worry if the bar is a little off center; as long as Sigonella is dead ahead the vertical bar will gradually creep toward the center. If the bar moves away from center, however, you're travelling away from the glide slope – turn the other way to correct your course.

Reduce Speed: Now cut your throttle back to about 50% by tapping *Decr Pwr* (-) a few times. To maintain level flight while your speed decreases, pitch your nose up slightly (but watch the altimeter on the right side of the HUD, you don't want to gain altitude).

Extend Flaps: When your speed reaches about 300 kts, extend your flaps by tapping *Flaps* (9). This slows you further by giving you more lift. You'll have to readjust the nose a little to maintain level flight.

Lower Gear & Reduce Speed Again: Tap *Gear* (8) to lower your landing gear, and cut the throttle to about 40% power. As your speed gradually decreases you'll have to raise the nose to maintain level flight. By this time you should be close to the glide slope, and travelling about 200 to 250 kts with your speed still decreasing.

If you're moving too fast, tap *Brakes* (0) to extend your airbrakes, then a few seconds later, tap it again to close them. Do not leave the airbrakes open, as this may cause you to stall and crash.

Intercept the Glide Slope: As you get near the airfield, the horizontal ILS bar on the HUD begins to move downward. When the bar approaches the Nose Indicator, pitch your nose down a little. Your objective is to go into a gradual descent that keeps the bar aligned with the Nose Indicator. Watch the Angle of Attack Approach Indexer to determine how much to raise or lower your nose: if the up-arrow is illuminated, pitch up a little; if the down-arrow is lit pitch down (the goal is to have the green cicle in the center lit). To avoid gaining speed in the descent, tap *Decr Pwr* (-) again to reduce your power.

If your speed is too slow, look at the Stall Speed Indicator (the colored bar rising from the bottom of the airspeed scale). If the stall bar is close to the middle of the scale, you're getting into trouble. Tap *Incr Pwr* (+) key once or twice.

As the airstrip comes up, check your speed. You should be travelling between 150 and 200 kts, or decreasing from 250 kts toward 200 kts. If your speed is above 250 kts, you're coming in too fast. Tap *Max Pwr* (Shift +), raise your landing gear, and retract flaps; you try again. Fly to Malta, turn around, and start over.

Touchdown: If your speed is correct (150-200 kts), start watching the altimeter. It should be at 100' to 300' and decreasing. Make small adjustments with the control stick to keep the descent rate steady, but not too fast. The runway is at 0' altitude. When you hear the squeal of your wheels on the pavement, tap *Brakes* (0) instantly, then shut off the engines by tapping *No Pwr* (Shift -). You've made a safe landing.

YOUR SECOND MISSION

DEALING WITH THE ENEMY

On your second practice mission you'll learn about enemy radar, aircraft, and missiles. When you get back to the Ready Room, go straight back into the Briefing Room. You'll be assigned the identical strike against a Tripoli radar station, but this time you're going to worry about the enemy too.

Mission Planning: Before takeoff, check out the intelligence briefing in more detail. Highlight the *Radar Sites* option on the menu and select it. Now use your controller to move the arrow around the map. As it passes over radar site icons, information about missile defenses at the site appears. If you select one of the icons, the effective range of the search radar at that site appears as a circle. You can select any or all of the sites at will and turn the range of each site on and off individually. Each solid circle is a Doppler radar, each dotted circle a pulse radar.

This screen helps you plan a route to Tripoli and back. Remember, the waypoints set in your F-117A's INS outline the default route shown on the map. You may wish to fly a better route, to evade enemy detection as much as possible.

Basically, you avoid detection by Doppler radars if you arc around them, keeping a constant range to the radar. You avoid detection by pulse radars if you fly directly toward or away from them. For more information about radar, see page 74.

When you're finished, you should have a mental "map" of where enemy radars are, how you'll fly through them to avoid detection, and what weapons you'll use to achieve your objectives.

Adjusting Waypoints: When you are on the carrier deck awaiting takeoff, you may wish to adjust the waypoints to fit your own mission plan. The first waypoint, by default, is half-way between your takeoff point and the primary target. Most pilots adjust this point.

To make adjustments, tap *Maps* (F2) until the satellite map appears on the left MFD. Then tap *Change Way Pt* (F8) to display the waypoints list on the right MFD and the plotted flight plan on the left MFD. Use the *Adjust Waypoints* keys (Keypad/Shift 2, 4, 6, and 8) to move Waypoint 1 around the satellite map. Notice the course line automatically "snaps" to the new waypoint as you move it. If you don't like your adjustments, tap *Reset Way Pt* (Shift F8) to reset all the waypoints to the initial default.

Flying to the Target: After takeoff, as you fly to the target, watch the radar patterns on the left MFD satellite map.

Enemy radar signals are displayed as arcs on this map. Dotted arcs represent pulse radar; solid arcs, Doppler. Ground search and AWACS radars are expanding circles, while all aircraft radars and ground tracking radars are short arcs.

Missiles and aircraft appear on the Left MFD satellite map as color-coded dots: red dots represent aircraft, black dots are ground radar sites, yellow dots are enemy missiles.

You'll notice that enemy aircraft with their forward-facing radars may complicate your original plan for penetrating enemy air defenses. You'll have to sneak behind or beneath them.

Flying Stealthy: Now that you understand the situation, watch the Electromagnetic Visibility (EMV) scale (below the Left MFD). The "visibility" of your plane to enemy radar appears as a thick, red bar extending from the right of the scale. Your visibility increases with altitude, higher speed, open bay doors, lower gear, or use of jammers. To keep your EMV small, you should fly low (about 200'), keep your gear up, bays closed, and jammers off; you should also fly toward or away from pulse radars, and at a constant distance (arcing around) from Doppler radars.

The thinner bars extending from the left of the scale represent incoming enemy radar signals. Enemy ground-based radar (EGR) signals appear on the top, enemy aircraft radars (EAR) on the bottom. The color of a particular bar signifies whether that radar signal has detected you or not. Basically, yellow, pink, or white bars indicate you've been detected (see page 48, for a complete explanation). Bar colors match radar arc colors on the satellite map. In addition, whenever you're detected by a signal, the EMV light illuminates briefly, and you hear a warning beep.

Warnings

Eventually, you'll make a mistake, or a previously silent enemy radar may suddenly turn on, and you'll be detected. Even if you are never detected by radar on your approach to a target, when you destroy the target, the enemy will certainly be alerted.

Search Warning: Enemy search radar detects your plane when the enemy radar strength bar overlaps your EMV bar. Search detection means that enemy fighters may be vectored toward your location, and that surface-to-air missile (SAM) batteries in the area may start tracking you.

Tracking Warning: Long- and medium-range SAMs must track a target with radar before firing. Tracking radar appears as a short, narrow arc on the Left MFD Satellite map. When the enemy tracks you, the "TRAK" warning light on your console begins flashing.

Missile Warning Lights: If a radar-homing missile is launched toward you, the "RAD" missile warning light flashes; If an IR (infrared) homing missile is launched, the "IR" missile warning light flashes.

The warning light continues flashing as long as any missile of the appropriate type homes on your plane. Missile warning lights are very important, because they're the only indication of what kind of missile is attacking, and therefore, of what defensive measures should be taken.

Missile Proximity Klaxon: When a missile approaches within a few seconds of your plane, the Missile Proximity Klaxon sounds. This very loud, repeating tone means you must do something immediately, or be hit. Typically you'll drop a chaff or flare cartridge, depending on the type of threat (chaff for radar missiles, flares for IR missiles). However, you can also attempt some last-second maneuvering.

Missile Defenses

When the "TRAK" or a missile warning light begins flashing, get ready to use your defenses – an attack is coming.

Understand the Attack: The first step is to check out the attack. Tap *Maps* (F3) to switch the left MFD to the tactical display. Use *Zoom* (Z) and *UnZoom* (X) to find a useful scale. Missiles are small color-coded lines – IR missiles are red and radar missiles are yellow.

Disappearing: If you're attacked by a radar missile (the "TRAK" or "RAD" light – or both – is flashing), you can evade the attack by reducing your EMV. If the enemy radar loses sight of you, the missile loses guidance and flies on blindly.

Jammers: You can use the ECM jammer against radar missiles (missiles that light the "RAD" warning). Tap *ECM* (4) to toggle the ECM jammer on and off. Use the IR jammer against IR-guided missiles (those which light the "IR" warning). Tap *IR Jammer* (3) to toggle it on and off.

After you turn on the jammer, change course and get away from the missile. If you don't, when you turn off the jammer (or when an advanced missile gets close enough), the missile starts homing on you again! Advanced missiles that "burn through" jamming include semi-active radar missiles, command guidance radar missiles, and second generation IR missiles.

Don't leave your jammers running. The ECM jammer increases your EMV; the IR jammer reduces your speed and can overheat (see page 80 for details).

Chaff and Flares: A chaff or flare cartridge lures a missile for two or more seconds, causing it to fly toward the chaff (radar missile) or the flare (IR missile).

Fire a chaff cartridge, tap *Chaff* (2), when a radar missile ("RAD" light) causes the klaxon to sound. Fire a flare cartridge, tap *Flare* (1), when an infrared missile ("IR" light) sets off the klaxon.

Decoys: Your F-117A carries three decoys that will lure everything for several seconds. To launch a decoy, tap *Decoy* (5). The Decoy light in the cockpit turns on, and remains lit while the decoy is running (see page 80 for more).

Maneuvering: Missiles have only a 45° forward "view." If you're outside of this arc, the missile cannot track you. Therefore, if you "blind" the missile with a decoy, jammer, chaff, or flare, then fly outside its arc, the missile may lose you and fly away. Missiles also have very wide turning circles. You can out-turn a missile (see page 83 for more details).

Ending the Second Mission

Use the instructions in the first mission to aid you in destroying your targets and returning to base. But this time practice evading radar and missiles. You may want to fly this same mission a few more times for more practice before trying a "real" mission. Good luck!
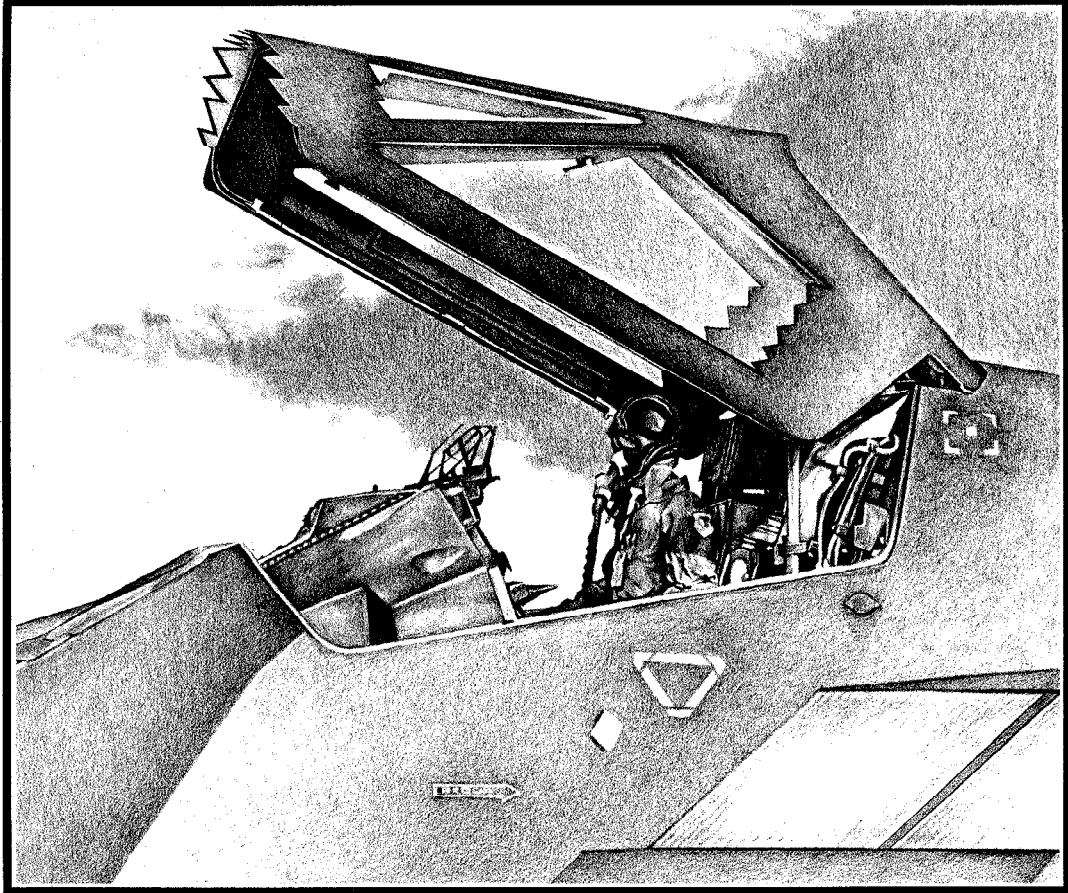
2 OPERATING INSTRUCTIONS

PREFLIGHT BRIEFING

F-117A Stealth Fighter 2.0 has many options. To make a choice, move the *Controller* (joystick, mouse, or keyboard) to position the arrow cursor over the option you want, then press the *Selector* (Button 1, Left Mouse Button, or Return/Enter). Note that pressing Button 2, the Right Mouse Button, or the Escape key, always returns you to the Ready Room (see page 30).

HARDWARE OPTIONS

You may be asked questions about your equipment. See the Technical Supplement for details, including advantageous trade-offs.

AIRCRAFT IDENTIFICATION

To be allowed to choose your own mission assignment, you must correctly identify an aircraft. Flip to the Warplanes section of this manual (pages 164-172) and find the drawing which matches the screen illustration. Observe carefully the shape of the wings, fuselage, nose and cockpit for accurate identification. Then select the correct name.

If your identification is wrong, you are automatically assigned to training. If the identification is correct, you have your choice of assignments.

PILOT ROSTER

Here you can start a new career or continue an existing one. Note that if you erase a pilot's name here the results are permanent. Do not erase pilot names unless you're sure! You will not be able to save pilot records unless you are playing from a copy of the game.

Selecting an Existing Pilot

You can highlight any one of the various names on the roster by moving the arrow cursor (with your *Controller*) over the name you want. Select the name by tapping *Selector*.

Creating a New Pilot

To create a new pilot, you must highlight an existing one and tap the Backspace or Delete key. You may then type in a new name for the pilot. When you've completed the new name tap the return key to enter the new name into the roster. You may then select that pilot as usual by highlighting his name then pressing the *Selector*.

When you've selected a pilot from the Roster a form appears that allows you to indicate some levels of skill for that pilot.

Opponent Quality

The quality of your opponents controls the difficulty of the simulation. The better your opponents, the more difficult your job, but the greater your rewards. Your score is significantly affected by this option. Selecting regular or green opponents reduces your score, making promotions slower and putting the highest medals out of your reach. Selecting veteran or elite opponents increases your score, speeding up promotions and making medals easier to obtain.

Green Opponents: Here the enemy has older aircraft and SAMs. His radar sets are poorly maintained and frequently out of order. Radar operators only understand the rudiments, and therefore are very bad at reading the sometimes-strange signals given off by your plane. Enemy pilots have virtually no skill in aerobatics and dogfighting.

Regular Opponents: Here the enemy has aircraft and SAMs appropriate to the region: older equipment for Third World and client states, more modern equipment when you face a superpower directly. Radar operators are trained and drilled, but lack experience. Enemy pilots have practiced mock dogfights and aerobatics, but lack the quick perception and aggressive maneuvering of a combat veteran.

Veteran Opponents: Here the enemy has aircraft and SAMs appropriate to the region, like regulars, but tend to use only the better equipment in combat. Radar operators are experienced and have a good sense of judgement. Enemy pilots have dogfighting experience and perhaps a few kills to their credit.

Elite Opponents: Here you face the enemy's best. Elite troops always get the best available equipment. Radar operators know their equipment inside out and can interpret your faint, confusing returns only too well. Enemy pilots are often aces who know every trick in the book and aren't above inventing new ones.

Roster

Squadron Bulletin Board

Pilots on Alert:

Pilot · Score Sorties Status

Lt Col Sid "Slime" Maier
Capt Jim "Raff" Sunoski
1st Lt David "V8" McKibbin
Capt "Woof Woof" Hendrick
Capt Bruce "Whammer" Shelley
Major Maximum Remington
Lt Col Al "Chance" Roireau
Major "Gon' Fishin'" Taormino
Major Ed "Coolguy" Fletcher
Press 'Delete' key to eras

2nd Lt Fletcher   Regular
Best Mission: 0   Realisti
Last Mission: 0   MicroPr

FORM AF635-PS Pilot Skill
Name: 2nd Lt Fletcher
Opponent Quality
Green ☐   Veteran ☐
Regular ☑   Elite ☐
Landing Skills
No Crashes ☐
Easy Landings ☐
Realistic Landings ☑
F117A Realism
MicroProse F117A ☑
Lockheed F117A ☐
Form Complete ☐

Landing Skills This option determines how difficult and dangerous it is to fly your F-117A. Your choice here also affects scoring; the more difficult the flight, the higher your scores will be and the easier to obtain medals and promotions.

No Crashes: This is the ideal choice when learning to fly. In a crash situation your F-117A rights itself and keeps going. When landing you can safely hit the ground as hard as you like. Unless you have your landing gear down, an automatic barometric altimeter keeps your plane above 200', simplifying low-level flying. However, enemy weapons are *not* affected and are still deadly. Your score is significantly reduced if you select this option, making promotions and medals hard to get.

Easy Landings: This choice is preferred by casual, weekend flyers. Safe landing parameters are relaxed considerably, which makes one of the toughest jobs much easier. To avoid a crash you must touch down on a runway, aircraft carrier, or prepared landing strip. Hitting the ground or water anywhere else destroys the plane. As in "No Crashes," an automatic barometric altimeter keeps your plane above 200' unless your landing gear is down. Your score is only slightly reduced if you select this option. Promotions are not materially affected, and you qualify for all but the highest medals.

Realistic Landings: You must be skilled to be successful with realistic landings. Coming down too fast can mean instant death. Your score is full value if you select this option. If all other selections are of similar difficulty, you can be promoted quickly and have a fair shot at every medal.

F-117A Realism This determines whether you'll be flying a "real" Lockheed F-117A or the MicroProse enhanced version. The Lockheed F-117A is more restricted in what it can do than the MicroProse F-117A.

Lockheed F-117A: If you choose the Lockheed F-117A you'll have 2 weapons bays instead of 4, not be able to carry air-to-air weapons (including the cannon) nor fly air-to-air missions, you will fly only at night, never launch from carriers, and you'll be much less visible to enemy radar.

MicroProse F-117A: The MicroProse F-117A sacrifices a little of the stealthiness of the Lockheed model for more weapons, more mission types, and day and nighttime flying (though day missions are still very rare). It's your choice!

Form Complete: When you're finished making selections on the form, select form complete. If you're finished with the Roster, select Exit from the lower right corner.

READY ROOM

This is the pilot's Ready Room, where pilots await orders. From this room you can go to any other room to choose various game options. You can also see a summary of all options currently selected, or return to the Pilot Roster.

To enter another room, move the arrow cursor to the door of the room you want to enter and press the *Selector*.

To return to the Pilot Roster, select the bulletin board on the far wall of the Ready Room.

COMMANDING OFFICER'S OFFICE

You go into the CO's office to request transfer to a different theater or a different duty assignment. Here you select the region of the world for your new assignment, the level of political and military tension in that region, and the types of missions you'll be flying there.

Regions of the World

There are nine different areas of the world in which to operate. Each one takes you to a different time period of contemporary history, and each has its own set of unique challenges and missions. Some areas are much more dangerous than others and you are rewarded more lavishly for operating in these areas.


Ready Room

Persian Gulf, 1984: This a complex and moderately dangerous situation. Iran is a radical, revolutionary state involved in a long war with Iraq, as well as numerous shooting incidents with the US Navy.

North Cape, 1985: You face the full strength and power of the Soviet Union during the height of the Cold War. This region contains many large USSR military complexes and naval bases. This is a dangerous area.

Libya, 1986: A client state of the Soviet Union, Libya is one of the prime supporters of international terrorism, and on the receiving end of American air and naval air attacks. This a relatively easy situation.

Training missions in Libya are fixed. Strike training is always a mission from the USS *America* to Tripoli; air-to-air training is always an interception of fighters patrolling the skies over Benghazi.
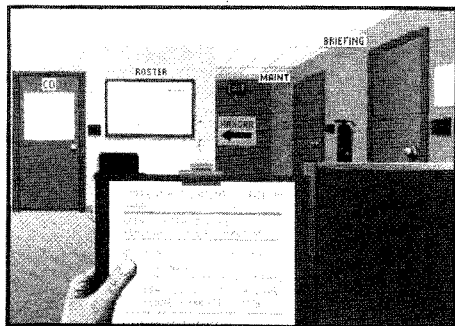
Central Europe, 1986: As in the North Cape, you face first-line forces of the Soviet Union and the Warsaw Pact. Numerically inferior but qualitatively superior NATO forces (including your F-117A) meet this huge military power. Should super-power skirmishing or a full-blown World War III occur, victory and defeat would hinge on events in this region. This is one of the most dangerous areas.

Middle East, 1989: The Middle East is a complex web of confusing alliances and rivalries. You'll face both Soviet and Western equipment as you fly missions against Syria, Iraq, and other terrorist-support states. This a dangerous area.
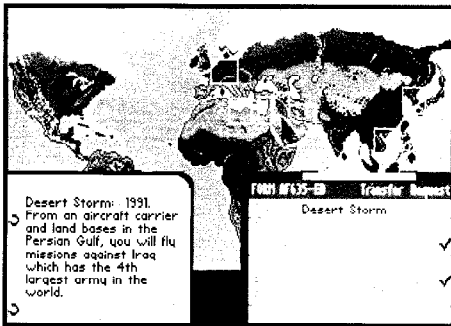
Desert Storm – Iraq, 1991: The vast military might of the US, Great Britain, France, and their Arab allies oppose the Baathist dictatorship of Saddam Hussein and the Iraqi military, in the Kuwait and Iraqi Theaters of Operations. This is a moderately challenging situation.

Vietnam, 1994: The US military has sent air units back into southeast Asia to oppose Vietnamese expansionism and to settle an old score. This is a very dangerous arena.

Cuba, 1995: Cuba is determined to expand the communist revolution into Central America and the eastern Caribbean. Washington has decided to stop it before it spreads. This is a dangerous situation.

Korea, 1997: The Chinese and North Koreans have finally had enough of US-dominated democracy in Asia. They are planning to carry out attacks against US and South Korean installations. Washington, of course, will defend its foothold in the Far East. This is one of the most dangerous situations.

Commanding Officer's Office

Desert Storm: 1991.
From an aircraft carrier and land bases in the Persian Gulf, you will fly missions against Iraq which has the 4th largest army in the world.

Desert Storm

Level of Conflict

The level of conflict in the region has a dramatic effect on how you must fly your missions. Each type of conflict has its own challenges. No choice is easier than another. In general, the hotter the war situation, the more violent and dangerous the mission, while Cold War demands careful planning and good judgement – different skills, but no less important ones!

Cold War means clandestine missions. Flying without being detected is key. (Fortunately, enemy radars and SAMs aren't expecting trouble. They often confirm a contact many times before attacking.) If you are detected, you must destroy the plane or radar which saw you. However, the more you use weapons, especially against any other targets, the greater the scandal, and the less successful your mission. In fact, many missions in the Cold War involve photo reconnaissance, flying secret materials in or out of enemy territory, or surgically "removing" a single, specific target.

Limited War missions are also clandestine. It is still important to fly without being seen, but since warfare is ongoing, military targets are fair game now. However, be careful to avoid hitting civilians. Attack and strike missions are common, but so are photo reconnaissance and clandestine spy missions. In limited war enemy radar operators expect some trouble. Their reactions are slightly faster.

Conventional War is all-out conflict. Inflicting the maximum destruction upon the enemy is the main objective here. Avoiding detection has no political importance, but is useful if you want to survive the mission! Any target in enemy territory is fair game, military or civilian. However, enemy air defense operators rarely confirm their targets – in wartime everybody shoots first and asks questions afterward!

Mission Type

You may select from two types of "real" missions and two types of "training" missions. Training missions represent flying a flight simulator instead of flying a real aircraft.

Air-to-Air Missions have an enemy aircraft as your primary objective. If you're a hotshot with air-to-air missiles (AAMs) and dogfighting, this is your cup of tea. However, the secondary objective is often a ground target.

Strike Missions assign ground targets as both objectives.

Training Missions generate normal air-to-air or strike missions, as appropriate, with three exceptions: you cannot be hurt by enemy fire; you are not scored for the mission – you receive no rating points, no decorations, no promotions (after all, the mission wasn't real!); you receive fixed mission orders. For example, if you selected Libya (as in the tutorial), strike missions are always against a ground target in Tripoli, air-to-air missions are always against fighters over Benghazi. If you're just learning to fly and fight the F-117A, this feature allows you to try the same mission over and over, until you understand fully what's happening.

BRIEFING ROOM

This screen shows a detailed map of the region of the world you chose in the CO's Office. On this map is the flight plan for your proposed mission. Your takeoff point (T), primary target (P), secondary target (S), and landing point (L) are always visible on the briefing map, as reference points.

Also shown on this map are important sites such as airfields and radar and SAM sites. You can learn important information about these sites by moving the cursor over them and reading the text that appears. In addition, you can see the range of various enemy radars and missiles. This screen, with its great variety of information, is the perfect place to plan your mission. You may wish to take notes about particularly dangerous enemies, or the route you have in mind.

Mission Brief

This presents a detailed description of your operational orders, with specific information about the primary and secondary objectives. After you've read this, and you tap the Return key, you'll read about your flight plan, describing your takeoff and landing sites, estimated fuel required, and a summary of the Rules of Engagement (ROE).

Radar and Missile Ranges

If you move the arrow around the briefing map, information boxes appear that tell you important facts about the various sites on the map. If you select one of the site icons, a circle appears that indicates either the radar range of that site or the missile range, depending upon which of the menu items is selected. You can select any or all of the sites at will and turn the range of each site on and off individually. If you choose "Select All" from the menu, all ranges are shown, if you select "Clear All" all ranges currently shown are erased.

Radar Ranges: If you select *Radar Ranges* from the menu at right, you are shown radar ranges when you select a site. The initial range shown is the site's effective radar range; if you then tap the Space Bar, the display switches to maximum radar ranges.

Missile Ranges: If you select *Missile Ranges* from the menu at right, you are shown missile ranges when you select a site. The range shown is always the SAM's maximum range.

Briefing Room

RADAR DATA
LOW IRON
TYPE: SA-3, Pulse
RDR RNG: 15km eff/
MSL RNG: 150km (max)

Radar Ranges
Missile Ranges
Enemy Troops

Select All
Clear All

Mission Brief

Select Weapons
Decline Mission

Press Escape button to return to Ready Room.

33
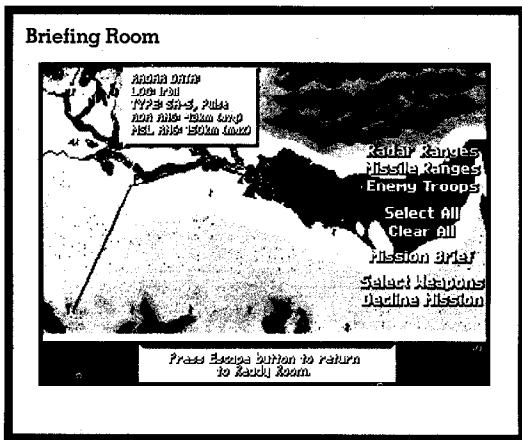
Enemy Troops   Selecting this option shows you the location of known enemy ground force concentrations. These locations are boxed on the map and indicate areas where there are likely to be large numbers of shoulder-launched SAMs.

Decline Mission   If you select this option, the current mission is cancelled and you are given a new one immediately. This may be handy if you want to be selective in the missions you fly.

Select Weapons   This option places you in the Maintenance Room where you can examine the weapons your crew chief has deemed appropriate for your assigned mission and change them if you desire.

Maintenance Room

MAINTENANCE ROOM

Here you select the weaponry and equipment you desire for your mission.

To place a weapon into a bay, use the Controller to move the the arrow to the bay you want to affect, then select the bay using the Selector. Now use the Controller to highlight the weapon you wish to place into the selected bay, and the Selector to place it there.

Note that your estimated fuel required, and current fuel carried, appear; make sure you have enough fuel to complete the mission!

Default Armaments: The initial weapons loaded in Bays 1 and 2 represent your crew chief's choice of weapons for your mission. The weapon in Bay 1 (upper left) is for the primary target, the weapon in Bay 2 (upper right) is for the secondary. If extra fuel appears in one of your bays it's because the crew chief has determined you'll need it.

Choosing Armaments: See pages 139-141, for details about each weapon. The "Weapon Effectiveness" chart, page 139, rates all weapons against common targets. It's wise to carry at least one "7" or "6" rated weapon for the primary and secondary objectives.

THE HANGAR

Here you see your F-117A being topped off with fuel for the mission. You are given the choice to go ahead and fly the mission or return to the Ready Room. Of course if you go ahead and fly, there's no turning back; but if you return to the Ready Room, you can go to any of the above rooms and change your assignments at will.

Hangar

Are you ready for your mission?

Yes   Not Yet
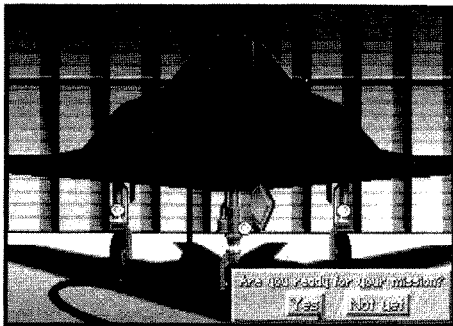
SIMULATION CONTROLS

VIEWING
CONTROLS

The following views are from inside the cockpit of the F-117A. They allow you to look in four different directions and change the cone of view out the front of the cockpit.

From-the-Cockpit Views

Cockpit: Tap *Cockpit* (F1) for the standard view, looking out of your cockpit through the HUD.

Wide Angle View: The *Wide Angle* key (C) toggles between a standard viewing arc (about 60°) and a wide-angle viewing arc (about 120°). This view places your point of view farther back in the cockpit, showing more of the cockpit structure and a wider angle view of the world outside. This is excellent for spotting and tracking enemies in a fast-moving dogfight.

View Forward: Tap *View Ahead* (Shift /) to turn off the HUD and look over the cockpit control panel, giving you maximum visibility forward.

View Rear: Tap *View Rear* (Shift >) to look through the back of your cockpit.

View Right: Tap *View Right* (Shift <) to look out the right side of your aircraft.

View Left: Tap *View Left* (Shift M) to look out the left side of your aircraft.

Out-of-Plane Views

As an aid to learning flight maneuvers and providing some very dramatic cinematography, a variety of out-of-plane views are available. In these views you're outside of your aircraft, looking at it and/or the enemy.

In all but the Chase Plane view, *Zoom* and *UnZoom* (Z and X) are operable, moving your viewpoint closer to or farther away from the F-117A.

Slot View: Press *Slot View* (Shift F1). This view is named after the famous "in the slot" position used by aerial acrobatic teams. You're positioned directly behind the F-117A. The viewpoint remains level with the ground, to clearly show the degree of pitch and roll of the F-117A as you maneuver it. This view is excellent for learning efficient flight.

Chase Plane View: Press *Chase Plane* (Shift F2). You're in a "chase aircraft," following a short distance behind the F-117A. As the F-117A accelerates, it will tend to "run away" from you, while when it slows down it tends to "fall back" toward you. *Zoom* and *UnZoom* dsoes *not* work with this view.

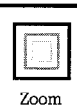The icons shown are labeled: Cockpit, Wide Angle View, View Forward, View Rear, View Right, View Left, Zoom, Unzoom, Slot View, Chase Plane.
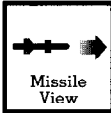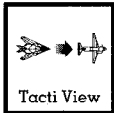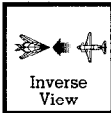
Side View | Missile View | Tacti View | Inverse View

Side View: Press *Side View* (Shift F3). You're to the right side of the F-117A. This view can provide a useful reference point. It's also an excellent way to check the state of your landing gear. Missile launches are most dramatic when seen from this viewpoint.

Missile View: Press *Missile View* (Shift F4). Here you're positioned directly behind the F-117A's active weapon. If ordnance is in flight, you're positioned behind the weapon launched most recently. If no ordnance is in flight, you're positioned behind the plane, and will follow the first item launched. This view lets you follow the weapon directly to the target. If you're having trouble understanding why your weapons miss, switching to this view after launch may be educational.

Tactical View: Press *Tacti View* (Shift F5). You're directly behind the F-117A, looking past it at whatever target you're currently tracking. This view automatically rotates and pans to keep both the F-117A and its target in view. This view is invaluable in combat situations; it helps you outmaneuver and line up on an opponent or return for a second or third attack run on a ground target.

Inverse Tactical View: Press *Invrs Tacti* (Shift F6). You're directly behind the F-117A's current target, looking past it toward the F-117A. You see the target in the foreground, and the F-117A (which often is no more than a dot in the sky) far away. The view automatically rotates and pans to keep both the target and the F-117A in view. This a very dramatic view when making attack runs on ground targets.

The Movie Director: An experienced pilot, flying in training mode, can use these views to good effect. By switching between the cockpit and various views, you can illustrate what's happening and impress casual bystanders.

For example, you can use the Chase Plane view and autopilot to watch your plane launching from the carrier and turning onto course. Then switch to Slot View and show off loops, rolls, split-S turns and Immelmans (see pages 89-92). Find an enemy aircraft and use the *Tacti View* to show your plane maneuvering against his. Then switch to *Invrs Tacti* to watch his responses. Before launching a missile go to the *Side View*, to watch the weapon dropping away. Then jump to the *Missile View* to follow it into the target. The possibilities are as endless as your imagination.

OTHER CONTROLS
Pause

Pause (Alt/P) immediately freezes the action. To resume, press any key.

Some computers have a special key labeled "pause" or "hold." Depending on the internal design of your machine, this key may also work. Pause may be very useful when you are first learning to fly.

37

Accelerate Time

Accelerated Time | Normal Time

Accel Time (Shift Z) doubles the rate at which time passes, and is useful when flying long distances without encountering significant threats. When in accelerated time mode, "ACCEL" appears on the HUD.

Norm Time (Shift X) returns the simulation to normal time. Since it's almost impossible to control and fight your craft in accelerated time, in combat and landing situations you're automatically returned to normal time. Accelerated time automatically stops if you're detected by enemy radar, you open the weapons bay, or lower the landing gear.

Detail Adjust

Detail Adjust (Alt/D) allows you to change the amount and depth of ground detail visible through the cockpit, speeding computer execution; the slower your computer, the lower the level of detail you should use.

Volume Adjust

Volume Adjust (Alt/V) allows you to change the type and variety of sounds used in the simulation. When you press the key, the new sound setting appears briefly on the HUD.

Training

Training (Alt/T) allows you switch into training mode at any time during play. This may be useful if things get particularly confusing, or if you decide to just go sightseeing. Remember though, you don't get rewards for training missions.

Resupply

Resupply (Alt/R) is available only in training missions. It fills the plane's fuel tanks and gives it extra weapons. Resupply is designed for sightseeing and target practice. Needless to say, those who prefer realism in simulations should never touch this option.

"Boss" Hide Game

"Boss" Hide Game (Alt/B) immediately pauses the simulation and clears the screen, effectively making the computer appear to be idle. To resume the simulation, you press *"Boss" Hide Game* again. This key is not only useful at the office, but also to forestall irate parents, children, spouses, and relatives who complain about the time you spend at the computer!
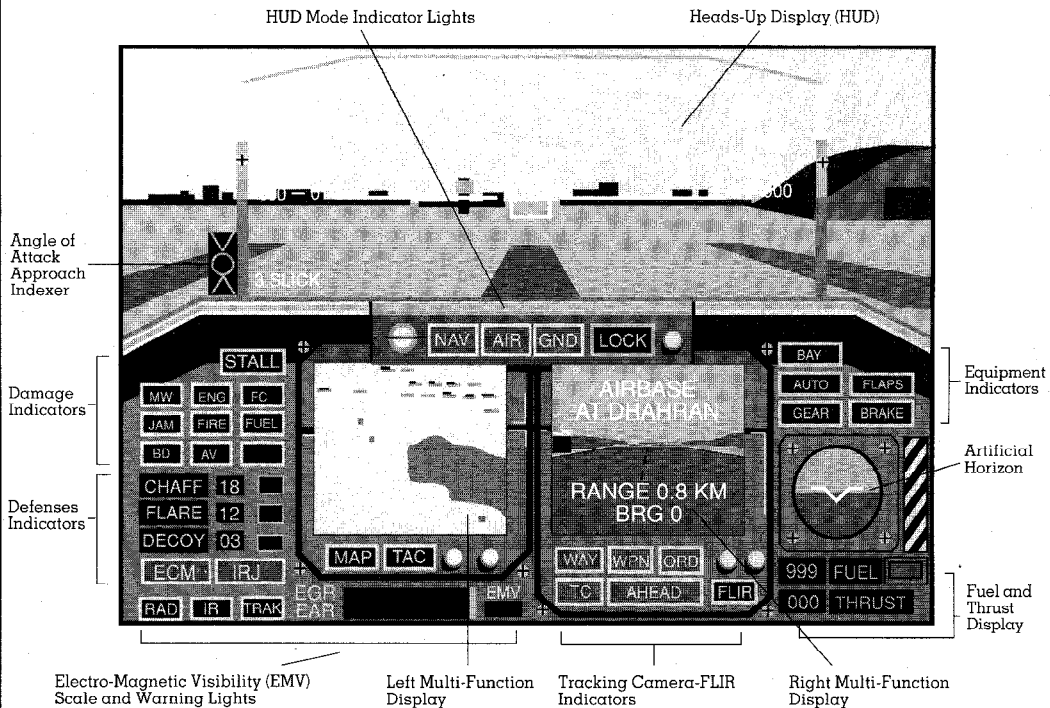
Quit

Quit (Alt/Q) immediately ends the simulation and returns the computer to DOS. It does not save information to disk, so any accomplishments since the last pilot roster will be lost.

Save

There is no "save" key in *F-117A Stealth Fighter 2.0*. Instead the simulation automatically saves your pilot record whenever your leave the pilot roster during the preflight briefing.

This "automatic save" feature requires you to be using a copy of the program (a copy on either a floppy or hard disk), rather than the original MicroProse disk from the box. If you're using the original disk, you cannot save data, although you can otherwise run the simulation normally.

Main Cockpit

HUD Mode Indicator Lights

Heads-Up Display (HUD)

Angle of
Attack
Approach
Indexer

NAV AIR GND LOCK

BAY

AUTO FLAPS

GEAR BRAKE

Equipment
Indicators

Damage
Indicators

STALL

MW ENG FC

JAM FIRE FUEL

BD AV

AIRBASE
AL DHAHRAN

Artificial
Horizon

Defenses
Indicators

CHAFF 18

FLARE 12

DECOY 03

ECM IRJ

RAD IR TRAK

RANGE 0.8 KM
BRG 0

MAP TAC

WAY WPN ORD

TC AHEAD

FLIR

999 FUEL

000 THRUST

Fuel and
Thrust
Display

Electro-Magnetic Visibility (EMV)
Scale and Warning Lights

Left Multi-Function
Display

Tracking Camera-FLIR
Indicators

Right Multi-Function
Display

DISPLAYS AND AIRCRAFT CONTROLS

TERMINOLOGY

Each control has a name in *italics*, which is used on the keyboard overlay; in addition, the actual key used in the IBM version of the game appear in parentheses. A master list of all names and keys also appears in the Appendix.

Controller refers to the pointing device used by your computer. This may be a mouse, joystick, or cursor keys, depending on your hardware. See the Technical Supplement for details.

HEADS-UP DISPLAY (HUD)

The HUD is designed to provide all the crucial flying and weapon information in a graphic format. HUD data is projected onto a wide-angle clear pane in the front of the cockpit. You look "through" the HUD to the situation outside. As a result, valuable information is right in front of your eyes, where it is most useful.

Because the F-117A is a night fighter, the text displayed on your HUD can be switched from white to green for ease of reading. At night it is green automatically; if you are assigned a rare daytime mission, the text appears white on your HUD. If for some reason you are forced to stay in the air past daylight, you may wish to switch the text color back to daytime colors. To do so tap *day/Night HUD* (F4).

In addition, you can customize your HUD to some extent using the *De-clutter* key (V). These modes condense some of the information to single digital readouts; experiment to find the setting you like best.

HUD Modes

Your HUD has three modes: Navigation (NAV), Air-to-Air (AIR), and Air-to-Ground (GND). You switch between modes using *HUD Modes* (F2). The HUD Mode Indicator Lights, directly below the HUD, indicate the HUD's current mode. Each mode has specific uses and affects not only the types of information displayed on the HUD, but also what types of information are available on your right-side Multi-Function Display (MFD).

NAV mode helps you navigate between airbases by restricting your tracking system to friendly and neutral airbases and aircraft carriers. AIR mode is for attacking aircraft, so your tracking system is restricted to flying targets. GND mode is for attacking ground targets. Your tracking system is restricted to these targets.
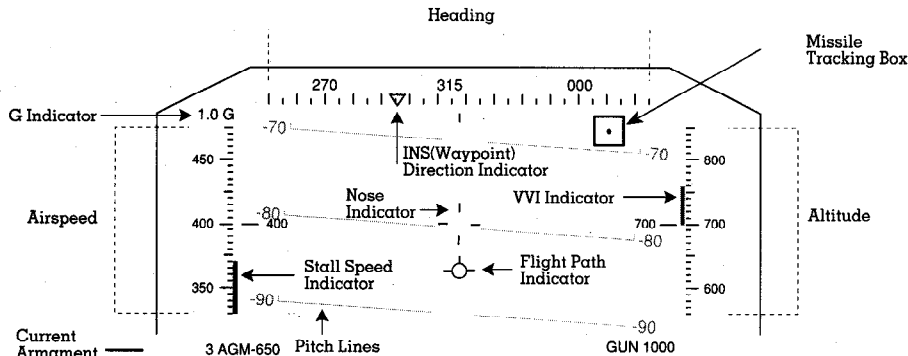
Universal HUD Information and Symbology

Some HUD information is universal across all modes. This information is displayed, or available, regardless of your HUD's current mode.

Airspeed: Your airspeed (in knots) is indicated on the left side of your HUD on a vertical scale; a digital readout of your current speed appears beside the center tick-mark.

Stall Speed Indicator: The Stall Speed Indicator is a colored bar which rises from the bottom of the airspeed scale. If it extends beyond the center tick-mark, your plane has stalled, and falls out of control briefly until the automated recovery system takes over. A low-altitude stall can be fatal.

Standard HUD Symbology

- Heading
- Missile Tracking Box
- G Indicator — 1.0 G
- INS(Waypoint) Direction Indicator
- Airspeed
- Nose Indicator
- VVI Indicator
- Altitude
- Stall Speed Indicator
- Flight Path Indicator
- Current Armament
- 3 AGM-650
- Pitch Lines
- GUN 1000

Altitude: Your altitude (in feet) is indicated on the right-side vertical scale; a digital readout of your current altitude appears next to the scale's center tick-mark. At 1,000' the scale changes to thousand-foot increments (2K is 2,000', etc)

Vertical Velocity Indicator (VVI): The small, colored bar extending upward or downward from the altitude scale's center tick-mark is the VVI. If the bar extends upward, you're gaining altitude; If it extends down, you're losing altitude. Each tick-mark represents 100 feet per minute, so the longer the bar, the faster you're gaining or losing altitude.

Landing Speed Indicator: This colored arrow appears only when your landing gear is down and marks the safe maximum VVI for landing. If the VVI extends below this mark, landing is unsafe.

Angle of Attack (AOA) Approach Indexer: The AOA Approach Indexer becomes operational when your landing gear is down. It assists you in obtaining optimal pitch of the plane's nose as you approach a landing. If the green circle in the center of the display is lit, your angle of attack is OK; if the yellow up arrow is lit, you need to pitch your nose up; if the red down arrow is lit, pitch your nose down slightly.

Heading: The horizontal scale across the top is your heading in degrees. North is 000°, East is 090°, South is 180°, and West is 270°.

INS (Waypoint) Cursor: The colored triangle above the heading scale shows the direction to the currently selected INS "waypoint." To get "on course," turn until the marker is above the middle tick-mark on the heading scale.

Nose Indicator: Fixed in the middle of the HUD, this cross-hair indicates the direction your plane's nose is currently pointing.

Flight Path Indicator: This indicator shows the direction you are flying (which may be different from the Nose Indicator). It is available only in NAV and GND modes.

The plane is geometrically level when the nose and Flight Path Indicators overlap (rare in an aircraft). Further, level flight (constant altitude) often requires the nose to be pitched slightly above the flight path (see Techniques and Tactics, 59).

G-Indicator: This readout in the upper left corner of the HUD indicates the current G-forces on your plane's airframe. The plane can withstand more G stress than the pilot, whose limits are between -3 and +9, depending on training and experience.

Pitch Lines: These lines appear on the HUD if you're in NAV mode or pitched so far up or down that the horizon is invisible. Each line represents 10° of pitch up or down. If you're perfectly level, pitch is 0°; when climbing straight up or diving straight down, pitch is 90°.

Current Armament: In the lower left the HUD indicates what weapon is currently selected, and the number currently available, such as "3 Sidewinders," or "2 Slicks," etc.

On the lower right is the word "Gun" followed by the number of rounds currently available. This refers to your 20mm cannon and its remaining ammunition.

Radio Messages: You are sent coded burst transmissions periodically, which are decoded by your onboard computers and displayed as text across the top of the HUD.

Tracking Box: The Tracking Box appears on your HUD whenever your F-117A's tracking system is locked onto a target and the target is visible through the HUD; the Tracking Box frames the target. In addition, the target appears in your right-side MFD. The current HUD mode determines what targets can be tracked.

The *Cam Ahead* (/), *Cam Rear* (>), *Cam Left* (<) and *Cam Right* (M) keys set the tracking camera to "look" in the direction indicated. Once locked onto a target, it follows that target, even if the target moves from one quadrant to another.

Missile Tracking Boxes: A Missile Tracking Box appears on your HUD whenever a missile is visible through your HUD. If the box is green, the missile it frames is one that you launched. If it is yellow, the missile is an enemy missile. There may be several Missile Tracking Boxes visible in your HUD simultaneously.

Air-to-Air Mode Indicators

To set the HUD to AIR mode, tap *HUD Modes* (F2).

Gunsight: The Gunsight circle replaces the Flight Path Indicator and shows where your shells would hit if you'd fired six seconds earlier (the time it takes them to travel the 6 kilometer maximum range). If you're tracking a target, it shows where the shells would land if you'd fired the proper time in the past for them to travel that range. See page 68, for details.

Missile Targeting Envelope: This large, faint circle represents the area in which an air-to-air missile can be aimed and "locked onto" a target.

Tracking Box and Oval: The Tracking Box appears on your HUD whenever your F-117A's optical tracking/targeting system is locked onto a target which is in front of the plane and visible through the HUD; the Tracking Box frames the target. In addition, the target appears in your right-side MFD if the tracking camera is activated. In AIR mode, the tracking system locks onto airborne targets.

HUD in AIR-to-AIR mode

The Tracking Box is color-coded to inform you if your currently armed weapon is appropriate for use against the current target. If the Tracking Box is white, the weapon is appropriate for the current target. The size of the Tracking Box indicates how effective the current weapon is against the current target — the larger the box the more effective the weapon. Tap *Select Weapon* (space bar), to arm a different weapon.

When using self-guided weapons, the box turns into an Oval when the target is within firing range and the missile is "locked on." When the Tracking Oval turns red, the shot is a "sure thing," with nearly no chance of missing.
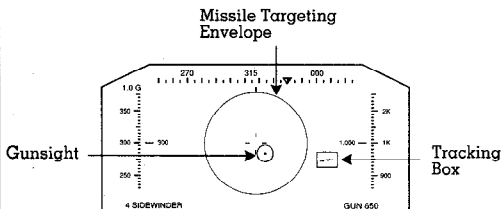
Air-to-Ground Mode Indicators

To set the HUD to GND mode, tap *HUD Modes* (F2).

Tracking Box and Oval: The Tracking Box appears on your HUD whenever your F-117A's optical tracking system is locked onto a target which is in front of the plane; the Tracking Box frames the target. In addition, the target appears in your right-side MFD. In GND mode, the tracking system locks onto ground targets only.

The Tracking Box is color-coded to indicate if your currently armed weapon is appropriate for use against the current target. If the Tracking Box is white, the weapon is appropriate for the current target. The size of the Tracking Box indicates how effective the current weapon is against the current target — the larger the box the more effective the weapon. Tap *Select Weapon* (space bar), to arm a different weapon.

When using self-guided weapons, the box turns into an Oval when the target is within firing range and the missile is "locked on." When the Tracking Oval turns red, the shot is a "sure thing," with nearly no chance of missing.

Bombsights: When free-fall and/or retarded bombs are armed, a special set of bombsight aids appears on the HUD. If your current course, speed and altitude will place you within a bomb blast, the HUD bombsight symbology (described below) flashes. You can still drop a bomb in this situation, but you should take appropriate action to escape the resulting blast.

Bombsight Flightpath Guide: This indicates the "path in the sky" you should fly for a perfect bombing run. Keeping your Flight Path Indicator centered within this symbol means you're "on course."
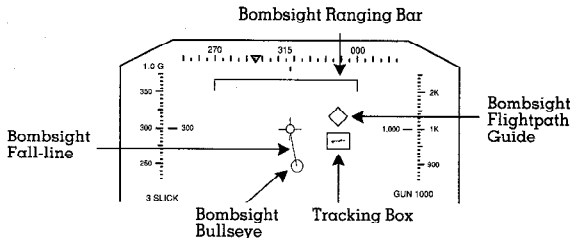
Bombsight Ranging Bar: This indicates when to release a bomb based upon range to the target. As you get closer to the drop point, the bar compresses. When it becomes a single vertical line (or dot) drop the bomb.

Bombsight Fall-line and Bullseye: This appears only if free-fall bombs are armed. A line extends from your flight path toward the ground. At the end of this line is a circle ('bullseye'). Your bomb will land in the middle of this circle.
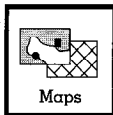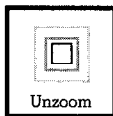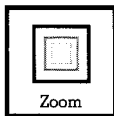
Camera Lens Sight: If your current armament is the 135mm/IR camera, the camera lens sight (a small "+") appears on the HUD. It indicates the direction your camera lens aims.

HUD in AIR-to-GROUND mode

Bombsight Ranging Bar

Bombsight Flightpath Guide

Bombsight Fall-line

Bombsight Bullseye

Tracking Box

This MFD appears on the left side of the cockpit and displays two different types of map: the Satellite/Radar Map and the Tactical Display Map. The *Maps* key (F3) toggles between them. Either map may be expanded or contracted, using the *Zoom* and *UnZoom* keys (Z and X).

The Satellite/Radar Map: This map displays the geographical features of the region, and is oriented so north is toward the top. When the Satellite map is on the display, the "MAP" light is illuminated.

Enemy radar signals are displayed on this map: dotted lines represent pulse radar; solid line are Doppler radar. Ground search and airborne early warning and control (AEW&C) radars are displayed as expanding circles, while ground fire-control and aircraft radars appear as short arcs.
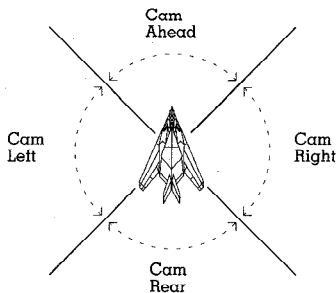
Missiles, aircraft, and important ground targets also appear on this map as color-coded dots. Your aircraft is white, other aircraft are red, and missiles are yellow. Your mission targets, flash and glow; ground radar installations are black.

The Tactical Display Map: This map portrays the local tactical situation. It is oriented so the top corresponds to your current heading. When the Tactical Map is on the display, the "TAC" light is illuminated.

The map graphically depicts aircraft, missiles, ground radar sources, airfields, and incidental ground targets. A 16 km square grid is superimposed for range referencing.

Color-coding: Aircraft and missiles are color-coded; dark red planes are at a lower altitude than you are, light red ones are at about the same, and yellow planes are above you; red missiles are IR seekers, and yellow ones are radar-homers or visually-guided.

Zoom   Unzoom

Maps

Right-Side Multi-Function Display (MFD)

This MFD appears on the right side of the cockpit and has four basic functions: to display images from your tracking system, provide an interface with your inertial navigation system INS, or to display summary information during flight (there are two types of summary information: weapons and orders). Tap the appropriate key to activate the desired function.

Tracking Camera: Your F-117A is equipped with a TV and forward-looking infrared (FLIR) camera, capable of scanning 360° to a range of about 80 to 100 kilometers in daytime and slightly less at night. To switch between your TV camera and FLIR tap *FLIR* (F6). When you are flying in deep night, you'll probably have to use the FLIR to identify what you are seeing in the right MFD.

F-117A TV/FLIR Camera Coverage

Cam Ahead

Cam Left

Cam Right

Cam Rear

On-board computers are programmed with target data that allows the camera to lock onto targets within its current field of view, providing a zoomed TV/FLIR view of the target along with its name, range, and bearing. Primary and secondary targets are indicated when the system locks onto one of these. For a more detailed explanation of the uses of the Tracking Camera and how it relates to the targeting system, see pages 68-73.

Activating and Moving the Camera: You can activate the camera (FLIR or optical) or change its current field of view by tapping *Cam Ahead* (/), *Cam Rear* (>), *Cam Left* (<) or *Cam Right* (M). Switch your tracking camera from optical to FLIR using the *FLIR* Key (F6).

When your Tracking Camera is active, the "TC" light is illuminated; if you're using the FLIR, the "FLIR" light is lit; the direction indicator tells what direction the camera is currently pointing.

Selecting and Designating Targets: The onboard computer contains a list of important targets in the area. Tap *Select Target* (B) to move the tracking camera to the next nearest target within 80-100 kilometers. In addition, you can reprogram the tracking camera to aim at any target on the ground. Simply aim your nose at the target and tap *Designate New Target* (N): the camera will find the nearest new target.

Waypoints: Displays waypoint data for each of the four INS waypoints (F7, F8, and shift F8) (See page 53, for details). When waypoints are displayed, the "WAY" light is illuminated.

Weapons: Displays weapons currently on board your F-117A (F5). When weapons are displayed, the "WPN" light is illuminated.

Mission Orders: Displays a summary of your current mission orders. When you have accomplished your primary or secondary mission, the summary is updated appropriately. When your orders are displayed, the "ORD" light is illuminated.

Select Target

Designated New Target

AIRCRAFT CONTROLS
Control Stick

The F-117A has a standard aircraft control stick. Pushing the stick forward pitches the nose down, pulling it back pitches it up. Pushing the stick left rolls the plane to the left, while pushing it right rolls the it right.

The more you push the stick, the more the aircraft pitches or rolls in that direction. When you release the stick (center it) the aircraft maintains its attitude.
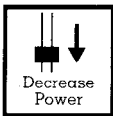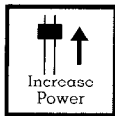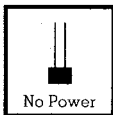
The control stick may be represented by a physical joystick, numeric/cursor keypad, or some other device. See "Controls Summary" in the Appendix for details.

Throttle and Fuel

Max Power

No Power

Increase Power

Decrease Power

The throttle controls the power output of your engines. Maximum throttle gives maximum speed but uses up fuel faster and increases your electromagnetic visibility (EMV).

Thrust Controls: The *Max Pwr* key (Shift +) immediately opens the throttle, giving you maximum thrust. The *No Pwr* key (Shift -) immediately closes the throttle, shutting down the engines. The *Increase* key (=) opens the throttle a small amount. The *Decrease* key (-)closes the throttle a small amount.
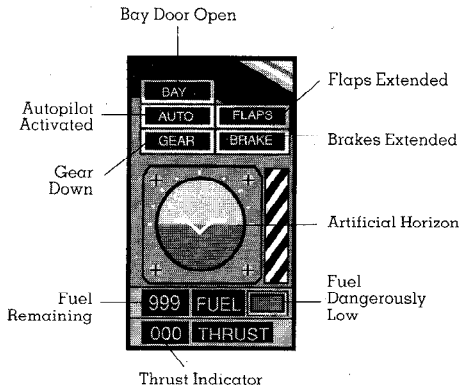
Thrust Indicator: In the lower right side of the cockpit is the Thrust Indicator, a digital readout of throttle, expressed as a percent of total potential. "100" is maximum power; "50" is half power, and so on.

Fuel Remaining: When your onboard fuel tank is full the digital readout reads "999." as you fly, the number decreases, showing the amount of fuel you have remaining in your tank.

Fuel Warning: The warning light to the right of the fuel gauge flashes whenever your fuel tanks are dangerously low.

Extra Fuel: If you are carrying extra fuel in your weapons bay, you can pump that fuel from the bay into the main tank by tapping *Select Weapon* until "EXTRA FUEL" appears on the lower left of the HUD. Then tap *Fire Weapon* (Return) to move the fuel from the bay into your main tanks.

Equipment Indicators

Bay Door Open

Autopilot Activated

Gear Down

Flaps Extended

Brakes Extended

Artificial Horizon

Fuel Remaining

Fuel Dangerously Low

Thrust Indicator

Equipment Controls

Artificial Horizon: This instrument indicates your current pitch and roll. It is particularly useful when flying in deepest night when the horizon is difficult to see.
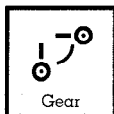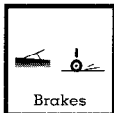
Landing Gear: The Gear key (6) toggles your landing gear up and down. The "GEAR" light illuminates when the gear is down; If the light flashes, you are going too fast for the gear to be down, and there is danger that the gear will be ripped off.

Autopilot: The Autopilot key (7) toggles the automatic pilot on and off. Autopilot sets at a minimum altitude of 500' and flies you toward the next INS waypoint (it does not, however, avoid hills and mountains!). When the autopilot is on, the "AUTO" light is illuminated. Turn off autopilot simply by touching the control stick. Note that if your avionics are damaged (the "AV" damage light is on), the autopilot doesn't function.

Weapons Bay Doors: Before using any weapon in your bays you must open the weapons bay doors, using the Bay Doors key (8). The "BAY" light flashes when the bay doors are open. After launching the weapon you should toggle the doors closed again. Note that damage to you bay doors (the "BD" light is lit) jams the doors open.

Flaps: The Flaps key (9) toggles the wing flaps between extended and retracted. When the flaps are extended the "FLAPS" light illuminates and the aircraft slows and gains lift. High speeds (in excess of 300 kts) can rip off the flaps, causing serious damage.

Brakes: The Brake key (0) toggles the airbrake in and out. When the brake is extended the "BRAKE" light illuminates and the aircraft slows down. When on the ground, the Brake key toggles the landing gear brakes on and off.

Ejection Seat: Tap Eject (Shift F10) to "punch out" of your plane. Your F-117A has an ACES II ejection seat, one of the safest, most flexible designs available. Your best chance of surviving a bailout exists if your altitude is between 2,000' and 14,000' while flying level or climbing slightly.

Electromagnetic Visibility (EMV) Scale
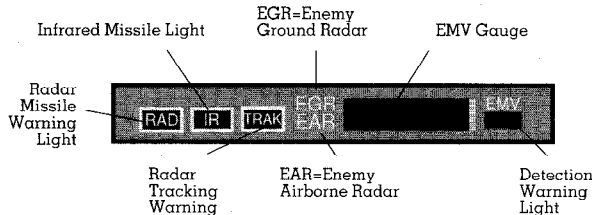
EVASION AND DEFENSE SYSTEMS

Electromagnetic Visibility (EMV) Scale

This gauge shows the current "stealthiness" of your aircraft.

Your EMV: The "visibility" of your plane to enemy radars appears as a bar extending from the left of this gauge. Your EMV increases as you climb to a higher altitude, increase speed, open your bay doors, lower your gear, or use your jammers.

Enemy Radars: The bars that extend intermittently from the right of the scale represent incoming enemy radar signals. Enemy ground-based radars (EGRs) appear on the top, enemy aircraft radars (EARs) on the bottom. The bars are color-coded to give additional detection information.

Detection: If an incoming signal overlaps your EMV bar, it has detected you (the Detection Warning Light flashes and you hear a warning beep). A pink incoming signal means that a ground radar has faintly detected you; a yellow bar means you have been fully detected. If an incoming air radar signal appears white on the gauge an enemy aircraft has detected you.

The colors of search radar signals that appear on your Satellite map and HUD are colored identically to those on the EMV gauge, so that you can easily locate the radar that has detected you (see "Display Colors Summary," in the Appendix).

Warning Devices

Search Warning: Frequently a single search detection does not give the enemy sufficient data to recognize your plane, but when you have definitely been seen, a message appears on your HUD to indicate the enemy has "seen" your plane.

Radar Tracking Warning: Long-range and medium-range Surface-to-Air Missiles (SAMs) must track you for a time before firing. Tracking radar appears as a short, narrow arc on the Satellite/Radar map.

When enemy tracking radar tracks you, the "TRAK" warning light flashes. Note, however, that some short-range enemy missiles (some IR-homers, see page 82) do not use a radar tracking system. Therefore, "TRAK" is not a foolproof warning of impending attack.

Missile Warning Lights: If a radar-guided missile is homing on your aircraft, the "RAD" light flashes. If an IR (infrared-homing) missile is homing on you, the "IR" light flashes.

The appropriate light continues to flash as long as any missile of that type is pursuing you. If jammers or some other device confuse the missile, the light goes off. If the missile later finds you, the light flashes again.

Missile Proximity Klaxon: When a missile is within a few seconds of hitting your plane, the Missile Proximity Klaxon sounds, signaling you to react quickly or be hit! Typically you'll drop chaff or a flare, depending on the type of threat (chaff for radar missiles, flares for IR missiles).

Defenses

Flare
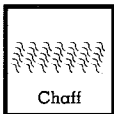
Chaff

Decoy

IR Jammer

ECM

Flare: This is a small, finely tuned heat decoy. Tap *Flare* (1) to release a flare cartridge behind your plane. The flare light illuminates while the flare is active and the digital readout indicates the number you have remaining. For the next 2–5 seconds the intense heat of the flare will cause all enemy infrared-guided missiles to home on the flare instead of your aircraft.

Chaff: Tap *Chaff* (2) to release a chaff cartridge behind your plane. The chaff light illuminates while the chaff is active and the digital readout indicates the number you have remaining. For the next two or more seconds the aluminum sheets of the chaff cartridge will confuse all enemy radar-guided missiles, causing them to home on the chaff instead of your aircraft.

Important Exception: Enemy Doppler radar-guided missiles will not home on chaff unless your course is perpendicular to that of the missile. As long as the missile chases you from the rear, or attacks from straight ahead, chaff has no effect.

Decoys: Your F-117A carries three decoys. To launch a decoy, tap *Decoy* (5). The "decoy" light illuminates while the decoy is running, and the digital readout indicates the number you have remaining.

Each decoy is a computer-controlled radar emitter/reflector and an IR source. To enemy radar and infrared it looks like your plane, but stronger. The decoy gradually floats down via parachute and self-destructs before landing. Enemy missiles, aircraft, and ground radars are fooled by decoys, although the amount of time depends on the experience and skill of the opposition (typically from 20 to 60 seconds). During this time the enemy chases the decoy instead of you.

Infrared (IR) Jammer: The *IR Jammer* key (3) toggles this device on and off. When the jammer is running the "IRJ" light illuminates. This device emits heat pulses to confuse a missile's guidance system. The missile stops homing on your plane and flies straight ahead. The jammer is highly effective against "first-generation" IR missiles, but good only at long range against "second-generation" missiles (see page 83). Using the IR jammer reduces your speed, and it shuts down automatically to avoid overheating.

ECM Radar Jammer: The *ECM* key (4) toggles this device on and off. When the jammer is running the "ECM" light illuminates. This jammer "blinds" radar-guided missiles. The jammer is particularly effective against older "beam-rider" missiles, but good only at long range against "semi-active" radar-homers (see page 79). The only drawback to using ECM is that your EMV is increased.

Defenses Indicators

Number Remaining

CHAFF 18 ☐ — Chaff Functioning
FLARE 12 ☐ — Flare Functioning
DECOY 03 ☐ — Decoy Functioning
ECM   IRJ

ECM Radar Jammer   Infrared Jammer

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Damage   The upper left of the cockpit has a bank of "telltale" lights that indicate which systems (if any) are damaged.

Missile Warnings (MW): When the "MW" damage light is illuminated, the Missile Warning system is inoperative. The "RAD" and "IR" missile warning lights no longer work.

Engine (ENG): When the "ENG" light is illuminated, engine damage has reduced the maximum thrust possible. Any additional damage further reduces thrust.

Flight Control (FC): When the "FC" damage light is illuminated, flight control computer damage makes the F-117A more difficult to control.

Avionics (AV): When the "AV" light is illuminated, avionics damage has disabled your Inertial Navigation System (INS) and autopilot.

Bay Doors (BD): When the "BD" light is lit, the weapons bay doors are damaged and jammed open, permanently increasing your EMV.

Jammers (JAM): When the "JAM" light is illuminated, your ECM and IR jammers no longer function.

Damage Indicators

- Engine Damage
- Stall Warning Light
- Missile Warnings Damaged
- Flight Control Damage
- Jammers Damaged
- Fuel Tank Damage
- Bay Doors Damage
- Fire Control Damage
- Avionics Damage

STALL

MW   ENG   FC
JAM   FIRE   FUEL
BD   AV

Fuel Tank (FUEL): When the "FUEL" light illuminates, damage and stress breakage is causing fuel to leak. Once a leak starts, any further damage increases the rate of fuel loss.

Fire Control (FIRE): When the "FIRE" light illuminates, your fire control systems are damaged.

Random Malfunctions: Your F-117A is an extremely complicated piece of equipment. Random malfunctions are possible in any of the systems at any time. The malfunction may include the reporting systems on board the craft. If so, you won't know that something has malfunctioned until you discover it doesn't work!

Malfunctions are more likely in intense combat situations, due to the heavy burden that places on your sophisticated electronic systems.
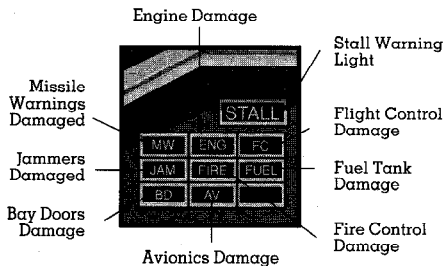
WEAPONRY

These instructions give the bare rudiments of weapons operation. Many important considerations and tactical tricks are described in "Chapter 3, Techniques and Tactics." See "Weapons Effectiveness," page 139, for a chart showing weapon effectiveness against various targets.

Selecting Weapons

The name of the weapon currently armed and ready for use always appears in the lower left corner of the HUD.

Weapon: Tap *Weapon* (F5) to display the contents of your weapons bays on the right MFD. The bay currently selected is highlighted, and the current armament appears in the lower left corner of the HUD.

Tap *Select Weapon* (Space Bar) to change the currently-selected weapon in your fire control system. Each key press switches to the next weapons bay, and the change is indicated both on the HUD and in the Right MFD Weapon display.

Cannon: Your 20mm cannon is always available for use (unless it is out of ammo or damaged).

Firing Weapons

Launching Weapons: Tap *Fire Weapon* (Return) to launch a weapon. This fires one missile or drops one bomb. The currently-selected weapon is the one used. See pages 68-73, for more specific instructions on launching weapons.

The *Reconnaissance Camera* (135mm/FLIR Camera) is "fired" like a weapon from an open weapons bay. Each "shot" takes one picture.

Special Equipment can be air-dropped by opening the bay doors and "firing" it out. It floats to the ground on a parachute. It is also loaded or unloaded on the ground at appropriate airstrips automatically (a message appears on your HUD when loading or unloading is complete).

Cannon: *Fire Cannon* (Backspace or Button 2) fires one burst.

Concept: The INS has up to four programmable "waypoints," to map a flight plan. The default waypoint setup puts the first point halfway between your starting base and primary target. The second is the primary target, the third is the secondary target, and the last is your landing point.

Waypoints Display: The *Select Way Pt* (F7) and *Change Way Pt* (F8) keys display a list of INS waypoints on the right-side MFD, and your projected flight path from waypoint to waypoint on the Satellite Map on the left.

The waypoints list display shows the current time at top, the ETA to each waypoint, and a fuel gauge across the bottom. The fuel gauge is a bar graph, predicting fuel consumption based upon your current speed and altitude. The far right side of the bar (black region) indicates fuel already consumed, the center parts (white for current waypoint and blue for others) indicates fuel needed to reach each waypoint, and the far left side (green region) indicates fuel reserves.

Selecting Waypoints: The waypoints list has one point highlighted (in white). This is the waypoint currently indicated by the INS cursor above the Heading Scale on your HUD.

To select a new waypoint, tap *Select Way Pt* (F7). Then use the *Last Point* (keypad 9) and *Next Point* (keypad 3) keys to move the highlight up and down the list. As you move the highlight the HUD's INS cursor moves accordingly.

Changing Waypoints: To change a waypoint to a new location, tap *Change Way Pt* (F8). Then use the *Last Point* (keypad 9) and *Next Point* (keypad 3) keys to select the waypoint you wish to change. Finally, use the keypad waypoint keys to actually move the waypoint. You can watch the results in the left MFD on Satellite Map.

Tap *Reset Way Pt* (Shift F8) to reset all waypoints to the original waypoints.

◇ Waypoints	◇⟶⊠ Changing Waypoints
	⊠⟶◇ Reset Waypoints
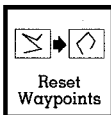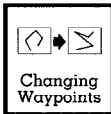
Waypoints CRT

```
        TIME 00-15-00
WAYPOINT 1 DIST-78 KM
9 MIN. ETA 00-23-45
WAYPOINT 2 DIST-156 KM
19 MIN. ETA 00-42-15
WAYPOINT 3 DIST-84 KM
10 MIN. ETA 00-51-45
WAYPOINT 4 DIST-230 KM
28 MIN. ETA 01-18-30
```
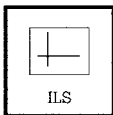
Change Waypoints

⇧ Shift

7 Home	8 ↑	9 LAST POINT Pg Up
4 ←	5	6 →
1 End	2 ↓	3 NEXT POINT Pg Dn

Instrument Landing System (ILS)

ILS

The *ILS* key (F9) toggles the ILS display on and off. When the ILS is on, a vertical and horizontal bar appear on the HUD to guide you to the nearest friendly airbase.

Principles of Operation: The ILS is designed to aid you on final approach, steering you down a descending "glide slope" to the runway. If you are flying a pattern to land, use the ILS to guide you to the airport, then turn it off until you are "on final." The ILS guides you to the runway or carrier deck, but ends there. Rather than produce inaccurate readings over the runway, the ILS automatically turns off before it degrades to useless.

Vertical "Course" Bar: To use the ILS, fly the plane so that the vertical bar lines up with with vertical ticks of your Nose Indicator. This means you're on course toward the airbase.

Horizontal "Glide Slope" Bar: The horizontal bar of the ILS represents the "glide slope," an imaginary sloping line extending from the airbase into the sky. If the bar is above the horizontal ticks of your Nose Indicator, you are beneath the glide slope. You can either fly straight ahead until you "intercept" it, or climb to get to the glide slope faster. If the bar is beneath your Nose Indicator, you are above the glide slope and should descend until the bar aligns directly with the Nose Indicator.

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POSTFLIGHT DEBRIEFING

After the mission you are debriefed. Your commander goes over the mission step by step, evaluating each event as it occurs and assigning a numerical score. Basically, if you accomplish the mission and follow the Rules of Engagement (see below), you'll do very well. The more difficult the opposition, the more credit you'll get.

ENDING A MISSION
Safe Landings

When you land, stop, and turn off your engines, the mission is over. You cannot refuel or rearm to continue the mission. Stealth missions are costly, carefully planned "one shot" operations. If a mission fails, higher-ups will decide later whether to try again, and if so, when, where and how.

Crashes

If you're using Easy or Realistic Landings, crashing the aircraft ends the mission and your career. To remain alive, you must eject before the plane hits the ground. Of course, selecting "No Crash" eliminates this problem – but greatly reduces your potential score.

Bailing Out

If you survive a bailout, you now have to worry about where you did it. Ejecting over the sea, far from an enemy coastline, is ideal because the aircraft sinks out of sight and you can be rescued. The next best location is over friendly territory. Again, you can be rescued, but fragments of the wreckage may be found by the public or by enemy spies. Bailing out over enemy territory is bad; even though your F-117A has a self-destruct mechanism, fragments of the plane will certainly be found by the enemy, teaching them valuable secrets of US stealth technology. In addition, you'll probably be captured and suffer a public trial and humiliation before the USAF manages to get you back.

SCORING
Objectives

Above all follow the Rules of Engagement and accomplish the primary objective – it's hard to do badly if you achieve this. Failing that, at least accomplish the secondary objective. If you fail both of these, it is difficult to gain any credit.

Cold War: It's important that nobody detect you. Visual sightings by enemy aircraft do the most damage. Enemy radars that positively track your plane are also bad.

Needless to say, random destruction is also unacceptable in Cold War, and destroying friendly planes and ground installations is the worst possible event. However, destruction of neutral or civilian targets is almost as bad. The least embarrassing events are destruction of enemy military targets, although even that should be avoided. In fact, the only time it is "permissible" to destroy targets is if your mission orders require it, the enemy has sighted or tracked you, or if the enemy fired first.

Limited War: It's also important to avoid detection during a Limited War, although the penalties aren't as great. Your commander wholeheartedly approves of attacks on enemy forces, including military aircraft and obvious military installations, but civilian targets (passenger airliners, oil wells, refineries, bridges, etc.) cause political problems and lower your score.

Conventional War: In this situation your commander doesn't care if you are detected, unless of course your plane is damaged by enemy fire (F-117As are very expensive).

You gain credit for destroying anything in enemy territory, even civilian targets (although military ones are worth more). In fact, your commander rather expects that you'll do a bit more than just hit the objectives. The only possible negatives come from the destruction of neutrals and friendlies.

REPUTATION
Combat Decorations

If your rating on a mission is high, your commander will recommend you for a decoration. The five possible decorations, from easiest to most difficult to achieve, are:

AM: Airman's Medal, recognizing good performance.

DFC: Distinguished Flying Cross, for superior performance in combat.

SS: Silver Star for Valor, for heroism in combat.

AFC: Air Force Cross, for extreme heroism.

CMOH: Congressional Medal of Honor, America's highest military decoration.

You must be outstandingly successful against the toughest opposition to be nominated for the Congressional Medal of Honor.

Other Decorations

The *Purple Heart* is awarded to pilots who come home wounded. Surviving a mission with a badly damaged aircraft frequently yields this award.

The *Combat Readiness Medal* is awarded to almost everyone in a combat unit. Beyond this, the number of missions you survive determines what other ribbons you may receive: 5 missions for the *Overseas Ribbon - Short Tour*, 15 missions for the *Overseas Ribbon - Long Tour*, 30 missions for the *Longevity Service Ribbon*, and 60 missions for the *Longevity Service Ribbon with Gold Cluster*.

Promotions   Your starting rank is 2nd Lieutenant. Promotions are based both on your total score *and* on your average score per mission. Therefore, if you "goof up" and do badly in a mission, you may need extra high-scoring missions before you qualify for promotion. In addition, you can't get promoted without sufficient experience.

Ranks available, from lowest to highest, include:

2nd Lt: Second Lieutenant

1st Lt: First Lieutenant

Capt: Captain

Maj: Major

Lt. Col: Lieutenant Colonel

Col: Colonel

B.Gen: Brigadier General

Brigadier General is not a flying rank. You don't have a chance of earning that rank until you're retired from active duty. No pilot is expected to fly more than 99 missions. After that the Air Force decides: are you promoted to Brigadier General, are you simply given a Washington desk job, or do they suggest you leave the service and seek your fortune in civilian life? Very few pilots survive 99 missions with a record good enough to earn their "star."

Incidentally, don't feel bad about a middling rank. In active fighter squadrons most pilots are First Lieutenants and Captains. Majors serve as flight leaders, Lieutenant Colonels as higher squadron officers or commanders, and full Colonels as squadron or wing commanders. Promotion to Major or above is increasingly difficult. A Lieutenant Colonel or Colonel still flying active combat missions is rare in the USAF.
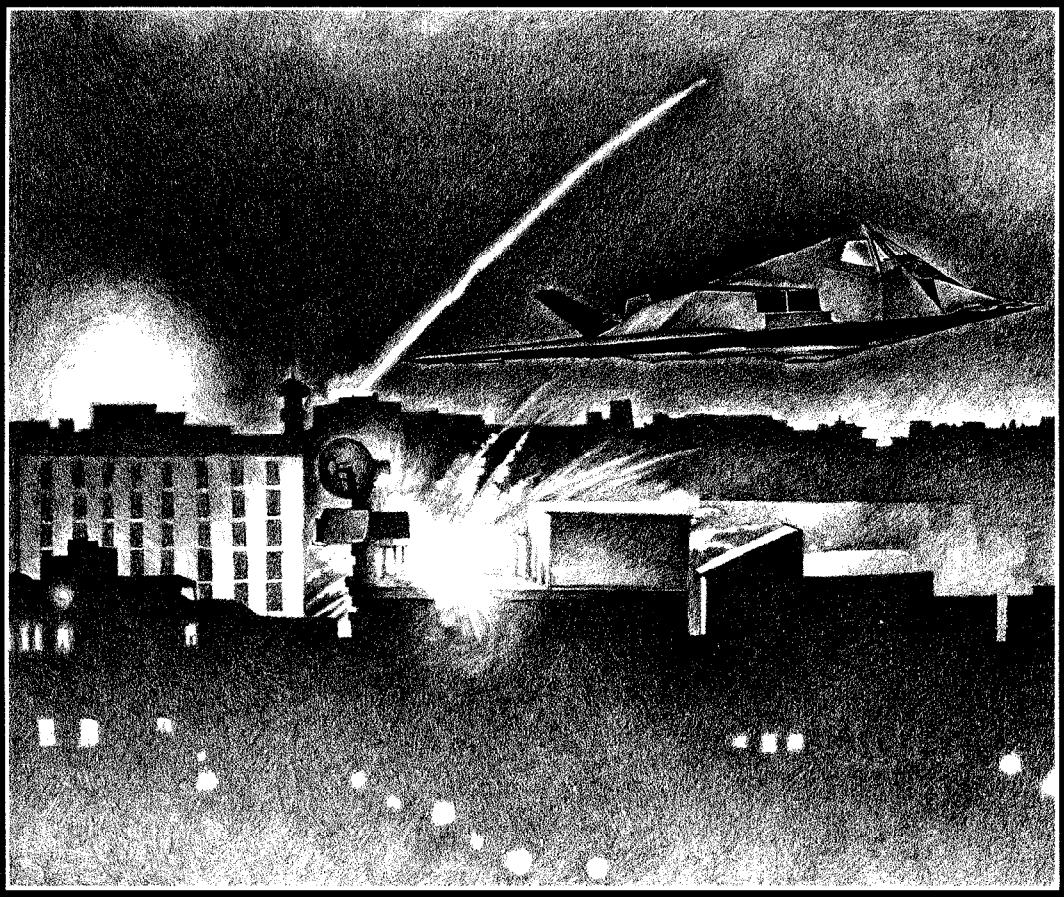
3 TECHNIQUES AND TACTICS

HOW TO FLY

AERODYNAMICS AND FLYING

This discussion of lift and flight is not rigorous or precise in a scientific sense. It only provides a rudimentary portrayal of the physics of flight and its practical effect on aircraft handling.

Lift: Aircraft fly because of a pressure difference created by the difference in the speed of the air flowing over the top of the wing as opposed to the bottom. Air moves faster over the top of the wing than it does over the bottom, creating high pressure beneath the wing and low pressure above it. The wing is pushed upward to compensate, providing lift. When the pressure difference becomes great enough, the upward lift is greater than the plane's weight and the aircraft flies.

Speed and Lift: The amount of lift generated by the wing varies with airspeed. The faster the plane flies, the faster the air flows over the wings, and the greater the pressure difference. If your plane is in level flight at a certain speed, reducing the speed reduces lift, causing a descent (without nosing down).

Angle of Attack and Lift: The amount of lift generated also varies with the angle between the wings and the airflow. If you pitch up a few degrees, you increase the pressure difference and, therefore, the lift. If you pitch the nose down, the reverse occurs. The difference between the airflow direction and a horizontal line through the wing is the "angle of attack" (AOA). Angle of attack is visible on your HUD in NAV and GND modes. Whenever your Nose Indicator is above your Flight Path Indicator, the difference between the two is the Angle of Attack.

Level Flight: To achieve "level" flight at a given power setting, a pilot raises or lowers the nose until his vertical velocity is zero (no ascent or descent appears on the "VVI"). Note that a pitch of 0° may show ascent or descent. Nosing up or down to a new "angle of attack" adds or subtracts lift as needed to achieve level flight.

To achieve "level" flight at a given speed, the pilot gets into level flight, adjusts his throttle to achieve the desired speed, then adjusts his pitch to find level flight for that airspeed.

The Effect of Roll

The force of lift is always perpendicular to the wing, so if the wings are banked, the lift force is no longer straight up relative to the ground. Instead it has two components, one moving the aircraft sideways, the other straight up. This causes the plane to turn, and, since upward lift (the force opposing gravity) is diminished, to lose altitude.

During a turn the pilot can adjust the angle of attack by control stick "back pressure," that is, by pulling back slightly on the stick. The amount of adjustment is very small. Overcorrecting is a common error among beginner pilots.

Special Situations

Stalls: An aerodynamic stall occurs when the wing's angle of attack becomes too large. The air stops flowing smoothly over the wing, and instead part breaks away onto an independent path. This erases the pressure difference, vastly reduces lift, and generally causes the nose to drop. Stall speed varies considerably depending on many factors. Tight turns increase the stall speed. Note that simultaneously the act of turning tends to decrease your airspeed. As a result, stalls are quite common in tight turns. The F-117A has an audible stall warning horn, a Stall Warning Light in the upper left of the console, and a colored bar showing stall speed on the HUD's Airspeed Indicator.

The F-117A includes a computerized stall recovery governor that instantly reconfigures the wing edges for automatic recovery, making your job much easier. To recover from a stall, first level the wings, then bring the pitch back to normal. A stall invariably costs you altitude, so a stall at low altitude can be fatal!

Flaps: Lowering flaps extends the wing surface and increases the pressure difference, adding more lift. They also increase drag, which lowers your speed. However, flaps are only useful at low speeds (under 350 knots).

FLYING THE F-117A

The F-117A is unflyable. The design is one of the most surprising ever seen – many experts said it wouldn't fly when they first saw it. In fact, a pilot would find it very difficult – maybe impossible – to fly without the aid of sophisticated onboard flight control computers. This aircraft, like some others, is said to "fly by wire."

The pilot uses a normal control stick (much like your joystick) and uses it just like a pilot of a normal civilian aircraft. But the pilot is not communicating with the control surfaces of the aircraft; instead he is talking to the computer, and it is talking to the control surfaces. When the pilots says "bank," the computer interprets his command and makes the wings bank, all the while correcting this and that to keep the plane airborne.

Remember, when you are flying this aircraft, you are interfacing with a computer that is flying the aircraft!

Taking Off

While sitting on the runway, perform the following pre-flight check-out:

1. **Check Your INS.** Tap *Maps* (F3) until the satellite map is displayed on your left MFD. Now tap *Select Way Pt* (F7) to show the INS waypoints list on the right MFD. The INS cursor above the heading scale on the HUD indicates the direction in which you must fly to reach the first waypoint listed on the right MFD; by using the *Next* and *Previous Waypoint keys* (Shift/keypad 3 and 9) you can cycle through all the waypoints currently assigned. Advanced pilots may want to change the location of one or more waypoints at this time.

2. **Check Armament:** Tap *Weapons* (F5) to check your weapons on the right MFD. Use *Select Weapons* (Space Bar) to cycle through the weapons. Note the active weapon appears in the lower left corner of the HUD.

3. **Extend the Flaps:** Tap *Flaps* (9). Note the "FLAPS" light in the upper right corner of the console. Flaps increase lift during takeoff.

4. **Check the Catapult System (Carriers only):** When launching from an aircraft carrier, the brakes will be set. The "BRAKE" light will be illuminated.

5. **Start the Engines:** Start your engines by tapping *Max Pwr* (Shift +).

6. **Activate Catapult (Carriers only):** Tap *Brakes* (0) to release the brakes and catapult, hurling you off the deck.

7. **Accelerate Past Stall Speed:** As you move down the runway or carrier deck, watch the speed scale (left side of the HUD) carefully. A colored bar (Stall Speed Indicator) will gradually go down. When it drops below the center tick-mark, your plane is past stall speed.

8. **Climb into the Sky:** Pull back gently on the stick. As you start climbing, watch the altitude scale on the right side of the HUD.

9. **Retract Landing Gear:** Tap *Gear* (6) to raise your landing gear. Don't leave the gear down — both it and your plane can be damaged if left down at high speeds.

10. **Retract Flaps:** Tap *Flaps* (9) to retract flaps. You no longer need extra lift.

11. **Turn onto Course:** Pull the stick left or right until the INS cursor is aligned with the center tick on the heading scale. Alternatively, you can simply tap *Autopilot* and let your autopilot turn you onto the correct course to the first waypoint. Since this is a stealth mission, you'll want to stay low. About 200' to 500' is ideal.

Smooth Flying Techniques

A Light Touch: Use a light touch on the Control Stick. The most common error is a "ham fist" on the stick, throwing the plane around the sky in wild abandon. Unless it's an emergency never push the stick to the limit.

Chasing the Gauges: When you change an aircraft's operating regime (move the stick, change the throttle, and so on), the effects of the change takes a second or two to "settle out" and show on the gauges. For smooth flying, make a change then observe the effects before making another. Constant adjustment and correction should be avoided, because all you'll do is "chase the gauges," overcorrecting every move.

Straight and Level Flight: To be a good combat pilot, you must master level flight. Do this in a training scenario, rather than real life.

Climb to an altitude of about 2,000' and level the aircraft so the nose of the plane points at the horizon. Now reduce the throttle to about 75% to achieve an economical cruising speed. Although the Nose Indicator appears level with the horizon, the HUD's altimeter and VVI probably show the plane is climbing or descending. If you're climbing, push forward on the Control Stick, then let go and observe the effects. If you're descending pull back a bit instead. Your objective is to keep the altimeter rock steady.

You'll notice that your Flight Path Indicator aims at the horizon, but your Nose Indicator may be pointed above or below it, depending on your speed. Generally, the slower you're travelling, the higher you must pitch the nose to achieve level flight.

Now experiment a little. Tap *Brakes* (0). This slows down your plane. Watch the HUD and notice how the Flight Path Indicator drops. Meanwhile, on the sides of the HUD, your speed is dropping and so is your altitude. To achieve level flight at this new, lower speed pitch up until the Flight Path Indicator is level with the horizon.

Turns: As you pull the stick right or left and your roll angle increases beyond 45°, the stall speed rises from the normal 120 knots (kts) range to over 200 kts (in a 90° roll). Tight turns "bleed off" airspeed, so a long, tight turn may cause a stall. Keeping an eye on the airspeed and stall speed is particularly important when making tight turns at low altitude, because stalls cause you to lose altitude rather quickly.

In extremely tight turns (where you roll 80°, 85°, or even 90°), you can tighten your turn rate by pulling back on the stick. However, this bleeds airspeed even faster, so keep a close eye on the Stall Speed Indicator bar.

Loops are easy in the F-117A, but ballistic ("straight up") climbs can be maintained only for short periods.

Remember that any prolonged vertical maneuver greatly reduces airspeed, which risks a stall if you didn't start the maneuver with a lot of speed. However, going vertical is very handy for changing direction, since you can roll while vertical, quickly pointing your nose in the desired direction, then push down into level flight again.

Low Altitude Flying: At altitudes under 500', expect increased buffets, downdrafts, and other irregularities that make flying difficult. Also beware of low ridges and mountains. It's easy to fly into a mountain if you're not looking. Good pilots develop a "cross check" routine of scanning the entire HUD periodically, to make sure everything is okay.

In "No Crash" and "Easy" flight modes you have a barometric/laser altimeter. If you drop below 200' this device automatically but gently pushes your plane back up. Be warned, the device automatically turns off when the landing gear is down, or when the gun is firing. The device is *not* proof against power dives, stalls, or other radical maneuvers, but works fine in normal flight regimes. In fully realistic flight the automatic altimeter is turned off, allowing skillful pilots to cruise at even lower altitudes.

Airbases: All airstrips have a north-south orientation and a center stripe down their middle. On approach, a course of 000° (if coming from the south) or 180° (if coming from the north) will align you with the runway.

Airbases are more than twice as long as your safe landing distance at 200 kts — a large safety margin. Aircraft carriers have arrestor cables near the stern. You must touch down before or on these cables in order to stop before rolling off the deck. Do not attempt to land on the bow of an aircraft carrier because there are no arrestor cables there. Furthermore, regular aircraft spotted for launching may be positioned there, and you certainly don't want to crash into them!

Aborted Landings: If you get in trouble landing, open the throttle to full power and retract the flaps and landing gear. Climb away and come around for another try. Do not make sudden movements with the control stick while landing or aborting. Wait for your airspeed to exceed 300 kts before making any big turns or similar maneuvers. Until then, gross maneuvers with the control stick may stall the plane, causing a fatal crash.

Typical Airstrips

Launching Catapults

Arrestor Cables
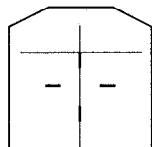
Landing Path

Runway

Hangars

Tower
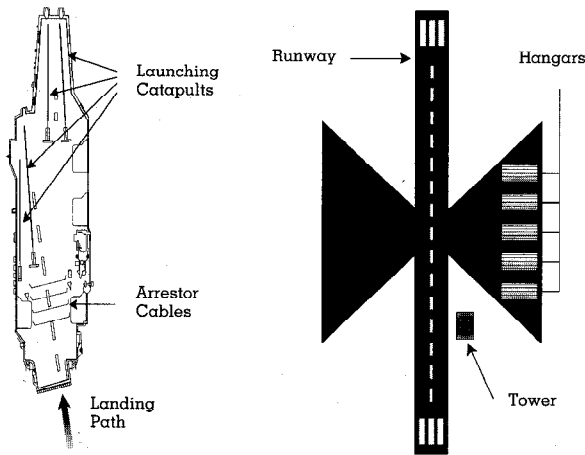
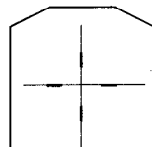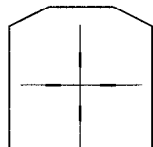## Using the ILS (Instrument Landing System)

ILS on HUD
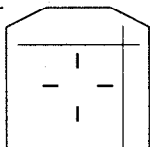
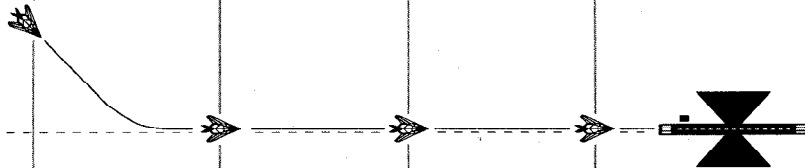Off course, must turn for correct approach

On course, approaching glide slope

Intercepts glide slope

Descending on glide slope

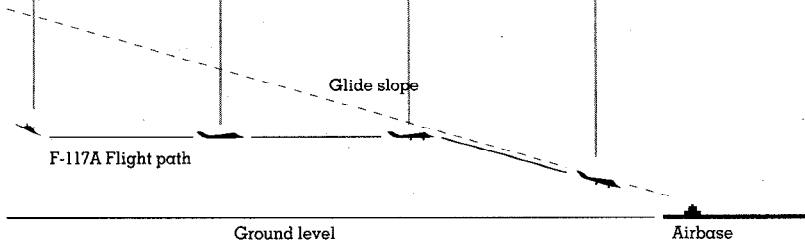Top view

Side view

Glide slope

F-117A Flight path

Ground level

Airbase

Using the Instrument Landing System (ILS)

To use the ILS, tap *HUD Modes* (F2) as necessary to switch the HUD to NAV mode, tap *Cam Ahead* (/) to activate the Tracking Camera, and tap *ILS* (F9) to activate the ILS. The ILS and camera will automatically track the nearest friendly or neutral landing site. It will *not* track rough airstrips behind enemy lines.

Line Up Your Approach: The first step is to line up on the correct course to the airbase (or aircraft carrier). To do this, fly at 500' to 1,000' to a point about 40 to 50 kilometers (km) north or south of the base and turn until the ILS vertical bar is centered on your Nose Indicator.

Intercept the Glide Slope: Once you're on course, you want to intercept the glide slope represented by the horizontal bar. Descend until the horizontal bar is slightly above the horizontal ticks of your Nose Indicator. The horizontal bar gradually drops until it aligns with the horizontal ticks of the Nose Indicator. When this occurs, you are intercepting (flying through) the glide slope.

Descent: Once you've intercepted the glide slope, begin your descent. Keep the horizontal bar centered, which means making a gradual descent. You must manage the descent like a normal landing (see "Descend on Final," below).

Touch down: The ILS will not guide you to touchdown. It is not accurate in the immediate vicinity of the base. It turns off automatically before you reach the runway.

ILS and Landing Patterns: The ILS is designed to guide you to the airbase. It does not control your plane through a landing pattern.

Straight-in Landings

1. **Line Up Your Approach:** Use the ILS to line up a correct approach. Beginners intercept the glide slope about 40-50 km from the runway. Attempting to find the approach and make a landing less than 20 km from base is *not* advised for the beginner.

2. **Throttle at 70%:** Fly your approach at 500' to 1,000'. Reduce the throttle to about 70%, which should reduced your speed to about 300 kts. Eventually you'll need to pitch up (raise the nose) a little to maintain level flight.

3. **Flaps Out, Throttle 50%, Gear Down:** Now extend the flaps and reduce the throttle to about 50%. This slows the plane to about 230 kts. As you reach this speed, lower your landing gear. If you're moving too fast, extend the brakes – tap *Brake* (0) – for a brief period.

5. **Descend On Final:** When the ILS' horizontal bar reaches the middle of the HUD Nose Indicator, you should start descending down the glide slope.

   Reduce the throttle slightly. If you were in level flight, you will gradually descend with your Nose Indicator above the Flight Path Indicator.

   Use the ILS horizontal bar to control your rate of descent. Adjust the throttle to keep the bar in the middle of the Nose Indicator.

   Finally, keep an eye on your airspeed and Stall Speed Indicator. If the stall bar indicator gets within 25 kts of your current airspeed, your throttle is too low. Conversely, if your airspeed is over 250 kts, extend the brakes for a brief period.

6. **Touch Down:** Your altimeter reads 0' on a runway, and 125' on an aircraft carrier. These are your "touchdown" altitudes. The safe touchdown vertical velocity is shown by an arrow on the VVI of your altimeter. A vertical velocity of 400'/minute or less (4 ticks on the scale) is always safe. In certain conditions a higher vertical velocity is allowable. Once you're on the runway, cut the power by tapping *No Pwr* (Shift -), and engage the brakes by tapping *Brakes* (0).

   Aircraft Carriers: Landing on a carrier is slightly more difficult, since you must touch down in the arrestor cables area. To avoid overshooting the cables, increase your descent by lowering the nose a little, then at the last second extend the air brake by tapping *Brakes* (0) as you pull the nose up.

   If you miss the carrier's arrestor cables, don't bother trying to touch down. Instead close the brakes tap the *Max Pwr* (Shift +).

Straight-in Landing

Approach		On final
Level flight 1,000'-1,5000' 300 kts	Gear down Flaps down	Slow descent 230-250 kts
Sea level		Carrier deck at 125'

66

OFFENSIVE ACTIONS

This section provides a short primer on how to use your weapons. Also, see page 139, for a chart indicating your various weapon's effectiveness against various targets.

FINDING AND HITTING A TARGET

1. **Find the Target:** Your primary and secondary targets are stored in your INS, initially as waypoint 2 and 3. If you've moved the waypoints, you can reset them by pressing *Reset Way Pt* (Shift F8).

    To reach the target, call up the waypoints by pressing *Select Way Pt* (F7), select the appropriate waypoint by tapping *Next Point* (Shift/keypad 3), then steer toward it following the INS cursor above the HUD Heading Scale.

2. **Check HUD Mode:** Change the HUD to the correct mode. Use *HUD Modes* (F2) to select the right mode: AIR (for firing at aircraft), or GND (for firing at ground targets).

3. **Use Tracking Camera:** Lock your tracking/targeting system onto the nearest target ahead, by tapping *Cam Ahead* (/). The display remains blank if there are no targets ahead within 80 to 100 km.

    To track other targets, tap *Select Target* (B). The tracking/targeting system is limited to targets stored in your onboard computer database. This group, of course, always includes your primary and secondary targets. To find the right target, you may have to tap *Select Target* (B) several times. When the primary or secondary target is located, your right MFD informs you.

    To track a target not stored in your onboard computer tap *Designate New Target* (N). The nearest potential target ahead is temporarily added to the computer's database. Once you've added a target to the database, it remains in the computer, and becomes part of the group that *Select Target* (B) cycles through. You can store only one new target in the database at a time.

4. **Select Weapon:** Tap *Select Weapon* (Space Bar) to cycle through the weapons in your bays. (Your cannon is always available.)

    Make sure you have the correct weapon selected. The size and color of the Tracking Box on the HUD indicates how effective the current weapon is against that target (see Display Colors Summary in the Appendix).

5. **Aim and Fire:** Different weapons are aimed in different ways, described below. Depending on the weapon selected, make sure it is correctly aimed at the target before you fire.

6. **Observe Results:** Friendly AWACS aircraft observing your mission report the results. Sometimes a hit damages a target without destroying it, sometimes you miss entirely, and other times a hit may be ineffective. Ineffective hits are caused by using the wrong weapon, or because the weapon malfunctioned.

FIRING YOUR MISSILES

Self Guided Missiles

AIM-9M Sidewinder
AIM-120 AMRAAM
AGM-65D Maverick
Penguin-3 ASM
AGM-84A Harpoon
AGM-88A HARM

All your missiles are self-guided (fire-and-forget) weapons, and there are several available to you. Some are used against enemy aircraft and others are used against ground targets. All fire-and-forget missiles are aimed and fired in a similar fashion (described below).

Missile Targeting Envelope: If the HUD is in AIR mode and an air-to-air missile is your current weapon, the Missile Targeting Envelope appears on the HUD, outlining the limits of your missile's seeker head; though your Tracking Camera can lock-on to a target anywhere, the air-to-air missile itself can lock-on to in-range enemy aircraft only within this circle. In GND mode, no targeting envelope appears, but a missile cannot lock onto a target that is not currently visible through your HUD.

Oval Lock-on: When the Tracking Box turns oval (and the "LOCK" light on the console begins flashing), the missile is locked-on to the target and has a good chance of hitting. When the oval turns red (and the "LOCK" light stops flashing), the missile has superior accuracy. Additionally, when the missile locks-on, a box (the "Lock Box") appears in the Tracking Camera display, and when you have attained superior accuracy, the Lock Box begins repeatedly contracting.

To fire, open the weapons bay by tapping *Bay Doors* (8) and then tap *Fire Weapon* (Return/Enter).

Restrictions and Suggestions: Missiles drop about 300-400' – with whatever airspeed, climb rate, or dive rate your plane has – before their own power carries them away. As a general rule, launching below 500' or in a power dive is not a good idea, and may even be dangerous. It is also unwise to launch while in a tight turn or inverted, as the missile may tumble when leaving the bay, losing guidance or even smashing into your plane. Once the missile is launched you can change to new targets, new weapons, and maneuver as you wish.
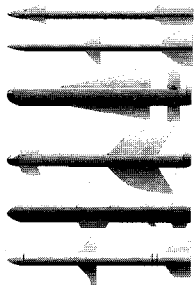
FIRING YOUR CANNON

20mm Cannon

Your cannon has a maximum range of 6 km and an effective range of about 3 km.

Air-to-Air Anticipation Firing: Your cannon's fire control system uses a "historical gunsight" that shows where your shells would be landing, if you'd fired a few seconds ago. Unless you're tracking a target, the fire control system assumes the range to be 6 km, and places the gunsight to show where the shells would be had they been fired 6 seconds earlier (the approximate time it would take the shells to travel 6 km).

If you are tracking a target, the system uses the current range to the target to calculate where to place the sight on your HUD. The Tracking Box shows the targeted enemy airplane and the range to the target appears in the right MFD.

To fire, you must "anticipate" when the enemy and your gunsight will meet. For example, if the enemy and your gunsight are converging and the range to the target is 6 km, you should open fire about 6 seconds before they converge. If you estimated correctly, they will converge just as your gunsight moves onto them.

Air-to-Ground Walking Fire: Attacking ground targets is much easier, since they don't move. The easiest way is by "walking" your fire over the target. Do this by flying low (about 500'), opening fire about 6 km from the target and observing where the shells hit the ground. Guide your plane to "push" the advancing explosions onto the target. Unfortunately, this technique consumes ammo rapidly unless you fire short, well-spaced bursts.

BOMBING
PAVE TACK
Laser-Guided
Bombs

Laser-Guided Bombs
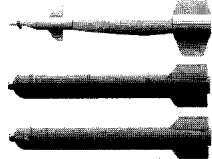
GBU-12 Paveway
CBU-72 FAE
MK 20 "Rockeye" II

Laser-guided bombs are essentially motorless missiles that glide from your plane to a target "painted" by the PAVE TACK laser mounted on your plane. Operating these weapons is a lot like launching self-guided missiles. You use the tracking/targeting system in exactly the same way with only a few exceptions.

Oval and MFD lock-on: The Tracking Box on the HUD frames your target and the Tracking Camera is locked onto it. When the Tracking Box turns oval, the bomb is locked onto the reflected laser energy and has a good chance of hitting. When the oval turns red, the bomb has superior accuracy.

However, because you must release the bomb so close to the target, you often can't see the Tracking Oval when it turns red; for this reason, you must rely upon the console "LOCK" light and Lock Box in the Tracking Camera to tell you when the optimal release time is.
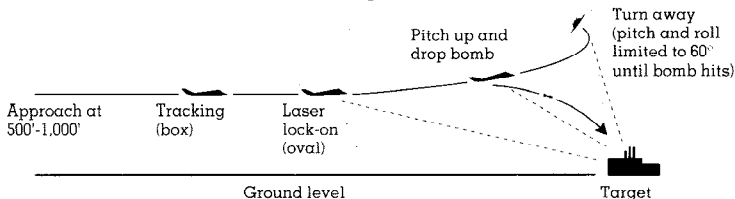
The Lock Box appears on the right MFD and the "LOCK" light begins flashing when the Tracking Box turns oval. When the optimal release time is reached, the "LOCK" light ceases flashing, and the Lock Box on the right MFD begins repeatedly contracting.

Toss Bombing: Glide bombs travel as fast as your plane, so if you release at low altitude, they hit the target when your plane is about directly overhead; if you're not careful the explosion can destroy you.

The standard attack technique is called "toss bombing." Approach fast and level at about 500'. When 3-6 km from the target pitch up into a 30-40° climb, tap *Bay Doors* (8) to open the bay, and watch the right MFD. When optimal release time is reached (the Lock Box begins contracting and the "LOCK" light stops flashing), tap *Fire Weapon* (Return/Enter) to release the bomb and turn away.

PAVE TACK Laser-Guided Toss Bombing

Approach at 500'-1,000' — Tracking (box) — Laser lock-on (oval) — Pitch up and drop bomb — Turn away (pitch and roll limited to 60° until bomb hits)

Ground level — Target

Level Bombing: You can also level bomb with glide bombs. As a general rule, though, you'll need to attack from at least 2,000' altitude. Here you can lock onto the target at 4 km range. Attack immediately and turn away. Needless to say, however, high altitude attacks make you a sitting duck for enemy radar and SAMs.

Restrictions and Suggestions: You must keep the underside of your aircraft facing the target until the bomb hits. If not, the laser guidance breaks and the bomb will almost surely miss. You can fly over the target instead of flying past at an angle, but you must rise above 3,000' to do this safely. However, the blast has a danger zone of roughly 3,000', so you must gain enough distance or altitude to avoid the blast.

Retarded Bombs

Retarded bombs are unguided but have parachutes or special fins to slow them down very quickly as they fall. As a result, you can be far away by the time they impact, allowing safe low-altitude bombing runs.

Level Bombing: Dive bombing and toss bombing don't produce useful results with retarded bombs, so you must use level bombing. In this standard technique for low-altitude runs with retarded bombs, fly straight and fast over the target at 600-800', releasing the bomb(s) according to cues from the Flightpath Guide and Ranging Bar on the HUD.

Flightpath Guide: When using retarded bombs, the diamond-shaped Flightpath Guide appears on your HUD. Turn to align the Flightpath Indicator to the Flightpath Guide. You can be above or below the Flightpath Guide without losing accuracy, but being left or right of it may cause a miss.

Ranging Bar: As you approach the target, the Ranging Bar appears on the HUD. As you near the target, the bar begins to collapse; the cue to release is when the line becomes a single dot. You may wish to extend your brakes to make the bombing run more manageable.

To Release the Bomb, tap *Bay Doors* (8) to open the bay, then *Fire Weapon* (Return) to release the weapon. If your brakes are extended, retract them immediately after launch to escape the blast area.

Restrictions and Suggestions: Retarded bombs are the easiest and safest weapons to use, and one of the most popular among USAF pilots. If you keep up speed in your bombing run, you can safely release from 600', even though the blast area is 3,000'. The Ranging Bar and Flightpath Guide flash if you're too low for safe release. However, the targeting system predictions assume you'll continue to fly "as is." If you drop the bomb, then immediately turn up and away, you could drop a bomb within the "danger area" and escape.

Retarded Bombs
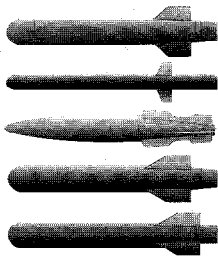
Mk 20 Rockeye
Durandal
Mk 82-1 Snakeye
Mk 35 Incendiary Cluster
ISC BB-1 Minelets

Free-fall Bombs

These are traditional bombs that arc down at high speed toward the target. In level bombing, the techniques for using them are identical to those for retarded bombs except that you need to be considerably higher to release them safely. A safe minimum altitude for releasing a free-fall bomb in level bombing is 3,000' as opposed to 600' for retarded bombs.

Free-fall Bombs

Mk 82-0 Slick
Mk 122 Fireye

Level Bombing: You use the Flightpath Guide and Ranging Bar just as you do for retarded bombs, but you have one additional HUD cue: the Bombsight Fall-line and Bullseye. In level bombing this indicator may be ignored.
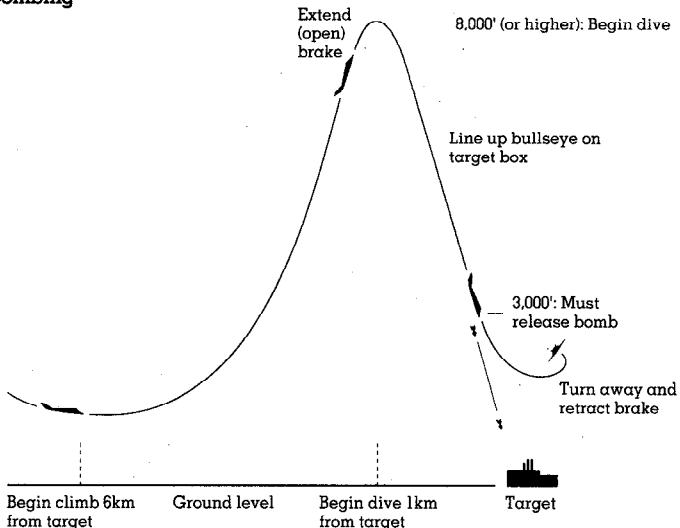
Bombsight Fall-line and Bullseye: This indicator appears on your HUD as a line extending from your Flightpath Indicator to the place on the ground a bomb would hit were it released now. At that point is a red oval bullseye. In level bombing the fall-line indicator usually extends off the bottom of the HUD, with the bullseye out of sight below. But in dive bombing it is indispensable.

Dive Bombing:

Dive Bombing: To make a dive-bombing attack, start by flying low toward the target. Switch your HUD to GND mode, make sure the correct weapon is selected (Mk 82-0 Slick or Mk 122 Fireye), and put your Tracking Camera onto the target. Now follow these steps:

1. *Guide on the Bombsight Flight Path:* Approach the target by flying straight at the diamond-shaped bombing flight path indicator. It's okay if the indicator is above or below your flight path, but make sure it's not to the left or right.

Extend (open) brake

8,000' (or higher): Begin dive

Line up bullseye on target box

3,000': Must release bomb

Turn away and retract brake

Begin climb 6km from target — Ground level — Begin dive 1km from target — Target

2. *Climb to Attack Point:* When the target is about 6 km away (you can tell by looking at the right MFD), zoom up into a 55° climb to an altitude of 8,000' opening your bay doors as you climb (tap *Bay Doors* (8)). Your objective is to reach 8,000' about 1.5-2 km from the target.

3. *Dive onto the Target:* Level out, flick open the brakes (tap *Brakes* (0)). At just under 1 km away, push down into a steep (80°) dive and align the Bomb Bullseye with the target box. Keep an eye on your altitude because you must release the bomb before reaching 3,000'. If you can't line up the Bullseye and Tracking Box before reaching 3,000', pull out and try again.

4. *Release Bomb and Turn Away:* If you manage to keep the bullseye steady within the target box before reaching 3,000', release a bomb immediately (tap *Fire Weapon* (Return)), then another if possible. After the release pull up sharply and roll away in a 90° turn. Close the brake (0) as you do this, to maintain maximum speed into the turn. Then close the bay doors (8).

Suggestions: The zoom climb to 8,000' is the most critical phase of the attack. If performed flawlessly, a 55° climb will cover 4 km of ground, assuming you start at maximum level speed at 200' and wish to arrive at 8,000'. Some pilots prefer to use a slightly shallower zoom climb up to 10,000', but this exposes you longer to enemy detection.

Climbing to a dive bombing position usually broadcasts your presence to the opposition. Therefore, once you're turning away from the target after the bombing run, look over and check the missile warning lights for an attack.

The most common mistake when dive bombing is forgetting to open the brakes at the top of the climb. With the brakes closed you plummet so fast it's almost impossible to line up the target and release the bomb before reaching 3,000'.

Restrictions: The HUD bombing symbols flash if you're within the blast area of the bomb (within 3,000' of the predicted drop point). Do not drop the bomb unless you're confident you can escape the blast.

PHOTOS AND SPECIAL EQUIPMENT
135mm/IR Recon Camera

The 135mm/IR Camera is a reconnaissance camera mounted in a weapons bay. It is fixed forward (unlike your target Tracking Camera, which moves and looks down).

Camera Operation: To configure your HUD and cockpit for camera operations:

1. Switch the HUD to GND mode by tapping *HUD mode* (F2).

2. Select the bay containing the camera by tapping *Select Weapons* (Space Bar).

3. Aim the Tracking Camera at the target by tapping *Cam Ahead* (/); tap *Select Target* (B) if necessary.

4. Tap *Bay Doors* (8) to open the bay doors.

Taking Pictures: When you open the bay, you see the ground below and just ahead of your plane in the right MFD, which is now viewing through the lens of the camera. Fly so that the cross symbol ("+") in the lower center of the HUD passes through the center of the Tracking Box. When this happens, you'll see the target pass through the lens on the right MFD. As it does, hit *Fire Weapon* (Return) one or more times to take the pictures. You'll see a message on the HUD indicating a good picture (when and if you get one).

Special Equipment

Delivering or Picking up Equipment: As a stealth pilot, you'll be required to make deliveries of highly classified materials; you may also be asked to pick up top secret items. Finding a secret airbase and landing there is a major challenge. They have no ILS system – just a few flares at either end of the runway! Furthermore, the runway is very short; it's only half the length of a runway at a major airbase.

To pick up or deliver equipment at a secret airbase, you must safely land at the airbase. Equipment is unloaded or materials delivered to you automatically. A message in the HUD indicates when this has occurred and you can take off again.

Dropping Equipment: To drop equipment, tap *Select Weapons* (Space Bar) until "EQUIP" appears in the lower left corner of the HUD. Tap *Bay Doors* (8) to open the bay, then, as you pass over the radio beacon, launch the equipment by tapping *Fire Weapons* (Return/Enter).

The minimum safe altitude to drop equipment is 500'. Try to avoid dropping it from altitudes above 1,000', since the higher you are the less accurate the drop.