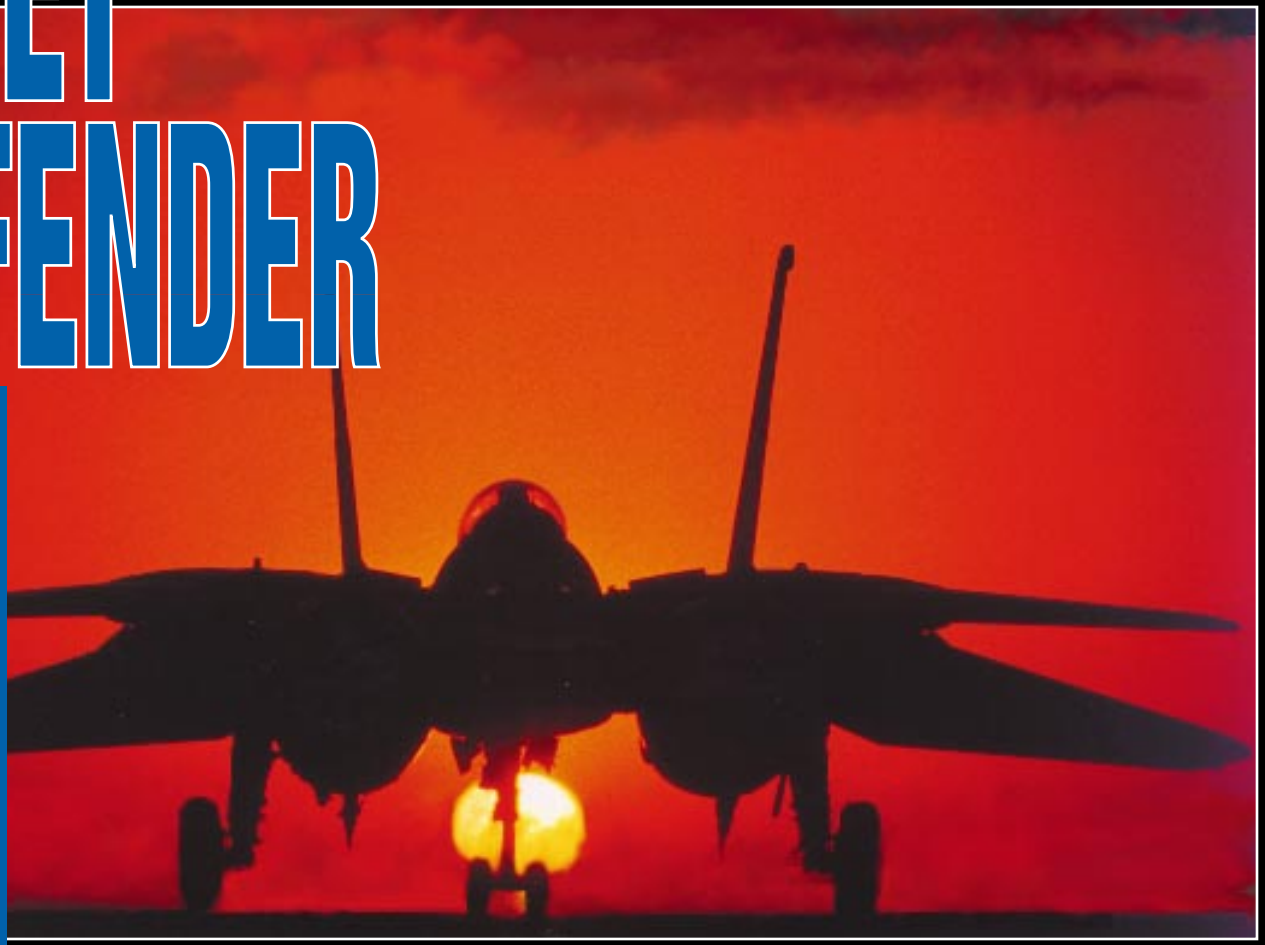
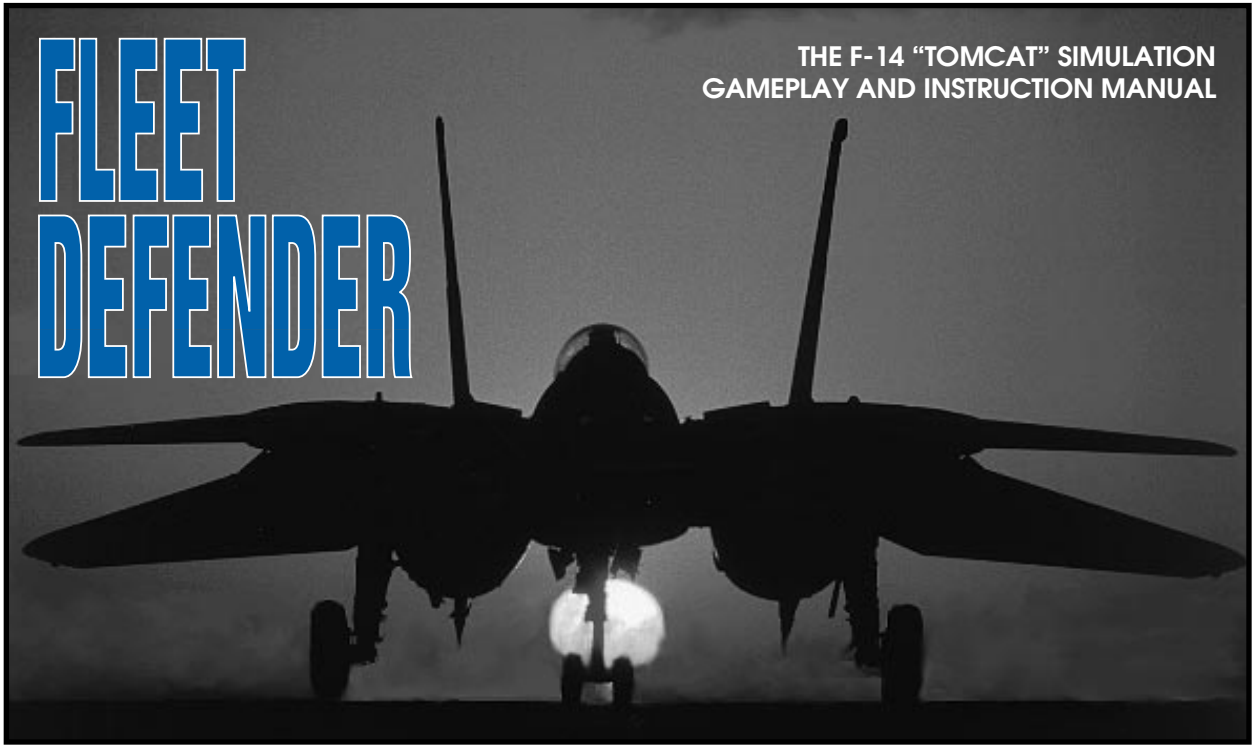
FLEET DEFENDER

THE F-14 TOMCAT SIMULATION

SIMULATION



GAME PLAY INSTRUCTIONS



FLEET DEFENDER

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ACKNOWLEDGMENTS

Figure I-1: During the 1991 Persian Gulf war, VF-103 was assigned to the U.S.S Saratoga (CV-60), a Forrestal-class aircraft carrier, on station in the Red Sea. The Sluggers conducted front-line operations over Iraq and Kuwait with distinction throughout the war.

As you may have guessed from the preceding credits, it takes many people working long hours to produce a flight simulation. There's an adage among pilots which goes, "Never fly an aircraft designed by committee." Well, in the case of computer simulations, especially ours, this saying simply isn't true. No one person could possibly hope to excel in all the different disciplines needed to complete one of these projects. Flight simulations are a collective effort and *FLEET DEFENDER* is no exception.

Those of you familiar with MicroProse products will undoubtedly recognize some of the names from past flight simulations. That's because the same core group of men and women who designed *F-15 Strike Eagle III* banded together once again to produce *FLEET DEFENDER*. Their mission was to integrate a flight simulation based on the F-14B Tomcat with a comprehensive air-sea campaign environment.

Improving on *F-15 Strike Eagle III* wasn't going to be easy. This simulation pushes the edge of the envelope as far as recreating air-to-ground attack action is concerned. But the designers put together a list features that players most wanted to see in our next sim. These included seamless play, state-of-the-art graphics, a realistic F-14 flight model, and improved AI. The design team set out to implement a dream sheet of features and in the process, create a flight simulator that's not too hard to learn yet fun to play.

Before all the programmers, artists, and game designers got started, the principle team members took a field trip to Oceana Naval Air Station, Virginia. Oceana NAS is the readiness and training site for east coast F-14 squadrons and is located within the city limits of Virginia Beach. They didn't spend much time at the beach though. Instead, the team was treated to a week of direct hands-on experience with the F-14 and its systems courtesy of VF-103, better known as the "Sluggers."

We are deeply indebted to the men and women of VF-103 who welcomed us and made us feel right at home. Unfortunately, space does not allow us to mention everyone who assisted us because just about the entire squadron would make the list. The "Sluggers" are just a superb bunch. Having said that, there were a few individuals deserving of special recognition for making the trip such a worthwhile venture. First, our thanks goes out to Lt. Sam "Splatt" Platt of VF-101 "Grim Reapers" for orchestrating the tour at Oceana and Lt. Eric "Opus" Higgins and his RIO Lt. JG Paul "Skippy" McHenry of VF-103 "Sluggers" for demonstrating their F-14 and guiding us through an actual F-14 simulator.

While at Oceana the team was able to "run wild" on the *U.S.S America* (CV-66) courtesy of the *America's* Commanding Officer, CPT. W.W. Copeland. We would also like to thank our escorts; Ensign C. J. Jenkins and Journalist First Class Albert J. McGilvray. Each of these gentlemen contributed to making *FLEET DEFENDER* a realistic and accurate simulation and we are sincerely grateful for their assistance.

Figure I-2: The U.S.S. America (CV-66) performing a gentle turn to starboard for the camera.

START-UP INSTRUCTIONS

Contents

Your complete *FLEET DEFENDER* F-14 simulation should contain, in addition to this instruction manual, four 1.44 MB 3 1/2" disks, a Key Reference Card, a registration card, and a backup disks order card.

Minimum System Requirements

FLEET DEFENDER requires the following minimum system components and memory:

Computer: IBM, or fully compatible, 80386 33 MHz (a 80486 33 MHz is recommended)
System Memory: 4MB of RAM, with 2208K EMS free
Hard Drive: with at least 14 MB available
Conventional Memory: at least 566 K free
Graphics: VGA graphics card and VGA monitor
Floppy Drive: one 1.44MB 3 1/2" (required only for installation)
DOS: MS-DOS 5.0 or higher

INSTALLATION AND LOADING INSTRUCTIONS

Installation

The installation program checks your system for a number of conditions, and advises you as to the status if your system does not meet the conditions. It decompresses and copies the simulation files from the distribution disks onto your hard drive.

The install program also auto-detects your computer's configuration and provides recommendations for sound, speech, control device (joystick, keyboard, etc.).

INSTALLATION CONDITION CHECKS

1. If your hard drive has less than 14 MB available, the installation program terminates and immediately advises you that adequate hard drive space is not available.
2. If your system has less than 566 K of free conventional memory, the installation program continues, but advises you that adequate conventional memory is not available.
3. If your system has less than 2208 K of free EMS, the installation program continues, but advises you that adequate EMS memory is not available. EMS memory is required for loading.

Loading

In order to load *FLEET DEFENDER* you must have first installed the program. If not, return to the section on installation and follow the instructions found there.

1. To load *FLEET DEFENDER* change over to the drive that contains the simulation directory. For example, if you installed the program to your C drive, change your system by typing C:. Now press the *Enter* Key.
2. Once you have accessed the proper drive, change over to the proper directory. If you selected the default MPS\F-14 directory, you can change to that directory by typing cd MPS\F14. Now press the *Enter* Key.
3. Type F-14. Press the *Enter* Key to begin the simulation.

Making A Boot Disk

If you feel uncomfortable about modifying your AUTOEXEC.BAT or CONFIG.SYS files, or you are unable to free up adequate conventional memory, your best bet is to utilize a *boot disk.* A boot disk creates a temporary configuration for your computer that is compatible with *FLEET DEFENDER* .

Use the *boot disk* to start your system whenever *FLEET DEFENDER* is to be loaded. That way, your normal system configuration is unaffected.

You must first install *FLEET DEFENDER* on to your computer before running the boot disk utility. Return to the "Installation" section and follow the instructions found there.

TO MAKE A BOOT DISK:

1. Insert a blank, formatted disk into your computer's A drive. (You must use your computer's A drive, since it can not boot from the B drive.)
2. Change your drive over to the directory containing the simulation files.
3. Type *bootdisk* and press the *Enter* Key.
4. If you have a ProAudio Spectrum sound card installed, type *bootdisk pas* and press the *Enter* Key.

The boot disk utility accesses your existing AUTOEXEC.BAT and CONFIG.SYS files for various pieces of information. It also searches your hard drive for required information not found in those two files. If it is unable to find any part of the required information, it prompts you to supply the information.

For example, suppose you renamed the directory in which your mouse driver resides to MY_MOUSE and moved it to the E drive. The boot disk utility would not know to look in that location for your mouse driver. You must supply this information when prompted. In this example, the response would be: e:\my_mouse\mouse.com

USING THE BOOT DISK

After making the boot disk, place it in drive A and reboot your computer. The boot disk configures your system for *FLEET DEFENDER* , and automatically starts the program.

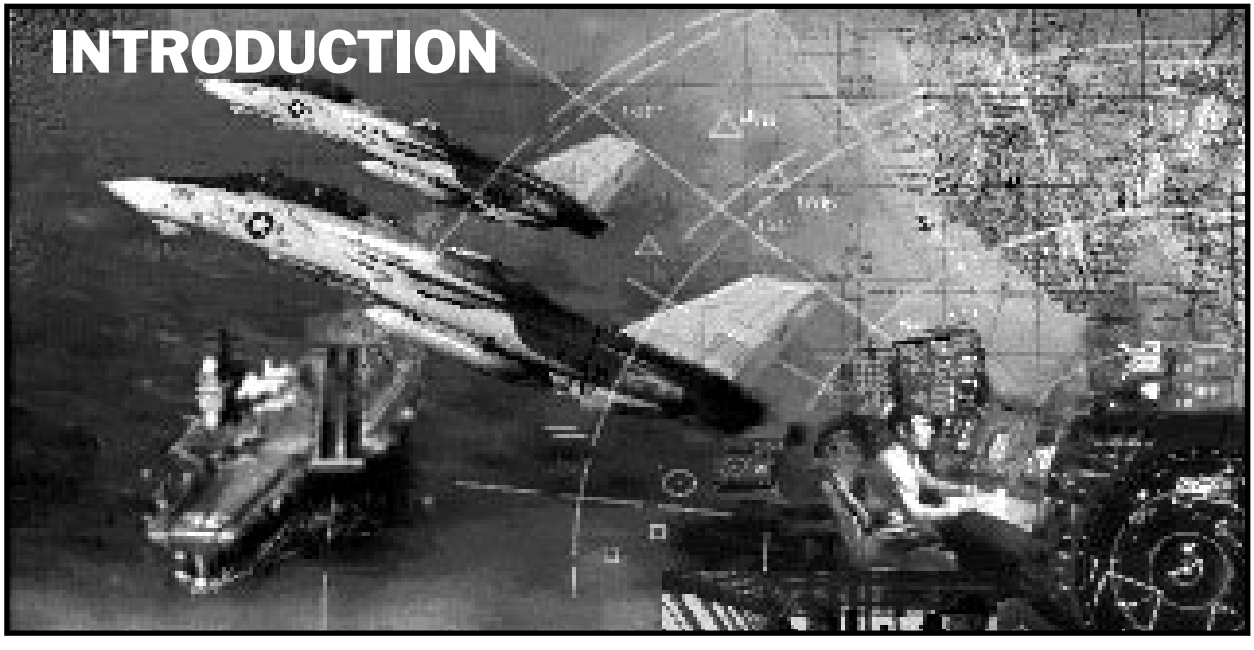
Restarting your System

When you are finished with *FLEET DEFENDER* , remove the boot disk from your computer's A drive, and reboot your system. Your system will restart with your normal configuration.

Configuration

As part of the installation process, you are required to designate selections for music, sound, digitized speech, and input controller. Fortunately, the install program auto-detects the majority of the possible options.

This configuration process is also utilized to change your selections if you add, delete or modify system equipment or just decide to change the selections.



ABOUT THE F-14 TOMCAT

HISTORICAL BACKGROUND

The Aircraft Carrier and Changing Naval Doctrine

Following the successful conclusion of World War II, the United States was sold on the concept of naval aviation. The island-hopping campaign in the Pacific against Japan would have been impossible without it. World War II changed naval strategy forever, not just in the U.S. but throughout the world. Air power (and the aircraft carrier) had replaced the big guns of the battleship. No longer would opposing fleets simply line up in parallel columns and hammer away at each other.

Starting with Coral Sea in 1942, naval battles could begin when the two sides were still hundreds of miles apart. Aircraft carriers lent mobility to air power, freeing it from the restrictions imposed by stationary land bases. Taranto and Pearl Harbor demonstrated the effectiveness of the surprise carrier strike.

A fleet could run from battle but it couldn't hide. Ships could now be tracked down and destroyed in their own bases. The aircraft carrier, on the other hand, proved its resiliency by withstanding wave after wave of Japanese pilots intent on committing suicide. The legendary *Kamikaze* ("Divine Wind" in Japanese) proved to be the ultimate challenge.

Clearly, naval strategy in future wars was going to be dictated by the development of naval aviation, at least as far as the United States was concerned. The Navy had over a hundred aircraft carriers left over at the end of World War II and a vested interest in promoting both the effectiveness and survivability of its carrier groups. With the war now over, the Navy had to start thinking about winning the peace. The next battles would be fought in the halls of Congress and on Capitol Hill over which branch of service would receive the most defense dollars.

Constructing and maintaining even a dozen modern aircraft carriers was going to cost plenty. The start-up cost alone would be enormous and that was just the beginning. By the time fuel costs, training and personnel costs were factored in, a single carrier would ultimately require billions in defense outlays. Of course one mustn't forget to add in the air wing consisting of eighty to ninety aircraft and the cost of training a new generation of naval aviators every twenty years or so.

Big carriers meant the Navy Department could ask for big money from Congress and get it. This is not to suggest that the Navy pursued carrier development out of a desire to increase their share of the nation's defense budget. Let's just say that things have a way of perpetuating themselves and that big budgets added to the Navy's prestige when dealing with the other services.

The Soviet Union, on the other hand, lacked the United States' industrial resources and practical experience in carrier warfare. What it did not lack was a commitment to become the preeminent military power on the planet. When WW II ended, the Soviets found themselves in possession of eastern Europe. Holding onto this expanse of territory would require land armies and their component air support.

For many years the Soviet Union had no real need to project its naval strength outside of Europe. Air and naval power was used to complement a European ground war only. So while the Army and Air force had lavish resources heaped upon them, the Soviet navy consisted of a few coastal patrol craft and surplus destroyers obtained from the U.S. during the war.

Each nation entered the Cold War with different strategic objectives. The United States recognized that it could never return to semi-isolationism and that containing the spread of Communism was going to require global involvement. To back this commitment, the U.S. had to create a naval force able to respond quickly to potential trouble spots. Such a force would have to be self-contained and provide for its own air defense.

The Soviet Union took a much more defensive stance. Its biggest concern was keeping U.S. warships out of Soviet waters. While the United States built up its fleet of aircraft carriers, the Soviets jumped ahead in missile technology. The Soviets planned to make the vaunted U.S. super-carriers vulnerable to low cost missile attacks.

In the 1950s, the U.S. Navy recognized that Soviet progress in missile technology would one day pose a serious threat to its carrier battlegroups. Naval tacticians could envision having to fend off waves of attacking long-range bombers or nuclear cruise missiles. It was assumed that sometime within the next decade the Soviets would manage to arm their strategic bombers with stand-off cruise missiles. Once this happened, U.S. carriers could be hunted down and destroyed before they sailed within striking distance.

To deal with this eventuality, the Navy wanted to develop a carrier-based fighter able to engage Soviet bombers at ranges in excess of the stand-off range of their missiles. Engineers were quick to point out that the Navy's mission requirements were at odds with the weight restrictions normally associated with carrier aircraft. A fighter conforming to this set of requirements, would have to be large enough to store tons of additional fuel yet remain light enough for carrier operations, an impossible task.

The Navy's answer was to design a fighter with a powerful radar and complement of long range air-to-air missiles. This solution had the advantage of increasing the combat radius of the aircraft without increasing its fuel load. The aircraft could take up a patrol station closer to the carrier and let its missiles reach out and perform the mission. Unfortunately, this concept meant the fighter would be burdened by the weight of its own radar system and missiles, thus losing much of its dogfighting capability in the process.

The ability to dogfight was not supposed to matter. Under these design specifications the aircraft would be a platform for launching missiles, and nothing more. Once it had expended all its missiles it would immediately return to the carrier. Labeled an *interceptor,* this aircraft was never meant to engage the enemy up close and personal. After all, didn't the Navy leave the guns off their Phantom II design? They wouldn't have done that if they thought for a moment that their pilots would be dogfighting with enemy pilots.

Figure I-4: A carrier battlegroup at sea.

Genesis of the F-14

In late 1957, the Navy won a contract to begin developing the XAAM-M-10 *Eagle,* a two-stage, solid fuel, radar-guided air-to-air missile with a range in excess of 100 nm. The Douglas F6D *Missileer* was the aircraft selected to carry the *Eagle.* The Missileer design called for the inclusion of a track-while-scan pulse Doppler radar with the ability to target, launch and control six Eagle missiles. This combination of aircraft and missile was intended to perform the Fleet Air Defense role through the 1970s. Three years later, in late 1960, the entire program was scrapped. Enter the Kennedy administration and a new Secretary of Defense Robert S. McNamara.

McNamara was a business man, moving from a successful business career in the private sector to head up the Defense Dept. It was his contention that the military could save billions of dollars in procurement by collective purchasing. That is, buying equipment in bulk. Instead of allowing each branch of service to buy different items to do the same job, McNamara stressed *commonality.* He wanted all the services to buy the exact same items to contain costs, including everything from tools to tanks, frying pans to fighters.

As it happens, both the Air Force and Navy were shopping around for a new fighter aircraft. The Navy was looking for a replacement for its canceled Missileer while the Air Force wanted a high speed, tactical strike fighter (the TFX program) to replace the aging F-105 *Thunderchief*. McNamara saw this as an opportunity to save money. He wanted the defense industry to build a single aircraft to suit the needs of both services.

In 1962, after much prodding by McNamara, the two services finally arrived at a compromise design. General Dynamics was awarded the Air Force's TFX contract. Grumman was given the contract to begin work on the Navy's version of the same aircraft. Both variants, the Air Force's F-111A and the Navy's F-111B, were designed with *maximum commonality* in mind.

The first F-111Bs were flying by 1965. From the very beginning pilots had serious reservations about McNamara's "one fighter for all occasions" idea. Chief among the complaints was the aircraft's weight, at 70,000 lbs., the aircraft was too heavy to operate safely from an aircraft carrier. Take-offs were risky, landings were worse. Catapults and arrestor cables in service at the time were not stressed to handle this load. On final approach, the aircraft had to be flown at such a high angle of attack that the pilot could no longer see the carrier deck.

As a result of the F-111B set backs, Grumman proposed to rework the aircraft using light weight titanium alloys. This reengineered design became known as the VFX. In early 1967, the Navy commissioned a study comparing the two design proposals. Grumman's VFX project won hands down. Using the same engines as the F-111B, the VFX turned in a consistently superior performance and Congress canceled funds for the F-111B in 1968.

This cancellation proved to be the turning point in the F-14's development. The way was cleared for the Navy to make a RFP (Request for Proposals) outlining specifics for a separate aircraft, apart from the Air Force's F-111A. Some of the design features mentioned were tandem seating for a two man crew, twin engines, a track-while-scan radar with multi-targeting capability, and carrier suitability.

Figure I-5: "Hey, buddy! Get the heck outta' the way." A turkey-feathered F-14 prepares to take-off.

The F-14A

Grumman was one of five aerospace companies which initially bid on the VFX (F-14) contract. Because of its past association with the Navy and experience with swept-wing technology, it was awarded the contract in 1969. Out of hundreds of different designs, prototype 303E was the one chosen for initial test production. The first of 12 developmental aircraft was flying two years later (21 December 1970). Operational F-14s were delivered to the Navy (VF-1, VF-2) in October 1972. These two squadrons were subsequently deployed aboard the *U.S.S. Enterprise* (CV-65) in 1974.

The F-14 took over the role of Fleet Air Defense from the venerable F-4 in the mid 1970s. The *Phantom* had done an admirable job in its day but the Vietnam War never seriously tested its ability as a *FLEET DEFENDER*. U.S. aircraft carriers were never threatened as they would be in a future war by Soviet bombers.

As more capable fighters entered service in Third World air forces it became clear that a number of modifications to the basic F-14 design were needed. For example, early model F-14s were issued with the TF30—P-412A turbofan engine. The TF30—P-412A consumed far too much fuel for the amount of power it produced. It was problematic and prone to compressor stall. The engine generated only 12,350 lbs of thrust (20,900 lbs. with afterburner). Clearly, even with two of these engines, the power produced was inadequate to the task of pushing a 70,000 lb. fighter around. The 412A was, however, the only engine available for use without an extensive delay period.

The Navy decided to go ahead with the 412A until a successor could be found. Starting in 1982, however, as F-14s came in for program maintenance and overhaul they were fitted with the new TF-30-P-414 turbojet engine. Though the 414 was slightly heavier than the 412A and produced the same thrust, it was more reliable and used less fuel. Its biggest drawback was that it produced smoky exhaust making the aircraft easy to spot in combat. (The F-4 suffered from the same problem.) Realizing that the 414 was still only an interim solution, the Navy directed that work continue on finding a more powerful replacement.

The USAF announced in 1984 that it was accepting a new engine, the F110-GE-100, for its F-16s. Several months later, Secretary of the Navy John Lehman told a Congressional Appropriations subcommittee that the F-14 and TF series engine represented *"probably the worst engine/airframe mismatch we have had in many years. The TF30 is just a terrible engine and has accounted for 28.2% of all F-14 crashes."* His testimony paved the way for the Navy to begin purchasing these engines along with the USAF.

Figure 1-6: The Fightin' 143, better known as the "Pukin' Dogs"

The F-14B

Shortly afterward, Grumman was awarded a $984 million contract to upgrade the F-14's avionics and engines. The upgraded F-14As, known as the F-14A(Plus), were given advanced avionics. Impressed with the USAF's F-110-GE-100s, the Navy redesignated these engines F110-GE-400 and placed them on the F-14A (Plus). F-14s could finally make a catapult assisted take-off without their afterburner engaged. (The 400 produces 14,000 lbs. of dry thrust, 23,100 lbs. of wet or afterburning thrust.)

The F-14A(Plus) was first flown in 1986 and delivered to VF 101 "Grim Reapers" at Naval Air Station Oceana, Virginia in 1988. Since then, F-14A(Plus) aircraft have also been delivered to VF-24 "Renegades," VF-74 "Bedevilers," VF-103 "Sluggers," VF-142 "Ghostriders," VF-143 "Puckin' Dogs," and VF-211 "Fighting Checkmates." On May 1st, 1991, the CNO (Chief of Naval Operations) ordered that all F-14A(Plus) models be redesignated F-14B. To avoid confusion, all F-14s in *FLEET DEFENDER* retain the B designation even in those scenarios prior to 1991.

Keep in mind, even when playing those pre-1988 Mediterranean campaign games, you are given a more powerful version of the F-14 that did not historically exist at the time. All F-14s flown in *FLEET DEFENDER* are assumed to be F-14B model aircraft regardless of the scenario being played.

It should be noted that the MicroProse design team tested a flight model using the original TF-30-P-412A engines installed in F-14As. The result was a particularly narrow flight envelope. The aircraft was very unforgiving if one failed to stay within these parameters. More often than not, inattentive pilots found themselves spinning in before ever engaging the enemy. In short, it wasn't much fun. For purposes of a commercial flight simulator, the F-14B with its improved turbojet engines, was a much better choice.

THE FLEET DEFENSE MISSION

Both the F-14 and the F-111 were originally thought of as mere platforms, built to facilitate the delivery of specialized ordnance. In the case of the F-111, the USAF saw the aircraft as a strategic bomber capable of low level, high speed penetration of enemy airspace. The F-14, successor to the *Missileer* concept, was intended to be a platform for launching AAMs at incoming bombers.

The *Missileer* program envisioned an aircraft which after taking off, could orbit a significant distance away from the carrier, for an extended period of time. From this patrol station, the *Missileer* would fire its long range missiles at any enemy aircraft venturing near. Once all its missiles were gone it would return to the carrier and another aircraft would take its place.

Figure I-7: An F-14 belonging to VF-33 "Starfighters", at rest.

Despite the program's cancellation, this concept of fleet defense remained. The Navy was still in need of an aircraft able to contend with Soviet advances in cruise missile technology. The U.S. Navy was forced to consider the state of carrier vulnerability 5-10 years down the road. To meet this future threat, any fighter chosen to perform Fleet Air Defense would have to be equipped with a powerful track-while-scan radar able to target multiple aircraft. The fighter would also have to be armed with active radar missiles so that it could have several of them in the air at one time.

The mission, Fleet Air Defense, exposes both the aircraft and crew to a very special set of stressful situations. After launch, an F-14 must fly a CAP hundreds of miles away, loiter at slow speed for several hours, then return to make a carrier landing under all types of weather conditions or at night. No wonder Navy flyers prefer to be known as aviators rather than pilots. Being a naval aviator puts them in a class all their own.

Flying an F-14 requires a certain mind-set. You are literally charged with protecting the lives of thousands of service men and women. A single lapse in judgment could be enough to allow an enemy bomber or missile to get through. Luckily there are safeguards and overlapping areas of responsibility built in to a carrier's air defense coverage. Even so, failure can lead to horrific destruction.

Keep in mind that the F-14 is a strategic *interceptor* and not a pure fighter. Although this distinction is somewhat subtle it's more than just a matter of semantics. There are profound differences in the way in which interceptors operate as compared to fighter aircraft.

To fulfill the Fleet Air Defense role on a strategic level, a long range air-to-air-missile is necessary. Under the original 1950's concept, this missile was to have been the *Eagle.* With its cancellation, work on the AIM-54 *Phoenix* was begun. (It is said to have risen from the ashes of the earlier program.) This combination of AWG-9 radar and Phoenix missile allows the F-14 to be such an effective aircraft.

One problem with the Phoenix is that there are never enough of them. The Tomcat can only carry six. When they are gone, what's next? As long as the F-14 has these missiles remaining it can act as a launching platform, firing at targets many tens of miles away. Once all six are expended, however, the F-14 has to close in and tangle with enemy aircraft. Despite its size the F-14 maneuvers quite well at slower speeds. It certainly doesn't handle like a nimble F-16 but it can hold its own in a dogfight.

The fact that the F-14 can make this role transformation is a credit to its swept wing technology. Swept wings allow the F-14 to operate in more than one combat environment. With its wings swept back it is configured for high speed (supersonic) dash profiles. The wings come back automatically (although there is a manual override) when you're feeling the need for speed. When the aircraft is in need of energy (or additional lift to maintain an AOA) the wings come forward. *Think of the wings as reaching forward as if grasping for more air.*

ABOUT *FLEET DEFENDER*

FLEET DEFENDER is a combat flight simulation based upon the United States Navy's principle carrier-based interceptor, the F-14B Tomcat. Since its deployment in 1972, the F-14 has been entrusted with the defense of the United States Navy's aircraft carrier battlegroups, its most valued military possession. More importantly, however, this aircraft is charged with protecting the lives of 8,000-10,000 servicemen and women that serve aboard the ships of an average battlegroup (CVBG). They are the Navy's shield. From Admiral to Ensign, Chief Petty Officer to Recruit, the F-14 is truly our*FLEET DEFENDER*.

Those of you already familiar with MicroProse's *F-15 Strike Eagle III* should feel free to jump right in with a single sortie. Notice that many of the control keys and features are common to both simulations. The programmers and game designers made a conscious effort to limit the functional differences between the two so that you could get started playing right away. But, if this is your first MicroProse flight simulation get ready for the ride of your life.

Figure I-8: The Cat Officer (in the foreground) is seconds from sending this F-14 on its way.

Picture yourself on the deck of a modern aircraft carrier suspended 70 ft. off the surface of the water. You and your RIO (Radar Intercept Officer) are strapped into your F-14 with over 30,000 lbs. of thrust spooling up behind you. "Greenshirts" swarm around your aircraft making sure everything performs as advertised. Underneath your aircraft, a steam catapult is building up pressure, it has to get your 30 ton "Tomcat" airborne in less than 300 feet. That doesn't leave a big margin for error. The blast deflectors are raised, signifying that the moment of take-off is fast approaching. You are about to be thrown off the flight deck with only one chance to get it right.

After the obligatory "thumb's up" exchange with the Cat Officer, it's time to go. With a deafening roar, your F-14 is thrust into the sky trailing a superheated column of air. There's no turning back now.... you're airborne, you're committed. You've become a *FLEET DEFENDER*. The rest is up to you.

FLEET DEFENDER is specifically designed to recreate carrier take-offs and landings (TOLs) in realistic detail. In fact, carrier landings are such a challenge that they can easily become a game within a game. *How many landings can you make before getting your first wave-off?* The stress of so many carrier approaches can get to be too much, especially at night.

In order to relieve the tension, this simulation combines carrier operations with air combat in two all-new theaters of war. Each theater of war contains three distinct campaign scenarios for you to participate in. If you're not ready for combat and just want to practice flying the Tomcat, there is an entire theater devoted solely to training.

Each of the campaign scenarios exposes your carrier and its escorts to savage attacks. Enemy aircraft probe your defenses and test your CAPs. Cruise missiles suddenly pop-up seemingly out of nowhere. Yes- there are numerous challenges which await you, from intercepting bomber formations at high altitudes to wave-hopping dogfights with supersonic fighters. All in all, you'll find yourself tangling with more than thirty different aircraft and helicopters.

You assume the role of flight leader on each mission and as the flight leader, you are placed in command of a *section* of two F-14s. A two-ship is a collective effort. You and your wing-man must work together as a team in order to get the job done. As the flight leader, you exercise a great deal of tactical control over your wing-man, keep him with you to cover your "six" or send him off to perform on his own. Use him but don't lose him.

Too many players think of their wing-man as cannon fodder. That's a habit you'll want to get out of because in *FLEET DEFENDER* your wing-man, as well as other members of your squadron, improve their skills with each mission they fly. The more experienced your wing-man becomes the better he'll perform so it's in your best interest to look after him.

With only twenty Tomcats on-board your carrier at the start of each campaign, you can't afford to lose a single one unnecessarily. If your squadron is handled roughly by the enemy early on, later missions may prove difficult if not impossible to complete. Remember that in each of the campaigns defense of the carrier is paramount. Lose the carrier- lose the campaign.

FLEET DEFENDER features an assortment of friendly aircraft ready to help you out in a dogfight or deliver a shattering counter-blow. When you're not out intercepting bandits, you may be required to escort strike packages. Luckily, your two-ship is not alone out there. Assisting you are additional two-ship CAPs and the full weight of a modern aircraft carrier battlegroup.

Unless you are forced to eject due to battle damage, you will be returning to your carrier. Even undamaged, landing back aboard your carrier will probably be the most stressful part of a mission, even more stressful than dogfighting or braving triple-A.

Figure 1-9: Comin' in for a perfect three-wire trap. This aviator has returned home in one piece.

For a naval aviator a good landing means catching the "three-wire" for a full stop. This type of landing is known as a *trap.* Miss all three wires and you had better be prepared to go to full throttle for a "go around." This is known as a *bolter.* If a bolter doesn't get your heart racing maybe you shouldn't be flying jets for the Navy.

If you find yourself having difficulty making carrier landings, don't get discouraged. *One of the F-14s involved in the downing of two Libyan Su-22s in 1981 took three trys to get back on deck.* You should expect to have your share of bolters before carrier landings get easier it to you. But while they may eventually get easier, they will never get routine. Just remember that everyone has their off-days, that's why extensive instructions on making carrier landings are included in this manual.

Even if you don't get the hang of it right away, don't give up. Points are deducted from your score if you end their mission without successfully landing back aboard the carrier, so stick with it. You will never get full credit for completing a mission until you can return safely to the carrier.

To help you along, a complete stateside training theater has been included. The Training theater revolves around Oceana Naval Air Station (NAS) located outside of Norfolk, Virginia. It extends as far north as southern Pennsylvania and as far south as the Bahamas. While in training at Oceana you'll be assigned to VF-101 "Grim Reapers", the east coast Fleet Readiness Squadron (FRS). As a Grim Reaper, you'll be given an opportunity to sharpen your flying skills before entering into combat. Go ahead and practice all those fancy maneuvers you see in the movies. Just remember that once in combat this game is for real. You just might want to discard all that hot-doggin' for some common sense ACM.

Figure I-10: VF-101 "Grim Reapers" squadron emblem

The majority of the training takes place over water. Somewhere out there is an aircraft carrier, *provided it hasn't been swallowed up by the Bermuda triangle.* This carrier is devoted to conducting training exercises with rookie aviators before classifying them as mission ready. Now is the time to practice take-offs and landings (TOLs). If you're going to make mistakes it's best to make them during training and not during combat.

FLEET DEFENDER does not require you to spend time in training, however. You may choose to ignore this theater altogether. Air combat can be very unforgiving to rookie pilots. It's life and death out there with no such thing as second best. You don't score any points for being a good loser.

Chivalry in sky was tried in WW I. The idea that air combat was a gentlemanly joust between knights in the sky didn't last long once men started dying by the thousands. Therefore a little advance training prior to combat can pay off big-time. If nothing else, it'll help you get a jump on the competition.

Those of you died-in-the-wool flight fanatics with an eye for detail will undoubtedly be saying to yourselves; Hey- if the F-14B didn't enter service until the late 1980s how come some of the campaigns take place before then? That's a fair question.

The design team choose to model the F-14B because it represents a marked improvement over the F-14A. The under-powered Tomcat-A wouldn't have performed up to everyone's expectations unless we toyed with the data some and produced an unrealistic flight model. We wanted to recreate actual campaigns but given our choice of time periods and theaters, this would have forced us to model the F-14A. It would not have been fun to fly.

As players, we all get a greater sense of involvement when the simulation is patterned after historical events. There's a greater emotional attachment to one's character (and one's aircraft for that matter) when you can equate game situations to "real life." So with this in mind the design team decided to keep the historical flavor yet allow the player to fly the F-14B.

If you believe this gives you too much of an edge, you can always limit yourself to a maximum power setting of 80%. We've taken care of play balance problems by allowing the Soviets to deploy some of their contemporary fighters in these early scenarios. Enjoy! Don't slow down for turns and may you always catch a three-wire on your way back home.

CHAPTER ONE: GETTING STARTED

If you're a pilot with a lot of flight sim time under your belt, this chapter is designed to allow you to begin play almost immediately. On the other hand, if you're new to flight simulations, bear with it. Flight isn't an easy thing to explain to newcomers.

Undoubtedly, you'll come across many terms and concepts that will be foreign to you. *FLEET DEFENDER*, like the F-14 it portrays, isn't always user-friendly (especially the portions dealing with radar). Don't become frustrated, though, we're sure you'll get the hang of it in no time. Just remember, the Navy spends years teaching its naval aviators the same information that *FLEET DEFENDER* tries to teach in hours (and days).

By the way, if this is your first flight simulator, we think you've picked a great one to start off your flying career. The F-14 is one of this country's classic fighter aircraft. It combines just the right amount of high-tech wizardry with old fashioned stick-and-rudder work.

Ideally, you should have the game running in front of you while you study this instruction manual. This way, you can refer back and forth from game to manual, and vice versa. The combination of play and study should help you learn even the most difficult parts of this game with minimal confusion. If, after all this, you're still stuck, feel free to call one of our technical experts in the MPS Customer Service Dept.

There are two different ways to play *FLEET DEFENDER* : SCRAMBLE and CAMPAIGN. The SCRAMBLE method is a one shot affair, you take-off, engage in combat, then return to the carrier. Because these missions represent only a single sortie, you are spared having to worry about the "big picture" events of a full campaign.

These missions allow you to jump right in and begin flying with minimal preparation. Although there is a standard default mission, SCRAMBLE also gives you the ability to create your own mini-combat situations from scratch. This is the preferred way to get familiar with the game before you embark on a full campaign. Turn to the section entitled SCRAMBLE for more information on these missions.

The second method of play is CAMPAIGN. A ***campaign*** is a series of inter-connected missions which take place over an extended period of time. These missions differ from single sorties in that there is a lot going on behind the scenes. You won't always see it, but it's there.

During testing, a furious battle erupted between a pair of Swedish Viggens and a group of MiG-23s that had wandered off course and crossed into Swedish (neutral) airspace. It was fascinating to watch. The Viggens had the Floggers for breakfast and prevented a major Soviet airstrike from reaching its target in Norway.

In a campaign, you (and other members of your squadron) are promoted based on your performance in combat. How well you do on one mission directly affects your likelihood of success on the next. For example, if your squadron was to experience heavy losses on a particular mission, it may not have enough aircraft leftover to carry out future assignments.

Campaigns give you access to greater numbers of friendly aircraft but with this greater force comes greater responsibilities. There are two F-14 fighter squadrons normally assigned to a carrier. These twenty aircraft are all that stands between the enemy and your ships. If these precious twenty airframes are ever bent, burnt, or lost at sea, they're gone for good. Chances are you'll need every one of these aircraft if you intend to last through to the end of a campaign.

Each campaign is made up of a variety of air defense and escort missions. Not only are you tasked with protecting friendly strike groups sent to attack enemy targets, you are also charged with defending your own ships from enemy air attack. If your aircraft carrier is ever sunk, the game is over. It doesn't matter how well you do as an individual pilot. The *raison d'être* for the F-14 is to protect the carrier, everything else is secondary. Turn to the section entitled CAMPAIGN for a more detailed explanation of these missions.

Key Reference Card

No matter which method of play you select, continually flipping through this instruction manual detracts from the overall simulation. For the first couple of missions you should keep the Key Reference Card next to your computer. This will enable to you to continue flying (and fighting) without having to pause each time you need to look up a particular command.

The Key Reference Card contains a summary of all the keyboard key commands you need to play this simulation. The commands are arranged according to their function so that after a few missions, you'll find yourself remembering commands without having to refer to the card any longer.

Terminology

Keyboard Keys: When a keyboard key is referred to in this manual, its name appears in *italics* followed by the key stroke (shown in uppercase and set in parentheses). For example, the key used to turn the radar system On and Off is noted as follows; Radar On/Off Toggle (R) key.

Selector: refers to the mouse, joystick button, or key controls. Selector #1 refers to either the left mouse button or *Enter Key,* Selector #2 refers to either the right mouse button or *Spacebar Key.*

Figure 1-1: An F-14 in a high energy state with wings swept back for speed.

Pause Option

You may halt this simulation at any time simply by pressing the Pause (Alt)(P). Because the *Pause* feature is a luxury not available to pilots in the real world, hard core "purists" are sometimes reluctant to use it. By not pausing the simulation, however, you are giving your opponents an unfair advantage. They continue to sneak up while you flip through the manual.

Feel free to use the *Pause* feature any time you need to refer to a section of instructions. *It's not considered cheating!*

START-UP SCREENS

THE MAIN MENU SCREEN

Figure 1-2: The Main Menu screen showing the two principle play options; SCRAMBLE and CAMPAIGN.

Figure 1-3: The Hall of Fame screen shows the top ten naval aviators along with their callsigns and top scores.

To begin playing *FLEET DEFENDER* , you must select one of the two play options found on the Main Menu Screen; SCRAMBLE or CAMPAIGN.

SCRAMBLE [S]

Press the *SCRAMBLE* [S] Key to begin a SCRAMBLE mission. The SCRAMBLE option is more than just a way to get flying in a hurry, it's a mission generator as well. After selecting this option, you are given an opportunity to create your own scenario and then go fly it.

CAMPAIGN [C]

Press the *CAMPAIGN* [C] Key to access a full CAMPAIGN. The campaign option puts you in the middle of an entire Air/Sea battle environment. In addition to flying combat missions, there are literally hundreds of decisions you're required to make. Your hands will be full from the very start.

TOP TEN [T]

You may also access the *FLEET DEFENDER* Hall of Fame from the Main Menu screen by pressing the *TOP TEN* [T] Key. The Top Ten roster shows the top ten highest scores (what else) your pilots have achieved. If you are good enough you may just find yourself at the top of this list.

QUIT [Q]

Change your mind? Pressing *QUIT* [Q] Key ends this session and exits you to DOS.

As an alternative to using the keyboard, you may use your mouse cursor to depress any particular button.

THE SCRAMBLE SCREEN

SCRAMBLE missions are single sorties that you generate yourself. With the exception of the 1981 Libyan default option, there are no canned SCRAMBLE missions.

Figure 1-4: The SCRAMBLE Screen. These are quick and easy missions that make for excellent tournament challenges.

MAIN MENU (M)

Pressing the *Main Menu button* [M] Key returns you to the Main Menu Screen.

DIFFICULTY (D)

Pressing the *DIFFICULTY* [D] Key takes you immediately to the Difficulty Screen. This screen is explained in more detail below. *The same Difficulty screen is used for both SCRAMBLE and CAMPAIGN missions.*

ARMING (A)

Pressing the *ARMING* [A] Key takes you immediately to the Arming Screen. This screen is explained in more detail below. *The same Arming screen is used for both SCRAMBLE and CAMPAIGN missions.*

TAKE OFF (T)

Pressing the *TAKE OFF* [T] Key puts you in the cockpit. At this point you're ready to go. You begin your mission either on the carrier deck or already in flight. If you start on the carrier deck, you must press the *Afterburner Engage* [A] Key to begin. Once your engine has "spooled up" to full RPMs, the catapult will fire. Your F-14 is hurled down the flight deck. In just seconds, you'll be airborne, so be ready for it.

Mission Generation buttons

The blue lower case buttons on this screen are known as Mission Generation buttons. They give you the ability to construct your own scenarios "on the fly". Consult the SCRAMBLE section below for full details on how to generate these missions.

THE CAMPAIGN SCREEN

Figure 1-5: The Campaign Screen. Campaigns allows you to undertake missions within a full air/sea environment.

A CAMPAIGN takes a little longer to set up than a SCRAMBLE mission as you might imagine, but they are well worth the extra effort. Campaign missions are the most challenging way to play *FLEET DEFENDER*.

The CAMPAIGN Screen shows you the current status of any on-going campaign your squadron may be involved in. Included in this information are notes concerning your current theater, current campaign scenario, your pilot name and that of your RIO. You are also given a summary of the number of missions already flown, your individual point score, your current campaign score and difficulty level. Finally, this screen indicates whether or not you are flying this mission in Training mode. (Don't confuse this mode with missions flown in the Oceana Training theater).

Squadron (S)

Pressing the *SQUADRON* [S] Key calls up the Squadron Roster board. This roster shows the available squadrons plus information about squadrons with campaigns in progress. Consult the Squadron Roster section below for more details. Press the Enter key or use the mouse cursor and press OK to return to the CAMPAIGN Screen.

Medals (E)

Pressing the *MEDALS* [E] Key grants access to your personal collection of awards and decorations. A Phoenix symbol marks the number of times you've had to resurrect yourself. (This feature has been added so that your friends can check up on you when you begin to tell *war stories*). Press the *Enter* key or use the mouse cursor and press OK to return to the CAMPAIGN Screen.

MAIN MENU (M)

Pressing the *MAIN MENU* [M] Key returns you to the Main Menu Screen.

DIFFICULTY (D)

Pressing the *DIFFICULTY* [D] Key takes you immediately to the Difficulty Screen. This screen is explained in more detail below. *The same Difficulty screen is used for both SCRAMBLE and CAMPAIGN missions.*

BEGIN (B)

Pressing the *BEGIN* [B] Key takes you to the Campaign Status screen.

THE CAMPAIGN STATUS SCREEN

As the name implies, this screen gives you information about the current status of your on-going campaign. Inside the status box is the number of the next mission to be flown as well as a short mission briefing. To see how well this campaign is going, press the blue lower case buttons to access first a mission log and then an individual pilot log.

Mission Log [M]

Press the *Mission Log* [M] Key to access a complete log of all the missions flown so far in this campaign. The mission log summarizes each mission so you can tell at a glance;

1) whether the mission succeeded or failed,
2) how many F-14 aircraft/aircrews were lost *by your squadron,*
3) how many enemy aircraft were shot down by members of *your squadron,*
4) and finally, *your squadron's* combined point score for this mission.

Pilot Log [P]

Press the *Pilot Log* [P] Key to access a complete log of all the missions you have flown thus far in this campaign. The Pilot log summarizes each mission so you can tell at a glance;

1) whether the mission succeeded or failed,
2) how many F-14 aircraft/aircrews were lost by *your squadron,*
3) how many enemy aircraft you were able to shoot down,
4) your LSO rating (how well you landed back aboard the carrier),
5) and finally, the point score you received for completing this mission.

Pressing the *Status* [T] Key returns you to the Campaign Status screen.

SQUADRON [S]

Pressing the *SQUADRON* [S] KEY returns you to the Campaign Screen.

BRIEFING [B]

Pressing the *Briefing* [B] Key takes you to the Mission Briefing screen.

THE MISSION BRIEFING SCREEN

Figure 1-6: The Mission Briefing screen contains a brief overview of the up-coming mission.

The Mission Briefing Screen contains a text briefing which outlines the nature of the mission along with the conditions for victory.

STATUS [S]

Pressing the *STATUS* [S] Key returns you to the Campaign Status screen.

WINGMAN [W]

Pressing the *WINGMAN* [W] Key gives you access to the *Squadron Assignment Board.*

The Squadron Assignment Board contains a list of all F-14 crews (Pilot/RIO combinations) in your squadron. It also lists, among other things, their current assignments *for this particular mission.* These assignments include CAP (Combat Air Patrol), Ready 5, and Standby.

Crews assigned to CAP missions will patrol predetermined areas around the carrier according to the carrier's standard air defense plan. You have no control over their placement. Crews assigned to Ready 5 positions are held in reserve on your carrier's flight deck until needed. If you get in trouble, these are the guys that'll be sent to help bail you out. Finally, air crews that are not needed for this mission are placed on Standby. These guys, in effect, have the day off.

Should you choose to, you may spoil their day off by requesting that a Standby crew be reassigned to fly this mission as your Wing-man. New Wing-man crews must be selected from the ranks of those crews on Standby. You cannot reassign crews that are already participating in this mission.

To change Wing-man, use your mouse pointer and press the *left mouse button* over the desired crew. Your old wing-man is now put on Standby.

Crews gain experience as they fly more missions and accumulate higher point scores, so rotating your Wing-men is advisable. Since there is always a chance that crews will be lost during a mission, building up a single crew at the expense of the others is risky.

VF-alt [T]

In addition to your own squadron, you may check on the status of your sister fighter squadron (VF alternate) by pressing *VF-alt* [V] Key. This roster is presented for informational purposes only. You may not select a wing-man from this squadron.

ARMING [A]

Pressing the *ARMING* [A] Key takes you immediately to the Arming Screen. This screen is explained in more detail below. *The same Arming screen is used for both SCRAMBLE and CAMPAIGN missions.*

TAKE OFF [T]

Pressing the *TAKE OFF* [T] Key puts you in the cockpit. At this point you're ready to go. You begin some missions on the carrier deck awaiting your turn to take-off. Other missions start with your aircraft already in flight and positioned at its CAP station.

If you start a mission on the carrier deck, you must press the *Afterburner Engage* [A] or *Max Accelerate* [Shift][=] to begin.

THE DIFFICULTY SCREEN

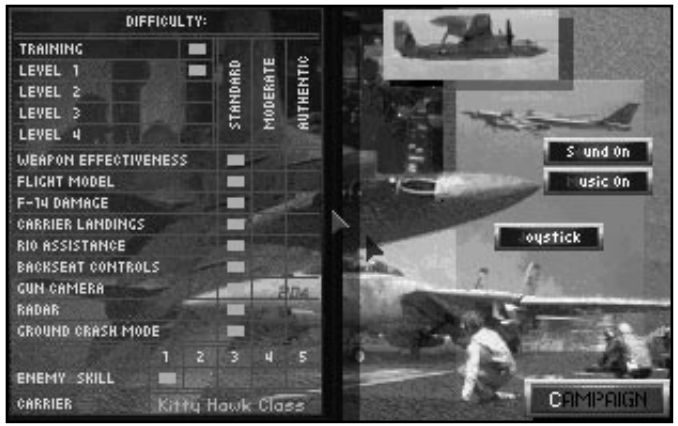


Figure 1-7: The Difficulty screen is a handy way of setting up a mission according to your individual tastes.

The Difficulty Screen allows you to set the difficulty levels of ten or more game features. The three difficulty levels are referred to as play Modes. They are Standard Mode (the easiest of the three), Moderate Mode (more complex than Standard Mode), and finally the ultimate in realism, Authentic Mode (the most challenging of the three difficulty levels).

Difficulty Levels

TRAINING: Select this mode and you'll never have to say you're sorry. You can "get away" with mistakes in Training mode that would end a regular mission. Training mode turns your F-14 into an invincible fighting machine. Enemy missiles (SAMs and AAMs) and gunfire cannot harm your aircraft but your weapons retain their lethality. Training mode also allows you to continually resupply your aircraft (and your wing-man's aircraft) with fuel and weapons. Given time, you can clear the skies of enemy aircraft.

Training mode also gives you the ability to "teleport" your F-14 to any point on the map with a click of your mouse button. Press the Map View [/] to access the campaign map. Now press the blue button marked *Move* [M] Key. You are now able to position your mouse pointer anywhere on the map you wish to go. *Press the left mouse button* and your F-14 is instantly teleported to this spot on the map. No fuel is used in this move.

As much fun as Training mode is, it does have one drawback. You are never given a score for Training missions. Even if you switch to Training mode for only part of the mission, you are given a score of zero (0).*All points scored on a mission are lost if you switch to Training mode while the mission is in progress.*

LEVEL 1 - 4

FLEET DEFENDER missions can be flown in various degrees of difficulty. There are four different levels; Level 1 (easiest) to Level 4 (Impossible). As you might imagine, more points are awarded for missions flown at the higher difficulty levels. You determine the difficulty level of each mission by setting the mission options to one of the following modes of play; *Standard, Moderate,* and *Authentic.*

STANDARD MODE is the easiest of the three modes of play. It is very forgiving of pilot error. Aircraft systems are simplified and abstracted for the player who just wants to fly and shoot without being overly concerned with realism.

MODERATE MODE is an intermediate difficulty level. It combines some of the easier aspects of Standard Mode play with the more realistic features of Authentic Mode. Many of the things that were performed automatically before must now be performed manually. The biggest change, however, comes in the operation of the radar and its component systems.

AUTHENTIC MODE represents the highest level of difficulty in *FLEET DEFENDER*. It is also the level at which players score the most points. Of the three, Authentic Mode places the greatest work load on the player. Aircraft avionics and weapons perform just as their counterparts do in real life.

As more mission options are set to harder modes of play, the overall level of difficulty goes up accordingly. *You can watch this happen by changing the mission options back and forth.*

Difficulty Options

There are ten difficulty options that need to be set prior to the initiation of any campaign. Consider these options carefully. Once a mission begins it's too late to change your mind.

WEAPON EFFECTIVENESS

Standard Mode: Your missiles are always 100% effective. They always hit and they always kill. It's hardly a challenge really, just aim and shoot.

Moderate Mode: Your missiles still destroy a target when they hit it but hitting a target has been made more difficult. Enemy aircraft can now avoid your missiles by using electronic counter-measures (ECM) or by outmaneuvering them, if given a chance.

Authentic Mode: The lethality of each missile is determined using information drawn from a carefully constructed database. Over thirty unique characteristics are taken into account to ensure that each missile performs in *FLEET DEFENDER* just as it does in real-life. This mode accurately models the differences between individual air-to-air missiles.

FLIGHT MODEL

Standard Mode: Your F-14 almost flies itself in this mode, it's very hard to make a mistake. The aircraft performs the same regardless of altitude. Roll inertia has been removed from the flight model in this mode. Adverse G effects have also been taken out. The aircraft automatically calculates and inputs the proper amount of trim for you. The Automatic pilot is equipped with a terrain-following feature to keep you from hitting the ground by accident.

Moderate Mode: Unlike Standard Mode, this flight model incorporates the affect of air density (altitude) on performance. In addition, you may damage the aircraft by exposing it to stress resulting from high G forces.

Roll inertia has been removed from the flight model in this mode as well and the proper amount of trim is input for you. The Automatic pilot is equipped with a terrain-following feature to keep you from hitting the ground by accident.

Authentic Mode: This flight model incorporates the affect of air density (altitude) on performance. You may damage the aircraft by exposing it to stress resulting from high G forces. (The G force tolerance of the aircraft has been reduced from that in Moderate Mode.)

Flight controls may seem a bit sluggish. This is because roll inertia has been added. You are also required to trim the aircraft frequently to maximize its performance. (Unless you are an absolute fanatic for realism, trimming the aircraft can get to be annoying. If you find the trim feature bothersome, press the *Auto Trim Bypass* [Shift][ ]. The terrain-following feature of the Automatic pilot has been removed. It only keeps your aircraft flying straight and level.

F-14 DAMAGE

Standard Mode: Your F-14 can take an unbelievable amount of damage and continue to fly.

Moderate Mode: You can still take a good deal of damage but missiles should not be ignored. Several hits are enough to bring you down. Avionics and other critical areas are assessed damage individually.

Authentic Mode: Damage is assessed realistically according to the type of hit your aircraft receives. For example, radar-guided missiles generally cause more damage than heat-seeking missiles because of their larger warheads. Missile hits usually (but not always) cause catastrophic failure to one or more systems. Bursts of gunfire cause less damage per direct hit than missiles. As a rule, it takes many bursts of gunfire to bring down your aircraft.

CARRIER LANDINGS

Standard Mode: The Landing Signals Officer (LSO) is very lenient in this mode. You can mess up an approach and still receive a good rating. Your F-14 is also eager to forgive mistakes. *Any landing you can walk away from is a good landing and this mode lets you walk away from most of them.*

Moderate Mode: Landings are somewhat more difficult. Your airspeed, angle, and rate of descent must all be within critical tolerances in order to land safely. The LSO is more critical of your landings than before but unless you put the nose of the aircraft through the deck, you should do okay.

Authentic Mode: The LSO is a SOB. He demands perfection and can't wait to give you a bad rating. You must stay in complete control of the aircraft throughout your approach or you'll receive a *wave-off.* In this mode, it is better to go around than risk a bad landing. Bad landings are usually fatal. Authentic Mode approaches require a high degree of piloting skill. If you are not sweating these landings than you just don't understand the problem.

RIO ASSISTANCE

Standard Mode: Your Radar Intercept Officer (RIO) gives you a great deal of assistance which allows you to concentrate on flying, your primary concern as a pilot.

The RIO automatically locks the nearest enemy aircraft for you. Sometimes this helps out and sometimes it doesn't. As a pilot, you must be the final arbitrator. Your RIO also alerts you to "bandits" (enemy aircraft) in the area by calling out their clock position. For example, if your RIO calls out "Bandit- 6 o'clock", this indicates that an enemy is on your tail.

In addition, your RIO is also responsible for deploying electronic counter-measures (ECM) when necessary. Even so, as the pilot, you might want to keep your finger near the Chaff/Flare switches yourself, *just in case.*

Finally, your RIO is responsible for calling out damage to your aircraft.

Moderate Mode: In this mode, your back seater is a little more casual about his duties. He's more than willing to let you take over some of the responsibilities. Your RIO still reports on bandits in the area, deploys countermeasures, and calls out damage, but *you* have to lock-up your own targets.

Authentic Mode: In this mode, your RIO is really just along for the ride. Oh sure, your RIO will still spot bandits and report on damage, but other than that, you're on your own.

BACKSEAT CONTROLS

Standard Mode: You may fly the aircraft from the back seat as you would if you were seated in the front. You just have to peer over the DDD to do it., that's all.

Moderate Mode: You cannot fly the aircraft from the back-seat. The aircraft maintains the stick position (pitch, yaw, and roll input) it was in when you exited the front seat.

Authentic Mode: You cannot fly the aircraft from the back-seat. The aircraft will follow its natural tendency to level itself, if possible.

GUN CAMERA

Standard Mode: The Vertical Display Indicator (VDI) shows the camera image in color and labels the primary targets for you. The camera itself can pan 360°.

Moderate Mode: The VDI shows the camera image in monochrome (green) and labels the primary targets for you. As in Standard Mode, the camera can pan 360°.

Authentic Mode: The VDI shows the camera image in monochrome (green). It does not label the primary targets for you. The camera has forward looking gimble limits of 20° left and right of center and 20° above and below the horizon.

RADAR

The three Radar difficulty modes are covered in the AWG-9 radar section of Chapter 4.

GROUND CRASH MODE

Standard: The aircraft can hit ground objects and terrain without being affected (i.e. you can crash into the ground and still keep flying). Your aircraft is not damaged in any way by contact with the ground. *Exception: If your aircraft has been previously damaged by enemy action, any contact with the ground ends your mission (and your career).*

Moderate and Authentic: Any contact with a ground object other than a carrier flight deck results in the immediate destruction of your aircraft. If you happen to be inside the aircraft when this occurs... see yah!

ENEMY SKILL: Enemy pilots are rated as follows; (1) Trainee, (2) Cadet, (3) Regular, (4) Veteran and (5) Ace. Choosing the higher levels just makes your job all the more difficult. Highly skilled pilots are simply able to fly and fight better than lesser trained pilots. Veteran pilots combine experience with training to produce superior performance. An Ace is a veteran pilot with exceptional instincts and superb judgment.

CARRIER CLASS: Select one of three different classes of aircraft carriers represented in the game; *Forrestal, Kitty Hawk,* or the giant nuclear-powered *Nimitz* class. The differences between the three carriers are largely cosmetic, however, the longer length of the Nimitz class flight deck makes landings a little easier.

Joystick [J]

Pressing the blue *Joystick* [J] Key brings up an additional panel labeled CONTROL. This panel allows you to set up the simulation according to the availability of your own hardware.

JOYSTICK: Use your mouse pointer to make a choice of controller devices (or combination of devices). Note that you may choose not to use a joystick at all and use keyboard controls instead. *FLEET DEFENDER* also allows for specialized equipment such as throttle controllers or foot pedals as well.

KEYBOARD SENSITIVITY: You may adjust the sensitivity of your keyboard between *High, Medium,* and *Low.* The more sensitive you make the keyboard, the more control input is generated each time you press a particular key.

ROLL RATE: Select one of two different roll rates: *Standard* or *Authentic.* Selecting *Standard* gives you a roll which is unaffected by altitude or airspeed. An *Authentic* roll rate is more realistic and takes into account all the aerodynamic factors which affect your flight performance.

Difficulty [D]

Press this key to return to the previous Difficulty panel.

Recalibrate [R]

Press the *Recalibrate* [R] Key to recalibrate your joystick or controller between flights. Follow the on-screen instructions. When finished, press *Escape/Menu Options* [Esc].

Sound Off [S]

This key is a toggle which turns the sound On and Off. Since the [S] Key is used for this toggle, to press the SQUADRON button you must use your mouse pointer.

Music [M]

This key is a toggle which turns the background music On and Off. Game sound is unaffected.

THE ARMING SCREEN

There are six different weapon configurations for you to choose from on the Arming Screen. Each mission has its own peculiar set of ordnance requirements so get to know them. Once in the air, it's too late to change weapons if you find you've made a bad selection.

Figure 1-8: The Arming Screen

Fleet Defense ALPHA

4 (AIM-54 Phoenix) + 2 (AIM-7 Sparrow) + 2 (AIM-9 Sidewinder)

This load-out represents a good mix of radar and heat-seeking missiles. Use this load-out when going up against a group of strike-fighters. The four AIM-54s should be used to pick off a few bandits at long range. The remaining missiles are good for proximity dogfighting with the survivors.

Fleet Defense BRAVO

6 (AIM-54 Phoenix) + 2 (AIM-9 Sidewinder)

This load-out best illustrates the Navy's *Missileer* launch platform concept. The six Phoenix missiles allow you to sit back safely out of range and shoot down the enemy with impunity. You pay a high price for this seeming invincibility, though. Note your top speed at sea level and don't even think about getting into a dogfight.

Fleet Defense CHARLIE

2 (AIM-54 Phoenix) + 1 (AIM-7 Sparrow) + 4 (AIM-9 Sidewinder)

Like the FD Alpha load-out, this mix of radar and heat-seeking missiles is great for multi-mission tasking. The two AIM-54s could be used against non-maneuvering targets like reconnaissance or ASW aircraft. The four "heaters" gives you plenty of ammunition in case of a BFM engagement.

MiG CAP ALPHA

4 (AIM-7 Sparrow) + 4 (AIM-9 Sidewinder)

This load-out is ideal for escort missions. The four Sparrows give you a medium-range capability while the Sidewinders allow you to break formation to dogfight with interceptors. Your speed is such that keeping up with a strike package is not a problem.

Figure 1-9: Shown here, a F-14 loaded down with a full compliment of six Phoenix missiles

MiG CAP BRAVO

6 (AIM-7 Sparrow) + 2 (AIM-9 Sidewinder)

Every now and then you get lucky and come across a flight of enemy helicopters or better yet, troop transports. When this happens there are never enough missiles around. The six Sparrows allow you to "turkey-shoot" a half dozen or so. These medium-range missiles let you stay out danger while you pick the enemy off one-by-one.

MiG CAP CHARLIE

4 (AIM-54 Phoenix) + 4 (AIM-9 Sidewinder)

This load-out combines long-range capability with speed. The four AIM-54s are perfect for taking out reconnaissance aircraft or tactical co-ordination platforms. Once the Phoenix missiles are gone, you're left with a dramatic speed advantage and a full complement of "fire and forget" missiles.

STANDARD ARMAMENT: In addition to the missiles, your F-14 always begins a mission with one 20 mm M61A1 gun (675 rounds) and two drop tanks of fuel each containing 267 gallons.

Detail [D]

Press the *Detail* [D] Key for a close-up inspection of your weapon configuration.

THE SQUADRON ROSTER

Figure 1-10: The Squadron Roster Board. There are no entrance exams to pass or initiations to endure before joining.

Before you fly any mission, you must first be assigned to a particular F-14 equipped fighter squadron. *FLEET DEFENDER* features ten (10) F-14 squadrons normally associated with the U.S. east coast naval commands. By pressing the *SQUADRON* [S] Key, you are given access to these squadrons and their current campaign status. Pick any one of the squadrons you desire.

EDIT PILOT (E)

Press the *EDIT PILOT* [E] Key to assign yourself to the squadron you've selected. A name plate labeled Pilot Name appears. Use the non-key pad arrow keys and backspace key to enter your first name (top line), callsign (middle line) and last name (bottom line). For example, your entry might look like;

Edward
"Killer"
Crawford

Once you have finished entering or editing your name, you must now do the same for your RIO. Use your mouse cursor to press EDIT RIO button. When you are satisfied, press the Enter key or use the mouse cursor and press OK to return to the Squadron Roster Board.

RESET (R)

The *RESET* [R] Key takes you back to the very beginning and allows you to start the campaign over. Any points you may have scored during the course of the campaign are lost when you start over again.

CAMPAIGN (C)

Press the *CAMPAIGN* [C] Key to make theater and scenario selections. There are three theaters to choose from; two are combat theaters (North Cape and Mediterranean). The third theater is the Oceana NAS theater featuring training operations off the east coast of the United States. Use the non-key pad arrow keys to select any one of the three. Your selection is highlighted in *yellow.*

Your choice of scenario depends entirely upon your choice of theater. Each of the combat theaters has three different scenarios to choose from. Use the non-key pad arrow keys to elect any one of the three. Your selection is again highlighted in *yellow.* The Oceana theater features six different training options. You may select any one of the six.

STATUS [S]

Press the STATUS [S] Key to access a more detailed summary of your campaign's current status.

OK [O]

Press the OK [O] Key when you are satisfied with the information on the Squadron Roster board. This key returns you to the CAMPAIGN Screen. As you can see, the CAMPAIGN Screen now reflects any changes you may have entered.

CANCEL [A]

The *CANCEL* [A] Key negates any configuration changes you may have made to the current campaign. If you make a set-up mistake, this key lets you correct it by starting over.

SCRAMBLE MISSIONS

For those of you who just want to get in one last mission before heading off to work, school, etc., The SCRAMBLE play option allows you to fly quick and easy single sortie missions.

Rather than present you with a host of stock missions, this play option features a mini-mission generator. By combining the SCRAMBLE mission generator with a little imagination, you are able to create a variety of aerial encounters.

SCRAMBLE Mission Generator

Use your mouse pointer or press the corresponding highlighted letters to select SCRAMBLE mission options.

Figure 1-11: The SCRAMBLE screen displays all your mission options. You can create all new missions or accept the default setting.

Type (Y)

By pressing this button, you are given access to the list of all available aircraft. Note that you are only allowed to select one aircraft type per mission. Use your mouse pointer and press the *left mouse button* to make your selection.

Skill (S)

Select the enemy skill level. Press this button and the skill level selections appear to the right. Choose from between Trainee, Cadet, Regular, Veteran and Ace. At the higher skill levels, enemy pilots are able to use their radar better, fire missiles faster, and generally fly a little smarter. An Ace is a real challenge, even in a Yak-38. Trainees are little better than sitting ducks, but even they get lucky from time to time.

Number (N)

Select the number of friendly and enemy aircraft you wish to take part in this mission. You may choose up to six (6) enemy and six (6) friendly aircraft. *Warning:* each additional aircraft you put in the sky practically doubles your work load. Imagine having to fight your way out of a furball consisting of twelve aircraft.

Formation [F]

Select the type of enemy formation. There are four different formations; *Box, Wall, Ladder,* or *Cruise.* A three-dimensional representation of each formation appears to the right of your selection. Consult the Oceana training section for more details concerning enemy formations.

Enemy Alt [E]

Select your enemy's starting altitude using the keyboard arrow keys. An altimeter appears to the right allowing you to view your selection. You may place the enemy anywhere from 1000 ft. up to the SCRAMBLE ceiling of 40,000 feet.

Your Alt [O]

Select your own starting altitude using the keyboard arrow keys. An altimeter appears to the right allowing you to view your selection. You may begin anywhere from 1000 ft. up to the SCRAMBLE ceiling of 40,000 feet.

Position [P]

Select your starting position vis-a-vis the enemy formation. You may choose one of three starting positions; Offensive (Advantaged), Neutral (Head-to-Head), or Defensive (Disadvantaged).

Time [I]

Select the time using the keyboard arrow keys. A clock appears allowing you to view your selection. The Day-to-Night (Dusk) transition begins at 1800 hrs and ends at 2000 hrs. The Night-to-Day (Dawn) transition begins at 0500 hrs and ends at 0700 hrs.

Weather [W]

Choose between three different types of weather conditions; *Stormy, Clear,* and *Overcast.* Stormy conditions are more severe than mere overcast, the cloud layer is thicker and the cloud ceiling is lower to the ground.

Squadron [Q]

You may choose to fly as a member of one of eight (8) different F-14 squadrons. The squadron's patch appears to the right as you cycle through your selections.

Default Option: If you're in a real hurry don't bother setting the mission options, just press *TAKE OFF* [T] and accept the SCRAMBLE mode default. This setting allows you to recreate the Tomcat's 1981 encounter with two Libyan Su-22s. Historically, both the "Fitters" were shot down by a pair of F-14s belonging to VF-41 "Black Aces." This was the famous Navy; 2, Libya; 0 incident.

CAMPAIGN MISSIONS

Rather than limit players to individual SCRAMBLE sorties, *FLEET DEFENDER* allows you to take part in an entire naval/air campaign. A single campaign has the potential to last anywhere from several days to several weeks. Your role will be to fly missions in support of your carrier and its strike operations. Since you have only one carrier per campaign scenario you must protect it. If it is ever sunk or so severely damaged that it can no longer perform air operations, the campaign is over.

In addition to CAP (Combat Air Patrol) missions, you are also tasked with escorting friendly strike packages while on-route to their targets. On these missions you are not accountable for how well the strike package performs. As a fighter "jock", you don't care if any of these aircraft hit their targets just as long as they all make it back home. Therefore, your performance is judged on the number of friendly aircraft that survive the mission and not the level of destruction inflicted on the target.

Campaign missions have been created based on actual air/sea tactics used by the Soviet Union. They have not been intentionally play balanced beforehand to make them easy or even fair, for that matter. You'll find that some missions are milk runs, while others will be downright impossible.

BEGINNING A CAMPAIGN

You begin each campaign aboard a single aircraft carrier being escorted by several Cruisers, Guided-missile Destroyers and Frigates. Onboard the carrier are approximately 90 combat aircraft and helicopters. Their striking power is awesome but it is mitigated to a degree by the enemy's formidable air defenses. The enemy has a host of ships and planes determined to stop your carrier group and this is where you come in.

You (and your RIO) represent one of twenty-two F-14 aircrews that make up the two fighter squadrons onboard the carrier. Two of these crews are actually replacements. There are only twenty F-14s onboard, and although this may sound like a lot, combat attrition will take its toll. You can't afford to press the envelope too often.

In order to begin a campaign, three things are necessary. You must;

1) choose one of the two combat theaters (either North Cape or Mediterranean),
2) choose one of the three campaign scenarios, and
3) be assigned to an active squadron.

Once you have accomplished these three things, you are ready to begin your first campaign mission.

Flying a Mission

Now, it's time to prepare for your first mission. Actually, individual campaign missions are no different than the single sortie missions flown in SCRAMBLE option. However, with all the many decisions that need to be made before take-off, it's probably a good idea to check everything once again.

1) From the CAMPAIGN screen, check the Squadron Roster Board to make sure you have the right squadron and the right campaign. Now, press the *DIFFICULTY* button [D] Key.

2) From the DIFFICULTY screen, set the difficulty options on the panel as desired. You may also recalibrate your joystick at this point if needed. Now, press the *CAMPAIGN button* [C] Key to return briefly to the CAMPAIGN screen.

3) From the CAMPAIGN screen, press the *BEGIN* button [B] Key. This takes you directly to the pre-Mission briefing.

4) From the BRIEFING screen, press the *BRIEFING* button [B] Key to get your mission briefing. Read the briefing text carefully, it contains important operational information and the mission conditions for victory. Now that you have an idea what is expected of you, press the *ARMING button* [A] Key.

5) From the ARMING screen, make your ordnance selections based upon the up-coming mission requirements. Now, press the *WINGMAN* [W] Key.

6) From the WINGMAN screen, you may assign yourself a new wing-man, if you so desire. Take a minute to check the other crew assignments so you are familiar with the crews participating in this mission. Once you are satisfied with the crew assignments, there is only one thing left to do; press the *TAKE OFF button* [T] Key and... take-off!

Ending a Mission

Hopefully, each of your missions will end with you returning safely to an undamaged aircraft carrier. Ideally, this is the way every mission should end. Sadly, the fortunes of war will dictate otherwise on occasion.

BECOMING A CASUALTY

There is always a chance you will not survive a mission. If this happens, the mission is over at the point of your demise. *See Resurrection below.*

EJECTING

Bailing out of a crippled aircraft is another way to end the mission. If you survive the ejection and are picked up, you are taken directly to the mission debriefing.

ABORT [A]

You may abort a mission in progress at any time. To abort a mission, press the *Escape/Menu Options* [Esc] to access the Control Options screen. Now, press the *ABORT button* [A] Key located at the bottom of this screen. Ending a mission in this manner causes you to loose credit for any points you may have scored on this mission. You are taken to the mission debrief.

EXIT TO DOS [X]

Rather than aborting a mission, you may also leave the simulation altogether from the Control Option screen. Press the *EXIT TO DOS* [X] Key. This key has the same affect as pressing the *Quit* [Alt][Q] Key.

Mission Debriefing

You receive a debriefing at the conclusion of each mission, whether you personally survive it or not. This debrief consists of a replay of the entire mission summarizing the major events and placing them in chronological order. A summary of your point score is also displayed along with any medals or awards you are to receive.

Ending a Campaign

Your carrier group will continue its operations until it achieves its objectives unless the campaign ends prematurely. There are two principle ways for a campaign to end prematurely, if your pilot is Killed In Action (KIA), or your aircraft carrier is sunk or severely damaged.

At the end of each campaign, you're overall performance is rated according to the number of successful missions you have flown. You can lose a few missions and still have a decent campaign record. In Baseball, a .500 percentage will get you in the World Series, so too, in *FLEET DEFENDER*. Win over half of the missions and you should feel pretty good, win 75% of them and you're doing great.

YOUR CAREER

FLEET DEFENDER allows you to personalize your pilot and RIO by giving them names of your own choosing. Most players tend to name the pilot after themselves and name the RIO after their best friend. There's no requirement to do this, however. You may give the pilot and RIO any names you wish.

Assuming you name the pilot after yourself, we can also assume that you now have a vested interest in doing well and surviving. In this respect, you are no different than any other naval aviator that flies the Tomcat in real life. He has his career to worry about, now you have yours.

BEGINNING A CAREER

Your career as a naval aviator begins the moment you give a name to your pilot. From this moment on, your career is simply the sum total of all the points scored during all the missions you have flown using this persona. *(You may have a different pilot name for each active squadron.)*

Your personal objective is to survive the campaign, all other considerations should be secondary. Along the way, however, you will accumulate points for accomplishing certain tasks and destroying enemy aircraft. If you are noticeably successfully, you are recommended for various awards and decorations.

Figure 1-12: Feeling that need for speed? This F-14 is showing its stuff on a low level pass.

CAREER PROGRESSION (PROMOTIONS)

Your ultimate career goal is to get promoted up the ladder until you reach the rank of Commodore. It won't be easy. You will only attain this lofty grade after flying many missions, in many campaigns. After you attain this rank, you are retired. Enjoy your break from combat, you earned it.

Mission Scoring

You receive a point score depending upon how well you performed as an individual. You also receive points as a member of the squadron for participating in a successful mission. These two sums are totaled to produce your final mission score.

Failure to accomplish your mission garners less points for you as an individual and makes a campaign more difficult to ultimately win. For example, you may be given a mission to prevent enemy reconnaissance aircraft from finding your carrier group. If the enemy is allowed to locate your carrier, the next mission may have you desperately trying to shoot down a salvo of cruise missiles.

Promotions

Promotions are based upon your accumulated point totals. They are not easy to get, but they do come in time. Every naval aviator starts the game as a Lieutenant JG (Junior Grade) with a point score of zero (0). In order to attain the next highest rank, you only need to accumulate the prerequisite number of points. The higher the rank, the more points you must accumulate to attain it.

Regardless of the number of points you receive, you are never promoted more than one rank after any one mission. If you do really well on a particular mission, you must fly another so that your promotions can catch up with your accumulated point score.

The following chart outlines the rank structure in *FLEET DEFENDER* and the point scores needed to attain them;

Rank	Points needed
Lieutenant JG	At Start
Lieutenant	6,000
Lt. Commander	18,000
Commander	40,000
Captain	60,000
Commodore	80,000

Your Wing-man can never be more than one rank above you. Any higher than that and he'd be considered the flight leader.

Likewise, your RIO is always kept at least one rank lower than you. *Sorry back-seaters, but that's just the way it is in this sim.*

AWARDS AND DECORATIONS

In addition to promotions, you may also earn various awards and decorations for outstanding performance. Like your point score, these stay with the pilot who earns them. They are not transferable.

The awards, as well as the point score needed to attain them, are as follows;

Medal Awarded	Point Score Needed
CMOH	7,000
Navy Cross	5,500
Silver Star	4,500
Distinguished Flying Cross	3,500
Air Medal	2,500
Navy Commendation Medal	1,500
Purple Heart	None
National Defense Service Medal	None

Figure 1-13: The Awards screen.

ENDING YOUR CAREER

Retirement

The most pleasant way to end a service career is through retirement after having achieved a chest full of medals. As soon as you reach the rank of Commodore, you are retired. Once you achieve the rank of Commodore your flying days are over. The Navy can't have its senior officers out tooling around in fighters, now can it?

Roll of the Honored Dead

The other way to end a career is not so pleasant. Every time you take to the sky there's a chance you may not return. At the conclusion of each mission, a list of those who won't be returning is published. This list is termed the Roll of the Honored Dead. If your pilot's name is on it, your career is over.

Resurrect [R]

All is not lost. Because being a *FLEET DEFENDER* is such a hazardous occupation, the designers have included a universal safeguard against premature retirement. If you are ever KIA for any reason, you are given a second chance. To resurrect yourself, press the *Resurrect* [R] Key. *If only it was this easy in real life!*

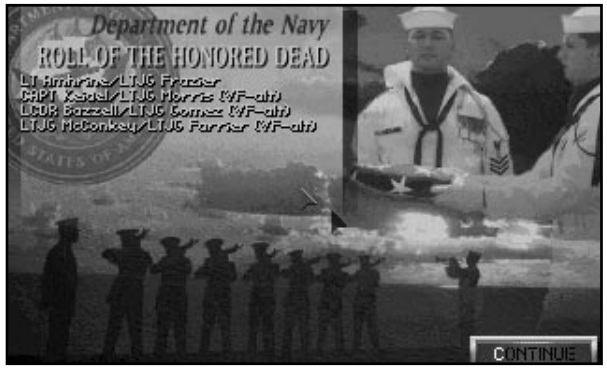


Figure 1-14: The Roll of the Honored Dead.

Resurrected pilots are immediately returned to active service and allowed to keep the points they scored prior to their demise. The drawback to resurrection is that you are considered to have failed the mission. All things considered, it's a small price to pay.

Perish [P]

If you are unwilling to toy with destiny, press the *Perish* [P] Key. The pilot is irrevocably gone and the campaign is ended.

Fly Over [F]

The Fly Over option is essentially the same as resurrection except that the pilot must start the same mission again. Press the *Fly Over* [F] Key to try again.

The Phoenix

A Phoenix, a mythological bird which rises from the ashes of its own destruction, is used to symbolize resurrection. One of these icons is placed with your medals each time your pilot is resurrected. There is no limit to the number of times a pilot may be brought back.

Because of the complexity of the F-14's weapon and flight control systems there are well over a hundred different key commands. Each command performs a unique function and is activated by the touch of a certain key or combination of keys on your keyboard.

Originally, the game designers considered including an overlay template showing all the distinct key combinations. Quickly we realized it would be unusable due to the overwhelming number of commands. So instead, a complete list of all the key commands used in *FLEET DEFENDER* is provided on the Key Reference Card included with your game. Keep the card handy for use during flight.

This chapter is intended to provide you with a detailed summary of all the various command functions used during the normal course of play. Each function is referred to by its name as it appears on the Key Reference Card followed by the actual keystroke in parenthesizes. The keys have been grouped into appropriate sections for quick reference. These include primary and secondary flight controls, simulation views, radar, weapons, and general simulation controls, etc.

There is an additional list of Wing-man controls which appear on the Key Reference Card but do not appear in this chapter. Details concerning wing-man control keys can be found in the Wing-man section of Chapter Four.

ZOOM COMMANDS: These commands expand or retract various fields of view as noted in the key summaries. They also increase or decrease the range of your radar, TCS, or other systems which have telescoping areas of coverage.

Zoom In [Z]: This view moves your perspective/range inward (closer) to the object or area.

Zoom Out [X]: This view moves your view perspective outward (farther away) from the object or area.

FLIGHT CONTROL KEYS

PRIMARY FLIGHT CONTROLS

Primary flight controls are usually non-combat related keys deemed most important to your ability to fly the aircraft. They represent keys that are frequently used during the course of a mission. As such they are easily remembered after a few sorties.

Front/Back Seat Toggle [']: This toggle allows you to instantly move between the front (pilot) seat and back (RIO) seat. Your view perspective defaults to a Look Ahead view as a result of this move.

Accelerate [=]: Pressing this key increases the throttle setting of your aircraft in increments of 10%. You are able to watch this incremental increase in power on the RpM gauge located directly under the pilot's altimeter. Notice a significant increase in fuel consumption as well.

Full Military Power [Shift][=]: Pressing this key immediately increases your throttle to 100% RpMs (Full Military Power).

Throttle Back [-]: Pressing this key decreases the throttle setting of your aircraft in increments of 10%. Notice how your fuel flow rate decreases as you throttle back.

Cut Throttle [Shift][-]: Pressing this key immediately shuts down both engines completely. You'd better have a landing spot already picked out. Gliding is not one of the F-14's strong-points.

Speed Brake Toggle [B]: If your aircraft is on the deck, toggling this key turns your wheelbrakes On and Off while you taxi. If your aircraft is airborne, this key toggles between the speedbrake's two positions, retracted (in) and extended (out). Extending your speedbrakes in flight is known as *"popping the boards"*.

Afterburner Engage [A]: Pressing this key kicks in the afterburner. Your afterburner boosts your thrust well over 100% but consumes fuel at a prohibitive rate. Use the afterburner sparingly.

Note that this key is not a toggle. You cannot use it to turn off the afterburner. To turn off the afterburner, press the Throttle Back [-] once.

Automatic Pilot [P]: By toggling this key, you may engage and disengage your aircraft's Automatic Pilot. When the Automatic Pilot is engaged, it maintains your heading and altitude. You are able to make minor course corrections without disengaging the Automatic Pilot. Automatic Pilot is most useful when you are busy attending to other chores (like working the radar systems in the back seat).

Stick Trim Up [[]: Each press of this key adjusts (trims) the pitch of the aircraft upward without putting back pressure on the joystick.

Stick Trim Down [ ]: Each press of this key adjusts (trims) the pitch of the aircraft downward without putting forward pressure on the joystick.

Auto Trim [Shift][ ]: Pressing this key automatically adjusts (trims) your aircraft's pitch for you.

Figure 2-1: Vampire... Vampire... Vampire..! A Sea-Sparrow missile is launched at in-coming anti-ship missiles just over the horizon.

Rudder Left [,]: Pressing this key causes the aircraft to yaw (turn w/o banking the wings) to the left.

Rudder Right [.]: Pressing this key causes the aircraft to yaw (turn w/o banking the wings) to the right.

Directional Controls (Arrow Keys): The keyboard arrow keys act as the Controller when the simulation is not being played with a joystick. These four keys are able to maneuver the aircraft, *up, down, left* and *right,* just as if you were using a joystick.

Eject [Shift][E]: When your aircraft is damaged by enemy fire and is no longer airworthy, it's time to bail out. Press *Eject* [Shift][E] to bail out but remember, there are no second chances. If you "punch Elvis" (hit the *Eject* key) by mistake, you are not given an opportunity to take it back.

IMPORTANT SAFETY TIP- You cannot successfully eject if your aircraft is inverted or traveling over 350 knots, so avoid premature ejections.

NAV mode [5]: This key causes the HUD to begin displaying navigation aids such as a velocity vector and 5^0 incremental pitch ladder. A Course Deviation Indicator appears on the Vertical Display Indicator to assist you in lining up for a carrier approach.

Waypoint Toggle [S]: This key toggles through all your assigned waypoint locations for the current mission. A brief description of the waypoint appears along the bottom edge of the screen as you cycle through the settings. The waypoint's relative bearing is also displayed on the HUD by means of a heading caret on your heading indicator.

SECONDARY FLIGHT CONTROLS

Secondary flight controls are also important though they are less often used than those previously described. These controls are usually associated with non-critical tasks.

External Lights Toggle [Shift][L]: This key toggles your external formation lights (including landing lights) On and Off. External lights are only important for identification purposes or close formation flying at night. Otherwise, turn them off or they assist the enemy in spotting your aircraft.

Jettison External Tanks [Shift][J]: Press this key to jettison external fuel tanks. Since external fuel is used up first, it is a good idea to jettison your tanks once you have used up the first 3,600 lbs. (or when your fuel state goes below 16,000 lbs). Even empty your fuel tanks add weight to the aircraft.

Landing Gear Toggle [G]: This toggle raises and lowers your landing gear UP and DOWN. *This should be the first key you press after leaving the flight deck on take-off. Flying with your landing gear extended risks damaging the aircraft. It also creates an unbelievable amount of drag resistance and slows you down.* You cannot lower the landing gear if you are traveling faster than 300 knots. Use the speed brake to slow to 300 knots or less before lowering the landing gear.

Landing Hook Toggle [H]: This toggle raises and lowers your aircraft's landing hook. Arrestor cables on deck cannot stop your aircraft unless the landing hook is lowered. Trying to land with the hook raised means an automatic*bolter.*

Hawkeye Picture [Shift][P]: Press this key to request that the E-2C Hawkeye update you with tactical information (bogey-dope). The Hawkeye is your aircraft carrier's seeing-eye dog, so to speak. Consult the section on the E-2C Hawkeye in Chapter 3 for complete information.

HSD/TID Toggle [Shift][R]: Toggling this key alternates the HSD monitor between displaying standard HSD navigational information and TID repeater data. A TID repeater is just a way for the pilot to view on his HSD (in the front seat) what the RIO is seeing on his TID (in the back seat). Consult the HSD and TID sections in Chapter 4 for more information.

VDI/TCS Toggle [V]: Pressing this toggle allows you to alternate the Vertical Display Indicator monitor between standard VDI information and images produced by the Television Camera System (TCS). Consult the VDI and TCS sections in Chapter 4 for more information.

Request Landing Clearance [Alt][L]: Press this key to request landing instructions from the Air Boss when returning to your carrier after a mission. You must be within 20 nm of your carrier before the Air Boss will acknowledge your request. Consult the section on Carrier landings for more complete details.

TOMCAT- Ball [Alt][B]: Press this key in response to a "Call the Ball" query from the LSO. By pressing this key you are acknowledging that you have a visual contact with the "meatball"- a landing device on the port side of the carrier deck. Consult the section on Carrier landings for complete instructions.

MISCELLANEOUS FLIGHT CONTROLS

These controls represent miscellaneous keys that are occasionally used during flight.

Escape/Menu Selection [Esc]: Pressing this key while in flight gives you immediate access to a number of simulation control options. These options include changing your joystick/hardware configurations, keyboard sensitivity, sound options, messages and detail levels. You may also recalibrate your joystick from this menu if necessary. The simulation is paused while you make your selections.

Quit [Alt][Q]: Pressing this key immediately ends the simulation and returns you to DOS. It does not save information to disk. Quitting a mission in this manner does not give you credit for any points you may have scored prior to leaving. You may as well have pulled the plug. Like cutting the power, this option may be exercised at any time during play.

Pause [Alt][P]: Press this key to halt the simulation in its tracks. The game is frozen indefinitely until you resume play. This feature is perfect in case the phone rings or your Boss should happen to walk in during a frantic "furball". Play is resumed by pressing any key.

Accelerate Time [Shift][T]: Accelerated time is useful when flying long distances and the chance of encountering hostile aircraft is low. There are eight (8x) levels of accelerated time. Your current time acceleration multiplier (if greater than 1x) is displayed in the upper left corner of the pilot's forward view screen. You are immediately kicked out of accelerated time if any enemy action takes place, otherwise press the *Normal Time* [T] to exit Accelerated time mode.

Normal Time [T]: Normal Time returns the simulation to a non-accelerated time rate (1x).

Training Mode [Alt][T]: Training Mode means never having to say you're sorry. While in Training Mode, you are immediately rendered invulnerable, enemy gunfire and missiles cannot hurt you and contact with the ground does not end your mission. You are also eligible to perform other "cheat" options like *Resupply*.

Training mode may be toggled On or Off as many times as you like during the course of a mission. However, if any portion of your mission is flown in Training mode (even if it's only for a couple seconds) you will not receive any points for completing the mission.

Resupply [Shift][R]: Each time you tap *Resupply,* your fuel tank is filled and your ordnance stores (missiles and gun ammo) are replenished. *Resupply* also automatically repairs all damage to your aircraft at the same time. You may use this key only in conjunction with Training Mode.

Clock Advance [Alt][=]: Each time this key is pressed, game time is advanced by five minutes. This feature can only be used in conjunction with Training Mode.

Clock Reverse [Alt][–]: Each time this key is pressed, game time is reversed by five minutes. This feature can only be used in conjunction with Training Mode.

Landing Cheat Toggle [E]: This key allows you to automatically advance your aircraft through the various stages of an approach pattern. By toggling this key repeatedly, you are able to move your aircraft through the entire landing procedure right down to the deck. This key is only functional while in Training mode or when your carrier landing difficulty level is set to Standard.

Figure 2-2: Flight leader and wing-man returning home from an uneventful CAP.

RADAR CONTROLS

Learning how to use the radar properly will be the most challenging aspect of *FLEET DEFENDER* . There are three (3) different radar difficulty levels; *(Standard, Moderate,* and *Authentic* Modes). Within each difficulty level there are three (3) search modes (SEARCH, PDSRCH, and RWS) and three (3) attack modes (PDSTT, TWS-A, TWS-M). Certain key commands are only applicable when playing at certain difficulty levels or when the radar is keyed to a particular mode. These cases are noted by asterisks (*).

Radar On/Off Toggle [R]: This key toggles your AWG-9 radar ON and OFF. A message appears at the bottom of your screen indicating whether the radar is *Active* or *Inactive* when you toggle this key. Consult the section on the AWG-9 for more details.

Change Radar Mode [D]: This key allows you to cycle through all the various radar search and attack modes that are available; PDSRCH, TWS-A, TWS-M, and RWS. Your current mode is indicated to the right of the DDD located in the back (RIO) seat. You can watch the radar mode indicator lights change as you cycle through the modes.

Identification; Friend or Foe, IFF [I]: Before you shoot at a target it is a good idea to determine its identity. You may destroy a friendly, neutral, or civilian aircraft by mistake and lose big-time points in the process. Special electronic systems are used to "interrogate" a target to determine its nature. Press the IFF [I] to interrogate a locked target (IFF is only effective with a locked target). Consult the section detailing the AWG-9 radar for more information concerning the IFF function.

Lock/Cycle Targets [Backspace]: Press this key to lock a target when the radar is in SEARCH mode. The radar instantly changes to PDSTT when the target is locked. By repeatedly pressing this key you are able to cycle through all eligible targets appearing on your radar display. *(Standard Mode radar only)*

Break Lock [K]: This key immediately breaks any radar "lock" you currently have on a target. Note that your RIO may immediately re-"lock" the target under certain circumstances.

Boresight/VSL Toggle [End]: This key toggles your radar between Boresight mode and Vertical Scan Lock-On. *(Used in Moderate and Authentic Mode difficulty levels)*

Beam Elevation Up 2° [Pg Up]: Each time this key is pressed, the radar beam elevation is raised 2°. The elevation setting can be checked on the indicator located to the left of the DDD. *(Used in Moderate and Authentic Mode difficulty levels)*

Beam Elevation Down 2° [Page Down]: Each time this key is pressed, the radar beam elevation is lowered 2°. The elevation setting can be checked on the indicator located to the left of the DDD. *(Used in Moderate and Authentic Mode difficulty levels)*

Adjust Bars [Home]: This key changes the number of bars currently being scanned by the radar. As more bars are selected the vertical area covered by your beam is increased. See the AWG-9 radar section for more information on bar settings. *(Used in Authentic Mode difficulty level only)*

Adjust Azimuth [Ins]: This key changes the width (azimuth) of your radar beam. The greater the azimuth setting, the greater the horizontal coverage of your radar beam. *This key is only used in Moderate and Authentic Modes. In Moderate Mode, this key toggles between Wide, Medium, and Narrow settings. In Authentic Mode, the settings are measured in degrees.* See the AWG-9 radar section for more information on azimuth settings.

WEAPON/ECM CONTROLS

Next to your primary and secondary flight controls, your weapon commands are the most important keys to remember. It's too late, once you're in a dogfight, to begin fumbling around trying to select the proper missile. Get to know the weapon commands ahead of time, this way cockpit confusion won't lead to a panic situation.

These keys allow you to call up three different missiles or place your 20 mm gun in priority for real close-in work. Your ECM controls allow you to escape from in-coming missiles by deceiving their infrared seekers or clouding their radar returns.

Master Arm Switch Toggle [M]: This key toggles your Master Arm switch On and Off. The Master Arm switch acts as a safety device. You can not launch missiles or fire your guns unless the Master Arm switch is On. The Master Arm switch indicator illuminates when the switch is On. When the switch is Off, an X symbol is superimposed over your HUD weapon indicator.

Guns [1]: Pressing this key places your 20 mm Vulcan M61A1 gun into priority. A floating gunsight pipper appears in the center of your HUD. The HUD weapon indicator reads G along with the number of rounds remaining on-board.

Sidewinder Missile [2]: Pressing this key puts a short range, heat-seeking AIM-9 missile in priority. The HUD weapon indicator reads SW along with the number of missiles remaining on-board.

Sparrow Missile [3]: Pressing this key puts a medium range, radar-guided AIM-7M missile in priority. The HUD weapon indicator reads SP along with the number of missiles remaining on-board.

Phoenix Missile [4]: Pressing this key puts a long range, "fire and forget" AIM-54 missile in priority. The HUD weapon indicator reads PH along with the number of missiles remaining on-board.

Fire Guns [Enter]: Each time this key is pressed one burst of 20 mm rounds is fired from your M61A1 gun. Tracers rounds are visible so that you are able to accurately track your fire.

Pickle Button [Spacebar]: One missile of the type currently in priority is fired each time this key is pressed. The number of missiles currently on-board is noted on your HUD. Each time is key is pressed, this number is reduced accordingly.

TEWS Jammer Toggle [J]: Press this key to toggle the TEWS Jammer On and Off. Although the TEWS jammer automatically activates when it detects enemy radars, it must first be turned On by toggling this key. The word JAMMER appears across the TEWS display when the jammer is turned On. When active, the word JAMMER flashes on the TEWS display.

Release Chaff [C]: Pressing this key releases a bundle of radar-distorting chaff. You are initially given twenty-four (24) bundles. When this key is pressed a message appears on the HUD indicating that you have released a bundle of chaff and how many you have remaining. In certain modes, your RIO is authorized to automatically deploy chaff bundles for you.

Release Flare [F]: Pressing this key releases a flare designed to decoy incoming heat-seeking missiles. You are initially given twelve (12) flares. When this key is pressed a message appears on the HUD indicating that you have released a flare and how many you have remaining. In certain modes, your RIO is authorized to automatically deploy flares for you.

HEAD-UP DISPLAY (HUD) CONTROLS

Most of your cockpit time is spent looking through the Head-Up Display (or HUD). The following commands allow you to tailor the HUD to suit your particular needs.

Increase HUD Brightness [Ctrl][H]: This key gradually increases the brightness of your HUD symbology each time it is pressed.

Decrease HUD Brightness [Shift][H]: This key gradually decreases the brightness of your HUD symbology each time it is pressed.

HUD Glare Filter Toggle [Alt][H]: Press this toggle to raise and lower the HUD glare filter. The symbology on the HUD changes to an orange hue when the glare filter is raised.

HUD Declutter Toggle [D]: Press this toggle when the amount of HUD symbology begins to clutter (overcrowd) the display. With the HUD Declutter activated only your heading symbology remains.

SIMULATION VIEWS

One aspect of *FLEET DEFENDER* that we're most proud of is the art work and detailed 3-D modeling that went into creating the aircraft you encounter. Many of these aircraft have never before been seen in a commercial flight simulator. The following key controls give you access to a wide range of simulation views. These perspectives allow you to enjoy all our hard work (right before you blow it up!)

Forward View [F1] : This perspective gives you a forward (inside the cockpit) view. It can be used from both front and rear cockpits. The front cockpit forward view gives you visual access to the HUD and all front seat instrumentation. The rear cockpit forward view gives you the RIO's perspective and visual access to the DDD and TID.

Full Front View [F2] This perspective gives you an unobstructed view out the front of the aircraft (outside the cockpit). This view is accessible from both front and rear seats.

LSO View [F3] This perspective is viewed from the Landing Signals Officer's (LSO) station on board the carrier. It is a reverse angle view from the carrier used to judge your landing approaches. Your aircraft automatically remains centered in the LSO's field of vision as you move.

Air Boss View [F4] This perspective is viewed from the control tower above the carrier deck and is known as the Air Boss view. Your aircraft automatically remains centered in the Air Boss' field of vision as you move.

Figure 2-3: Imagine the spectacular view this pilot must have as he soars high above the clouds.

Remote View [F5] This is an external perspective which initially defaults to a rear view of your aircraft. You are able to PTZ (pan, tilt, zoom) this view. It automatically keeps your aircraft centered in your field of vision.

Full Motion Pilot View [F6] This view gives you the perspective from the pilot's field of vision. It is called full motion because it can moved wherever a pilot is normally able to swivel his head and look. To move this view, use the key pad numbers; 2- down, 4- left, 6- right, and 8- up. Pressing the 5 Key (in the middle of the Keypad) automatically brings the view back to a straight ahead perspective.

Missile View [F7] This view gives positions your perspective directly behind a missile as it flies to its target. If more than one missile is in flight, you are positioned behind the one most recently launched. If no ordnance is in flight, you are positioned behind your aircraft. Multiple presses of this key cycles you through all in-flight ordnance including enemy ordnance launched at your aircraft. You are able to PTZ (pan, tilt, zoom) this perspective. It automatically keeps the missile centered in your field of view.

Padlock View [F8]: This view is similar to the *Full Motion Pilot View* with one exception, this view does all the work for you. Padlock view automatically "locks" on a specific air target and keeps it centered in your field of view. Multiple key presses allows you to cycle through all aircraft, both friendly and enemy, that you would normally be able to see.

Tactical View [F9]: This view positions your perspective so that you are looking past your aircraft at a target. It automatically rotates to keep the target centered in your field of view. You are able to PTZ (pan, tilt, zoom) this perspective. It is invaluable when dogfighting by letting you "see" your maneuvers in relation to those of your enemy's. Multiple presses of this key cycles through eligible aircraft.

Reverse Tactical View [F10]: This view is the same as the Tactical View [F9] except that you are seeing the situation from the enemy's perspective. It automatically rotates to keep your aircraft centered in the field of view. You may use *Zoom In/Out* commands in conjunction with this view. Multiple presses of this key cycles through eligible aircraft.

Map View [/]: This key brings up a large scale theater map which gives you the ability to spot the location of various friendly objects (i.e. your F-14, your wing-man, other F-14s, your carrier, etc.) The location of your mission waypoints are also noted on the map. You are also able to review your mission briefing in case you've forgotten.

The Map view allows you to "move" the position of your aircraft to any position on the map instantaneously. Press the Move button [M Key] and follow the on-screen instructions.

PILOT/RIO VIEW CONTROLS

In addition to the normal simulation views, *FLEET DEFENDER* gives you quick and uncomplicated access to a variety of pilot and RIO perspectives. These keys allow you to change your field of vision in order to better operate and monitor your aircraft's avionics. You can also sight-see outside the aircraft as well. Occasional glances outside do wonders for your situational awareness.

All numeric keys used in changing these view perspectives are found on the keypad. Each of these perspectives may be used by both the pilot and RIO.

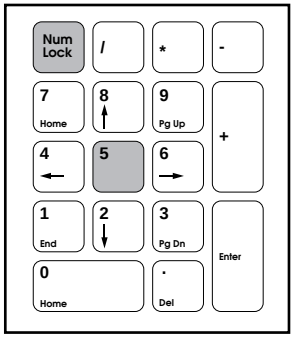


Figure 2-4: The keypad numeric keys are used to change your view perspective. Use the Front Seat/Back Seat Toggle ['] in conjunction with these keys to get both pilot and RIO fields of vision.

Look Ahead [5]: Press this key to access a forward (straight ahead) view.

Look Up [8]: Press this key to return to a normal forward perspective from a Look Down view.

Look Down [2]: Certain cockpit instrumentation may only be accessed by looking down. Press this key to look down. (self-explanatory)

Look Left [4]: Press this key to look left. (self-explanatory)

Look Right [6]: Press this key to look right. (self-explanatory)

Look Rear Left [1]: Press this key to look behind the aircraft. The view perspective is oriented at 225^0.

Look Rear Right [3]: Press this key to look behind the aircraft. The view perspective is oriented at 135^0.

Figure 2-5: This Tomcat, flying slow with wings out-stretched for the camera, belongs to the famous VF-143 "Pukin' Dogs." Actually the emblem is not a dog at all, but rather a mythological beast known as a Griffin.

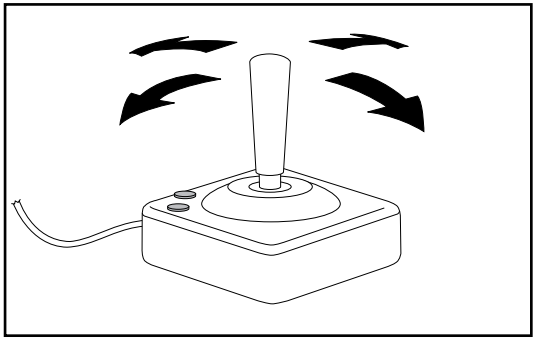
HARDWARE CONTROLS

Due to the immediacy of modern air combat, it is worth the time to familiarize yourself with the cockpit and controls before you take to the air. A good airplane can never compensate for a poor pilot. So, before you attempt to master the art of combat, you must first master your aircraft. In other words, flying a supersonic aircraft is difficult enough without having to worry about being detected and shot down.

To configure your hardware, press the *Escape/Menu Options* Esc. A Control Options menu appears with your hardware configurations.

JOYSTICK CONFIGURATIONS56

Figure 2-6: FLEET DEFENDER is entirely compatible with any standard joystick interface.



NONE

Even if you do not possess a joystick, you can still play *FLEET DEFENDER* using keyboard control keys. Select NONE. (We recommend, however, that you play this simulation with at least one joystick.)

ONE

If you intend to play the simulation with only one joystick (in conjunction with keyboard controls), use your mouse pointer and *left mouse button* to select ONE.

The joystick simulates the actual control stick in the aircraft. Pull back to go UP, push forward to go DOWN. Banking the aircraft left and right is done by moving the joystick to the LEFT and RIGHT. The degree of joystick input controls the extent to which the aircraft responds.

The uppermost button (Selector #1) emulates the Pickle Button Spacebar. It is used to fire missiles. The lower button (Selector #2) emulates the Fire Guns Enter.

TWO

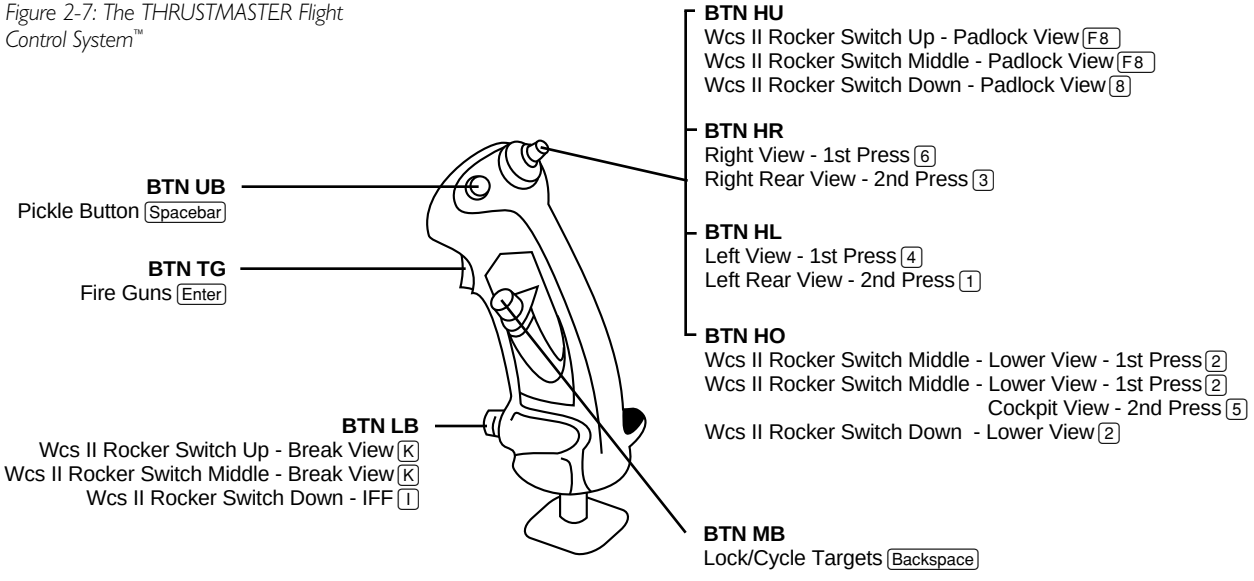
If one was good, two ought to be better, right! FLEET DEFENDER can be played using two standard joysticks. The second joystick emulates the throttle control keys found on your keyboard. Pushing forward has the affect of increasing your thrust (Accelerate Key). Pulling back has the opposite affect (Throttle Back Key).

W/Throttle

If your joystick includes a separate throttle control, select the W/THROTTLE option. The software automatically knows to look for this control on your joystick.

THRUSTMASTER FCS™

Figure 2-7: The THRUSTMASTER Flight Control System™



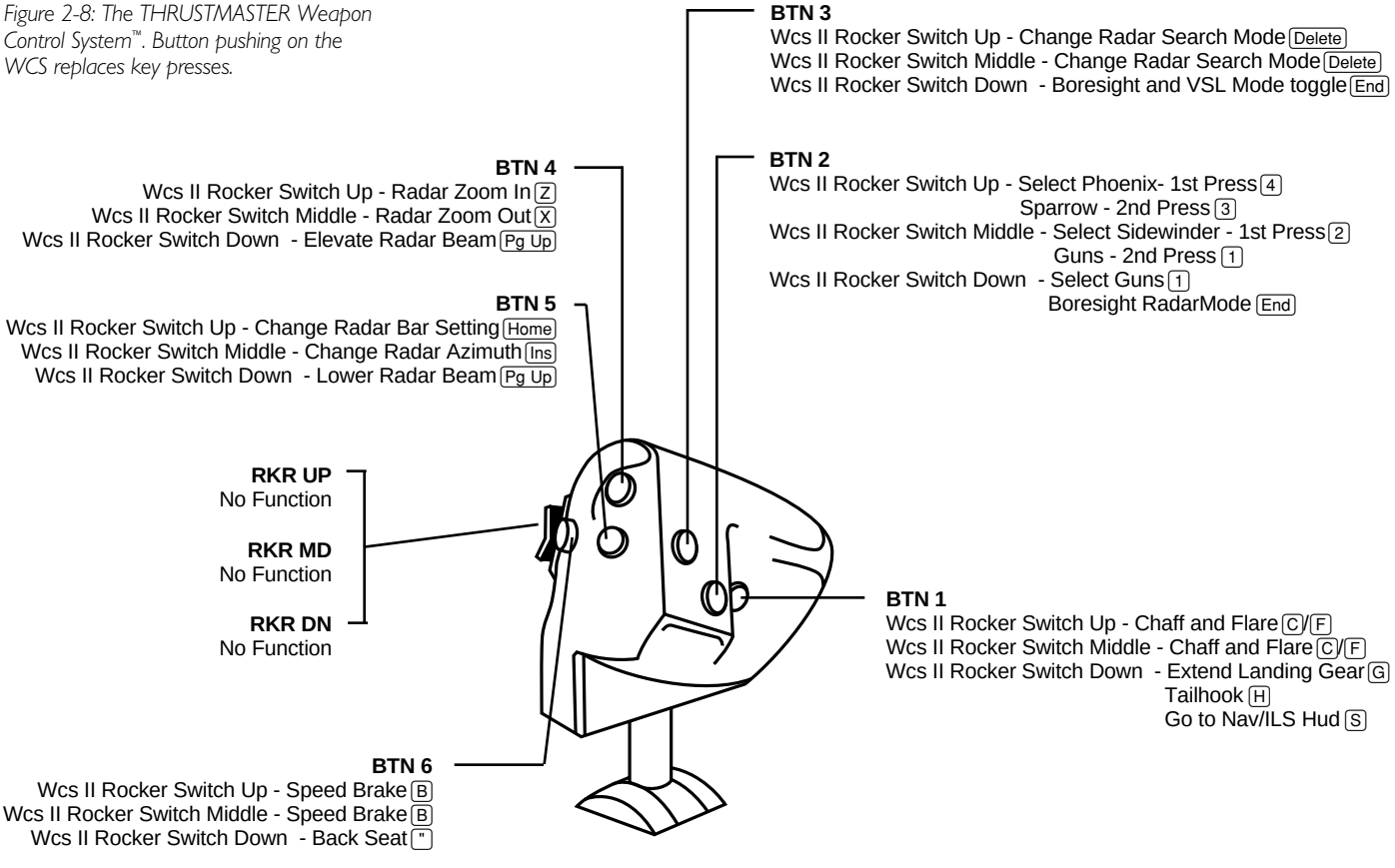
The THRUSTMASTER Flight Control System™ is compatible with *FLEET DEFENDER*. It consists of three main components, a pistol-grip flight stick, a four-position *hat* controller, and four control buttons. These controls (or combination of control buttons) emulate keyboard functions as shown in the diagram.

FCS-MARK II WCS

The FCS Mark II WCS can be used as an analog throttle control. Set the top switch to ANALOG and set the *hat controller* switch to DIGITAL.

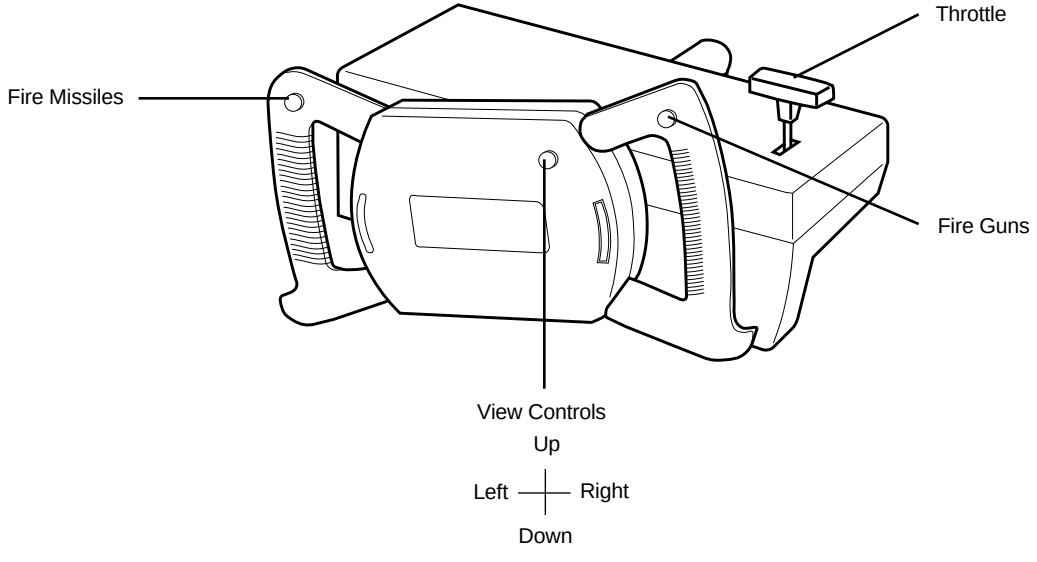
WCS Mark II drivers are included in a *FLEET DEFENDER* sub-directory. If you wish to devise your own control settings, you may download this code for yourself.

Figure 2-8: The THRUSTMASTER Weapon Control System™. Button pushing on the WCS replaces key presses.



VIRTUAL PILOT™

Figure 2-9: VIRTUAL PILOT™

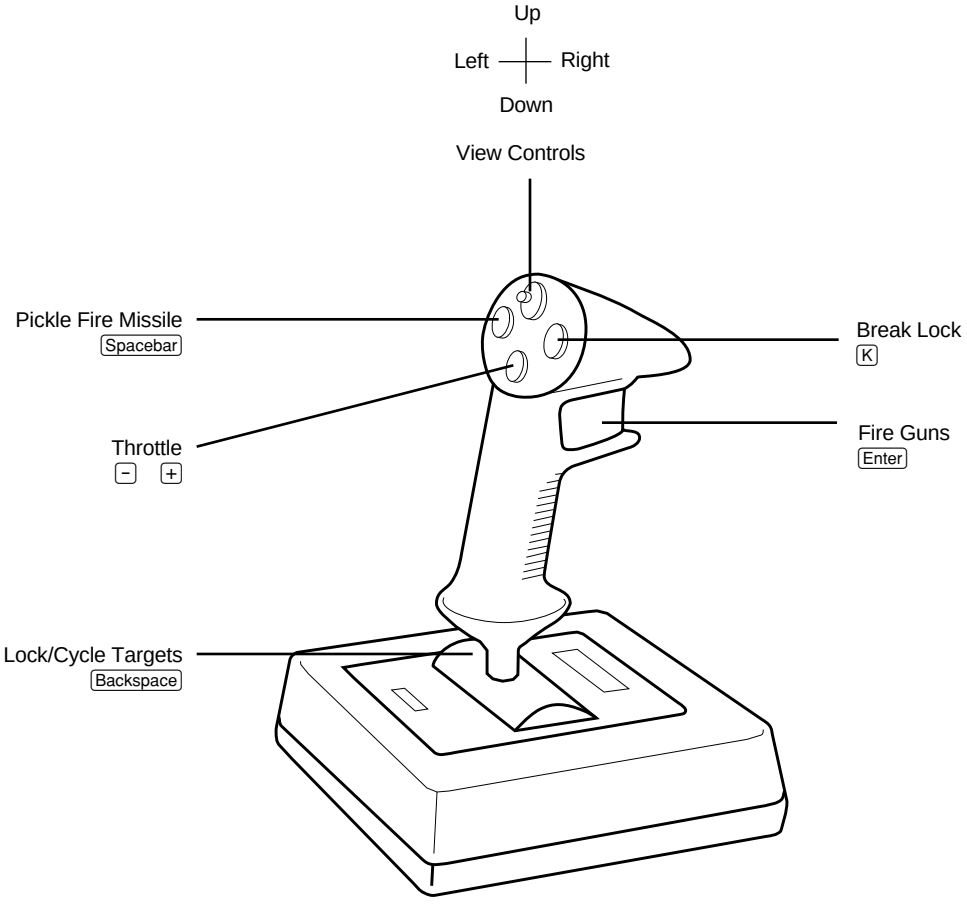


VIRTUAL PILOT™ consists of four main components; a steering wheel device, a four-position hat controller, a bar throttle control and four control buttons/switches.

The control functions emulate *FLEET DEFENDER* control keys according to the above diagram.

FLIGHTSTICK PRO™

Figure 2-10: FLIGHTSTICK PRO™



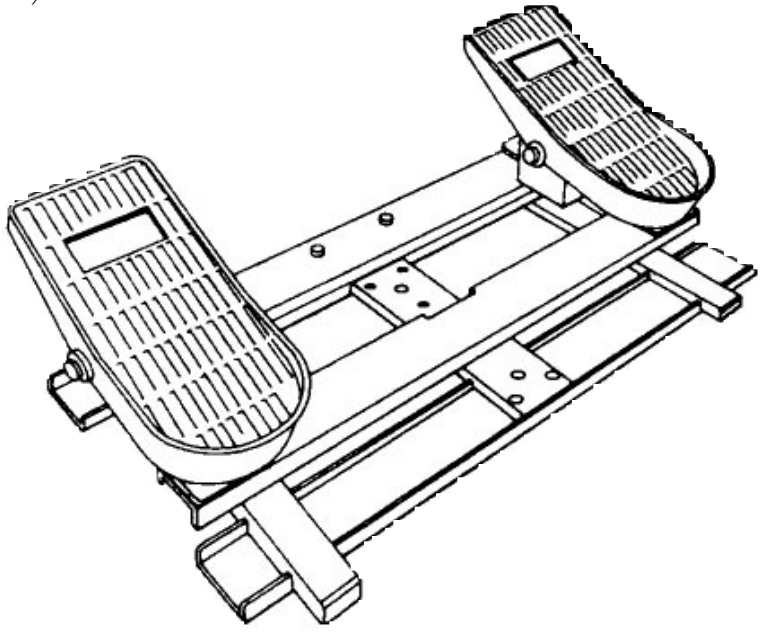
FLIGHTSTICK PRO™ consists of four main components; a standard pistol grip joystick, a four-position hat controller, a wheel type throttle control and four control buttons/switches.

The control functions emulate *FLEET DEFENDER* control keys according to the above diagram.

FOOT PEDALS

THRUSTMASTER RCS (Rudder Control System)

Figure 2-11: The THRUSTMASTER RCS™ (Rudder Control System)



The THRUSTMASTER RCS™ (Rudder Control System) consists of two linked foot pedals which operate the aircraft's rudders. Moving the foot pedals, forward and back, emulates the Rudder Left [,] and Rudder Right [.]

CHAPTER THREE: HOW TO FLY

FLIGHT DYNAMICS

The most intensely scrutinized portion of any commercial flight simulator is its flight model. Comparing flight models seems to be an industry pastime these days. Whenever a new sim is released the first topic of discussion is inevitably- its flight model. What's a flight model, you ask? A flight model is simply the set of mathematical formulae that your computer uses to approximate the performance of a real aircraft. Flight models vary according to the aircraft being simulated.

While flight models can get close to the real thing, (and this is entirely subjective) nothing you can do on a computer sitting at home can compare to the sensation of actual flight. There's nothing like it. Flight is the hardest thing in the world to describe to people who have never experienced it.

Let the game designers and programmers argue amongst themselves, you and I will just have fun. There are plenty of bandits to hunt down and there's always another bad weather approach waiting to give you "white knuckles".

The following section shows you how to make the flight model work for you. It'll also teach you the finer points of controlling your aircraft while in flight because you can't be expected to *max perform* your aircraft without first being familiar with how an aircraft operates. Flight Dynamics covers the art of flying in its most general (and useful) terms.

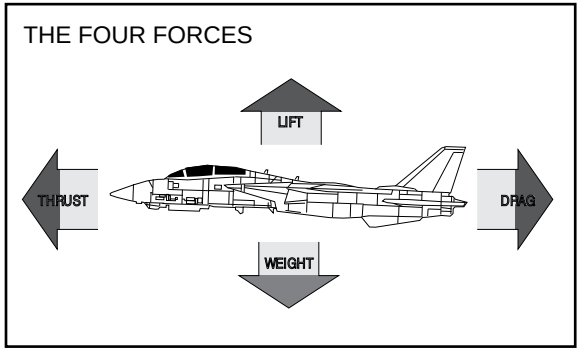


Figure 3-1: As you can see by the above diagram the laws of physics act and counter-act upon an aircraft. Controlled flight is merely the art of juggling these four forces.

THE "BIG FOUR"

There are four basic forces which affect each and every object as it moves through the air; Lift, Thrust, Drag, and Gravity. *We call these forces; the Big Four.*

Controlled flight is the art of managing these universal forces in order to travel through the air and reach a desired destination safely. The same forces which act upon a football to determine how far it travels also affect huge civilian airliners with hundreds of people aboard.

Lift

Lift is perhaps the most misunderstood of all the four forces. When an aircraft is in flight, air strikes the leading (forward) edge of its wing surface. As air strikes this edge, its flow is disrupted and re-routed to go over, under, and around the wing surface. Deflected air changes speed as it is forced past the wing. Air moving over top of a wing surface moves at a greater speed than the air moving below. Since slow moving air has a higher air pressure, the higher pressure under the wing surface pushes on the bottom of the surface causing it to rise. This, in a nutshell, is the basic secret to heavier-than-air flight.

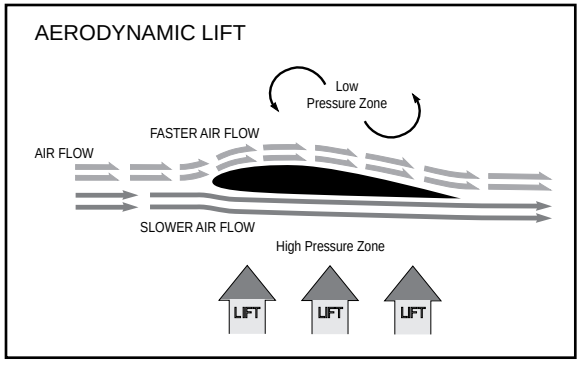


Figure 3-2: Lift Diagram Lift is created by the greater pressure exerted on the bottom of a wing surface by virtue of the slower moving air.

Forward motion is very important in producing Lift. The faster a wing surface moves, the greater the volume of air that forced past it. As the volume of air increases, the volume of air being deflected downward increases as well. This results in a greater pressure differential between the air above and the air below the wing.

Confused yet? Let's simplify matters and state that Lift is the force which directly counter-acts an aircraft's weight during flight. For example, if your F-14 weighs 80,000 lbs. then your wings must produce exactly 80,000 lbs. of Lift to maintain level flight, not 79,999 or 80,001. Any Lift produced above or below this number will cause the aircraft to change altitude.

Gravity (Weight)

"Whatever goes up, must come down." All objects (animal, vegetable, and mineral) fall toward the center of this planet at a constant rate of roughly 32 ft. /second^2. As a practical matter, gravity holds things down and keeps them from flying off into space. In fact if it wasn't for gravity, life as we know it wouldn't exist.

Gravity works at cross purposes to Lift. It must constantly be overcome by Lift in order for anything to remain airborne for very long. In level flight, Lift forces our aircraft away from the Earth's surface just as gravity pulls it downward. If the force of Gravity becomes greater than the Lift being exerted, the object will be drawn toward the ground, eventually ending the flight. So, while we all must appreciate the beneficial effects of gravity, it sure presents problems for those of us who want to fly.

See the section on G Forces for more information on the affects of gravity.

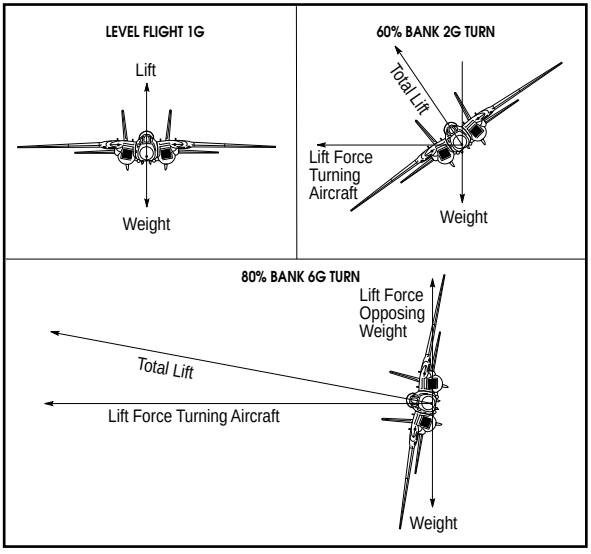


Figure 3-3: G-Forces when banking. As you can see the flight attitude (bank angle) that an aircraft assumes while turning has a direct relationship to the number of "G's" inflicted on the aircraft and pilot.

Thrust

Modern fighters have fantastic performance envelopes due to the tremendous amount of power their jet engines can produce. This power is known as Thrust.

Thrust is the aerodynamic force which propels an object through the air. It makes no difference if the object is pulled through air by a propeller or pushed from behind by a jet engine. The purpose of Thrust is to force air across the aircraft's wing surface in order to create Lift. As long as the aircraft maintains a level flight attitude increasing the amount of Thrust results in a corresponding increase in Lift.

Pilots often discuss the relative merits of their aircraft in terms of *thrust-to-weight* ratios. A Thrust-to-weight (T/W) ratio is a numerical calculation which compares the amount of Thrust (measured in pounds) being produced versus the weight of the aircraft (also measured in pounds).

Ideally, aeronautical design engineers would like to build every aircraft with a T/W ratio greater than 1:1. Such aircraft would then produce more thrust than their weight and allow them to maintain vertical climbs almost indefinitely. Unfortunately, greater thrust requires larger engines which drives the weight of the aircraft up which then requires more thrust--well, you get the idea.

Many players have expressed the misconception that the Tomcat's twin jet engines should allow it to make accelerated vertical climbs. Sorry to say but there aren't any front line fighter aircraft that can perform such a climb outside of Hollywood. This type of climb is reserved for ICBMs and the national debt.

Each of the F-14B's two General Electric F110-GE-400 turbofans are able to produce approximately 16,100 lbs. of dry thrust or 27,000 lbs. of wet (afterburning) thrust each. That is a huge amount of power being generated but given the Tomcat's combat weight of almost 80,000 lbs. it's not nearly enough to sustain a vertical climb.*Nuff said!*

Drag

Aerodynamic resistance to the forward movement of the aircraft is known as Drag. Just as Lift and Weight counteract each other in the vertical plane, Thrust and Drag counteract each other in the horizontal plane.

To grasp the concept, it is first necessary to separate Drag from the idea of weight. Weight is only an impediment to the extent that it counteracts Lift. Therefore, weight is counter-acted by increasing Lift while Drag can be counter-acted by altering the aircraft (in simple terms). Increasing Thrust does not overcome the affect of Drag.

Drag is a function of a particular aircraft's size and shape (design). All aircraft create a certain amount of Drag no matter how aerodynamically well constructed they may be. For example, an aircraft which exposes a large frontal area to the direction of flight creates a lot of Drag. This type of Drag is known as *Parasitic.* It can be reduced by aerodynamic streamlining such as minimizing the exposed frontal area of the aircraft.

Parasitic Drag is a major concern to aircraft designers. The size of an aircraft is usually dictated by the avionics carried, the size of the radar, and the amount of payload (including crew members) required. These factors cannot be changed to any great degree once an aircraft is in flight. Therefore, the amount of Parasitic Drag is generally fixed.

Some aircraft, like the F-14, are capable of changing the sweep of their wings from 90 degrees to something almost flush with the fuselage. These variable-geometry fighters are able to cut down on the effects of Parasitic Drag by adjusting their wings thereby exposing less critical surface to the direction of flight. As a general rule, variable sweep wings are extended forward for low energy maneuverability and retracted for speed.

BASIC CONCEPTS

Airspeed

Your airspeed is given in knots or nautical miles per hour. Since a nautical mile is 2,000 yards in length (longer than a regular mile), an aircraft traveling at a speed of 200 knots is going considerably faster than one going 200 miles per hour. Keep this in mind when you are flying, especially at slow speeds. Think in terms of*knots* and not *mph.*

Airspeed is the velocity of an aircraft relative to the surrounding air mass. It is not an absolute indication of the aircraft's speed over ground. A reading of 450 knots does not necessarily mean that the aircraft is traveling 450 nautical miles an hour between points on the ground.

Your speed is displayed in KIAS (Knots *Indicated* Air Speed). The primary difference between *IAS* (indicated airspeed) and *TAS* (true airspeed) is air density. Pilots use *indicated airspeed* because it is a constant as opposed to *true airspeed* which is affected by both ambient temperature and altitude variations. Because air density at higher altitudes is less than that found at sea level, an aircraft's *indicated* airspeed will decrease as altitude increases. Therefore, an aircraft flying at 30,000 feet with an *indicated* airspeed of 350 knots is traveling much faster than an aircraft at 5,000 feet with the same *indicated* airspeed.

A mach number is the speed of your aircraft in relation to the speed of sound. An aircraft flying at the speed of sound is said to be traveling at mach 1. The same aircraft flying at twice the speed of sound would be traveling at mach 2. Above 30,000 feet, pilots maneuver their aircraft using mach numbers instead of *indicated airspeed.*

As you can see by the following chart, the *indicated airspeed* of an aircraft traveling mach 1 varies considerably due to altitude. An aircraft flying at sea level has to be doing 661 KIAS to break the sound barrier. The same aircraft at 60,000 feet, however, would only show an indicated airspeed of 198 KIAS.

Altitude	KIAS at Mach 1
at 0 ft:	661 KIAS
at 10,000 ft:	548 KIAS
at 20,000 ft:	450 KIAS
at 30,000 ft:	360 KIAS
at 40,000 ft:	312 KIAS
at 50,000 ft:	251 KIAS
at 60,000 ft:	198 KIAS

You can also use the mach number to get a rough idea of your aircraft's ground speed. Simply multiply the mach number by 10. This is the approximate distance your aircraft is traveling in nautical miles per minute. For example, at mach 1 the aircraft is traveling 1 x 10 or 10 nautical miles per minute. At mach 2, this distance would be doubled (2 x 10= 20).

Angle of Attack (AOA)

Angle of Attack is one of those concepts that flight instructors can describe, define, and demonstrate for hours. But a student pilot will either grasp the concept within the first few minutes or he won't get it no matter how long his instructor raves. The definition of Angle of Attack in its most simplistic form is: *the angle (measured in degrees) at which the wing surface of an aircraft cuts into the relative wind.* That's all there is to it and yet it is one of the most difficult concepts for novice pilots to understand.

Basically, AOA is the difference between the aircraft's flight path and the "chord line" of the wing. In level flight, the "chord line" of the wing is facing directly into the airflow. When climbing, the "chord line" of the wing is pitched upward relative to the airflow. With its nose and wing pitched up, the aircraft is said to have increased its angle of attack. The reverse is true when diving.

Angle of Attack is not the same thing as pointing the nose at a certain tick mark on the climb ladder and it has nothing to do with the position of the horizon. *(Pointing the nose of the aircraft up or down is called aircraft attitude.)* Aircraft attitude and Angle of Attack are two different things. For instance, let's say you are performing a Zoom climb in order to shake a bandit off your tail. Your aircraft would have a very nose-high attitude *(pointed straight up)* and yet have a very low Angle of Attack.

Stalling the Aircraft

It is a common misconception among the non-flying public that *stalling* means trouble with the engines. They instantly picture a *stall* in terms rooted in their ground based existence; a sputtering, coughing motor in the family car. Actually, use of the word stall in the context of flying has nothing to do with the engines. Certain aircraft, specifically gliders, fly very well without any engines at all. And while these aircraft are certainly subject to stalls, the lack of an engine is not to blame.

A stall is caused by an actual separation of the air flow from the upper surface of the wing. The air flow over top of the wing surface ends in an area of disturbed air extending forward from the trailing edge. This condition causes the aircraft to "depart from controlled flight" or *stall.*

Note that this condition may occur with the engines going full tilt. Speed has little to do with the onset of a stall. Stalls occur when the aircraft's AOA is too great to produce the necessary amount of Lift to keep it flying. Trying to fly the aircraft at too great an Angle of Attack is the one sure way to cause a stall.

It is important to note that speed, pitch attitude, and bank inclination are all factors in determining whether a plane is about to stall. An aircraft in level flight may stall if it attempts too sharp a turn without increasing its speed. This is due to insufficient lift being generated by the wing in direct opposition to gravity's affect on the aircraft.

The effects of a stall are different depending on the aircraft. Some aircraft simply assume a mild nose-down attitude until returning to level flight. Other aircraft may enter a sudden and potentially dangerous spin. On low level missions a pilot may not have time to recover before striking the ground. This is especially true if one wing stalls before the other.

In *FLEET DEFENDER* the most likely time for stall condition to occur is immediately after take-off or while trying to land. Despite having a catapult to literally throw you into the air, you are initially flying at just above stall speed. Therefore, on take-off, avoid sharp climbs until you are certain not to stall.

Long slow-flight landing approaches bring your airspeed down to dangerous levels. You must constantly be on guard. In trying to land you will be flying at near-stall speed for an extended period of time. If you stall somewhere in the landing pattern, you will not have enough altitude to affect a recovery before hitting the water.

G FORCES (GRAVITY)

Gravity is measured in Gs (i.e. one G equals the normal force of gravity, 3 Gs would be a force equal to three times the normal force of gravity). The pilot and aircraft experience 1 G in straight and level flight. If that same pilot pulls a hard turn, centrifugal force will "load" additional force on his wings.

Modern fighter aircraft are constructed to withstand many times the force of gravity. It is actually the pilot that places limits on the maneuverability of an aircraft. Aircraft are quite capable of performing maneuvers that would instantly incapacitate any pilot that tried them.

Gravity governs every move we make on this planet. We are so used to the effect of gravity that we are usually not even conscious of it as a matter of course. With few exceptions, human beings experience a constant 1 G (the force of normal gravity) on a daily basis. We take for granted that our leg muscles will overcome this force. We also take for granted that if we place this instruction manual next to our computer, gravity will keep it there until the next time we need it.

Think for a moment if the force of gravity was suddenly multiplied several times. Walking would become quite a chore. At 2 Gs our bodies would weigh twice what they weighed at 1 G. If the force of gravity continued to increase eventually it would exceed our muscle's ability to raise our feet.

Pilots routinely expose their aircraft (and themselves) to repeated periods of severe G-induced stress. During combat, these periods of stress can be quite prolonged. Sometimes it's the ability of a pilot to withstand that extra G which makes all the difference in combat. For example, when flying high performance aircraft, a 200 lb. pilot can easily be made to weigh over half a ton.

A normal human head weighs approximately 25 to 30 lbs. but when subjected to a relatively mild 5 G turn, it would now weigh 125 to 150 lbs. Imagine having to support such a load. That kind of weight places a tremendous strain on a pilot's neck. The pilot can't just brace this weight against the back of his seat, he has to be constantly turning his head about looking for bandits. Operating an aircraft under these conditions is extremely difficult. Every action becomes a major test of strength and endurance.

Aside from making pilots weigh a great deal, gravity has certain other physiological affects. When the human body is subjected to high positive Gs, blood is forced away from the brain and begins pooling in the feet. When too much blood leaves the upper extremities, a pilot will lose consciousness because his brain is starved for oxygen. This loss of consciousness is known as a *G-induced black-out.* Pilots just call it "taking a nap."

Positive Gs and Black-Outs

A pilot subjects himself to positive Gs whenever he pulls back on the stick. As you might imagine, this happens fairly frequently. Even when inverted, once that stick comes back positive G forces are the result. Smart pilots will keep their eye on the G count. When the G forces reach around 8 Gs, it's time to consider unloading the aircraft. Expose yourself to anything over 8 Gs and you run the risk of going to sleep.

When a black-out does occur the screen fades to black. It remains entirely black for the duration of the event. As you recover from the black-out, the screen fades back in. The length of time that the screen stays black is entirely a function of the amount of Gs you experience over how long a period of time.

While the screen is black, the simulation continues at its regular pace. *(The world does not stop just because you're asleep.)* In fact, by blacking-out you have become a perfect 1 G strafe target, perfectly helpless. Any enemy pilot in the vicinity has an open invitation to make sure your nap is permanent.

Negative Gs and Red-outs

Negative G forces, like positive Gs, act on a pilot and aircraft as well. Understandably, it may be confusing at first to think in terms of negative Gs. In our earlier example, positive gravity is what kept this manual resting firmly next to our computer. Negative gravity would cause the manual to be pulled from the table.

Negative Gs are caused when a pilot pushes the stick forward (away from himself). In normal flight the aircraft would respond to this control input by dropping the nose or diving. If the aircraft was inverted, pushing the stick forward would cause the nose to rise. In either case, negative Gs are created which, like positive Gs, have certain physiological effects.

Instead of pooling in the feet, blood is pulled from the lower extremities and into the head. The arterial network of the brain is swelled by the force of this additional fluid. In particular, the small blood vessels within the eyes (capillaries) are stretched and sometimes burst. This condition causes what is known as Red-out. The affects of Red-out are very pronounced and can lead to a pilot being temporarily blinded.

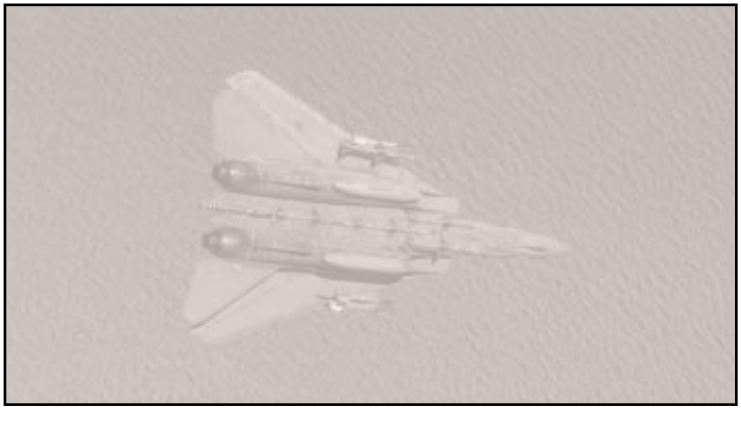


Figure 3-4: This pilot is pulling some heavy G's in this 900 left bank. With his wings swept full aft, you can get some indication of his energy state.

Negative G forces greater than 3.0 cause the onset of Red-out. When this happens the screen will fade to red. The affects of Red-out are somewhat different than that of Black-outs. Instead of losing consciousness, a player is temporarily blinded. The screen remains red (indicating a Red-out condition) until such time as the negative G stress is removed.

There is a simple way around Red-outs. Rather than push the nose of your aircraft down and create negative Gs, roll 180 degrees inverted. Now that you are inverted you can pull back on the stick to drop your nose. You are now creating positive Gs which are much easier to deal with. Once you have reached the desired nose down attitude just roll 1800 again. Now you are right side up and in the proper dive angle. Remember, negative Gs are easy to avoid by rolling inverted and creating positive Gs in their place.

FLYING THE F-14 TOMCAT

Your success in *FLEET DEFENDER* depends almost entirely upon your ability to fly the F-14 Tomcat. All the high tech gadgetry in the world can't save you if you can't fly the plane. In fact, it's the skill you display at maneuvering your aircraft that ultimately decides the majority of your battles.

This section covers some of the finer points of becoming a Tomcat driver. Obviously, this manual can't cover everything. There are certain things you must find out for yourself.

FUEL MANAGEMENT

Fuel Load

In addition to enemy action or inadvertent contact with the ground, the only thing that can force an early end to a mission is running out of fuel. An empty fuel tank will stop your mission with the same finality as an enemy missile. Therefore, it is important that you remain cognizant of your fuel state at all times.

Rather than being measured in gallons, aviation fuel is measured in thousands of pounds (lbs.). One gallon of JP 4 (fuel) weighs approximately 6.5 lbs. Fully fueled, your F-14 carries almost 20,000 lbs. of fuel. This figure reflects internal tanks containing 16,200 lbs. plus two external tanks with an additional 3,600 lbs.

The F-14 fuel gauge, located to the right of the HSD (Horizontal Situation Display) states the total amount of fuel remaining onboard. Your total fuel load, indicated at the top of the gauge, is divided into equal portions, signifying the fuel available to each engine. A reading of 5600 would indicate that five thousand six hundred pounds of fuel remain onboard.

Dry Thrust (Normal, non-afterburning operation)

Dry Thrust is the nickname given to power produced by the engines without engaging the afterburner. The highest throttle setting (100%) using Dry Thrust is known as Full Military Power. At lower power settings you consume less fuel. You fly slower but your endurance time is raised significantly.

Practicing fuel economy while in-flight is an important part of your mission. Fuel is power, but it is also weight. The heavier an aircraft is, the more fuel is burned up pushing it around. You arrive at the break-even point very quickly. During the course of normal patrol operations, use Dry Thrust except in case of emergencies. It saves gas.

Wet Thrust (The Afterburner)

Afterburning engines give the pilot access to enormous additional power. This power is known as wet thrust because raw liquid fuel is literally dumped directly into the engine's flaming exhaust. When you're feeling the need for speed, kicking in the afterburner will do the trick but all this extra power comes at a heavy price in fuel.

There are really only two times that you should engage the afterburner, on take-off and when conducting BFM.

The need to use the afterburner when taking-off is obvious. Getting safely off the deck takes precedence over fuel conservation.

BFM engagements put your aircraft through its paces. They often require you to fight with the afterburner engaged just to sustain the rapid energy consumption that occurs. A few minutes of afterburner is all it takes to drain a tank, so watch it. There's no sense using all your fuel up in combat just to be forced into ejecting later on. A plane down is a plane down. It doesn't matter whether you are shot down or crash after running out of gas.

Fuel Conservation

The F-14 was meant to be a *strategic* interceptor able to cover long distances. You can't fulfill this role very well if you're always having to return home on Bingo fuel. The secret to being a strategic interceptor is letting your radar and missiles do the work for you.

The AWG-9 radar is very powerful. Use it to check out areas that are far away rather than wasting fuel flying over to them.

Figure 3-5: This thirsty "Cat" takes a drink from a KA-6 Refueling tanker.

The Phoenix missile gives you the ability to reach out and touch someone nearly 100 nm away. Sure beats having to travel that 100 miles just to pop off a Sidewinder, doesn't it? Think of the fuel you're saving.

Setting your engines to *cruising speed* (80% RpM) gives your aircraft its best mix of power versus fuel consumption. This setting should be used when you are flying long distances. Avoid using high power settings, especially the afterburner, except in emergencies.

You should remain at cruise speed for most of each flight. What's your hurry? The Navy's *launching platform* concept doesn't require speed, it requires endurance. Complete each mission even if it means flying at 240 knots to and from the target.

Make no mistake about it, when the fuel is gone- it's game over. You had better have a landing spot in mind 'cause the F-14B has a glide path like a brick.

NAVIGATION

Getting lost has always been a problem for pilots as far back as the Wright brothers. Fortunately, the F-14 has sophisticated navigation equipment onboard to help you to find your way home. In fact, your NAV gear enables you to fly back to the carrier in any low visibility weather condition, including pitch darkness.

Waypoints

Your F-14 has a navigational computer which contains a pre-programmed set of co-ordinates known as *Waypoints.* These points help you navigate by inserting reference carets on the HUD Magnetic Heading Indicator.

Each mission you fly has its own unique waypoints. Examples of waypoints for a particular mission might be: your carrier, your mission objective, a CAP location, and even the strike package your supposed to being escorting. Waypoints are not necessarily fixed points in space. In the case of your carrier or strike package, the waypoint moves as they do.

Once in flight, press the *Waypoint Toggle* [S] to toggle through this mission's list of waypoints. A brief description of the waypoint appears along the bottom of the screen. For each waypoint there is a corresponding bearing caret. This caret is located on the HUD Magnetic Heading Indicator which runs across the top of the HUD.

To reach a particular waypoint, along you need do is toggle the *Waypoint Toggle* [S] until you have selected this point. With that accomplished, turn the aircraft so that you are flying directly toward the bearing caret. (It will be positioned in the center of the HUD Magnetic Heading Indicator).

RIO Campaign Map

Another means of navigation is having your RIO pull out his campaign map. The campaign map shows a wealth of information including your present location and that of your carrier. The map is oriented so that the top edge is north (or 360^{0}). Use the map in conjunction with the front cockpit magnetic compass (located directly to the right of the VDI).

The RIO map also allows you to pinpoint the location of other friendly aircraft as well. Press the blue buttons to make your selection.

Horizontal Situation Display

The HSD provides you with your most efficient means of navigation. This display contains a NAV compass which indicates your current heading. A bearing indicator on the NAV compass ring shows how to reach your next waypoint. Distance information concerning that waypoint is also displayed. Finally, you are given airspeed data in both TAS and GS formats. *See the section on the HSD in Chapter 4.*

DAMAGE

This section deals with a subject that no one wishes to talk about- damage. Unless you spend your entire career in Training mode, no matter how good you are, at some point your F-14 will suffer battle damage.

In Standard Mode, you can withstand numerous hits (missiles seem to just bounce off your aircraft's fuselage). As the level of difficulty is increased, the amount of damage you can withstand before being shot down is decreased. At Authentic Mode, any hit is a potential show stopper.

Non-specific Structural Damage

Each time your aircraft is hit by enemy fire, either missile or gunfire, it is liable to suffer two different types of damage. The first type is *non-specific structural damage*. This is general damage resulting from shell hits (or near-miss missile detonations) which puncture the fuselage but fail to hit vital areas. A running total of this sort of damage is kept throughout your mission. When the accumulative effect of damage in this "pool" reaches a certain level, it can force an early end to your flight.

Critical Systems Damage

The second type of damage is known as *critical systems damage*. While you are less likely to sustain this type of damage, the result is far more serious. Critical damage is not cumulative, its effect is assessed against you immediately.

You are able to determine the extent of this damage by looking at the Master Caution-Advisory Panel on both the pilot and RIO's right hand console. Use the *Look Right* [6] from either seat. The areas of your F-14 affected by critical systems damage are;

GEAR- Damage to the landing gear prevents it from being extended or retracted. If your landing gear cannot be extended (for landing purposes) you may as well return to the carrier group, slow down to 200 knots, and "punch Elvis" next to an escort vessel.

HOOK- Once your arrestor hook is shot away or damaged, you cannot use it to land safely. You are said to suffer from PBS *(permanent bolter syndrome)*. You may as well return to the carrier group, slow down to 200 knots, and "punch Elvis" next to an escort vessel.

BINGO- While not actual damage, the Bingo fuel lamp illuminates when you have reached a critical fuel state. Your aircraft only has enough fuel onboard to return home. If you don't turn back immediately, you are almost guaranteed to go for a swim.

BRAKES- Damage to your speedbrakes prevents you from using them in flight. *Your wheel-brakes will still function.* This type of damage isn't too bad, unless you have to slow down in a hurry.

HYDRAULIC PRESSURE- If you lose hydraulic pressure, the aircraft becomes very difficult to fly. All of your flight controls are liable to give out on you at any moment. You are an accident waiting to happen, so RTB right away before you are forced to "punch Elvis".

LEFT/RIGHT ENGINES- Engine hits are very serious. While the Tomcat *can* fly on only one engine, it wasn't meant to. You lose half your thrust and half your fuel when an engine is hit. Of course, if both engines are hit...

LEFT/RIGHT FUEL LOW- When your fuel state is within several thousand pounds of reaching Bingo, these lamps will illuminate. Fuel tanks are always vulnerable to being pierced by shell fragments. If your aircraft suffers from this type of hit, leakage will cause you to lose much of your fuel supply.

WING SWEEP- Critical damage to the wings keeps them from being able to sweep forward and back. They become jammed in their current position. You are therefore restricted to only certain portions of your flight envelope.

DATA LINK- Damage to your Data Link system prevents outside data from being fed into your targeting system. Data-linked information is no longer shown on your TID.

AWG-9- Damage to the AWG-9 knocks on your radar. You are no longer able to search or use your radar to fire missiles. *Note however, that this does not prevent you from using heat-seeking Sidewinder missiles.*

AWG-15- This is your aircraft's fire control center. Damage to the AWG-15 prevents you from launching any missiles or firing your guns.

NAV- Damage to your NAV system prevents you from using waypoint information to navigate.

EJECT... EJECT... EJECT! (BAILING OUT)

Since the last section talked about damage, perhaps now is a good time to discuss ejecting (i.e. bailing out).

Both pilot and RIO are equipped with rocket-assisted GRU-7A Martin-Baker Zero-zero Ejection seats. The zero-zero rating means that the seat is designed to perform at zero knots and at zero altitude (standing still on the ground). *Hey, if it ever fails, you can always take it back to the manufacturer.*

When your aircraft suffers a fatal hit, it will nose over and go into what's known as a "graveyard spiral". The aircraft is essentially uncontrollable at this point. You cannot recover from this downhill spin so don't waste time trying. You have only one task left and that is to get out before the aircraft hits something hard. In other words, it's time to "punch Elvis" (i.e.- yank the ejection handles).

In order to bail out of a crippled Tomcat, press the *Eject* Shift E. There are two things which have an affect on whether or not you get out safely. The first is airspeed. Punching out at too high a speed is fatal. In fact, anything over 350 knots is a show stopper. Stay in the aircraft until your airspeed drops below this number. Patience is a virtue. You may have to "ride it in" for awhile.

Unfortunately, once your aircraft begins its terminal dive it tends to pick up airspeed, not lose it. If you're going to get out it's sometimes best to decide early.

Figure 3-6: "Green Shirts" getting the next aircraft ready for take-off. It's not a glamorous job, but these are the guys that make it happen on the flight deck.

The second thing which affects bailing out is attitude. *We're not talking about your attitude here- we're talking about the aircraft*'s. You cannot eject while the aircraft is inverted (i.e. upside down). Again, timing is everything. Once the aircraft begins spiraling down you must wait until it's right-side up before ejecting. If you eject downward, chances are you will not survive.

Once you have ejected, your mission is over. There's nothing left to do but wait for the rescue helicopters to come and fish you out of the water.

Although the view instantly changes to a descending exterior perspective upon ejection, this is not meant to be a parachute view. If it was, you'd be spending a good deal of computer time floating to the ground. As it is, the exterior view follows your aircraft until it "augers in." Both the view and the aircraft reach the ground simultaneously. The mission ends and your final score for the mission is tabulated.

CARRIER OPERATIONS

In a way, *FLEET DEFENDER* is as much a simulation about air/sea combat as it is about air-to-air dogfighting. The center piece of this campaign environment is the aircraft carrier. It is in your best interest to help protect the carrier because after each mission, you are required to return to the ship and land, whether you win, lose, or draw.

FLEET DEFENDER revolves around your ability to successfully operate off an aircraft carrier at sea. You can be the *top* gun in your squadron, averaging three or four kills per sortie. You can be the best aviator aboard ship, always catching a "three-wire". None of that matters if your carrier is sunk. It doesn't matter how good you are, nobody really cares. If a multi-billion dollar ship is destroyed taking thousands of servicemen to the bottom in the process, don't expect people to shed tears over your career coming to an end.

Fortunately, every precaution is taken to ensure the carrier remains in one piece. Your and your wing-man are just one part of these precautions. A minimum of six F-14s are stationed around the carrier at all times. Known as *CAP*s (Combat Air Patrols), pairs of F-14s are positioned around the carrier so that they are able to intercept enemy aircraft approaching from any direction.

An additional pair of Tomcats is kept on the deck of the carrier in case a CAP would need immediate assistance. Known as the *Ready-Five,* these aircraft are ready and waiting to go. They can be launched in well under *five minute*s should the need arise. In addition to F-14s, all manner of friendly aircraft are continuously taking-off and landing.

THE CARRIER AIR WING

E-2C "Hawkeye"

Next to the F-14, the E-2C "Hawkeye" is perhaps the most important aircraft aboard ship. It is an Airborne Early Warning (AEW) aircraft, distinguishable by a large radome which houses a powerful radar used to scan the sky. It this respect it is much like its land-based cousin-the AWACS. Despite its importance, there are only a few of these aircraft on board a carrier. They are jealously guarded by at least one CAP at all times.

Figure 3-7: The E-2C Hawkeye is the Navy's principle eye-in-the-sky.

THE HAWKEYE "PICTURE"

In *FLEET DEFENDER*, the E-2C Hawkeye orbits the carrier keeping a constant close watch on anything moving within 200 miles. It sends out frequent tactical reports to the various F-14 CAPs so that nothing sneaks up on the carrier. These reports are known as Hawkeye "pictures". You may request a Hawkeye "picture" at any time during a mission by pressing the *Hawkeye Picture* Shift P.

The Hawkeye controller responds by reporting on the enemy aircraft nearest to you that it has detected. Its response always follows the same pattern of information.

If enemy aircraft are detected, the Hawkeye reports; *CONTACTS-* (the bearing from your aircraft) and (the range from your aircraft).

If no enemy aircraft have been detected, the Hawkeye reports; *CLEAN.*

HAWKEYE DATA-LINK

In addition to providing you with a verbal "picture", the Hawkeye is able to send you tactical information direct via a data-link system. You are able to actually target and engage enemy aircraft that the Hawkeye "sees" but your radar does not.

Data-linked targeting information is displayed (where else) on your RIO's Tactical Information Display (TID). See the section in Chapter 4 concerning on the TID for more information on the data-link feature.

STRIKE AIRCRAFT

Not all of a carrier's aircraft are devoted to defense. A modern carrier packs an awesome offensive punch. After all, it's the reason your carrier is at sea in the first place. Accordingly, strike packages are continually being assembled, readied, and launched with clockwork precision.

Because *FLEET DEFENDER* contains scenarios which cover a period of 20+ years, strike aircraft can range from venerable A-7 Corsairs to A-6 Intruder and F/A-18 Hornets. These aircraft carry a wide variety of bombs, rockets, anti-ship missiles, and even mines.

Anti-Submarine Warfare Aircraft

While the "Hawkeye" watches above the waves, ASW *(Anti-submarine warfare)* like the S-3 Viking keep watch below. These aircraft, along with LAMPS helicopters, are constantly rotating to and from missions. Their ordnance ranges from standard depth charges to sono-buoys and homing torpedoes.

Figure 3-8: This is on route to another pickup. The response time on these missions is critical.

Search and Rescue (SAR) Helicopters

Finally, SAR *(Search and Rescue)* helicopters are always on alert status should somebody go down. Whenever a friendly aircraft is hit and forced to ditch at sea, these helos are immediately dispatched to pick up survivors. There may be times when you are called upon to escort these angels of mercy.

FLIGHT RULES

Just like the flow of automobile traffic is regulated to keep cars from crashing into one another, so too is air traffic. In fact, it's even more important for pilots to follow certain established flight rules. *If aircraft are involved in a mid-air collision the pilots just can't get out an exchange licenses.* Certain flight regulations are in affect during the entire time you are airborne, but by far the most critical time for traffic control is during take-offs and landings (TOLs).

There's one man on board a carrier whose job it is to enforce the rules. This man is known as the *Air Boss.* You can access his view perspective by pressing the *Air Boss* [F4]. Break even the smallest regulation and he'll take a personal interest in seeing that you stay below deck for the rest of the time you're at sea. If you don't want to end up "flying" a desk, play by the rules!

The Air Boss is responsible for choreographing all aircraft movement both on the flight deck and in the air. His word is law when it comes to traffic control. Nothing moves above deck or below without his express approval. Air Traffic Controllers (ATCs) work directly for the Air Boss. They are on duty at all times to assist pilots and help the Air Boss ensure that nobody breaks the rules. Even with all these safeguards momentary lapses can occur and the result can be disaster.

FLEET DEFENDER makes things a little easier for you by always having the carrier turn to a heading of 360^0 (directly north) when someone is landing or taking-off. This makes lining up on the carrier so much easier, especially during bad weather or night OPs. To make everyone's job easier, particularly the LSO's, read the following section on carrier flight operations.

The Carrier Flight Deck

The flight deck of a modern aircraft carrier is a busy place to say the least. Air operations are maintained 24 hours a day, seven days a week. It's a place where even small mistakes can have a big impact. This frantic pace must be maintained in order to get aircraft into the air in a timely fashion. With all four of its catapults in operation, a modern carrier can launch one aircraft every twenty seconds. There's not an airport in the world that even comes close to this sustained level of activity on a daily basis.

Because the flight deck is such a deafening place to work, hearing protection is mandatory. Most communication is conducted visually through a series of intricate gestures. These often comedic-looking signals must be understood by everyone with access to the flight deck. Any misinterpretation could cause a potentially fatal accident or loss of an aircraft.

CARRIER TAKE-OFFS (CAT-SHOTS)

Carrier take-offs are pretty straight-forward *(no pun intended-* well maybe just a little one) but they are also somewhat dangerous. Loaded with fuel and weapons, your aircraft is the heaviest it will ever get during the mission at take-off.

All take-offs from the carrier are assisted by a steam-powered catapult. You won't see it, but it's there. With the catapult's assistance your 80,000 lb. aircraft will be hurled into the air in less than 400 ft. Even with the help of the catapult, your aircraft will be flying just above stall speed. It will also be traveling extremely close to the ground with no reserve momentum or energy reserve to call upon if needed. *You are unable to trade altitude for airspeed in case of a stall so don't play around.*

Figure 3-9: Another heart-pounding, adrenaline pumping cat-shot off the deck for this lucky naval aviator.

Although use of the aircraft's afterburner is *not mandatory* for take-offs, we recommend that you use it. Your aircraft should begin every take-off at *Full Military Power* [Shift][=] as a minimum. But to be on the safe side, press the *Afterburner Engage* [A] to begin the mission. It'll take several seconds for your engines to "spool up" to full RpMs. Once they reach the necessary thrust, the catapult will fire and your F-14 will start down the flight deck. By the time you reach the end of the flight deck, you will have gathered up enough airspeed (hopefully) to get airborne.

From the moment the aircraft begins rolling, you had better be on your toes. Take-offs can be very unforgiving if you are not 100% in control. Striking an object on the deck or careening off the side of the carrier and into the water can be fatal. If you see that this is going to happen, by all means, hit the *Eject* [Shift][E].

As soon as you are clear of the carrier, raise your landing gear by pressing the *Landing Gear* [G]. Notice your airspeed jump up as the drag created by having your gear extended disappears. Keep the nose of the aircraft pointed slightly above the horizon while your airspeed continues to build. Extra speed (energy) will be necessary when you pull back on the stick to gain altitude.

One thing you don't want to do while taking-off is lose either energy or airspeed. A stall at low altitude is usually fatal. There just isn't time to regain control before hitting the ground. Examples of energy-losing maneuvers would be high G turns (i.e. wings banked at 90 degrees) or sharp increases in your aircraft attitude. Avoid anything that might cost you forward airspeed when you're this close to the ground.

If the aircraft is moving fast enough, it will start to climb. Try to maintain a 5^{0} to 10^{0} angle of attack but keep an eye on your airspeed. As you climb your airspeed will drop. If it dips below 150 knots you are in danger of stalling the aircraft. Play around with the *Remote View* [F5] in order to get familiar with take-offs.

Continue your initial climb to an altitude of 2000 ft. and then level off. At this point, it is probably safe to shut down the afterburner. Press the *Throttle Back* [-] once. The less fuel you consume on take-off, the longer you can remain at your patrol station.

Now that you are clear of the traffic pattern you can relax for a moment. Press the *Automatic Pilot* [P]. With the Auto Pilot engaged, take this time to look about the two cockpits (yours and the RIO's).

Repeat this Take-Off checklist before proceeding with the mission;

Take-Off Checklist

1) Check the position of your landing gear to insure that it has been retracted (raised). *Landing Gear Toggle* [L].
2) Make sure the Afterburner is disengaged. *Throttle Back* [-].
3) Turn the Master Arm Switch to On position. *Master Arm Switch Toggle* [M].
4) Activate the AWG-9 radar. *Radar On/Off Toggle* [R].
5) Set your NAV equipment to your first waypoint. *Waypoint Toggle* [S].
5) Contact your Wing-man. Direct him to begin flying in formation with you. *Formation* [Alt][F3].
6) Turn to the proper waypoint heading *(you may have to disengage the Automatic Pilot)* and begin your mission.

Congratulations. You've survived your first "cat-shot". Now you and your RIO are about to take on your very first mission. But don't get too smug. Now that you're up there, sooner or later you've got to get back down.

You've only got about 2-3 hours worth of fuel on board. That's just enough time to let the butterflies loose in your stomach and read this next section on how to land. Good luck!

RETURNING TO THE CARRIER

If there's one thing which separates naval aviators from regular pilots, it's the fact that they have to shoot a carrier landing in order to get home. All F-14 pilots must be qualified to land aboard a carrier at sea before they're any good to the Navy.

Next to actual combat, carrier landings or "traps" as they are called, are the most frightening part of a mission. You can be the "Top Gun" of your squadron, even fly rings around MiG-29s, but it all means nothing unless you can get back down safely.

Carrier landings are extremely complicated affairs. They are the most individually challenging aspect of becoming a naval aviator. Ask any Navy flyer and he'll tell you that coming home to a carrier is worse than air combat, especially at night or in bad weather.

Landing on a carrier deck requires total concentration, a bit of luck, and a whole lot of skill. You can't fake an approach. You're either "on the ball" or you will receive a *wave-off* from the LSO. If you get a wave-off, count on going around again and starting your approach over. A carrier cannot afford to have a missed approach result in a crash on deck. There are just too many people and too much equipment aboard to allow that to happen.

Every approach will end one of three ways. You will either score a "trap" meaning that you caught an arrestor cable and landed successfully or you will score a "bolter" meaning that you missed the wires and had to go around and try again. It's probably best not to think about the third alternative, namely- crashing. Crashing into the flight deck, or any other part of the ship for that matter, is fatal. Game over.

Being able to make safe carrier landings is crucial to your success in this simulation. *If you can't master carrier landings, break out F-15 Strike Eagle III and play that for awhile.* We're confident however, that given time, you will be able to perfect your landing techniques. Therefore, the following section is devoted entirely to helping you get back down safely.

The Air Boss and Air Traffic Control

Your missions do not take place in a vacuum. The airspace around your carrier is very likely to be crowded with other aircraft, taking-off or returning home just like you. This is the reason for having an Air Boss and air traffic controllers. It's their job to make sure everything runs smoothly and that everyone stays between the lines.

The whole point of air traffic control is making sure that aircraft don't bump into each other while in flight *(or on the ground either!)*. This is often easier said than done. There are no paved roadways in the sky with nicely painted lane markers to keep pilots from straying into the other guy's flight path.

There is, however, an invisible oval (racetrack) shaped traffic pattern which surrounds the carrier and regulates all air movement in the vicinity. All pilots are required to stay within the flow of this traffic pattern unless given an express directive not to do so by the Air Boss or ATCs.

As aircraft return from their missions, the Air Boss directs them into pre-determined routes so that he knows where they are at all times. His ATCs keep the aircraft at safe separation distances so that they don't run into each other. More importantly, however, aircraft are spaced so that only one aircraft tries land on the deck at a time.

Certain aircraft will have landing priority over others. Aircraft that are low on fuel need to get down in a hurry. They are obviously given top priority. The rest of the aircraft in a package are brought down next.

Damaged aircraft often have to wait until last. Why? Because damaged aircraft run the risk of fouling the deck should their approach go poorly. Of course if there are wounded crew members aboard a damaged aircraft the priority may change according to the severity of the wound.

No one is allowed to approach the carrier traffic pattern unless given clearance to do so. This is why each returning pilot, including you, must request landing instructions from the control tower.

Landing Instructions

Each time you attempt to land back aboard the carrier, you are required to request landing instructions before proceeding. In *FLEET DEFENDER*, this is done by pressing the *Request Landing Clearance* Alt L when you have reached a point within twenty (20) nm of the carrier.

The ATCs in the "control tower" will either give you clearance to land immediately or delay your landing by redirecting you to some *marshal point* away from the carrier.

CLEARANCE TO LAND

If the flight deck is clear and the traffic pattern is not too congested, the TOWER will give you immediate clearance to land. You should already have the HUD in Navigation (NAV) mode at this time, if not, switch the HUD over to NAV Mode Turn by pressing the *NAV mode* [5].

Toggle the Vertical Direction Indicator (VDI) to VDI mode by pressing the *VDI/TCS* [V] if the monitor is showing TCS imagery. Pick up the Course Deviation Indicator (CDI) on the VDI and maneuver your aircraft so that it is centered. You are now on a direct course toward the carrier, *though not necessarily lined up properly with the flight deck.*

Continue to fly down this heading until you are approximately ten (10) nm from the carrier. Check your distance from the waypoint (your carrier) on the HSD. At this time, you must begin your transition into the traffic pattern.

Because the carrier will be pointing north and into the wind, you want to be approaching it from the south. *All carrier landings are conducted from the rear of the ship.* If you are approaching the carrier from astern, the CDI should be centered on the VDI while you fly a magnetic heading near 360°.

Although the TOWER has given you clearance to land, there still may be others ahead of you in the pattern. Caution must be exercised when entering the traffic pattern. You should stay 2-3 nm away from any traffic ahead of you. This gives them time to land safely and get clear of the runway before you start your final approach.

MARSHAL POINTS

Sometimes it is necessary for the TOWER to delay your landing. This can be due to a number of different reasons such as; too many aircraft already in the pattern, down equipment, or even a "fouled deck" situation.

In these cases, your request for landing instructions is met with a directive ordering you to go to a holding area known as a "MARSHAL POINT". A Marshal Point is nothing more than a pre-set location in space where the ATCs can send you while they wait for the traffic situation to clear.

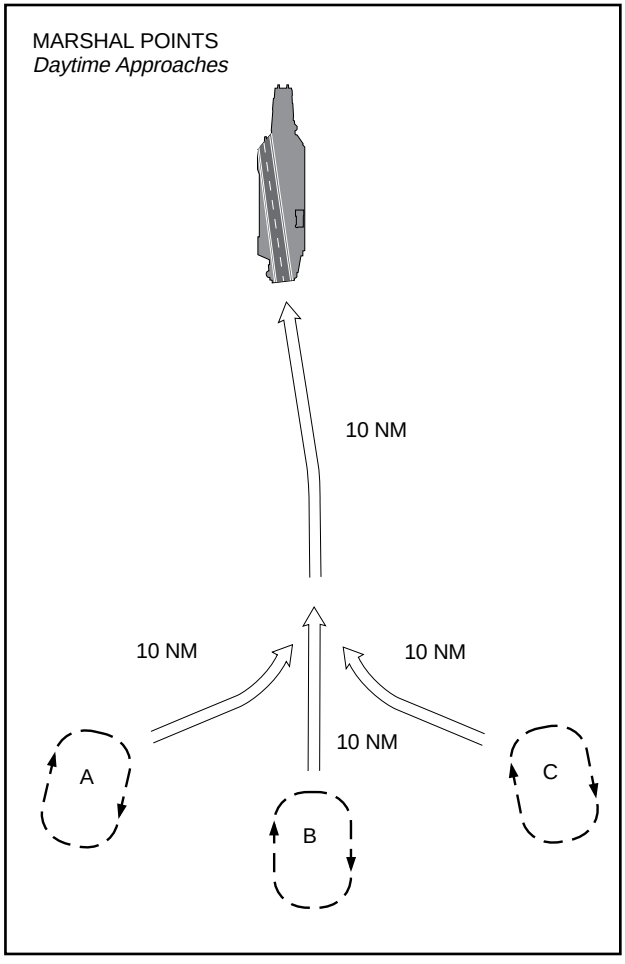


Figure 3-10: When your landing is delayed the ATC will send you to a holding area known as a Marshal Point.

If you receive a Marshal Point directive, the TOWER will also assign you a certain attitude. You must stay at this altitude or risk running into other aircraft. The ATCs may have "stacked" a number of aircraft at this Marshal point, each one holding at a different altitude.

During *Good Weather (Daytime)* operations, a carrier will have three Marshal Points labeled A, B, and C. These three holding areas are located as depicted in the diagram, some 10-20 nm astern of the carrier. You will be sent to one of the three until it's your turn to land.

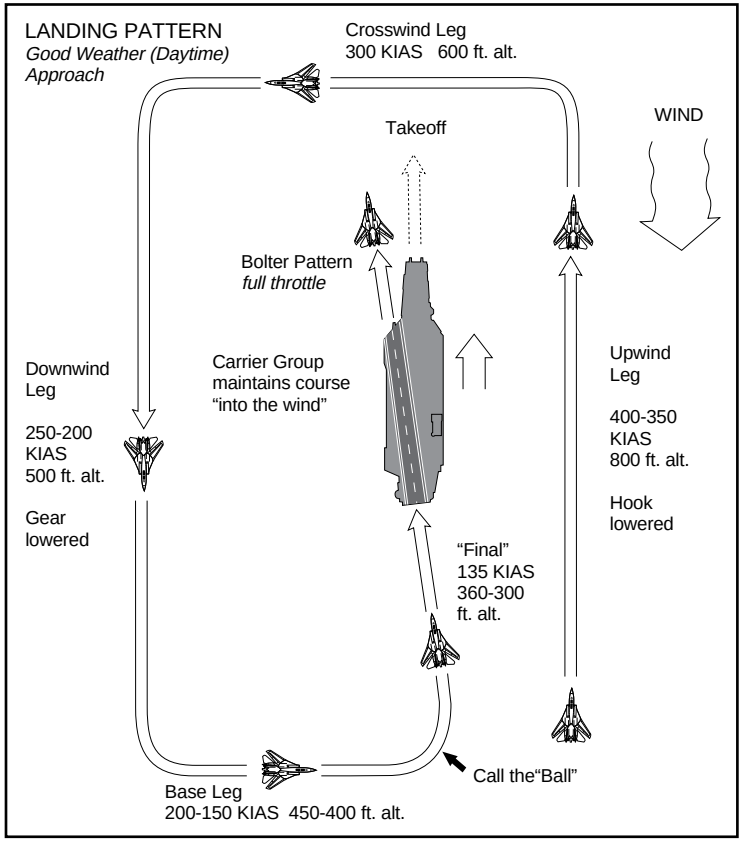


Figure 3-11: In good weather (daytime) approaches, pilots are required to follow a racetrack approach pattern consisting of four basic "legs". Each leg gradually has you flying just a little bit lower and a little bit slower.

During periods of *low visibility* (bad weather or night), only the Marshal Point located directly behind the carrier B is ever used. This allows the pilots to transition from the Marshal Point to a straight approach with minimal course corrections.

To assist you in locating the Marshal Point, your waypoint navigation system is automatically updated. Simply toggle the *Waypoint* (S) until the message bar reads "Marshal Point".

Use the HSD to fly a racetrack pattern around the Marshal Point until the TOWER gives you clearance to land. This usually takes several minutes, so cut your throttle back to 50% RpM to conserve fuel while waiting.

When the pattern clears, the TOWER will send you a message indicating that it's your turn to land. You do not need to keep requesting landing instructions. The Air Boss knows you're out there.

CARRIER LANDING PATTERNS

There are two basic landing patterns you are expected to recognize and adhere to; good weather patterns and low visibility (bad weather or nighttime) patterns.

Good Weather (Daytime) Approaches

The standard good weather (daytime) approach requires that the pilot fly a prescribed racetrack pattern consisting of four distinct "legs." As you can see by the Good Weather (Daytime) Approach diagram, your initial entry into the traffic pattern begins astern of (behind) the carrier. This is called the *Upwind Leg* because here you are flying directly into the wind.

UPWIND LEG

As you fly the Upwind Leg, maintain a separation distance of approximately one mile from the carrier. Your speed should be dropping to 350 knots. Use the *Automatic Pilot* (P) to hold your altitude steady at no less than 800 ft. You want excess energy and airspeed to "bleed" off so keep the nose of your aircraft pointed level with, or slightly above, the horizon. It's a good idea to lower your landing hook while flying the Upwind leg. Press the Landing*Hook Toggle* (H).

When you reach a point approximately one mile in front of the carrier, it's time to turn into the second leg of the approach- the *Crosswind Leg.* Turn into the Crosswind Leg at a 45^0 to 60^0 left bank angle.

CROSSWIND LEG

The Crosswind leg is so named because you are now flying with the wind at a perpendicular angle. Level off from the turn and extend your speed brake *briefly* by pressing the *Brake Toggle* (B). Keep it on long enough to bring your airspeed down to just below 300 knots. At the same time, you should be gradually descending to 600 ft. altitude. Hold at 600 ft. using the *Automatic Pilot* (P).

When you reach a point approximately one mile west of the carrier, it's time to turn into the third leg of the approach- the *Downwind Leg.*

DOWNWIND LEG

The Downwind Leg is so named because you are now flying with the wind at your back (down the wind direction). Level off from the turn and lower your landing gear by pressing the *Landing Gear* (G).

Your airspeed will immediately drop as soon as the drag affects of having your wheels down takes hold of the aircraft. Add power as necessary to maintain an airspeed of at least 225 knots. Continue descending to an altitude of no less than 500 ft.

Upon reaching a point approximately 3/4 to 1 nm astern of (behind) the carrier make a 90^0 left turn onto the *Base Leg* of the landing pattern.

BASE LEG

The Base Leg is your last chance to make corrections before turning "on final". Your airspeed should continue to gradual bleed off to 160 knots with your landing gear extended. Your altitude should be no greater than 400 ft. You must hold this altitude yourself because the Automatic Pilot has difficulty being precise below 500 ft.

Once you are satisfied that you have the aircraft under proper control, steal a quick glance out the left side. Look for the carrier. When you see that it is lined up directly perpendicular to your flight path, it's time to turn*on final.*

FINAL APPROACH

From this point on, until your wheels touch on the deck, nothing you do will seem fast enough. You'll always be playing "catch-up", one step behind the pace of events.

You'll intercept the glideslope approximately 3/4ths of a mile from the carrier. At this point you should be flying at no more than 145 knots and no higher than 360 ft.

Line up your general approach with the vertical stripe painted on the stern of the carrier. It corresponds with the centerline of the flight deck. When you are this close to the carrier- *never bank your wings.* You want to touch down with your wings level. Therefore, always use the rudder keys, *Rudder Left* [,] and *Rudder Right* [.] to make minor course adjustments.

"CALLING THE BALL"

The "meatball" is a tiny light array located on the port (left) side of the carrier, approximately halfway down the flight deck. It is difficult to make out with all the other lights lining the deck. You generally cannot see the "ball" if you are more than a mile from the ship. *Do not mistake the red light atop the "island mast" (to the right of the deck) with the ball.*

As soon as you level off from the Base to Final Leg turn, the Landing Signals Officer (LSO) takes over. The first thing he will ask you, *if you are on the proper glideslope,* is to "CALL THE BALL". Your response will either be "TOMCAT- BALL", if you see it or "CLARA", if you don't.

Figure 3-12: The "meatball" is a visual landing aid which helps pilots assume the proper 3^0 glideslope during the final approach leg of the traffic pattern.

If you have visual contact with the ball, press the TOMCAT- Ball [Alt][B]. This lets the LSO know that you are receiving visual reference cues from the ball.

If you are too low in the glidepath, the ball will appear as a *dull reddish* colored light.

If you are too high in the glidepath, the ball will appear as a *bright yellow* colored light.

If you are maintaining the proper 3^0 glideslope, the ball will appear as *green* colored light. This indicates that you are on slope.

APPROACH INDEXERS

In addition to the "meatball", your F-14 is equipped a tiny square light located on the left HUD brace (just below the Stall Warning indicator) This light is known as the *Approach Indexer.* It is designed to help you maintain the proper airspeed while flying down the final glideslope approach.

If you are flying too fast, the indexer lamp turns a *bright yellow* color.

If you are flying too slow, the indexer lamp turns a *dull reddish* color.

If you are in the glideslope and proceeding at the proper speed, the indexer lamp turns a *bright green* color. This indicates that you are on *speed.*

THE LANDING SIGNALS OFFICER (LSO)

Every take-off and landing is carefully scrutinized by the Air Traffic controllers in the Tower and a Landing Signals Officer (LSO) stationed on the flight deck. It is the LSO's job to talk you through each and every landing.

As you proceed down the final approach glide path, the LSO asks you to *CALL THE BALL.* Your response lets him know whether or not you are able to visual inspect the "meatball".

Either way, his responsibility is to get you down in one piece. He will give you landing guidance such as *ADD POWER, COME LEFT,* or *WAVE OFF.* Do not ignore his instructions. He is actually in a better position to judge your approach than you are.

LSO RATING

Once you have been successfully brought back aboard ship, the LSO must rate your approach. He is looking at things like approach speed, proper descent rate, AOA, and wing position on touchdown.

He will give each one of your landings a score between one (1) and four (4). A score of (1) means you have some serious work to do on your landings. A four (4) rating means you could probably land on the back of a postage stamp.

The Carrier Landing difficulty setting (Standard, Moderate, or Authentic Mode) has a lot to do with how severely your landings are critiqued.

"TRAPPING A WIRE"

The end result of this highly regulated approach pattern is to have your wheels touch down on the deck right where you (and the LSO) want them to. If you follow the prescribed glideslope, your landing hook will catch the third arrestor cable (second to last wire). This is known as "catchin' a 3-wire". It signifies a perfect landing.

Trapping the first or second wire means your aircraft was a little low in the glidepath and hit the deck early. Trapping the 4-wire means you waited a little too long to touch down. Even so, hooking the 4-wire is better than a *bolter* (missing the wires altogether).

OPTIMUM LANDING CONDITION

To receive the best possible LSO rating, you should attempt to achieve the following optimum landing conditions;

1. Wings Level
2. Airspeed: 135 knots maximum on touch down
3. Glideslope: 3° descent on final approach
4. Nose-high Flare: rear wheels should make contact first
5. Landing Hook: should snag the #3 wire (second from the last arrestor cable)

Wasn't that easy! Good weather and daytime landings are a snap. Now let's try a few Low Visibility approaches - landings that take place during periods of bad weather or total darkness.

Low Visibility Approaches

Not every mission you are assigned is flown in good weather. Sometimes it can get downright nasty out there, especially in the North Cape. Marginal weather conditions make just flying rather dicey, never mind trying to shoot a good landing. There are times when the carrier will be *socked-in* by low lying clouds that obscure the flight deck.

When low visibility conditions exist, the normal approach pattern is not used. Instead, pilots are given clearance to make straight in approaches. Rather than fly a racetrack pattern around the carrier, pilots line up with the stern of the carrier and are brought down immediately.

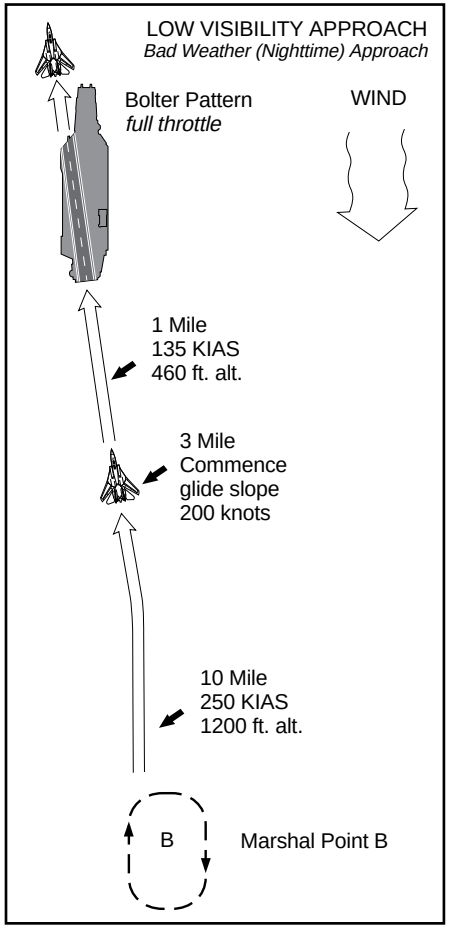


Figure 3-13:

Because you won't have the luxury of being able to see the carrier, these approaches require you to place an inordinate amount of trust in your instruments. Without visual cues to guide yourself, you will be at the mercy of your HSD and VDI's Course Deviation Indicator.

LOW VISIBILITY MARSHAL POINT

Things take longer during periods of low visibility because aircraft are moved around more cautiously. The Air Boss and ATCs demand greater separation distances between aircraft for safety purposes. Therefore, poor visibility increases the likelihood that you will be sent to a Marshal point prior to landing.

Marshal Point B, the holding area directly behind the ship, is the only one of the three points used during low visibility OPs. It is positioned at least 15 nm behind the ship. An additional mile is added for 1,000 ft. of altitude you are assigned. For example, if you are told to go to Angels 5 (5,000 ft.), the center of the Marshal Point will be positioned 20 nm from the ship.

The reason for only using the central Marshal Point during periods of low visibility is- simplicity. This procedure allows you to transition from the holding area directly into the landing approach by simply flying a heading of 360°.

Once you are given clearance to land from the TOWER, you will be flying a "straight in" approach aimed at the stern of the carrier. *You can fly this approach looking through the HUD, but we recommend that you change your view perspective.* Press the *Look Down View* [2] so that you're able to see both the VDI and HSD on the screen at the same time.

Now that you have both of these monitors in front of you, your view to the outside world is limited. It's unsettling, isn't it- kind of gives you the *willies.* Welcome to the real world of low visibility flight. You should be getting some appreciation of what the real pilots must go through.

There's a reason for having you do this, however. In the first place, there's nothing to see outside, everything you need to look at is located inside the cockpit. Why not have it all in front of you at one time? Having both the VDI and HSD monitors at your disposal allows you to shoot your approach much more precisely.

STRAIGHT IN APPROACH PATTERN

The farther away you are from the carrier when you begin lining up the more time you have to assume the proper glide-slope. This is why low visibility Marshal Points are placed far away from the ship.

Assuming you have remained within your holding area, turn to a heading of 360°. You are now heading on a northerly course toward the stern of the carrier. Perfect!

The Course Deviation Indicator (CDI) bar should be centered on the Vertical Display Indicator (VDI). If it is not, put your aircraft on a heading that centers the bar. Because the CDI bar only points in the direction of the carrier, you want to fly a heading that also lines you up with the flight deck as well.

Since the carrier's flight deck always runs directly north-south (360°-180°), you want to fly a heading aimed at the carrier as close to 360° as possible. The closer you are to a heading of 360°, the fewer course corrections you will have to make later on.

Press the *Automatic Pilot* [P] to keep you on the proper heading. From this point on you are required to trust your instrumentation and "fly the needles."

Now it's time to check your approximate distance from the flight deck. Look at the Horizontal Situation Display (HSD) to get your waypoint distance (WPD). Your waypoint should remain toggled to CARRIER throughout your approach.

Toggle off the *Automatic Pilot* [P] and begin a gentle descent. At a distance of ten (10) nm, you should be flying level at an altitude no greater than 1,200 ft. Maintain an airspeed of 350 knots and stay at this altitude until you reach a point three (3) nm from the carrier. *Low visibility operations are inherently more risky so you should keep your speed a little higher than usual in case of emergency. An extra 10 knots of airspeed should do the trick.*

At three miles, tap the *Brake* [B] so that your airspeed drops below 300 knots. Extend your *Landing Gear* [G]. *Don't forget to retract your airbrakes.* During the next two miles, gradually descend so that at one (1) mile from the carrier your altitude falls to 460 ft and slow your approach to 180 knots.

At one mile you're are considered to be on *final approach*. Continue slowing down until you are flying at approximately 150 knots. Begin your final descent. The flight deck should become visible at this point.

Peg the Vertical Velocity Indicator (VVI) at a spot on the flight deck and keep it there. As you get nearer to the carrier, you can fine tune this aiming point. *Throttle Back* [-] so that you are flying just a few knots above stall speed (135 knots). Once again, when you are this close to the carrier- *never bank your wings.* You want to touch down with your wings level. Therefore, always use the rudder keys, *Rudder Left* [,] and *Rudder Right* [.] to make minor course adjustments.

Okay- great job! If you followed these instructions to the letter you should catch the #3 wire without any trouble. Whooops! Nowhere in these instructions did it say anything about lowering your *Landing Hook* [H]. You went to all that trouble just to *bolter.*

Don't panic. By sheer coincidence, the following section covers exactly what you should do in case of a bolter or missed approach.

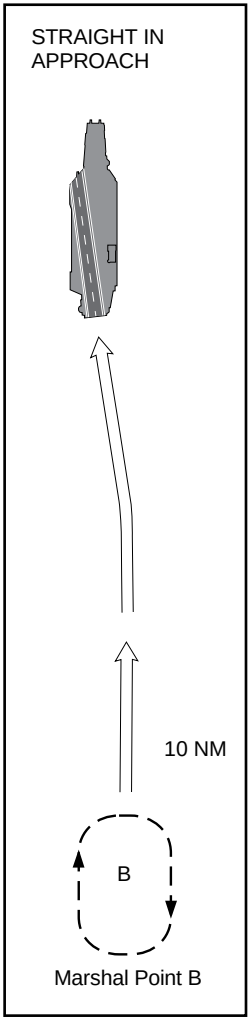


Figure 3-14: The Straight In approach is used during periods of Low (or No) Visibility because it places less strain on the pilot.

MISSED APPROACH PROCEDURES

A "missed approach" is a landing attempt that for whatever reason, has gone wrong. Missed approaches can occur as a result of excess landing speed, straying from the glideslope, even forgetting to put down your landing gear. But just because you miss an approach doesn't mean you're a bad pilot. It happens all the time. You must expect a few missed attempts. The point is that a pilot should know how to recover quickly and safely from a botched landing.

Figure 3-15: The LSO station. These guys are responsible for bringing you home safely. They also score each one of your landing attempts and post them for all to see.

The key to recovery is recognizing a missed approach for what it is early on. It's no sin to have to go around for another try. Just think of it as additional practice. Many pilots will continue to fight a bad landing past the point of no return. The problem is that in trying to correct a bad approach you are likely to over compensate. Small problems rapidly become big ones the closer you get to the carrier.

Rule #1: Never waste time trying to correct a good approach gone bad.

The LSO Wave-Off

If you fail to heed Rule #1 and continue a bad approach, the Landing Signal Officer (LSO) will signal a *wave-off.* A wave-off is your cue to forget about this landing and go around for another try. As soon as you get a wave-off call from the LSO, you should immediately begin following your "missed approach" procedures as described below.

If you ignore the wave-off and land anyway prepare to see your mission score reduced. This is the Air Boss' way of chewing you out. Disregarding a wave-off is a very serious offense and will be dealt with accordingly. Unless you are flying on vapors, it's not worth ignoring a wave-off.

Rule # 2: Unless you are low on fuel, and then only if you are down to fumes, never disregard a wave-off.

FOULED DECK

Just as your F-14 is not the only aircraft in the sky, it's also not the only aircraft on the flight deck. Aircraft are shuffled between the hangar deck and flight deck as quickly as possible but sometimes this just isn't fast enough. It can take up to five minutes to taxi an aircraft, prep it for launch, then cat-shoot it free of the flight deck. When the flight deck is full of aircraft waiting to take-off, other aircraft shouldn't be trying to land. This situation is known as a*fouled-deck.*

In fact, any time the flight deck is obstructed, it is considered *fouled* and landing operations are suspended. If the deck is fouled prior to you entering the traffic pattern, you are sent to a Marshal Point holding area until the situation is cleared.

If the deck is fouled while you are at any point in the pattern, including final approach, you are to implement the "missed approach" procedure.

BOLTER

Whenever your aircraft touches down but fails to hook any of the wires, it is known as a "bolter." For example, an aircraft which attempts to land at too high a speed may "float" and touch down beyond the last of the wires.

Pilot error is another reason for bolters. In the excitement of the moment a novice may forget to lower his hook. *Don't laugh, it's happened to me.* If you experience a bolter, don't panic. Treat a bolter the same way you would any missed approach and refer to the missed approach procedures described below.

MISSED APPROACH PROCEDURES

Missed Approaches are extremely hard to recover from. Why? Because in attempting to land, you have configured your aircraft to descend until it touches down on something solid. Your wings, flaps, trim vanes, spoilers and everything else are positioned to set the aircraft down. Now all of a sudden, you are required to move the aircraft in a different direction- *up!* It takes time to reconfigure, time you don't have when flying low and slow.

Obviously, the earlier you identify a missed approach, the easier it will be for you to recover from. The closer you are to the flight deck the more difficult your recovery will be. You'll be flying a near stall speed with a considerable downward velocity. Halting the downward motion is going to consume energy (airspeed) and potentially push you below your minimum *stall speed.*

The following Missed Approach checklist of procedures should be followed whenever a missed approach is declared or wave-off received;

1) Power Up- immediately go to afterburner by pressing the *Afterburner Engage* [A]. You are going need an immediate burst of power to arrest your descent and then climb out in order to re-enter the traffic pattern.
2) Gear Up- Retract your landing gear by pressing the *Landing Gear* [G]. Do this second. If you are not quick enough to halt your descent you may touch down on the flight deck anyway. With your wheels down you still have a chance to take-off again. If your wheels are up, contact with the flight deck usually results in a fatal crash.
3) Nose Up- keep the nose of the aircraft pointed no more than 10° above the horizon. Nurse the aircraft back into the sky. An abrupt pitch change will kill your forward airspeed and cause a stall.
4) Wings Level- Keep your wings level. Perform a straight forward climb out. Do not bank your wings or you will kill off any excess Lift being produced.

The object of these missed approach procedures is to reconfigure your aircraft for normal flight as quickly as possible. We recommend that you climb out to a minimum of 1500 ft. and then rejoin the traffic pattern at a 45° angle to the *crosswind leg.* Having to go around a second (or even third) time sure beats having a crash landing end a promising career.

Figure 3-16: Flight leader and wing-man being prepared for their mission.

YOUR WING-MAN

As if flying the F-14 in combat wasn't enough, *FLEET DEFENDER* gives you the opportunity (responsibility) to control the actions of another F-14, that of your wing-man's. While this means added work for you, it also allows for an almost endless list of tactical possibilities.

Usually, the minimum number of F-14s sent on any one particular mission is two (2). Known in the Navy as a *section,* a formation of two aircraft consists of a flight leader and wing-man. On each mission you (as the active player) assume the role of flight leader. As a flight leader, it will be your job to coordinate the actions of both aircraft. This is not easy. It will either double your effectiveness in combat or half it through miscommunication and poor coordination.

Although you are able to direct your wing-man's responses in combat, if left alone, his own artificial intelligence will take over. Otherwise, your wing-man is always be right where you put him. You'll never have to worry about him leaving a fight early just to save himself at your expense.

In fact, when controlled by the computer, your wing-man is every bit as capable as you, sometimes, even more so.

The more missions you wing-man has under his belt, the more skilled he becomes. Actually, *FLEET DEFENDER* keeps track of four separate areas of wing-man development: general flying skill, use of the radar, weapon employment and initiative.

GENERAL FLYING ABILITY: Your wing-man's expertise at performing ACM is based upon his general ability to handle the aircraft. This rating improves as he gains experience.

RADAR USE: As your wing-man's pilot/RIO skill level improves, hostile targets are located on radar faster. In addition, it takes less and less time for your wing-man to sort and lock targets.

WEAPON EMPLOYMENT: Your wing-man's ability to use his weapons once a target is found, is judged according to his skill level.

INITIATIVE: Each time your wing-man engages an enemy aircraft his AI routine attempts to gain a position of advantage. The more initiative a wing-man takes the better able he is to achieve this position. If however, your wing-man is forced to take up a defensive posture, he will call "ENGAGED DEFENSIVE".
ENGAGED DEFENSIVE is equivalent of you pressing the alt F5 Key which request assistance from your wing-man.

WING-MAN CONTROL KEYS

The addition of a second F-14 significantly increases the combat power at your disposal and gives you the ability to perform multiple tasks simultaneously. But, having a wing-man along is only a positive thing if your are able to use him wisely, otherwise he's something else to worry about and get in the way.

Your wing-man has the ability to make reasoned decisions if left alone. (*FLEET DEFENDER* features stunningly competent AI routines.) However, you (as flight leader) are able to exercise a great degree of control. The following keys allow you to direct the actions of your wing-man;

Go Tactical Alt F1 : Pressing this key releases your wing-man to attack targets independently. His response to you is either; Roger (indicating he is after a specific target) or "No Joy", indicating he has no bogeys in sight. In any case, by pressing this key you are releasing him to go find targets. If none are to be found, he will reform on your wing.

Target Directive Alt F2 : This command directs your wing-man to attack the target *that you currently have locked on your radar.* This key must be pressed after your wing-man has received the *Go Tactical* Alt F1 command. His response to you will be BOGEY TARGETED when he has achieved a radar lock on your target. You are free to choose a new target at this time.

Formation Alt F3 : Directs your wingman to assume one of three specific formations. Your options are: (1) Parade, (2) Cruise, or (3) Combat Spread. Press the appropriate number key. Your wing-man responds by acknowledging your formation selection. Only Combat Spread allows your wing-man to independently target and engage enemy aircraft.

Bracket Alt F4 : Directs your wing-man to perform a bracket in conjunction with your aircraft. The options are: (1) Bracket Left, (2) Bracket Right, (3) High, (4) Low, and (5) Straight. Press the appropriate number key to select an option. Your wing-man responds by acknowledging the selected option. If you select either (3) High or (4) Low, you must then select an altitude differential of up to 10,000 ft.

Engaged Defensive Alt F5 : Directs your wing-man to come to your immediate assistance. He will drop whatever he happens to be doing at the time to come to your aid. *Such loyalty deserves repayment in kind.*

Sanitize Alt F6 : Directs your wing-man to perform a radar sweep in the direction selected. Your options are: (1) Left, (2) Right, (3) Front, and (4) Back. If your wing-man makes contact with an object in the area he responds with the number of contacts he has sighted, their range, and finally their altitude.

Sort Alt F7 : Directs your wing-man to report on the target he currently has locked-up. His response is either: Sorted None, Sorted Lead, Sorted Trail, Sorted Left, Sorted Right or Unknown. A report of UNKNOWN indicates that your wing-man is not sure of target's location within the formation. *It does not mean to imply a response to an IFF check.*

Alibi Alt F8 : Directs your wing-man to report his current damage and weapon status.

Rejoin Alt F9 : Directs your wing-man to rejoin with you. Watch for him to appear and saddle up along side your aircraft.

Return to Base Alt F10 : Directs your wing-man to return to the carrier (base). His response, "RTB", acknowledges your command.

Delouse Shift F1 : Sends a message to your E-2C controller (or carrier) to send an F-14 two-ship to your location. This two-ship will either come from the carrier (the Ready 5 aircraft) or it will be drawn from another CAP station nearby.

SECTION FORMATIONS

In order for your section to function properly, flight leader and wing-man must fly and fight as a team. If you are only interested in becoming a "Top Gun" you can forget about forming an effective two-ship. In fact, if you don't know how to cooperate with your wing-man you might as well leave him back on the deck.

One good thing you don't have to worry about is mid-air collisions, either with your wing-man or the enemy. This allows for some really tight formations as you may well imagine. It also keeps pilots from playing bumper cars or attempting to ram the enemy as a final gesture before going down. Nobody does this intentionally- nobody. Even if unintentional, the chances of a mid-air collision with an enemy aircraft are very small indeed. Ramming is just not a viable tactic anymore.

Formations Alt F3

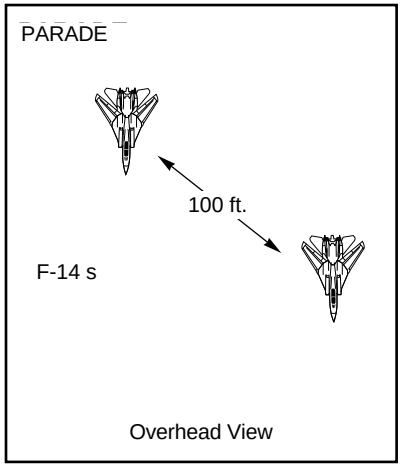


Figure 3-17: The Parade formation

There are three basic formations that you and your wing-man can assume; *Parade, Cruise,* and *Combat Spread.* You can change your formation at any time, just by pressing the *Formation* Alt F3 . Press the appropriate number key to make your selection.

PARADE FORMATION

When flying in parade formation, your wing-man takes up a position behind you, less than 100 ft away. While flying in parade formation your wing-man *is unable to target or fire upon enemy aircraft.* He is essentially under a "weapons hold" restriction until you free him by pressing the *Go Tactical* F1 or by putting him into a *Combat Spread* 3 formation.

CRUISE FORMATION

When flying in cruise formation, your wing-man takes up a position behind you, less than 200 ft away. While flying in cruise formation your wing-man is unable to target or fire upon enemy aircraft unless you release as previously described.

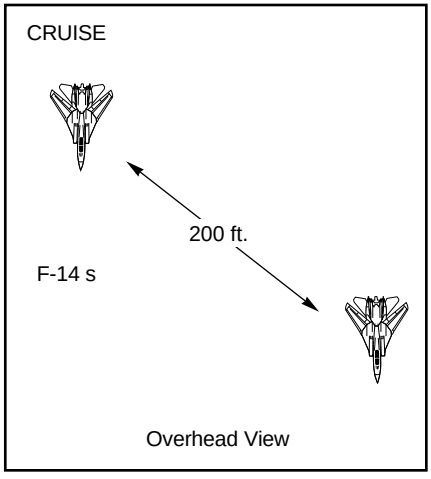


Figure 3-18: The Cruise formation

COMBAT SPREAD FORMATION

When flying in a Combat Spread formation your wing-man takes up a lateral (line abreast) position off your wing. From this position he may target and fire upon enemy targets of opportunity *without your prior approval.*

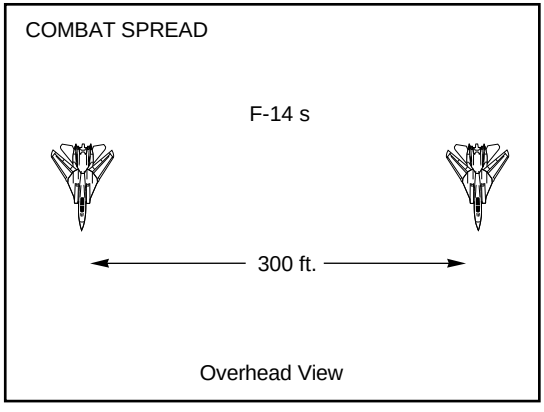


Figure 3-19: The Combat Spread formation.

BRACKET FORMATION Alt F4

The Bracket is more of a section tactic than a traveling formation. It is labeled a formation and included here only because it deals with the tactical positioning of your wing-man.

You may order your wing-man into assuming a Bracket formation at any time by pressing *Bracket* Alt F4 . Pressing this key causes a secondary menu to appear which lists your Bracket options. Press the corresponding numeric key to assign your wing-man one of the following Bracket options: (1) Bracket Left, (2) Bracket Right, (3) High, (4) Low, and (5) Straight.

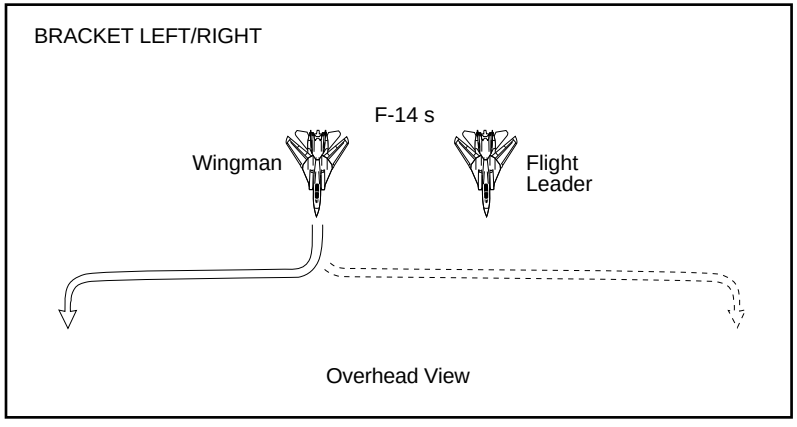


Figure 3-20: Your wing-man assumes the various bracket positions as shown here.

Note that your own F-14 becomes the off-setting pivot point for the Bracket. The offset distance for a Bracket Left, Bracket Right, or Bracket Straight is 5 nm. When ordering a High or Low, you are required to select an altitude differential using the numeric keys from one(1) to ten (0) thousand feet.

Tactically, the Bracket attack resembles a pincer movement, if conducted properly, enemy aircraft are sandwiched between you and your wing-man. The enemy is approached until he is forced to commit on either you or your wing-man. Once this commitment becomes apparent, the uncommitted (unengaged) friendly aircraft is then considered the "free" fighter.

The *free* fighter should immediately assume an offensive posture and convert on the enemy's "six." The *committed* fighter should break in a manner which facilitates the free fighter's attack.

If performed correctly the two-ship will have caught the enemy between them. The enemy is vulnerable to the free fighter's attack unless he disengages from the committed fighter. If the enemy does disengage, he has lost any initiative he might have had and now faces a 1 v. 2 situation.

CHAPTER FOUR:
F-14 COCKPITS and AVIONICS

We recommend that first time flyers take the time to read this chapter and do some practicing in the Oceana Training theater. This way newcomers can get the hang of things and not have to face hostile aircraft right away. Eventually all this "pilot stuff" will become second nature but for now let's concentrate on the F-14's flight instrumentation.

Each functioning gauge, dial, and indicator is described in detail so that you can tell at a glance just how well your aircraft is doing. It is divided up into the major instrumentation of both the front and back seat cockpits.

In addition, instrumentation on the pilot/RIO's side panels and console is also covered in separate sections.

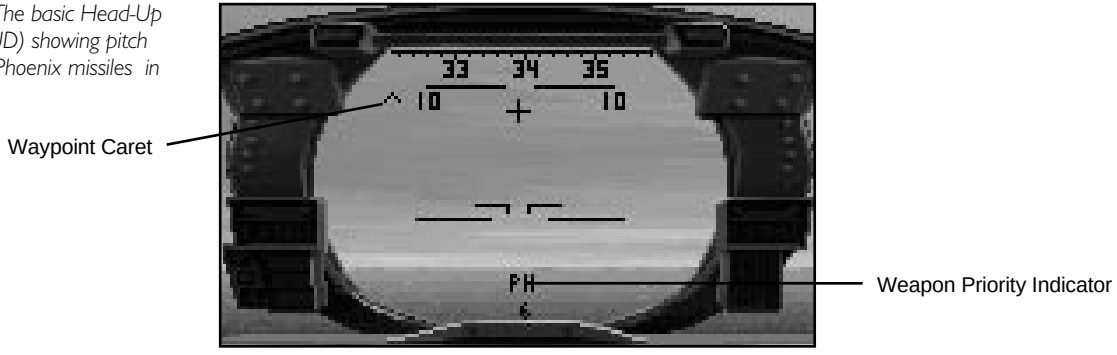
Figure 4-1: Smiling under all that headgear, this "Tomcat" driver has just returned from a successful mission.

PILOT (FRONT SEAT) COCKPIT

Because you portray a F-14 pilot in this simulation, most of your time will be spent in the front seat cockpit. All the necessary flight controls are located here. While you occupy the front seat you are in command of the aircraft, you make the decisions. The following section describes the various displays and instrumentation you have at your disposal.

HEAD-UP DISPLAY (HUD)

Figure 4-2: The basic Head-Up Display (HUD) showing pitch ladder and Phoenix missiles in priority.



The Head-Up Display is actually a transparent pane of "plexi-glass" situated directly in front of your field of vision. When you look directly forward, you are actually looking through the Head-Up Display (HUD). As the name implies, the reason for a HUD is simple. Flight and weapon symbology is superimposed on the "glass" so that you do not have to look down to read instruments. This allows you to keep your head upright when involved in combat so you don't lose sight of a bandit at an inopportune moment.

Standard HUD Information

Much of the symbology on the HUD is standard information which shows up regardless of the weaponry or mode selected.

The Magnetic Heading Indicator

Stretching across the very top of the HUD is the Magnetic Heading Indicator. This indicator is divided into 10° compass heading increments which are then further sub-divided into 2° increments.

Your course is equal to the compass heading which occupies the center position of the indicator (directly above the tiny cross). You can check the accuracy of the Magnetic Heading Indicator with the analog compass located to the right of the Vertical Display Indicator (VDI).

WAYPOINT CARET

Located underneath of the Magnetic Heading Indicator is a waypoint reference cue known as a caret (pronounced carrot). The caret resembles an inverted V and is positioned on the heading indicator according to the waypoint you have selected.

AIRCRAFT RETICLE

The aircraft reticle depicts the position of your aircraft's wings (chord line). It appears on the HUD as two L shaped characters that have been knocked over on their sides. This line indicates where the nose of the aircraft is pointing, relative to the horizon. The position of the aircraft reticle on the pitch ladder indicates your aircraft's relative pitch angle.

PITCH LADDER

The pitch (up/down reference) angle of your aircraft is displayed by means of a *pitch ladder.* The pitch ladder is the set of horizontal pitch lines in the center of the HUD which are arranged like the rungs of a ladder.

The pitch lines of the ladder are divided into 10^0 increments, from 0^0 (level) to 80^0. The greater the pitch angle, the more your aircraft will be pointing up or down.

Solid pitch lines indicate your aircraft is pointed upward. A small circle indicates that your aircraft is pointing straight upward in a sheer vertical climb. *Dashed* pitch lines indicate your aircraft is pointed downward. A small circle with a X inside indicates that your aircraft is pointing straight down.

WEAPON PRIORITY INDICATOR

Centered at the bottom of the HUD is symbology indicating which weapon system is currently in priority. (Being *in priority* means which type of missile would be launched if you were to fire a missile right now. Even though the M61A1 gun is always ready to fire, there is a separate HUD mode for the gun system which displays a floating gunsight.)

The letter codes which appear on the HUD are PH (Phoenix), SP (Sparrow), SW (Sidewinder) and G (Gun). Underneath the letter code is displayed a number which equals the number of those missiles left onboard. If a zero (0) appears, none of that type of missile remains.

If the Master Arm Switch is in the Off position, an X is superimposed over the Weapon Priority Indicator.

HUD Navigation Mode Symbology

When you press the *NAV Mode* [5], special navigation symbology appears on the HUD to assist you. Notice that the Weapon Priority Indicator is removed. It is assumed that you will not be engaging in combat while flying in Navigation mode.

Figure 4-3: The pilot is able to use information shown on the HUD to assist in navigation and precision landings. The HUD shown here in NAV mode, is helping this pilot return home.

PITCH LADDER

The pitch ladder has been changed from 10^0 pitch increments to increments of 50. This allows you to fly the finer pitch angles required for precision navigation.

VERTICAL VELOCITY INDICATOR (VVI)

A Vertical Velocity Indicator is placed on the HUD to assist you in visually determining your sink rate when landing. The VVI is the tiny circle with three tick marks protruding from it. It is usually located under the aircraft reticle.

The VVI is normally used when making carrier approaches. It is an indication of where your aircraft is actually going. Note that this is sometimes different from the aircraft reticle, which only shows where your aircraft is pointing.

For example, in a carrier approach, the nose of the aircraft is kept pointed slightly above the horizon to maintain a glide-slope flare. The VVI, however, is located below the horizon indicating that the aircraft is descending (even though the nose angle indicates a climb).

On final approach, keep the VVI aimed at the spot on the carrier deck where you wish to land. Use it as an aiming stake. If you keep the VVI on the deck, you can glide the aircraft down for perfect landings every time.

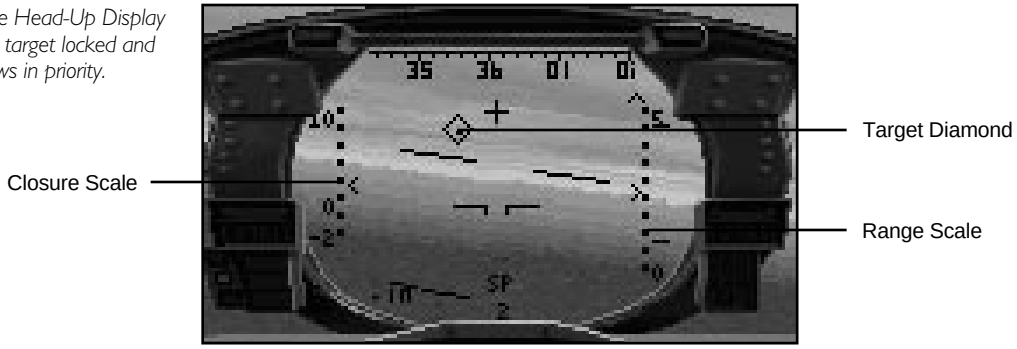
Combat Mode Symbology

Except for take-offs and landings (when the HUD should be placed in NAV mode), the majority of time your HUD should be set to display Combat mode symbology. A Combat mode is one in which a weapon system has been put in priority (Gun or missile). *Basically, the HUD is in Combat mode if it is not in Nav mode.*

Standard Combat Mode Symbology

Some Combat mode symbology is standard on the HUD regardless of what weapon is placed in priority.

Figure 4-4: The Head-Up Display (HUD) with a target locked and AIM-7 Sparrows in priority.



TARGET RANGE SCALE

When the HUD is placed in a Combat mode, a vertical Target Range Scale appears on the right side of the display. The bottom of the scale always reflects a range of zero. The upper end of the scale varies according to the range of the target.

In order for a target to appear on this scale, it must either be radar-locked (in PDSTT) or designated (in a TWS mode). A range caret (the V-shaped symbol lying on its side) is located on the left side of the scale. As the name implies, this caret indicates the range of the principle target.

Two tick marks extend from the right side of the range scale. The upper tick mark represents the weapon's Rmax, the maximum effective range of the weapon in priority. The bottom tick mark represents the weapon's Rmin, the minimum effective range of the weapon in priority.

CLOSURE SCALE

When placed in a Combat mode, the vertical scale on the left side of the HUD shows the relative rate of closure between your aircraft and the target. A caret (a V-shaped symbol tilted to one side) is positioned on the right side of the vertical scale. This caret indicates your rate of closure. This scale registers closure rates of between -200 knots (at the bottom of the scale) and +1000 knots (at the top). A positive value means you are closing in on the target at the indicated speed. A negative value means that the distance between the two aircraft is increasing by the indicated amount.

A negative closure rate indicates that the target is actually pulling away from you.

TARGET DESIGNATOR DIAMOND

When a target has been radar-locked or designated, a Target Diamond appears on the HUD corresponding to the actual position of the target. If the target goes off the HUD, the diamond is peg-ged along the side nearest its point of exit.

SHOOT CUES

When a target is brought within the Rmax and Rmin of the weapon system in priority, HUD symbology begins to flash. This flashing symbology is your shoot cue telling you it's time to fire the weapon.

BREAK X

When a target is within the Rmin range of the weapon system in priority, a large X symbol appears in the center of the HUD. This X is known as the Break X indicating that you need to back off and increase the range between you and the target. Note that the M61A1 gun has no Rmin.

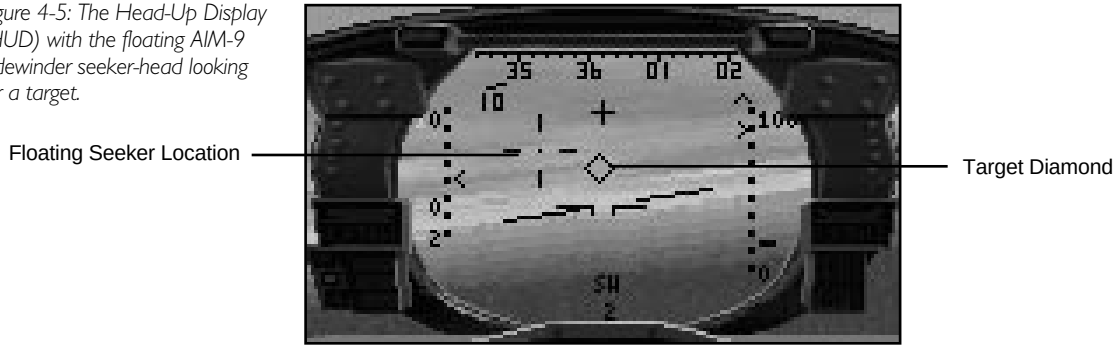
Gun Priority Symbology

By pressing the Guns [1], the HUD symbology is changed to reflect that your M61A1 has been placed in priority.

When the M61A1 gun is in priority, a floating gunsight reticle appears on the HUD. This gunsight automatically computes the amount of lead angle needed to score a hit on a particular target. When firing the gun, you must maneuver the aircraft so that the floating gunsight is placed on your intended target.

AIM-9 Sidewinder Priority Symbology

Figure 4-5: The Head-Up Display (HUD) with the floating AIM-9 Sidewinder seeker-head looking for a target.



By pressing the *Sidewinder* [2], the HUD symbology is changed to reflect that your AIM-9 heat-seeking Sidewinder missiles have been placed in priority.

When your Sidewinder missiles are in priority, a floating *seeker-head* reticle appears on the HUD. This reticle floats about the HUD looking for a heat source to lock-on to *(acquire)*. The seeker-head detection range is approximately 6 nm, therefore, the Sidewinder will not acquire a target on its own unless the target is within this distance.

The seeker-head reticle will continue to float about the HUD until it acquires a target. Once a target is acquired, the reticle is superimposed on the Target Diamond Designator. The symbology will flash, your shoot-cue to fire.

Note that the Sidewinder missile does not require radar to engage a target. You can even turn off the radar and acquire the target solely through the missile's seeker-head.

AIM-7 Sparrow Priority Symbology

By pressing the *Sparrow* [3], the HUD symbology is changed to reflect that your AIM-7 medium-ranged, radar-guided, Sparrow missiles have been placed in priority.

Sparrow HUD symbology is exactly the same as that of the Sidewinder with the exception that there is no floating seeker-head. The Sparrow missile requires the aircraft's radar to engage a target and does not have a internal seeker like the Sidewinder.

AIM-54 Phoenix Priority Symbology

By pressing the *Phoenix* [4], the HUD symbology is changed to reflect that your AIM-54 long-ranged, radar-guided, Phoenix missiles have been placed in priority.

Phoenix HUD symbology is exactly the same as that of the Sparrow missile. The upper range limit (Rmax) of the Phoenix missile is considerably greater than that of the Sparrow, however. This is reflected on the vertical range scale.

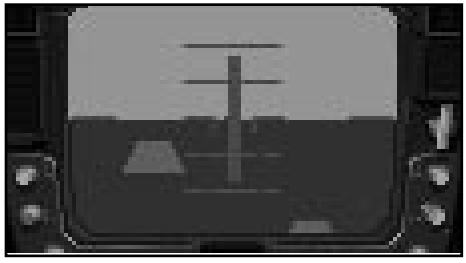
VERTICAL DISPLAY INDICATOR (VDI)

The Vertical Display Indicator (VDI) is located in the front seat cockpit directly underneath the HUD. In its primary role, the VDI acts as a HUD repeater (a back-up) in case the real HUD is ever damaged in combat. In addition to acting as a substitute HUD, the VDI monitor can also be toggled to display images produced by the Television Camera System (TCS).

Press the VDI/TCS Mode Toggle [V] to alternate between the two modes.

VDI Navigation Mode Symbology

Figure 4-6: The Vertical Display Indicator (VDI) in NAV mode showing the CDI.



PITCH LADDER

The pitch ladder on the VDI is a duplicate of the pitch ladder on the HUD. Solid pitch lines indicate your aircraft is pointed above the horizon (i.e. upward). *Dashed* pitch lines indicate your aircraft is pointed below the horizon (i.e. downward).

AIRCRAFT RETICLE

The VDI aircraft reticle functions exactly as the aircraft reticle on the HUD. The two L shaped characters indicate where the nose of the aircraft is pointing relative to the horizon. The position of the aircraft reticle on the pitch ladder indicates your aircraft's relative pitch angle.

GROUND TEXTURE

Ground texture appears on the VDI as a pair of light tone patches that appear to be continually revolving. *(They look like the dashed lines on a highway as you are driving past.)* These patches remain in motion even if your aircraft is stopped. They are merely aid in making the visual distinction between above and below the horizon.

COURSE DEVIATION INDICATOR

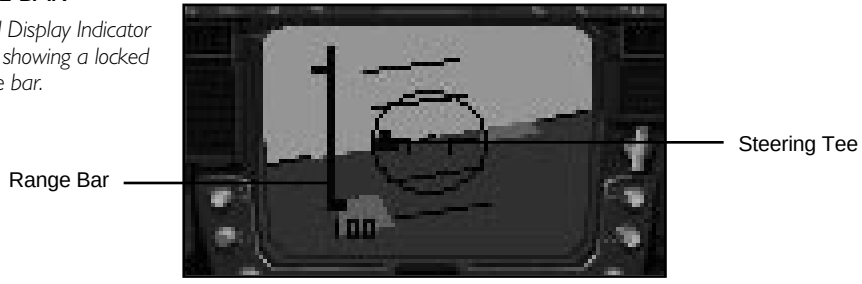
The Course Deviation Indicator (CDI) is a vertical bar which moves left or right across your VDI. The purpose of the CDI is to assist you in getting a more exact bearing on your aircraft carrier. It is not part of an Instrument Landing System and should not be used for precision approaches.

The CDI functions in the same manner as the waypoint caret on the HUD's Magnetic Heading Indicator. It is a visual cue that you are heading toward your carrier. Although you are aimed at your carrier, it *does not* mean that you are properly lined up with the flight deck. You could be flying directly at the carrier and still be perpendicular to the flight deck. In this instance, the CDI would still be centered on the VDI.

VDI Combat Mode Symbology

AZIMUTH RANGE BAR

Figure 4-7: The Vertical Display Indicator (VDI) in combat mode showing a locked target and target range bar.



The vertical bar positioned on the left side of the VDI is known as the *Azimuth Range* Bar. This bar is used to determine whether or not a target is within range of the weapon system currently in priority. It *does not* give you the exact range to target, however. You must estimate target distance for yourself.

Estimating target distance is done by noting the scale of the bar and the position of the Target Range Mark. The number located on the VDI beneath the Azimuth Range bar represents it's maximum range (in nm).

If a target is currently locked on radar, a tick mark (known as the Target Range Mark) appears on the left side of the bar. Note its location, (i.e. 1/3rd of the way up the bar, half the way up etc.) on the bar and compare this to the maximum range of the bar as indicated. *A Target Range Mark located halfway up a 100 nm bar would indicate that the target is approximately 50 nm away.*

On the right side of the bar are two other tick marks. These are known as Rmax and Rmin indicators. If the Target Range Mark falls between these two tick marks, the target is within range.

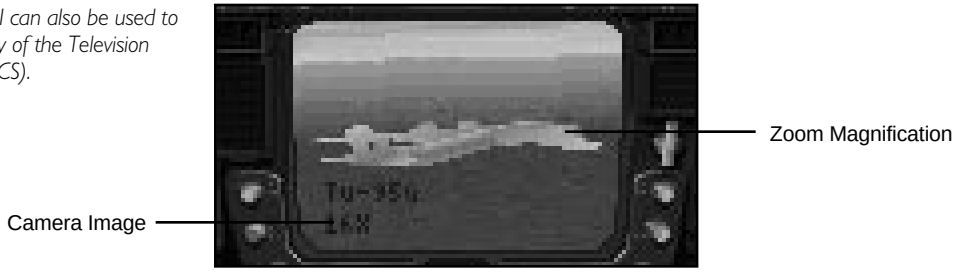
Rather than having a Target Diamond Designator appear on the VDI, this display uses a symbol known as a *steering tee.* The steering tee is an inverted T-shaped symbol and functions exactly as a Target Diamond Designator does on the HUD.

ALLOWABLE STEERING ERROR (ASE) CIRCLE

The dashed line circle in the middle of the VDI is known as the Allowable Steering Error (ASE) circle. For best results, it is recommended that you maneuver the aircraft so that the steering tee is inside the ASE circle before you fire a missile. This is not a requirement, though. It just means that the enemy will have a more difficult time avoiding your missile because you have made the effort to line up a cleaner shot.

Television Camera System (TCS)

Figure 4-8: The VDI can also be used to view targets by way of the Television Camera System (TCS).



The F-14 has an onboard television camera system which is slaved to the AWG-9 radar. The camera automatically focuses on locked targets and continues to track them as long as the target remains within the gimbal limits of the TCS. The camera image is broadcast on the VDI and can be magnified up to 20 times.

The TCS functions differently according to the difficulty level setting. For details, consult the difficulty level section of Chapter 1.

HORIZONTAL SITUATION DISPLAY (HSD)

Figure 4-9: The Horizontal Situation Display (HSD) is your primary means of gathering navigational information.

The Horizontal Situation Display (HSD) consists of a rotating compass dial with three lines of navigational text information inserted in the center. Like the VDI, it is multi-functional. This monitor can alternate between showing standard HSD navigational information and being a Target Information Display (TID) repeater.

To alternate between the displays, press the *HSD/TID Toggle* Shift R.

HSD Navigation Information

COMPASS HEADING

Your direction of flight is indicated by the Command Course bar located at the top of the dial (12 o'clock position). Your aircraft's heading is indicated by the compass reading which appears under the Command Course bar at any given moment.

WAYPOINT INDICATOR

An small tick mark is placed on the compass heading indicating the direction of the waypoint you've selected.

WAYPOINT DISTANCE (WPD)

The top line of text located in the center of the compass dial gives your current distance (in nm) from the selected waypoint.

TRUE AIRSPEED (TAS)

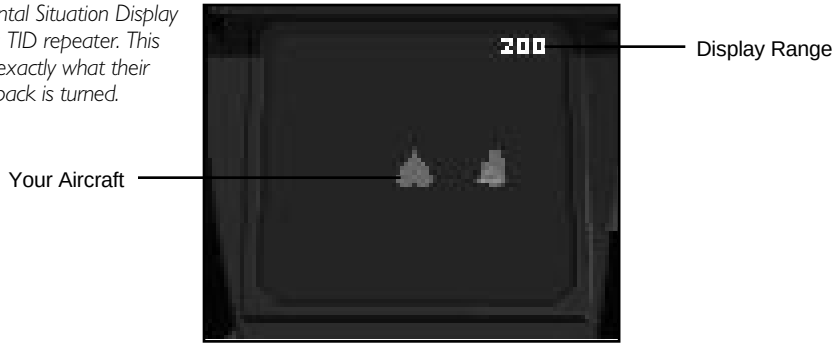
The middle line of text gives your true airspeed (in knots). Since your airspeed indicator is calibrated to reflect your airspeed at sea level, your actual airspeed at higher altitudes will vary. True airspeed (TAS) takes this variance into account. *To get a estimate of your true airspeed through the air, increase your KIAS reading by 2% per thousand feet of altitude.*

GROUND SPEED (GS)

The bottom line of text gives your actual over land ground speed (in knots). Note that for the purposes of FLEET DEFENDER, it is the same reading as your Indicated Air Speed (KIAS).

Target Information Display (TID) Repeater

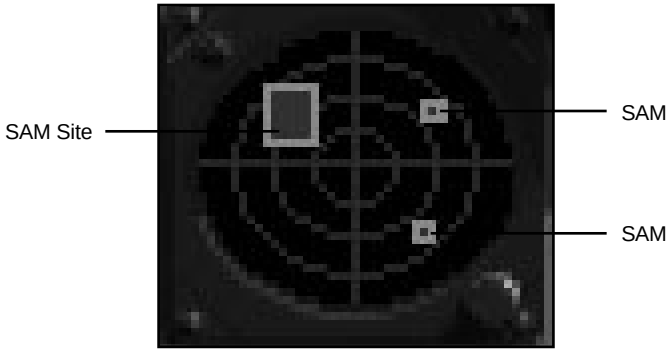
Figure 4-10: The Horizontal Situation Display (HSD) can also act as a TID repeater. This lets paranoid pilots see exactly what their RIO is doing while their back is turned.



By pressing the HSD/TID Toggle Shift R the HSD monitor is turned into a TID repeater. This way, you can see all the information currently showing up on the RIO's TID. The range (in nm) of the display is shown in the upper right hand corner of the monitor.

TACTICAL ELECTRONIC WARFARE SYSTEM (TEWS) DISPLAY

Figure 4-11: The Tactical Electronic Warfare System (TEWS) is part of your overall self-preservation effort.



The Tactical Electronic Warfare System (pronounced "Tooz") is an integral part of your aircraft's self-defense capability. It consists of an array of sophisticated sensors and receivers located throughout the aircraft. The TEWS gives you the ability to locate enemy aircraft by the energy their radars emit. It also allows you to pinpoint the location of ground based tracking radars. In fact, any radar that is emitting energy, whether it be friend or foe, is detectable.

The TEWS display appears on your console as a series of four concentric circles centered on a pair of horizontal and vertical lines. Your aircraft is located at the intersection of the x and y-axis lines (in the center of the screen). The display itself is oriented so that the top of the screen always represents 12 o'clock (in front of your aircraft). The bottom of the display is your aircraft's 6 o'clock position (the rear of your aircraft).

The maximum display range of the TEWS is 40 nm. Each of the concentric circles represents a radius increase of 10 nm. Targets that are detected beyond 40 nm are peg-ged along the edge of the TEWS display. They could be located anywhere from 41 nm to as far away as 200 nm.

Ground-based Radars (square icons)

When a ground-based radar is *Searching* for your aircraft the audio warning will "beep" or "hit" each time the radar's energy passes over you. No icon appears on the screen, however. You receive audio warnings only.

When an enemy ground-based radar is *Tracking* your aircraft, a square icon with a number inside from 1-9 appears on the screen at the appropriate range and bearing. You also receive an audio alert cue.

When an enemy ground-based radar has *"Locked-and launched"* the square icon begins flashing. A smaller square icon appears over top of the flashing icon. This is a surface-to-air missile which the SAM radar is directing toward your aircraft. In short, it means trouble.

Aircraft Radars (diamond icons)

Enemy aircraft radars appear on the TEWS only after they have *"Locked-On"* to your aircraft. A diamond-shaped icon is placed at the appropriate range and bearing. These icons do not flash when a missile is launched, just count one being fired anyway. *(Just think how quickly you fire a missile once you achieve a "lock." Enemy pilots are just as eager to shoot at you).*

Inside each of these icons is a number from 1-9 which signifies the type of radar emissions being detected by the TEWS. The numbers correspond to a particular type of radar as listed below;

Ground-based Radar Indicators (square icons)

[1] Continuous wave Long-range SAM radars
SA-2, SA-3, SA-N-3A, SA-N-3B

[2] Pulse-Doppler Long-range SAM radars
SA-5, HAWK, Crotale

[3] Continuous wave Short-range SAM radars
SA-6, SA-N-7, SA-N-9

[4] Pulse-Doppler Short-range SAM radars
SA-8, CADS-N-1

[8] AAA Acquisition and Tracking radar
Triple-A batteries

[9] Long-range Search radars
Ground Control Intercept (GCI) Stations

Aircraft Radar Indicators (diamond icons)

[1] Pulse-Doppler Multi-target Search and Track radar
F-14, F/A-18, Su-27, MiG-29, MiG-31

[2] Pulse-Doppler Single-target Search and Track radar
F-4, F-16, Viggen, Tornado MK.3

[3] Multi-mode Search and Track radar
MiG-23, MiG-25, Mirage F-1

[4] Single-mode Search and Track radar
MiG-21, Su-17, Su-22, F-5E

[5] Range-only radar
MiG-27, Su-24

[9] Airborne Early Warning radar (AWACS)
E-2C, Tu-126

SAM and AAM Detection

Radar missiles, both ground and air launched, appear on the TEWS as tiny unnumbered squares. If a SAM installation or enemy aircraft launches a radar-guided missile, you can see it begin to head toward your aircraft. This should give you plenty of time to deploy counter-measures or maneuver to defeat it. *Heat-seeking missiles, because they don't emit radar energy, never appear on the TEWS.*

TEWS Jammer

In addition to detecting enemy radars, the TEWS actively attempts to distort, or otherwise jam their signal. The TEWS jammer interferes with the ability of enemy radars to first; detect you, or having failed at that, lock you in their beam.

You may turn the Jammer ON or OFF by toggling the TEWS Jammer Toggle [J], *what else!* When the Jammer is ON, the word "JAMMER" appears across the TEWS display screen. If turned off, the word is removed.

When actively jamming an enemy radar, the word JAMMER" flashes. This indicates that the jammer is blanketing the sky with "white noise". While this makes you hard to hit with a missile, all that "noise" you are making makes you easy to detect. If stealth is more important to you than missile avoidance, turn the Jammer off.

RIGHT INSTRUMENTATION PANEL

Figure 4-12: The Pilot's right instrument panel.

Wing-Sweep Indicator

The F-14 has a computer-controlled variable wing sweep which allows the aircraft to take advantage of swept and straight wing characteristics. Swept wings reduce drag and produce good linear performance, straight wings give the aircraft a superior maneuvering ability.

This indicator lets you know at a glance the degree at which your wings are swept (0^{o} to 70^{o}). *FLEET DEFENDER* does not allow you to manually adjust your wing configuration.

Right Engine FIRE Lamp

This light illuminates when your right engine has been damaged and is on fire.

Standby Attitude Indicator (Artificial Horizon)

This gauge functions as an artificial horizon indicator. Use this gauge only in emergencies. Although the pitch lines are legible, you would not want to use it for judging a landing approach.

Heading Indicator

This gauge is a magnetic heading compass. It is useful as a back-up NAV device if your HUD is damaged.

G Meter

This window displays a digital indication of the G forces currently being placed on the aircraft (and pilot).

Fuel Quantity Indicator

The Fuel Quantity Indicator can be the most important instrument onboard the aircraft at times, especially when it's dark and you're a long way from home.

TOTAL FUEL STATE INDICATOR

The top five-digit window states the total amount of fuel currently onboard the aircraft. This figure represents your fuel state as measured in pounds (not gallons).

BINGO FUEL INDICATOR

The number directly below your total fuel state indicator is your Bingo Fuel mark. This number represents the minimum amount of fuel needed your you to return safely to the carrier. When you reach this number during the course of mission, it's time to turn around and head home- *immediately!*

LEFT/RIGHT ENGINE FUEL INDICATORS

Your total fuel state figure is divided up among your two engines. The fuel is not transferable between engines should one get knocked out.

LEFT INSTRUMENTATION PANEL

Figure 4-13: The Pilot's left instrument panel.

Angle-of-Attack Indicator (AOA)

This gauge displays your current angle-of-attack in degrees of AOA.

Vertical Velocity Indicator

This gauge indicates your rate of climb or descent. The numbers represent 1000s of ft./ minute. For example if the needle was pointed at the number 2, this indicates you are climbing (or diving) at a rate of 2,000 feet per minute.

Air Speed Indicator

Your air speed indicator displays your current speed in KIAS. Notice that as you increase in altitude, these numbers make it appear that you are going slower. This is not the case. Check your airspeed indicated here with your *true airspeed* (TAS) displayed on the Horizontal Situation Display (HSD).

Radar Altimeter

This gauge is a radar altimeter which displays your Above-Ground-Level (AGL) altitude. Note the subtle difference between AGL and ASL (Above-Sea-Level). If you can't grasp the concept, don't fly over mountains in the dark. This altimeter is connected to a Terrain Following Radar (TFR) and will register AGL readings as high as 3000 feet.

Altimeter

Unlike the radar altimeter, your standard altimeter measures Above-Sea-Level (ASL) readings in hundreds and thousands of feet. The large number (at the nine o'clock position on the dial) is your current altitude in thousands of feet. The smaller numbers (at all points on the clock) represent altitude in hundreds of feet.

Engine Instrument Group

The Engine Instrument Group consists of three main gauges; the RpM (revolutions per minute) indicator, the EGT (Engine temperature) indicator and the FF (Rate of Fuel Flow) indicator. These three instruments are collectively known as the Engine Instrument Group. They are used for monitoring purposes only.

RIGHT CONSOLE

You can access the pilot's right hand console by pressing the *Look Right* [6]. *You must first occupy a front seat view.* This screen is informational only. There are no "hot" buttons or interactive keys available on this screen. The RIO has a duplicate advisory panel available to him.

Figure 4-14: The Pilot's right hand console. In foreground is the column of lights known as Master Caution-Advisory panel. When these lights are On, you know you've got problems.

Master Caution-Advisory Panel

The main item on this screen is the column of red warning lights. These lights are collectively referred to as the Master Caution-Advisory Panel. When a vital aircraft system is damaged, its corresponding lamp will illuminate.

Arrestor Hook Lever

The lever to raise and lower your *Arrestor Hook* [H] is located to the far left of this screen.

LEFT CONSOLE

Figure 4-15: The Pilot's left hand console. The throttle is the prominent feature on this particular view.

You can access the pilot's left hand console by pressing the Look Left [4]. *You must first occupy a front seat position (view).*

Throttle Lever

The main item on this screen is the throttle. You can watch the throttle advance and retreat as you press the throttle [-] and [=].

Landing Gear Lever

Positioned directly above the throttle handle is the Landing Gear lever. You can watch the lever move as you toggle the *Landing Gear* [G].

RADAR INTERCEPT OFFICER (REAR SEAT) COCKPIT

The F-14 is far too complex a machine to ever be operated by a single human, no matter how well trained. Therefore, in addition to a pilot, the F-14 features a Radar Intercept Officer or RIO. This individual provides the pilot with a second pair of hands and a second pair of eyes. It is the RIO's responsibility to anticipate, rather than react to events.

The RIO is given the task of operating the radar and weapon systems. Although the pilot has the ultimate say in when to pull the trigger, it's the RIO's job to find the bad guys and make it easy for his front-seater to shoot 'em down.

The two main displays he must operate are: the Detailed Data Display (DDD) and the Tactical Information Display (TID). These displays represent the heart of the F-14's radar system and allow the RIO to locate and engage targets out to 200 nm away.

The back-seater has one major drawback though- he cannot fly the aircraft should the pilot become incapacitated. The Grumman design team that put together the F-14 evidently choose to leave flight controls out of the RIO's reach.

STANDARD MODE DETAIL DATA DISPLAY (DDD)

In Standard Mode, the Detailed Data Display (DDD) monitor is your radar screen. It is positioned (in the back seat) at eye level, directly in front of the Radar Intercept Officer (RIO). Because it has a monochrome green background, it reminds you of a football field when viewed from above.

The DDD is oriented so that the top edge of the monitor is 12 o'clock (ahead of your flight path), the left edge of the monitor is 9 o'clock and the right edge, therefore, is 3 o'clock. Your aircraft is centered along the bottom edge of the monitor. In fact, think of your aircraft as being the central tick mark on this line.

The two vertical bars in the center of the monitor (each has 4 horizontal tick marks) are positioned at a 30º to your line of flight. Radar blips outside these bars, therefore, represent aircraft that are 30º or more to your left or right. The full display width equals 130º. Note the tiny tick marks along the bottom edge. There is a 10º azimuth width between each one.

The radar range of the display is 200 nm in Standard Mode. You can use *Zoom In/Out* [Z] and [X] to make the range numbers change above the display, but this has no real affect on the radar range. Even if the display is set to 5 nm, it is still detecting targets out to 200 nm. *Range settings have no affect while playing with the radar set to Standard Mode.*

Because of the display's orientation, the nearer target blips are to the bottom edge, *the closer they are to your aircraft in actuality.* This is only true in Standard Mode. *Blip positions in Moderate/Authentic mean something entirely different.*

Detailed Data Display (DDD) Modes

Figure 4-16: The Standard Mode Detailed Data Display (DDD) in SEARCH mode displays targets like a conventional radar screen.

When the radar is set to a Standard Mode difficulty level, the DDD has only two operational modes of operation; SEARCH and TRACK. *Your current operating mode is shown underneath the DDD monitor.* The radar mode buttons located to the right of the display are used in Moderate/Authentic Mode only. You can ignore these buttons while playing in Standard Mode.

SEARCH MODE

Search mode is the radar's normal mode of operation. You will spend 95% of the mission flying around, looking for the enemy with your radar set to SEARCH. *In Standard Mode (difficulty level), targets in front of you are automatically detected when your radar is set to SEARCH mode.*

When your radar is active (turned On) and set to SEARCH mode, a vertical bar moves back and forth across the display. This motion shows the position of your radar beam as it sweeps the sky. In Standard Mode, your radar sweeps a full 1800 arc in front of your aircraft. When it comes in contact with an enemy aircraft, a tiny, square radar "blip" is created. This blip is then placed on the display in its proper relationship to your aircraft.

Once you have detected a target, the next thing you'll want to do is "lock" it on radar. In Standard Mode, you can lock-up a target in one of two ways. The first way is by pressing the *Lock/Cycle Target* Backspace. This immediately locks-up the nearest target blip (friendly, enemy or neutral).

The second way of locking targets is done directly on the DDD monitor itself. Move your mouse pointer onto the DDD screen. Once the pointer moves across the monochrome display, it changes into two horizontal lines known as *Acquisition bars* or "Ack bars". Position these bars above and below the desired target blip (so that the blip is straddled). Now press the *left mouse button* to lock the target.

TRACK MODE

Figure 4-17: The Standard Mode Detailed Data Display (DDD) tracks single targets by focusing the radar beam. Note that you lose sight of the other targets while you are in TRACK mode.

TRACK Mode is the DDD's second mode of operation. This mode is used when a target has been locked on radar. The radar switches from Search to Track automatically. The word TRACK appears underneath the DDD monitor when the radar has been switched to TRACK Mode.

The symbology on the DDD also changes when the radar is in TRACK mode. Because the radar beam is now focused (locked) on one particular target, only that target's blip appears. *The radar beam stops its sweeping motion and remains fixated on the locked target.*

In addition, a horizon line and Allowable Steering Error (ASE) circle are displayed. The horizon line allows you to orient yourself vis-a-vis your pitch angle. This is particularly important when flying at low altitudes and occupying the backseat. Ideally, the target blip should be inside the ASE circle before launching a missile. This is not a strict requirement, however.

MODERATE/AUTHENTIC MODE DETAILED DATA DISPLAY (DDD)

The Moderate/Authentic Mode Detailed Data Display (DDD) works very differently than it does in Standard Mode. Physically, however, it looks much the same.

Once again, the DDD is oriented so that the two vertical bars (each with 4 horizontal tick marks) are positioned at a 30^0 to your line of flight. Radar blips outside these bars, therefore, represent aircraft that are 30^0 or more to your left or right. Like the Standard Mode DDD, the full display width equals 130^0.

In this mode, the position of the target blips on the display has nothing to do with range. We repeat; the position of the target blips on the display has nothing to do with range. The DDD, in this mode, shows azimuth (the horizontal location of the target in relation to your aircraft) and target closure.

Target closure is displayed on the DDD vertically. The nearer to the top of the screen a target blip is located, the faster it is moving toward you. *Note that running down both sides of the display are five tick marks.* (The tick marks are directly underneath the tiny T symbols in upper corners). The uppermost tick mark (directly under the T symbol) represents a closure rate of 1200 knots. The next tick down represents a closure rate of 600 knots. The center tick mark indicates no closure, both of you are traveling at nearly the same speed.

Target blips located below the center tick mark are actually moving away from you. A target located parallel to the bottom tick mark is moving away from you at 1200 knots.

The range of the DDD is adjustable. You can use *Zoom In/Out* [Z] and [X] to change the maximum range setting. The range numbers change above the display to indicate the current maximum range.

While the Standard Mode DDD worked just like a radar screen, in Moderate/Authentic Mode, the DDD functions very differently. Actually, putting the word "Detailed" in this display's name is a mistake. When you get right down to it, this display does not give you much detail at all. Most of the time you will be jumping back and forth between the DDD and TID to get the complete target picture.

Figure 4-18: The Moderate/Authentic Mode Detailed Data Display (DDD) displays by the horizontal azimuth and rate of closure, not range!

Display Information and Symbology

Although the symbology displayed on the Moderate/Authentic Mode DDD is fairly similar to Standard Mode, the display itself is set up differently. Instead of giving you range and azimuth like a normal radar, the Moderate/Authentic Mode DDD gives you azimuth and closure rate.

Changing Radar Modes

The buttons directly to the right of the DDD change you radar mode. Use your mouse pointer to press the desired button or change radar mode by toggling the *Change Radar Mode* [Del]. Your current radar mode is displayed in the text

window underneath the DDD.

You may also change the azimuth (width) of the radar beam by toggling the *Azimuth Setting* [Ins] . Depending upon your mode, you have three choices, Narrow, Medium, and Wide. Your current azimuth setting is also displayed in the text window underneath the DDD.

Figure 4-19: The Tactical Information Display (TID). In Standard Mode, the TID gives you an unfair advantage over the competition.

STANDARD MODE TACTICAL INFORMATION DISPLAY (TID)

The RIO's Tactical Information Display (TID) is located underneath the Detailed Data Display. Some players have referred to it as the "crystal ball", others are reminded of peering down into a fishbowl. In either case, the TID is a large circular display and is accessed by using the *Look Down* [2] while occupying back seat.

Unlike the DDD, your aircraft is located in the center of the Tactical Information Display. This gives you a 360° "God's eye" view of the tactical situation surrounding your aircraft. The TID can also be range scaled between 10 nm and 200 nm.

Display Icons and Symbology

Your aircraft, as well as other friendly aircraft icons are displayed in blue. Enemy and neutral icons are displayed in red. The icons themselves are easily distinguishable. Appearing on the display are fighter, bomber, ship and SAM radar icons.

When you lock a target on radar, a white box appears around its icon. This makes it easy to see your target it the midst of a crowd.

Your assigned waypoints also appear on this display as green triangles.

MODERATE/AUTHENTIC MODE TACTICAL INFORMATION DISPLAY (TID)

The TID no longer displays pretty colored icons for you in Moderate/Authentic Mode. In this mode, the TID resembles a baseball diamond, with your aircraft positioned at home plate. Instead of icons, targets are depicted on screen as symbols representing friendly, enemy, neutral, or unknown targets.

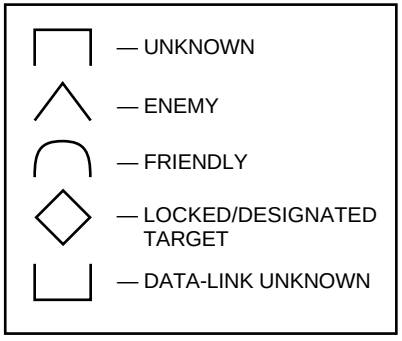


Figure 4-20: Moderate/Authentic Mode target icons.

TID Target Icons

There are icons to represent friendly, enemy, or neutral aircraft. There is even an icon to represent targets which are passed to you via data-link.

Pulse-Doppler Search (PDSRCH)

The Tactical Information Display is inoperative when your radar is in PDSRCH mode. When the radar is in PDSRCH, the TID screen remains blank.

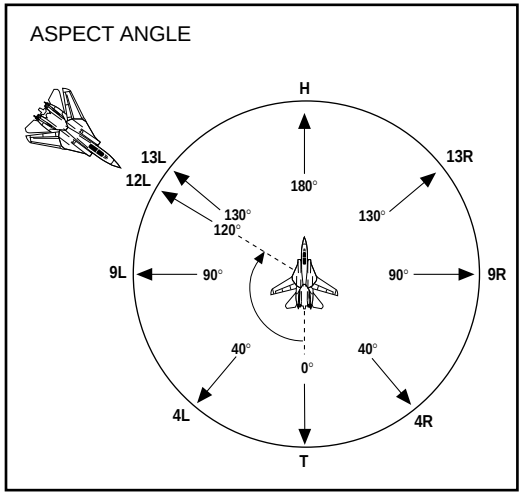


Figure 4-21: Aspect Angle is the angle at which you are looking at the target (i.e. the side of the target facing you). The angle can be either a single or double digit value. (For example, an angle of 80° would be displayed as 8, an angle of 120° would be displayed as 12- the last zero is always dropped.)

Pulse-Doppler Single Target Track (PDSTT)

When the radar is toggled to PDSTT, the TID provides you with targeting information specific to the target you have locked-up.

The target's range (RA) is displayed at the top left side of the monitor. The range is given in nautical miles (nm).

The target's altitude (ALT) is displayed directly underneath the target's range indication. The altitude is given in thousands of feet.

The target's aspect angle (TA) is displayed directly to the right of the target's RA indication.

The target's closure rate (displayed in knots) is centered halfway down the right hand side of the screen. The greater the closure rate number, the faster the target is approaching and the less time you'll have to deal with it.

Finally, located in the lower right hand side of the display is the Weapon Priority Indicator along with the number of missiles you have remaining. This symbol is repeated on the HUD.

Track-While-Scan (TWS-M, TWS-A)

The TID is most effective when toggled to one the Track-While-Scan modes

(Manual or Automatic.) You do not receive the same level of information about specific targets that you get with PDSTT, but you are able to target and engage multiple bogeys simultaneously.

With the radar in a Track-While-Scan mode, you can look over the entire battlefield, inspecting many aircraft instead of having to lock them up one at a time.

HIGHLIGHTING TARGETS [HT]

In Standard Mode, you had to lock-up a target before you could IFF check it. The advanced modes allow you to highlight a target instead of locking it up. This lets you IFF check an enemy aircraft without setting off his radar warning receivers.

To highlight a target, simply use the mouse pointer to press the HT (Highlight Target) button located at the bottom of the TID. Now move the mouse pointer over the target icon you wish to designate. Press the left mouse button. The target icon is now highlighted. Press the IFF [1] to identify this target.

DESIGNATING TARGETS [DT]

In TWS mode, you are able to aim your Phoenix missiles at more than one target at a time. This is done by designating targets in a particular sequence or firing order (i.e. direct the order in which missiles are fired at specific targets.

To designate a target, use your mouse pointer to press the DT (Designate Target) button located underneath the TID. The letters on the button will illuminate when the button is pressed.

Once this has been done, simply choose the targets you wish to designate (add to the firing order). Move your mouse pointer over the target icon and press the *left mouse button.* As each target is designated, a firing order sequence number is placed to the right of the target icon. *You can only do this if you Phoenix missiles remaining on-board.*

CLEARING TARGETS [CL]

If you change your mind about a particular firing sequence, use the mouse pointer to press the CT (Clear Targets) button. The CT button is located under the TID monitor. When this button is pressed, all stored information, such as target ID, firing order, etc., is erased.

Range-While-Search (RWS)

The TID displays only target icons when toggled to this radar mode. Data link information still appears however.

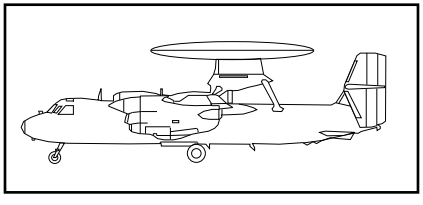


Figure 4-22: The E-2C Hawkeye allows you to fire on targets based on information it provides you via data-link.

Data Link Targeting

Your F-14 has the ability to engage targets based on information provided to you via a data-link with the E-2C Hawkeye. To display data-linked targets, use your mouse pointer and press the DL (Data-Link) button located at the bottom of the TID.

Once these targets appear on the TID, they are treated as any other target.

You may fire on them at your leisure, even if you radar is turned off.

RIGHT CONSOLE

You can access the RIO's right hand console by pressing the *Look Right* [6]. *You must first occupy a backseat view.* The

Figure 4-23: The RIO's right hand console.

main item on this screen is the column of red warning lights. These lights are collectively referred to as the Master Caution-Advisory panel. When a system is damaged, its corresponding lamp will illuminate.

This screen is informational only and duplicates the pilot's panel in the front seat. There are no "hot" buttons or interactive keys available on this screen.

LEFT CONSOLE

Figure 4-24: The RIO's left hand console.

[redacted]
of the AWG-9 radar.

The radar system on the F-14 Tomcat is the AWG-9 (Air Weapons Group-9) radar. It is an integrated radar/weapon system able to track up to 24 different targets at one time. Six of these targets can be attacked simultaneously using the AIM-54 Phoenix missile. The system can also use targeting information provided by other aircraft through a data link.

The AWG-9 does have certain drawbacks, though. This radar and its component systems represent 1960s technology, long before the term "user friendly" was ever heard of. It shows. There is nothing friendly about the AWG-9 radar. The complexity of the AWG-9's displays requires a second set of eyes- *and hands.* Luckily, *FLEET DEFENDER* gives you the option of turning over certain radar duties to your RIO by setting the level of RIO assistance.

If this is your first time in an F-14 cockpit, you can avoid a great deal of confusion by learning how to operate the radar in Standard Mode first. This mode is the least difficult level of operation. It represents a streamlined version of the more advanced modes. Only after you are completely comfortable with using the radar in Standard Mode should you begin to experiment with the more realistic (and complex) modes.

Moderate Mode radar represents a big step up from Standard Mode but it is still only an intermediate level of difficulty. The ultimate challenge in *FLEET DEFENDER* is to play the simulation with the radar set to Authentic Mode. Authentic Mode is —well, authentic. Don't say we didn't warn you. Next to carrier landings, becoming proficient with the radar system is admittedly the most difficult part of *FLEET DEFENDER.*

The term "mode" is used frequently in the following text to describe the various operative functions of the radar. It is important not to confuse these "modes" with the different levels of difficulty; Standard, Moderate, and Authentic Mode. Difficulty levels and operative modes are two entirely different concepts. Therefore, the term "mode" is always used uppercase when referring to levels of difficulty and lowercase when describing radar functions

STANDARD MODE RADAR

Modes of Operation

Standard Mode radar has two basic methods of operation, known as operative modes; Search and Track. Your radar spends the majority of its time in *Search mode.* That is, the radar beam just sweeps back and forth looking for targets, sending out energy. This is the radar's normal mode of operation.

When your radar is operating in *Search mode,* it is detectable. In most cases it does not cause the enemy pilots to react with undue alarm. They are only aware that a radar is operating in their vicinity. Once a target enters a piece of sky being covered by your radar, the target is detected. Detected targets appear on the DDD as tiny green squares (radar blips).

The radar's other operative mode is known as *Track mode.* This mode is used when you wish to concentrate your radar beam on a particular target. Concentrating your radar beam (locking-up a target) is a necessary prerequisite for using

radar-guided missiles. The radar switches from *Search mode to Track mode* when a target is locked. Enemy aircraft react to being locked-up. Don't you? Therefore, it is in your best interest to remain in Search mode for as long as possible.

Note that *Track mode* is the abbreviated form of the phrase *Single-Target-Track mode (STT).* The STT indicator light, located to the right of the DDD, illuminates when *Single-Target-Track mode* is in operation (i.e. when a target is locked).

Operating the Standard Mode Radar

Step 1: Turn the radar On (activate the radar).

Press the Radar On/Off toggle [R]. From the rear seat cockpit you can also turn on the radar by clicking the *left mouse button* on the cockpit switch marked RDR. A text message appears letting you know that the radar has been activated. The cockpit switch labeled RDR illuminates when the radar is on. *Note that in Standard Mode, the radar is already switched on for you.*

Step 2: Be sure the Master Arm switch is On.

Press the *Master Arm Switch toggle* [M] or move your mouse pointer over the Master Arm switch and press the left mouse button. When the Master Arm switch is activated the Master Arm light illuminates. Note that in Standard Mode, the Master Arm switch is already turned on for you.

Step 3: Adjust the display range of your radar beam.

At the higher difficulty settings, you would normally adjust range of your radar here. In Standard Mode, your radar's display range is unimportant. Your radar beam always searches out to a maximum range of 200 nm. You can change the range setting but this has no real affect on your beam. This step is only included as a reminder. This step is only used in the more difficult modes.

Step 4: Target detection.

In Standard Mode, your radar automatically detects any targets in front the 3/9 axis of your aircraft. As long as the target is even one foot in front of your aircraft, it is detected regardless of its altitude. Targets appear on the rear cockpit Detailed Data Display (DDD) as tiny green squares (or radar "blips"). Notice that your radar beam continues to sweep back and forth across the DDD, so information concerning the targets is continually updated. *Read the DDD section in this chapter for details on DDD symbology.*

Step 5: Select your weapon.

The F-14 has the capability to carry three different types of AAMs and is also equipped with a multi-barreled 20 mm cannon. To select a weapon, press either *Guns* [1], *AIM-9 Sidewinder* [2], *AIM-7 Sparrow* [3], or *AIM-54 Phoenix* [4]. Your

weapon selection appears on the bottom of the HUD, along with the number of missiles (or rounds) you have remaining. *If your Master Arm switch is off, an X symbol is placed over your weapon selection indication.*

Step 6: Obtain a radar lock.

To lock-up the desired target, press either the Lock/Cycle Targets (Backspace Key). In Standard Mode, each additional press of this key cycles through all eligible targets.

You can also lock-up a target directly from the DDD by moving your mouse pointer over the DDD screen. As the mouse pointer moves over the DDD screen it changes into an Acquisition symbol. The Acquisition or "Ack" symbol appears as two horizontal bars. Move the bars so that they straddle (above and below) the target blip and press the left mouse button.

Your radar stops sweeping after you lock a target. It changes mode from Search to Track. It centers on the target aircraft you have locked and remains stationary.

Step 7: Perform an Identification, Friend or Foe (IFF) check.

Before you fire at a target, it is a good idea to conduct an Identification, Friend or Foe (IFF) check. *You are severely penalized for shooting down friendlies and neutrals.*

In order to IFF check a target, the target must be locked. Press the *IFF* [I] or use your mouse pointer to press the IFF button in the rear cockpit. If the target is friendly, you'll hear a solid tone sound. If the target is an enemy or neutral aircraft you do not hear the tone.

When an IFF check is made on a friendly target, two horizontal lines appear on the DDD which bisect the target's blip. When neutral targets are checked a single line bisects the blip. When an IFF check is made on an enemy target, no lines appear on the DDD.

With your radar set to a Standard Mode level of difficulty you can always check the TID screen to see if the target is blue (meaning friendly) or red (meaning neutral or enemy).

Step 8: Return to the front seat cockpit.

In the F-14, the pilot has the ultimate responsibility for launching all ordnance, the RIO's job is done once a target is locked.

Return to the front cockpit to view the Head-Up Display (HUD). All the targeting information you need appears on the HUD when a target is locked. For example, a target diamond is superimposed over the locked target on the HUD screen. *Read the HUD section in this chapter for details on HUD symbology.*

Figure 4-25: Fox-2. A missile launch on a locked target.

Step 9: Receive a "Shoot cue".

Wait until the target is within range of your weapon. The *maximum (Rmax)* and *minimum (Rmin)* ranges of the selected weapon are displayed as tick marks on the HUD range bar. The uppermost tick mark is the maximum range of your weapon, the lower tick mark is the minimum range of the weapon.

The target itself is shown as a caret positioned on the left side of the range bar. When this caret moves between the maximum and minimum range of your weapon, the HUD symbology begins to *flash.* This is a shoot cue indicating that your target is in range, and that you are ready to fire.

Step 10: Fire the weapon.

Once you receive a shoot cue you can fire your selected weapon. To fire a weapon press the *Pickle Button* [Spacebar] or push Joystick button #2. After a brief delay, a missile leaps off the rail and heads toward your target. Your vision is momentarily obscured by the missile's smoke trail. Note that your inventory of that weapon, as indicated on the HUD, is reduced accordingly.

Quick note: If the missile is an AIM-7 Sparrow you must keep the target locked on your radar until the missile actually hits. You can only have one of these missiles in the air at a time.

How to Handle Multiple (Standard Mode) Targets

Note that the detect, lock, and shoot procedure can be repeated very quickly if multiple targets are detected on the DDD. Simply cycle through all the eligible targets using the *Lock/Cycle Targets* [Backspace] and fire a missile at each one. Repeat this cycle of lock-shoot, lock-shoot until you have fired on all the targets or have run out of missiles.

Be sure that you have selected either Sidewinder or Phoenix missiles when firing on multiple targets. *Sparrow missiles require that your radar remain locked on a single target until the missile actually hits.*

MODERATE MODE RADAR

One of the biggest differences between Standard Mode and Moderate Mode is the addition of several new radar operative modes. In Standard Mode, the radar was simplified and easy to use, you only had to worry about two operative modes: *Search* and *Track.* Now that you have graduated to the Moderate level of difficulty, the *Search mode* function has been divided into a number of new modes.

In addition to introducing new modes of operation, your radar no longer detects targets just because they happen to be in front of your aircraft. Moderate Mode gives your radar beam shape (an area of coverage). Targets must fly into this area of coverage (the radar's scan pattern) in order for you to detect them.

In Standard Mode, the *horizontal* coverage (azimuth) of your radar beam was fixed at a full 1800. The entire area in front of your aircraft was covered both vertically (from ground level on up) and horizontally. Moderate Mode introduces the concept of radar scan patterns (the conical area covered by the radar's energy). Your radar now has both vertical and horizontal limitations which vary according to the radar's mode of operation.

The vertical size of your radar scan pattern is measured in *bars.* The more bars a radar beam scans, the larger the area of vertical coverage. More bars means a greater difference between the upper and lower limits of the radar beam. The horizontal size (azimuth) of your radar beam is measured in degrees.

Moderate Mode also forces you to take the target's radar cross-signature into account. In Standard Mode, your radar

was able to detect all targets out to a maximum range of 200 nautical miles, regardless of their size. This has now been changed to reflect a more realistic relationship between the size of the target and the distance at which it can be detected.

Radar cross-signatures are described in the radar training portion of the Oceana training theater section.

Your radar mode also plays an important role in determining how far away it can detect targets. For example, *Pulse Doppler Search mode* (PDSRCH) is able to spot large-sized targets, like four engined bombers, out to a range of 200 nm. *Track-While-Scan mode,* because it has to monitor many radar returns, has a much shorter range (approximately 145 nm).

Modes of Operation

PULSE DOPPLER SEARCH (PDSRCH) MODE

Pulse Doppler Search mode (PDSRCH) is the normal operating state of your radar in Moderate Mode. It functions much the same as *Search mode* did at the Standard Mode level of difficulty, but there are some important differences.

In Moderate Mode, the size of the PDSRCH scan pattern is adjustable. It can be set to one of three patterns: *Wide* (2 bar/65°), *Medium* (4 bar/40°), or *Narrow* (8 bar/20°). The current width setting is recorded underneath the Detailed Data Display (DDD).

Read the TID section of this chapter for details on Target Information Display (TID) symbology.

PDSRCH provides you with rudimentary target information only. It alerts you to the presence of other aircraft but does little to aid your situational awareness. For example, PDSRCH never provides target range information. Targets appearing on the DDD could be 100 nm away or as little as 10 nm. As long as you remain in PDSRCH mode, you'll never know. Therefore, once a target is detected, it is recommended that you quickly switch to another radar mode.

The Target Information Display (TID) does not function while the radar is in Pulse Doppler Search (PDSRCH) mode.

2) RANGE WHILE SEARCH (RWS) MODE

Range-While-Search (RWS) mode functions exactly as PDSRCH with one exception, *target icons show up your RIO's Target Information Display (TID).* Not only does the TID give you a top down view of the tactical situation, it also allows you to determine a target's approximate range.

The TID can be range-scaled from a maximum range of 200 nm to 10 nm by pressing the Zoom In/Out [Z] and [X]. Target range is determined by comparing the position of the target within the display. If a target is near the middle of the display and the display is set to a range of 100 nm, the target is approximately 50 nm away from your aircraft.

Range-While-Search mode (RWS) allows you to check on the range of

Figure 4-26: The Moderate/Authentic Mode TID showing targets displayed in Range-While-Search Mode.

targets without having to lock them on radar. Like PDSRCH, RWS has three variable scan pattern widths: Wide (65°), Medium (40°), or Narrow (20°). The current width setting is recorded underneath the DDD.

Read the TID section in this chapter for details on Target Information Display (TID) symbology.

PULSE DOPPLER SINGLE-TARGET-TRACK (PDSTT) MODE

Pulse Doppler Single-Target-Track mode (PDSTT) functions much the same as *Track mode* did at the Standard Mode level of difficulty. When a target is detected in *Pulse Doppler Search* (PDSRCH) or *Range-While-Search* (RWS) modes, it can be locked-up by changing the radar mode to *Pulse Doppler Single-Target-Track mode* (PDSTT).

To change the radar mode from PDSRCH to PDSTT, press the *Lock/Cycle Targets* Backspace. Alternatively, you can move the mouse pointer to the STT button (located to the right of the DDD) and press the *left mouse button.*

PDSTT gives you away, however. Locking-up a target using PDSTT causes the enemy pilot's radar detector to start sounding-off in his headset *(just like yours does when an enemy pilot locks you up!)* For this reason you may not want to use this mode unless its absolutely necessary.

Once you have locked a target using PDSTT, your TID provides you with specific details concerning this target. Check the TID for range, altitude, and closure information.

PDSTT only allows you to track and engage one target at a time. Although you can fire any of your missiles using this mode, PDSTT is best used to fire AIM-7 Sparrow missiles. AIM-7s are semi-active radar-guided missiles which require the full attention of the radar. You can only have one of these missiles in the air at a time, anyway.

Figure 4-27: A F-14 lets an AIM-54 Phoenix go. Even traveling mach 5, with such a long range, it'll be several minutes before it hits its target.

TRACK-WHILE-SCAN-AUTOMATIC (TWS-A) MODE

Track-While-Scan-Automatic mode (TWS-A) is the AWG-9's *raison d'être.* The combination of Track-While-Scan and Phoenix missile is what makes the F-14 so deadly.

Track-While-Scan is pronounced "Twiz" by those in the know.

TWS-A allows you to fire AIM-54 missiles at up to six (6) different targets at a time. Note that unlike PDSTT, you do not lock-up individual targets using this mode, so the enemy is not alerted. Therefore, you can fire on targets in TWS-A mode and they may not even see it coming. This makes TWS-A the radar mode of choice when launching missiles at BVR (beyond visual range) targets.

In order to keep track of so many targets at once, the AWG-9 radar needs to be updated with fresh targeting information every two seconds. This means that the area covered by your beam must be smaller than usual so that it can be scanned more quickly. Accordingly, TWS-A allows for beam widths of medium and narrow size only.

To select *Track-While-Scan-Automatic mode,* press the *Change Radar mode* Del. Alternatively, you can move the mouse pointer to the TWSA button (located to the right of the DDD) and press the *left mouse button.* Once selected, TWS-A is

indicated, along with the current beam width setting underneath the DDD.

Locking-up targets defeats the purpose of TWS-A. The main benefit of this mode is the ability to engage multiple targets without them being aware that you are looking at them. The key to using TWS-A is the Target Information Display (TID). Be sure that you are familiar with the symbology on the TID especially the information dealing with target sequences.

In *TWS-Automatic mode,* targets are automatically assigned a position on the launch sequence. That is to say, the radar determines which targets pose the greatest danger (those closest to your aircraft) and directs your missiles accordingly. Targets nearest to your aircraft are usually fired upon first.

The firing order is displayed on the TID by placing a number directly to the right of the target's icon.*Numbers to the left of target icons indicate the target's altitude.* A target with the #1 next to it is fired upon first, the #2 target is fired upon next, up to a maximum of six, equally the maximum number of Phoenix missiles carried by the F-14.

As you fire your Phoenix missiles, targets move up in the firing order and are renumbered. The #3 target becomes the #2 target , the #2 target becomes the #1 target, and so on. *You can never have more targets occupying positions in the firing order than you have AIM-54 Phoenix missiles.*

TRACK-WHILE-SCAN-MANUAL (TWS-M) MODE

Track-While-Scan-Manual mode functions exactly the same as *Track-While-Scan-Automatic,* with one important difference. Whereas TWS-A designated targets for you and assigned them a position in the firing sequence, *Track-While-Scan-Manual mode makes you responsible for prioritizing the targets, hence the term "manual".*

Track-While-Scan-Manual mode (TWS-M) allows you *(forces you)* to decide which targets you will fire on and in what order. To designate targets in TWS-M mode, simply move your mouse pointer to the button marked DT (Designate Target). The DT button is located beneath the circular TID screen. Press the *left mouse button* when the pointer is resting on the DT button. The DT button turns red signifying that you are in the process of designated targets.

Once you have pressed the DT button, move the mouse pointer over to the target icon on the TID you wish to designate. Press the *left mouse button* again. The target you have designated is assigned a number indicating its place in the firing order. If this is the first target you have designated, a number one (1) appears to the right of the target icon.

You may continue to designate targets up to the number of AIM -54 Phoenix missiles you have remaining. TWS modes (Automatic and Manual) are only relevant when you are carrying AIM-54 Phoenix missiles. Without Phoenix missiles, Track-While-Scan modes are a moot point!

Figure 4-28: The Moderate/Authentic Mode HUD showing the Boresight circle.

BORESIGHT (BRST) MODE

Boresight mode (BRST) is designed specifically to aid the pilot in the fast-paced environment of modern air combat. *Boresight mode* allows you to

lock-up an enemy without going through normal step-by-step radar procedures. It is a close-quarter dogfighting mode that allows you to instantly get a radar lock on any target that is directly in front of your aircraft.

To change the radar to *Boresight mode* (BRST), press the *Boresight/VSL Toggle* End. As you may guess, this key toggles between *Boresight mode* and *Vertical Scan Lock-On mode* (VSL). Continue to press the toggle until the letters BRST appears in the window beneath the DDD.

Boresight mode focuses your radar beam along the heading of your aircraft. When your radar is in *Boresight mode,* a circular boresight indicator appears in the center of your HUD. In addition to the circular HUD boresight, the Boresight indicator in the pilot's cockpit illuminates.

Any aircraft (friendly or enemy) that ventures into or is maneuvered inside this circle is automatically locked-up on your radar. You do not have to press a key. The BRST circle automatically changes to a target diamond when the target is locked. However, the maximum range of *Boresight mode* is 5 nautical miles. That is to say, a target must be within 5 nm of your aircraft and within the BRST circle in order to be locked-up.

Figure 4-29: The Moderate/Authentic Mode HUD showing the Vertical Scan Lock-on (VSL) diamond.

This mode is also very useful in picking a specific target out of a group of aircraft. If more than one aircraft is located inside the BRST circle, the target aircraft nearest your own is the one that is locked.

VERTICAL SCAN LOCK-ON (VSL) MODE

Like BRST, *Vertical Scan Lock-On mode* (VSL) is another radar mode used almost exclusively in the tight turning confines of a high G dogfight. VSL causes the radar to sweep in an *up and down* motion rather than in the normal *left to right* fashion. The gimble limits of your radar in VSL are -150 down and +550 up. In a turning dogfight, with your aircraft in a high G bank, being able to sweep at +550 almost gives your aircraft the ability to see around corners.

To change the radar to VSL, press the *Boresight/VSL Toggle* End. This key toggles between *Boresight mode* (BRST) and *Vertical Scan Lock-On mode* (VSL). Continue to press this key until the letters VSL appears in the window beneath the DDD.

A diamond-shaped icon sweeps up and down on your HUD. This is not an actual target performing high speed loops, it is only an indication that your radar is in VSL mode. Like *Boresight mode,* when VSL sweeps across an eligible target, it automatically "locks" that target for you. No muss, no fuss. The only drawback to VSL mode is that the beam width is very

narrow and the risk of overlooking targets on either side is great. Again, like *Boresight mode,* VSL is range restricted to 5 nm or less.

Note that you cannot further elevate the beam by pressing keys normally used to raise or lower the beam. VSL limits the vertical scan parameters to -15° and +55°.

Operating the Moderate Mode Radar

Step 1: Turn the radar on.

Press the *Radar On/Off Toggle* [R]. From the rear seat cockpit screen you can turn on the radar by clicking the left mouse button on the cockpit switch marked RDR. A text message appears letting you know that the radar has been activated. The cockpit switch labeled RDR illuminates when the radar is on and the beam can be seen sweeping back and forth on the DDD.

Step 2: Be sure the Master Arm switch is on.

Press the Master Arm Switch toggle [M] or move your mouse pointer over the Master Arm switch and press the *left mouse button.* When the Master Arm switch is activated the Master Arm light illuminates.

Step 3: Adjust the maximum display range of your radar beam.

To adjust your radar's maximum display range, you must be seated in the RIO's cockpit (back seat). Press the Zoom Out [X] to increase the range or press the Zoom In [Z] to decrease the range.

You can select a radar range of either 5 nm, 10 nm, 20 nm, 50 nm, 100 nm, and 200 nm. The current range of the radar beam is illuminated on the panel above the DDD. It is also shown in the tiny display window.

Step 4: Adjust the radar beam elevation.

Your radar projects a conical beam directly ahead of your aircraft. If a target is above or below this cone (i.e. outside the limits of the beam) your radar cannot detect it.

In Moderate Mode you can adjust the beam's elevation by pressing *Beam Elevation Up 20* [Pg Up] or *Beam Elevation Down 20* [Pg Dn]. You can inspect the radar beam's current elevation setting on the vertical gauge directly to the left of the DDD. The numbers 0°, 20°, 40°, and 60° refer to degree of beam elevation or depression.

Hint: Adjusting your beam elevation has tactical benefits. One is to fly very low (wave-hop) with your radar beam pointed upwards. This makes it hard for enemy aircraft to detect you (you'll be below their radar coverage!). Meanwhile, you'll be able to spot them just fine.

Step 5: Select a radar mode.

This decision was made for you in Standard Mode. There were only two operative modes: *Search mode* to find targets and *Track mode* to attack 'em. In Moderate Mode, however, there are several search modes and several "attack" modes.

As you will come to understand, there are pros and cons to using each radar mode.

You have two search modes to choose from. They are;

1) the PDSRCH mode for general long range, wide area coverage, and
2) the RWS mode which functions exactly like the PDSRCH with the added benefit of range information on the TID.

After locating a target (or targets), it is a good idea to switch over to one of the several attack modes now available to you. These are as follows;

1) the PDSTT mode for locking-up and attacking single targets, or
2) the TWS-A mode for attacking multiple targets with Phoenix missiles, or
3) the TWS-M mode for manually designating multiple targets to be attacked with Phoenix missiles, or
4) the BRST mode for point-blank dogfighting (the proverbial knife fight in a phone booth), or
5) the VSL mode for hard turning (banking) fights emphasizing vertical coverage over horizontal coverage.

Step 6: Target detection.

Regardless of the radar mode you choose, a target must be physically located within the area covered by the scan pattern of your radar beam in order to be detected. This is why bar and azimuth settings are important. They delineate how big an area your radar is covering. Beam elevation is also important because it determines where your radar is pointing.

Not only must a target be inside your radar scan pattern, it must also be large enough to reflect the radar energy back to your aircraft. Large targets have big radar cross-signatures and are detected at greater ranges than small targets. For example, cruise missiles like the Exocet or Kingfish, have very small radar signatures.

When targets are detected they appear on the RIO's Detailed Data Display (DDD) as tiny green squares (or radar "blips"). As long as you do not lock-up a target, your radar beam continues to sweep back and forth across the DDD, continually updating target information.

Always allow several seconds for target information to settle on the display.

Step 7: Perform an Identification, Friend or Foe (IFF) check.

Before you fire at a target (or group of targets), it is a good idea to conduct an Identification, Friend or Foe (IFF) check. *You are severely penalized for shooting down friendlies and neutrals.* To IFF check a target, the target must be "highlighted" on the TID (if your radar is in a *Track-While-Scan mode)* or locked (if your radar is in *Pulse Doppler Search mode).*

If your radar is in PDSRCH or RWS, lock the desired target directly from the DDD by moving your mouse pointer over the DDD screen. Once the mouse pointer moves over the screen, it changes into an Acquisition "Ack" symbol. (The "Ack" symbol appears as two horizontal bars). Move the "Ack" bars so that they straddle (above and below) the desired target and click the *left mouse button.* The target is now locked. Note that your radar automatically changes to PDSTT when a single target is locked.

In order to IFF check a target, the target must be locked. Press the *IFF* [I] or use your mouse pointer to press the IFF

button in the rear cockpit. If the target is friendly, you'll hear a solid tone sound. If the target is an enemy or neutral aircraft you do not hear the tone.

When an IFF check is made on a friendly target, two horizontal lines appear on the DDD which bisect the target's blip. When neutral targets are checked a single line bisects the blip. When an IFF check is made on an enemy target, no lines appear on the DDD.

If your radar is in TWS-A or TWS-M you can IFF check multiple targets on the TID by *highlighting individual target icons.* On the TID, different target icons distinguish friendly, enemy, and neutral targets. *See the TID section in Chapter 3.*

To highlight a target, move your mouse pointer over the button marked HT at the bottom of the TID. Press the *left mouse button.* The HT button turns red indicating you can now highlight target icons on the TID screen. Move your mouse pointer over the desired target icon and press the *left mouse button.* The icon changes to a lighter shade indicating that it has been highlighted.

You can now perform an IFF check on this target by pressing the *IFF* [I]. The target icon changes its shape to indicate its friendly, enemy, or neutral status.

For multiple targets, simply move the mouse pointer to a new target icon and press the *IFF* [I]. Repeat this procedure as many times as there are unidentified targets present on the TID.

Step 8: Select the appropriate weapon.

Having found a target (or group of targets), you must decide which type of weapon to use. The F-14 has the capability to carry three different types of AAMs and is also equipped with a multi-barreled 20 mm cannon.

To select a weapon, press either *Guns* [1], *AIM-9 Sidewinder* [2], *AIM-7 Sparrow* [3], or *AIM-54 Phoenix* [4]. Your weapon selection appears on the bottom of the HUD along with the number of missiles (or rounds) you have remaining. *If your Master Arm switch is off, an X symbol is placed over your weapon selection indication.*

Step 9: Conduct the attack.

In Standard Mode, all the hard decisions were made for you. All you had to do was switch the radar to Track mode, thereby "locking-up" the target. Once the target was locked, you simply waited for it to get within range of your selected weapon.

In Moderate Mode, your method of attack differs greatly from that used previously in Standard Mode. Now, you must consider your tactical situation (including choice of weapon) and select a radar mode accordingly. You have a choice of the following radar attack modes; *PDSTT, TWS-A, TWS-M, BRST,* and *VSL.*

PULSE DOPPLER SINGLE-TARGET-TRACK MODE

In PDSTT, the target is locked (as in Standard Mode) so all you need do is wait until the target is within range, then fire the weapon. Tactically however, it is unwise to use PDSTT if other enemy aircraft are in the area. Your radar remains

focused on the single, locked target and loses track of all other potential threats.

All three missiles (Sidewinder, Sparrow, and Phoenix) can be fired using PDSTT for guidance. Since the AIM-9 Sidewinder and AIM-54 Phoenix are "fire and forget" missiles, you can immediately break your lock after firing them by pressing the *Break Lock* [K] if you desire. These missiles are self-guiding after launch. Only the AIM-7 Sparrow requires further radar guidance, you must keep the radar focused on the target until the Sparrow actually hits (or is deemed a miss).

TRACK-WHILE-SCAN (AUTOMATIC AND MANUAL) MODE

Track-While-Scan mode gives you the ability to target and engage several targets at a time. Targets are designated on the TID and given a numerical position within the firing sequence. All you need do is insure that the targets are all within range before firing. If you are carrying Phoenix missiles (the recommended load-out), you can ripple fire your missiles. They automatically guide themselves to their individual targets.

TWS-M is a little more difficult. You must individually select and designate your targets on the TID using the mouse pointer. The order in which you designate targets becomes the order in which they appear in the firing sequence. Once you have finished designating your targets, you are ready to fire. As with TWS-A, all you need do is insure that the targets are within range before firing. If you are carrying Phoenix missiles (the recommended load-out) you can ripple fire your missiles. They automatically guide themselves to the targets you have designated.

Step 10: Receive a "Shoot cue".

Obviously, you must wait until the target is within range of your weapon if you expect it to hit the target. In PDSTT, the *maximum (Rmax)* and *minimum (Rmin)* ranges of the selected weapon are displayed as tick marks on the HUD range bar. The uppermost tick mark is the maximum range of your weapon, the lower tick mark is the minimum range of the weapon.

The target itself is shown as a range caret positioned on the left side of the range bar. When this caret moves between the maximum and minimum range of your weapon, the HUD symbology begins to flash. This is a *"shoot cue"* indicating that your target is in range, and that you are ready to fire.

In the *Track-While-Scan modes,* because you are able to fire on more than one target, it is possible that some of your targets will be in range while others will not. In these modes, you must pay close attention to the target icons displayed on the TID to ensure that the targets are in range. If targets are in range of your selected weapon, their icons flash.

Step 11: Fire the weapon.

Once you receive a "shoot cue" you can fire your selected weapon. To fire a weapon press the*Pickle Button* [Spacebar] or push Joystick button #2. After a brief delay, a missile leaps off the rail and heads toward your target. Your vision will be momentarily obscured by the missile's smoke trail. Note that your inventory of that weapon, as indicated on the HUD, is reduced accordingly.

How to Handle Multiple (Moderate Mode) Targets

In Standard Mode, multiple targets were handled easily just by switching to Track mode and cycling through all the eligible targets using the *Lock/Cycle Targets* [Backspace].

In Moderate Mode, you cannot cycle through targets. The best way to handle multiple targets in this mode is by switching to a *Track-While-Scan mode* (either Automatic or Manual) and by making sure you have plenty of AIM-54 Phoenix missiles along. TWS modes allow you to target and engage more than one aircraft at a time. *Using PDSTT when multiple bandits are present is not recommended.*

Data-Linked Targeting

Moderate and Authentic Modes give you the ability to engage targets using information fed to you from other aircraft via data-link. A data-linked target is one that has been detected by a friendly radar other than your own. That radar information is then passed to your aircraft. Data-linked targeting allows you to launch missiles at enemy aircraft that you do not detect. (You can even have your radar turned off, to avoid giving yourself away, and fire at targets which are data-linked to your aircraft.)

Because data-linked targeting is primarily a function of tracking targets on the Target Information Display, refer to the TID section in this chapter for more details.

AUTHENTIC MODE RADAR

Authentic Mode is virtually identical to Moderate Mode, with one exception. In Authentic Mode, the vertical coverage (number of bars) and width (azimuth) settings of your radar beam are adjustable. This allows you to tailor your scan pattern (within certain limits) to suit your own tastes.

At the Moderate Mode level of difficulty, you were allowed to alternate between three radar scan patterns: *Wide* (2 bar /65^0), *Medium* (4 bar /40^0), or *Narrow* (8 bar /20^0) when your radar was toggled to PDSRCH or RWS modes. When your radar was toggled to a *Track-While-Scan mode,* you were allowed to alternate between Medium (2 bar /40^0) and Narrow (4 bar /20^0) patterns only.

At the Authentic Mode level of difficulty, you are no longer able to select pre-set wide, medium, or narrow scan patterns. You are responsible for shaping the parameters of your radar beam. In case you forget, however, the Authentic Mode radar defaults to a radar scan setting of (2 bar /40^0).

Selecting a radar pattern is not an easy decision. For example, you could conceivably create a radar beam with an azimuth of 65^0 and 8 bar vertical coverage. A scan pattern of this size would cover a tremendous amount of sky. The drawback to a beam of this size is the length of time the radar would need to sweep the area. It might take up to half a minute to completely sweep such a large pattern. An enemy aircraft can travel quite a ways in that amount of time.

Likewise, you could create a scan pattern with an azimuth of 10^0 and 1 bar vertical coverage. Such a beam could sweep this small patch of sky like a laser, updating your radar almost instantaneously. The drawback is, of course, you're not likely to find any targets this way.

ADJUST THE VERTICAL COVERAGE (BAR SETTING) OF YOUR RADAR BEAM.

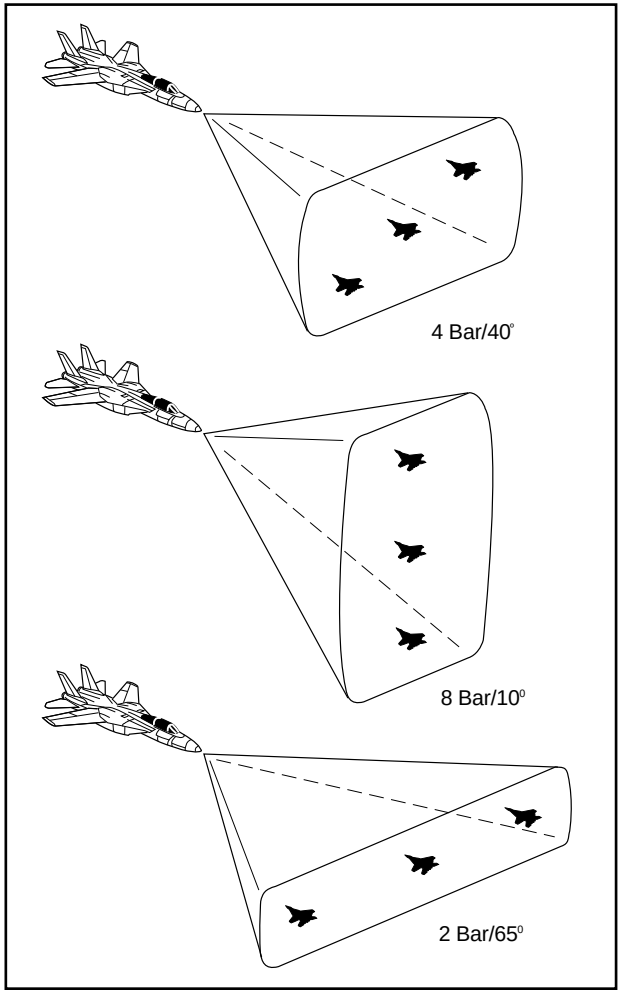


Figure 4-30: This diagrams shows the three most commonly used azimuth and bar settings. In Authentic Mode, you can change the scan pattern of your radar any way you like.

To adjust the bar setting press the *Adjust Bar Scan* [Home]. You can choose a bar setting of either 1 bar (the shortest), 2 bar, 4 bar, or 8 bar (the tallest). Note that the only way you are able to distinguish your current bar setting is by looking at the EL bar indicator located on the RIO's left control panel. You can view this indicator on the RIO's left side by pressing the *Left View* [5].

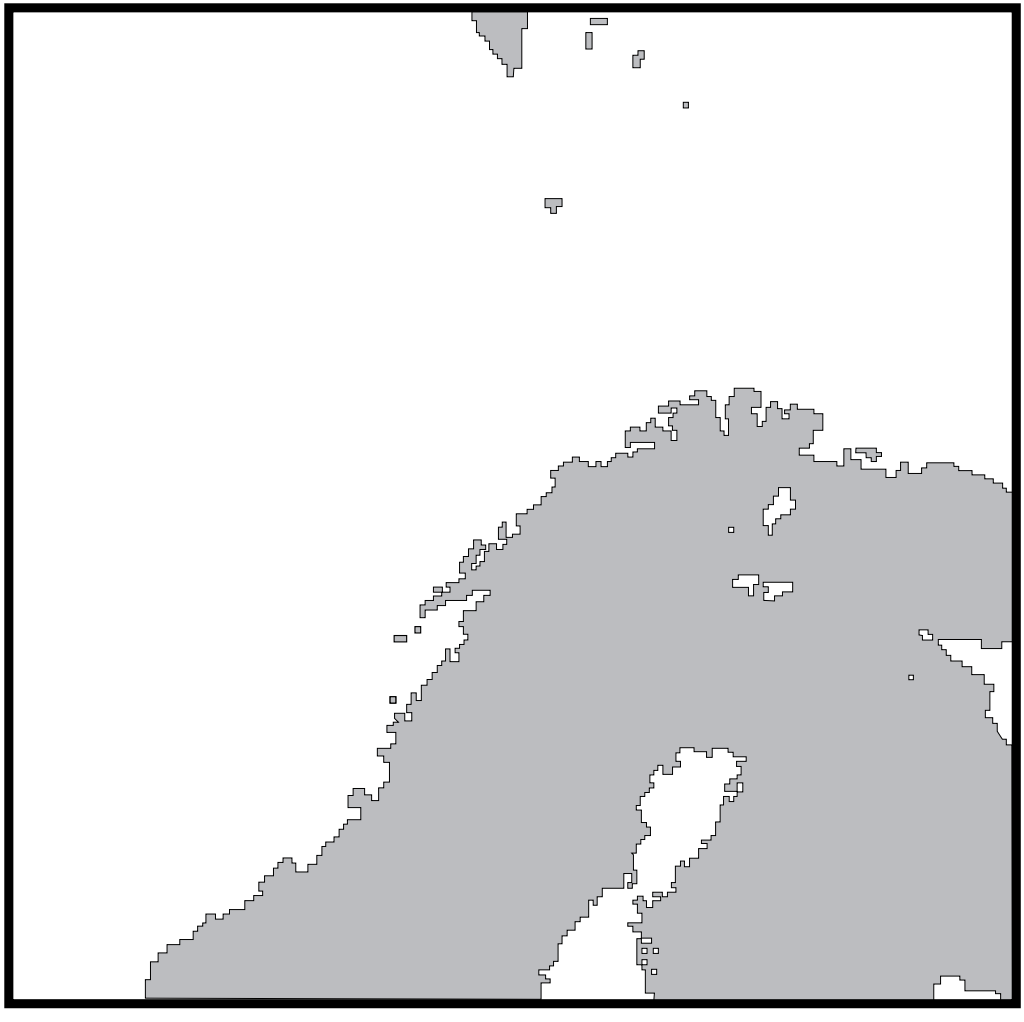
ADJUST THE HORIZONTAL COVERAGE (AZIMUTH) OF YOUR RADAR BEAM.

To adjust the azimuth of your radar beam press the *Adjust Azimuth* [Ins]. You can choose between 100 (the narrowest), 20°, 40°, or 65° (the widest) scan widths. You can see the width of your radar beam change on the DDD. You can also view the current azimuth setting on the AZ Scan indicator located on the RIO's left side by pressing the *Left View* [5].

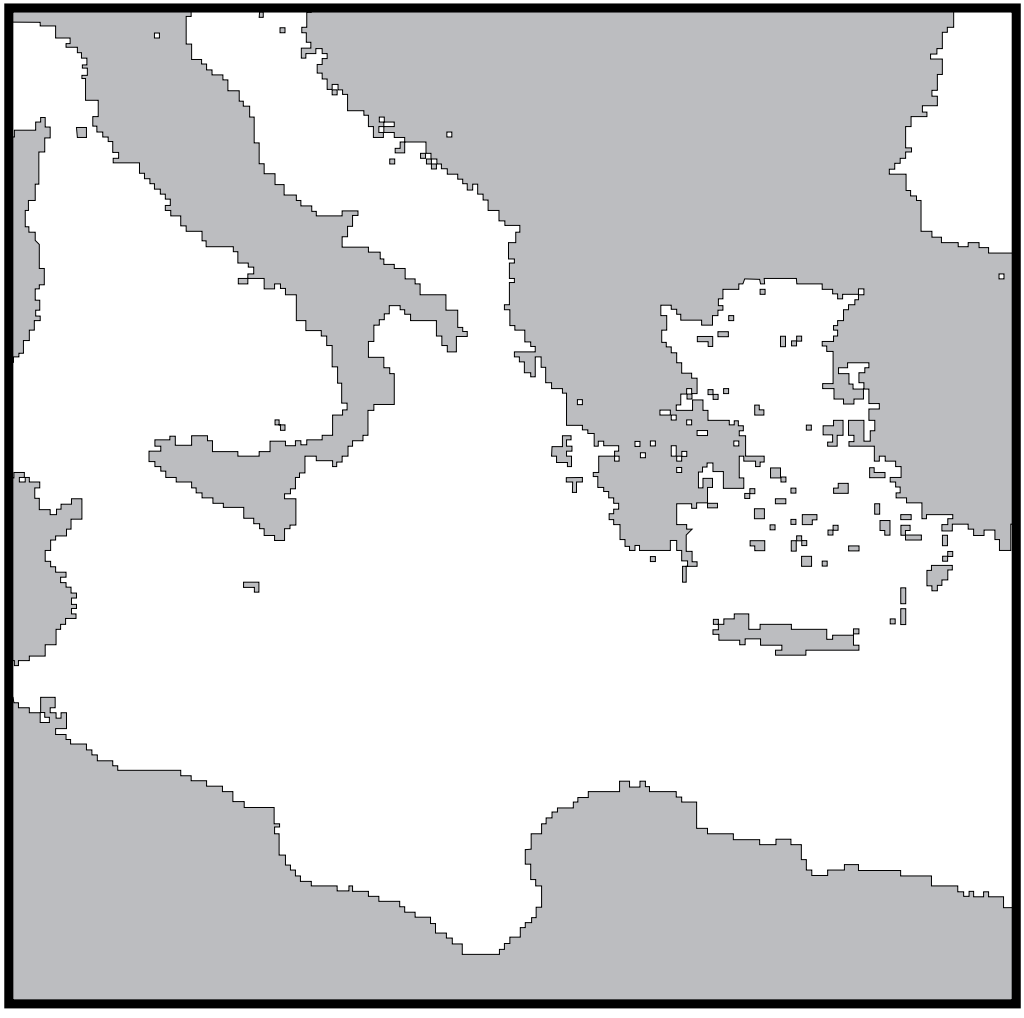
Note: Track-While-Scan modes function only if the scan pattern is changed to (2 bar/400) or (4 bar/200). Check the AZ and EL scan indicators to be sure that you are in compliance with this requirement.

CAMPAIGN MAPS

NORTH CAPE THEATER



MEDITERRANEAN THEATER



OCEANA TRAINING THEATER