



USER MANUAL



NOVA



LOGIC®

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INTRODUCTION

"Only Comanche has the ability to conduct lethal deep, close, and rear operations and survive while providing critical data, protection, and flexibility to forward-deployed maneuver forces."

The Honorable Togo West, Secretary of the Army

Thank you for purchasing *Comanche® Gold*, the latest helicopter simulation from NovaLogic, Inc. Those of you familiar with our other Comanche products will immediately notice some significant improvements in this simulation. Because of the greater RAM and processing horsepower of today's computers, our design team was able to do things it couldn't do in earlier versions. Consequently, *Comanche Gold* looks, sounds, and plays better than ever.

We could not have achieved this level of realism without the kind assistance of some very special people. First of all, our sincere thanks go out to the men and women of BoeingSikorsky's "First Team," who along with a number of contractors, designed and built the Army's most sophisticated helicopter, the RAH-66 Comanche. We would also like to thank certain members of the U.S. Army who helped us get an accurate picture of helicopter weaponry and flight tactics. For security purposes they must remain unnamed but... *you know who you are.*

Since NovaLogic was designing a simulation based on Sikorsky's "baby," it's perhaps only natural that their engineers would take an interest in what we were doing. Early on in the process, they extended a gracious offer to come visit their facilities. We quickly accepted and in no time at all our design team was on its way to Sikorsky headquarters in Connecticut. Once there, the team spent many hours getting "up close and personal" with their state-of-the-art Comanche simulator.

In addition to flying, our design team was able to corner the experts and grill them on every last little detail. As a result of this friendly interrogation, the team members came away with a new appreciation of everything the Comanche can do. They returned to NovaLogic determined to make sure those capabilities got into the game and passed on to you. Everyone here is very pleased with the end result.

Comanche Gold features our Voxel Space® 2 graphics engine. This revolutionary technology is able to move pixels with amazing speed. It allows you to view the battlefield in fine detail. Thanks to Voxel Space 2, the campaign "worlds" have been greatly expanded. Each mission covers more than 80 square miles of the most visually satisfying territory you'll ever see in a flight simulation.

These expanded “worlds” give you plenty of room to maneuver. That’s a good thing too. *Comanche Gold*’s multi-player gaming option makes things a bit crowded up there. You can fly with up to nine other players and that’s enough to give any air traffic controller nightmares. The chat mode feature lets you send text messages back and forth. You can now strategize with friends or use this option to taunt your opponents.

In addition to looking good, *Comanche Gold* flies more like an actual helicopter than its predecessors. The flight equations and movement physics have been almost entirely re-engineered. Aircraft and helicopters move about the “world” according to the same laws of motion and inertia that affect their real life counterparts. This simulation is so close to the real thing that we had to add in an Easy *Flight Model* as a learning tool. People just weren’t ready to take on the “advanced” Flight Model right away.

Your weapon systems behave realistically, too. Laser-guided missiles, like the deadly AGM-114 Hellfire, don’t follow a straight path to the designated point of impact. They pop up after launch and plunge down on their target from above, just like the real missiles are programmed to do. The trajectory of each of your 20 mm shells is calculated separately; as is each piece of debris that comes flying off of exploding objects. Watch out. Those shards are not just cute visual effects. They’re deadly. They can damage or destroy anything they happen to strike.

Comanche Gold also sounds as good as it looks. From the low pitch whir of your rotors to the ripping sound of shells leaving your gun, the audio quality of this simulation puts you in the action. Call in an artillery strike then sit back and listen as the fire mission is executed. You’ll hear the characteristic whump-whump-whump of 155 mm shells as they begin to impact the target. Authentic cockpit chatter, recorded by actual helicopter pilots, accompanies you on every mission. You can even hear the splash effect when your rounds hit water instead of terra-firma. Cruise past a tree and you can almost hear birds chirping.

It is a difficult task, flying a helicopter, especially one as technologically advanced as the Comanche. That’s why this simulation comes with both an Easy and Advanced Flight Model. We recommend that novice pilots spend time flying the Easy model first. This manual contains a Quick Start tutorial that lets you jump right in. It also introduces you to some of the finer points of rotary wing flight.

When you’ve finished flying the training missions or you think you’re ready for a greater challenge, place your name on the Pilot Roster. From this moment on you’re a member of Griffon Squadron, the Army’s premier Comanche fighting force. This small but highly specialized unit can be deployed anywhere in the world on a moment’s notice. Its members are on call 24 hours a day, seven days a week. Once your name is added to the squadron’s duty roster, prepare yourself for some intense action.





C R E D I T S

Programmed by

Kyle Freeman

Game Design

Kyle Freeman

Executive Producer

John Garcia

Project Management

David Seeholzer

Technical Management

John Butrovich

Programming Support

John Bojorquez

Randy Casey

Mark Davis

David King

Eric Milota

Jim Ratcliff

Kent Simon

Associate Producer

Wes Eckhart

Mission Design

Keith Butler

Dan Chang

Mat Jennings

David King

Steve McNally

David Merrick

Todd Owens

Troy Sheets

Alicia Taylor

Technical Consulting

Simon Bradley

Andy Johnson

Major Allen Sakcriska,

U.S. Army Retired

Art Direction

Keith Rust

Art

Daniel Cabuco

Jhoneil Centeno

Lawrence Kevin

Craig Marschke

Mike Maza

Rod Parong

Jon Tando

Darren Thorne

Jason Tull

Additional Art

Timothy Higgins

Keith Rust

Animation

Dean Fowler

Digital Video Processing

Daryl Kimoto

Audio Director

Tom Hays

**Sound Effects
and Digital Editing**

Richard Adrian

Kyle Freeman

Scott M. Gilman

Tom Hays

Music Composed by

James Donnellan
Scott Gilman
Tom Hays
Rik Schaffer

Voices

Valerie M. Arem
CWO Keith Bauer
Shawn Burke
Sgt. Oscar Galvin, USMC-R
Cpt. Denise D. Howard
Tim Knight
Tony Kotelenets
CWO Howard Lewis
Mike Maza
Capt. Christopher McCarthy, USMC
CW2 Jamie Tardif
1Lt. Miguel Torrente
CWO James T. Ybarra

Manual and Packaging Layout

Brett Wooldridge
Lillian Dollenmayer

QA Management

Tim Knight

Lead Testing

Tony Kotelenets

Testing

David Arranaga
Fred Beers
Daniel Constant
John Graham
Tim Knight
Kevin White

Technical Support

T.J. Busko
Ron De Los Santos
Chris Lauw
Doug Rothman

Computer Maintenance

Glenn Kronick

Special Thanks

Jon Hausam
Kris Kraves
James Lamorticelli
Jackie Lay
John Loose at Dolby Laboratories
Lee Milligan
Lisa Nielsen
David Pollack
Matthew Ruhl
Tara Stivers
Rozita Tolouey
Karly Young
Boeing Sikorsky First Team



“Always Prepared”



BOEING SIKORSKY RAH-66 COMANCHE

As a member of the Army's elite Griffon Squadron, you're expected to know your Comanche inside and out. The following overview should be considered "required reading" for new pilots.

The Boeing Sikorsky RAH-66 is the U.S. Army's concept of what a 21st century reconnaissance/attack helicopter should be. It is fast, light-weight, and packs a powerful punch. The Comanche is also quiet, hard to spot visually, and nearly invisible to enemy radar. Even if detected, it can take repeated hits from triple-A fire that would blast lesser helicopters from the sky. It's superbly designed to survive on the modern battlefield.

The Army has sought to equip it with the very latest high-tech electronic surveillance and targeting systems. Its avionics are designed so they share maximum commonality with the USAF's F-22™ Raptor™. There's something else the Comanche shares with the F-22: *low observable* stealth characteristics.

One axiom to arise out of late 20th century warfare is the idea that, "if you can be seen, you can be hit; and if you can be hit, you can be killed." The military has taken this lesson to heart. It has learned that its weapon systems can no longer be protected by giving them thicker armor or faster engines. These days the only real way to safeguard anything is to make it difficult to detect. The enemy can hardly destroy something it doesn't even know is around.

If there is such a thing as a stealth helicopter, the Comanche is it. Consider the ways a helicopter can be spotted. An enemy force can see it with the naked eye, hear it with the naked ear, or detect it using sophisticated means such as IR sensors, radar and radar detectors. The Comanche has been designed to be a true stealth helicopter. It has features which minimize or eliminate each of the enemy's normal means of detection.

Because the Comanche pilot is equipped with a low visibility night piloting sensor system, he can operate the helicopter equally well in day or night conditions. By choosing to operate at night, the Comanche cuts down on the enemy's ability to detect it visually. Even in daylight, the Comanche is nearly impossible to see from a distance. It is only 43 feet long (compared to the length of the Apache at 51 feet) and only 8 feet wide when viewed head-on. Its small fuselage can easily be overlooked.

The Comanche is also very hard to hear. The enclosed (shrouded) tail rotor significantly reduces noise by deflecting the air flow away from the main rotorwash. This eliminates a large portion of the slap-slap-slap noise created by most helicopters. In fact, Sikorsky engineers consider the Comanche to be two times quieter than the Apache or Kiowa.

Another principle means of detection is radar. The Comanche presents a very small radar cross-section because of its precisely shaped fuselage. Its radar return is estimated to be 600 times smaller than that of the Apache. Weapons are stored internally so that the Comanche presents a smooth external appearance. This allows the Comanche to deflect radar waves away from it rather than reflect them back to a radar receiver.

It is equally hard to detect through infrared means. The Comanche's exhaust is cooled and diffused before being released into the surrounding atmosphere. The materials used to construct the fuselage absorb heat rather than reflect it. As a result, the Comanche's IR signature is half that of the Apache.

Of course the best way to remain hidden from enemy view is to stay as far away from that enemy as possible. Because of its sophisticated long range targeting sensors, there's less of a need for the Comanche to venture close to the enemy. In short, the Comanche survives in combat because of its ability to destroy the enemy before the enemy knows it's there.

Surviving in combat is one thing, being effective in battle is another. Not only is the Comanche hard to detect, it is able to dish out punishment like no other ordinary reconnaissance helicopter. By relying on a variety of weapons, the Comanche can take out both air and ground targets.

Its two side-mounted weapon storage bays each have three hardpoints. Each hardpoint can mount one AGM-114 Hellfire, or two AIM-92 Stingers, or a single rocket pod of four Hydra 70 FFARS. In addition, the Comanche carries a three-barrel 20 mm cannon with 500 rounds of ammunition. The cannon is located in a turret beneath the cockpit and is slaved to the pilot's helmet.

When stealth becomes secondary to firepower, the Comanche is able to mount two wing-like EFAMS (External Fuel and Armament Management System). Each of these non-lifting "wings" has four hardpoints which, like the internal hardpoints, can mount one Hellfire or two Stingers per point. The EFAMS use the same four-rocket pods that are also used internally. Four of these four-rocket pods can be mounted on each EFAMS for a total of sixteen rockets.

The Comanche's five-bladed main rotor is powered by two LHTEC T800-LHT-801 turboshafts each rated at 1,380 horsepower. These engines give the RAH-66 a maximum speed approaching 175 knots and a flight endurance of almost three hours of non-stop flight. The Comanche can self-deploy 1300 nautical miles to a combat area when fitted with external fuel tanks. In emergencies, up to eight Comanches can be carried inside a single C-5A Galaxy transport by simply removing the main rotor. These eight helicopters can be ready for battle within 30 minutes of touch-down.

According to the General Accounting Office, "the Comanche will be the most computerized, software intensive Army helicopter ever built. The Army estimates that about 1.4 million lines of code are required to perform and integrate mission critical functions... this compares to about 573,000 lines of code for the upgraded Apache attack helicopter with (Longbow) fire control radar."

The Comanche will be replacing helicopters that will be thirty or more years old by the year 2000. When it finally enters service early in the next decade, the Comanche will be the most sophisticated weapon system the Army possesses. It will also be the only helicopter with stealth characteristics that allow it to go where it needs to go and survive where it needs to survive.



INSTALLATION & SETUP

Welcome to *Comanche Gold*. This chapter will help you get the program installed on your computer, and will walk you through the configuration of your system. The last part of this chapter is a Quick Start section for those of you with significant flight sim experience, or for those who want to jump right in and learn by doing.

INSTALLING COMANCHE AND STARTING PLAY

In order to play *Comanche Gold*, you must first install the game files onto your computer's hard drive. You should also calibrate your joystick before beginning play, and there are a series of game options offered by the program itself that you should consider.

GAME INSTALLATION

Your gateway to installing and running *Comanche Gold* is the AutoRun program. AutoRun will automatically load itself and run each time you insert the Comanche CD into your CD drive.

THE AUTORUN PROGRAM

Before you begin installing the game, close all programs that your computer may be currently running. The installation program requires all your computer's resources. Then:

1) Place the game CD into your CD ROM drive and close the drive door. The AutoRun program will now take over. If you have turned off the Autorun feature or if Autorun fails to launch automatically, double-click on the "My Computer" icon on your desktop and then double-click on your computer's CD-ROM drive letter. This should launch *Comanche Gold's* Autorun.

2) Click the mouse on one of the menu choices, or type the letter corresponding to the underlined hot-key. The AutoRun menu gives you the following choices:

Start Comanche— Select this option to play the simulation. You will first have to install the program to your hard drive.

Install Comanche— Select this option to install the simulation onto your hard drive. You must install the game before you can play.

Start Mission Editor—Select this option to run *Comanche Gold* Mission Editor. You will first have to install the game on your hard drive.

Install Armored Fist 2 Demo— Click here to have a demo version of Armored Fist 2 installed on your hard drive.

Install F-22 Raptor Demo— Click here to have a demo version of F-22 Raptor installed on your hard drive.

Explore CD— This CD also contains additional data and program files not accessible through the Autorun screen. Use this option to install the Adobe Acrobat Reader or programmable joystick files.

View Readme— The Readme file contains the latest technical and game-related information about the program.

Install DirectX— Make this selection to install this version of DirectX. You must have DirectX 5.0 or greater installed on your machine to play *Comanche Gold*.

Exit— Exits the AutoRun program.

When you are ready, select Install *Comanche*.

INSTALLING *Comanche Gold* GAME FILES

Use your mouse to make appropriate selections, or press the letter of the underlined hot key.

1) At the beginning of the installation program you are given the opportunity to select a destination folder for the game. A default destination (C:\Program Files\Novalogic\Comanche Gold) is typed in the window for you. Press the Enter key to select the default destination. Otherwise, select your own folder name. If the folder you specify does not already exist on your hard drive, the Install program will create it for you. You will be prompted to choose which install size you want. The Large Install is a complete multiplayer station installation allowing multiplayer gameplay without multiple CD's. The Small Install is the minimum install for balanced hard drive and CD-ROM usage.

2) If there is enough free hard drive space at the destination site, the program will copy the files from your *Comanche Gold* CD ROM. An on-screen progress meter displays the completion percentage as the program transfers the files.

3) The install procedure automatically adds a NovaLogic folder to your Windows® 95 Start Menu under the Programs heading. A *Comanche Gold* sub-folder within the NovaLogic folder contains an application short-cut icon for the game. The install also places a Comanche Gold shortcut icon on your desktop. Additional shortcuts for the Readme file, Mission Editor and Mission Editor Readme file are also placed in the Start Menu in the *Comanche Gold* sub-folder.

4) If your system does not already have DirectX 5.0 or greater installed, you will need to install it now. Select Install DirectX 5.0 from the AutoRun program, then follow the on-screen instructions.

5) You will need to restart your computer to activate DirectX 5.0 before you can play *Comanche Gold*.

CALIBRATING THE JOYSTICK

You will need to calibrate your joystick in Windows® 95 for it to work properly in *Comanche Gold*. Follow these steps:

1. Click on the Start button at the far left of the Taskbar at the bottom of the screen.
2. Highlight Settings, then select Control Panel from the menu.
3. Double-click on the Game Controllers icon.
4. Select your joystick from the list of game controllers you have installed, then follow the on-screen instructions to calibrate your joystick.

STARTING THE GAME

1. If your computer is already turned on and the *Comanche Gold* CD is in the CD drive, double-click on the *Comanche Gold* shortcut icon, or go to the directory containing the simulation and double-click on the *Comanche Gold* program icon.
2. If your computer is on, but the program CD is not in the drive, insert the *Comanche Gold* CD into the drive and select Start from the AutoRun screen. If no screen appears when you insert the CD, double-click on the My Computer icon on your desktop, then double-click on the icon for your computer's CD drive. You can then choose Start from the AutoRun screen. You may also use your computer's Browse function to locate and launch the program.
3. Enjoy!

CONFIGURING THE GAME FOR PLAY

Comanche Gold offers the player a variety of configuration options for customizing control of the game and allowing you to take advantage of joysticks and other controllers. These configuration options are accessed in the menu bar. Chapter 3, section C discusses the menu bar in detail; however, here is a brief run-down on the options which are available.

The menu bar can be accessed from the main menu or while playing a mission by pressing "ESC". Use the "left" or "right" keys to select between menus, use the "up" and "down" keys to highlight options from within each menu and press "ENTER" to select a highlighted option. When you are finished making changes, press "ESC" again to remove the menu bar.

Game Menu

The game menu has different options for mission playbacks, ending missions and exiting the game.

Control

The control menu provides options for using joysticks and other game control devices. You can enable the currently configured Windows joystick as well as throttle controller, foot pedals, etc. You can also customize some flight characteristics in this menu.

Options

The options menu allows you to choose between the Easy and Advanced Flight Models as well as enable or disable certain individual Comanche flight characteristics.

Detail

The detail menu contains options for controlling the graphical detail and volume settings in the game. Most of the options in this menu have variable settings. To change the settings for an option, highlight it using the “up” and “down” keys, then press the “+” or “-” keys to increase or decrease the setting level.

Video

The video menu lets you specify a video mode or window size, switch between full-screen and windowed mode and adjust the gamma of the display.



Comanche rearms and refuels in under 15 minutes.



QUICK START

For those players who want to jump right in and start flying, this portion of the manual is for you. It's designed to get you into the game quickly yet alleviate your frustration when things start happening and you can't figure out why.

Comanche Gold comes with two separate flight modes: an Easy Flight Model and an Advanced Flight Model (*which is as close as most of us will ever come to flying the real thing*). This chapter contains a detailed discussion of both.

Also included in this chapter is a checkride tutorial which takes you step by step through the first training mission: *Fort Rucker*. This tutorial is designed to get you off the ground in a hurry. It is not intended to explain everything to the *n*th degree. It may be necessary, even with the tutorial, to fly awhile... pause the game and read a bit... then resume flying again. In any case, the tutorial teaches one aspect or feature of the game at a time.

A. EASY FLIGHT MODEL

It will be stated and restated throughout this manual that learning to fly a helicopter is not an easy thing to do. Add to this the fact that sometimes *bad* people will be shooting at you and you can see you're going to need all the help you can get, at least initially. The Easy Flight Model is set up to allow you to toggle its features On and Off. This way you can customize the Flight Model to suit your individual taste (not to mention skills).

The *Easy Flight* Model features are listed under the **OPTIONS** topic on the Menu Bar. You can either toggle the features On collectively or pick and choose among them. With practice you will come to depend less and less on the simplicity of the *Easy Flight Model*. When you find this happening you can simply begin toggling the *Easy Flight Model* features Off.

1. FANTAIL® MIXED WITH CYCLIC




The uniqueness of the tail rotor design is evident by the fact that it is a registered trademark of Sikorsky. This Easy Flight Model feature links your tail rotor (FANTAIL®) to your cyclic control so that your flight maneuvers are properly coordinated. Normally, a helicopter turns as a result of cyclic-induced bank. The tail rotor helps smooth the turn by yawing the nose of the helicopter in the proper direction. With this feature engaged, the tail rotor automatically adds the necessary yaw motion for you.

Using this feature makes it difficult, if not impossible, to fly laterally (sideways). Because it automatically links your tail rotor to your cyclic, this option will cause your helicopter to turn rather than maintain its heading and fly sideways. Weigh this negative carefully when deciding whether or not to use this option.

2. LIMIT CYCLIC RANGE () TOGGLE

Your Comanche is capable of some pretty radical maneuvers but as a new pilot you should probably refrain from performing them. It's too easy to get yourself into trouble.

The *Limited Cyclic Range* feature acts as a governor on your cyclic stick. It prevents you from performing extreme pitch and bank maneuvers by limiting its gimbals. Most of the time you can fly with no problem using this feature. The movement of the cyclic, even when limited by this feature, gives you a healthy operating envelope.

Emergencies will arise from time to time that require you to operate outside of this normal flight envelope. The *Limit Cyclic Range* feature can be overridden for brief periods of time by using the  key. Simply hold down the  key while giving the helicopter cyclic input and this feature will be momentarily disengaged. Releasing the  key re-engages the *Limit Cyclic Range* feature.

B. ADVANCED FLIGHT MODEL

Once you've mastered the Easy Flight Model, the next step is to tackle the Advanced Flight Model. This model introduces you to some new control options and features that give you a much more realistic sensation of actual flight.

Like the previous Flight Model, the Advanced Flight Model is set up to allow you to toggle its various features On and Off. With practice you will come to depend less and less on these features. The following Advanced Flight Model features are listed under the **OPTIONS** topic on the Menu Bar. You can either toggle these features On collectively or pick and choose among them.

The Advanced Flight Model uses both of the Easy Flight Model options plus the following:

1. LIMIT COLLECTIVE TO AVOID OVER-TORQUE

Just as the Limit Cyclic Range feature kept you from performing extreme pitch and bank maneuvers, this feature prevents you from inadvertently damaging your engines by over-torquing them. Normal collective settings produce engine torque readings from 0 to 100. It is possible, even desirable in certain circumstances, to exceed this for short periods of time.

Allowing your engine torque to exceed 100 is known as over-torquing the engine. This technique is useful in emergencies but it places a great deal of stress on the engines. Over time the accumulated stress will permanently damage the engines. The Limit Collective option automatically steps in and keeps this from happening. Note that it does not prevent you from over-torquing the engine, it just keeps you from doing it long enough to cause damage.

2. HOVERHOLD (J)

Helicopters don't fly as fast or as high as fixed wing aircraft. They can't carry nearly the same amount of cargo and are expensive to maintain. So with all these negatives, why have them around in the first place? It's because helicopters can do a number of things that other aircraft can't do.

Helicopters are blessed with the ability to hover and fly vertically which has enormous battlefield practicality. This ability to hover, or maintain a stationary position, allows helicopters to perform tasks that require precise maneuvering. They can take-off and land within confined areas that would otherwise be prohibited to fixed-wing aircraft. It also comes in handy when masking themselves behind cover. Helicopters are able to pop-up and attack targets at just the right moment.

As useful as hovering is, it is one of the more difficult flight maneuvers to master. There is a vertical and a horizontal component you need to be concerned with. In order for a helicopter to remain in a hover, its thrust and lift must be in equal balance to its weight and drag. Maintaining this balance in the old days used to be a real chore and pilots got tired after just a few minutes. Fortunately, the Comanche, with its fly-by-wire flight controls, is a more sophisticated bird.

The Comanche is equipped with a HoverHold mode that automatically maintains a hover for you. To activate HoverHold, press the **J** key toggle. When activated, you'll notice the appearance of four dots arranged in a diamond shape on the HMD. This indicates that HoverHold will be engaged anytime you meet the necessary criteria.

In order to engage HoverHold, your current speed (in any direction) must be below 10 knots. Look at the four HoverHold dots on the HMD. The acceleration cue on the tip of the velocity vector must be positioned inside the dots for HoverHold to engage. To maintain HoverHold, you must refrain from giving any cyclic input and your airspeed must remain below 10 knots.

While HoverHold is engaged, your helicopter will maintain its current position with regard to lateral drift. You can yaw the aircraft, using the tail rotor controls, without kicking out of HoverHold. HoverHold is just like cruise control when it comes to disengaging it. Simply move your cyclic in any direction and you seamlessly kick yourself out of HoverHold mode.

HoverHold *does not* maintain altitude for you but this is a good thing. It leaves you free to move up and down vertically while remaining in place. Besides taking-off and landing, HoverHold is particularly useful when it comes to popping up from behind cover, looking around for targets, then settling back down.


3. VERTICAL STABILIZER (V-STAB)

Maintaining a steady altitude will no doubt prove challenging to new pilots. To assist you, your helicopter has a Vertical Stabilizer (V-STAB) option that makes it easier and more intuitive to control your altitude.

V-STAB is automatically turned on if you are playing using the Easy Flight Model. If you are flying with the Advanced Flight Model, V-STAB can be turned

on or off from the Options menu. Keep in mind that the following description always applies in the Easy Flight Model, but only when V-STAB is enabled in the Advanced Flight Model.






Without V-STAB, you have direct control of the Comanche's collective. Increasing collective increases lift, decreasing it decreases lift. Without V-STAB, in order to maintain a constant altitude, you must constantly adjust your collective to compensate for other factors which affect it such as pitch and ground effect.




When V-STAB is enabled the collective controls your helicopter somewhat differently. When your collective is "centered" (set to 50% by pressing the  key or putting the throttle controller into the center position), V-STAB attempts to maintain the current altitude, compensating for factors such as pitch and ground effect as well as possible. V-STAB then lowers the helicopter if you apply less than 50% collective, and raises it if you apply more than 50%.

C. YOUR COMANCHE CHECK RIDE TUTORIAL

All new pilots must prove their mastery of a particular aircraft before being allowed to fly it in combat. One way this is done is through the use of check rides. Check rides are just like the driving portion of the test you took when you first learned to drive the family car. Remember how nervous you were the first time you had to parallel park in front of the testing proctor? Well, this check ride won't be that bad. Your instructor isn't such a bad guy. At least he won't chew your head off if you make a mistake. Just listen to what he has to say and follow along in the manual, you'll do fine.

Your check ride, entitled *Fort Rucker*, happens to be the very first mission under the heading Training Flights. Here's how you get there. You must first install the simulation on your machine. Assuming you followed the installation and set-up instructions in the previous chapter, you're ready to go on your first flight. Helicopter veterans call this your "cherry hop".

Ready- The first thing you see when entering the game is the **Pilot Roster** screen. There will be a list of default pilot names already on the roster. To use one of the default pilots, simply use the   keys to scroll the selection bar up and down the menu, then press the  key when you decide on one you like. To enter in a new name, press the  key and type in a new name. Press the  key when you are done. This takes you to the pilot's individual **Duty Roster**.

Set- Now that you have accessed your pilot's Duty Roster, you'll see a list of game options. This tutorial is the very first training mission so again, use the   arrow keys to scroll the selection bar to **Training Flights**. Press the  key.



Go- Find the mission entitled *Fort Rucker*. It should be the very first mission on the list. Press the  key and stand-by while the mission loads.

The Mission Briefing- Before every mission, you receive a quick mission briefing. These briefings are designed to explain the purpose and objective of the flight. You are given a description of your ordinance load-out as well as a mission map which outlines your flight path. Important points of interest are

also noted on your mission map as waypoints. Sometimes these waypoints will just be used as navigation aids, other times that will be used to mark the location of specific objects.





Before taking-off on a mission, it's helpful to take a moment and look at each of the waypoint map icons so that you know what to expect. When you're satisfied that you know what you need to know, go fly the mission.


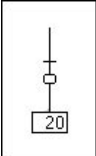






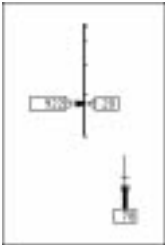
TRAINING MISSION 1: FORT RUCKER

- 1) As this training mission begins, you are seated in the front seat of your Comanche RAH-66. Listen as the soothing voice of your flight instructor welcomes you to Fort Rucker. He'll be seated in the CP/G's (Co-Pilot/ Gunner) seat behind you throughout the flight. This mission is not timed so there is no need to hurry. If necessary, freeze the simulation in place by pressing the  key. Press the  key again when you want to resume play.

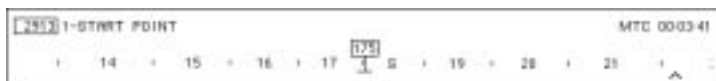




Consider this your PANIC button. Feel free to halt the simulation at any time.

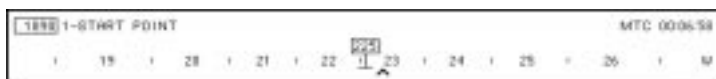
- 2) The view you are currently looking at is known as the *Forward Cockpit View*. You can access this view anytime by pressing the  key. In front of you are two small cockpit monitors known as *Multi-Function Displays* (MFDs). These monitors display various flight and weapons system information but they are not important at the moment. We'll get to them a little later.
- 3) Right now, direct your attention to the white symbology that appears all over the screen. This symbology is actually being displayed on the visor of your helmet. This piece of Army hardware is known as the *Helmet Mounted Display* (HMD). No matter which direction you look, this information will always be positioned in front of your eyes. It lets you see outside the helicopter without taking your eyes off of crucial flight data.
- 4) Your engine will start *spooling up* (turning) your main rotor as the mission begins. They are not turning fast enough to cause you to lift off yet so don't panic. Not enough engine torque is being produced to get you off the ground.
- 5) While you're getting settled in, take a moment to look around. Use the (*Left Cockpit View*)  key to look left, now press the (*Right Cockpit View*)  key to look to your right. As you can see, the white HMD symbology stays with you regardless of where you look. Now return to the *Forward Cockpit View* by pressing the  key.
- 6) You are all set to take-off. To rise up off the ground you must first change the pitch of your rotor blades so that they give you more lift. You change the pitch of your blades by using what's called the *collective*. Your collective is controlled by the row of numbered keys on your keyboard. (It can also be controlled by a throttle device if present.)


- 7) The collective is set to *No collective* at the beginning of the mission. *No collective* is set by pressing the  key. Direct your attention to the engine torque indicator symbology in the lower left corner of your Helmet Mounted Display (HMD). You'll see that even with a setting of *No collective*, the engine is producing a torque indication of 20. Keep an eye on this gauge. The relationship between collective and engine torque is important to your understanding of flying a helicopter.
- 
- 8) Increase your collective setting by pressing the  key. You'll notice an increase in engine torque and a thick bar begins to rise up the stem of the torque indicator. You still aren't producing enough lift to get off the ground, however. Go ahead and increase the collective a little more by pressing the  key.
- 9) Still not enough, eh? Okay, go ahead and push the  key. Bingo. You're flying. The helicopter should rise to an altitude of about 75 feet and then settle back a bit. Don't be alarmed. The helicopter won't crash. It's being suspended on a cushion of air referred to as the *In Ground Effect*. Notice the power bar on the torque indicator has risen up the stem almost to the bottom of the tiny circle. This indicates that you almost have enough torque to maintain a hover outside of the *In Ground Effect*. More on that later.
- 10) You still don't have enough altitude to safely clear all the nearby towers and buildings. Press the  key to add more collective. A collective setting of 6 gives you more than enough lift to begin climbing. You don't want to climb too high, however.
- 11) Take a look at the Above Ground Level (AGL) altitude indicator. This digital indicator is calibrated in feet. When it reaches a reading of 80 (80 feet), press the (Lock Current Altitude)  key.
- 12) Because you locked in the altitude, your Comanche will seek to maintain this altitude above ground level for the rest of the mission. We may want to change this later but for the time being leave the V-STAB feature engaged.
- 13) Wow, after all that it's finally time to transition from a hover into forward flight. Whereas your collective controls the vertical aspect of helicopter flight, your *cyclic* stick controls flight in the horizontal axis. Although cyclic control is usually input using a joystick, you can also use the four directional arrow keys on your keyboard or numbered keys on the keypad to perform the same function.
- 14) To begin moving forward, press the  key. This will pitch the nose of your helicopter downward and cause you to begin moving forward. Because the V-STAB feature is engaged even though you dip the nose of the helicopter, and it looks like you should be entering a dive, you will remain at 80 feet. Notice the number increase inside the tiny rectangle on the right side of your HMD. This is your *groundspeed indicator*. It is calibrated in knots (nautical miles per hour) and tells you how fast you are traveling over the terrain outside.
- 


- 15)** Your instructor asks that you proceed to the mission start point. The start point for this mission is waypoint 1. Waypoint 1 is located approximately 2900 meters away, bearing 225°. (In the upper left corner of the HMD you'll see the waypoint indicator and distance to waypoint readout.)

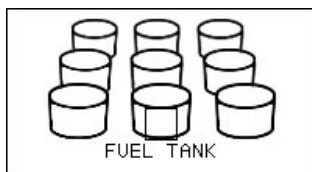





- 16)** You are moving forward on a heading of 175°. In order to reach your first waypoint, you'll have to turn a little to the right. You can change your heading using the cyclic control by pressing the  key or by using the tail rotor  to yaw the nose of the helicopter. Notice your heading change occurring on the magnetic tape indicator.
- 17)** There is an inverted V symbol halfway between the 22 and 23 on the magnetic heading indicator. This inverted V is known as a waypoint caret. Its position on the heading tape indicates that you must fly a heading of 225°. Turn or yaw so that the waypoint caret is positioned directly under your heading indicator.

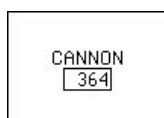






- 18)** So far so good. You should now be en-route to your first waypoint, flying a heading of 225° at an altitude of 80 feet. Your HMD should now be displaying a symbol that looks something like a lollipop with the number 1 inside. This symbol is known as a waypoint stake. The bottom of the waypoint stake points to the actual position of the waypoint on the ground. Continue flying toward it.
- 19)** Upon reaching the first waypoint, your instructor should congratulate you on your navigation skills. You'll notice that the waypoint stake has disappeared and that the waypoint caret has moved to a different position on the magnetic tape. It is now indicating the position of waypoint 2.
- 20)** Straight ahead you'll notice a little valley. Slow down to about 30 knots by flaring the helicopter (pitching the nose up). You can do this by pressing the  key or pulling back on your joystick.
- 21)** Just ahead is waypoint 2. This waypoint notes the position of a tower and some oil pumps. Use this waypoint as a nav aid. Begin a gentle turn to the right once you reach the tower.
- 22)** Now you should see a lollipop indicating the position of waypoint 3. This waypoint indicates the position of a group of fuel tanks. Your instructor will direct you to try a little target practice and rip 'em up with your 20 mm cannon. Continue moving slowly forward until you have the tank farm in sight.

- 23) In order to hit the fuel tanks you must first target them using your *Target Acquisition and Designation System (TADS)*. To target an object, press the  key. If there is a clear line-of-sight (LOS) between you and the target, a *Target Designator (TD)* box symbol will be superimposed around the object (in this case a fuel tank).



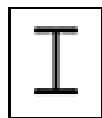
- 24) Now that you have a TD box around one of the fuel tanks, you can “open up” on it. To ready the cannon for firing, press the  key. This is called placing the weapon “in priority”. You’ll see the word **CANNON** appear in the lower left corner of the screen along with a box containing the number of cannon rounds you have remaining. To fire the cannon, press the  or  key on the keypad. You’ll see tracer rounds leave your helicopter and hopefully impact the target. (When you initially begin a mission, the default weapon in priority will be the cannon.)








- 25) Once you have destroyed a fuel tank, press the  key or  key to target another one. Continue to press the  key or  key until you have targeted and destroyed all the fuel tanks at waypoint 3. Good shooting!
- 26) Let’s test your nerves a bit. The next leg of the mission takes you through a narrow canyon pass. Are you ready? Good... let’s do it. With your altitude locked at 80 feet, you should be able to fly under the bridge. To fly over it, simply add additional collective.
- 27) These canyons are tricky to fly but ...*you were the one who wanted to be a Comanche pilot!* Comanche units only take the best. Prove you’re the best by making it through in one piece. Up ahead you’ll see the waypoint stake indicating the position of waypoint 6.
- 28) Located at waypoint 6 is a Forward Area Rearming Point (FARP). The Army will have established FARPs in some of your missions as a means of rearming your Comanche close to the action. Landing on the tiny raised FARP platform takes a little skill, but it’s worth it if you’re running low on ammunition.
- 29) This training mission does not require you to land at this FARP unless you want to. You may choose to bypass the FARP altogether and continue on to waypoint 7. If you do decide to practice landing at this FARP, we recommend that you pause the simulation at this point and read the section on landing in Chapter 4: **Flying the Comanche**. Pay particular attention to the collective setting information and associated landing symbology presented in that section.
- 30) Waypoint 7 is an ammo dump. Advance on the ammo dump slowly and get set to blast it with 70 mm rockets.

- 31)** Place your rockets “in priority” by pressing the  key.

You’ll see a new I-beam symbol appear. This is the aiming pipper used with rockets. This symbol is actually known as the *Rocket Steering Cue* but we’ll refer to it as the I-beam aiming pipper while you are in training.



- 32)** Since rockets are unguided, you must pitch and bank the helicopter so that the I-beam aiming pipper is positioned over the target. To fire the rockets, press the  key or  key. Continue to press the  key or  key until you have targeted and destroyed all the targets within the ammo dump.
- 33)** Once you have destroyed some of the ammo dump targets, your first training mission is complete. Press the  key when prompted to end the mission and receive a debriefing. That wasn’t so bad, was it? Think you can do it again? Great. Get ready for the next training mission.



Comanche is a formidable attack platform as well as an unequalled reconnaissance asset.



ROSTER SCREENS & PLAYER OPTIONS

A. THE PILOT ROSTER

The Pilot Roster is your launching point into the simulation. Think of it as Griffon Squadron's "ready-room". The Pilot Roster has space for up to ten (10) different pilots. They stay there undisturbed until you call upon them to perform a mission.

By separating your pilots in this manner, *Comanche Gold* allows you to have multiple careers going on at the same time. For example, pilot X can be occupying one slot on the roster (and undertaking training missions) while pilot Y may be off somewhere "on campaign" fighting for his or her country.

Aside from just being a starting point, the main purpose of the Pilot Roster is to give you a quick way of creating or removing pilots from the game.

As you might imagine, the Army frowns on letting unidentified people fly their aircraft; therefore, you are required to select a pilot from the Pilot Roster before proceeding any further.



1. SELECTING A PILOT FROM THE ROSTER

- a) Use the keys to move the selection bar up and down the list of names on the Pilot Roster.
- b) When you have positioned the selection bar underneath the name of the pilot you wish to use, press the key. The Duty Roster of the pilot you select now appears.

2. ADDING AND DELETING PILOTS

- a) Adding a pilot to the Pilot Roster is easy. Position the selection bar on an available slot. It may be a blank slot or it may contain the name of a pilot you wish to remove from the Pilot Roster.
- b) Press the key. At the cursor prompt, type the new pilot's name as you wish it to appear on the roster. Press the key. The new pilot's name now appears in the slot. This pilot is now ready for action.

Note that because the Pilot Roster only has slots for ten pilot names, it may be necessary for you to delete an existing pilot if there are no empty slots available.

B. THE DUTY ROSTER

1. SELECTING A DUTY ROSTER OPTION

A pilot's Duty Roster is designed to help you manage that pilot's career throughout the game. As soon as a pilot name is added to the Pilot Roster, that pilot is immediately issued his or her own personalized Duty Roster. This roster remains with the pilot until retirement (voluntary or otherwise).

Each Duty Roster contains a number of menu options. To select an option, use your keys to move the selection bar up and down the Duty Roster menu. Once the selection bar is situated underneath the desired option, press the key.

2. DUTY ROSTER OPTIONS

The Duty Roster is arranged to make it easy for you to jump right in and begin play. Your options are:

a) Training Flights

Training flights are designed to familiarize you with the Comanche and its systems in a relatively safe environment. This way you can devote your full attention to flying. In the beginning, it will be hard enough just to keep from smacking into things.

Use these training hops to “get the feel” of the helicopter before you venture out to do battle. The training program consists of five missions that have you flying over a variety of terrain types. Take the time to fly each one. You know the old saying, “More sweat in training, less blood in battle.” Make your mistakes here, not in combat.

b) Silver Operations (Campaigns)

Campaigns consist of multiple missions which are referred to as “operations”. There are five separate operations: one training and four combat operations. Each one has its own unique terrain features and new set of challenges. Tactics that work well against enemy troops in one operation may not work as well in another. Your objective is to complete all the missions in an operation without getting hurt in the process.



have been sent to a remote base inside Saudi Arabia near the Jordanian border. Here you will immediately begin flying missions designed to evict Iraqi troops from the Hashemite Kingdom.

c) Gold Operations

Operation: Swift Justice

Cambodia's democratic leadership has been ousted. A military junta seized power in a bloody coup promising to improve economic conditions throughout the country. The country quickly became a major drug haven acting as a warehousing and shipment center for the Golden Triangle. Enormous financial gain began flowing to the junta. Instead of improving conditions for the Cambodian people, the junta has used their financial resources in a massive militarization of the country. Now this force is threatening to destabilize the region as the junta attempts to expand their influence outside of Cambodia's borders. No longer able to ignore the junta, the Association of Southeast Asian Nations (ASEAN) has appealed to the UN for help. Griffon Squadron has been assigned the preeminent U.S. role in a joint UN/ASEAN mission to restore democracy to Cambodia. In addition, the National Command Authority believes this is an excellent opportunity to cripple the flow of drugs from this region.

Operation: Providence

U. S. intelligence agencies have noticed an increase in illicit arms sales throughout Southeast Asia and Eastern Europe. The small nation of Kyrgyzstan appears to be the base of operations for the arms dealers. Its isolated territory, weak government, and close proximity to both Russian and Chinese arms sources have made it an ideal location for an organized group of these dangerous entrepreneurs, with ties to several radical groups throughout the region. Weapons used by the Cambodian junta were traced to this area as terrorist activities have increased across the globe. One way to deal with these organizations is to destroy their sources of weapons and ammunition. Griffon Squadron will participate in a covert operation to shut down these arms dealers.

Operation: Far Reach

Documents captured in Kyrgyzstan confirm the presence of a large terrorist training network operating in Mongolia. Its remote location and sparse population have made it an ideal hiding place... until now. Operating from mobile camps close to the Chinese border, terrorist units have begun to skirmish with Chinese forces. In addition to their extensive training and logistics camps inside Mongolia, it is rumored that they also have begun to construct facilities capable of manufacturing chemical and biological weapons. Eager to prove to the world that it is ready to be a partner in world peace efforts, China has asked to assist the U.S. in a covert operation to eliminate this threat to world stability.

Campaign: Kingpin

Ushering in a new era of cooperation, simultaneous Japanese and Russian commercial projects have completed bridge construction linking their countries with Sakhalin Island. In anticipation of commercial expansion,

they have established a jointly owned commercial space port on the island. Taking advantage of this era of rampant growth, terrorist elements have subverted part of the less populated southern region of Sakhalin. Within this area they have established some manufacturing facilities, which intelligence believes they are using to manufacture chemical and biological weapons. An analysis of financial records captured in Mongolia has revealed an extensive investment in aerospace technology, including the commercial spaceport. Captured documents indicate the terrorists will use the launch facilities to introduce biochemical weapons into the atmosphere. It is imperative that their operations are quickly neutralized. Russia and Japan have asked the United States to assist them in reaching this goal.

Operation: Southern Star

Over the past few years a radical separatist sect has seized control of an outlying island area of Indonesia. Since the death of their president in the late 1990s, Indonesia has been wracked with dissension and the government has been paralyzed with indecision. Using the wealth from the petroleum resources in the area, the separatist sect has positioned itself to take control of the entire country. They also pose a threat to the Philippine Islands. In addition the sect is holding a group of technical workers hostage. These workers are being forced to maintain the sect's petroleum operations. Indonesia has requested U. S. aid in dealing with this threat. Buoyed by the recent success of their covert operations, Washington has concluded a secret agreement with Indonesia to intervene. Seeking to avoid imposition of the War Powers Act, the President has ordered that this operation must be completed within 90 days. Griffon Squadron is tasked to work with a joint Army/Marine task force dispatched to carry out the operation.

d) Special Operations

This set of operations is unique to *Comanche Gold*. It consists of one campaign of missions personally designed for Comanche by Major Allen Sakcriska, former Army Training and Doctrine Liaison to Boeing/Sikorsky Helicopter.

e) Load User Mission

Use this option to load and play a mission created using the *Comanche Gold* Mission Editor. The Mission Editor is automatically installed onto your hard disk when you install the game. To run the Mission Editor or view the documentation, select one of the shortcuts from the Start menu.

The User's Manual for the Mission Editor exists on the *Comanche Gold* CD as an Adobe Acrobat file. If you do not already have an Acrobat Reader installed, you will find an installable version in the ACROBAT directory on the CD. Note: Acrobat always starts up showing the files which are in its own directory. To view the manual you will need to look in the root directory of the *Comanche Gold* CD for the file named EDITOR.PDF.

f) Multi-Player War Games

This multi-player aspect of *Comanche Gold* is covered in the **B: Multi-Player Missions** section of **Chapter 6: Playing the Simulation**. Consult this chapter for complete information concerning the functionality of the multi-player options.

g) Comanche Overview

Receive a technical specification and performance summary of your Comanche. Note that the facts and figures shown here reflect ideal operating conditions. Once in the field, the individual performance of your helicopter will vary according to local weather, maintenance, and a myriad of other factors.

h) Service Record

Access this pilot's official Service Record.

i) Credits

View game credits.


j) Re-Enlist


Return to the Pilot Roster.

k) Request Leave





Exit the simulation.

C. MENU BAR

The Menu Bar gives you the ability to make changes to a variety of game options while the game is in progress. To access the Menu Bar, simply press the  key. It will appear along the top of your screen and pause the game.

There are five menu topics on the Menu bar: *Game, Control, Options, Detail, and Video*. Use the   keys to highlight the desired topic.

As you highlight each of the topics, a drop menu will appear underneath. It contains your topic options. Use the   keys to move the gray selection bar and highlight a desired option.

The  key and  act as a select/de-select toggle. Once a menu option is selected, the green square pertaining to that option is filled in. (An open square will change to a solid green square.) You may de-select an option simply by pressing the  key or  again.

1. GAME

The menu options under this topic give you a quick way of getting in and out of the simulation.

a) Exit Menu

Selecting this option removes the menu bar and is the same as pressing ESC.



b) Restart Mission

If you get the feeling that a mission just is not going your way, select this option to restart the mission over from scratch.

c) Mission Playback

The first few minutes of each Comanche mission are recorded for posterity. If you would like to see this replay, select this option. Mission Playback recordings are not saved however. Once you start a new mission, the old recording is erased.

You may change the view of the action at any time by pressing a view key as you would normally. View changes are saved to the Mission Playback so that the next time you watch the recording you'll see it with the view changes you made previously.

Another neat feature of Mission Playback is the ability to stop the recording at any point and resume the action live. To do this, press the   keys. This lets you pick up the action and fly the mission as you would normally.

d) Takeover Playback

This option is only available while a mission playback is in progress. Select this during playback to take over control and play out the remainder of the mission. Note that although you have taken over control in the middle of a mission playback, you can still select Mission Playback again to play back the most recent version.

e) About Comanche

Select this option to view the *Comanche Gold* version information.

f) End Mission

This menu option ends the mission currently being played. You will immediately view the post-mission debriefing screen where your performance for that mission will be summarized. From there, press "1" to restart the mission, "2" to exit the mission or "3" to play back the mission.

g) Exit Game

Select this option to immediately exit from the game entirely.

2. CONTROL

The options in the Control Menu let you select different methods of controlling your helicopter. Set these options according to the hardware you have available and your preferences.

a) No Joystick

Selecting this disables joystick input completely. When selected, all other joystick options in the Control menu will also become disabled.

b) Windows Primary Joystick

Selecting this option enables the joystick currently configured in Windows through the “Game Controllers” control panel. This control panel is accessible through the START menu under “Settings\Control Panel”.

c) Enable Throttle (Collective)

If you intend to use a throttle device, or a throttle slide control on your joystick, select this option. When this option is not selected, you must use either the keyboard or the joystick hatswitch (with “Hatswitch Controls Collective/Fantail” turned on) to control the Comanche’s collective.

d) Enable Twisting Stick or Pedals (Fantail)

Select this option if you have foot pedals or if your joystick has a twisting feature (such as the Microsoft® SideWinder Pro series joysticks). This will allow you to control the Comanche’s fantail directly by pressing the foot pedals or by twisting the joystick. (Note: The twisting feature of the SideWinder is very similar to the cyclic control in the real Comanche)

e) Reverse Throttle

If you are using a throttle device to control your collective, you can use this option to reverse the way in which throttle is applied. Normally, pushing forward on your throttle controller decreases collective and pulling back increases it. With this option selected, collective is increased as you push forward and decreased as you pull back.

f) Reverse Pedals

Very similarly to “Reverse Throttle”, this option reverses the effect of the pedals or twisting stick. This is particularly useful when using foot pedals if the helicopter’s reaction to pushing the pedals seems to be the opposite of what you would expect.

g) Fantail mixed with Cyclic

When this option is selected, the on-board computer coordinates the Comanche’s fantail when you apply left or right on the cyclic. This causes the helicopter to turn to the left or to the right when you push the cyclic in those directions. With this option unselected, the Comanche will just slide to the left or right without turning. This option applies whether you are using a joystick or even just the keyboard to fly.

h) Hatswitch Controls Collective / Fantail

This option applies only to players who are using a joystick with a hatswitch. When selected, the hatswitch controls collective and fantail according to the following table. When unselected, the hatswitch controls the directions of view.

Button Movement	Option On	Option Off
Up	Momentary Max (collective)	Full Screen Forward View
Down	Momentary Min (collective)	Forward Cockpit View
Left	Yaw Left (tail rotor)	View Left
Right	Yaw Right (tail rotor)	View Right

i) Limit Cyclic Range

This option places limits on the amount of movement the cyclic is capable of. The effect of this is that the Comanche will not be able to pitch, turn or bank as severely as it is can otherwise, making the helicopter a little easier for beginning pilots to control and reducing the risk of losing control or causing a forward blade stall.

3. OPTIONS

The menu options under this topic all deal with features belonging to the two Flight Models. They can be activated collectively or chosen individually. Both the Easy and Advanced Flight Models are discussed at length in **Chapter 2: Quick Start**.

4. DETAIL

The menu options under this topic allow you to tailor the visual and audio game settings. Increasing the graphic detail level makes your computer work harder. Use these options to set the level of detail so you get the best combination of game detail and game speed. This menu has options for controlling sound and in-game music.

5. VIDEO

The menu options under this topic are primarily video resolution modes. Typically, lower resolutions will allow the game to play faster. Choose the mode that results in the best combination of visual presentation versus game speed on your computer.

The Gamma option is used to adjust the contrast of the presentation.

Selecting the Full Screen option causes *Comanche Gold* to run using the entire screen. When unselected, the game will run in a window on your desktop. You may find that the performance or look of the game is improved when running with the Full Screen option selected.



The Comanche is 6 times more effective in finding targets than current helicopters.



FLYING THE COMANCHE

There's an old saying among helicopter vets that goes something like, "helicopters don't really fly, they just beat the air into submission".

A. HOW HELICOPTERS WORK

Helicopters are not easy things to fly. Most pilots consider them to be more difficult to manage than fixed-wing aircraft. For some, the change to rotary aircraft can be disorienting. It's like learning to drive a standard transmission after years of driving an automatic. Every new helicopter pilot goes through this period of adjustment, so don't feel bad. Just count on there being times when you feel as if you need an extra set of hands and feet just to operate everything properly.

The first section in this chapter covers the basics of helicopter flight starting with your three primary flight controls: the collective (along with the torque indicator), the cyclic, and the tail rotor. This section is followed by a series of instructions on how to perform some basic flight maneuvers. The last portion of this chapter is devoted to keyboard commands. Here you'll find a detailed description of all the key commands you need to play the game.

1. THE COLLECTIVE CONTROL

The function of the collective is to produce lift by changing the pitch of the main rotor blades. On the actual Comanche, the collective is a large control stick situated on the pilot's left. It's called the collective because it *collectively* changes the pitch of all the blades equally and simultaneously.

By changing the pitch of your blades, you change their *angle of attack* (i.e. the way the blades cut into the relative wind) and ultimately their ability to produce lift. Think of the collective as your primary means of altitude control. You can gain and lose altitude by changing the pitch of the helicopter but it is the lift produced by your collective that keeps you in the air.

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Collective Controls

Collective control is represented in this simulation as a setting ranging from (no collective) to (max collective). The larger the collective setting you input, the greater amount of lift your main rotor will generate. You set the collective by pressing the - keys on your keyboard. The normal collective

CHAPTER 4

25

setting for general flight operations is 50. You can instantly set the collective to 50 by pressing either the **5** or the ***** key on the keypad. This setting approximates what you'll need to perform an Out Of Ground Effect (OGE) hover.

a) Enable Throttle (Collective) option



To better simulate the Comanche's actual collective, use a throttle device (like the CH Pro™ Throttle or ThrustMaster WCS™) instead of pressing keys on the keyboard. You may set up your throttle by pressing the **ESC** key. This activates the Menu bar. Use the **←** **→** keys to select the Control pull-down menu.

Now use the **↓** key to move the gray selection bar to *Enable Throttle (Collective)*. Press the **enter** key or **space** to toggle the selection On and Off. When the box is filled, your throttle device is enabled. This allows you to use your throttle to set the collective instead of using keyboard commands. Note that while the *Enable Throttle (Collective)* option is activated, the keyboard commands controlling the collective are disabled.

b) Reverse Throttle option

There is also an option on the Control pull-down menu that allows you to reverse the motion of the throttle. Normally, pushing forward on the throttle device reduces the collective setting and pulling back increases it. If you are uncomfortable with this arrangement, activate the *Reverse Throttle* option. This configures your throttle device to increase the collective when you push forward and reduce it when you pull back.

c) The Torque Indicator

Increasing the amount of collective also increases the amount of torque being produced by your engines. While there is no gauge on the HMD representing your collective input, there is a torque indicator which functions similarly. Keeping track of engine torque is important. The torque indicator lets you know if your collective setting is sufficient for the task at hand (i.e. *Do I have enough collective input to clear that next row of trees?*).

The torque indicator is located in the lower left corner of the HMD. It indicates the current amount of engine torque being produced in digital form. This reading is displayed in the rectangular box at its base. Depending upon your flight profile, a collective setting of **20** will produce a torque indication of 20. A collective setting of 5 will usually produce a torque indication of 75 and a collective setting of 0 will produce a maximum torque indication of 120.

In addition to the digital reading, there is a corresponding power bar which travels up and down the indicator stem. The small circle in the center of the indicator stem represents the amount of torque necessary to maintain a hover above the In Ground Effect (IGE) zone (below 50 feet). If the top of the power bar falls below the small circle, the helicopter will descend; not enough engine torque is being produced. Likewise, if the top of the power bar moves above the top of the circle, the helicopter will climb because excess torque is being produced. The helicopter will hover if the top of the power bar falls within the circle.



You'll notice that it is possible to over-torque the engine and exceed an indication of 100. While it is useful to over-torque in emergencies, it places stress on the engines. Eventually, the accumulation of stress will cause damage. The torque indicator will begin to flash red if an over-torque situation is getting ready to damage the engines. In addition to the flashing red symbology, you will also get a simultaneous audio alert. Once

you get these warnings you have only seconds to act. You must reduce your collective setting so that the torque indication falls below 100. Failure to act quickly will result in severe and permanent damage to the engines.

2. THE CYCLIC CONTROL

The purpose of the cyclic control is to tilt the rotation plane of the main rotor blades. By tilting the plane of rotation, you are able to direct (or vector) the lift being produced in a desired direction. The practical effect of the cyclic is to cause the helicopter to pitch and bank. Technically however, the cyclic pitches and banks the plane of the rotor blades and the helicopter just comes along for the ride.

Pitching the helicopter up or down changes the vector of the lift its rotor is producing. This causes the helicopter to move about the horizontal plane. There is some change in altitude associated with pitching and banking but the cyclic is primarily responsible for horizontal flight.

You could, if you wanted to, pitch the nose of your helicopter down and maintain a level flight profile. You could even gain altitude (while pitched nose down) because of your collective setting.

Dipping the nose of the helicopter will cause you to lose altitude but the trade-off is an increase in speed. Raising the nose of the helicopter will cause you to climb but there's a loss of speed associated with doing this. (Raising the nose even further causes you to begin backing up rather than climb.) You must use the cyclic in combination with the collective to maintain positive control over your flight.

As you can see by the diagrams, your main rotor directs thrust and lift perpendicular to its plane of rotation. When a helicopter is in vertical flight, thrust and lift are directed upward. It moves up or down based upon the amount of thrust and lift produced in relation to its weight and drag.

If the rotor is producing more thrust than the helicopter weighs, the helicopter rises. If the rotor produces less thrust than is needed to overcome its weight, the helicopter will descend. In a hover, the four forces (thrust, lift, weight, and drag) are kept in equal balance.

When your rotor is tilted forward, thrust and lift are being vectored up and ahead of the helicopter. This causes the helicopter itself to begin moving

forward but it does not necessarily mean that the helicopter will climb. The helicopter will begin to climb *only* if your collective is set to produce enough lift to overcome its weight. In the case of backward (or reverse) flight, the plane of the main rotor is directing thrust and lift above and behind the helicopter. This causes the helicopter itself to move backward.







Cyclic control is simulated by the use of a standard joystick. Moving the joystick left or right banks the helicopter accordingly. Pushing the joystick forward pitches the nose of the helicopter down while pulling back on the stick pitches the nose upward. If you do not have a joystick, you may use the directional arrow keys or the numbered keys on the numberpad.





Consult the readme file on your *Comanche Gold* CD for a complete set of programmable joystick files.

3. THE COMANCHE FANTAIL®

Newton's Third Law of Motion states that for every action there is an equal opposite reaction. Therefore, when the Comanche's engines are turning the main rotors in one direction, the fuselage wants to turn in the other. This natural tendency to turn in the opposite direction is known as *torque*. Torque must be controlled if the helicopter is to fly properly and not spin wildly like a mad top.

Like most helicopters, the Comanche uses a tail rotor to offset the effects of engine torque by generating counter-acting thrust. (The Comanche's tail rotor is a unique design trademarked as FANTAIL®) When balanced correctly (i.e. when tail rotor thrust and engine torque are equal) the helicopter will maintain a constant heading. When the two are out of balance, it will begin to yaw either left or right.

You can alter the amount of thrust produced by the tail rotor by using the , ,  and  keys.

	= looks left
	= centers view
	= yaws nose left
	= yaws nose right







Instead of using the keyboard commands, players with foot pedals may utilize them to control the tail rotor instead. To activate your foot pedals, select the *Enable Twisting Stick or Foot Pedals* option on the menu bar Control pull-down menu.



4. IN GROUND EFFECT (IGE)

One of the nice things you'll discover when flying the Comanche is the magic of IGE or In Ground Effect. When helicopters operate near ground level, the force of their rotor downwash cannot be fully dissipated. Think of the helicopter as resting on a cushion of air created by the force of its own rotors. The practical benefit to IGE is an increase in the amount of lift being generated by the rotors without requiring a corresponding increase in collective.

As a general rule, the effects of IGE only extend to about 50 feet above the surface. When you are within 50 feet of the ground, the lift benefit from IGE gives your Comanche a little extra "buoyancy". In most cases, this will be a good thing. You can travel at significant speeds over flat terrain using IGE and a healthy cyclic input. However, IGE is a detriment when you are trying to land because it makes the helicopter want to stay aloft and ride this cushion of air.






In order to land, you must first overcome the helicopter's natural tendency to want to float in its IGE cushion. Most of the time you'll wind up having to force it to touch down. The danger here is overcompensating and touching down too hard. The best way to avoid coming down too hard or too soon is to step the collective down in measured increments. Don't set the collective setting all the way to  or  right off the bat. Drop it down to  or  at first, then if necessary, reduce it further.

B. EXAMPLE OF HELICOPTER FLIGHT

Flying a helicopter is a study in management. Because flying a helicopter is so different than flying a fixed-wing aircraft, you will have to learn new ways of doing certain things. To help avoid the frustration that generally accompanies the learning process, the following section is a quick tutorial on performing certain basic operations.

1. STANDARD TAKE-OFF PROCEDURE

Taking off can be tricky, especially if there are ground obstacles in the way. Before taking off, you need to be sure that your rotors won't strike something inadvertently. Clipping a building or tree while taking off is not only embarrassing, it is also a good way to damage your aircraft and end a mission before it starts.

- a) Press the   key to start your engines, if they are not already turned On. You'll hear the engine crank up and begin turning the main and tail rotors. (This is known as *spooling*.)
- b) Allow time for the rotor to spool up to its proper operating speed. You'll see the engine torque begin to increase on the torque indicator.
- c) To take off, slowly add collective. Press the  key. This will cause the collective to produce slightly more lift than is necessary for an OGE hover. Depending upon outside conditions, your helicopter will rise straight up between 50 and 75 feet. At this point, you should be clear of ground obstacles.
- d) Gradually increase collective by pressing the  or  key. This will give you enough lift to begin your transition to forward flight without losing too much altitude. Push the cyclic stick forward to begin moving but keep an eye on your Rate of Climb indicator. If you start to lose altitude you can either add collective or back off on the cyclic.


When taking off, always consider your ground clearance. Ground obstacles such as trees, towers, or buildings represent a severe hazard. Even small gusts of wind can push your helicopter into something and at the very least, striking a ground object will damage your helicopter.

In diagram #1, the pilot has cut it close. By pushing forward on the cyclic too soon, he has barely cleared the tree in front of him. The pilot should have looked around before taking off and chosen a flight path away from ground obstructions if he needed to get off the ground in such a hurry. In diagram #2, the pilot has chosen to add collective, raising him above the obstruction before transitioning into forward flight.

Also important is the need to avoid over-controlling the helicopter by adding too much collective. A sudden burst of collective will cause you to pop up into view. The enemy just may spot you before you're ready to deal with them. Keep the helicopter under control at all times by using deliberate, measured command inputs.

2. FORWARD FLIGHT

In order to begin flying forward, you must pitch your main rotor so that the thrust and lift being produced are vectored to the rear. Changing the pitch of the rotors is a function of your cyclic control (the joystick or directional arrow keys).

- a) Gently push the joystick forward (or use the  key). This will pitch the plane of your blade rotation down in front and up in the back. Gradually, your helicopter will begin moving forward and picking up speed.
- b) Since less lift is being directed straight down, you will probably experience a loss in altitude. This loss in altitude will become more pronounced as the pitch angle increases. To correct this, assuming that you want to keep the helicopter at a level attitude, you can do one or two things. You can either add collective and maintain the pitch angle or you can reduce the pitch angle by easing back on the cyclic. You will go faster by maintaining the pitch and adding collective. Pulling back on the cyclic will stop the altitude loss but slow you down in the process.


- c) The more your helicopter blades are pitched forward, the more thrust they direct behind the helicopter. As more thrust is directed to the rear, the faster the helicopter is able to fly. To maintain level flight, find the proper mix of pitch angle and collective input.

Being able to balance the collective and cyclic controls is the secret to flying helicopters. It is this combination that allows you to control the forward speed of the helicopter. You must constantly monitor both your collective setting and cyclic input. Changing one will often cause you to have to adjust the other. This process of adjusting and re-adjusting will continue throughout the flight. This is one reason why flying a helicopter is so tiring.

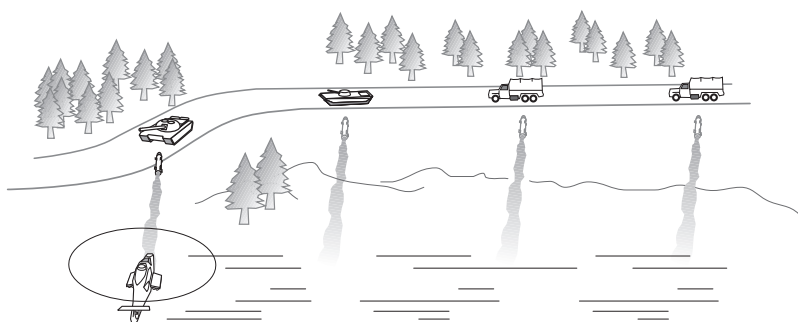
Remember, the collective control determines the amount of lift your blades will produce. The cyclic control just “tells” them where to send it.

3. REVERSE FLIGHT

Reverse Flight is unique to helicopters and difficult to do properly. Sometimes flying backward becomes necessary however, especially when you want to keep your eye on the enemy and back yourself out of an unpleasant situation.

- a) The biggest danger when backing up is inadvertently running into something solid—like a tower or a hillside. Before you do any reverse flying, check to make sure that you have sufficient room to maneuver.
- b) The explanation of forward flight in the previous example also applies to flying in reverse. As with forward flight, flying backward is a matter of directing thrust so that the helicopter moves in the direction you wish to go.
- c) Gently pull the joystick toward you (or use the  key). This will pitch the plane of your blade rotation up in front and down in the back. Gradually, your helicopter will begin moving in reverse. Since less lift is being directed straight down, you will probably experience some loss in altitude. In order to maintain your altitude, you will have to increase the collective input.

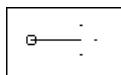
Visibility is a problem when flying in reverse. Try switching to a side view when backing up. At the very least, looking out the side of the helicopter will allow you to orient yourself with the ground.



4. LATERAL FLIGHT

Another unique thing about helicopters is their ability to fly sideways (try doing this in an F-16!). Flying sideways opens up a whole new range of tactical possibilities. Consider the utility of masking yourself by flying sideways along the crest of a ridgeline. Better yet: think of how devastating you would be flying sideways down a course parallel to a column of enemy vehicles. You could rake the entire column in a single pass.

- a) To begin flying sideways, you must first disengage the easy control *Fantail Mixed With Cyclic* option. (This option automatically inputs tail rotor control based on your cyclic input and makes it more difficult to perform lateral flight.)
- b) Start the maneuver from a neutral pitch hover. It will be difficult, if not impossible, to assume a lateral flight path if you start with some forward motion. Instead of flying sideways, the helicopter will want to turn.
- c) Use your cyclic control to bank the helicopter in the direction you wish to go. Be careful not to dip or elevate the nose. This will cause motion along the helicopter's longitudinal axis and make it turn rather than bank.
- d) Check the magnetic heading tape running across the top of your HMD. Keep the nose of the helicopter pointed at a constant heading while banking.
- e) Check your velocity vector. When you are flying laterally it will be stretched horizontally at either 90° or 270° .
- f) The groundspeed indicator will register your lateral speed as a positive number. It takes practice but soon you'll be flying laterally at speeds reaching 60 knots.




Flying sideways is one of the more exciting things to do in a helicopter. Just take a look at an external view next time you do it. Pretty cool... huh?

5. LANDING

Because every good mission must come to an end it's a good idea to know how to land. Like everything else about flying a helicopter, landing is tricky and takes concentration. A common error novice pilots make when trying to land is touching down too soon, before they're ready. Be sure that you have total control of the aircraft before setting down.

- a) The most important part of landing is remembering to extend your landing gear. If you touch the ground without having your landing gear down you will damage or destroy your helicopter. Check to see if your gear is down by looking for the word **GEAR** in the lower right corner of your HMD. You can also inspect the status of your gear by switching to an External view.

Your on-board computers will inform you when your gear is not properly deployed for landing. A **GEAR UP** warning will flash in the lower right corner of the HMD whenever you are less than 20 feet off the ground and traveling at less than 10 knots.

- b) Choose a nice level area to set the helicopter down. Although a heli-pad is best, you can land just about anywhere as long as it's reasonably flat. Use your MFD landing map view to check out the terrain below.
- c) Approach the area from a point downwind so that you are facing into the wind during the landing procedure. (To check wind direction, see which way the wind-sock is blowing. You want the trunk of the sock blowing directly at you.)
- d) Gradually slow the forward momentum of the helicopter by pulling back slightly on the cyclic control (joystick or  keys). You want to end up in a neutral pitch position with the nose of the helicopter aimed at the dashed horizon line.
- e) Simultaneously, reduce the collective so that you are not gaining altitude while pulling back on the cyclic.
- f) Maintain a heading toward your intended landing site while continuing to reduce your airspeed. Ideally, you want to transition into a hover directly over the point where you want to land.
- g) Enter a hover over your landing spot. Gradually reduce your collective so that you slowly begin to lose altitude. You should be dropping at no more than 5 feet per second. As you near the ground, the In Ground Effect will cushion your descent. Reduce your collective in increments until you once again begin settling.

Landing Symbolology: When you are in the process of landing at a FARP or any raised landing site, your HMD generates landing symbology. This symbology is designed to assist you in performing precision landings. In order for the symbology to appear, you must be traveling at less than 10 knots at an altitude of 25 feet or less.






As you approach the landing site, a small square box (dashed lines) appears on your HMD with a larger (solid line) circle surrounding it. The box represents the dimensions of the landing site, while the circle represents your distance from its exact center. The closer you get to the center of the landing site, the smaller the circle becomes.

It will equal the rectangle in size just about the time your helicopter reaches the outer edge of the landing site. As you can see in the diagram above, the pilot is just about at the outer edge of the landing site.

The circle will continue to get smaller until it becomes a mere pin-point. This indicates that your helicopter is positioned directly over the center of the landing site. (You can verify this with a quick look at an external view or by cycling a MFD to a landing map mode.)


C. KEYBOARD COMMAND EQUIVALENTS


Although we believe that using input devices like a joystick, throttle, and foot pedals will enhance your enjoyment of the game, *Comanche Gold* can be played entirely from the keyboard. It may not seem as “real” to you but it can be done.


Even if you are using one or more input devices, it is still necessary to issue some commands using the keyboard. Most command functions require you to only press a single key. There are some, however, (particularly player view controls) that require you to hold down two keys at the same time. These commands will be noted by listing the modifier first (such as the , , or ) then the function key. For example, to access the Letterbox view you must hold down the  and  keys simultaneously.


1. General Simulation Controls



The following keys are general simulation controls:

Menu Bar  : This key gives you instant access to the menu bar with its five pull-down menu topics.

Pause  : This key freezes the simulation in progress. Press the key a second time to resume play.


Help  : This key displays a summary of all the various command keys on screen. The summary remains in view only as long as this key is held down.




End Mission  : Upon completing your mission goals you are prompted to press this key to end your mission.


Enter Mission Replay   : This key allows you to reenter the game when viewing it via mission replay.


2. Player Views


Comanche Gold comes with a number of different pilot and camera angles that allow you to see the action from almost every conceivable vantage point.




Forward Cockpit View  : The Forward Cockpit View is the standard look outside the helicopter from the front seat of the helicopter. This view allows you to see the terrain in front of you while keeping an eye on your two cockpit multi-function displays (MFDs).




Full Screen View  : The Full Screen View removes the cockpit obstructions from the Forward Cockpit View. Your HMD symbology is superimposed over a forward looking view of the terrain. You can rotate this view by simultaneously holding down the  key and a  key.




Left Cockpit View  : The Left Cockpit View shows the view of the pilot when looking out of the cockpit to the left.


Right Cockpit View  : The Right Cockpit View shows the view of the pilot when looking out of the cockpit to the right.


Fly-By CAM  : The Fly-By CAM shows an external view of your Comanche as you fly by a fixed point in space.



External Chase View  : The External Chase View looks at the outside of your Comanche from a position directly to its rear (i.e. its six o'clock position). This camera view can be rotated through a limited range of motion by simultaneously holding down the  and a  key.




Left MFD Close-up View  : The Left MFD Close-up View enlarges the left MFD to a full screen size. You may use the  and  keys to Zoom In and Zoom Out eligible MFD modes.







Right MFD Close-up View  : The Right MFD Close-up View enlarges the right MFD to full screen size. You may use the   keys to Zoom In and Zoom Out eligible MFD modes.



Enemy View  : This unique view gives you a chance to see yourself from the enemy's perspective. In order to use this view you must first target an enemy object (aircraft, ground vehicle, or structure). A camera is placed behind the targeted object looking in the direction of your helicopter. The camera moves so that both you and the object remain in view.



Your View of Enemy  : This is another unique external view. It gives you an external perspective of both yourself and a targeted object. In order to use this view you must first target an enemy object (aircraft, ground vehicle, or structure). A camera is placed behind your helicopter looking in the direction of the target. The camera angle moves so that both you and the object remain in view.


Team Mate View  : The Team Mate View gives you a chance to see the battle from the front seat of your Team Mate's helicopter. This view is exactly like your own  key full-screen view except that it is viewed from your wingman's perspective, not your own.


External Team Mate View  : The External Team Mate View looks at the outside of your Team Mate's helicopter. This camera perspective can be rotated through a limited range of motion using the  and  keys.


F2/F6 View Camera Motion   : You may rotate the Full Screen View  and External View  camera angles. Simultaneously hold down the  key along with a  key to move the camera in the desired direction.




Spin Cam   : Spin Cam is an external view which slowly rotates 360° around your Comanche.


Letterbox View   : The Letterbox View minimizes the screen into Letterbox format.


Full Screen Left View  : The Full Screen Left View gives you a full screen size Left Cockpit View.


Full Screen Right View  : The Full Screen Right View gives you a full screen size Right Cockpit View.


Drop CAM View  : The Drop Camera View gives you an external view of your helicopter from the perspective of a camera that is placed on the ground in front of you.

External Front CAM  : The External Front View looks at the outside of your Comanche from a position directly in front (i.e. its twelve o'clock position). This camera perspective can be rotated through a limited range of motion by simultaneously holding down the  and a  key.

Missile View  : The Missile perspective gives you an external look at your missiles as they fly toward your targets.


External 3/4th CAM  : This key gives you a 3/4 external view of your Comanche.


Optical Zoom In  : This key allows you to Zoom In any optical cockpit view.


Optical Zoom Out  : This key allows you to Zoom Out any optical cockpit view.


3. PRIMARY FLIGHT CONTROLS



The following keys are considered to be Primary Flight Controls. They deal directly with controlling the motion of your helicopter through space. After a few games of *Comanche Gold* you should attempt to have these keys memorized. Knowing these keys instinctively will cut down considerably on your reaction time to threats or emergencies.



Start/Stop Engine  : This toggle turns your engine On and Off. Obviously, the engine must be On in order to start spooling the rotors. At the beginning of every mission, your engines will be turned on for you automatically.

Full Collective  : This key instantly sets your collective to 100 or full collective output. At this setting, your collective results in a reading of approximately 120 on the torque indicator.

Set Collective Increments  : These keys allow you to set the collective output in increments from 10 to 90. A collective setting of 5 will result in reading of approximately 75 on the torque indicator.




Normal Collective Setting  : This key instantly sets your collective output to 5. This is the collective setting most commonly used for flight operations.


No Collective  : This key sets the collective output to 0. A collective setting of  will normally result in reading of 20 on the torque indicator.


Momentary Maximum Collective  : This key is used to increase your collective setting to 100 for as long as this key is held down. Once you release the key, the collective returns to its previous setting. You may also use the  key on the keypad to perform this function.


Momentary Minimum Collective  : This key is used to decrease your collective setting to  for as long as this key is held down. Once you release


the key, the collective returns to its previous setting.


Cyclic Control    : These keys are used to pitch and bank your helicopter. They are the equivalent of using a joystick to input cyclic commands.


Tail Rotor Left  : This key causes the nose of the helicopter to yaw to the left by decreasing the amount of thrust being produced by the tail rotor. It is the keyboard equivalent of foot pedal input.

Tail Rotor Right  : This key causes the nose of the helicopter to yaw to the right by increasing the amount of thrust being produced by the tail rotor. It is the keyboard equivalent of foot pedal input.

Limit/Full Cyclic Range  : This key acts as a toggle to override the currently selected cyclic option. If you are flying with the *Limit Cyclic Range* option activated, holding this key down will allow you to make extreme pitch and bank maneuvers. If you are flying with the *Limit Cyclic Range* option off, holding this key down will limit the range of your cyclic controls.


Lock Current Altitude  : Pressing this key locks your helicopter at the current altitude. The Comanche will automatically adjust the collective in an attempt to maintain the current altitude. If you manually change the collective using either the keyboard or other controller, altitude lock will be turned off.


Altitude Lock  : This toggle activates/deactivates the altitude lock feature. When this option is activated, you see a red tick mark (V-STAB indicator) on the analog altimeter. (See the *Advanced Flight Model* section in chapter 2 for details.)


HoverHold  : This toggle activates the HoverHold mode and symbology. In order to engage HoverHold you must be traveling less than 10 knots and refrain from giving the helicopter collective input. (See the *Advanced Flight Model* section in chapter 2 for details.)


4. KEY PAD FLIGHT CONTROLS


The keyboard has been set up so that many of your flight controls are controlled by duplicate sets of keys. The following keys are located on your keypad and correspond to many of the primary flight control keys listed previously.







Normal Collective Setting  (key pad) : This key instantly sets your collective output to 5. This is the collective setting most commonly used for flight operations.


Max Collective  (key pad) : This key instantly sets your collective to 100 or full collective output. At this setting, your collective results in a reading of approximately 120 on the torque indicator.


No Collective  (key pad) : This key sets the collective output to 0. A collective setting of num lock will normally result in reading of 20 on the torque indicator.


Momentary Maximum Collective  (key pad) : This key is used to increase your collective setting to 120 for as long as it is held down. Once you release the key, the collective returns to its previous setting.

Momentary Minimum Collective  (key pad) : This key is used to decrease your collective setting to zero for as long as it is held down. Once you release the key, the collective returns to its previous setting.

Cyclic Control   ÷     (key pad) : These keys are used to pitch and bank your helicopter. They are the equivalent of using a joystick to input cyclic commands.


Tail Rotor Left  (keypad): This key causes the nose of the helicopter to yaw to the left. (It decreases the amount of thrust being produced by the tail rotor.) It is the keyboard equivalent of foot pedal input.


Tail Rotor Right  (keypad): This key causes the nose of the helicopter to yaw to the right (It increases the amount of thrust being produced by the tail rotor). It is the keyboard equivalent of foot pedal input.


Fire Weapon  (key pad): Pressing this key fires one round (or burst) of the weapon that is currently in priority.


5. SECONDARY FLIGHT CONTROLS


These keys are considered Secondary Flight Controls. They do not impact the actual flight maneuvering of the helicopter yet they do control the functions of important cockpit avionics.


Bay Doors  : This toggle opens and closes your bay doors. Leaving your bay doors open makes it easier for the enemy to detect you. Your bay doors open automatically when you launch a weapon that is stowed internally. The status of your bay doors is shown in the lower right hand corner of your HMD. When the word BAY appears, the doors are open. Bay doors do not automatically retract after launch. You must close them manually.

Landing Gear  : This toggle extends and retracts your landing gear. Leaving your landing gear down makes it easier for the enemy to detect you. Touching the ground when your gear is retracted will result in damage to the aircraft. The status of your gear is shown in the lower right hand corner of your HMD. When the word **GEAR** appears, the landing gear is extended.

Cycle Waypoint  : This key cycles through all your current navigational waypoints. Your currently selected waypoint appears in the upper left corner of the HMD. You are shown the distance to the waypoint (in feet) along with a brief text description.

Cycle HMD Detail  : This key cycles through the four HMD information levels: 0-3. Higher information levels display greater amounts of HMD symbology (See chapter 5: *Flight Avionics* for more detail on the HMD).

Cycle HMD Color  : This key cycles through the HMD colors. Use these colors as appropriate to increase/decrease the color contrast and better your HMD visibility.



Cycle Map Mode  : This key cycles through the three map modes shown on the Tactical Situation Display.


Map Zoom Out  key: This key *Zooms-Out* the TSD map screen.

Map Zoom In  key: This key *Zooms-In* the TSD map screen.

6. TARGETING CONTROLS

The following keys are used to activate the various modes of targeting. General information concerning targeting and target modes is contained in the *Targeting Procedures* section of chapter 5: **Flight Avionics**.


Cycle Targets   : Either of these keys allows you to designate a target for your weapon systems (i.e place a TD box around a target). Pressing this key additional times will cycle through a complete list of eligible targets. Target eligibility is determined according to your targeting mode.

Change Target Mode  : This key allows you to toggle between Cycle and Priority modes.

TRGT Hold  : This key switches your targeting mode to Hold.



TRGT Cycle  : This key switches your targeting mode to Heading.



TRGT Priority  : This key switches your targeting mode to Priority.



Break/Delete Target Lock  : This key is used in conjunction with the Hold targeting mode. It breaks your TADS lock on a currently selected target. This key is also used to delete targets from your Hold target list.



7. WEAPON CONTROLS



The following keys are used to control your various weapon systems. Once you have designated a target, these keys are used to place one of your weapons “in priority”, then fire it.



Fire Weapon  : Pressing the spacebar key fires one round (or burst) of the weapon that is currently in priority. You may also fire your weapons using the  key on your keypad.

Cycle Weapon Selection   : These keys allow you to cycle (forward and backward) through your weapon systems.

Select Cannon  : This key places your 20 mm chain gun in priority. Gunfire is effective against all targets. Pressing the  or appropriate joystick trigger will fire one burst of 20 mm ammunition.


Select Rocket  : This key places your Hydra-70 FFAR rockets in priority. These rockets are best used against unarmored targets like ground troops and wooden structures. Pressing the  or appropriate joystick trigger will launch one 70 mm rocket.


Select Hellfire  : This key places your Hellfire missiles in priority. Hellfires are best used against armored vehicles or hardened structures. They can be used against any target, however, including air targets. Pressing the  or appropriate joystick trigger will launch one AGM-114 Hellfire missile.

Select Stinger  : This key places your Stinger missiles in priority. Stinger missiles are best used against air targets. Pressing the  or appropriate joystick trigger will launch one AIM-92 Stinger missile.



Artillery  : This key sends a fire mission request to a nearby artillery





battery. Designate a target, press this key, then sit back and watch the rounds begin to fall.





Team Mate Targeting  : This key allows you to send targeting hand-off commands to your Team Mate (wingman). See the *Using your Team Mate* section in chapter 5 for details.

Team Mate Orders  : Press this key to specify standing orders for your Team Mate.

8. MULTI-PLAYER MODE

Cycle View of Other Players   : Press this key to cycle through the current views of the other players. This key allows you to see through the eyes of the other players. The name of the player you are currently remote viewing through is indicated on-screen. This feature is only available in multi-player Co-op mode. (Refer to the *Multi-player* section in chapter 6 for more details.)

Player View   : This key instantly returns the screen back to your player view rather than having to use the  and  keys to cycle back. (Refer to the *Multi-player* section in chapter 6 for more detail.)

Chat Mode  : This key activates Chat Mode and allows you to send text messages between players. Simply press this key then type in your message. Press  to send the message,  to cancel, or use the  key to erase the message and start over (Refer to the *Multi-player* section in chapter 6 for more details).





FLIGHT AVIONICS

In the preceding chapter you learned a little about flying the Comanche. Now that you are somewhat familiar with its handling, the next step in your training program is to learn about its avionics and weaponry. In other words, now that you know how to fly, it's time to learn how to fight.

This chapter begins with a detailed look at your Helmet Mounted Display (HMD) and Multi-function Displays (MFDs). You'll be briefed on the different levels of HMD symbology as well as the various MFD modes of operation. The chapter concludes with a section on targeting and a primer on how best to manage your weapon systems.

A. THE HELMET MOUNTED DISPLAY

One of the truly amazing pieces of equipment to emerge in recent years is the Helmet Mounted Display (HMD). When flying the Comanche, the HMD is your primary method of acquiring flight and weapon system information. Rather than having your eyes chase around the cockpit looking at a bunch of instruments, the HMD collects the information and places it right in front of you—on your helmet visor. This takes the work load off of you and frees you up to do other important tasks.

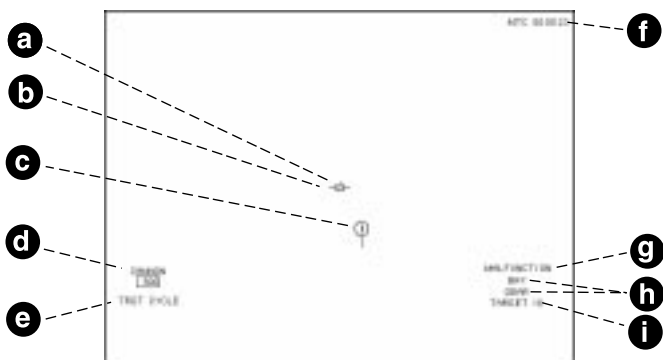
The HMD has a tendency to get cluttered at times so the symbology is displayed in four different levels of detail (0, 1, 2, and 3). These levels can be changed pressing the *Cycle HMD Detail*  key. By pressing the  key, you are able to cycle through all the detail levels and stop at the level you wish to display.

1. LEVEL 0 HMD SYMBOLOGY

At this level of detail, you receive no HMD generated symbology. The zero level of detail essentially turns off your HMD. Your MFDs continue to function normally, however. If you're just into the scenery and not too worried about where you're going, this is the detail level for you. Switch to a full screen view, crank up some tunes, and enjoy the flight. Uncle Sam is paying for it.

2. LEVEL 1 HMD SYMBOLOGY

This first level of detail gives you minimal navigation and weapon targeting symbology. Although this amount of detail is less than ideal, you can certainly accomplish your mission using only this information. But stick close to your waypoints. Without all the usual navigation information, you're liable to get lost.



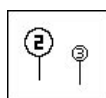
a) Gunsight Pipper: The gunsight pipper is the aiming point in space for your 20 mm gun. If nothing is currently targeted, the gun automatically aims directly forward so that the pipper symbol overlaps the pitch indicator.



b) Pitch Indicator: The Pitch Indicator shows where the nose of your helicopter is pointing relative to the horizon.



c) Waypoint Stakes: Waypoint stakes are visual references indicating the location of your navigational waypoints. They are sometimes referred to as “lollipops” because of their appearance. Each waypoint stake is given a reference number corresponding to its position in the navigational sequence. Only two waypoint stakes will appear on the HMD at any given time. The larger of the two stakes is the next point in your waypoint sequence (i.e. the one you are currently heading toward).



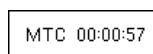
d) Weapon In Priority (WIP) Indicator: The Weapon In Priority (WIP) indicator is located in the lower left of your HMD. It indicates the weapon you currently have selected to fire (i.e. placed “in priority”). Your WIP options are: *Cannon, Rockets, Stingers, Hellfires, Artillery, and Teammate Hand-Off*. The number of remaining rounds for each weapon is displayed in the rectangular box.



e) Targeting Mode Indicator: The Targeting Mode Indicator is located in the lower left corner of the HMD directly beneath the WIP Indicator. It indicates your currently selected targeting mode; Hold, Cycle, or Priority. Refer to the *Targeting Procedures* section (in this chapter) for more information on the various targeting modes.



f) Mission Time Code: This digital readout in the upper right corner of the HMD displays your total elapsed mission time (hours:minutes:seconds). The clock starts ticking as soon as the mission begins. If you choose to spend mission time dragging your feet on the ground, it's up to you.



g) **System Damage Indicator:** The Comanche is equipped with a system that constantly monitors the helicopter looking for damage. If any of your flight systems have sustained damage, the word **MALFUNCTION** appears in this spot on the HMD. For more specific information on damage, refer to the MFD Systems Damage display.



h) **Bay Door/Landing Gear Indicators:** The word BAY appears in the lower right corner of the HMD when your bay doors are open. The word GEAR appears when your landing gear is extended. Pay attention to these indicators. Having your bay doors open and/or your landing gear extended makes it easier for the enemy to detect you. The warning message GEAR UP appears here as a reminder to extend your landing gear if you try to land with your landing gear retracted.

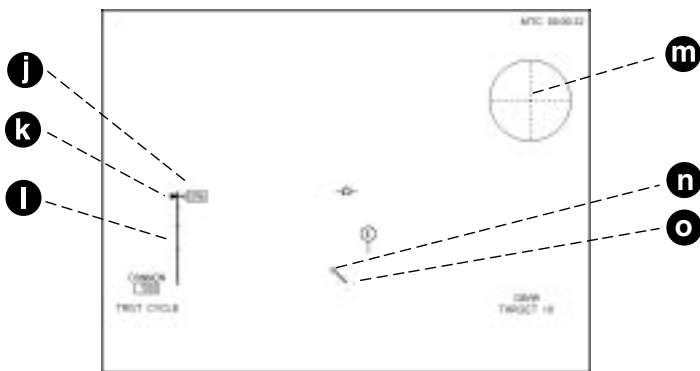


i) **Targets Remaining:** The Target Indicator is located in the lower right corner of the HMD. The number to the right of the word Target indicates the remaining number of goals (targets) you need to destroy before successfully completing the mission.



3. LEVEL 2 HMD SYMBOLOGY

This second level of detail adds some of the symbology associated with your altimeter group. It also adds a Threat Display in the upper right corner.

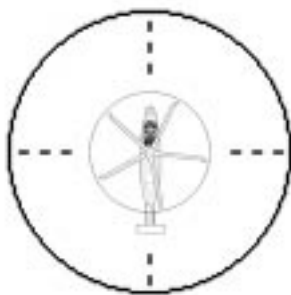


j) **Digital AGL Altimeter:** The digital AGL (Above Ground Level) altimeter indicates your current altitude above ground level up to a maximum of 500 feet. Altitudes higher than 500 feet AGL do not register and cause the scale to peg on a reading of 500.

k) **Altitude Lock:** Altitude Lock functions as kind of an altitude cruise control. It automatically maintains the helicopter at any altitude you set. The tick mark located on the analog AGL altimeter gives you a visual indication of the altitude currently being maintained.

l) Analog AGL Altimeter: This unmarked vertical scale in the lower left corner of the HMD displays your altitude above ground level (AGL) in increments of 100 feet. The bottom of the scale represents 0 feet (i.e. ground level). The top of the scale represents 500 feet. Altitudes higher than 500 feet do not register on this scale.

m) Threat Display: The Threat Display is situated in the upper right corner of the HMD. This circular display is sometimes referred to as a *God's Eye* view because it gives you a 360° look around your helicopter. It is the same view one would get if they were able to view the battle from directly above. Your helicopter is always situated at the center (at the intersection of the *crosshairs*). The radius of the Threat Display is approximately one kilometer (1,000 meters).



With the exception of mission goals, only friendly and enemy military objects appear on the situation display. Basically, if something can shoot at you it will show up. Inanimate objects such as buildings or bridges do not show up unless they are mission goals. The objects which appear on this display are color coded so that you can distinguish them from one another.

- **Blue dots:** these represent your Teammate in Single Player mode or other human players in multi-player mode.
- **Green dots:** these represent friendly air and ground objects.
- **Red Dots:** these represent enemy aircraft (helicopter or fixed-wing) objects.
- **Yellow Squares:** these represent enemy ground objects.
- **Orange circles:** these represent enemy objects that have to be destroyed to satisfy the mission's victory conditions (goals).

Enemy objects appear and disappear on the Threat Display according to your ability to spot them. You must have a direct line-of-sight (LOS) between you and the object in order to detect it. If your LOS to an object is blocked, that object will not appear. Once your LOS to the object is restored, that object will once again appear on the display.

For purposes of discussion, enemy objects include aircraft, ground vehicles, structures, etc. Friendly objects that appear on the Situation Display include aircraft and ground vehicles. Friendly structures do not appear.

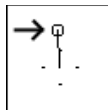
On some missions, you will have the help of a friendly JSTARS (Joint Surveillance Target Attack Radar System) aircraft. Targets detected by the JSTARS aircraft will be displayed regardless of the LOS between you and them. You will be informed during your pre-mission briefing if a JSTARS is present.

The Threat Display also functions as a threat detection and warning system. When you are being targeted by an enemy object (either by laser

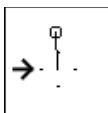
or radar), the Threat Display draws a red target designation line between you and that enemy object. The enemy will attack you as soon as you come within range of its weapons.

In addition to the red target designation line, a flashing red circle will appear inside the Threat Display. Along with these visual cues, you will also receive an audio warning whenever you are being designated by an enemy object.

- n) Velocity Vector:** The Velocity Vector is located in the center of the HMD directly underneath the pitch indicator. This symbol consists of a thin line which varies in length according to how fast the helicopter is traveling and points in the direction your helicopter is traveling. The faster you fly, the longer the line will stretch. The small circle at the tip of the velocity vector is referred to as the Acceleration Cue.

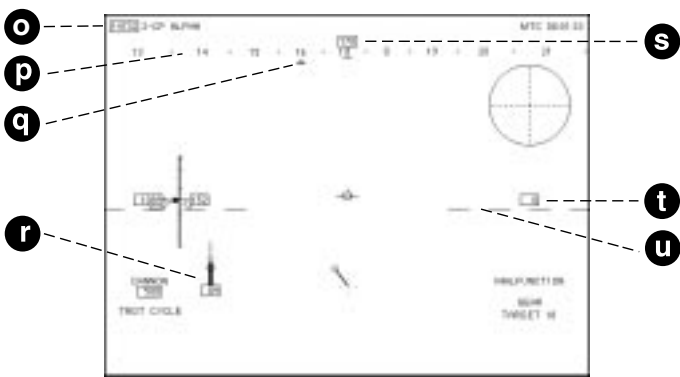


- o) HoverHold Envelope:** The HoverHold Envelope is located directly below the Pitch indicator. It consists of four dots arranged in a diamond shape. When the Acceleration Cue (the small circle at the end of the velocity vector) falls within these four dots, the HoverHold is automatically engaged.



4. LEVEL 3 HMD SYMBOLOGY

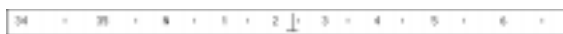
This level of detail represents the highest level of symbology available in the simulation. You receive everything an actual Comanche pilot would see on a real mission.



- o) Waypoint Indicator:** The waypoint indicator displays your currently selected waypoint along with a brief description. The number in the rectangular box represents the waypoint's distance from your present location (in feet). Use the **[W]** key to cycle through the waypoint sequence.

15654 2-RELEASE POINT

- p) Magnetic Heading Tape:** The magnetic heading tape runs across the



upper edge of your HMD. Think of it as a linear compass which is able to scroll left and right. The tick marks indicate the compass direction in which you are currently looking. Each tick mark represents a change of 10° . The final zero has been left off so that an indication of 27 actually means that you are looking directly west (270°). A reading of 6 indicates a compass direction of 60° . The letters N,S,E,W (north, south, east, and west) are used instead of their respective compass headings (360, 180, 90, and 270°).

- q) Waypoint Caret:** The waypoint caret is an inverted V shaped symbol which appears beneath the magnetic heading tape. Its position on the tape indicates the bearing of your currently selected waypoint. If this waypoint is located on a bearing outside the limits of the tape (as viewed on the HMD), the caret will peg on the side of the tape closest to the selected waypoint bearing.



- r) Torque Indicator:** The Torque Indicator gives you a visual reference as to the amount of torque being produced by the engines. It is indirectly tied to the collective control. The more collective input you give the main rotor, the greater the amount of torque produced by the engine.

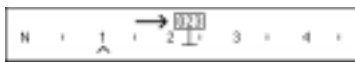


The number inside the rectangular box at the base of the torque indicator (84: in the example) is the percentage of engine torque output. The thick power bar which goes up and down the central stem of the indicator also displays engine torque.

The small circle in the middle of the indicator stem represents the amount of engine torque required to maintain an OGE (Out of Ground Effect) hover. When the tip of the power bar is positioned inside the confines of the circle, the helicopter will hover. If the power bar extends up the stem above the circle, the helicopter will climb; below the circle, the helicopter will descend.

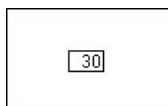
The cross bar intersecting the indicator stem represents an engine torque output of 100. You'll notice that the stem continues past the 100 mark. This is because it's possible to over-torque the engines up to a maximum output of 120; although doing so risks over-stressing and subsequently damaging the engines.

- s) Heading Indicator:** The Heading Indicator is a rectangular box with an inverted T extended below it. It is located in the center of the magnetic heading tape. The number inside the rectangular box is the current compass heading (in degrees) of your helicopter.



The number inside the Heading Indicator represents the direction that the helicopter is pointing. The magnetic heading tape represents the pilot's 80° field of view (i.e. the facing of the pilot).

- t) **Groundspeed Indicator:** The Groundspeed Indicator shows how fast your helicopter is traveling over ground: forward, backward, or sideways. The indicator displays your speed in knots or nautical miles per hour. (A nautical mile is equal to 6,076 feet.) All values are positive, so you must know your direction of travel. Flying backwards or sideways still registers as a positive number.

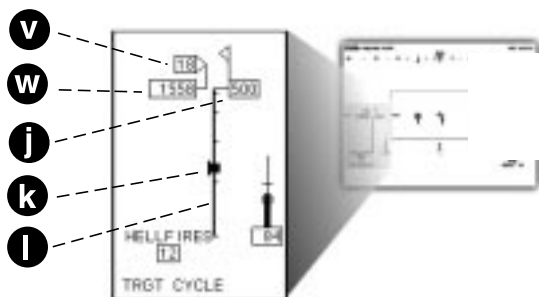


- u) **Horizontal Situation Indicator (HSI):** The HSI is a series of dashed lines which indicates the approximate position of the horizon in relation to the pitch and bank of your helicopter.



5. THE ALTIMETER GROUP

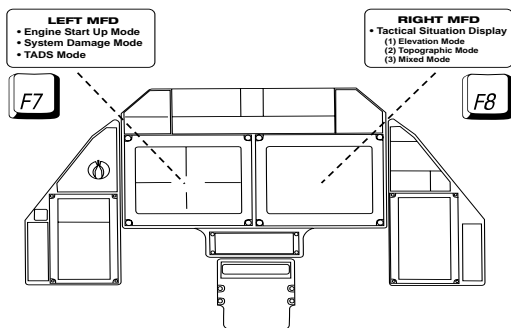
The Altimeter Group is shown here in expanded format because of the density of information conveyed in this diagram.






- v) **Rate of Climb Indicator:** The Rate of Climb (ROC) Indicator is a digital readout which displays the rate at which your helicopter is changing altitude. Altitude changes are displayed in feet per second. When the helicopter is climbing, the ROC box is located above the digital ASL altimeter readout. It will be located beneath the digital altimeter readout if the helicopter is losing altitude.
- w) **Digital ASL Altimeter:** The digital ASL (Above Sea Level) altimeter indicates your current altitude in feet above sea level.
- j) **Digital AGL Altimeter:** See Level 2 HMD symbology for description.
- k) **Altitude Lock:** See Level 2 HMD symbology for description.
- l) **Analog AGL Altimeter:** See Level 2 HMD symbology for description.

B. MULTI-FUNCTION DISPLAYS (MFDS)

In addition to the information contained on your Helmet Mounted Display (HMD), you have access to two cockpit multi-function displays (MFDs). As the name suggests, each of these displays has a number of different operational modes. These modes provide you with critical flight data and can help increase your situational awareness.



1. VIEWING THE MULTI-FUNCTION DISPLAYS

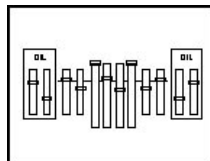
To view the MFDs, press the  key to access the Forward Cockpit View. The MFDs are the two monitors situated side-by-side on the cockpit console. You can view your MFDs from this vantage point but they are small and sometimes hard to read when a lot of action is going on. To make them easier to see, your MFDs can be enlarged to a full screen size. Press the  key to enlarge the left MFD or  key to enlarge the right MFD.

2. DISPLAYS AVAILABLE ON THE LEFT MFD

The left MFD defaults to a wire-frame view of the Comanche. This view is known as the System Damage Mode. It is used to keep an eye on the level of damage your helicopter has sustained thus far. System Damage Mode is replaced by an optical or thermal image whenever the TADS is designating a target.

a) Engine Start-Up Display Mode

The left MFD automatically switches to the Engine Start-Up Display mode whenever the engine is turned On or Off. This display allows you to monitor the initial RPM and manifold pressure indicators. You cannot interact with this display in any way other than to view it. The Engine Start-Up display is included on this MFD for representational purposes only.



b) System Damage Mode

The level of design sophistication in the Comanche is evident by its internal damage monitoring system. Damage is recorded, evaluated and sent to a central processor. It is then displayed graphically on either MFD.

To monitor your system damage, cycle the desired MFD to System Damage Mode. System Damage Mode displays a wire-frame profile view of your Comanche. It will appear in *green* at the start of each mission when “all things are go.” As individual systems are damaged or destroyed, the wire-frame parts corresponding to the affected system will change colors.

Partial damage

Component systems which have suffered partial damage are displayed in *yellow*. These systems continue to operate at full capacity. However, they are easily destroyed if forced to sustain additional damage in the future.

Critical damage

Systems which have sustained critical damage are displayed in *red*. These systems will only function intermittently or not at all.

The component systems susceptible to damage are:

System	Critical Damage effects
Tail Rotor	: rotor imbalance causes flight control problems
Engine	: loss of power in affected engine
Sensors	: intermittent failure to acquire targets
Cannon	: intermittent cannon stoppages
Main Rotors:	rotor imbalance causes severe flight control problems
Landing Gear:	gear jams in current position, will not retract or extend

c) Target Acquisition and Designation System (TADS) Mode

The Comanche is equipped with a comprehensive Target Acquisition and Designation System which goes by the acronym TADS. The TADS uses an array of sensors located in the nose of the helicopter. During daylight, you acquire targets using a highly magnified electro-optical (television) system. At night, you acquire targets using a second generation thermal imaging system known as a FLIR (Forward Looking InfraRed). Day or night, the TADS targeting and imaging information can be displayed on either MFD.

TADS Mode is only available if you have a target designated (i.e. you have an target inside a Target Designator Box). Once a target is designated, its image will appear on your left MFD.

Along with a close-up image, TADS Mode also determines your range (in feet) to the designated target and displays this information along the top of the MFD. There's something unnerving about viewing a target via the TADS and seeing it point its gun in your direction.

3. Tactical Situation Display (TSD)

The only display mode to appear on the right MFD is the Tactical Situation Display (TSD) Mode. This mode is a state-of-the-art digitized navigation map which also shows the location of friendly and enemy objects.

Your helicopter is always placed in the center of the TSD so that you get a 360° representation of the terrain and tactical situation around you. The TSD rotates so that no matter which direction you are heading, the nose of your helicopter (your 12 o'clock position) is oriented toward the top of the display.

a) Tactical Situation Display Modes

The TSD is divided into three separate mapping modes: *Elevation Mode*, *Topographic Mode*, and *Mixed Mode*. You can cycle between the modes using the I key.

(1) Elevation Mode

Elevation Mode is a three-color representation of the terrain surrounding your helicopter. The main purpose of this map is to keep you from running into the ground during periods of low (or no) visibility. It color codes the surrounding terrain based upon its elevation in relation to your current altitude. This allows you to see at a glance whether a particular terrain feature constitutes a hazard to safe navigation.

This mode color-codes the navigational map using the same colors as a regular traffic signal: stop on red, slow on yellow, and go on green.

Red: indicates a piece of terrain which is higher than your current altitude. You should stop before entering such an area otherwise you WILL crash. Either go around these terrain features or increase your altitude and fly over them.

Yellow: indicates a piece of terrain which is slightly lower but generally approximates your current altitude. This terrain is navigable but you should proceed with caution. Man-made objects such as buildings or towers do not show up on this map. Therefore, you could conceivably smack into one of these objects even though on the elevation map everything looked good.

Green: indicates a piece of terrain which is lower than your current altitude consequently you are free to fly over this terrain without worrying about crashing. Again, man-made objects such as buildings or towers do not show up on this map. Normally, these objects will not present a hazard to navigation if located on a patch of green terrain.

(2) Topographic Mode

Topographic Mode displays the surrounding terrain in its normal colors. It is useful for determining terrain contours and topographic relief.

(3) Mixed Mode

Mixed Mode is merely a combination of the other two map modes. Color-coded Elevation Mode information is placed over the topographic Mode relief map. Not only do you see the terrain contours, you see the elevation of the terrain in relation to your altitude.

b) Tactical Situation Display (TSD) Symbolology

The TSD uses various symbols to represent objects in the “world” around you. It also uses color to assist you in distinguishing friend from foe.

(1) TSD Symbols

-----: represents a direct path to your currently selected waypoints



: a waypoint, number indicates the waypoint's position in the mission sequence



: represents static structures and objects which do not constitute a threat to your helicopter. Naval vessels are also represented by this symbol. While they do pose a threat, they are easy to distinguish. Few other structures represented by this symbol float.



: represents an armored vehicle such as the M1A2, T-80, or BMP.



: represents fixed wing aircraft such as the A-10 or Su-25.



: represents helicopters such as the RAH-66, Ka-50, or Apache.



: represents fixed anti-aircraft artillery positions.



: represents SAM missile systems including the 2S6M, SA-9, and SA-2.



: represents a FARP (Forward Air Rearing Point).

Objects which are moving have "lead lines" extending from their symbol. The lead lines point in the direction that the object is moving. The longer the lead line, the faster the object is moving.

(2) TSD Color Coding

White: neutral or static objects such as buildings, towers, etc.

Blue: your Teammate or other human players (in multi-player play)

Green: friendly objects

Red: enemy air objects

Yellow: enemy ground objects

Orange: objects that have to be destroyed for mission victory

C. TARGETING PROCEDURES

Though the TADS sensors are sophisticated, they are also designed to be easy to use. Basically, engaging a target is a three step process. All you need to do is remember "the three Ds" as outlined below:

• Target Detection

Obviously, knowing where the enemy is located is very important. You can't take action against hostile targets until you find them so your first step in the targeting procedure is always target detection. Fortunately finding targets in a Comanche is not difficult. Your primary means of



target detection are the “God’s Eye” Threat Display (with its LOS and JSTARS object spotting) and the Tactical Situation Display information (shown on your MFD). Enemy objects appear as colored dots on the Threat Display and as individualized symbols on the TSD.

• Target Designation

Now that you know enemy targets are out there— the next step is to designate them (i.e. point them out) for your weapon systems. The Comanche uses its Target Acquisition and Designation System (TADS) to designate or *acquire* targets. (Target designation is also referred to as *target acquisition*.)

To designate a target, simply press the Designate Target (Enter or Caps) key. A Target Designator (TD) box will now appear around an eligible target according to your targeting mode. (See the section on the Target Designator boxes below.) Before moving to the third and final step, make sure that your target is within range and gimbal.

• Target Destruction




Now that you’ve designated the target (i.e. have placed a TD box around it), all that’s left to do is destroy it. Pick the on-board weapon that is most effective versus the target you have designated and fire it. Weapons can be fired by pressing the  or  key on the keypad. (If you are using a joystick device, weapons are fired by pressing the trigger button.)

1. TARGETING MODES

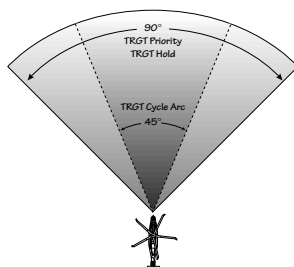
Your Comanche is very versatile in the manner in which it handles potential targets. It uses three different methods (or modes) to designate target objects. All you need to do is decide which of the three targeting modes will work best for you in a given situation.

a) TRGT Cycle

TRGT Cycle has the ability to designate all objects (both friendly and enemy) that lie within a 45° arc originating at the TADS sensors in the nose of your helicopter. It places all objects in sequential order beginning with those nearest to you and ending with those farthest away.

You can switch to TRGT Cycle by pressing the  key. Once in TRGT Cycle Mode, you can cycle through the entire group of targets within your forward arc simply by pressing the  or  keys.

The benefits to using TRGT Cycle is that you are able to instantly designate those targets which lie closest to you and therefore presumably pose the greatest danger. The drawback to using this mode is that it segregates targets within a very narrow arc according to their proximity to you and not their potential lethality. For example, TRGT Cycle would be a bad targeting mode to use if you were suddenly confronted by a convoy of enemy supply trucks followed by an SA-9 Gaskin vehicle. You would have to cycle through all the trucks before being able to designate the SA-9.



b) TRGT Priority TRGT PRIORITY

TRGT Priority seeks to redress the targeting liabilities of the previous mode. Instead of using proximity as a means of determining danger, TRGT Priority actually takes in to account the target's ability to threaten the Comanche. Like TRGT Hold, TRGT Priority Mode has the ability to designate all objects (both friendly and enemy) that lie within a 90° arc originating at the TADS sensors in the nose of your helicopter.

You can switch to TRGT Priority by pressing the Q key. Once in TRGT Priority, all of the eligible targets which lie within your forward arc are segregated into categories. These categories are then arranged according to the following targeting sequence:

- 1st category:** enemy air targets (helicopters and aircraft)
- 2nd category:** enemy ground units (T-80s, BMPs, SA-9 Gaskin vehicles, etc.)
- 3rd category:** enemy static units (installations, towers, buildings, fixed AAA emplacements, etc.)
- 4th category:** friendly air targets (helicopters and aircraft)
- 5th category:** friendly ground units (M1A2, Bradleys, M109s, etc.)
- 6th category:** friendly static units (installations, towers, buildings, fixed AAA emplacements, etc.)

You can cycle through the entire group of targets within your forward arc simply by pressing the enter or caps lock keys. However, you must cycle through *all* the targets in the previous category before you can begin to target objects which lie in a lesser category. For example, if you wished to target enemy tanks (category 2) you would first have to cycle through any objects in the first category (enemy air targets). Of course, if no air targets are present in your forward arc, the targeting sequence moves directly to the second category.




The benefit in using TM-Priority is that it quickly targets those objects which have the greatest potential to do you harm and lets you deal with them first. The drawback to this targeting mode becomes apparent if you trying to deal with targets in a lower priority category. Try shooting up an enemy installation when there are many enemy ground vehicles in the way and you get the idea.

c) TRGT Hold TRGT HOLD S

The third method of targeting is TRGT Hold. You can switch to TRGT Hold by pressing the tab key. TRGT Hold works exactly like TRGT Cycle with one big difference—TRGT Hold allows you to instantly place Target Designator boxes on up to six different targets simultaneously. TRGT Hold can designate all objects (both friendly and enemy) that lie within a 90° arc originating at the TADS sensors in the nose of your helicopter. It places all objects in sequential order beginning with those nearest to you and ending with those farthest away.

Instead of designating targets individually as you would when using TRGT Cycle, TRGT Hold places TD boxes on multiple targets (up to six) all at once. The closest target (of those designated by TRGT Hold) is given a standard TD box symbol. (If it is within range and gimbal, it will be marked with a TD shoot cue symbol.) The remaining targets are marked with a phantom TD box consisting of four small dots.



Once you have your targets designated using TRGT Hold, their positions are constantly updated. You know where all of the targets are at all times. Even if “held” targets mask themselves behind a terrain obstacle, TRGT Hold keeps the object in memory and instantly updates the TD box when a direct LOS to the target is re-established.

You can cycle through the entire group of “held” targets simply by pressing the  or  keys. If for some reason targets appear in this group that you do not want to “hold” in memory (a friendly target for instance) you can delete them from the group as you cycle through by using the  key.

Once you have deleted the unwanted targets from the “held” targets you are ready to open fire. The beauty of TRGT Hold is that as targets from this group are destroyed, the next closest target is automatically designated. This way you can use “ripple fire” tactics and eliminate large numbers of enemy vehicles in quick succession. For more details on TRGT Hold, refer to the general strategies and tactics section in chapter 6: Playing the Simulation.

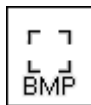
2. THE TARGET DESIGNATOR BOX SYMBOLOGY

The Comanche’s TADS highlights potential targets for you by placing a special HMD symbol known a *Target Designator* box. The purpose of the Target Designator (TD) box is to indicate the specific target currently being designated (i.e. to remind you which target your weapons are currently aimed at).

The TD box appears differently on the HMD depending upon the type of targeting mode you are using. Regardless of mode, you can cycle the TD box through your eligible targets by pressing the  or  keys.

a) Standard Target Designator box

The Comanche has powerful targeting designators. Because of this, you can designate targets far beyond the range of your weapons. You can also designate targets which lie outside the gimbal limits or firing arc of your weapons. If you designate a target which is out of range or outside your firing arc an open square TD box is used. Do not fire your weapons at targets with open square TD boxes around them.



b) Shoot Cue symbology

Once targets are in range or come within your firing arc, the Target Designator box changes to a solid square outline. This is done to indicate to the pilot that it's okay to shoot.



c) Mission Goal symbology

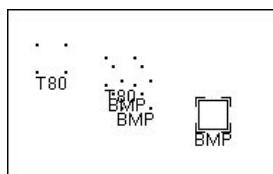
Since the object of each mission is to destroy certain mission goals, these important targets are given their own special Target Designator box symbology. Targets which are mission goals function exactly like normal targets in all other respects.



d) TRGT Hold symbology

TRGT HOLD 5

TM-Hold Mode uses the same TD box symbology as the other modes. One new symbol is added to indicate those targets which are not currently being designated but instead are being stored in TRGT Hold memory. You cannot fire at targets with phantom TD boxes around them. All this symbol means is the TADS is keeping an eye on this target for you. (Refer back to the TRGT Hold section of this chapter for more information.)



e) Break X symbology

Your sensors can detect and designate friendly objects as well as enemy. To avoid unpleasant friendly fire incidents, friendly objects have an X symbol superimposed over their Target Designator box. This symbol is known as a Break X. It's there to remind you NOT to shoot.



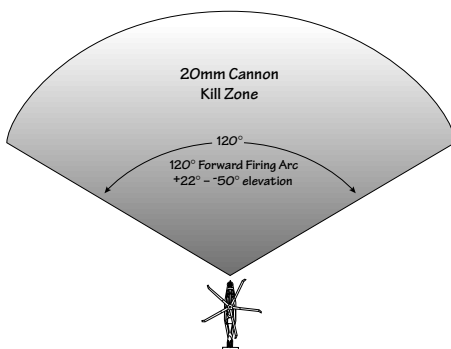
D. COMANCHE WEAPON SYSTEMS

The Comanche carries a variety of weapons so it is up to you to employ the proper one in any given situation. Your ordnance loadout is pre-determined at the start of each mission. However, you can over-ride and customize your Comanche's loadout screen prior to starting the mission.

1. 20MM CHAIN GUN (Z KEY)

The Comanche carries a three-barrelled 20 mm cannon mounted directly beneath your cockpit. It has a forward firing arc of approximately 120°. The cannon is tied in directly to your helmet and is automatically aimed at whatever you have targeted within this forward arc. It will attempt to stay trained on the target no matter which way you fly.

Your 20 mm shells don't do much damage in comparison to other weapon systems you carry but they do have some effect on most targets you'll encounter. What the individual rounds lack in hitting power they make up for in volume. Since cannon shells travel faster than Hellfire missiles or rockets, using the cannon just might shave a second or two off your engagement time. Another good thing about using the cannon is that you are not required to open your bay doors to fire it. For all its good points, the cannon should be used sparingly. You are limited to only 500 rounds of ammunition and they go very quickly.



To use the cannon, you must first place it “in priority” by pressing the **[Z]** key. The word **CANNON** will now appear on the WIP indicator. This lets you know that your cannon is ready. When the cannon is “in priority” but not currently targeted on an object, the gunsight pipper is positioned directly over the pitch indicator (i.e. aimed directly forward).

You could, if you wanted to, fire the cannon right away without first having a designated target. You’d just be wasting ammunition, however. Try it once. You’ll see that your rounds travel straight ahead and hit the point in space occupied by the gunsight pipper.



Press the **[enter]** or **[caps lock]** key to target an object. A TD box will appear over one of the objects in your forward arc. Wait until the TD box changes to a shoot cue. Now press the **[space]** or pull the joystick trigger. You’ll see and hear the cannon rounds leave the gun.

Limit your firing to short (1 second) bursts to conserve ammunition. You’ll be able to see how much you are using by watching the WIP ammunition counter tick down to zero. Once the counter reaches zero, you are out of ammunition.

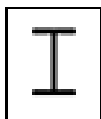
2. HYDRA 70 MM ROCKETS (**[X]** KEY)

The Comanche carries rocket pods both internally and on EFAMS. Each pod contains a number of 70 mm Folding-Fin Aerial Rockets (FFARs). These unguided rockets contain high explosive warheads which are most effective against soft targets like troops in the open or wood structures.



To launch a rocket, press the **[X]** key so that the word **ROCKETS** appears in the WIP Indicator. The number of rockets you have remaining will appear in the box below. Once you have placed your rockets “in priority”, a special I-beam aiming pipper appears on your HMD. This I-beam symbol indicates where your rockets will impact. Since rockets are unguided, the I-beam symbol moves according to the pitch and bank of the helicopter.

You do not need to have a TD box to fire at a target. You may launch a rocket at any time by pressing the *Fire Weapon* **[space]** or by pulling the joystick trigger. Even if a TD box is present on the HMD, you must still maneuver so that the I-beam symbol falls within the TD box before firing. Again, rockets are unguided. They will not fly toward a target just because you have placed a TD box around it.



3. AGM-114C HELLFIRE (**[V]** KEY)

The most powerful weapon carried aboard your Comanche is the laser-guided AGM-114C Hellfire made by Rockwell International. Originally designed as an anti-armor weapon, subsequent modifications have made this missile effective against just about anything; from other helicopters in flight to ships at sea. The Hellfire missile has a 9 kg. warhead which contains either a hardened anti-armor shaped-charge or an anti-personnel fragmentation high-explosive charge. The missile is highly accurate and versatile.



In order to use your Hellfire missiles you must first place them “in priority” by pressing the **[V]** key. The word **HELLFIRES** will appear in the WIP Indicator. The number of missiles you have remaining will appear in the box below. Once you have placed your Hellfires “in priority”, you’ll see a large dashed-line rectangle appear on your HMD.

This *engagement* rectangle represents the gimbal limits of your laser designator. In other words, your laser designator is only able to designate targets which are located within the confines of this rectangle. You'll notice when using Hellfires that the TD box will only change to a solid-square shoot cue when the target lies within this engagement rectangle.

Besides outlining your targeting envelope, the engagement rectangle has one other important feature— a *distance to target* (DOT) indicator. The DOT indicator is a thick solid line which runs along the vertical length of the rectangle whenever a Hellfire is in flight. The length of the DOT indicator is equal to the distance between the missile and the target.



When you initially launch a Hellfire missile, the DOT indicator stretches from the bottom of the rectangle to the top. As the missile nears the target, the DOT indicator shortens. This reflects the diminishing distance between missile and target. The missile will hit your target at the moment the line disappears off the bottom of the rectangle.

In order to hit a target, the Hellfire missile requires that you designate it with the TADS laser designator (i.e. keep the target within a TD box). The Hellfire is unique, however, in that it responds to post-launch targeting information. This allows you to fire a Hellfire *then* place a target inside a TD box if you wish. The missile will “see” the target now that you have designated it and steer itself accordingly.

The ability to designate targets while the missile is in flight is known as *Lock-on After Launch* (LOAL). LOAL gives you a serious tactical advantage over your enemy. For one thing, it allows you to cut down on your exposure time. Consider being able to fire a Hellfire missile in the general direction of a suspected enemy force. At the last moment, you pop up and designate a target. The missile will immediately steer toward the TD box striking the target only seconds after you designate it. The enemy is given no chance to react.

Another advantage of LOAL is the ability to change targets while the missile is in flight. Let's say you fire a missile at a particular tank only to see your Teammate destroy it first. Normally, the weapon you fired would be wasted— not so with a Hellfire. You need only designate a new target. The missile will instantly begin steering itself to your new target. (See the general strategies and tactics section in chapter 6 for more Hellfire tricks.)

4. AIM-92 STINGER (C KEY)

The AIM-92 Stinger (Air Intercept Missile) is an all-aspect infrared (or heat seeking) air-to-air missile.



General Dynamics, now Hughes Missile System, started a program in 1984 known as ATAS (Air-to-Air Stinger) to develop an air-to-air version of the successful shoulder-fired Stinger. Four years later, the first Stinger AAMs were being delivered.

Stingers are primarily effective against aerial targets like helicopters and aircraft. While you are able to target and hit ground targets with Stingers their effectiveness against these targets is minimal. (You might get lucky and knock the track off a BMP or chip the paint of a T-80 using a Stinger but don't expect much more.)

To launch a Stinger missile press the **[C]** key so that the word **STINGER** appears in the WIP Indicator. (The number of Stingers you have remaining will appear in the box below.) Remember that to have any hope of hitting anything you must first have a target designated within a Target Designator box. Once the target is inside a TD box, make sure it is within range then press the *Fire Weapon* **[SPACE]** or pull the joystick trigger.

There is no special HMD symbology associated with the Stinger other than that displayed on the WIP indicator.

The AIM-92 is considered a “fire and forget” weapon because it uses infrared radiation to track its targets. Once you launch a Stinger, you are free to maneuver or seek a new target. You are not required to maintain the TD box after the missile is launched. The missile’s own seeker-head will guide it to the target without further help from you.

5. ARTILLERY (**[B]** KEY)

No Comanche ever runs out of ammunition since the nearest artillery battery is just a radio call away. Part of what makes the Comanche such a formidable weapon is this ability to detect targets and direct the fire of friendly batteries. Because you are not the only one requesting fire support, artillery units are limited in the number of fire missions they can perform for you. Each mission assigns you a specific number of fire missions.

By pressing the *Artillery* **[B]** key the word **ARTILLERY** appears in the WIP indicator. The number of fire missions that headquarters has allotted you will appear in the box below. To execute a fire mission, you must first target an enemy ground vehicle or structure.

Once the target is inside the Target Designator Box, make sure the WIP indicates Artillery. Now press the *Fire Weapon* **[SPACE]** key or pull the joystick trigger. In a few moments, rounds will begin to fall.



Artillery fire is most effective against static ground targets. Because there is some lag between the time you first request a fire mission and when the artillery rounds actually begin falling, enemy targets have an opportunity to move out of the impact area. Such is war. Aerial targets like aircraft or helicopters are unaffected by artillery.

6. YOUR TEAMMATE (GRIFFON 27) (**[N]** KEY)

You’ll never hear a self-respecting Army pilot refer to his sidekick as a wingman- that’s an Air Force term. Instead of wingman, Comanche pilots prefer to use the term *Teammate*. For all intents and purposes, however, your Teammate is your wingman.

Notice the word *team* in the phrase Teammate. It’s there for a reason. The missions you are undertaking are difficult. They will require that the two of you work in concert as members of a single team. Combat is not the place to hot-dog so don’t try to do everything yourself. Used properly, Griffon 27 can be a tremendous force multiplier. Used incorrectly, he’ll just get blasted out of the sky early and allow the enemy to concentrate all its forces against you.

Griffon 27's standard operating procedure (SOP) is to follow behind you at a respectable distance. He usually travels somewhat slower than you because he must anticipate your moves. When you are in contact with the enemy, he will take up a position on your flank. He'll engage targets on his own, unless ordered not to by the player.

You can specify different standing orders for your teammate using the **M** key. This is described in detail in the following section. Regardless of your teammate's current standing orders, you can "hand-off" a target to him at any time.

Select the *Teammate Hand-Off* option by pressing the **N** key. Your WIP indicator will change to read **TEAM HAND-OFF**. Underneath this line, the WIP indicator will display one of the following phrases depending upon your Teammate's current status:

Link Ready: This phrase will appear on the WIP indicator if Griffon 27 is ready and able to accept hand-off targets. It will continue to read *Link Ready* as long as you remain in Teammate Hand-Off Mode.

TEAM HANDOFF
LINK READY

Not Responding: This phrase will appear on the WIP indicator if Griffon 27 has been shot down. If this is the case, you are no longer able to exercise the *Teammate Hand-Off* option for the remainder of this mission.

TEAM HANDOFF
NOT RESPONDING

To hand-off a target to your Teammate, simply designate a target as you normally would. Once the TD box appears around the desired target, press the **space** or pull the joystick trigger. Griffon 27 will now go to work.

Link Active: This phrase indicates that Griffon 27 has received your targeting hand-off and is in the process of carrying out your orders. This phrase will remain posted on the WIP indicator until such time as the designated target is destroyed. Once the target is destroyed, the phrase will revert back to *Link Ready*.

Keep in mind that if your wingman is not currently in the vicinity, it may take some time for him to reach the targets and the probability of him finding and destroying the target may be reduced.

TEAM HANDOFF
LINK ACTIVE

E. TEAMMATE ORDERS

Your teammate, Griffon 27, will normally begin missions with standing orders to "Follow and Engage". This means that he will fly along with you off to your side, watching for threats and engaging in combat as deemed necessary or when a target is specifically handed off to him.

You can, however, give your teammate new standing orders at any point in a mission. Press the **M** key to bring up the list of available orders. The current orders will be shown highlighted in green. To change them, press the number key from "1" to "8" corresponding to the desired orders. To leave the teammate orders unchanged press the "ESC" key or **enter**.

1 FOLLOW AND ENGAGE

The default orders for your teammate at the beginning of a mission. Your teammate will attempt to fly along with you and will engage in combat, pursuing enemies if necessary.

2 ENGAGE AIR

A variant of “Follow and Engage” with directives only to engage air targets.

3 ENGAGE GROUND

Another variant of “Follow and Engage” with directives this time only to engage ground targets.

4 FOLLOW AND EVADE

Your teammate will fly along with you but will try to avoid conflict, taking evasive action or retreating from battle if attacked. Use these orders when it is important that direct conflict be avoided or when you want to “save” your firepower for another target.

5 SCOUT AHEAD

Instructs your teammate to travel ahead and scout for enemies. The teammate will head in the direction that your Comanche was facing when the directive was given. Therefore, you can “aim” your helicopter in a given direction and then tell your teammate to go in that direction and check it out. Enemies will be engaged as encountered.

6 COVER ME

These orders tell your teammate to remain near your helicopter and engage any enemies which attack you.

7 STAY HERE

These orders instruct your teammate to hold at the current location. This can be effective when you want to scout ahead into potentially dangerous territory without putting both helicopters at risk. Your teammate will remain in the current location until given new standing orders or until a target is explicitly handed off to him.

8 PATROL BASE

Directs your teammate to return to base and remain there “on patrol” until otherwise directed.



PLAYING THE SIMULATION

Now that you've taken the time to read through the tedious portion of the manual, *the part which describes what all the buttons and knobs do*, it's time to go fly this thing and have some fun.

The first section in this chapter deals with playing the simulation as a single player (i.e. *mano-a-mano* against the computer). It explains the campaign structure, the mission structure and mission briefing routines. To round things out, it concludes with some neat tactics you can use to get the upper hand on your opponents live or artificial.

The final section of this chapter details what you need to know about connecting to and playing with others in Multi-player mode. Multi-player mode enables you to play with (or against) up to nine other pilots. It's the ultimate gaming experience and one that makes *Comanche Gold* such a great simulation.

A. SINGLE PLAYER MISSIONS

Comanche Gold comes with six training missions and 72 single player combat missions. Single player combat missions are divided into nine separate campaigns each taking place in a different part of the world. (Campaigns are referred to as *operations* in this simulation).

1. TRAINING MISSIONS

Training missions are designed to teach you how to fly and fight by guiding you through a gradual step-by-step sequence of instructions. Each subsequent mission builds upon knowledge gained by successfully completing the previous one.

You are not required to fly the training missions; however, they are recommended for players who are not already familiar with the *Comanche*. The final training mission is Free Flight, giving you an opportunity to indulge your new piloting skills without fear of enemy threats.

2. CAMPAIGN MISSIONS (OPERATIONS)

There are 72 combat missions grouped among the four *silver* operations and five *gold* operations. Each of these operations takes place in a different theater of war and consists of eight separate missions. Your objective in each of these operations is to successfully complete all eight missions. If you do that, you are given a special award signifying your victory.

Even though all missions in an operation are inter-related, you may fly the first seven missions in any order you desire. In order to fly the final mission of the campaign, however, you must already have successfully completed the first seven. When a mission is successfully completed, it will turn "blue" in the menus.

At the conclusion of every mission, your skill as a pilot is evaluated in a post-mission de-briefing which lists your performance statistics. You are also given a mission score which is based (among other things) on the value of the targets you destroyed. (Friendly targets *subtract* from your score. If you want a high mission score, refrain from shooting guys wearing the same uniform as you.)

3. SPECIAL OPERATIONS

This set of operations is unique to *Comanche Gold*. It consists of one campaign of missions specifically designed for *Comanche Gold* by actual Army personnel.

Operation Elva missions were created by Major Allen Sakcriska, Former Army Training and Doctrine Liaison to Boeing/Sikorsky Helicopter.

These very special missions allow you to fly in combat situations very much like the one's which real Comanche pilots will face.

4. MISSION BRIEFINGS

Before each training and campaign mission you are given a briefing in the Griffon Squadron Headquarters. Each briefing consists of three main components: a mission description, a loadout screen and a mission map.

a) Mission Description

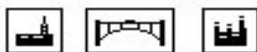
The first portion of each briefing is a text description of the mission you are about to fly. Take a minute and read through it. It will outline some general information regarding the mission such as your ordnance load-out, light conditions, etc. More importantly, it will give you specific orders telling you exactly what you need to do to win this mission. The narrative portion of the briefing will contain any information regarding the enemy force structure and disposition.

▲	flips to the previous briefing page.
▼	flips to the next page of the briefing.
Back:	takes you to previous Menu screen.
Next:	takes you to the Mission Map.

b) Mission Map

The second part of each mission briefing consists of a top-down view of the mission map. The mission map gives you a look at the terrain topography. You'll be able to tell at a glance

NEUTRAL ICONS



whether you'll be flying over a smooth desert floor or through narrow mountain canyons. The map also shows vegetation. You'll be able to distinguish the difference between flat-tilled farm land and dense forest.

ENEMY ICONS



FRIENDLY ICONS



In addition to terrain, the mission map contains a number of different symbols used to indicate the presence of friendly, enemy, and neutral objects. Your waypoints and flight path are also superimposed on this map. You'll be able to trace your route in relation to the location of these objects.

2X/1X:	magnify or decrease your view of the map.
▼	advances you to the next waypoint.
▲	returns you to the previous waypoint.
◀◀	takes you immediately to your starting location.
▶▶	takes you immediately to your last waypoint.
Back:	returns you to the Mission Briefing screen.
Next:	takes you to the Loadout screen.

c) Comanche Loadout

The last step before embarking on your mission is to customize the weapons loadout for your Comanche.



The loadout screen lets you specify which weapons are loaded onto each of the Comanche's available hardpoints.

In its stealth configuration, the Comanche has six hardpoints located in the doors of the internal weapons bay. An additional eight hardpoints are available in the "heavy" configuration, with the optional EFAMS installed. By default, the

Comanche is given a loadout considered "appropriate" for your mission. If the mission calls for stealth, only the internal weapons bay will be used. If more firepower is needed and stealth is less important, EFAMS will be mounted.

Each hardpoint is capable of holding one Hellfire missile, two Stinger missiles, or a quadpack of 70 mm folding fin rockets. You may customize the loadout by clicking with the mouse on the "+" and "-" buttons for each type of weapon. Clicking "+" for a given weapon will add the number of that weapon that will fit on a single hardpoint. You cannot, however, load more weapons than can physically fit on the available hardpoints. Therefore, since the helicopter will initially be fully loaded when you see the Loadout screen, you must decrease the number of one type of weapon before you can add another. The words "Full Loadout" will appear whenever all hardpoints are loaded with munitions.

You can add or remove the EFAMS by clicking on the “EFAMS” button in the lower left area of the display. If you add EFAMS, the additional hardpoints will appear initially empty and ready to be loaded. Likewise, if you turn off the EFAMS, any weapons currently loaded on them will be removed from the loadout.

Keep in mind that the ability to carry the additional weapons does not come without cost. If you add EFAMS when they were not initially installed for a particular mission, you will be entering the mission with far less stealth than was intended. See the following section on “Stealth Considerations” for more discussion of these factors.

5. HELICOPTER STRATEGY AND TACTICS

The following section contains hints and tips that you can put to good use in your single player and Multi-player war games.

a) Stealth Considerations

Your Comanche is designed to survive on the modern battlefield by being difficult to detect. Obviously, the enemy can’t shoot you down if they don’t know where you are. Luckily, there are several things you can do to make it harder for the enemy to detect you.

For maximum stealth, you should check to see that your bay doors are closed and your landing gear is retracted. Both of these items, when extended, reflect radar waves and enhance your radar signature. Likewise, if you are flying around with EFAMS you will be easier to spot. Unfortunately, there’s nothing you can do about the EFAMS once in flight. The extra ammunition they carry is the trade-off for making you easier to detect.

Use the terrain to your advantage. Keep something solid (like a mountain or ridge) between you and the enemy. If you see yourself being “painted” by enemy radar, try flying behind some elevated terrain. The red line and flashing warnings on your Threat Display will disappear once the enemy can no longer see you.

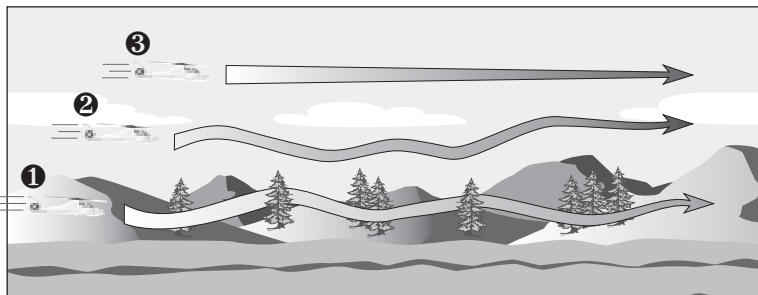
Finally, stay as low to the ground as possible. By keeping low, you add to the enemy’s difficulty of spotting you. Since radar works by LOS, an elevated terrain provides you with some measure of cover. By staying less than 50 feet AGL there’s a good chance that even if the enemy has a direct LOS, you’ll be able to evade detection. Low flying objects are difficult to detect because of ambient ground clutter and false echoes.

b) Flight Profiles

The altitude at which you fly makes a big difference when it comes to detection. As a general rule, the higher you fly, the easier you are to spot. Of course, you can fly faster at higher altitudes because you are less likely to run into anything. Depending upon the tactical situation, helicopters generally assume one of three flight profiles: *Nap-of-the-Earth (NOE)*, *Contour flight*, or *Altitude dash*. These three profiles represent a graduated trade-off: speed for safety.

∂ Nap-Of-the-Earth is used when you need to traverse the battlefield and you are in contact with enemy units. NOE requires that you remain just far enough off the ground to move. Instead of flying over obstacles like trees

or buildings, you fly around them. Because your primary concern is safety, NOE is the slowest of all three profiles. When flying NOE, remember the 30-30 rule. Stay below 30 feet and under 30 knots.

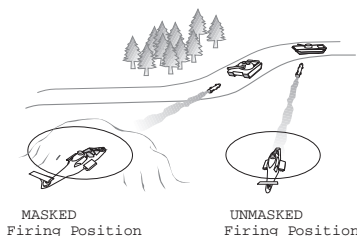


Σ Contour flight is used when you are flying in an area where contact with the enemy is possible but not expected. You are still flying relatively close to the ground but not so low that you have to weave in and around ground obstacles. When flying Contour you want to stay between 30-100 feet above the ground. Your risk of detection is raised slightly. Hopefully it's off-set by your increased speed.

Π Altitude dash is the flight profile used when contact with the enemy is unlikely and unexpected. Basically, you are flying high enough off the ground to cause commercial airliners to swerve. Well, maybe not quite that high. But certainly, you're high enough that anyone for miles around could spot you with a pair of binoculars. This is the fastest of all three profiles. With nothing standing in your way, you can put the "pedal to the metal".

c) Masking and Unmasking

The Comanche's innate stealth characteristics protect it from harm by concealing its presence from the enemy. The only thing better than concealment is *cover*. Concealment only provides you with protection from enemy observation. Cover provides you with protection from enemy fire.



For a helicopter pilot, the best cover is terrain. Nothing stops a bullet or a missile quite like slamming into the side of a hill. Using terrain to protect you from enemy fire is known as *masking*. A helicopter is said to be *masked* when it maneuvers to place an obstacle between itself and the enemy. As you can see by the diagram, it is far better to pop-up and attack from a masked position than fly out into the open.

d) Bounding Overwatch

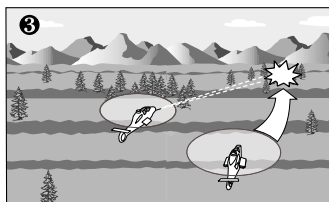
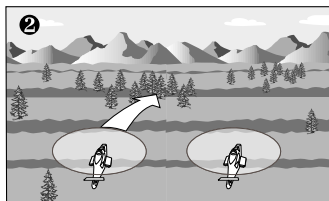
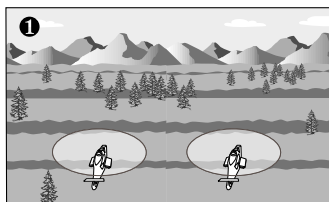
Bounding Overwatch is the name of a fire-and-movement technique that you and a Team Mate can use when playing in multi-player mode. It is a method of moving from one point to another by a series of leaps and bounds that allows both of you to provide cover for the other. The beauty of this maneuver is that you and your Team Mate can continue moving even in the face of enemy opposition but it's a slow, methodical process. Sometimes it's your only choice.

∂ Two Comanches have uncovered a likely enemy position in the copse of trees ahead. At this point, neither pilot is sure if there are enemy troops there or not, but neither wants to take chances.

Σ The Comanche on the left bounds forward while the one on the right remains stationary and keeps an eye on the tree-line. It's ready to provide cover fire if necessary.

[] The Comanche on the left reaches its intended position and halts. It is now able to provide cover fire while the one on the right bounds forward.

This process of advancing in stages will continue until the two helicopters have cleared the area.



e) Ripple Fire tactics

The Hellfire missile can do some pretty amazing things if you let it. One trick that works very well with this missile is ripple fire. Firing Hellfires one at a time is a poor tactic when you have multiple targets to destroy. It takes too long and gives the enemy plenty of opportunities (far more than they need) to fire back. Ripple fire, on the other hand, cuts down on the enemy's response time.

Ripple fire is a technique used when you are confronted by a group of enemy targets at medium to long range. It requires that you launch multiple missiles in rapid succession so that you have more than one Hellfire in the air at the same time.

Hellfire missiles, no matter how many you launch, will all head for the target you currently have designated. For example, if you designate a T-80 and launch three Hellfire missiles, all three of the missiles will fly toward this same tank. Normally this would be wasteful since the first missile will likely destroy the tank.

When using Hellfires, you have an opportunity to designate a new target while the second and third missiles are in the air. Both missiles will automatically steer themselves toward the new target. When the second missile destroys the

new target, you quickly designate another. The third missile will now steer for it. This method of cycling forward through targets *while* your missiles are actually in the air allows you to fire your missiles in rapid succession; hence the term *ripple fire*. See the Diagram on page 80.

f) Artillery Barrages

Artillery is one of the most deadly weapons you have at your disposal. It's even more deadly than the Hellfire missile. By pressing the B key, you can act as a Forward Observer (FO) for an artillery battery stationed far to the rear.

Though artillery is powerful, its one drawback is its lack of responsiveness. It takes time for your request to be processed through the proper channels. It takes even more time for those artillery guys to get out of their bunks and fire a couple rounds for you. As a consequence, there can be quite a delay between the time you call for fire and when it arrives on the target. Fast moving targets are likely to exit the impact area before the shells begin falling, causing you to hit empty real-estate and waste one of your fire missions.

You can cut down on the enemy's ability to escape your artillery barrages by keeping them pinned inside the impact area. One way to do this (if your target is a column of vehicles) is to call artillery in on the lead vehicle then shoot it yourself. It will block the path of the vehicles trailing behind, forcing them to slow down and go around. Your artillery will be landing around the now destroyed vehicle just about the time the rest of the column is moving past.

B. MULTI-PLAYER WAR GAMES

Comanche Gold is designed with the multi-player gamer in mind. Refer to this section for help in configuring your computer so that you are able to participate in Multi-player war games. Once you've finished setting up your computer, you (and up to seven other players) are ready to participate in multi-player war games.

Multi-player War Games come in two flavors: Cooperative missions or Head 2 Head (Melee) matches.

Cooperative missions allow you to interact (cooperate) with other pilots to achieve a common set of objectives. *Comanche Gold's* 72 single player combat missions can be replayed in multi-player *Cooperation* mode.

Head-to-Head (Melee) missions, on the other hand, are competitive events where it's "every man for himself". There are eight *Melee* mode missions specially designed to let you go head-to-head against other live players.

1. MULTI-PLAYER CONNECTION OPTIONS

There are several ways you can connect with other *Comanche Gold* players: via NovaWorld over the Internet, through an IPX network, or with a modem or serial cable. You begin by selecting the Multi-Player War Games option from the Main Menu screen.

Note: *Comanche Gold* is not compatible with *Comanche 3* via multi-player. You can only play with other gamers who have *Comanche Gold*.

a) NovaWorld

Comanche Gold works with the NovaWorld online gaming site to match you with other *Comanche Gold* players from around the world.

Select NovaWorld from the Multi-player war games menu, then choose either Browser or NovaWorld Client to enter the NovaWorld matchmaking site. If you have an internet browser such as Netscape or Internet Explorer installed as your default browser in Windows, you may select the browser option. If you are using AOL or if you experience any problems accessing NovaWorld using your browser, choose the NovaWorld client option. In either case, the *Comanche Gold* application will be minimized as the browser or client application is launched.

At NovaWorld you may join a game from the list of games currently being offered or you can choose to host your own game and offer it for others to join. After that, the browser or client application will be minimized and you will return to *Comanche Gold*.

HOST: If you are hosting a game, you will watch as other players join in. You will have the option of deciding when enough players have joined and when to start a mission. It will also be your responsibility to select the mission to play.

JOIN: If you are joining a game, you will wait as various pilots join the game until the host decides to begin the game.

b) IPX Network

This option allows you to connect with up to seven other players over a local area network. All players must have access to the same network.



One player in an IPX multi-player game must "Host" the game and all other players will "Join" that game. The host controls which mission will be played by everyone.

Select "IPX Network" from the Multi-Player War Games menu, then select either "Join an IPX Game" or "Host an IPX Game". As other pilots join the game, their names will appear. If you are hosting, you must decide when enough players have joined and press "ENTER" to proceed, then select a mission to play.

c) Modem

Connecting via modem allows you to play the game with one other person. In order to connect, one player must call and the other must answer. When connecting by modem, the player whose computer has answered is designated as the "Host" of the game.


Select "Modem" from the Multi-Player War Games menu. The player designated to answer should then select "Wait for Call" from the Modem menu.

The player designated to call should select a phone number from the phonebook list. If the number desired is not already listed in the phonebook, select a “slot” for it, press  to erase any existing entry, type the phone number to be called and then press . To dial the selected number, press “Enter”.

If problems are encountered while attempting to connect via modem, check to be sure that the modems for both players are properly configured and that the answering player was set to answer before the calling player called.




d) Serial Cable



Connecting via serial cable allows you to play the game with one other person. Make sure the cable is properly connected to both computers.

Select “Serial” from the Multi-player war games menu. If the correct COM port is not already selected, highlight the correct one and press  to select. Then select “Join a Serial Game” on one of the computers and select “Host a Serial Game” on the other.

After successfully connecting, the Host controls the selection of the mission to be played.

2. MULTI-PLAYER CHAT MODE

Players have the ability to send text messages to one another when playing Multi-player War Games. To send a message, simply press the  key. A message prompt will appear at the bottom of your screen. Type the message you wish to send, then press the  key. Brevity counts, so limit your messages to the number of characters able to fit on the screen. When you have finished typing, press the  key. Your message will be sent to all your fellow players.

Comanche Gold comes with ten pre-determined Chat messages (macros). To send these Chat macros, simply press the  key to access message prompt. Press the key corresponding to the message you wish to send. The message will appear next to the prompt. Send the message by pressing the  key. You may store the current line as a macro by pressing Alt-F1 through Alt-F9

If you don't like the default macros, you are free to create and store up to nine of your own. Select the *Define Chat Macros* option on the Multi-Player menu. A list of the predefined macros appears. To change a macro, select it then type in the message you wish to assign to that key. Creating Chat macros before battle will save you typing time later.

3. THE MULTI-PLAYER ENVIRONMENT

Multi-player War gaming differs from single player gaming in that you are reacting to other human players rather than computer-generated intelligence. Games tend to be less predictable and a whole lot more fun.

a) Head 2 Head Melee Gaming

Head 2 Head Melee games pit you against the other players in a wild free-for-all slogging match. You better be fast and you better be good because while you are out to get them, they are all out to get you. The object of a Head 2 Head Melee mission is to shoot down as many other players as you can within the prescribed time limit. Of course, you must try to avoid getting shot down yourself.

You can land and rearm at any FARP. If you happen to get shot down, you restart the mission on a randomly chosen FARP.

b) Cooperative Missions

Cooperative missions are missions in which all players are friendly (i.e. on the same team) and act in concert to achieve a common victory. Your objective in Multi-player mode is the same as the one given for the mission in single player mode. These missions give you an opportunity to test and refine real helicopter tactics.



The Comanche flies low and deep into enemy territory to overcome the enemy's use of terrain and weather, camouflage, and deception which limit the capability of space and high-flying strategic surveillance systems.



TECHNICAL SPECIFICATIONS

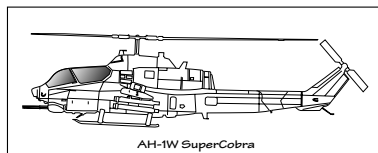
This appendix is a general reference detailing the various fixed and rotary winged aircraft you will encounter in the game. Use the accompanying line drawing profiles to aid you in recognizing these aircraft when you see them on the battlefield. These representations are not drawn to scale.

A. FRIENDLY AIRCRAFT

The friendly aircraft listed below will sometimes be tasked to aid you in accomplishing your mission; other times they will be involved in peripheral missions of their own. You are not able to issue orders to these aircraft or direct their activities in any way. Although they are here to help you, the pilots of these aircraft are not allowed to deviate from their mission assignments.

★ **AH-1 SuperCobra**

The genesis of the AH-1 SuperCobra can be traced back to the Vietnam War. In 1965, the Bell Helicopter Company began offering the Bell 209 (AH-1 Cobra) to the U.S. Army as a dedicated attack helicopter. This company-funded design proved immediately successful in southeast Asia. The USMC, in particular, was impressed by this helicopter's practical mix of air-to-ground weaponry. It was the perfect platform for prosecuting a low-tech guerrilla war primarily against personnel. Fast forward thirty years and the emphasis has shifted to a more "conventional" (i.e. mechanized) style of warfare.



AH-1W SuperCobra

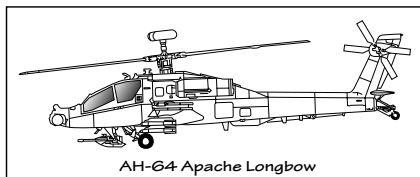
The AH-1 Cobra earned the distinction of being the first helicopter to shoot down another helicopter in aerial combat. Helicopter vs. helicopter combat was actually quite common during the ten-year Iran-Iraq War. Iran saved its fixed wing air power for strategic targets and came to rely upon the Cobra to conduct its ground support missions. On 8 November 1980, two Iranian AH-1 Cobras engaged two Iraqi Mi-24 Hinds over Dezful, Iran. Both Iraqi Hinds were shot down presumably by Cobra gunfire.

The AH-1 SuperCobra carries up to eight TOW or AGM-114 Hellfire missiles. It has also been known to carry AGM-65D Mavericks. In addition to missiles, the SuperCobra can carry anti-personnel Hydra rockets or gun pods. There is also a chin-mounted turret housing a 20 mm three-barreled gun. For self-defense, it carries two heat-seeking AIM-9 Sidewinder missiles but it relies primarily on its innate maneuverability to escape adverse situations.

The SuperCobra is powered by two GE-T700-GE-401 turboshafts. These engines (1723 horsepower each) drive a twin-bladed main rotor/ twin-bladed tail rotor combination. This gives the SuperCobra a maximum level speed of approximately 155 kts. at sea level. Count on these aircraft to use their speed and agility to overcome their more powerful counterparts. Their biggest advantage over other aircraft is their small size and narrow fuselage. With a fuselage width of less than 8 ft., the SuperCobra is nearly invisible if viewed head-on.

★ AH-64 Apache

Depending upon who you talk to, the AH-64 Apache is either a flying marvel of western technology or an expensive collection of spare parts. Despite the cheery optimism of its manufacturer and glowing after-action reports from Desert Storm, the mechanical reliability of the Apache remains a serious concern. There is no question that these aircraft are incredibly capable machines but many including the General Accounting Office, have begun to take a jaundiced look at their excessive maintenance requirements.



AH-64 Apache Longbow

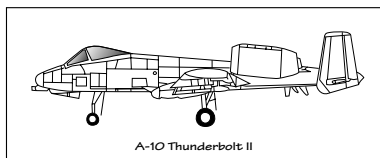
The first AH-64s were delivered in 1984. The design entered operational service in 1986. Since that time more than 800 Apache aircraft have been constructed and delivered. The latest model Apache is the AH-64D. The “D” model is distinguished by the mast-mounted millimeter wave radar targeting system known as “Longbow” plus cheek fairings which house an improved avionics suite. It features a crew of two situated in a single cockpit. The CP/G (co-pilot/gunner) is seated in front. The pilot occupies the raised seat to the rear.

The Apache is arguably the most advanced and deadliest attack helicopter in the world. It features a single barreled 30 mm chain gun (designated M230) with 1,200 rounds of ammunition. There are a total of four under-wing hardpoints, two per wing. Each hardpoint is able to carry four AGM-114 Hellfire anti-armor missiles or a rocket pod containing 2.75 inch FFARs. For self-defense, the helicopter can also carry small IR air-to-air missiles like the AIM-92 Stinger.

Over 300 Apaches participated in the Gulf War. The initial air strike of the air war was conducted by eight Apache helicopters (Task Force Normandy) against two important Iraqi early warning radars. The Apache is most famous for its gun camera footage of Iraqi soldiers putting their underwear on a stick to surrender.

★ A-10 Thunderbolt II

Ahhh... the infamous A-10 Thunderbolt II. No doubt about it, this is one ugly plane. Commonly known as the “Warthog,” it has been said that the reason the A-10 stays in the air is because the runway doesn’t want it back. Well perhaps, but the people over at Fairchild might disagree. The A-10 is powered by two widely spaced, non-afterburning turbo-fans. Each is capable of producing over 9000 lbs of thrust.



A-10 Thunderbolt II

They give the Warthog a normal mission speed (with combat load) of approximately 350 knots. The usual combat radius (including a two hour loiter) is about 250 miles. Of course, all these figures are averages and depend entirely upon the type and weight of the ordnance carried. Although the A-10 is made to carry heavy loads on Low-Low-Low flight profiles, these missions do take their toll.

The A-10 is the perfect companion to helicopter operations. It shares a great deal of similarity with attack helicopters in both the way it flies and in the way it fights. Despite talk from pilots to the contrary, A-10s won't fair well in air-to-air combat with other fighters. They can, however, hold their own against rotary aircraft. If used correctly, the A-10 and Comanche compliment the combat abilities of the other. Think of the two together as part of an aerial combined arms team.

The A-10s you encounter in *Comanche Gold* are equipped with AGM-65 Maverick missiles for use against ground targets and AIM-9 Sidewinder heat seeking missiles for use against enemy aircraft. No description of the A-10 would be complete without mentioning the astounding GAU-8 Avenger. This seven-barreled 30 mm cannon runs almost the length of the fuselage. It's a killer. It can destroy even the most heavily armored vehicle.

B. ENEMY AIRCRAFT

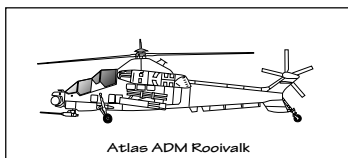
The aircraft listed below are considered hostile and should be dealt with accordingly. All of these aircraft will seek to engage you with gunfire or air-to-air missiles, so the sooner you detect and destroy these aircraft the better off you will be. In time, the strengths and weaknesses of each of these aircraft will become apparent. For example, Mi-24s are heavy and perform poorly at high altitudes. Su-25s lack decent "look-down shoot-down" radars and have difficulties operating at slow speeds. Adjust your tactics to suit your particular circumstances.

✚ Atlas CSH-2 Rooivalk

The Atlas CSH-2 Rooivalk is designed and produced in South Africa as a combat support helicopter. Although it is based largely upon Aerospatiale's SA-330 Puma, the vast majority of critical components are built domestically. The Rooivalk (or

Red Kestrel) program began back in the 1980s. At that time, the South African Air Force (SAAF) was involved in military operations in Namibia and looking for a helicopter capable of assuming a role much like the USAF's AH-1 Cobra performed during the Vietnam war. Specifically, the SAAF was interested in a helicopter able to conduct Close Air Support missions and escort transport helicopters on the battlefield if necessary.

Unfortunately for Atlas, the Namibia situation quieted down in 1990 just as the first prototype was unveiled. The program was subsequently halted as defense spending was curtailed. Atlas decided to continue work on the Rooivalk using its own money and concentrate on selling its design to foreign customers. The gamble seems to have paid off. Not only have several foreign nations expressed interest (notably Thailand and Malaysia) but South Africa



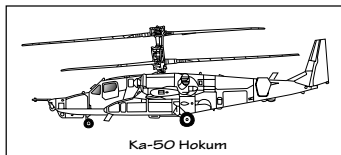
itself ordered sixteen CSH-2s from Atlas in 1994, enough to equip two full squadrons.

The Rooivalk features two stepped, tandem cockpits with the pilot occupying the rear seat. Both cockpits have redundant flight controls so that either crew member can fly the aircraft in case the other becomes incapacitated. Only the pilot's cockpit features a moving navigation map.

This helicopter is well equipped to carry out Close Air Support missions. Mounted on the nose of this helicopter is a gyro-stabilized turret housing a TDATS (target detection, acquisition, and tracking system) which includes a laser range-finder, FLIR, and LLTV. Located underneath the WSO's cockpit is a 20 mm GA-1 Rattler chain gun linked to 700 rds. of ammunition. Each "wing" contains three hardpoint ordnance stations: a wingtip station for mounting infrared AAMs (one per station) and two articulated under-wing stations. The outer under-wing station can carry up to four anti-tank missiles (ZT-4 or ZT-25 Swift.) The inner station is usually reserved for a rocket pod containing twenty-two 68 mm rockets.

⊕ Ka-50 Hokum (Werewolf)

Known as Werewolf to its Russian pilots, the Kamov Ka-50 Hokum is a very capable attack helicopter. It features dual contra-rotating, three-bladed main rotors which eliminate the need for a tail rotor to control torque. Although the prototype Ka-50 flew successfully back in 1982, the Werewolf did not enter series production until 1994. Russia has been actively marketing this helicopter to foreign buyers ever since. Had the Werewolf program progressed satisfactorily during the 1980s, it is possible that a number of these helicopters may have shown up in Iraq prior to Desert Storm.



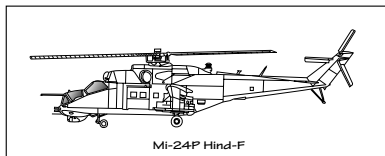
The Ka-50 features a comprehensive mix of air-to-air and air-to-ground weaponry. While its primary mission seems to be killing other helicopters, the Werewolf is well able to dish out death and destruction on the ground. It possesses a single barrel 30 mm chain gun (model 2A42) located along the right side of its fuselage. There are four external hardpoints able to carry a combination of up to twelve AT-12 Vikhr LGMs, eighty S-80 80 mm rockets (in four 20 rd. pods), or four AA-11 Archer heat-seeking AAMs.

Overall, the Werewolf is a typically solid Russian design. Its avionics are perhaps less advanced than those commonly available in the West, but they are tough, easy to maintain, and most importantly— they work! Its engines (two 2,190 shp Klimov turboshafts) give it a top speed of approximately 165 knots with an endurance of 2.5 hours.

The helicopter's only major shortcoming is its reliance on a single pilot. Without a co-pilot, the Werewolf pilot is expected to both fly and navigate, fight and communicate. If the pilot is a good cockpit manager, he will do okay. The majority of Werewolf pilots however will tire quickly due to the stress of such a heavy workload.

✚ Mi-24P Hind F

The Mi-24 Hind was a shock to Western intelligence analysts when it first appeared in the mid 1970s. The Soviet Union had managed to field what looked to be a “flying tank.” It scared the US military silly and touched off a minor arms race. U.S. helicopter manufacturers scrambled to close this supposed “helicopter gap”.



Mi-24P Hind-F

Known to Russian pilots as Gorbach (“hunchback”), the early Mi-24s (models A, B, and C) boasted thick belts of armor. Aside from giving it a unique appearance, it gave the Mi-24 the ability to withstand hits from small arms fire and triple-A guns up to 12.7 mm in caliber. The .50 cal machine-gun that came standard on U.S. M-113 APCs would be lucky to chip its paint.

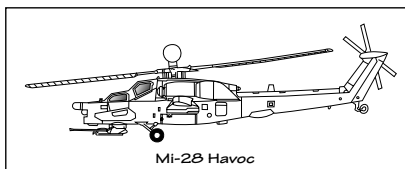
Hundreds of these “devil’s chariots” were exported during the early 1980s. While most wound up going to Warsaw Pact countries, many were sold outside of Europe. While they performed well enough in Europe and the Persian Gulf, they were less successful in the high mountains of Afghanistan. After learning some expensive lessons, both the machine and the tactics had to be altered. Post-war Mi-24s were given a greater offensive punch but the basic power-to-weight problems remained.

The Hind Fs represented in this simulation all have an electro-optical (LLTV) sensor, radar, and FLIR. They carry twin GSh-30 30 mm cannons mounted in a chin turret. These guns are equally effective against helicopters as well as tanks. External hardpoints provide space to mount rocket pods and AT-6 Spiral air-to-ground missiles.

These days production of the Hind helicopter is centered around factories in Arsenyev and Rostov. More than 15 new Mi-24s are built each month. Although the Hind is beginning to show its age, the Hind F remains an extremely tough opponent. In the hands of a skilled crew it can be devastating and virtually unstoppable. Fortunately, the Hind F is primarily interested in blowing things up on the ground. This “flying tank” can withstand a lot of damage, but is too cumbersome to maneuver effectively against a lighter aerial opponent.

✚ Mi-28N Havoc

The design of this helicopter is in keeping with the fine Russian tradition of building things with a single purpose in mind. The Mi-28 Havoc has one mission- go out and kill tanks. It is Russia’s “*Apache-ski*”, a very capable attack



Mi-28N Havoc

helicopter. Production of the original Havoc has given way to full assembly production of the Mi-28N. It was due to enter service in mid 1997.

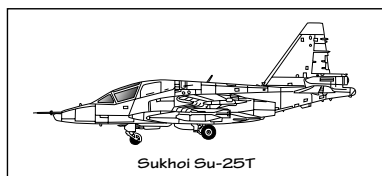
The Mi-28 highlights the divergent design themes currently ongoing within Russia. With its main and tail rotor combination, the Havoc looks more like a conventional Western attack helicopter than the Ka-50. It features a comprehensive all-weather flight and weapons avionics. Its crew of two is seated in tandem inside a stepped cockpit, like the Comanche.

The design philosophies between the Comanche and the Havoc are noticeably different. The Mi-28 pilot is seated above and behind the front seat nav/gunner. The Havoc's cockpit arrangement gives a clear delineation of duties between pilot and gunner. Rather than having access to identical systems as in the Comanche, only the pilot is equipped with a HUD and monitor for LLTV. The main gun and guided weapons are controlled by the front seat CP/Gunner. The pilot can fire the rocket pods and main gun if the gun is locked down in a non-traversal mode.

The Mi-28 is supremely equipped to carry out its anti-armor mission. It features external hardpoints for up to sixteen radio-controlled 9M114 Shturm (AT-6 Spiral) missiles and two UB-20 pods housing twenty 80 mm rockets each. The Havoc also has a chin-mounted NPPU-28 30 mm chain gun with 250 rounds of AP ammunition. Provisions have been made to mount two SA-16 Igla air-to-air missiles though it is unclear whether this adaptation has actually been fielded as yet.

✚ Su-25 Frogfoot

The Sukhoi-25, better known by its NATO designation Frogfoot, is Russia's equivalent to our own A-10 Thunderbolt II. This single seat close air support platform is just the latest in a superb line of ground attack aircraft dating back to the Sturmoviks of WW II fame.



Sukhoi Su-25T

The Frogfoot was introduced into service in 1984 and immediately saw limited service in Afghanistan. Its initial mediocre performance caused it to be withdrawn pending the implementation of certain modifications. The subsequent alterations reflect an awareness of the aircraft's vulnerability to heat-seeking missiles. When the Su-25 returned to combat duty, it featured additional chaff/flare dispensers and IR exhaust diffusers.

Since the early 1990s, Russia has aggressively marketed an export version of the Frogfoot. The Su-25 is affordable and cost effective. Like the A-10, it is ideal for prosecuting low tempo, low tech wars. This aircraft can now be found in Third World air forces all over the globe. It delivers quite a bang for just a few bucks.

The Su-25s that you'll encounter in *Comanche Gold* are the T model anti-tank variant. They are mainly interested in blowing up armor vehicles on the ground. Most of the time you'll come across them while they are assigned to Ground Support missions.

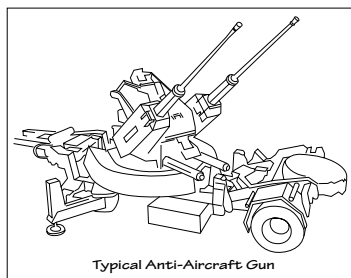
Even so, the Su-25 is equipped with two heat-seeking AA-8 Aphid air-to-air missiles. Frogfoot pilots are more than willing to mix it up with you. These aircraft are slightly faster than you but cannot maneuver as tightly. Sucker a Frogfoot into a low altitude, turning fight and you'll have the advantage. Let one of these fighters catch you flying high above the ground however and they'll make quick work of you. Shooting down your Comanche would give them a wonderful story to tell their "comrades" back at the base.

C. THE AIR DEFENSE THREAT

Although your Comanche has been designed with an emphasis on survivability, the threat posed by enemy air defenses in this simulation is very great. Dealing with the enemy in this game will take a combination of knowledge, skill, and luck. You will definitely survive longer if you rely on finesse rather than force. The following section provides a brief description of what you can expect.

⊕ Anti-Aircraft Artillery (AAA)

Anti-aircraft artillery has undergone many name changes since the beginning of this century. During World War I, it was known as “archie” or “ack-ack”, then in World War II, the German word *flugabwehrkanone* or “flak” came into common usage. When the “Cold War” broke out in the late 1940s, the term *anti-aircraft artillery* gained prominence but with the advent of the jet engine, troops found that this phrase took too long to say especially when under attack. As aircraft began to fly really fast, it became fashionable to start blurting out “triple-A”.



Typical Anti-Aircraft Gun

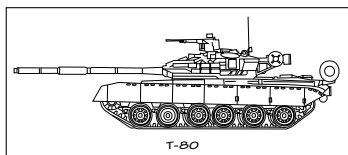
Although the name has changed over the years, the basic nature of triple-A has not. It is still just an effort to throw stuff up in the air in the hopes of hitting something and knocking it down. Back in the early days, shooting down an enemy aircraft was really just a game of percentages. The key was not so much accuracy but volume. If enough people on the ground threw enough lead into the sky for a long enough period of time, chances were good that somebody somewhere was bound to hit something.

These days, computers and fire control radars have taken all the guesswork out of air defense. Triple-A has become much more sophisticated and consequently more deadly. The gunner's TLAR (That Looks About Right) method has been replaced by radar equipped gun directors and laser designators. Even worse from a pilot's standpoint, the volume of fire produced by triple-A guns has also been increased dramatically. Air defense systems can throw more lead into the sky with greater accuracy than ever before.

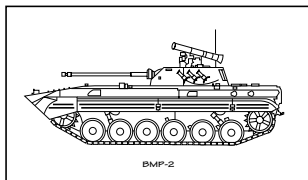
Besides volume and accuracy, another big improvement in triple-A is the increase in its mobility. While stationary (or fixed) triple-A has a role to play in air defense, its biggest problem is the fact that it's stationary. Permanently planting triple-A in a particular spot is like defending one's self with both feet in concrete. You hand over the initiative to your enemy. This type of triple-A fire is easily avoided- don't go near it. Unfortunately, fixed triple-A sites usually guard other things that don't normally move, like buildings.

When warfare became more mechanized, and thus more mobile, fixed triple-A sites became impractical for defending troops in the field. Before long, someone got the bright idea to try mounting triple-A guns on vehicles. By doing this, commanders never again had to worry about leaving the protective umbrella of their fixed air defenses. If they needed to move, they simply brought their protection with them.

You will encounter both fixed and mobile triple-A guns. A good common sense rule to follow is the more important a target is, the heavier and more dangerous the ground fire will be. Count on fixed sites being positioned near important targets like air bases, SAM sites, naval facilities, etc. These guns are extremely deadly and should be avoided wherever possible. Not only are these guns radar guided in many cases, most have a high rate of fire despite their size. They are capable of tossing a lot of accurate lead around. As the saying goes, “It only takes one hit to spoil your day.”

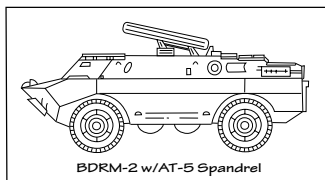


T-80



BMP-2

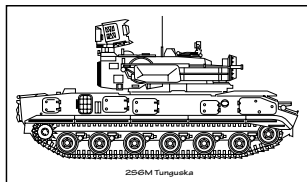
Mobile triple-A can be just as accurate but it usually takes more than just a couple shell hits to bring down a helicopter. These guns are characterized as being lighter than stationary guns but with higher cyclic rates of fire. Mounted on armored chasis, mobile guns accompany the maneuver troops they are assigned to protect. Sometimes there's just no way to avoid this kind of triple-A. You have to get in, do your mission, then get out in a hurry. Hanging around enemy vehicles while they're blazing away is just asking for trouble.



BDRM-2 w/AT-5 Spandrel

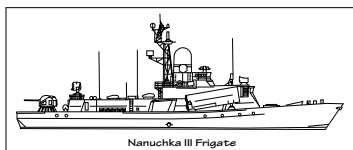
The Russian T-80 MBT, BMP-2, and BRDMs depicted in this simulation are all equipped with multiple heavy machine-guns. These guns can't do enough real damage to bring you down immediately but continued exposure to their fire will certainly result in disaster.

One of the more unique vehicles you'll encounter is the 2S6M “Tunguska” air defense vehicle. This vehicle first appeared in 1986 as a replacement for the very successful ZSU-23-4. There's nothing like this vehicle's gun/missile combination anywhere in the West. It carries eight SA-19 “Grison” radar-guided surface to air missiles and an E-band “Hot Shot” surveillance radar. It also carries two 30 mm GSh-30K water-cooled cannons for close-in work.



2S6M Tunguska

Regardless of how light or heavy the triple-A guns are, they all need a direct line-of-sight and unobstructed line of fire to your helicopter. Your best defense therefore, is to use the surrounding terrain as cover and concealment. Remember too, that your flight envelope is considerably different from that of a fixed wing attack aircraft. Instead of zooming in on a target at 600-700 knots, you'll be ingressing/egressing at a top speed of 150 knots if you're lucky. At this rate the enemy has plenty of time to shoot at you.



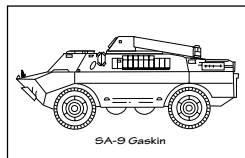
Nanuchka III Frigate

Certain missions task you with destroying Nanuchka class missile frigates—a mission that rightfully belongs to the Navy. It's no wonder that the Navy passed this mission onto Griffon Squadron. Each Nanuchka is equipped with multiple triple-A guns, a 30

mm Close In Weapon System and a “Bass Tilt” fire control radar system. They also carry lots of the SA-N-4 Gecko surface-to-air missiles. Heck, crewmembers can even fire shoulder-launched SA-9s at you from the deck. It’s best to keep your distance whenever possible.

9K31 Strela-1 **(NATO designation: SA-9 Gaskin)**

The 9K31 Strela-1 is a Russian-built, self-propelled, surface-to-air missile system. This single stage, solid fuel missile was developed in tandem with the ZSU-23/4 during the mid-1960s to provide ground units with a means of protection from tactical aircraft.



A single launcher consists of a 9P31 BRDM-2 (4x4) amphibious TEL (transporter-erector-launcher) with four heat-seeking SA-9 missiles inside container-launch sleeves. A battery is comprised of four of these vehicles giving it a total of 16 missiles. Normally, each armor and motorized regiment contains a single SA-9 battery in its TO&E (Table of Organization & Equipment).

The first SA-9 units became operational in 1968. Once again, Israeli pilots were the first to encounter these missiles in actual combat over Lebanon in 1981. Two years later, a U.S. Navy A-6E Intruder was shot down by a Syrian SA-9, also over Lebanon. More recently, Iraq used SA-9s during its 10 year war with Iran. Iraqi SA-9s were also deployed during the Gulf war in 1991.

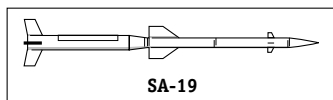
The all-aspect SA-9 Gaskin has an engagement envelope which extends from a minimum range of 1,000 ft. to a maximum range of eight kilometers. A target is initially detected by the vehicle’s ‘Flat Box’ passive radar system. The vehicle gunner next acquires the target visually through the use of a magnifying optical sight. The missiles are slewed to the proper azimuth. The gunner then activates (uncages) the missile’s seeker head.

The SA-9 seeker head itself is cryogenically cooled by lead sulfite and able to distinguish radiation in the 1 to 5 mm waveband. When the IR seeker has locked onto the target, the gunner receives an audible tone indicating permission to fire. Once launched, the SA-9 continues to track the target based on the IR energy it detects coming from the target.

Because the SA-9’s warhead is so small (only 2.6 kg of high explosive), two of these missiles are normally fired at a single target. The missile has lethal blast radius of 15 ft. with a fragmentation hazard zone extending out to 25 ft. from the point of detonation. Even if it fails to register a kill, an SA-9 will most likely inflict crippling damage to an engine or other vital area forcing the aircraft to abort its mission.

SA-19 **(NATO Designation: Grison)**

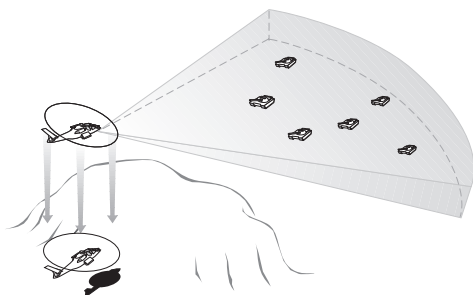
The SA-19 (NATO designation: Grison) is a two stage radar-guided surface-to-air missile carried by the 2S6M Tunguska. The naval version of this missile is designated SA-N-11. The 2S6M vehicle uses a E-band surveillance radar to detect



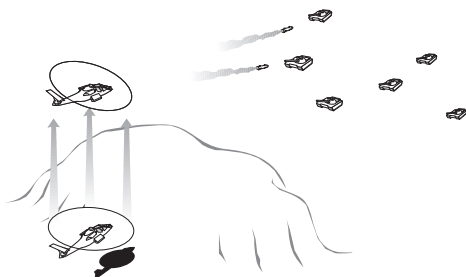
targets. Once a target is detected, it is passed to the J-band fire control radar situated on the vehicle's turret. Normally, two missiles will be launched at a target to ensure complete destruction.

This missile has a relatively large warhead (9 kg.) for its size (2.6 meters in length). The warhead utilizes a proximity fuze which detonates when the missile comes within 5 meters of the target. The SA-19 is particularly effective against low flying aircraft and helicopters. Russian sources claim the missile to score hits on targets flying as low as 50 feet. This means that the Grison can take out helicopters still within their IGE cushion. The best defense against these missiles may be to avoid 2S6M Tunguska vehicles altogether.

RIPPLE FIRE



In the diagram above, the Comanche has scanned the battlefield and detected six enemy vehicles. It now drops down behind the ridge to process this information into TRGT Hold mode format.



In this diagram, the Comanche pops up from behind the ridge and lets loose with a ripple fire volley of Hellfire missiles.

For more information, refer to page 66.



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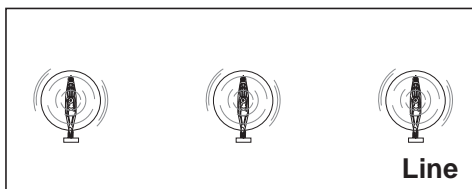
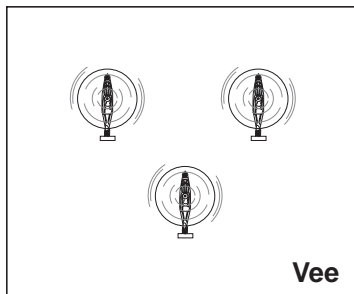
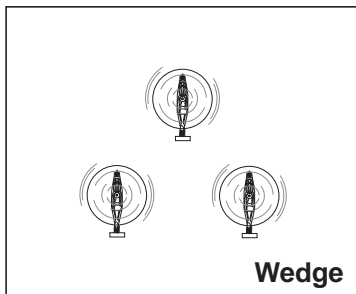
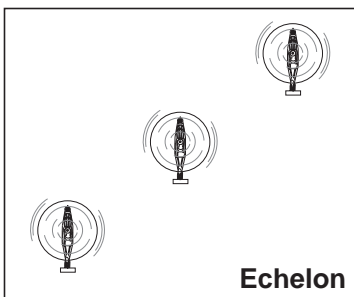
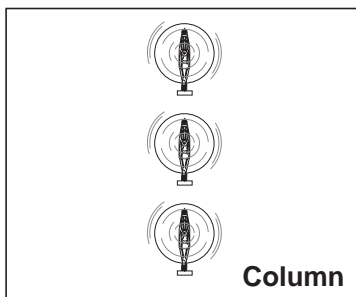
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FORMATIONS



Helicopters assume different formations based on time, terrain, and proximity to the enemy.

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U.S. MILITARY AIRCRAFT DESIGNATIONS

The U.S. military uses a common system of designation which applies to all military aircraft. Most of us know that the "F" in F-22 stands for fighter. Here is a complete list of designations that probably aren't so familiar.

Examples:

YF-22 (Status Prefix/Basic Mission - Model Number)

KC-135 (Basic Mission/Expanded Mission - Model Number)

RAH-66 (Basic Mission/Expanded Mission/Aircraft Type - Model Number)

B-1b (Basic Mission - Model Number)

Status Prefix

G Permanently Grounded

J Special Test (temporary)

N Special Test (permanent)

X Experimental

Y Prototype

Z Planning

Basic Mission

A Attack

B Bomber

C Transport

E Special Electronic outfit

F Fighter

O Observation

P Patrol

R Reconnaissance

S Anti-submarine

T Trainer

U Utility

X Research

Expanded Mission

A Attack

C Transport

D Director

E Special Electronic Outfit

F Fighter

H Search and Rescue

K Tanker

L Cold Weather

M Multi-mission

O Observation

P Patrol

Q Drone

R Reconnaissance

S Anti-submarine

T Trainer

U Utility

X Research

Aircraft Type

G Glider

H Helicopter

V VTOL/STOL

Z Lighter Than Air Vehicle