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INTRODUCTION

On January 16th 1991, eight Apache helicopters fired the first shots in Operation Desert Storm, using their Hellfire missiles, 70mm rockets and 30mm rounds against Iraqi early warning radar systems, paving the way for the allied air offensive that followed. Apaches were the first to arrive in Saudi Arabia for Operation Desert Shield. The first attack helicopters to take prisoners, without ground troops present, capturing over 500 Iraqi soldiers. The only coalition aircraft to fly on February 25th and 26th when other aircraft were grounded due to weather restrictions. Throughout the conflict, the Apache maintained the best reliability record of any helicopter in the combat arena.

The Apache has long been regarded by many as the most exciting modern combat helicopter and it is now set to get even better. The current Apache modernisation programme will give the U.S. Army the AH-64C and AH-64D Longbow variants. The AH-64D Longbow Fire Control Radar provides a major advancement in tactical capability for the Apache, sweeping the battlefield through a full 360 degrees to evaluate and prioritise air and ground threats. The Longbow radar is integrated with the onboard Target Acquisition and Designation Sight (TADS) allowing rapid engagement of multiple ground and air targets with fire-and-forget Longbow Hellfire missiles. Crew can preprogram flight routes and multiple target locations, navigating accurately to and from the battle area to engage the enemy in total darkness.

Apache-Longbow is the first desktop flight simulator to present the Apache helicopter in such authentic detail. Public domain information on the Apache Longbow is limited, but with the assistance of McDonnell Douglas we have been able to represent many of the innovative features of this aircraft. Apache-Longbow gets you into the thick of the action from the moment you load the product. Combining a vast selection of missions and campaigns with state-of-the-art 3D computer graphics, we aim to keep you enthralled for many hours. The real Apache is at the forefront of technology and we are proud to present a simulation to match. Climb aboard and experience for yourself what it's like to fly this awesome warrior.

Apache-Longbow....nothing comes close.



QUICKSTART

When running the game for the very first time, the introductory animation leads directly into the Quickstart "Arcade" option and you are immediately airborne, weapons armed, flying over hostile territory. Options are preset for unlimited weapons, unlimited fuel, simplified controls - and lots of action! **There is no time limit but you can get shot down.** Targets are automatically locked and tracked by your ground radar, leaving you to fly the Apache and launch weapons.

Push forward on the joystick (or press **↑**) to accelerate and pull back on the joystick (or press **↓**) to slow down. Bank left or right to turn (**←** and **→**, or joystick). Adjust your altitude using the collective lever control (**Q** to go up, **A** to go down).

Weapons available to you are Hellfire radar-guided missiles, unguided Hydra rockets or the 30mm chain gun. The Hellfire missiles are the easiest to use - just make sure that the small target designator box lies inside the large missile acquisition box before you launch the missile.

To arm weapon:	Press ←Enter or press Spacebar once.
To launch weapon:	Press Spacebar .
To select weapon:	Press ←Enter .

Press **Ctrl** and **Esc** together to end your flight.

When selected from the Main Screen, Quickstart has two options:

(i) **Invincible mode:** unlimited weapons and fuel, simplified controls and no enemy fire. You will be awarded a score during each flight dependent upon how many targets you destroy. Your flight will end when you quit using keys **Ctrl** and **Esc**.

(ii) **Arcade mode:** as described above. Your flight will end either when you quit using keys **Ctrl** and **Esc** or you get shot down.

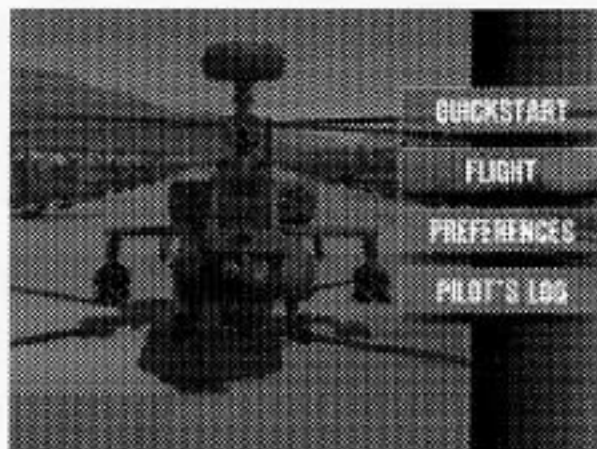
Have fun!



FLIGHT OPTIONS



Figure 1.0



Main Screen

Summary

Apache-Longbow contains four flying areas:

1. Fort Hood, U.S.A. - training area
2. Yemen - combat area
3. Korea - combat area
4. Cyprus - combat area

Training missions at Fort Hood should be used to learn the basics of flying your Apache and how to use your weapon systems. Each combat area offers a selection of single missions and a multi-mission campaign. There are two Quickstart options, three two player options and a network option for up to 16 players.

Figure 1.0 shows the overall structure of Apache-Longbow. When running the game for the very first time, the introductory animation leads directly into the Quickstart "Arcade" option. Thereafter the introductory animation and title page lead you to the Main Screen.

Main Screen

Use the mouse pointer to click on any of the following options:

Quickstart: two options are available:

- (i) **"Invincible" mode:** infinite weapons, infinite fuel, no enemy fire. This option is great for just flying around and taking-out anything that moves (or doesn't!).
- (ii) **"Arcade" mode:** infinite weapons, infinite fuel, but you are no longer invincible to enemy fire. A score is awarded for the number of targets destroyed.

Flight: click here to select the Flight Screen (see below)

Preferences: here you can specify a number of preferred settings depending upon your hardware. See the chapter on System Configuration for a full description of preferences.

Pilot's Log: click here to select or begin a new pilot's log. The log supports up to ten users and each user may have up to ten pilot names. To enter a new user name, click on "Rename User" and type in your new user name. To add a new pilot, click on Create and type in your pilot's name. Options are also available to Delete and Rename a pilot.

Exit: click here to return to DOS. On all other screens, the exit button will take you to the previous screen.

Flight Screen

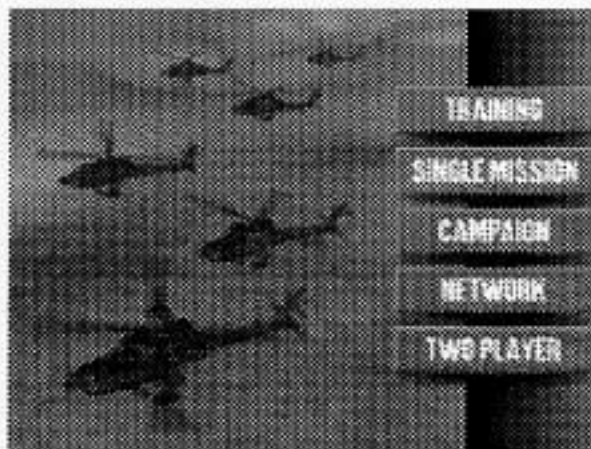
Training: click on this icon with your mouse pointer to display the list of training missions. During training you may select infinite weapons and switch off crash detection. Training always takes place at Fort Hood, U.S.A.

Single mission: click on this option to proceed to combat area selection. You will then be presented with the list of available missions for the area. Select your mission and click on Commit.

Campaign: click on this option to proceed to combat area selection after which you will arrive in the Base of Operations. The campaign for each combat area has eight levels. With several different possible missions at each level, your success or failure on any level will determine how the campaign progresses.

Network: click here to select the multiplayer network option. Up to sixteen users can fight for survival in this "free-for-all" scenario.

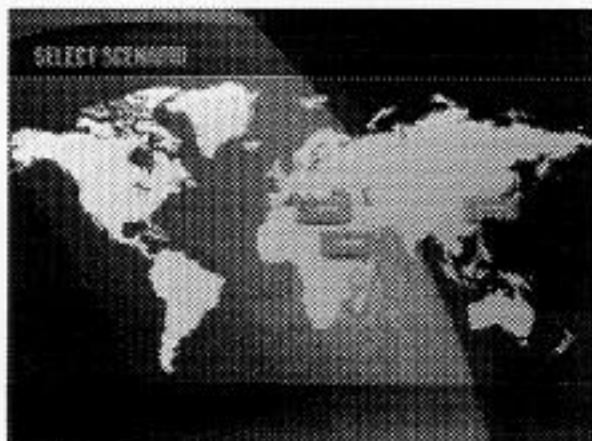
Two player: click on this icon for the following options:



Flight Screen

- (i) **Combat:** a two player game allowing you to fly head-to-head against a friend.
- (ii) **Leader/Wingman:** this allows you to fly cooperatively with another player on any of the single missions
- (iii) **Pilot/Gunner:** this option allows two players to crew the same Apache - one as pilot, the other as copilot/gunner, on all single missions

All of the two player options are playable across a modem, a direct serial cable link or across a network.



World Map

World Map

You have a choice of three geographical areas - Yemen, Korea or Cyprus. The regions were chosen because they represent potential trouble spots in the modern world, each offering a different set of challenges. In Yemen, you are part of a shipborne rapid reaction unit. Enemy forces are equipped with a variety of Soviet and Western hardware but are relatively weak. This region is recommended for your first attempts at combat. In Korea, the Northern forces are well equipped with Soviet hardware. Poor weather conditions and a difficult terrain combine to give demanding missions. The Cyprus scenario has been designed to be the most challenging. Both sides have Western equipment, including

Apache helicopters, which can make identification difficult. You are stationed at the "sovereign base" at Dhekelia.

Although all geographic areas in this simulation are based upon real countries, we do not wish to imply that military tactics or capabilities are accurately portrayed. All scenarios are totally fictitious. We do not wish to glorify war or its consequences. We hope that you will gain a better understanding and appreciation of the equipment and risks involved, in the safety of your own home. For your interest, a brief synopsis follows of each territory to help you understand why the areas were chosen.

Yemen

The port of Aden was annexed by the British in 1839 as part of a number of naval bases used to protect the Indian Empire. At this time, Yemen was ruled from Saana by imams, authoritarian extremist leaders. In order to protect their interests, the British created the artificial division of North and South Yemen and proclaimed the south as the Aden Protectorate. Yemen united with the rest of the Arab world in hostility towards Britain during the Suez war of 1956, and despite the loss of the Suez Canal at this time, the British were determined to retain Aden as a base of operations in the Gulf. Following the death of Imam Ahmad in 1962, the Egyptians organised a coup in Saana, only to be met by fierce resistance from the imam tribes, supported by the Saudis and the British. The bombing of guerilla bases in Saudi Arabia by the Egyptians brought the two countries to the verge of war and British presence in Aden became untenable. After Egypt's defeat in the Six Day War in 1967, the Egyptians pulled out of North Yemen and the British abandoned South Yemen one month later.

The area continued unsettled for the next twenty years. During this time, South Yemen received limited economic support from the Soviet Union. Frequent and bloody changes of government led to the outbreak of a savage battle in 1986. The unstable truce that followed lasted for four years, during which time the Soviet Union gradually reduced its support. Several attempts have been made to unite North and South and in 1990 an agreement was ratified by both governments. However, with Aden no longer strategically important and the deterioration in relations with Saudi Arabia, the future remains bleak and unstable.

Korea

At the end of the Second World War, the Soviet Union and the United States divided Korea along the 38th parallel. In a determined effort to reunite the country, the North Koreans invaded the south on June 6th, 1950. The United States responded, with the support of the United Nations, and South Korea was liberated within weeks. However, General MacArthur continued to drive his armies up to the Chinese border with the intention of unilaterally reuniting Korea. The Chinese

retaliated by assisting the North Koreans to counterattack and recapture Seoul. The Korean war lasted from 1950 to 1953 and devastated the country.

The restoration process has been difficult for both sides. The south has concentrated upon economic growth and has continued to prosper with democracy established in 1987. On the other hand, North Korea has stagnated with the continuous rule of Kim Il Sung for over forty years and remains dedicated to invading the south. The border is recognised as one of the most dangerous in the world. Numerous acts of terrorism by North Korea have demonstrated their desire to antagonise the south. Recent concerns have focused on the possibility of the north becoming a nuclear threat and the fear of invasion remains high.

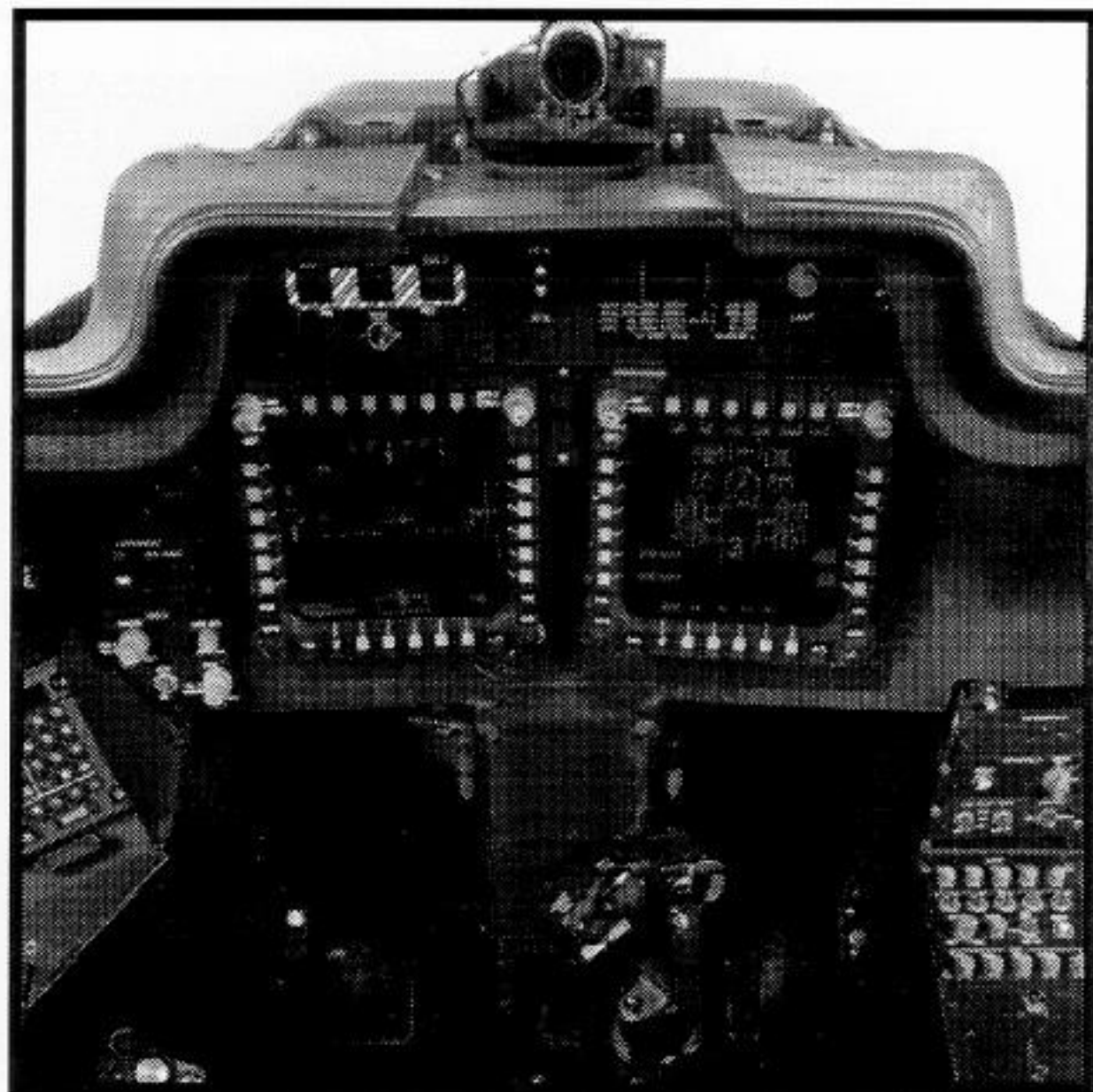
Cyprus

Cyprus has long been the source of extreme tension between Greece and Turkey. Forcibly partitioned by the Turks in 1974, the island is split into two zones; one Greek (60%), the other Turkish (40%). The "green line" that separates the two zones is policed by 2000 UN troops, the UNFICYP.

The Greek Cypriots desire unification with Greece but the Turks are not prepared to accept a Greek base 50 miles off its southern coast. Attempts by the British to form a combined Greek-Turkish constitution have failed and the United States continues to avoid involvement.

The British have retained two "sovereign bases" on the island at Akrotiri and Dhekelia on the south coast. Their main interest is in the use of the island as a "listening post" for observing events throughout the Middle East.

The island has suffered numerous activities by terrorist organisations such as the PLO. As a result, Cyprus has expelled a number of foreigners suspected of terrorist sympathies.





a) Pitched down



b) Rolled left



c) Rolled right



d) Pitched up

Introduction

The Apache cockpit is a two-seat tandem arrangement with the pilot in the rear seat and the co-pilot/gunner in the front seat. The aircraft is flyable by either pilot or copilot/gunner. Cockpit instrumentation in the AH-64 C/D is an entirely new "glass cockpit" design, with most of the earlier analogue dials replaced by two multi-function displays.

Pilot's instrument panel (rear cockpit)

Press **[Home]** to select the pilot's cockpit.

Primary flight instruments:

Artificial horizon: (shown on left) shows the pitch and roll attitude of your aircraft.

Airspeed: shows your forward speed in knots, calibrated from 0 to 200. There is no indication of sideways or rearward speed.

Altimeter: shows your barometric altitude in feet. The small hand is calibrated in 1000's, and the large hand in 100's. NB. This is your height above sea level, not height above the ground. All airfields in Apache-Longbow are at sea level.

Standby compass: shows the magnetic heading of your aircraft.

Clock: shows time of day, corresponding to your mission.

Multi-function displays (MFDs): Each of the displays has nine user-selectable modes. Use **[Left Arrow]** to cycle through modes on the left MFD or **[Right Arrow]** to cycle through modes on the right. Use **[Shift]** & **[Left Arrow]** or **[Right Arrow]** to cycle in reverse direction. In the event of damage, use **[Ctrl]** & **[Left Arrow]** or **[Right Arrow]** to switch the MFD off. It is not possible to have both MFD's in the same mode.

Modes:

- Ground radar
- Air radar
- Tactical Situation Display
- FLIR
- Flight Plan
- Weapons
- System status
- Moving map
- Engine instruments

Pilot's instrument panel

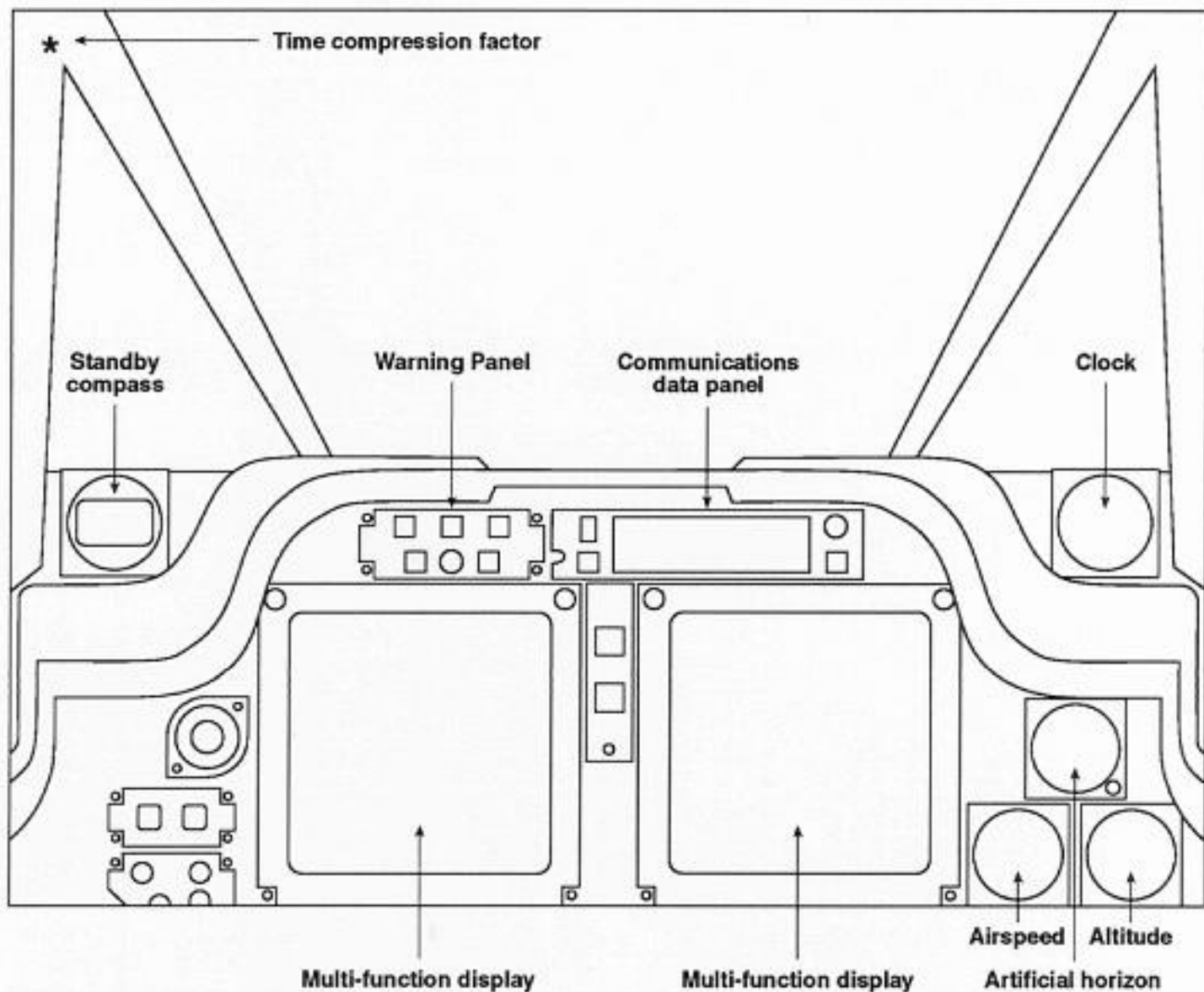
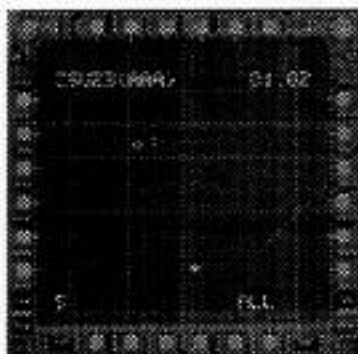
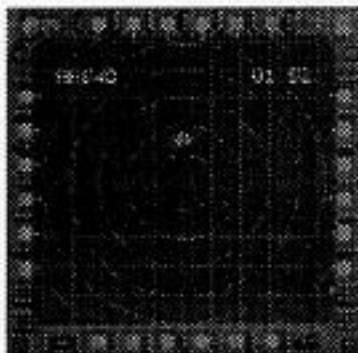


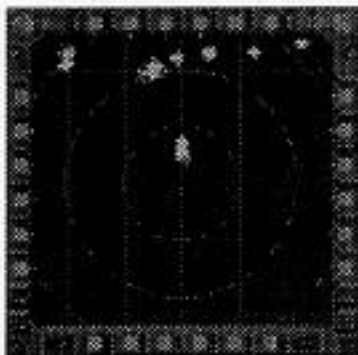
Figure 2.0



MFD in Ground Radar mode



MFD in Air Radar mode



MFD in Tactical Situation Display mode

(i) **Ground radar:** a symbolic display of buildings and ground vehicles within a 45 deg. field of view ahead of your aircraft. Press **[R]** to select either ground radar or air radar. Press **[G]** to cycle through short range (2.5 miles), medium range (5 miles) and long range (10 miles). It is not possible to display the ground radar on one MFD and the air radar on the other MFD.

Symbols: \diamond building + vehicle

The ground radar is not capable of distinguishing between allied and enemy vehicles. Exercise caution in territories such as Cyprus where Western equipment is in common use by both sides. The same problem arises with non-military vehicles such as truck convoys. If you are not certain that your target is hostile, use the TADS for visual confirmation.

By default, the ground radar will automatically evaluate the situation and designate the highest threat as the target. You may override this selection by pressing **[+Backspace]** repeatedly to cycle through targets, or **[⇧Shift]** and **[+Backspace]** to reverse cycle. Press **[M]** ("mask") to cycle between All, High, Medium and Low priority targets. (**[⇧Shift]** **[M]** to reverse). If you wish to designate targets by using the helmet-mounted sight or the TADS system whilst the radar is switched on, press **[Y]** to select boresight mode. (Confirmed on the radar display by 'BORE'.) Press **[Y]** again to restore radar target selection.

It is important to remember that your radar cannot see through hills. In such a situation you will need to ascend until the targets become visible on your radar (known as "unmasking"), freeze the radar by pressing **[U]** and then descend into cover ("remask") in order to evaluate and prioritise your targets. Press **[Ctrl]** **[R]** to turn the radar off.

Radar target priority:

High: SAMs, AAA and APC's

Medium: Tanks, artillery, combat aircraft, military ships
 and radar installations

Low: Fortifications, buildings, other vehicles, ships and aircraft

COCKPIT

(ii) **Air radar:** a symbolic display of enemy airborne targets with a full 360 deg. field of view. Range is fixed at 5 miles. Press **[R]** to select air radar. Press **[Ctrl][R]** to turn radar off.

Symbols: allied aircraft
 x enemy aircraft

Press **[M]** to toggle between ENEMY only or ALL. Press **[Y]** to select boresight mode on/off.

(iii) **Tactical Situation Display:** a symbolic display of allied and enemy aircraft and ground vehicles, with a full 360 deg. field of view around of your aircraft. Press **[K]** to select range as 2.5 miles or 8 miles. Incoming missiles are also shown.

Symbols: allied aircraft T radar-guided missile
 x enemy aircraft ⊥ infra-red missile
 + vehicle

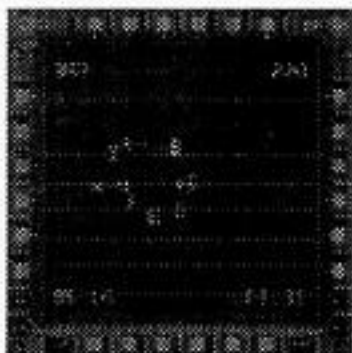
(iv) **FLIR (Forward Looking Infra Red) mode:** This is part of the Target Acquisition and Designation Sight (TADS). The FLIR is used for target identification purposes and displays the target currently selected by the TADS.

(v) **Flight Plan:** a symbolic display of your current position relative to your flightplan (waypoints A,B,C etc.) with the next waypoint highlighted. Press **[N]** to select the next waypoint or **[Shift][N]** to select the previous waypoint. The scale of this display adjusts automatically. The display is orientated with your aircraft facing the "12 o'clock" position. Reading clockwise from the top left corner of the display you will see heading, bearing, time to go and distance to next waypoint. To fly directly to the next waypoint, turn until your heading matches the bearing. The waypoint should now be at the 12 o'clock position of the display.

(vi) **Weapons:** displays weapons currently loaded. Also confirms selection of manual chaff and flare operation **[Ctrl][C]** and ECM on/off **[E]**.



MFD in FLIR mode



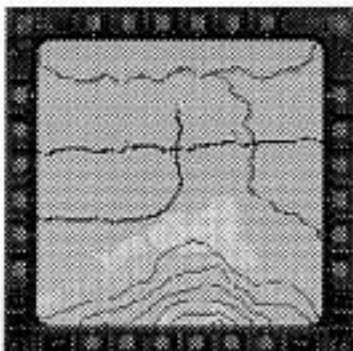
MFD in Flightplan mode



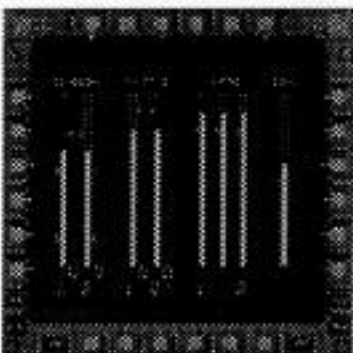
MFD in Weapons mode



MFD in System Status mode



MFD in Moving Map mode



MFD in Engine Instruments mode

(vii) **System status:** displays status of all major systems:

warnings:	radar	ground, air, damaged
	fuel low	
failures:	DTV	daytime TV
	IHADSS	helmet mounted sight
	TADS	laser failure
	PNVS	pilot's night vision system
	FLIR	copilot's FLIR display
	ECM	ECM
	COMMS	comms receiver
	GUN	chain gun

(viii) **Moving map:** a display of local geographic features centred about your present position, orientated with your aircraft facing the "12 o'clock" position. Six ranges are available from 0.4 miles to 12.4 miles, using to decrease range and to increase range.

(ix) **Engine instruments:** displays engine rpm, engine torque, engine temperature and rotor rpm. The collective lever position has been added to this display although it does not appear in the real aircraft. This mode is particularly important during an emergency autorotative procedure when the pilot would wish to monitor rotor rpm after engine failure.

Unlike a fixed wing aircraft, throttle control is automatic. The engine will automatically adjust its torque output in order to keep the rotor rpm at 100%. Under normal conditions, engine rpm remains at or near 100%.

Communications data panel: alphanumeric display showing fuel status, flight time remaining, weapon status and systems failure warnings. E.g. 'INCOMING-3' - incoming missile, 3 seconds to impact.

Warning lights

Engine failure lights: illuminate when either engine is damaged.

Fire warning light: illuminates when there is a fire onboard. You are advised to land as quickly as possible if this occurs - there is no ejection seat!

Audio warnings

Overtorque: It is possible to demand up to 130% torque for a few seconds. Whenever you exceed 100% torque, you will hear an audible warning. A warning message will also appear on the communications data panel. Continuous demand of over 100% will result in engine damage. You can avoid this by lowering the collective lever as soon as possible.

Copilot/Gunner (CP/G) instrument panel (front cockpit)

Press **[Pg Up]** to select the copilot/gunner cockpit.

Forward Looking Infra Red (FLIR)

The CP/G has two MFD's identical to those of the pilot. In addition to this, there is a centrally-mounted display, dedicated to FLIR (Forward Looking Infra Red). When used in conjunction with the pilot's MFDs, a total of five display modes may be operational simultaneously (two front, two rear and front FLIR).

Target Acquisition and Designation Sight (TADS)

Mounted above the CP/G FLIR display is the TADS eyepiece. The copilot views the outside world through the TADS in any of three modes - DVO, FLIR and DTV. All three modes give a full screen image representing the view through the TADS eyepiece. The view is steerable 120 degrees left or right, 30 degrees up & 60 degrees down.

(a) Direct View Optics (DVO): This is a telescopic view with magnification selectable between 3.5 times and 16 times.

(b) Forward Looking Infra Red (FLIR): This is an infra red image with magnification selectable between 2 times and 11 times.

Copilot/gunner instrument panel

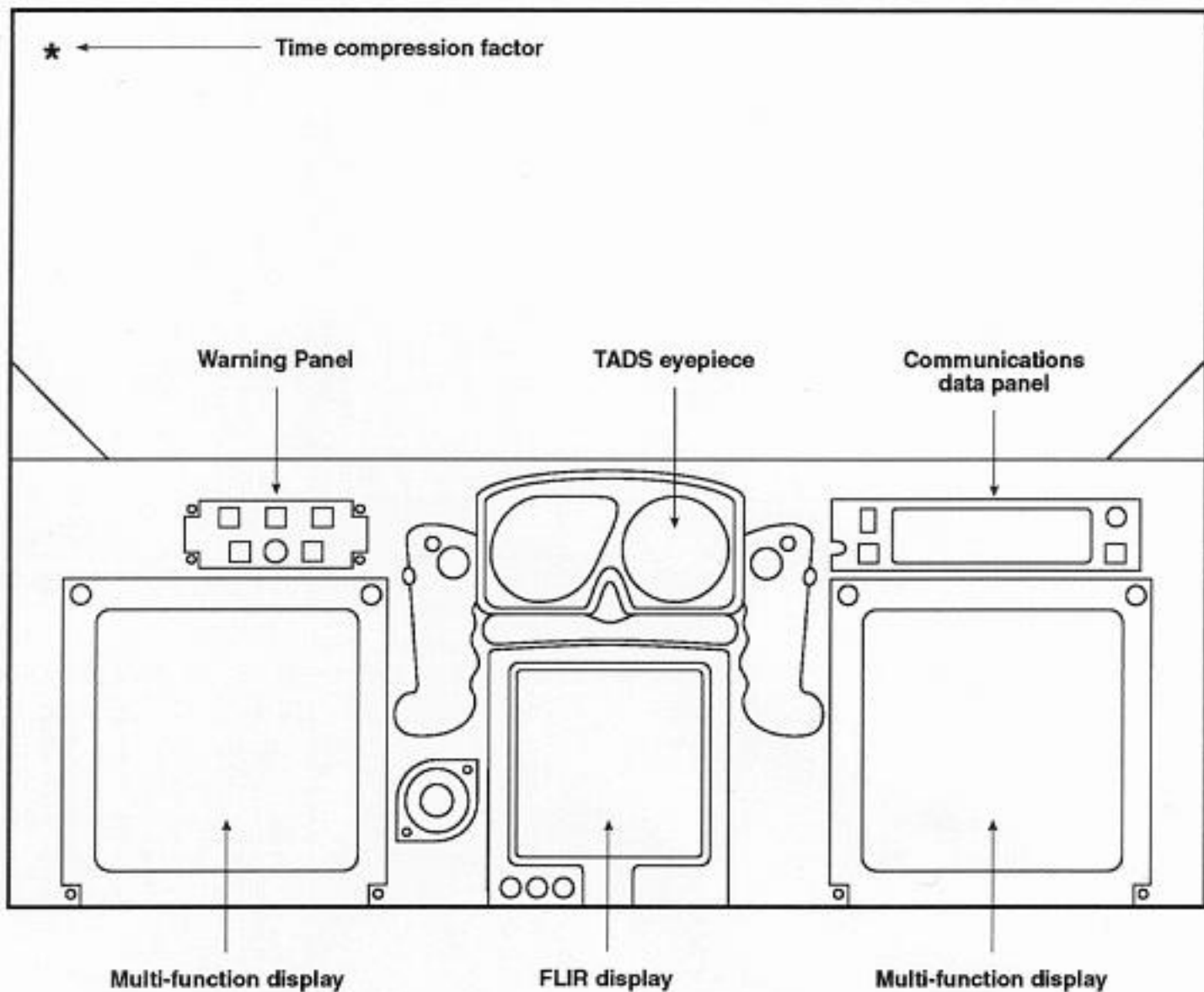


Figure 2.1

(c) **Day TV (DTV):** This is a TV image with magnification selectable between 28 times and 126 times.

Operation of the TADS system is described in detail in the Weapons chapter.

Integrated Helmet and Display Sight System (IHADSS)

Both aircrew wear helmets with a built-in "head-up display", a sophisticated sighting system and a night vision system. This enables either crew member to pilot the helicopter, day or night or in adverse weather conditions, and to aim weapons by simply looking at the target. Display contrast may be adjusted for different lighting conditions by pressing key **[I]**.

(a) Primary flight information

On the actual aircraft, flight information is projected into the pilot's right eye by means of a helmet-mounted monacle. This is represented in Apache-Longbow by the information being superimposed on all cockpit view modes (*see figure 2.2*)

Heading indicator: Helicopter compass heading, (1 to 360 degrees) calibrated every 30 degrees. The Bearing Marker shows the direction to the next waypoint.

Pitch bars: Bars showing aircraft pitch and roll attitude, calibrated every 10 degrees. The bars remain parallel with the horizon with their inner ends pointing at the ground. Bars above the horizon are solid, bars below the horizon are broken.

Roll angle indicator: displays roll angles of up to +/- 30 degrees. For clarity reasons, this feature is not displayed when a weapon is armed.

Altitude scale: a vertical "thermometer-style" display of altitude, usable at 200 feet or less. Calibrated every 50 feet.

IHADSS symbology

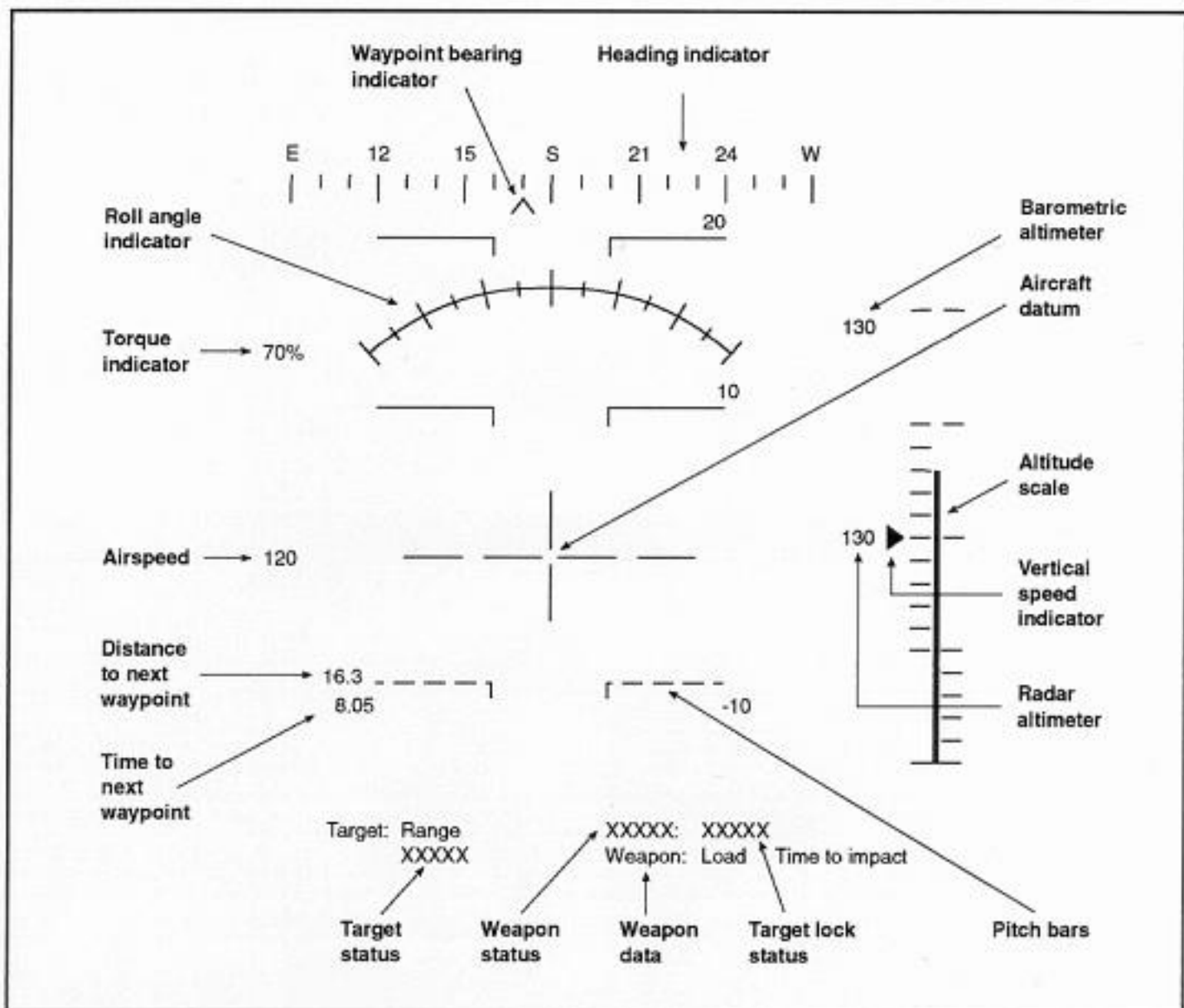


Figure 2.2

COCKPIT

Vertical speed indicator: centred on the altitude scale, the VSI pointer rises or falls to show the helicopter's rate of climb or descent. Usable up to a maximum scale deflection of 100 feet per second.

Radar altimeter: a digital display of your height above ground, in feet.

Barometric altimeter: displays your height above sea level, in feet.

Aircraft datum: used as a reference point for the pitch ladder.

Airspeed: your forward speed in knots. There is no indication of sideways or rearwards speed.

Torque indicator: digital display of engine torque. This will normally approximate to collective lever position.

Distance and Time: digits showing distance (n.m.) and time (minutes and seconds) to next waypoint.

Weapon data: shows weapon currently selected, number available, and time to impact if a weapon is in flight.

Weapon status:

armed
unarmed
failed
safe

Target lock status:

locked
selected
designated

Target data: if the TADS is active and locked onto a target, the target name and range (in feet or n.m.) will be displayed.

Target status:

no lock	no target, or weapon not armed
acquired	weapon has locked onto target
out of range	target beyond range of weapon
under range	target too close
target obscured	weapon does not have clear flight path to target

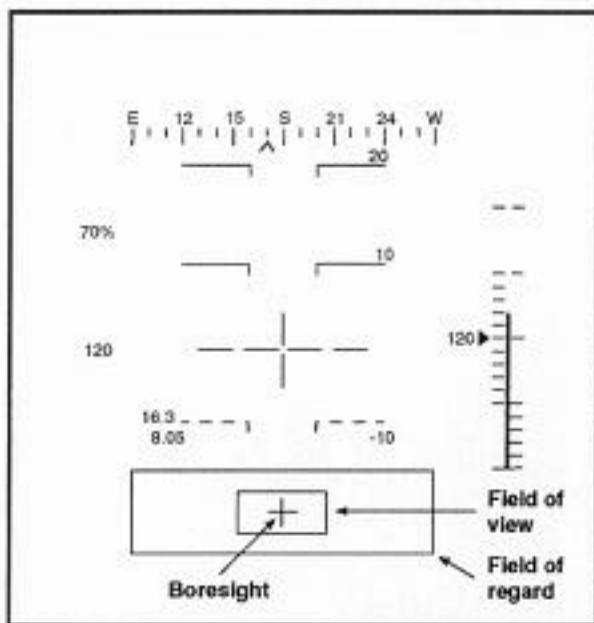


Figure 2.3

out of lock cone target out of weapon field of view
no IR signature inappropriate target for IR-guided weapon

(b) Helmet-mounted Sight

With the helmet-mounted sight, targets may be designated by simply looking at them. The system defaults to looking straight ahead and we refer to this as the **"boresight mode"**. When looking straight ahead from within the cockpit, the sighting system will automatically select the target nearest the centre of the display. Press **[L]** to lock onto a target. Press **[L]** again to unlock. If the target moves out of the boresight field of view the target lock will be lost.

By pressing **[H]** you will select **"helmet mode"**, a full screen outside view, steerable within the limits of 90 degrees left or right, 80 degrees up and 45 degrees down. The view is steered by pressing **[Alt]** together with the cursor keys, or by pressing Fire button 2 together with moving the joystick. As

you adjust your head position notice the "field of view" box moving inside the "field of regard" box. (see figure 2.3) This depicts your head position and limits of head movement available to you.

When using the helmet mode, the sighting system will automatically select the target nearest the centre of the display. Press **[L]** to lock onto a target. If the target is airborne, the view will also become locked in the direction of the target. Press **[L]** to unlock if you wish to select a different target. If you are currently locked onto a target and you return to a cockpit view with the radar active, the locked target will be passed to the radar.

(c) Pilot's Night Vision System (PNVS)

This provides both aircrew with a helmet-mounted infra-red image. In practice it is used in conjunction with the helmet sighting system but for gameplay purposes, we have also made the PNVS image available at night with the normal in-cockpit views. The PNVS may be switched on/off with **[V]**.



WEAPONS

Air-to-air:	Stinger IR missile 30mm chain gun
Air-to-ground:	Hellfire AGM114A laser-guided missile Hellfire AGM114B radar-guided missile Hydra rocket, M261 and M255 warheads 30mm chain gun

Use **←Enter** to cycle through your available weapons. Use **Spacebar** to fire. Weapons may be armed but not fired when on the ground. With the radar switched on, **Enter** will cycle through air-to-air or air-to-ground weapons as appropriate.

Hellfire AGM114A laser-guided missiles

The laser-guided Hellfire is a powerful air-to-ground missile for use against armoured vehicles, buildings etc. It has a maximum range of approximately 3 miles and a maximum speed of Mach 1.2. The target is illuminated by a laser beam from the Apache itself or by ground forces. When compared to the radar-guided Hellfire, it has the advantage that targets can be designated without using the radar which may alert the enemy to your presence. The Hellfire has a minimum range of 2500 feet. Firing at targets under this range may not give the Hellfire sufficient time to manoeuvre in order to hit the target.

Press **←Enter** until AGM114A appears in the lower right hand corner of the IHADSS display. The weapon is now selected and armed. The field of view of the missile is depicted as a large square on the IHADSS. The next task is to designate your target with the helmet sight, the radar or the TADS system.

(a) Using the Helmet-mounted sight

Press **Home** to select the pilot's forward view. The helmet-mounted sight will now automatically select the target nearest the centre of the screen. This is the "**boresight mode**" and is the simplest method of acquiring targets automatically as you fly around. Weapons will be guided to the currently selected target. If no target is available, turn

radar or Tactical Situation Display may be used to help you decide which way to turn). As soon as a target is selected, its position will be shown on the IHADSS display by the Target Designator box. (see figure 3.0) Target type and range appear in the lower left corner of the IHADSS. Automatic target selection is confirmed by the word "Selected" appearing on the display (lower right corner). As you manoeuvre, the system will continuously select the target nearest the centre of the screen, automatically switching between targets as necessary.

If you wish to remain locked onto a particular target, press **[L]**. This instructs the sight to continue tracking the chosen target instead of switching to whichever is closest to the centre of the screen. Lock-on is confirmed by the word "Locked" replacing "Selected" on the IHADSS display. However, it is not necessary to lock onto a target before firing the weapon.

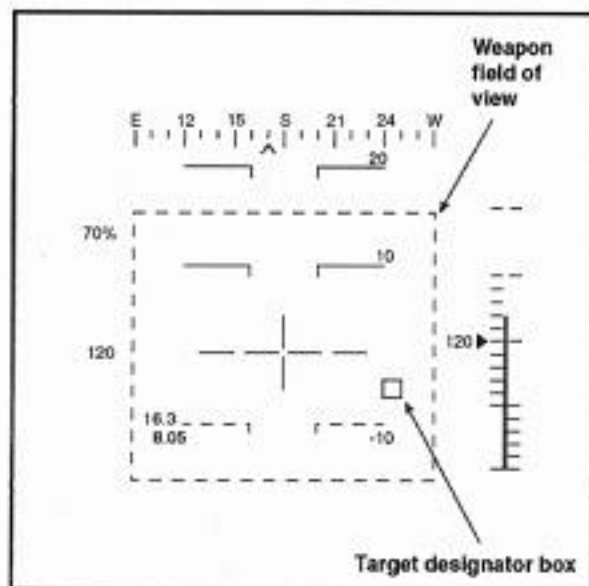


Figure 3.0

The field of view of the missile is shown on the IHADSS as a large dashed square. When the target designator box lies within the missile's field of view, the large square will change from dashed to solid, confirming that the missile has acquired the target. (The target must also be in range for this to occur.) Target acquisition is also confirmed by the word "Acquired" appearing on the IHADSS, together with the estimated time to impact, in seconds. The missile will now have a high hit probability. After launch, the countdown timer displays the estimated time to impact.

Press **[H]** to select "Helmet mode", a full screen steerable outside view. The view is steered by pressing **[Alt]** together with the cursor keys, or by pressing Fire button 2 together with moving the joystick.

The sighting system will automatically select the target nearest the centre of the display. Press **[L]** if you wish to lock onto a target. If the target is airborne, the view will also become locked in the direction of the target. Press **[L]** to unlock if you wish to select a different target. The

target designator box and missile field-of-view box operate as described earlier.

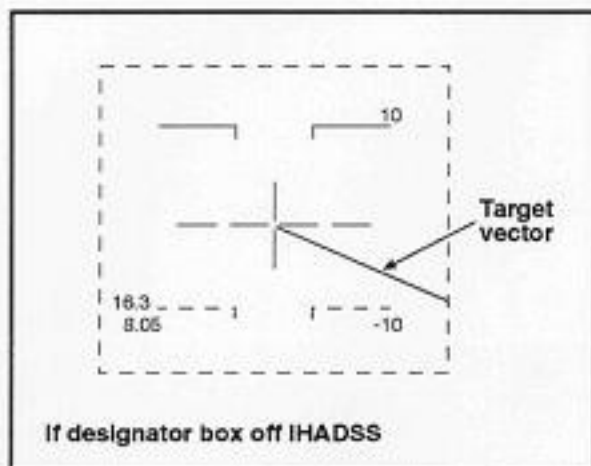
Summary:

Boresight mode: Press **↵Enter** to select weapon.
Turn towards target for automatic selection.
Press **Spacebar** to launch weapon when in range.

Helmet mode: Press **[H]** for Helmet mode.
Press **↵Enter** to select weapon.
Steer view towards target for automatic selection.
Press **Spacebar** to launch weapon when in range.

(b) Using radar

Press **[R]** to activate the ground radar. By default, the ground radar will automatically evaluate the situation and designate the highest threat as the target. You may manually override this selection by pressing **↵Backspace** repeatedly to cycle through available targets, or **⇧Shift** and **↵Backspace** to reverse cycle. Press **[M]** ("mask") to cycle between All, High, Medium and Low priority targets. (**⇧Shift** **[M]** to reverse). As each target is selected the target name and range (n.m.) will appear on the radar. Turn your helicopter until the target is ahead of you and you will see the target highlighted on the radar display. The position of the target will be marked in the IHADSS display by the Target Designator box. Target type and range will be displayed in the lower left corner of the IHADSS display.



If the selected target moves off the IHADSS display, a target vector will be drawn as a steering cue pointing towards the target. (see figure 3.1) The vector will be dashed if the target is behind you.

Figure 3.1

Summary:

Press **R** to select ground radar.

Press **↵** to select weapon.

Turn towards target.

Press **Spacebar** to launch weapon when in range.

If you wish to designate targets using the helmet-mounted boresight whilst the radar is switched on, press **Y** to disable automatic radar target selection. The radar display will confirm BORE (boresight). Press **Y** again to restore radar target selection.

(c) Using TADS

You may also select and lock onto targets with any of the three TADS systems - FLIR, DVO or DTV. Press **T** to select the TADS view and to cycle through the three TADS modes. Adjust magnification with **+** to increase and **-** to decrease. The view is steered by pressing **Alt** together the cursor keys, or by pressing Fire button 2 together with moving the joystick.

When in TADS mode, the sighting system will automatically select the target nearest the centre of the display. Press **L** if you wish to lock TADS onto a particular target. TADS will now continue to track the same target as you steer the sight. Press **L** to unlock if you wish to select a different target. The target designator box, missile field-of-view box and target vector all operate as described above. On returning to the in-cockpit view, the radar display will confirm TADS target selection if the target was locked. Press **Y** to restore radar target selection. We suggest that the TADS steering controls only be used when the helicopter is hovering as it is disorientating for a single player to manoeuvre the helicopter and use the TADS simultaneously.

Summary:

Press **T** to select TADS mode.

Press **↵** to select weapon.

Turn towards target for automatic selection.

Press **Spacebar** to launch weapon when in range.

(d) Launching without locking-on to a target

Laser-guided Hellfires are usually launched after the target has been selected and lock-on is confirmed. However, it is possible to launch the missile in the general direction of the target but without actual lock-on. A few seconds prior to impact, the target is then designated with TADS and the missile will then lock onto the target. This technique is employed in situations where you wish to minimise exposure to enemy fire by utilising cover for most of the duration of the missile's flight, popping up only briefly to designate the target prior to impact. Bearing in mind that the missile will only take approximately 14 seconds to fly its maximum range, the extra time spent in cover will be minimal. If missiles are launched without a designated target, the countdown timer will be inactive.

It is possible to fire several laser-guided Hellfire missiles in quick succession (ripple firing), with launches every 10 seconds or so. As each target is destroyed, TADS will select the next target in its field of view and the following missile will adjust its flight path accordingly. In this situation, the countdown timer corresponds to the next missile to reach its target.

(e) Target laser-designated by allied ground forces

If your target is being illuminated by allied ground forces, simply approach the target area with the laser-guided Hellfires armed. TADS will automatically lock onto each target. It is not necessary to continue flying towards the target after firing the weapon.

Hellfire AGM114B Radar-guided missiles

The radar-guided Hellfire is identical to the laser-guided version in terms of effectiveness, speed and IHADSS symbology. However, it has the significant advantage of being "fire and forget" with automatic target selection and designation by the Apache's fire control radar at ranges up to 5.5 miles. Hellfires may be ripple-fired at multiple targets, with no requirement for the Apache to continue facing the target during the missile's flight. However, a clear line of sight must be maintained in order for the radar to continue tracking the target.

Radar-guided Hellfires may be launched without a target designated on the radar. At maximum range the Hellfire can take up to 24 seconds to reach its target so it may be worth taking cover after launch. To do this, you will first need to ascend so that potential targets appear on the ground radar (referred to as "unmasking"). You can now take a radar "snapshot" by pressing **[U]** (radar Update) and then descend (re-mask) behind cover. Missiles may now be launched upwards from behind cover and the radar will use the frozen "snapshot" to allocate targets. The countdown timer operates in the same way as for the AGM114A. Prior to impact, you must unmask once again so that the target can be tracked by your radar. In practice, no more than two Hellfires are launched in this manner at any one time. Remember to "unfreeze" the radar (press **[U]** again) before attempting to acquire new targets.

Summary:

- Press **[R]** to select ground radar.
- Press **[←Enter]** to select weapon.
- Turn towards target.
- Press **[Spacebar]** to launch weapon when in range.

Hydra 70mm rockets

These are unguided rockets with a maximum range of approximately 3 miles. With 19 rockets per pod and a maximum of four pods, the Apache is capable of carrying a total of 76.

Two types of warhead are represented in this simulation:

- (a) the M255, designed for use against battlefield targets, trucks and other helicopters

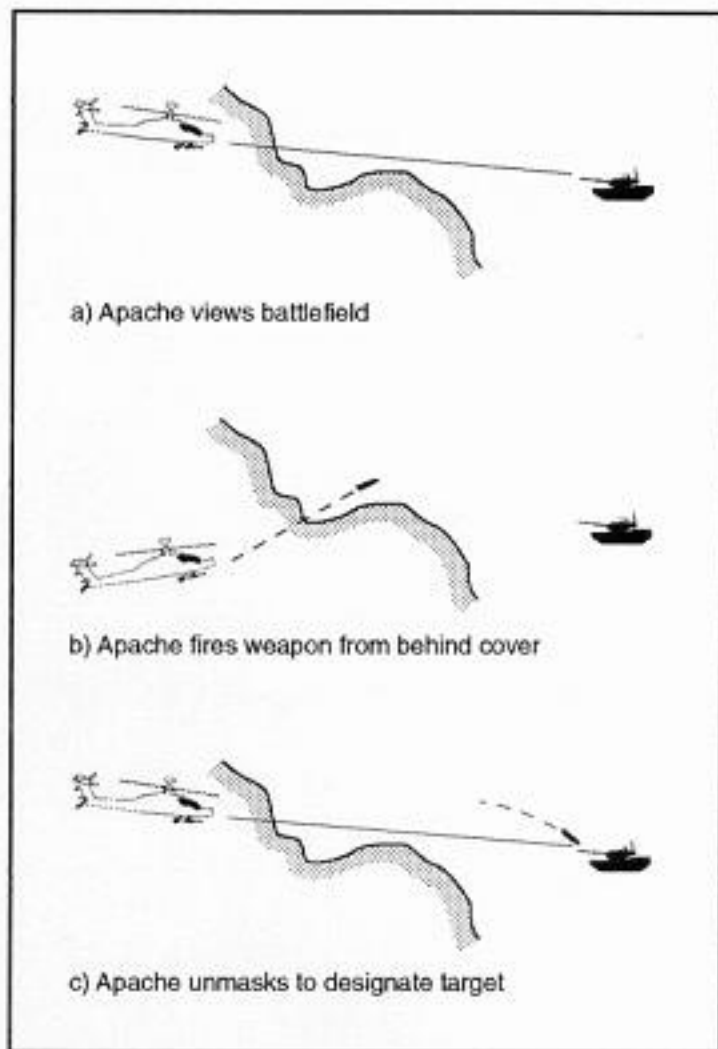


Figure 3.2

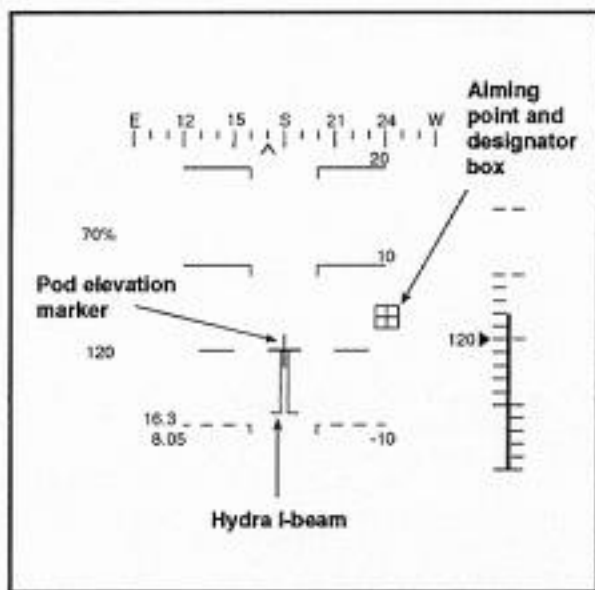


Figure 3.3

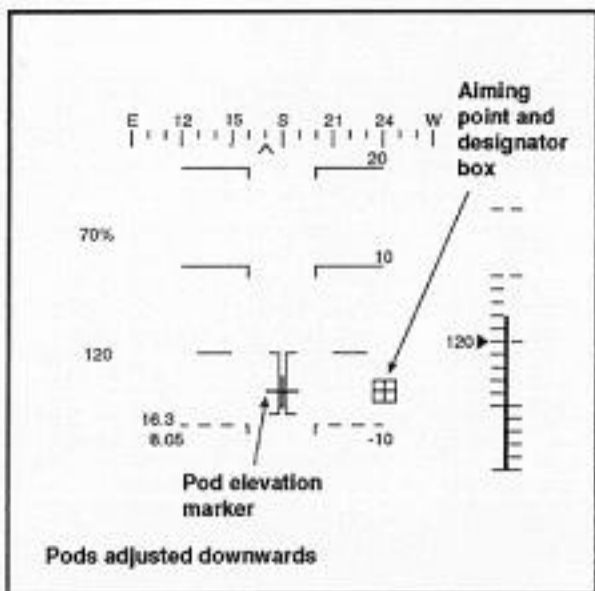


Figure 3.4

(b) the M261, a multi-purpose warhead for use against armoured vehicles, equipment and battlefield targets.

Elevation adjustment is available so that the rockets may be launched towards the ground with the helicopter remaining level. This is automatic when a target is selected using ground radar or TADS.

Since the weapon is unguided, it is necessary to take sighting guidance from the IHADSS, TADS or ground radar. Press **↵Enter** repeatedly until the weapon is selected and confirmed on the IHADSS. The sight, referred to as the I-beam, is centred on the IHADSS display and looks like **⌋**. Superimposed on the I beam is the Pod Elevation Marker (a + symbol) which sits at the top of the I beam when the pods are horizontal.

Manual elevation adjustment is available (**W**) and (**S**) providing that there is no target designated. Line up the Pod Elevation Marker with the target and launch. Both variants of Hydra may be launched without designating a target.

Summary:

- Press **R** to select ground radar or **T** to select TADS.
- Press **↵Enter** to select weapon.
- Turn towards target for automatic selection.
- Press **Spacebar** to launch weapon.

Designating a ground target for other aircraft

If you are tasked with laser-designating a target for attack by another aircraft, first select your target and lock onto it by pressing **L**. You will be advised as the allied aircraft approaches and releases its weapons.

Stinger IR air-to-air missile

The Stinger is an infra-red-guided air-to-air missile with a range of approximately 3 miles. Having selected the weapon, you will see the Lock-on diamond and Boresight at the centre of the IHADSS.

Switch the air radar on using **[R]**. It will automatically select the nearest airborne threat and providing that the threat is in your field of view you will see the small target designator box overlaying the target position. On the left hand side of the IHADSS you will see a list of four numbers, reading from the top: target Bearing (degrees), target Altitude (100's feet), target Speed (knots) and target Heading (degrees).

As soon as the weapon acquires a target, acquisition will be confirmed and the Lock-on diamond will overlay the Target Designator box. You are also provided with an Aiming Point which predicts the position of the target after the weapon has travelled the current target range. To maximise the probability of scoring a hit, line up the Boresight with the Aiming Point and launch at less than 8000 feet range.

Summary:

- Press **[R]** to select air radar.
- Press **[Enter]** to select weapon.
- Turn towards target.
- Press **[Spacebar]** to launch weapon after it has acquired target.

30mm chain gun

The chain gun is useful for both air-to-air combat and for lightly-armoured ground targets. Although limited in range (4500 feet) and lethality, the chain gun is steerable by the radar, TADS or IHADSS. When used in conjunction with the air radar, the gun is automatically aimed in order to put the

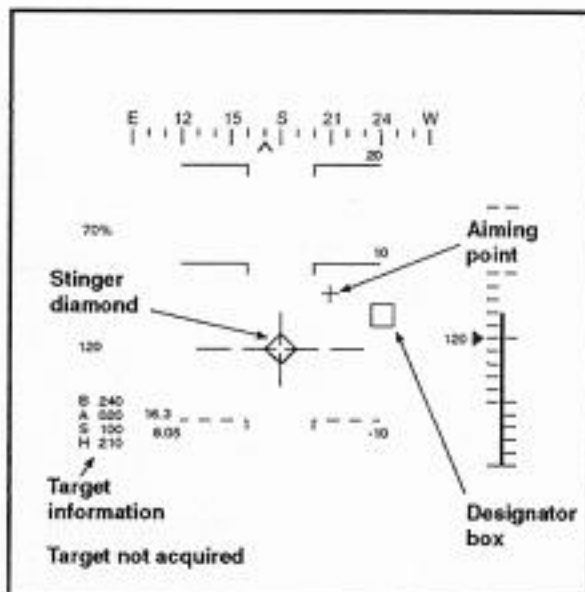


Figure 3.5

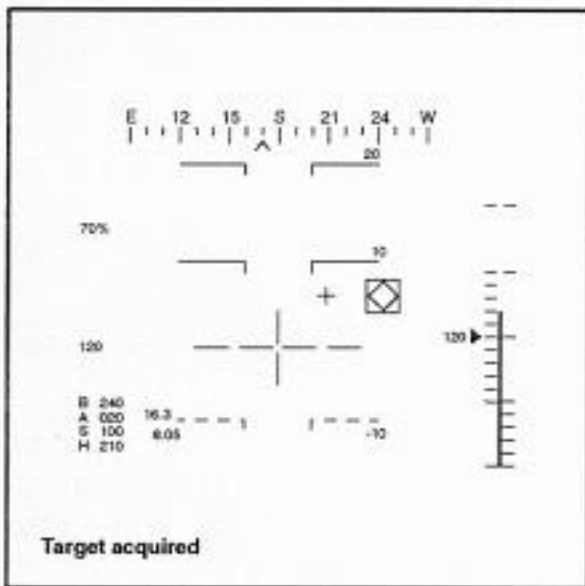
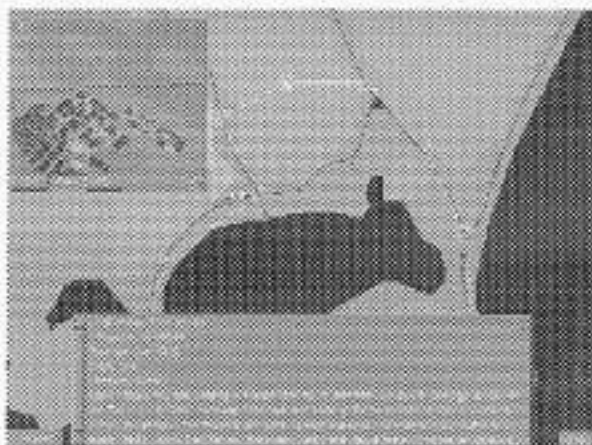


Figure 3.6



Summary

This is where you will be given a description of your mission objectives. You will arrive at this screen after selecting your mission. When you are ready to start flying, click on "Take-off" to proceed to the cockpit.



Briefing Screen

Briefing Screen

Upon reaching the Briefing screen, your mission objectives will be displayed. The description should be read carefully. Take a few moments to study the flightplan, noting significant landmarks and waypoint positions.

As soon as you click on "Take-off" you will proceed to the cockpit, with your aircraft fully armed and refuelled.

At the end of your flight you will return to this screen for a "Debriefing". Your flightpath will be displayed and your mission effectiveness will be described. Click on "Exit" to leave the debriefing.

After a Training mission or a single combat mission, you will be given the option to log the flight. If you choose not to log the flight, no details of the flight will be saved. Flights are always logged during campaigns.

Mission planner

If the "Mission Planner" option is set in the Preferences, many additional features become available so that you may study your flightplan in much greater detail prior to take-off.

Recentering the map

At the beginning of each briefing, the flightplan is centred and scaled to fit the screen. Clicking on any point of the map with the right mouse button will recentre the map at the new position.

Map Toolbox

With the Mission Planner enabled, a Map Toolbox will be displayed on the Briefing screen. To select a function, click on its name with the left mouse button. Functions are as follows:

Zoom: click and hold left mouse button whilst dragging the mouse diagonally to define the area to be magnified. Upon releasing the mouse button, the specified area will be rescaled to fit the screen. Alternatively, clicking once with the left hand mouse button will zoom to a higher detail level at the position of the mouse pointer.

Rotate: used to rotate map about centre of screen. Having selected the Rotate function, click and hold the left mouse button and drag forwards/rearwards to rotate map. This function can be used to orientate yourself during briefing.

Disable: click on this to disable the left mouse button. This is used in conjunction with the 3D button described below.

Way: click to activate the Waypoint mode. Each click of the left mouse button will introduce a new waypoint at the location of the mouse pointer. To remove a waypoint, first click on the waypoint symbol then click on Delete. Click and hold on a waypoint to enable it to be dragged to a new position. To insert a waypoint in between two existing waypoints, first select the waypoint at the end of the leg to be modified, then click on Insert. A new waypoint is then added at the midpoint of the leg and the waypoints are assigned new letters. Click on Info to observe information about a waypoint e.g. grid coordinates, recommended airspeed and altitude to waypoint, and type (turning, initial, target, recon, departure, approach, landing). You are expected to "Transmit Reconnaissance Data" (**D**) when reaching a reconnaissance waypoint. The first and last waypoint of any flightplan cannot be moved.

Back: click to return to previous zoom level.

Fit: click to return to original settings of zoom and rotate.



Map Toolbox



Payload Window

Key: displays the map key. Click on the Key buttons to turn elements on/off e.g. hills, roads etc.

Met: click on this to view Meteorological conditions for the flight. Wind direction is FROM South, FROM East etc. For example, a wind direction of South East will be blowing from 135 degrees and you will drift North West i.e. 315 degrees.

Pay: click to view the Payload display. Weapons may be loaded symmetrically only, on wing tips, inner pylons and outer pylons. The chain gun is always fully loaded prior to take off. Full fuel is always loaded. Select required weapon and click on the appropriate pylon.

3D: first click on the Disable button in order to reduce confusion when using the 3D function. This mode opens a small window containing a 3D visual, used for exploring areas of the map. The window has three selectable modes:

Fly: click on any point on the map and the 3D visual window will "fly" to that location. If the left mouse button is held, the 3D view will fly to the location of the mouse pointer. If the mouse is moved whilst holding the left button, the 3D visual will follow the cursor.

Point: click on any point on the map and the 3D visual window rotates about the point, looking down at the ground.

Sat: a vertical "satellite" view of the ground.

Click, hold and drag on the bottom right hand corner of the window in order to resize the window. Click on the top left "close box" to close the 3D window.



Compared to many modern helicopters, the Apache is easy to fly. Automatic stabilisation systems and fly-by-wire technology have reduced the Apache pilot's workload enormously. We have taken Apache-Longbow one step further and included a simplified "Arcade" option that will significantly reduce the likelihood of a novice crashing. For those of you who are more familiar with helicopter controls, Apache-Longbow includes a "Realistic" option that has been modelled on the authentic performance of the real helicopter.

Handling modes

Arcade mode:

To take off, press **Q** to increase your altitude and press **A** to decrease your altitude. These keys represent the pilot's collective lever with which he controls his rate of climb or descent. In this mode, this is the only means of adjusting your altitude. The rate of climb or descent depends upon how long the key has been pressed.

Push forward on the joystick (or press **↑**) to accelerate. The helicopter will adopt a nose-down attitude but will not descend. Centralise the joystick when you have reached the desired forward speed.

Pull on the joystick (or press **↓**) to slow down. The helicopter will adopt a nose-up attitude but will not climb. Centralise the joystick when you have reached the desired forward speed.

At low forward speeds or in the hover, moving the joystick left or right will result in sideways flight. Moving the joystick left or right at higher forward speeds will bank the helicopter, resulting in a turn onto a new heading.

At low forward speeds or in the hover, pressing **Z** or **X** will yaw the helicopter left or right. For example, if you press **Z** or **X** when in the hover you will turn on the spot. This effect reduces as forward speed increases.

Aerobatic manoeuvres such as loops and rolls are not possible in the Arcade mode. Maximum forward speed is approximately 150 knots.

Realistic mode:

In Realistic mode, Apache-Longbow becomes totally aerobatic and is capable of performing manoeuvres typical of the real helicopter. To exploit the full agility of the Apache, it will be necessary to coordinate all three primary flight controls in some manoeuvres. Variations in aerodynamic efficiency due to forward speed, air density, aircraft weight, profile and induced drag and other effects are included to give a closer representation of the real aircraft.

Controls

As in the real Apache, you have three primary flight controls:

Cyclic control - the central joystick giving pitch and roll control. As the main rotor blades rotate, the angle of attack on each blade is altered "cyclically" to pitch or roll the helicopter. At low speeds, this control is used to initiate movement in the desired direction e.g. forwards, sideways or rearwards. At higher forward speeds, the general effect of fore/aft cyclic joystick movement is to put the helicopter into a dive or zoom climb. In Apache-Longbow, the cyclic control is on the cursor keys or joystick 1.

Collective lever - governs the amount of lift generated by the main rotor blades. As the main rotor blades rotate, the angle of attack on all four blades is altered "collectively" to increase or decrease the overall lift. In the hover, the collective lever controls vertical ascent or descent rate. To sustain high forward speeds, the collective lever is raised significantly in order to generate the extra lift required to overcome aerodynamic drag. Variations in lift with forward speed also affect the collective lever setting necessary to maintain level flight. The power demanded from the engines by the main rotor blades is measured as "torque" and

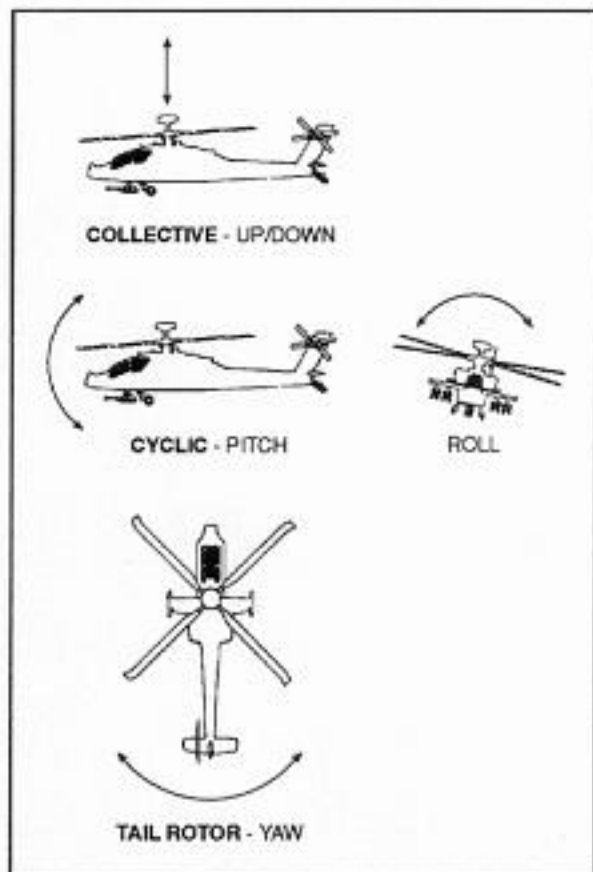


Figure 4.0

helicopter pilots typically refer to pulling percentage torque rather than to a collective lever setting. In Apache Longbow, collective lever control is on keys **Q** and **A** or a throttle stick/throttle wheel. Keys **1** to **0** can also be used for preset torque settings 10% to 100%.

Tail rotor controls - used to yaw the helicopter about its vertical axis (e.g. turning on the spot when hovering). In a real helicopter, the pilot controls the pitch of the tail rotor blades with his rudder pedals. In Apache-Longbow, tail rotor control is available on keys **Z** and **X**, **Ins** and **Del**, a second joystick or rudder pedals if available.

Brakes - active when pressing **B**. Use to slow down when taxiing on ground.

Time compression - For periods of flying where you may wish to speed up your progress, press **Tab** for several levels of time compression. Press **Ctrl** and **Tab** to resume normal time.

Joystick - press keys **Ctrl** and **J** to switch between keyboard and joystick operation. Centralise your joystick and press keys **Alt** and **J** to recalibrate your joystick in flight. Further information regarding joystick operation can be found in the chapter on System Configuration.

Manoeuvres

Taxiing

The Apache is fitted with two main undercarriage wheels and a tail wheel, allowing it to be taxied and steered on the ground. To initiate movement, it is necessary to raise the collective lever to approximately 20% torque. This is insufficient to lift the helicopter off the ground but forward movement may be started by pushing on the cyclic control. By varying the torque setting with the collective lever (up to a maximum of approximately 50%) it is possible to taxi up to speeds in the region of 60 knots. At this sort of groundspeed, the Apache will be on the verge of becoming airborne. Be sure to centralise the cyclic control before pulling any more torque or else you will nose dive immediately you become airborne, with disastrous consequences. To slow down, use a

combination of pulling on the cyclic control and the wheel brakes. It is possible to taxi slowly backwards by pulling on the cyclic control but is not possible to taxi sideways.

Steer on the ground by using the tail rotor. For safety reasons, tail rotor effectiveness reduces as forward speed increases.

Take-off to the hover

This simple manoeuvre is executed by raising the collective lever to approximately 80% torque. The rate of ascent will be dependant upon the total weight of the helicopter. Having reached the desired height, reduce the torque setting until the helicopter is no longer climbing. "Ground cushion" effect will reduce the torque required to hover below approximately 50 feet. This effect can best be demonstrated by lowering the collective lever whilst in the hover just enough to give a slow descent rate. The helicopter will descend until ground cushion effects counteract the descent rate.

Transition from the hover to forward flight

To accelerate forwards, it is necessary to pitch the helicopter nose down. In so doing, lift from the rotor blades provides the force necessary to accelerate the aircraft. However, the action of pitching down reduces the vertical component of lift and unless the collective lever is raised to compensate, the helicopter will begin to sink. The correct technique is therefore a combination of pushing the cyclic control to pitch down and pulling on the collective lever to maintain altitude. With practice, maximum acceleration can be achieved by pitching to at least 30 degrees nose down and pulling 100% torque. As forward speed increases, adjust the pitch attitude in order to keep the vertical speed zero. Bring the fuselage level when the desired speed is reached and adjust the collective setting so that you are no longer climbing.

Forward flight

The lift generated by the rotor blades increases with forward speed - a phenomenon known as translational lift. The net result of this is a


reduction in torque required to maintain level flight. This continues until approximately 60 to 70 knots at which point the increase in aerodynamic drag begins to require an increasing amount of torque up to the maximum speed.

Turning

At low speeds and at the hover, turns are executed with the tail rotor control. At higher speeds, turns are executed by banking left or right. With the realistic handling mode, the helicopter will tend to sideslip as you bank, but the effect reduces as forward speed increases. Height loss in a turn is offset by increasing the collective control rather than pulling back on the cyclic.

Slowing down to hover

The most effective way to slow down is to pitch up by gently pulling on the cyclic control. Offset the zoom climb by simultaneously lowering the collective lever. Reduce the pitch angle as the speed decreases, remembering to increase the collective setting to avoid loss of height.

Slow down to less than 10 knots and press key  for **autohover**. Your speed will decay to zero and your altitude will stabilise. You may manoeuvre at up to 10 knots with autohover engaged. The system will cut out above this speed. Use your collective control to adjust altitude.

Landing

Normally executed from the hover. Carefully lower the collective lever, monitoring your rate of descent. Adjust your position over the ground if necessary by gentle banking prior to touch down. Damage will result if you land whilst flying sideways or rearwards.

Sideways & rearwards flight

The Apache is surprisingly agile and may sustain sideways and rearwards flight up to approximately 60 knots. Care must be taken when executing such manoeuvres as you have no indication of airspeed or groundspeed in these conditions. It is easy to get disorientated when using the tail rotor controls.

Loops and rolls

Perhaps the most impressive manoeuvres of all, the Apache is capable of looping-the-loop and full 360 degree rolls. To execute either manoeuvre, you will need to be flying at a reasonable forward speed and at a safe altitude. You are advised to practise your technique in training, with crash detection switched off, in order to familiarise yourself with the speed and altitude requirements.

Torque turns

Another common helicopter manoeuvre is the torque turn. Executed frequently at airshows, the manoeuvre involves pulling up into a steep climb, yawing through 180 degrees as the speed bleeds off to zero, and pulling out of the steep dive as the speed increases.

Start by making a mental note of your heading. Begin the manoeuvre by pulling up into a steep climb, simultaneously reducing the collective lever to zero. As your speed drops below 20 knots or so, apply left tail rotor to yaw the helicopter round into a steep dive. You will need to anticipate the required heading by releasing the tail rotor before you have yawed completely through 180 degrees. As the speed builds up in the dive, pull back on the cyclic control and increase your collective setting. You should now be flying on a reciprocal heading, i.e. your original heading plus 180 degrees. Practise the manoeuvre in both directions, left and right, until you can apply just enough tail rotor to yaw round to the new heading. This manoeuvre is very useful when you wish to reverse your direction of flight quickly.

Autorotation

This is the helicopter's equivalent to gliding in a fixed-wing aircraft. Contrary to what many might expect, helicopters do not immediately drop out of the sky after the total loss of engine power. Providing that the pilot responds quickly by reducing the collective setting to a minimum, it is possible to fly, manoeuvre and land safely (with practice!).

FLYING THE APACHE

The Apache's ideal autorotation speed is approximately 60 knots. At this speed the descent rate is roughly 40 feet per second, which if unchecked, is just within crash survival limits for the aircrew and airframe. The objective however is to land at a much gentler rate, in the region of 10 feet per second or less.

In the event that you lose total engine power, either through battle damage or running out of fuel, your first and immediate task is to reduce the collective setting to minimum. Failure to do this will result in the rotor blades slowing down rapidly, followed by loss of control.

However, with the correct procedure, the resulting descent rate will provide sufficient "windmill effect" to maintain the rotor blades at or near 100% rpm. You will also need to maintain a forward speed of approximately 60 knots, so dive if necessary to achieve this condition. The Apache will stabilise in forward flight, descending at approximately 40 feet per second. Your next task is to decide where to land. Having chosen your site, manoeuvre your helicopter until you are on the approach, decreasing your forward speed by gently pitching up as you approach the landing point. As you descend through 100 feet, reduce the rate of descent by carefully increasing the collective setting. This will result in a slow bleed off of rotor speed as you make your final adjustments for touchdown. The tendency is to either raise the collective lever too early, resulting in a hover too high off the ground with the rotor blades slowing down rapidly, or to raise the collective lever too late, resulting in a very heavy landing.



Internal views

Both pilot and copilot/gunner have the following 5 viewing modes from within the cockpit:

view	key
Forward (pilot)	F2 or Home
Forward (copilot)	F3 or Pg Up
Shift view right (45 deg. and 90 deg.)	F4 or End
Shift view left (45 deg. and 90 deg.)	F5 or Pg Dn

External views

Tracking view

Press **F6** to view your helicopter from an external viewpoint. The position of the viewpoint may be rotated around the aircraft using **Alt** and cursor keys (or joystick), zoomed in with **Alt** and **O**, and zoomed out with **Alt** and **A**.

Weapon view

Press **F7** to view from the weapon first launched. Rotate and zoom controls as above.

Weapon target view

Press **F8** to view weapon from designated target (guided missiles only).

Target lock view

Press **F9** to look towards the currently designated target from outside your aircraft. When you are heading directly towards your target you will be viewing yourself from the rear.

Remote view

Press **F10** to fix your viewpoint at the current location of your helicopter. The view rotates to track your aircraft as you manoeuvre.

Spectator view

Press **F11** to fix the viewpoint at the current location.

TADS viewing modes

Press **T** to view the outside world through the TADS system. In the two player "pilot/gunner" mode TADS is selectable only by the copilot/gunner. All modes are steerable 30 degrees up, 60 degrees down, and 120 degrees left and right. Use **>** for higher magnification or **<** for lower magnification. The three TADS modes are:

Direct View Optics (DVO): a telescopic view with magnification selectable between 3.5 times and 16 times.

Forward Looking Infra Red (FLIR): an infra red image with magnification selectable between 2 times and 11 times.

Day TV: This is a TV image with magnification selectable between 28 times and 126 times.

Helmet mode

Press **H** to select Helmet mode, a full screen steerable view. Available to both pilot and copilot/gunner, this is a *1 magnification full screen helmet display. The view is steered by pressing **Alt** together with the cursor keys, or by pressing Fire button 2 together with moving the joystick. The view may be steered 90 degrees left and right, 20 degrees up and 45 degrees down.

Two player

These options allow you to link two computers via modem, direct cable link or network, and fly with a friend. You will need a copy of Apache Longbow on both computers.

Access to the two player games is as follows:

1. **At the Main screen select Flight.**
2. **At the Flight screen select Two Player**

NB. details of two player games are not saved to the pilot's log.

Two player game modes

- i) **Combat** - a simple head-to-head duel. Scores will be displayed at the debriefing between flights. Either player may select weather conditions, time of day and crash detection on/off.
- ii) **Leader / wingman** - In this option, you will each fly your own Apache. You may fly cooperatively on any of the single missions in any combat area. Leader will select war zone and mission. Both players will then be briefed.
- iii) **Pilot / gunner** - In this option, you fly in the same Apache, one in the front seat (copilot/gunner), the other in the back (pilot). You may fly on any of the single missions in any combat area. Pilot picks war zone and mission. Both players will then be briefed.

Set-up

(a) Connection via modem

The modem interface supports any Hayes-compatible modem (AT commands) that is capable of at least 2400/2400 baud (V22 bis 2400) but we recommend a V32 modem (or better) with a serial port baud rate of at least 19200. If you run at a baud rate of less than 19200 the game may slow down.

To use a modem for two player games, proceed as follows:

1. Connect a modem to any serial port (COM1 to COM4) and select the port by clicking on the appropriate screen button.
2. If a non-standard port IRQ is used, select the appropriate button.
3. Select a baud rate. We recommend playing at the highest baud rate available on your modem. (19200 baud for 8250 IC, 38,400 baud for 16450 IC and 115,200 baud for 16550 IC)
4. Select your modem type.
5. Click on the Modem button to enable the modem controls. The dialogue box will display "Initialise modem" followed by initialisation messages and OK if successful. If a problem occurs you will see a message e.g. "transmission error" or "no reply, reset modem and retry". Further explanation on fault finding is given below.
6. Click on Game Mode for two player options e.g. Combat, Leader/Wingman, Pilot/Gunner. Select each player's function - one player must select the left button and the other player the right button.
7. Decide which player will be the "caller". The other player will be the "receiver".
8. For the caller to dial a number, click on the "Phone no" button, enter the number, (see your modem manual for any special command characters) followed by .
9. Select Tone or Pulse dialling and then click on the dial button. The dialogue box will say "Dialling number" followed by "Connect nnnnn" if successful, where nnnnn is the baud rate.

Possible errors are:

- i) "No dial tone" - check that your modem is connected to the phone line.
- ii) "Busy" - line is engaged
- iii) "No answer" - receiver not responding.
- iv) "No carrier" - receiver's phone is answering but his modem is not responding.

See below for other error messages.

10. The receiver may use either "auto-answer" or "manual answer". For auto-answer, click on the "auto-answer" button and wait for the phone to ring. The dialogue box will say "Awaiting call", followed by "RING" and "CONNECT nnnnn" when the phone has rung and the connection has been established. Alternatively, if you wish to use manual answer, click on the "manual answer" button when the phone rings.

11. As soon as communication between the two computers is established, the dialogue box will print "Testing link", then "Machines linked", "Menu data sent", "Received other machines menu data", followed by further instructions. See below for details on the three game modes.

12. If an error occurs when testing the link, determine the cause of the error and try again by pressing the Start Game button.

13. To abort a call once connection has been made, click on the "hang up" button. The dialogue box will confirm this by printing "Hang up phone" followed by OK if successful.

14. The "Command" button is used to send commands to the modem to reconfigure it, check its status etc. To send a command, click on the button, enter the command and then press . Clicking on the button will abort entry and the command will not be sent.

15. The port number, interrupt, baud rate, modem type and phone type are all saved in the file PREFS.CFG so that the program is already configured when you next use it. The phone book section allows you to save up to six frequently used numbers, entered as follows:

- i) type in the phone number (see 8)
- ii) press the "phone book set" button
- iii) click on the phone book button where you wish to save the number
- iv) enter the text string and press . The phone number is now saved on this button.

Fault finding when using a modem

Modem messages are the same as the standard Hayes messages with the following additions:

"Checksum error"	data corruption
"Unexpected response"	expecting OK but got a different response
"Unrecognised response"	not a recognised Hayes response
"Transmission error"	serial communication problem
"Timeout error"	no response from modem

All errors described below for direct link operation also apply.

Problems

1. If the modem is not responding:

- i) Check all connections and that the modem is switched on.
- ii) The modem may be in "quiet" mode. The modem controller has been written with a smart receiver which will allow the modem to be in half or full duplex mode, with short form or verbose responses, but it cannot cope with quiet mode "ATQ1". Try cancelling this mode by sending "ATQ0" command.

2. Communications error when "Testing link":

- i) Both users should try to re-establish the link by clicking on the "Start Game" button.
- ii) Have you selected a baud rate that is compatible with your modem?
- iii) Try using the lowest baud rate i.e. 2400

3. Did you dial the wrong number? Select "Hang up" and retry.
4. Have you selected the right COM port? Check to see which port your cable or modem is plugged into.
5. Are you clear about who is the "caller" and who is the "receiver"? If you both try to be "caller" you will get nowhere.
6. If you phone has a "Call waiting" facility, this may disrupt the modem connection during your game. It should be possible to disable this feature temporarily prior to starting your game. Check in your phone handbook.

b) Direct link using null modem cable

If you intend to use a direct cable link, a "null modem" cable must be connected into a serial port on each computer. For pin connections, see diagram. The plugs on the end of your null modem cable must match the ports of both computers. The ports will either be 9-pin or 25-pin, and will probably be male (pins).

If you do not have a null modem cable, you may order one direct from Digital Integration sales on 01276 684959. Check the ports on both computers before ordering your cable. As the diagram shows, there are three possible configurations for your cable.

Please note that you do not need a modem in order to use a "null modem" cable. Just plug one end of the cable in to a serial port (e.g. COM1) on one of the computers and plug the other end into a serial port (e.g. COM1) on the other computer. The length of cable will limit how far apart you can place the computers, up to a maximum of several hundred feet.

Proceed as follows:

1. Specify the baud rate, interrupt number and serial port you wish to use. The same baud rate must be used on each computer. If you run at a baud rate of less than 19200 the game may slow down.

2. Select Game mode e.g. Combat, Leader/Wingman, Pilot/Gunner.
3. Click on Start Game button.
4. The dialogue box will announce "Testing link" followed by "Machines linked", "Menu data sent", "Received other machines menu data", followed by further instructions.
5. "Testing link" may be aborted by pressing "Start Game" key.

Fault finding when using direct link

- i) Are the pin connections correct on your cable? Check the diagram.
- ii) Have you both selected the same baud rate?

Error messages

"Timeout" - one or both computers are not receiving data. The possible causes are:

- i) computers are not connected to each other
- ii) cable connected to the wrong serial port or incorrect serial port selected
- iii) faulty cable
- iv) different baud rates selected
- v) more than 30 seconds had elapsed between both players selecting Start Game.

"Transmission error" - this is caused by data corruption, possibly due to an excessively long cable or an electrically "noisy" environment. Try re-routing the cable.

"Checksum error" - see Transmission error

"Error both players must pick combat or leader/wingman" - players have selected different game modes. One player must change so that the game mode selected on both machines is the same.

MULTIPLAYER GAMES

"Error - both RED leader or both BLUE leader". Both players have selected the same option. One player must change.

c) Connection across a network

Two player games may also be played using a network to connect the two computers. Proceed as follows:

1. Select Network on the Two Player screen
2. Select Game mode e.g. Combat, Leader/Wingman, Pilot/Gunner.
3. Both players must select a common channel number that is different from any other players on the network.
4. Click on Start Game button.

Network game

Up to sixteen users may play against each other across an ipx network. Access to the network game is as follows:

- 1. At the Main screen select Flight.**
- 2. At the Flight screen select Network**

NB. details of network games are not saved to the pilot's log.

Once you reach the Network Setup screen, you will see a list of up to 16 players. Click on the "Enter name" button, type in your name (up to eight characters) and press **Enter**. Your name will be added to the list. Preferences listed on screen should also be set or reset.

Click on Take-off when all players are present on the list. Your start position is at one of 16 randomly-selected positions. During the game, a player may repair damage or re-arm with weapons by landing. Press **Ctrl Esc** to exit the game.



Preferences

A number of program features are user-selectable and are collectively referred to as the Preferences. Depending upon your hardware configuration, the following options will determine how this product runs on your computer. Select the Preferences screen as follows:

At the Main screen select Preferences.

Visual detail: In the upper left corner of the Preferences screen you will see the Visual Window. This demonstrates the level of visual complexity controlled by the slider bar beneath the window. Use the mouse pointer to drag the slider from minimum complexity at the left hand end to maximum complexity at the right hand end. Maximum complexity includes features such as Gouraud shading, texture mapping, light sourcing and maximum visual range. Bear in mind that less capable computers will slow down as you increase the visual complexity.

Screen mode: selectable as either low resolution (320 by 240 pixels) or high resolution (640 by 480 pixels). Slower computers will benefit from running in low resolution.

Flight model: selectable as Arcade or Realistic. If you are not familiar with the controls of a helicopter, the arcade flight model is much easier to fly.

Enemy rating: selectable as Poor, Fair or Good. This "difficulty factor" will determine the effectiveness of the enemy.

Mission Planner: selectable as Disabled (default) or Enabled. The mission planner is described in detail in the chapter "Mission Briefing".

Animations: selectable as Disabled or Enabled (default). Users with slower machines may wish to disable the animations that precede each campaign mission.

SYSTEM CONFIGURATION

Sound:	Speech	on/off
	Music	on/off
	Effects	off, minimal, full

Card: click here to view a list of card types. Select your card or its nearest equivalent.

Address: the address of the card. The program will attempt to set this for you. If the sound does not work, check your sound card manual.

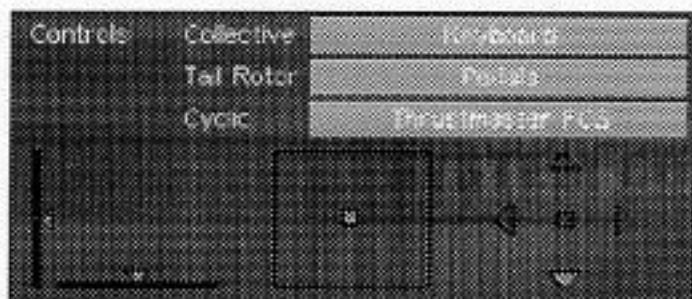
Interrupt: interrupts setting for your card. The program will attempt to set this for you. If the sound does not work, check your sound card manual.

DMA: DMA setting for your card. The program will attempt to set this for you. If the sound does not work, check your sound card manual.

Controls: The last item on the Preferences screen concerns the type of device you wish to use for each of the helicopter controls. The Collective (up/down), Tail Rotor (yaw) and Cyclic (pitch and roll) controls are selectable as follows:

Collective	keyboard or throttle stick (or throttle wheel)
Tail rotor	keyboard or pedals
Cyclic	keyboard or joystick or Thrustmaster FCS or Flightstick Pro or Virtual Pilot Pro

SYSTEM CONFIGURATION



Joystick preferences

The diagram shown left gives visual confirmation of operation of each of the controls, including the coolie hat if available.

All of your preferences are automatically saved to disc and will be preset automatically when you next load the game. NB. All pilot logs use the same preferences.

Joystick configuration files

Files are located in the following directories:

Joystick

Gravis Phoenix
Thrustmaster WCS
F-16 FLCS

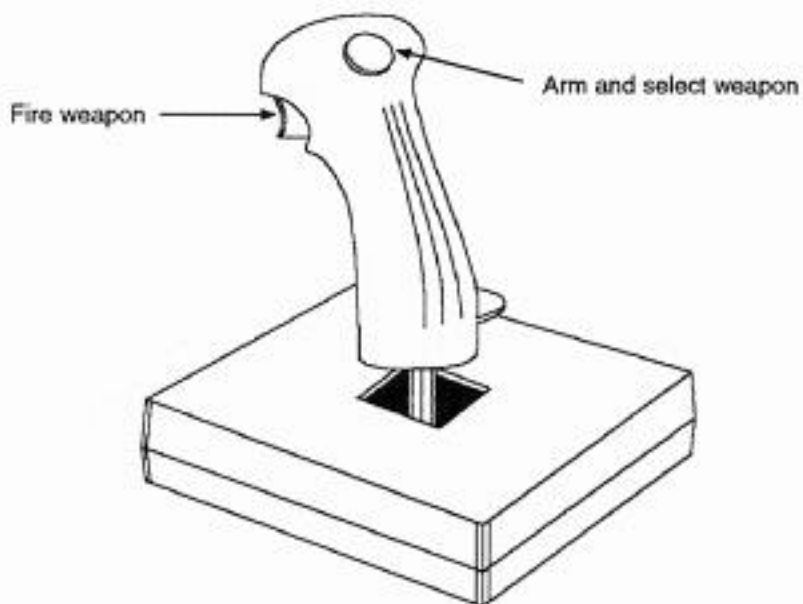
Directory

APACHE\CONTROLS\GRAVIS
APACHE\CONTROLS\THMASTER
APACHE\CONTROLS\THMASTER

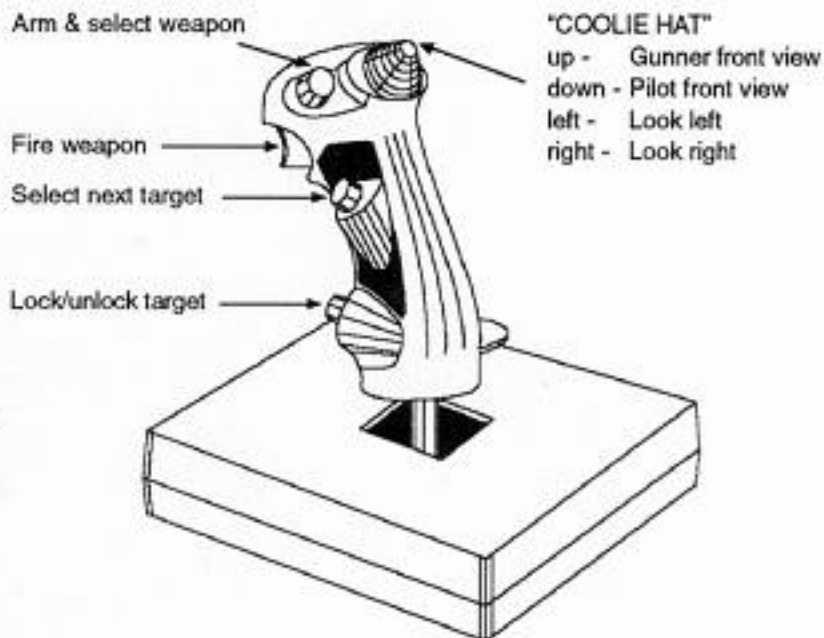


JOYSTICKS

STANDARD JOYSTICK



THRUSTMASTER FCS



THRUSTMASTER FCS

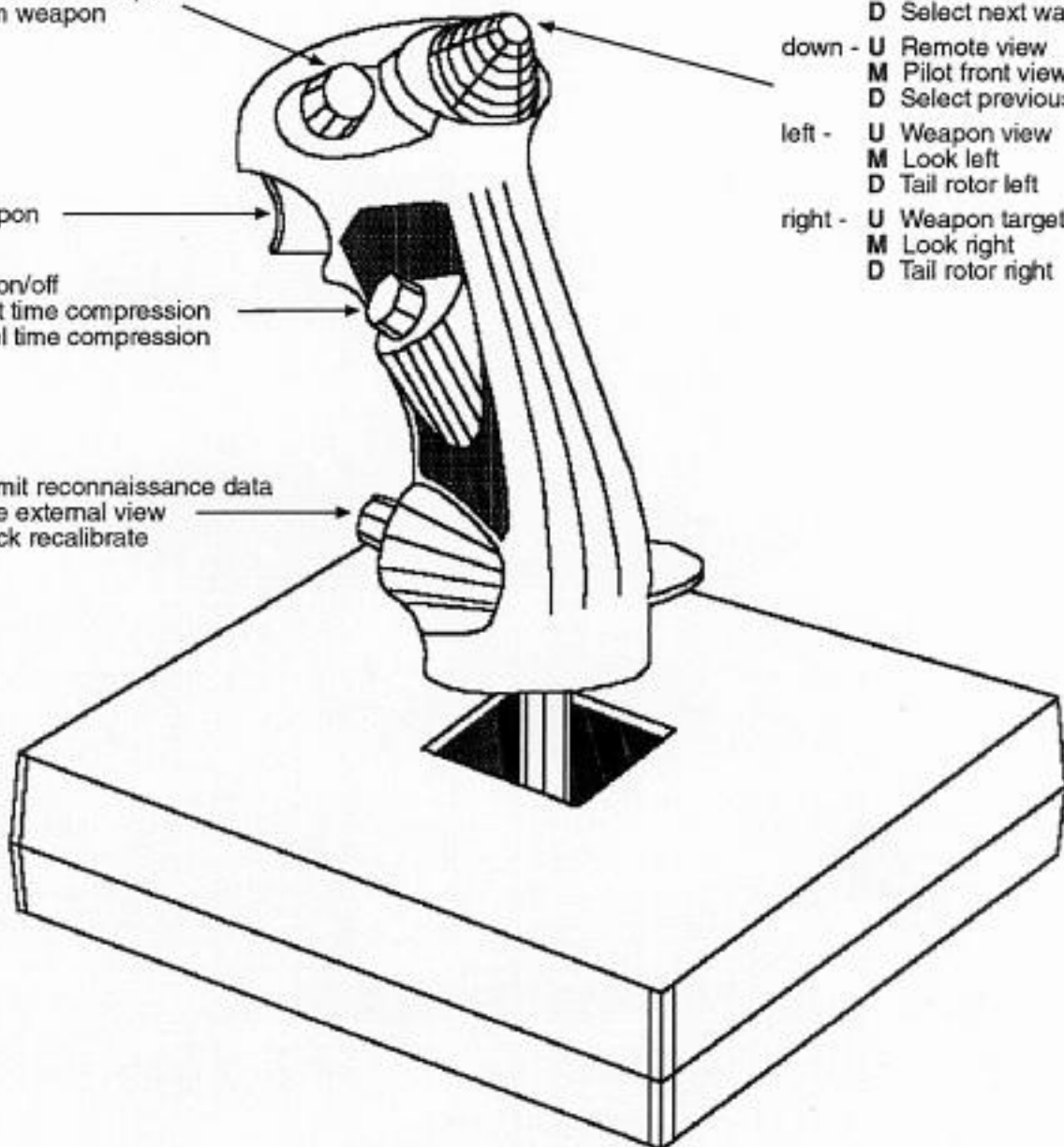
- U PNVS on/off
- M Arm & select weapon
- D Unarm weapon

Fire weapon

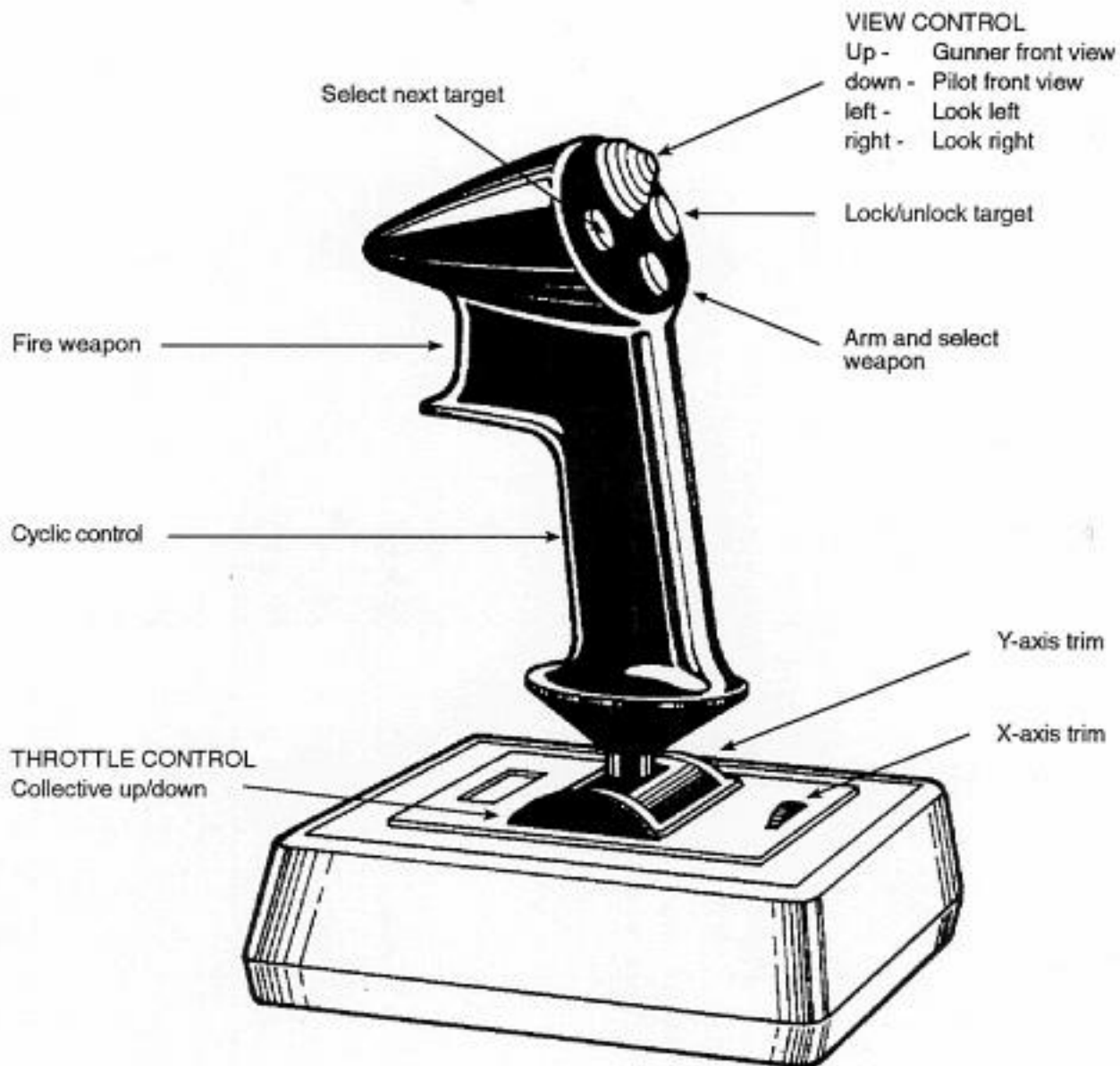
- U ECM on/off
- M Select time compression
- D Cancel time compression

- U Transmit reconnaissance data
- M Rotate external view
- D Joystick recalibrate

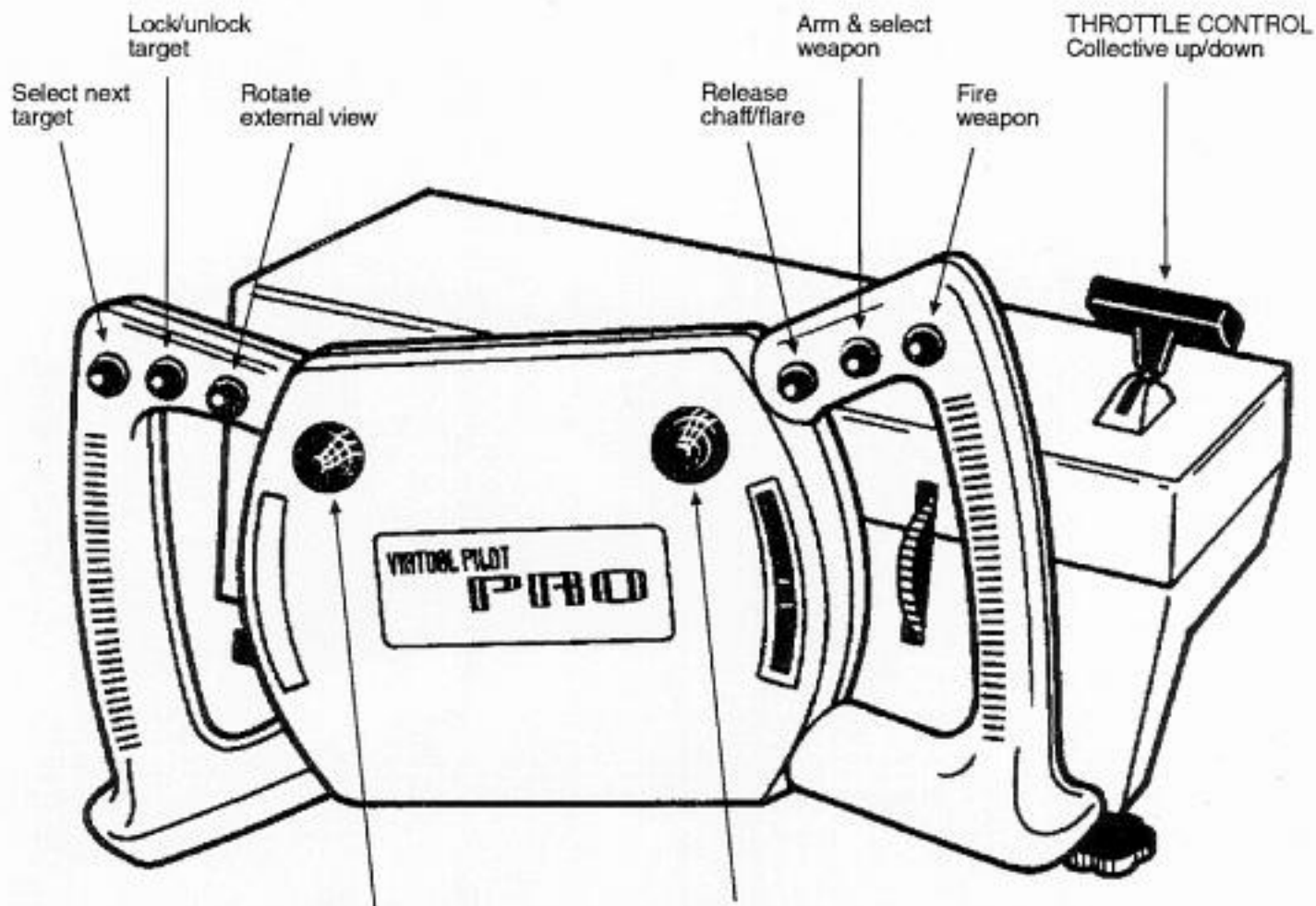
- up - U Apache external view
M Gunner front view
D Select next waypoint
- down - U Remote view
M Pilot front view
D Select previous waypoint
- left - U Weapon view
M Look left
D Tail rotor left
- right - U Weapon target view
M Look right
D Tail rotor right



CH FLIGHTSTICK PRO

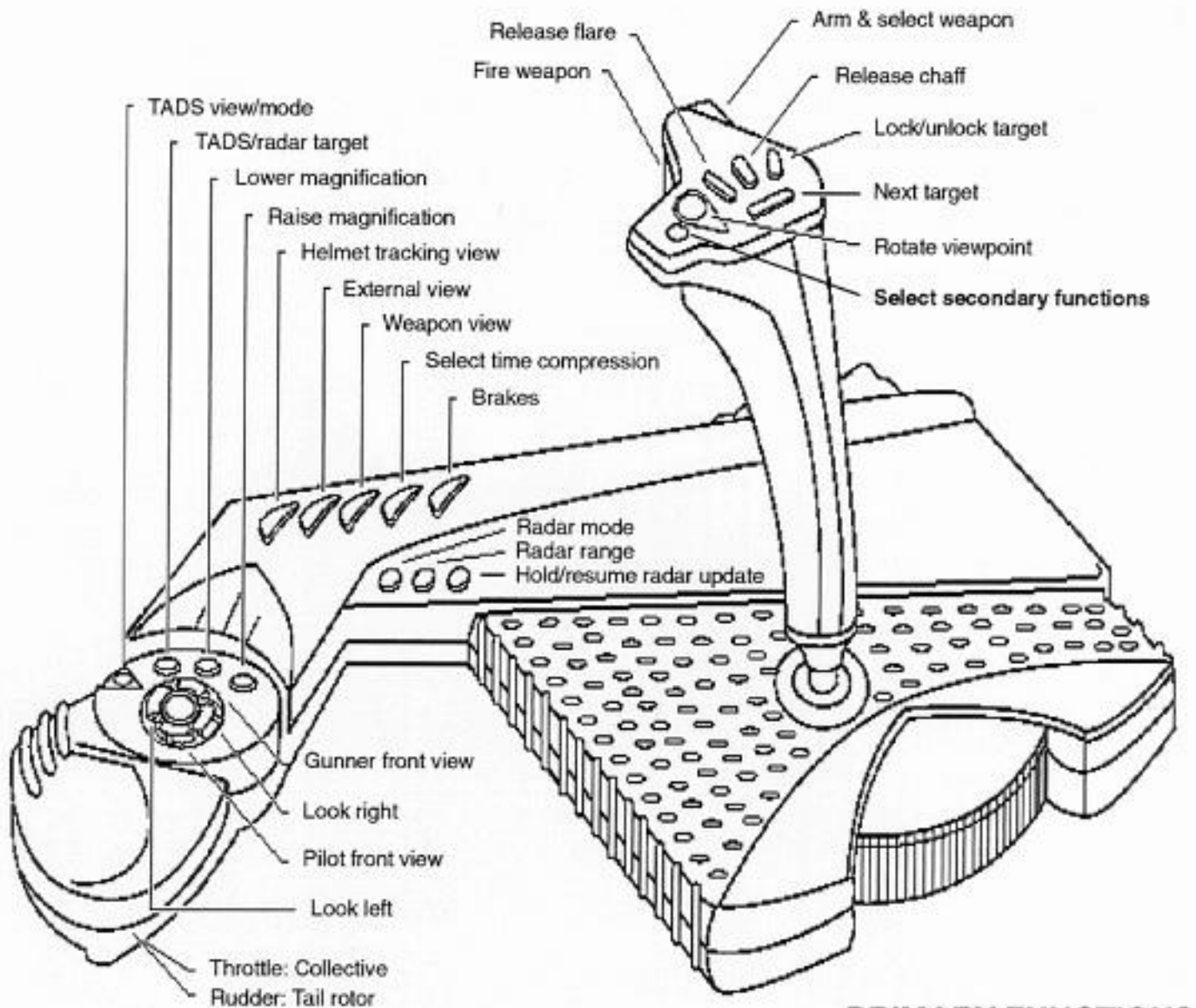


CH VIRTUAL PILOT PRO



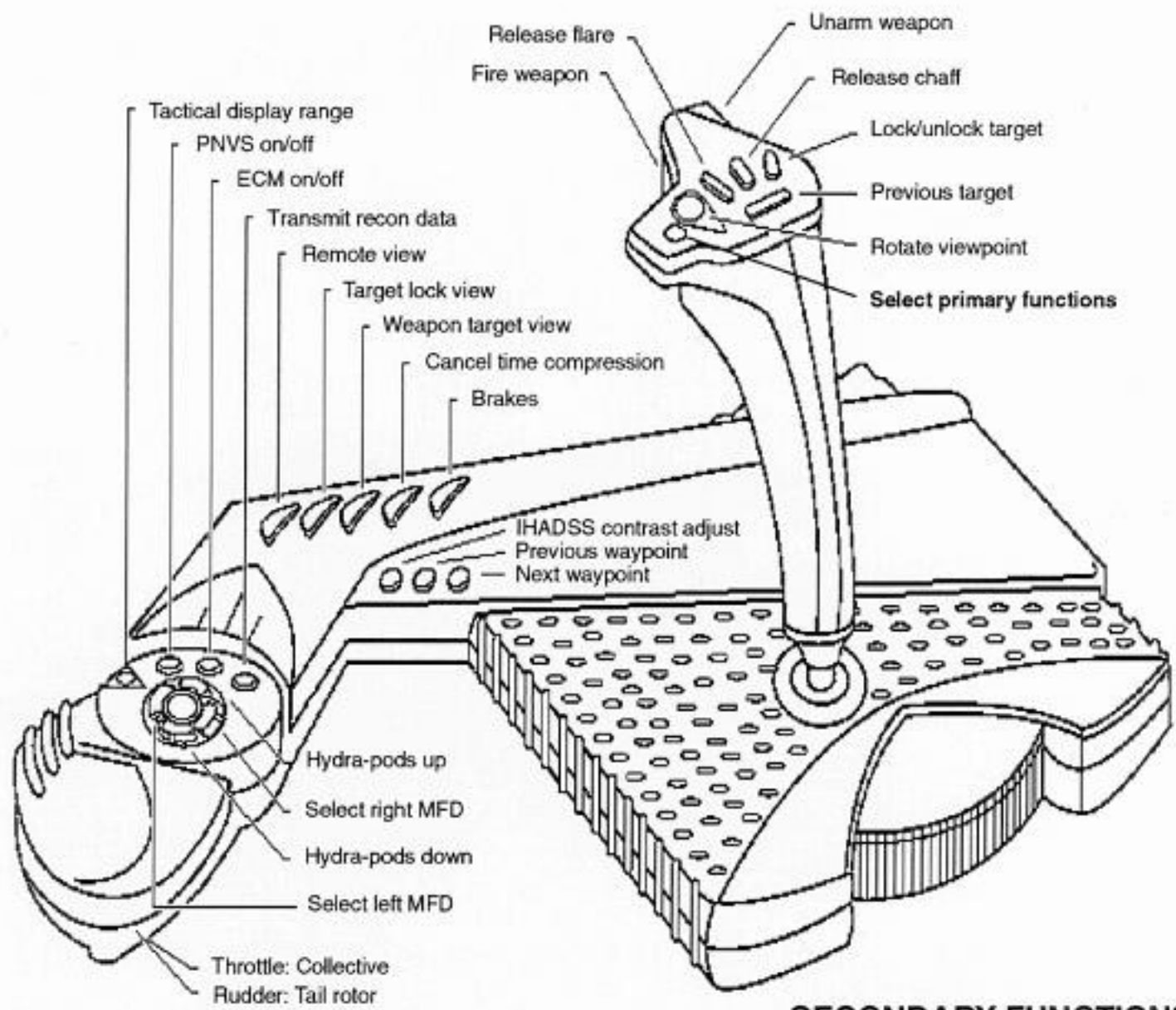
4-WAY TRIM SWITCH
up - Raise magnification
down - Lower magnification
left - TADS view/
select TADS mode
right - Helmet view

4-WAY VIEW SWITCH
up - Gunner front view
down - Pilot front view
left - Look left
right - Look right

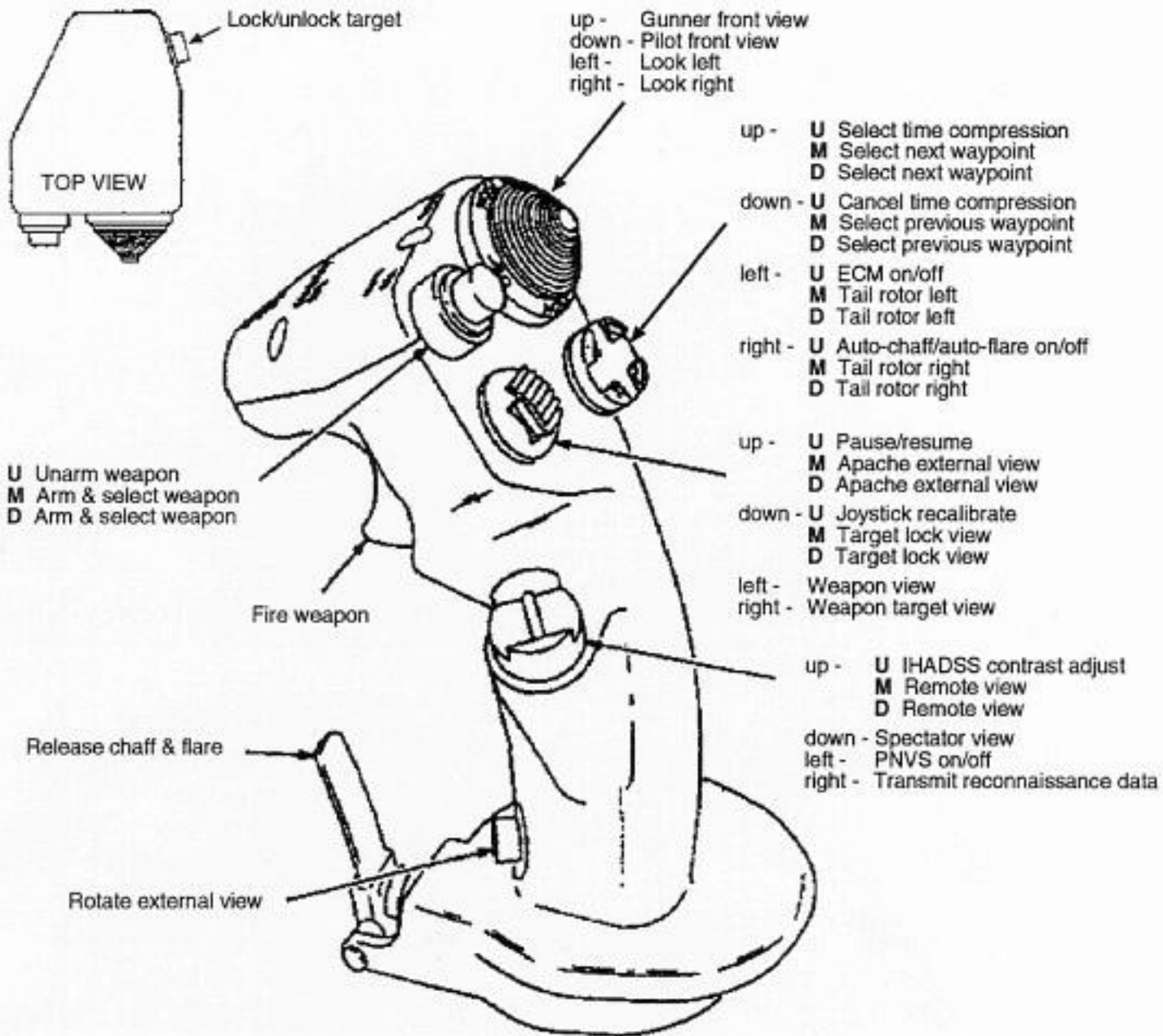


PRIMARY FUNCTIONS

SYSTEM BY ADVANCED GRAVIS



SECONDARY FUNCTIONS



+ WCS SETTINGS

- U** Raise magnification
- M** Next target
- D** Radar mode

- U** TADS view/select TADS mode
- M** Hydra-pods up
- D** Select next right MFD

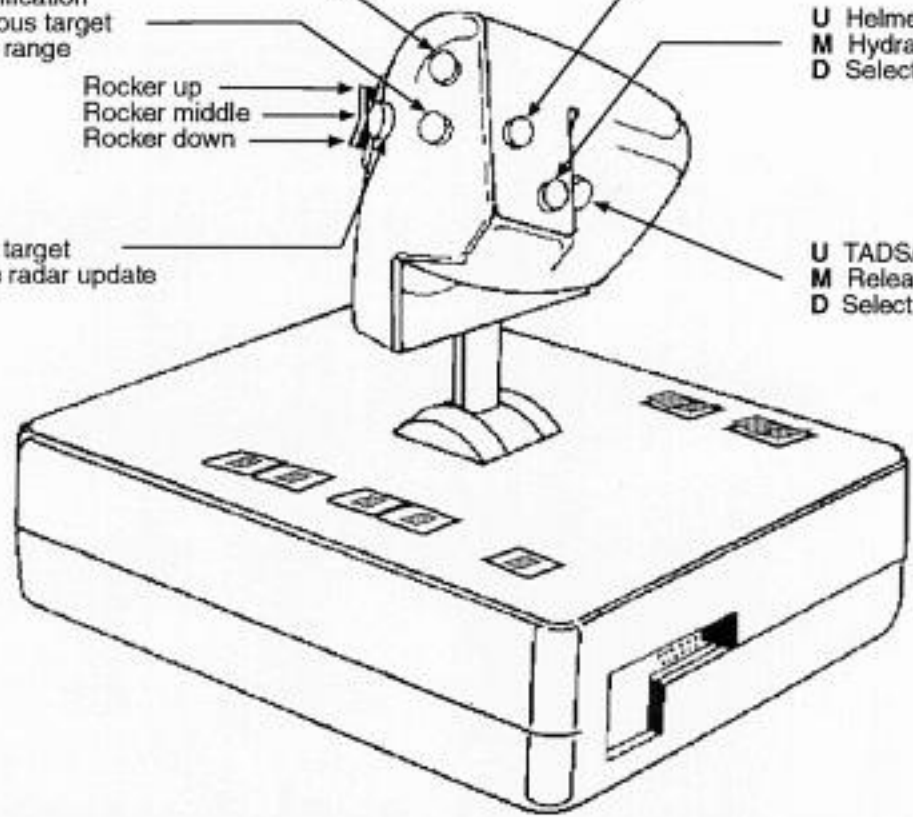
- U** Lower magnification
- M** Select previous target
- D** Select radar range

- U** Helmet view
- M** Hydra-pods down
- D** Select next left MFD

- Rocker up
- Rocker middle
- Rocker down

- U** Brakes
- M** Lock/unlock target
- D** Hold/resume radar update

- U** TADS/radar target select
- M** Release chaff and flare
- D** Select tactical display range

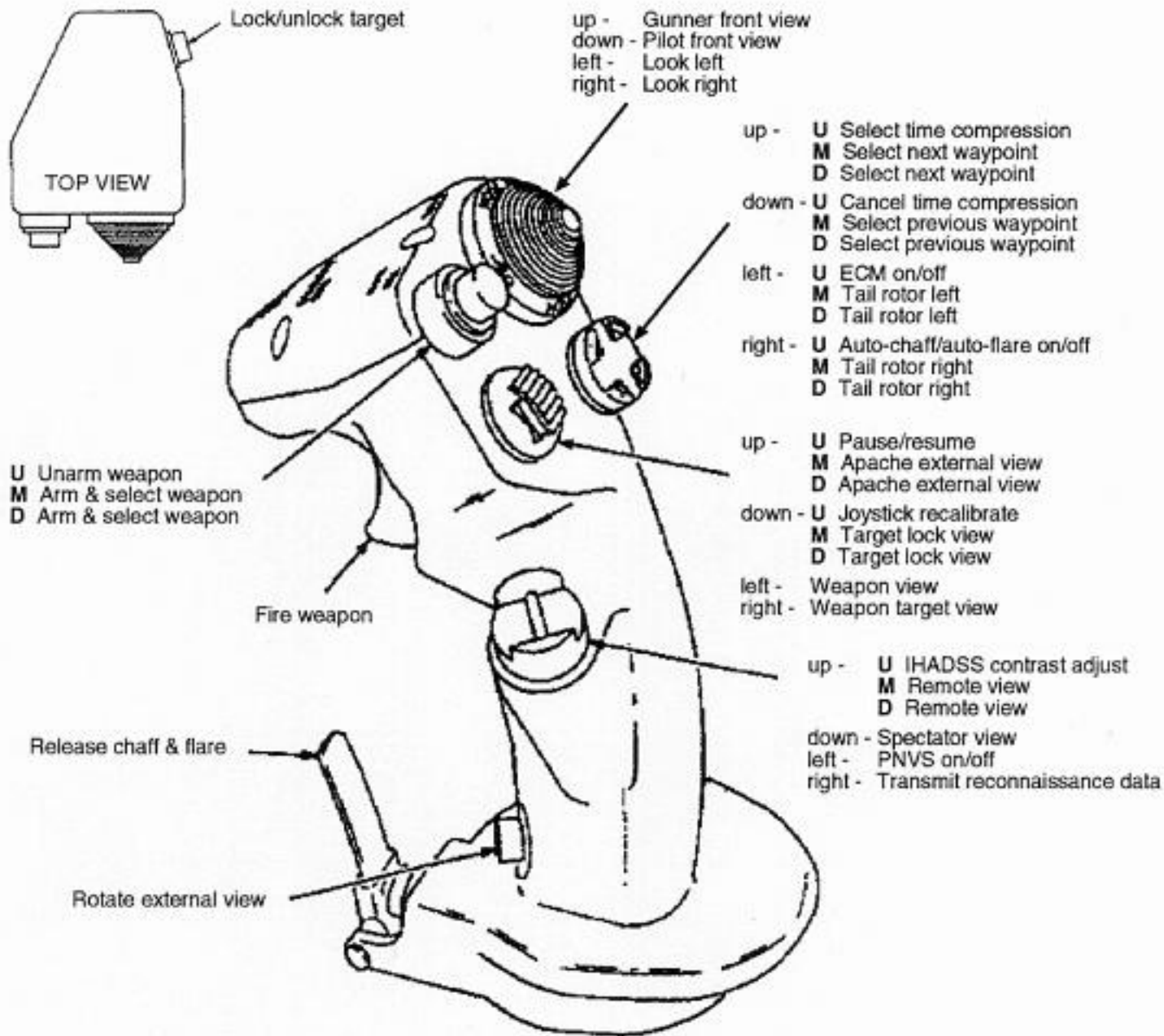


WCS MARK II ROCKER SWITCH POSITIONS

- U** indicates rocker switch up
- M** indicates rocker switch middle
- D** indicates rocker switch down

WCS MARK II BASE SWITCH SETTINGS

- Set black hat switch to DIGITAL
- Set red switch to ANALOGUE



+ WCS SETTINGS

U Raise magnification
M Next target
D Radar mode

U TADS view/select TADS mode
M Hydra-pods up
D Select next right MFD

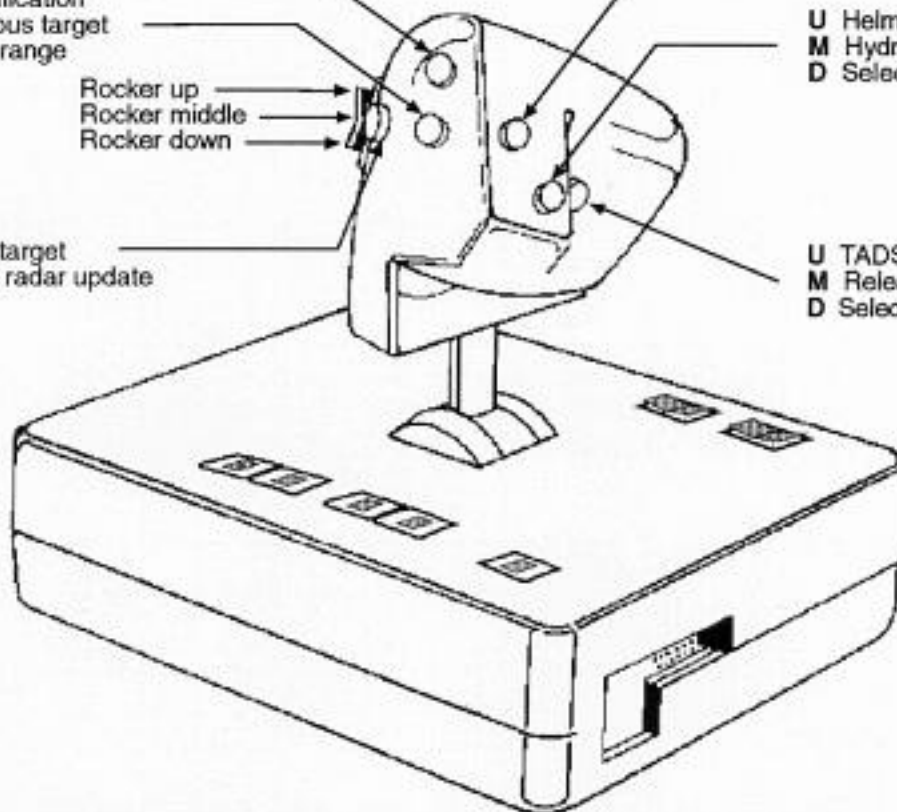
U Lower magnification
M Select previous target
D Select radar range

U Helmet view
M Hydra-pods down
D Select next left MFD

Rocker up
Rocker middle
Rocker down

U Brakes
M Lock/unlock target
D Hold/resume radar update

U TADS/radar target select
M Release chaff and flare
D Select tactical display range



WCS MARK II ROCKER SWITCH POSITIONS

U indicates rocker switch up
M indicates rocker switch middle
D indicates rocker switch down

WCS MARK II BASE SWITCH SETTINGS

Set black hat switch to DIGITAL
Set red switch to ANALOGUE

TWO PLAYER PILOT CONTROLS

MISCELLANEOUS CONTROLS

End mission	Ctrl	Esc
Joystick on/off	Ctrl	J
Joystick recalibrate	Alt	J

PRIMARY FLIGHT CONTROLS

Cyclic forward	↑
Cyclic backward	↓
Cyclic left	←
Cyclic right	→
Collective up	Q or +
Collective down	A or -
Collective presets (10 to 100%)	I to O
Tail rotor left	Z or Ins
Tail rotor right	X or Del
Brakes	B
Autohover	O

COCKPIT CONTROLS

Select left MFD function	I
Select previous left MFD function	⇧ Shift I
Left MFD on/off	Ctrl I
Select right MFD function	J
Select previous right MFD function	⇧ Shift J
Right MFD on/off	Ctrl J
Lower moving map magnification	<
Raise moving map magnification	>
IHADSS contrast adjust	I
Select next waypoint	N

Select previous waypoint	⇧ Shift N
Helmet tracking view	H
Select tactical display range	K
PNVS on/off	V

COCKPIT VIEW CONTROLS

Pilot front view	F2 or Home
Look left	F4 or End
Look right	F5 or Pg Dn

EXTERNAL VIEW CONTROLS

Apache external view	F6
Weapon view	F7
Weapon target view	F8
Target lock view	F9
Remote view	F10
Spectator view	F11
Rotate view	Alt + cyclic controls
Zoom out	<
Zoom in	>

TWO PLAYER COPILOT/GUNNER CONTROLS

MISCELLANEOUS CONTROLS

End mission	Ctrl	Esc
Joystick on/off	Ctrl	J
Joystick recalibrate	Alt	J

COCKPIT CONTROLS

Select left MFD function	I
Select previous left MFD function	⇧ Shift I
Left MFD on/off	Ctrl I
Select right MFD function	J
Select previous right MFD function	⇧ Shift J
Right MFD on/off	Ctrl J
Lower moving map magnification	<
Raise moving map magnification	>
IHADSS contrast adjust	I
Select next target	+ Backspace
Select previous target	⌘ or ⇧ Shift Backspace
Lock/unlock target	L
TADS view, select TADS mode	T
Boresight mode on/off	Y
Lower TADS magnification	<
Raise TADS magnification	>
Helmet tracking view	H
Select radar mode	R
Switch radar off	Ctrl R
Select radar range	G
Select radar target priority	M
Hold/resume radar update	U
Select tactical display range	K
PNVS on/off	V
ECM on/off	E
Transmit reconnaissance data	D

WEAPONS CONTROLS

Arm and select weapon	← Enter
Unarm weapon	Ctrl ← Enter
Fire weapon	Spacebar
Release chaff	C
Release flare	F
Auto-chaff/auto-flare on/off	Ctrl C
Hydra-pods up	W
Hydra-pods down	S

COCKPIT VIEW CONTROLS

Gunner front view	F3 or Pg Up
Look left	F4 or End
Look right	F5 or Pg Dn

EXTERNAL VIEW CONTROLS

Apache external view	F6
Weapon view	F7
Weapon target view	F8
Target lock view	F9
Remote view	F10
Spectator view	F11
Rotate view	Alt + cyclic controls
Zoom out	<
Zoom in	>

TWO PLAYER PILOT CONTROLS

MISCELLANEOUS CONTROLS

End mission	Ctrl	Esc
Joystick on/off	Ctrl	J
Joystick recalibrate	Alt	J

PRIMARY FLIGHT CONTROLS

Cyclic forward	↑
Cyclic backward	↓
Cyclic left	←
Cyclic right	→
Collective up	Q or +
Collective down	A or -
Collective presets (10 to 100%)	1 to 0
Tail rotor left	Z or Ins
Tail rotor right	X or Del
Brakes	B

COCKPIT CONTROLS

Select left MFD function	I
Select previous left MFD function	⇧ Shift I
Left MFD on/off	Ctrl I
Select right MFD function	J
Select previous right MFD function	⇧ Shift J
Right MFD on/off	Ctrl J
Lower moving map magnification	<
Raise moving map magnification	>
IHADSS contrast adjust	I
Select next waypoint	N

Select previous waypoint	⇧ Shift N
Helmet tracking view	H
Select tactical display range	K
PNVS on/off	V

COCKPIT VIEW CONTROLS

Pilot front view	F2 or Home
Look left	F4 or End
Look right	F5 or Pg Dn

EXTERNAL VIEW CONTROLS

Apache external view	F6
Weapon view	F7
Weapon target view	F8
Target lock view	F9
Remote view	F10
Spectator view	F11
Rotate view	Alt + cyclic controls
Zoom out	<
Zoom in	>

TWO PLAYER COPILOT/GUNNER CONTROLS

MISCELLANEOUS CONTROLS

End mission	Ctrl	Esc
Joystick on/off	Ctrl	J
Joystick recalibrate	Alt	J

COCKPIT CONTROLS

Select left MFD function	I
Select previous left MFD function	⇧ Shift I
Left MFD on/off	Ctrl I
Select right MFD function	I
Select previous right MFD function	⇧ Shift I
Right MFD on/off	Ctrl I
Lower moving map magnification	<
Raise moving map magnification	>
IHADSS contrast adjust	I
Select next target	← Backspace
Select previous target	← or ⇧ Shift Backspace
Lock/unlock target	L
TADS view, select TADS mode	T
TADS/radar target select	Y
Lower TADS magnification	<
Raise TADS magnification	>
Helmet tracking view	H
Select radar mode	R
Select radar range	G
Select radar target priority	M
Hold/resume radar update	U
Select tactical display range	K
PNVS on/off	V
ECM on/off	E
Transmit reconnaissance data	D

WEAPONS CONTROLS

Arm and select weapon	← Enter
Unarm weapon	Ctrl ← Enter
Fire weapon	Spacebar
Release chaff	C
Release flare	F
Auto-chaff/auto-flare on/off	Ctrl C
Hydra-pods up	W
Hydra-pods down	S

COCKPIT VIEW CONTROLS

Gunner front view	F3 or Pg Up
Look left	F4 or End
Look right	F5 or Pg Dn

EXTERNAL VIEW CONTROLS

Apache external view	F6
Weapon view	F7
Weapon target view	F8
Target lock view	F9
Remote view	F10
Spectator view	F11
Rotate view	Alt + cyclic controls
Zoom out	<
Zoom in	>



MISSION TIPS

Most missions have been designed with a cruising speed of 140 knots between waypoints and a speed of 60 knots as you approach each target area. This gives sufficient flexibility for you to adjust your speed and position relative to your wingmen. Your typical altitude will be 100 feet. Specific details can be checked by using the waypoint box on the mission planner. You must execute the required task (e.g. destroy required targets) and land at the last waypoint for a mission to be successful. Performance over and above the mission requirements may earn an outstanding rating.

There will always be at least one wingman on your mission. Until you have acquired combat experience, we suggest waiting a few seconds prior to take-off and then joining the formation at the rear. This helps avoid mid-air collisions and enables you to keep track of your formation. Wingmen will not wait until you take-off. If your wingmen depart from the flight route, it is probably because they are being fired at or they have engaged enemy air defences. They will return to the flightplan but may not be able to catch up with you if you have flown on ahead. We do not recommend that you attempt to remain in formation when engaged with the enemy.

When faced with the threat of an incoming missile, you are strongly advised to turn sharply (jinking) to minimise the chances of being hit. The same technique is advised when being fired upon by air defences e.g. ZSU23 AAA. Chaff and flares are dispensed automatically unless you select manual operation.

On higher difficulty levels we recommend that you make maximum use of available ground cover e.g. buildings and trees. Popping up to launch your weapons and then descending into cover will increase your chances of survival significantly. Flying low will decrease the likelihood of SAMs, particularly if you make use of the terrain i.e. keeping below the horizon. You may change your payload during briefing if you prefer a different weapon mix. Just remember that Stingers and Laser-guided Hellfires do not function in fog. Fire your chain gun using short bursts. Its range is quoted as 4500 feet but it is sometimes possible to hit a target slightly beyond this limit. Its effectiveness will vary depending upon the 'hardness' of the target.

MISSION TIPS

In Cyprus, both enemy and allied forces use common equipment e.g. Leopard tanks, tracked Rapier and M113 APCs. The vehicles are differentiated by colour - green for allied, brown for enemy, but recognition can still be difficult at long ranges. Use of the TADS system can help to identify targets visually. Be sure to check the inventory in the manual. Prior to take-off, make a note of where your route crosses the front line. This will help prevent you from firing at allied forces. In the confusion of battle it is inevitable that this will happen and you will be requested to cease fire.

Unlike the arcade model, the realistic flight model does not have terrain following, and even the arcade model is not infallible when flying at higher speeds. Care must be taken in order to avoid crashing into hillsides at night.

Tank formations engaged in battle occur frequently along the front line. These forces are accompanied by air defence equipment e.g. SAMs and AAA. If you are fired upon, take out the air defences but do not waste weapons on tanks unless this is the purpose of your mission. Focus your attention on those targets that fire at you! Use radar masking key **[M]** to reduce radar clutter.

Prior to landing at the end of your mission, press **[F6]** followed by **[Shift]** and **[↓]** in order to obtain an overhead view of your landing spot. The airfield apron can be a busy place with aircraft and vehicles movements.

Promotion through the ranks and medals are awarded as follows:

	No. of missions completed
Lieutenant Colonel	50
Major	30
Captain	15
Lieutenant	5
Warrant Officer	0

Bronze Star: Awarded after successful completion of two campaigns or one campaign and ten single missions.

Distinguished Flying Cross: Awarded after successful completion of all three campaigns or two campaigns and twenty single missions.

Medal of Honour: Awarded after successful completion of all three campaigns and all thirty single missions.



Introduction

The primary role of the Apache is to attack and destroy hostile armoured vehicles with maximum surprise and with maximum safety for its crew. This can be achieved under the most adverse weather conditions, day or night, even after suffering significant battle damage.

Development

The design of the Apache began in response to the U.S. Army requirement for a new Advanced Attack Helicopter. A contract was awarded to Hughes in June 1973 to build two prototypes, the first of which flew on 30th September 1975. Following a competitive fly-off against the Bell model 409, the Hughes prototype AH-64 was selected for further development.

Subsequent modifications in phase 2 included extension of the main rotor mast by 9.5 inches to prevent the blades making contact with the fuselage which was happening under certain manoeuvres. The tailplane was moved from the top of the fin to the base of the tailcone to improve handling qualities. Three more prototypes were built with modifications including a further extension of the rotor mast, swept-back tips to the main rotor blades, a 3 inch increase in the tail rotor diameter and the introduction of the "Black Hole" exhaust coolers.

Performance

Agility or aircraft response to control inputs is fast and precise. The Apache will produce 100 deg/sec rate of roll and a high instantaneous turn rate, allowing it to be manoeuvred briskly around obstacles at low altitude. Sloppiness and slow response typical of most helicopter flight controls are absent. In fact, pilots tend to over control until they adjust to the crisp response. Despite this, pilots adapt to the Apache's handling characteristics surprisingly quickly.

Tilting sharply forwards out of the hover and pulling 100% torque, the Apache reaches 100 knots in 250 yards, equivalent to 0 to 60 m.p.h. within 4.6 seconds. An impressive acceleration for a machine weighing over 7 tons! True airspeed in level flight with normal maximum

continuous power is approximately 150 kts. Aerodynamic drag rises sharply above this speed, with 100% torque giving roughly 160 kts in level flight. The maximum speed in a dive (V_{ne}) is 197 kts. The Apache can survive a single engine failure, even in the hover.

Avionics

The Apache contains many on-board computers with built-in self-test and automatic fault detection. Many of the "black boxes" are duplicated in different parts of the aircraft to reduce vulnerability to enemy fire. Much of the avionic equipment is housed in large external fairings either side of the fuselage.

(a) Flight Control System

The flight control system is designed to simplify the task of flying under stressful conditions. Pilots find the Apache easy to fly, even without the autostabilisation. At the heart of the system is the Digital Automatic Stabilisation System (DASE) which takes information from sensors around the aircraft and shapes the pilot's control inputs to optimise the aircraft's response. Control cross-coupling effects typical of many helicopters have been eliminated by compensation. A moving tailplane or stabilator is continuously adjusted by the DASE to maintain the Apache fuselage level across its entire speed range. The stabilator eliminates the nose-down attitudes seen so often on helicopters.

(b) Target Acquisition and Designation Sight (TADS)

This is a cluster of sensors mounted in a stabilised housing at the front of the Apache to give both pilot and copilot/gunner a choice of how to view the outside world. The weapon-aiming displays are viewed by the gunner through his eyepiece, plus a small "heads-out" display on his instrument panel. The TADS may be swivelled 120 degrees left or right, 30 degrees up or 60 degrees down. Forward Looking Infra Red (FLIR) is used for night-time vision, Daytime TV (DTV) in the near infra-red band can penetrate smoke and haze, and Direct View Optics (DVO) give a display with a maximum magnification of $\times 126$ - capable of zooming-in on a target up to 3 miles away! All three systems have a choice of magnification.

The TADS will automatically track a target after locking onto it. The gunner will use the laser to determine target range, in practice offsetting the laser to avoid detection by the target. The target will be illuminated by the laser just prior to impact. The target may be illuminated by a remote source e.g. ground infantry.

(c) Pilot's Night Vision System (PNVS)

A remarkable system available to both crew members is the Integrated Helmet and Display Sighting System (IHADSS). The pilot looks through a helmet-mounted television monocle to view the outside world projected life-size into his right eye. Sensors in his helmet determine head position and drive the camera turret in the nose of the Apache accordingly. The PNVS turret can swivel 90 degrees left or right, up 20 degrees and down 45 degrees. By combining the functions of TADS and IHADSS, either crew member may aim his weapon simply by looking at the target.

Weapons

The fuselage carries a stub wing fitted with four weapon attachment points or pylons. The inboard pylons are normally used to carry eight Hellfire missiles, four per side.

The primary attack weapon is the Hellfire missile with a warhead capable of defeating all known armoured threats at significant stand-off ranges. The 30mm chain gun provides accurate suppressive fire power at 625 rounds per minute, can easily destroy lightly armoured vehicles and provides self-protection against air threats. The Apache is also capable of carrying a payload of seventy six 70mm folding-fin aerial rockets, mounted on moveable pylons. The improved AH-64C and AH-64D Apaches can carry four Stinger air-to-air missiles, mounted on the ends of the stub wing.

Structure

The fuselage is a conventional semi-monocoque aluminium structure using fracture-tough materials, redundant load paths and oversized

structural members to minimise effects of battle damage. The main rotor consists of four blades, each having five stainless steel spars lined with structural glass fibre tubes, a laminated stainless steel skin and a composite trailing edge to give a multiple redundant structure. The tail rotor arrangement is an unusual design with the blades mounted 55 degrees apart to give optimum low noise levels.

Apache is build to survive the battlefield. Both crew are protected by armour-plated seats and a transparent blast shield separates the crew compartments. Fitted with infra-red "Black Hole" suppressors on the engine exhausts, an IR jammer, chaff and flare dispensers and a radar jammer, the Apache is a difficult target to track. With composite armour protection, self-seal fuel cells, redundant flight controls and widely-spaced twin engines, Apache is invulnerable to small arms hits and tolerant of 23mm projectile hits in critical areas. Main rotor blades can continue to operate 5 hours after taking a hit by a 23mm high explosive projectile. The transmission can operate for 1 hour after loss of oil. Crash worthiness features include the ability to withstand vertical impacts up to 30 m.p.h. with 95% probability of crew survival. Ground crews can change an engine in less than 30 minutes and fully refuel and rearm in just 10 minutes.

Apache modernisation programme

All U.S. Army Apaches are to be upgraded to the AH-64C/D common configuration. This includes new "Manprint" crew stations with "glass-cockpit" multi-function displays, improved secure communications, precision inertial and GPS navigation systems and the addition of fire-and-forget Hellfire missiles and air-to-air missiles.

The mast-mounted Longbow fire control radar on the AH-64D can detect, classify and prioritise multiple air and ground threats automatically in all weather conditions. Battlefield awareness and target acquisition is possible through a full 360 degrees. Targeting information can be passed to other Apaches, improving attack coordination and effectiveness.

Introduction

The primary role of the Apache is to attack and destroy hostile armoured vehicles with maximum surprise and with maximum safety for its crew. This can be achieved under the most adverse weather conditions, day or night, even after suffering significant battle damage.

Development

The design of the Apache began in response to the U.S. Army requirement for a new Advanced Attack Helicopter. A contract was awarded to Hughes in June 1973 to build two prototypes, the first of which flew on 30th September 1975. Following a competitive fly-off against the Bell model 409, the Hughes prototype AH-64 was selected for further development.

Subsequent modifications in phase 2 included extension of the main rotor mast by 9.5 inches to prevent the blades making contact with the fuselage which was happening under certain manoeuvres. The tailplane was moved from the top of the fin to the base of the tailcone to improve handling qualities. Three more prototypes were built with modifications including a further extension of the rotor mast, swept-back tips to the main rotor blades, a 3 inch increase in the tail rotor diameter and the introduction of the "Black Hole" exhaust coolers.

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VEHICLE INVENTORY

YEMEN

Allies

Vehicle	Radar name
Helicopters	
AH64D APACHE LONGBOW	AH64D
AH64C APACHE	AH64C
UH60 BLACKHAWK	UH60
Fixed wing aircraft	
F14 TOMCAT	F14
F18 HORNET	F18
A10 THUNDERBOLT	A10
C130 HERCULES	C130
Air defence	
PATRIOT SAM LAUNCHER	Patriot(SAM)
M163 AAA	M163(AAA)
Armoured vehicles	
M1A1 ABRAMS Tank	M1A1(MBT)
M113 ARM. PERSONNEL CARRIER	M113(APC)
Artillery	
MLRS AFV	MLRS
Other	
GIRAFFE MOBILE RADAR	GiraffeRadar
FUEL BOWSER	FuelBowser
MILITARY TRUCK	Truck
Ships	
LHA TARAWA	LHA TARAWA
FRIGATE OHP CLASS	Frigate

Enemy

Vehicle	Radar name
Helicopters	
Mi24 HIND	MI24 HIND
Fixed wing aircraft	
MiG27	MIG27
C130 HERCULES	C130
Air defence	
SA8 ROMB SAM	SA8(SAM)
SA9 GASKIN	SA9(SAM)
SA13 STRELA SAM	SA13(SAM)
ZSU23 SHILKA AAA	ZSU23(AAA)
SILKWORM SAM	Silkworm
Armoured vehicles	
T62 TANK	T62(MBT)
BDRM2 APC	BDRM2(APC)
BDRM2 + SAGGER	BDRM2(APC)
BMP2 APC	BMP2(APC)
Artillery	
MAZ543 SCUD	MAZ543(SCUD)
D30 HOWITZER	D30
COASTAL GUN	Coastal Gun
Other	
FUEL BOWSER	FuelBowser
MILITARY TRUCK	Truck
Ships	
MINE LAYER	MineLayer
OSA MISSILE BOAT	OSA MB

VEHICLE INVENTORY

KOREA

Allies

Vehicle Radar name

Helicopters

AH64D APACHE LONGBOW AH64D
 AH64C APACHE AH64C
 UH60 BLACKHAWK UH60

Fixed wing aircraft

A10 THUNDERBOLT A10
 C130 HERCULES C130
 F15 EAGLE F15
 F16 FIGHTING FALCON F16
 F18 HORNET F18

Air defence

PATRIOT SAM LAUNCHER Patriot(SAM)
 M163 VULCAN AAA M163(AAA)

Armoured vehicles

M1A1 ABRAMS TANK M1A1(MBT)
 M113 APC M113(APC)

Artillery

MLRS AFV MLRS
 M109 HOWITZER M109(SPH)

Other

GIRAFFE MOBILE RADAR GiraffeRadar
 FUEL BOWSER FuelBowser
 MILITARY TRUCK Truck

Enemy

Vehicle Radar name

Helicopters

Mi24 HIND MI24 HIND

Fixed wing aircraft

MiG29 MIG29
 MiG27 MIG27
 Su25 SU25

Air defence

SA8 ROMB SAM SA8(SAM)
 SA9 GASKIN SA9(SAM)
 SA13 STRELA SAM SA13(SAM)
 ZSU23 SHILKA AAA ZSU23(AAA)

Armoured vehicles

T62 TANK T62(MBT)
 T80 TANK T80(MBT)
 BMP2 APC BMP2 (APC)
 BDRM2 APC BDRM2(APC)
 BDRM2 + SAGGER BDRM2(APC)

Artillery

D30 HOWITZER D30
 MAZ543 SCUD MAZ543(SCUD)

Other

FUEL BOWSER FuelBowser
 MILITARY TRUCK Truck

Ships

ROMEO SUBMARINE RomeoSub
 OSA MISSILE BOAT OSA MB
 MINE LAYER MineLayer
 SUPPLY BARGE Barge

VEHICLE INVENTORY

CYPRUS

Allies

Vehicle	Radar name
---------	------------

Helicopters

AH64D APACHE LONGBOW	AH64D
AH64C APACHE	AH64C
UH60 BLACKHAWK	UH60

Fixed wing aircraft

F15 EAGLE	F15
F16 FIGHTING FALCON	F16
F18 HORNET	F18
A10 THUNDERBOLT	A10
C130 HERCULES	C130

Air defence

TRACKED RAPIER	Rapier(SAM)
PATRIOT SAM LAUNCHER	Patriot(SAM)

Armoured vehicles

WARRIOR APC	Warrior(APC)
CHALLENGER TANK	Challenger
LEOPARD TANK	Leopard(MBT)
M113 APC	M113(APC)

Artillery

M163 VULCAN AAA	M163(AAA)
M109 HOWITZER	M109(SPH)
MLRS AFV	MLRS

Other

FUEL BOWSER	FuelBowser
MILITARY TRUCK	Truck
GIRAFFE MOBILE RADAR	GiraffeRadar

Ships

SUPPLY BARGE	Barge
FRIGATE OHP CLASS	Frigate

Enemy

Vehicle	Radar name
---------	------------

Helicopters

AH1W SUPERCobra	SuperCobra
-----------------	------------

Fixed wing aircraft

F16 FIGHTING FALCON	F16
C130 HERCULES	C130

Air defence

GDF SPAAG AAA	GDF(AAA)
M113 APC	M113(APC)

Armoured vehicles

LEOPARD TANK	Leopard(MBT)
LEOPARD AEV/ARV	LeopAEV

Artillery

M109 HOWITZER	M109(SPH)
MLRS AFV	MLRS

Other

LEOPARD BIBER BRIDGE LAYER	LeopBiber
FUEL BOWSER	FuelBowser
MILITARY TRUCK	Truck
GIRAFFE MOBILE RADAR	GiraffeRadar

Ships

SUBMARINE TYPE 209	SubT209
MEKO 200 CLASS FRIGATE	Frigate
TUG	Tug
FPB 57 CLASS	FPB57

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If you have any questions about Apache Longbow or any of our other products, please contact our Customer Support at:

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If you require technical support, please call the above number, not our sales line. It helps enormously if you can have the following details to hand:

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Address

Product name

Computer

Description of problem

Error messages appearing on screen, if any.

Faulty items

If you purchased Apache Longbow direct from Digital Integration and you are unhappy with the product for any reason, it is our company policy to offer an exchange or refund your purchase price, less the cost of postage and packing. This offer is subject to the goods being returned to us in a resaleable condition within 14 days of purchase. If you are having trouble with the installation then please call or write to Customer Support. If you suspect that the CD ROM is faulty, please return it direct to us (not via your retailer) and we will send you a tested replacement. Please include the name and address of your supplier. We regret that it is not possible for us to offer a refund if the product was not purchased from Digital Integration. In such cases, your request must be addressed to the vendor. Your normal consumer rights are not affected by this policy.

VEHICLE INVENTORY

YEMEN

Allies

Vehicle	Radar name
---------	------------

Helicopters

AH64D APACHE LONGBOW	AH64D
AH64C APACHE	AH64C
UH60 BLACKHAWK	UH60

Fixed wing aircraft

F14 TOMCAT	F14
F18 HORNET	F18
A10 THUNDERBOLT	A10
C130 HERCULES	C130

Air defence

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Armoured vehicles

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Artillery

MLRS AFV	MLRS
----------	------

Other

GIRAFFE MOBILE RADAR	Giraffe
FUEL BOWSER	FuelBowser
MILITARY TRUCK	Truck
TRAIN	Train

Ships

LHA TARAWA	LHA TARAWA
FRIGATE OHP CLASS	Frigate

Enemy

Vehicle	Radar name
---------	------------

Helicopters

Mi24 HIND	Mi24 HIND
-----------	-----------

Fixed wing aircraft

MiG27 FLOGGER	MiG27
C130 HERCULES	C130

Air defence

SA8 ROMB SAM	SA8(SAM)
SA9 GASKIN	SA9(SAM)
SA13 STRELA SAM	SA13(SAM)
ZSU23 SHILKA AAA	ZSU23(AAA)

Armoured vehicles

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BRDM2 APC	BRDM2(APC)
BRDM2 + SAGGER	BRDM2(SAG)
BMP2 APC	BMP2(APC)

Artillery

MAZ543 SCUD	MAZ(SCUD)
D30 HOWITZER	D30
COASTAL GUN	Coastal Gun
SILKWORM MISSILE	Silkworm

Other

LONG TRACK RADAR	LongTrack
FUEL BOWSER	FuelBowser
MILITARY TRUCK	Truck
TRAIN	Train

Ships

MINE LAYER	MineLayer
OSA MISSILE BOAT	OSA MB

VEHICLE INVENTORY

KOREA

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 MILITARY TRUCK Truck
 TRAIN Train

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 BRDM2 APC BRDM2(APC)
 BRDM2 + SAGGER BRDM2(SAG)
 MT-LBU APC MTLBU (APC)
 MT-LBUS ECM MTLBUS

Artillery

D30 HOWITZER D30
 MAZ543 SCUD MAZ(SCUD)

Other

LONG TRACK RADAR LongTrack
 FUEL BOWSER FuelBowser
 MILITARY TRUCK Truck
 TRAIN Train

Ships

ROMEO SUBMARINE RomeoSub
 OSA MISSILE BOAT OSA MB
 MINE LAYER MineLayer
 SUPPLY BARGE Barge

VEHICLE INVENTORY

CYPRUS

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C130 HERCULES C130

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M163 VULCAN AAA M163(AAA)

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CHALLENGER TANK Challenger
LEOPARD TANK Leopard
M113 APC M113(APC)

Artillery

M109 HOWITZER M109(SPH)
MLRS AFV MLRS

Other

FUEL BOWSER FuelBowser
MILITARY TRUCK Truck
GIRAFFE MOBILE RADAR Giraffe

Ships

SUPPLY BARGE Barge
FRIGATE OHP CLASS Frigate

Enemy

Vehicle Radar name

Helicopters

AH1W SUPERCOBRA SuperCobra

Fixed wing aircraft

F16 FIGHTING FALCON F16
C130 HERCULES C130

Air defence

GDF SPAAG AAA GDF(AAA)
TRACKED RAPIER Rapier

Armoured vehicles

LEOPARD TANK Leopard
LEOPARD AEV/ARV LeopAEV
M113 APC M113(APC)

Artillery

M109 HOWITZER M109(SPH)
MLRS AFV MLRS

Other

LEOPARD BRIDGE LAYER LeopLayer
FUEL BOWSER FuelBowser
MILITARY TRUCK Truck
GIRAFFE MOBILE RADAR Giraffe

Ships

SUBMARINE TYPE 209 SubT209
MEKO 200 CLASS FRIGATE Frigate
TUG Tug
FPB 57 CLASS FPB57

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FREQUENTLY ASKED QUESTIONS

Q. My mouse pointer flickers; what do you suggest?

A. Try running Apache by typing: APACHE /V2 .

Q. I have a Tseng Labs ET4000 W32 video card and my display glitches.

A. Load Apache by typing: APACHE /V4 .

Q. The music soundtrack is not clear.

A. Make sure that you have selected the correct sound card.

Q. I keep getting errors when running the two player games with a modem.

A. You are probably using a 'standard speed' serial port card. Using a high speed serial port card should cure the problem. You can check your card type by running MSD (Microsoft Diagnostics), and pressing for Com Ports. If the UART chip listed is a 16550 then your port is high speed.

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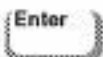
Cyprus 13

Korea 12

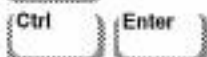
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WEAPONS CONTROLS

Arm and select weapon



Unarm weapon



Fire weapon



Release chaff



Release flare



Auto-chaff/auto-flare on/off



Hydra-pods up

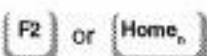


Hydra-pods down

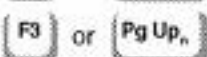


COCKPIT VIEW CONTROLS

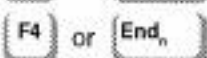
Pilot front view



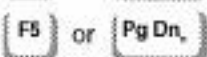
Gunner front view



Look left



Look right



EXTERNAL VIEW CONTROLS

Apache external view



(rotate and zoom available)

Weapon view



(rotate and zoom available)

Weapon target view



Target lock view



Remote view

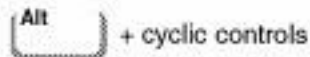


Spectator view



(rotate available)

Rotate view




Zoom in







Zoom out



Note:

 = keys on numeric keypad

MISCELLANEOUS CONTROLS

End mission   or  

or  

Pause/resume 

Select time compression 

Cancel time compression  

Joystick on/off  

Joystick recalibrate  

PRIMARY FLIGHT CONTROLS

Cyclic forward 



Cyclic backward 

Cyclic left 

Cyclic right 

Collective up  or 


Collective down  or 

Collective presets (10 to 100%)  to 

Tail rotor left  or 



Tail rotor right  or 


Brakes 

Autohover 

COCKPIT CONTROLS


Select left MFD function 


Select previous left MFD function  


Left MFD on/off  

Select right MFD function 

Select previous right MFD function  

Right MFD on/off  

Raise moving map magnification 

Lower moving map magnification 

IHADSS contrast adjust 

Select next waypoint 

Select previous waypoint  

Select next target 

Select previous target  
or  

Lock/unlock target 

TADS view/select TADS mode **T**
(use **Alt** + cyclic controls to adjust view)

Raise TADS magnification **>**

Lower TADS magnification **<**

Boresight mode on/off **Y**

Helmet tracking view **H**

(use **Alt** + cyclic controls to adjust view)

Select radar mode **R**

Switch radar off **Ctrl R**

Select radar range **G**

Select radar target priority **M**

Hold/resume radar update **U**

Select tactical display range **K**

PNVS on/off **V**

ECM on/off **E**

Transmit reconnaissance data **D**



CONTROL SUMMARY CD ROM

