

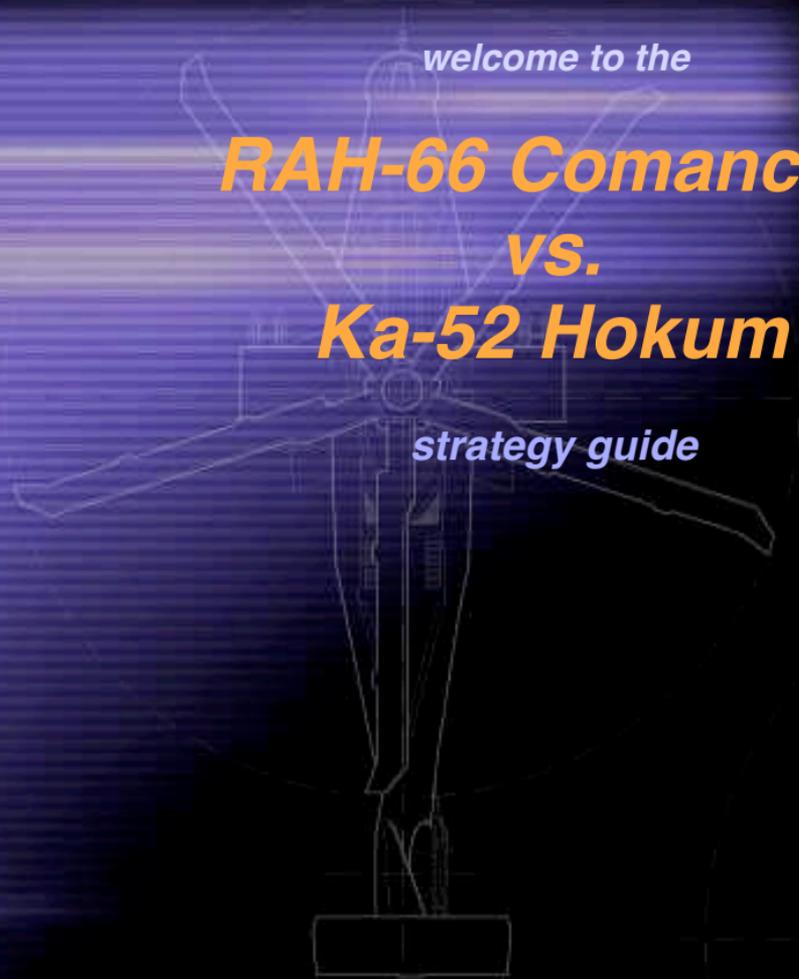
welcome to the

**RAH-66 Comanche**

**vs.**

**Ka-52 Hokum**

strategy guide





## CHAPTER 1

# Getting Started, Simulation Briefing

### IN THIS CHAPTER

- Introduction
- Gameplay Basics
- Golden Rules For Helicopter Combat Survival
- Joystick Configurations - Special Keys
- Real Apache Control Layout

## 1.1 Introduction

Like its predecessor Apache Havoc, Comanche Hokum presents a live theatre of war populated by AI entities, each following their own set of orders and all interacting in complex and subtle ways. Understanding the nuances of the campaign is ultimately rewarding.

This strategy guide does not assume familiarity with the previous Apache Havoc strategy guide, but does assume some knowledge of the basics of helicopter flight. If more basic help is required then study of the Comanche Hokum manual is a good place to begin.

To get the best flight experience from a helicopter simulation it is highly recommended you use a joystick with a separate throttle controller and rudder pedals.

This guide aims to provide insights into how the campaign operates, game mechanics, tactics, cheats and some information of how you can customise the simulation. Some of the information presented is duplicated in the Apache Havoc guide as the two simulations share basic elements. However since this guide is more recent, in the case of any discrepancies this guide should be considered overriding.

### Strategy Guide Updates

Updates of this Strategy Guide may be found on the Razorworks web site at:

<http://www.razorworks.com/chguide>

## 1.2 Gameplay Basics - Why Am I Here?

First a quick word about the world of Comanche Hokum and the entities that inhabit it. The mission and campaign system of Comanche Hokum is "reactive" - meaning that an action by one entity will often result in a reaction by another entity. Consequent actions by entities may in turn produce yet more actions. This fact is critical for the successful completion of campaign goals.

Here is an example of this reactive intelligence: Should an attack helicopter engage a group of enemy tanks, those tanks will radio for assistance. A nearby base will generate a retaliation mission for any available aircraft at that base. Depending on what resources are available, the mission may be assigned to attack helicopters or fighters. Also, should helicopters come under fire from SAMs, a SEAD (suppression of enemy air defences) mission may be generated, indeed you may be tasked to fly a SEAD mission for a computer controlled flight.

It is very similar to its predecessor - Apache Havoc.

You play the role of the pilot and to some extent the co-pilot in either the RAH-66 Comanche or the Ka-52 Havoc, and if you have the previous game installed you will also be able to fly the AH-64D Apache and MI-28 Havoc helicopters.

## 1.3 Golden Rules For Helicopter Combat Survival

Basic rules for survival in helicopter combat:

- *NEVER, EVER forget your stand-off capability.*
- *Never overfly dead targets. The one you missed will get you.*
- *Keep low and slow when expecting enemy contact.*
- *Leave the engagement area as soon as possible.*

Dead helicopters shouldn't have unused countermeasures or wing mounted ordnance. Use 'em or loose 'em. Chaff bundles are no good to you once you have been shot down.

Once you initiate an attack at close range, carry it through and prosecute the enemy as *\*fast\** as possible. Seconds really do count.

## 1.4 Joystick Control Configurations

*The Enemy Engaged - Comanche vs. Hokum* CD has a number of configurations for various kinds of joysticks and controllers. These are not installed to your hard disk and remain in the "JOYSTICK" folder on the CD.

### Special Keys for Programmable Joysticks

*Enemy Engaged - Comanche vs. Hokum* and *Apache Havoc* sensor mode keys use the six gray edit cluster keys (Insert, Home, Page Up etc.), some programmable joysticks have difficulty handling these. Thrustmaster joysticks can use press and release RAW codes to handle these. But to circumvent this problem, duplicate sensor controls not marked on the keyboard overlay are available:

- SHIFT 1 - Ground Radar
- SHIFT 2 - Air Radar
- SHIFT 3 - HMS
- SHIFT 4 - FLIR
- SHIFT 5 - DVO
- SHIFT 6 - DTV

In addition...

- SHIFT 0 - Toggle Transparent Cockpit
- ALT V - Snap to cockpit view 1
- ALT B - Snap to cockpit view 2
- ALT N - Snap to cockpit view 3

### Sticky Keys / Loss of Key Response

If you seem to experience a loss of key control when using programmable joysticks - try increasing the rate at which the joystick sends its key commands using its software where applicable. Thrustmaster programs can specify this using the RATE command in the program file. The loss of keyboard response is due to the joystick button RELEASE code being quickly overwritten by a new key PRESS code. So the keyboard can think that a modifier key such as SHIFT or CTRL or ALT is still being held down. Pressing and releasing these keys on the keyboard will restore normal keyboard operation.

For Thrustmaster joysticks, setting the RATE to 20 (20 microseconds) generates characters very quickly. The lower the number, the faster the setting.

### "I Prefer My Own Configuration - What Commands Should I Program?"

Very much a matter of personal preference, given that most joysticks have some kind of HAT for view panning (as of version 1.1e the panning no longer snaps back to a target making it easier to use).

Here are my list of favourites (in order of preference):

- Weapon Cycle
- Air and Ground Radar Modes / IHADSS mode
- Flares (and or chaff)
- Cyclic Trim and Clear Trim
- CTRL and arrow key cockpit view stepping

Well there are more but the above represents the basic flight and survival commands you will need. If you can program a key series on one button then a single button that releases both a FLARE and CHAFF bundle will help you survive a lot longer.

Cyclic Trim - like in Apache Havoc - does have it's uses, it makes steady flying much easier. Trim the input several times to adjust for wind, roll or maintaining a hover helps lighten your stick workload. That is what it is there for - real pilots use it, you can too.

For reference, here are the control positions of the real Apache AH-64A pilot controls.





# Campaigns



## IN THIS CHAPTER

- Introduction
- Campaign Objectives
- Capturing a Base
- Anatomy of an Airbase
- Recon Photos
- FARPs
- Base Efficiency, Damage & Repair
- Base Supply Levels

## 2.1 Introduction - AH & CH Campaign Differences

There are three campaigns supplied with *Enemy Engaged Comanche verses Hokum* and three more if *Apache Havoc* is installed.

The new campaigns take place in smaller areas however the terrain mesh is more detailed allowing for more tactical masking opportunities. The entity AI and campaign flow logic is also improved. These improvements in logic and flow transfer to the older and much bigger *Apache Havoc* campaigns giving them a new lease of life.

Each campaign has a number of very specific objectives : on the campaign map, the **SIT-REP** screen displays the status of these objectives. Each objective requires the destruction or capture of the indicated base or facility.

*Apache Havoc* campaigns are different, these are mostly a war of attrition, requiring enemy force levels to be pounded below specific levels and sectors captured by flying into them. For more details on *Apache Havoc* campaigns see the [Apache Havoc Strategy Guide](#). Or look on the StrategyGuide directory on the simulation CD.

All campaigns have a finite number of vehicles and aircraft. As they are destroyed, replacement vehicles or aircraft are requested from the reserves. Reserves "appear" in the 3D game world at special airbase buildings. This is covered in more detail later.

## 2.2 Campaign Objectives

To achieve campaign victory you need to accomplish a number of primary objectives which are different each time you start a campaign. Usually you are required to capture a specific enemy base or airstrip.

For example:

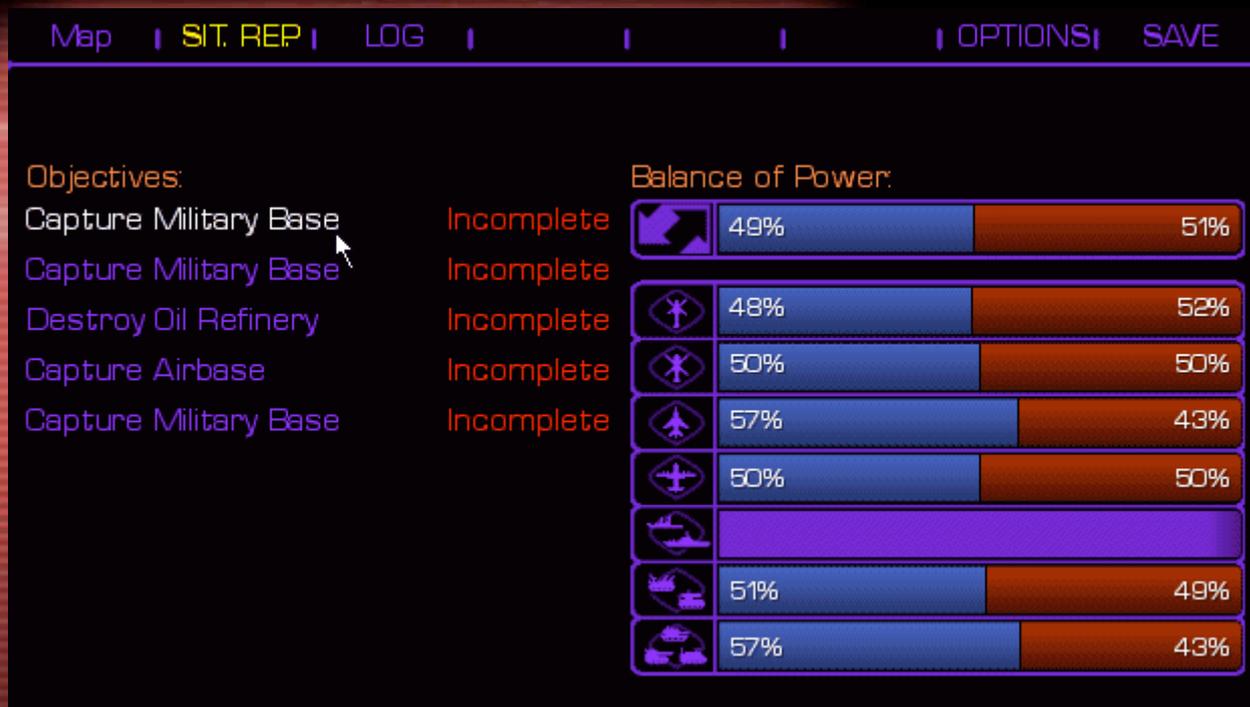


figure 2-1: Campaign Objectives and Force Balance

Clicking on an objective will switch to the map display so you can identify its location. On the campaign map, Objectives are marked by black border lines, see the following example.



Figure 2-2: Typical Objective Icon

You won't find getting to some of the objectives easy. The large airbases are often heavily defended by surrounding military bases and deep inside enemy territory. Concentrate on nibbling away at perimeter defences, this clears the way for follow-up missions. Capturing surrounding FARPs can be beneficial as this can help establish a foothold from which to launch deeper probes into enemy territory. But avoid capturing non essential Military Bases, this can take valuable time and needlessly use up vital assets through combat losses which could be used on more pressing targets.

Overall, priority should be given to eliminating air defences (SAMs and FARPs) and driving towards the most heavily defended objective as early as possible. The most basic campaign is the desert based "Sword In The Sand".



Figure 2-3: Sword In The Sand, Blue Force push

This shows the main Blue Force thrust, a succession of FARPs are captured, closing toward the target airbase deep in enemy territory.

## 2.3 Capturing A Base

Capturing a base requires three things:

### Step 1

The base is attacked and severely damaged. A successful strike mission (either planned or opportunity) will generate a follow-up strike mission or a BDA (battle damage assessment) mission.

### Step 2

Secondly, a follow-up BDA (recon) mission must confirm target is inoperative.

### Step 3

Finally, a "Troop Insertion" mission is created. Once the troops land in the base, the installation is captured.

Large military airfields are sources of resupply and can bring a great deal of firepower down on any nearby FARPs you establish or capture.

Once BDA reconnaissance of a damaged base has been completed (and it must be successful) the capture mission will be scheduled. Of course there must be the appropriate helicopter assets available for the Troop Insertion; Red force will use Hinds, Blue force require Blackhawks. A scheduled **Troop Insertion** will remain unassigned until assets have been allocated.

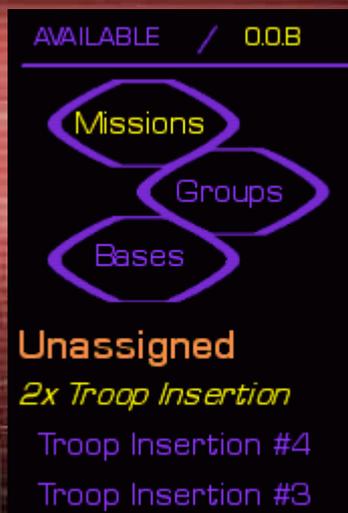


Figure 2-4: The O.O.B bar will show waiting Troop Insertion and other missions.

To see if any insertion missions have been scheduled, on the map screen click the O.O.B button (above the Mission/Group selector) and scroll down the list for Troop Insertion (click on it to view the dust-off and LZ points on the map) or you can click on the  mission button right of the map and search for yourself.

Not all Troop Insertion missions are successful, the difficulty of capture is determined by the base "efficiency" level. The more damage done to a base, the lower the efficiency. See [section 2.6](#) below for more details.

## 2.4 Anatomy of an Airbase



Damaging or capturing enemy air bases are vital for a successful campaign outcome. Not only are airbases typically primary objectives, but they are also the source of replacement aircraft, supplies and ground vehicles.

### Begin the Engagement - Perimeter Defences

When you attack a base, your priority should be the surrounding SAM defences. It is wise to set your radar priority filter to HIGH on approach. This will pick out the SAM "triangles", kill all of them first. You will hear search radar warning tones when you begin to attack so make sure you attack from a maskable position - a place you can duck down and hide from incoming missiles.

#### **Notes for engaging from a hover**

*Use Hover Hold to help maintain location, if you have a throttle controller, you can still operate this to move up and down. Move it GENTLY as excessive downward motion may not be correctable and upward motion may give you too much altitude and cause you to panic and drop the throttle - again causing a crash.*

*There is another version of Hover Hold called Stable Hover Hold, this overrides the throttle controller and maintains the altitude at moment it was engaged. Both version can take a little while for the flight computer to dampen out any motion. With EXPERT avionics they will only work when flying below 20 knots. Personally I prefer NOT to use the automatic flight assist modes but instead use the stick-trim (T and SHIFT T) to maintain a stable hover.*

## Key Airbase Buildings - Interior Assault

Once the perimeter air defence vehicles are destroyed proceed into the airbase perimeter.

Airbases have special buildings called "generators". These special hangars serve to resupply the campaigns operational pool of aircraft when they get shot down. The campaigns resource pool is a finite number of specific aircraft types for that theatre. The maintenance sheds serve as the "portal" between the aircraft pool and the 3D world. Occasionally you may notice helicopters or fighters emerging from the doors of these hangars.

- **Vehicle Garage** - spawns replacement land vehicles
- **Helicopter Hanger** - replacement helicopters emerge from these
- **Generator Building** - replacement fixed wing aircraft

For such airfield busting missions I recommend the pilot arm their helicopter with as many rocket pods as they can fit. Rockets instead of air-to-ground guided missiles will do much more damage to an airfield. The smaller buildings can be damaged with just two standard Hydra rockets. Although hardened hangars may require two or three Hellfire or Vikhr ATGMs. Use your wingmen, order them to attack specific structures.

### PRIORITY TARGET - VEHICLE GARAGE



If you can, locate and destroy the vehicle generator building as soon as possible. Once you have destroyed the airbases perimeter SAM vehicles or parked SAM vehicles, new SAM vehicles may emerge while you are nearby.

Reserve forces emerging from the vehicle garage will park up outside before driving off to join front-line forces.

## PRIORITY TARGET - HELICOPTER HANGER



Destroy this and you will stop replacement helicopters arriving at nearby FARPs and in turn help protect your ground forces. They are typically found near the helicopter pads. For location examples, please refer to the recon photographs below

## PRIORITY TARGET - GENERATOR BUILDING / AIRCRAFT SERVICE HANGER



These come in a variety of shapes but tend to be the larger buildings located near the runways or parking apron. They spawn replacement fighters and transport fixed wing aircraft from the reserve pool. Destroying these will hamper enemy air efforts.

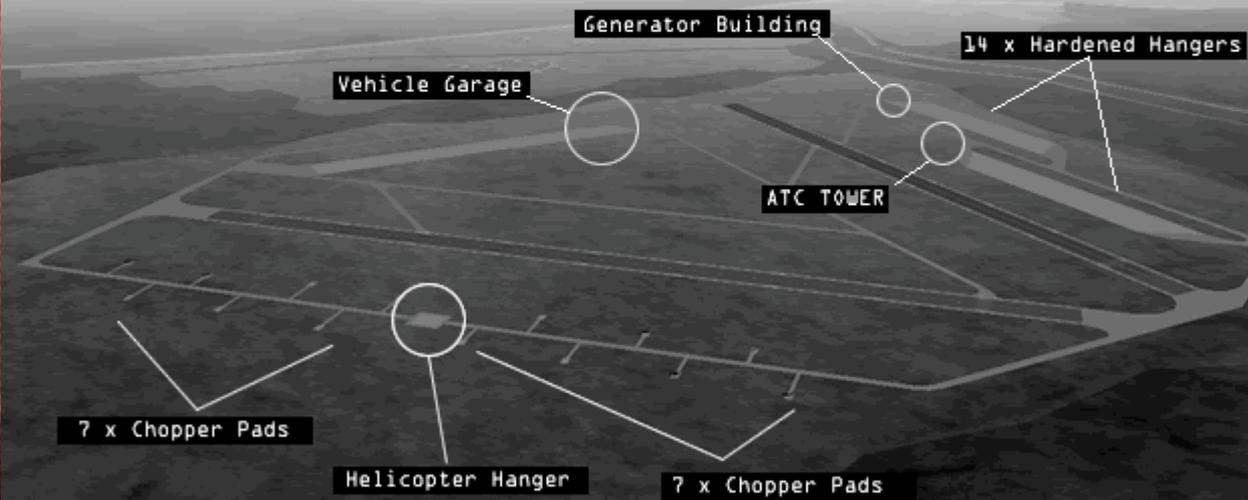
## Recon Photographs - (Lebanese Airfields)

As mentioned above, your priority targets are the vehicle respawn structures. These buildings are marked on the intelligence photos below.

The airfields shown here are fairly typical. There are many other base layouts including dirt strips in the campaign areas. Only three are presented below. Dirt strips do not have any generator buildings.

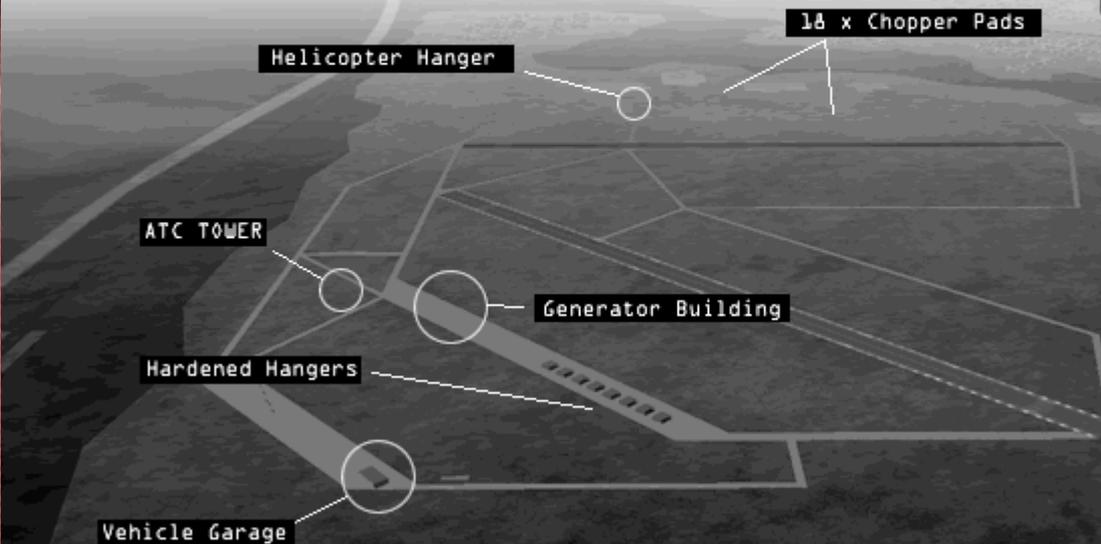
The "sector" is the map grid co-ordinate.

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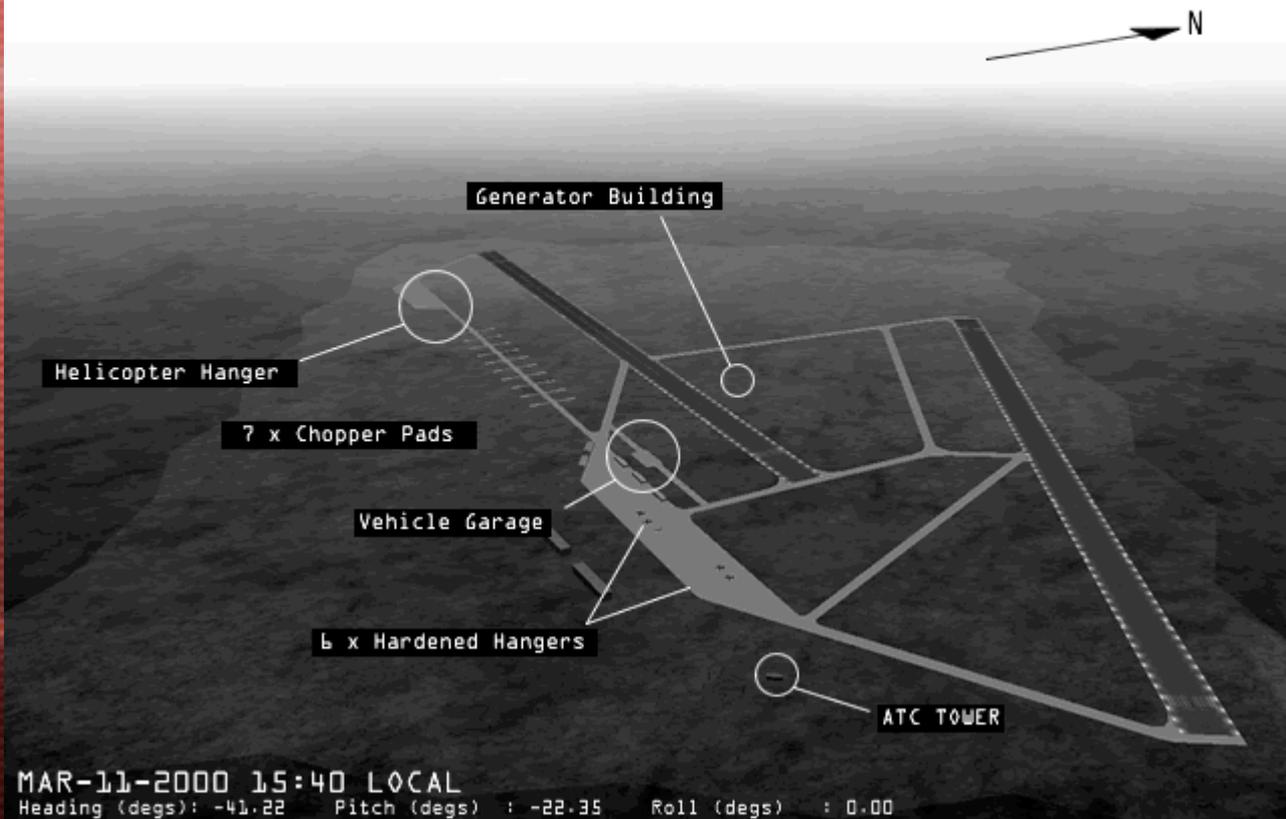
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(The recon photos are standard screen-shots, colour desaturated with labels added by hand.)

## 2.5 FARPs Forward Area Refuelling Points

FARPs are easy pickings, mostly consisting of soft vehicles, mules and external power units that can be destroyed with the cannon. Even better if you can catch them with aircraft on the ground.

Although a single ATGM, Hellfire or Vikhr, directed at the fuel supply will take out about half the FARP. Locate a collection of small fuel tanks or a mule near a group of tents.

## 2.6 Base Efficiency, Damage & Repair

### Efficiency

Each structure at a base (structures such as tents, trucks, hangers, mules etc.) contributes a certain amount towards the "efficiency" of the base. Structures like control towers and hangers are more important than tent or sheds etc.

When buildings are destroyed the efficiency of the base drops, and it requests a repair task. When the "engineers" arrive via the transport aircraft the base slowly starts repairing and the efficiency rises accordingly.

If the efficiency falls below a certain threshold (which just so happens to be 33%) then the base is considered "Out Of Action". When this happens the rate at which missions from that base are assigned is significantly decreased so it becomes less useful to the war effort.

The efficiency level also determines the outcome of troop insertion missions against a base. Not all troop insertion missions result in a successful capture. Basically, the lower the base efficiency the higher the probability of the base being captured. A fully repaired base will always manage to repel the invading forces, whereas an "Out Of Action" base will nearly always be captured. Troop Insertion missions are only generated against bases with low efficiency, but of course the base can repair itself quite a bit while the assault helicopters are en route.

## Damage & Repair

Once a base (airbase or FARP) is damaged to the point where it is marked "Out Of Action", it will require special equipment to arrive by transport. Transport helicopters carry out these "Repair Missions". Once they have arrived, repairs will begin. The amount of time need to repair a base will vary, it depends on what has been damaged.

Individual items (tents, trucks, mules) require a certain amount of time to repair. A tent or shed takes 2 minutes, whereas a hanger or control tower takes 10 minutes. Repairs are done one at a time. A really badly damaged FARP may take 15 to 20 minutes to repair. A badly damaged airbase may take 1 or 2 hours.

## 2.7 Base Supply Levels

Whenever an aircraft lands at a base after a mission, fuel and ammo is removed from the base stores. When a base supply level drops below a certain value, it calls in a "Supply Mission".

Large transport aircraft located at the bigger airbases takeoff and drop supplies by parachute onto the base. Supply drops may be either of fuel OR ammo, not both. A base may require two drops to fully restock.

### CAUTION

Do not use APU 95% cold start switch when the ambient temperature is above 0° F C-18° C). Use of this switch will reduce the power takeoff (PTO) clutch life drastically, and could cause premature failure of the clutch duplex bearing/needle bearing as well as main transmission accessory gear case component failure.

# Combat & Situational Awareness



## IN THIS CHAPTER

Air To Air Combat - Helicopters  
 Air To Air Combat - Fast Movers  
 Infantry - Manpads  
 Dual Cockpit View Memory  
 Padlock Waypoint Multipurpose

## 3.1 Air To Air Combat - Helicopters

Success in helicopter air-to-air combat requires putting your nose (and hence weapon systems) onto the target while denying the enemy the same privilege. Helicopters are not very fast and don't have the speed to run away from fights once they have begun. Either you use available terrain to mask an escape - or you stand and fight.

There are basic rules to keep in mind when engaging in air-to-air combat. Some of which are covered in this chapter.

### Remember

***The best attack position is above and behind on the six-o'clock***

Ambush your foe wherever possible, the terrain of Enemy Engaged allows a pilot to exploit landscape features such as small depressions, dried up riverbeds, gullies and saddles. You can hide in such locations and wait for enemy helicopters to pass-by. Once an enemy exposes their rear, unmask, lock on with the helmet mounted sight (HMS), close to within 0.5km from above and use the cannon. That is the ideal situation and terribly sneaky hence satisfying for a combat helo pilot.

All entities will not actively engage you if you are not perceived as a threat or their mission target. If they are on Combat Air Patrol or have been called in by other forces that perceive you as a threat force then expect some form of response.

Usually firing at an enemy AI will alert them immediately to your intentions and respond if they are able to do so (they could be out of ammunition or fixated on another target).

Often you can easily sneak up behind a flight of enemy helicopters and start blasting at near point-blank range.

A Hellfire or Vikhr missile has enough explosive power to destroy two or three helicopters with one good hit. If your targets wingmen are close, they will be caught in the blast. Laser guided weapons work best, these are difficult to spoof.

### 3.11 Close In - Gunfights

Most of the time computer AI aircraft engage with missiles and not the cannon, so the following section mostly applies to combat with human pilots.

Helicopter cannons are mounted in such a way they shoot DOWN and have little positive travel in the vertical axis. An enemy will find it much much harder to aim the cannon on a target above them. In order to do so the pilot will be forced to raise the nose of the helicopter thus slowing the helicopter down (bleeding energy) and most likely gaining altitude risking exposure to surface to air threats. A helicopter doing this can become a sitting duck but it is often the best defence against single fighters which will be discussed later.

In a close-in flight, helicopters with a turreted nose cannon have a clear advantage. The victor will be the first who can achieve a good gun track. A steady burst of 20 or 30mm cannon rounds at close range will bring down or severely cripple a helicopter.

Ambush your foe wherever possible, the terrain of Comanche Hokum allows a pilot to exploit small depressions and gullies. You can hide in these locations and wait for enemy helicopters to pass-by. Once they expose their rear, unmask, lock on using the helmet mounted sight (HMS) close to within 0.5km and use the cannon.

The moment you open fire, your opponents will begin a tight turn to respond - but it should be already too late.

### Head-On Closure - "Crossing the Stream"

In a head-on engagement, your opponent is located between your 10 to 2 o'clock position. If you within 1.5km and are out in the open you should press the attack.

*To determine if an AI entity is engaging you, switch to "Player Target" view - look at the object text, if you see "Task Attacking" and the nose of the aircraft is facing away from the screen then that is a sure sign the AI is coming for you. This view always orients so that you are in the middle of the screen in the background and the target in front.*

All cannon fire is shot in bursts of varying duration depending on the shooter. It is aimed directly towards the target - thus if a target helicopter is flying directly away or towards incoming fire, from the shooters point moving. A non-moving target is very easy to hit.

You can drastically reduce the Pk (probability of kill) by "crossing the stream", flying at or near perpendicular to the incoming fire. Speed is essential, that puts air between where you ARE and where you WERE. And incoming cannon shells are aimed at where you WERE.

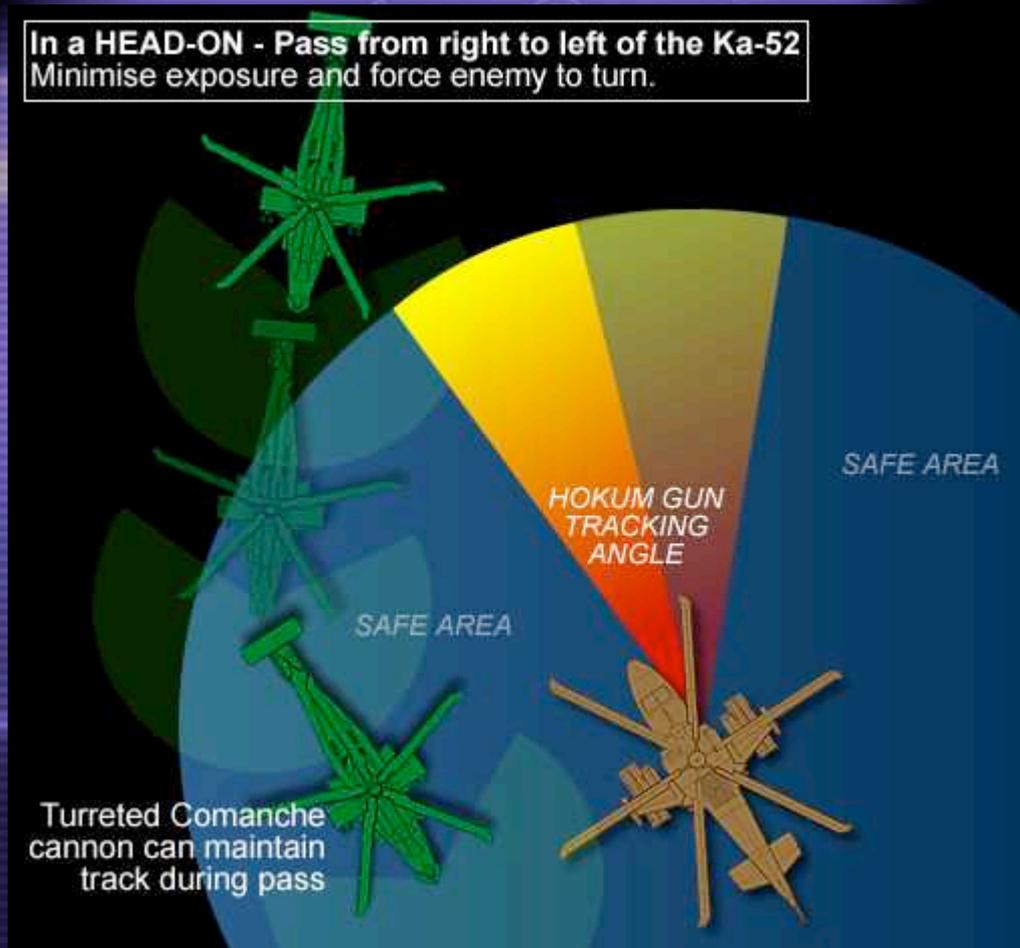
### Verses the Hokum - "Cross & Close"

Flying against the Ka-50/52 presents another opportunity. The Cannon is mounted on the starboard side and has limited travel - the arc to the port side is blocked by the nose of the helicopter. Therefore approaches on this side of the helicopter are effectively masked forcing the Hokum pilot to pedal turn (something which the Ka-50/52 can do rather rapidly) towards the attacker.

But as the range and offset between the attacker and the Hokum decreases, the angle of turn required for the Hokum to bring guns to bare changes steeply forcing a faster turn. This has the same net effect as "Crossing the Steam".

Crossing from the right to the left of the Hokum affords another advantage, a turreted cannon can return fire throughout the manoeuvre.

In a HEAD-ON - Pass from right to left of the Ka-52  
Minimise exposure and force enemy to turn.



## 3.2 Air To Air Combat - Fast Movers

By far the most dangerous of air threats is the enemy fighter. Their high speed allows them to approach, engage and extend out of range of your air to air missile systems. Your helicopters air search radar can take several seconds to conduct a full 360-degree sweep. In that time, the enemy aircraft can cover a maximum of 2km before you even know it's there.

The best way to stay alive is simply avoid direct confrontation with enemy fighters, particularly air superiority fighters.

A single attack helicopter against a single fighter is a winnable situation, engaging two fighters is pushing the odds, however ground attack fighters are much more vulnerable than air superiority or multi-role fighter aircraft. An engagement against more than two fighters without support from friendly units and you are seriously outgunned. Face facts - there are situations that should be avoided, getting into a furball against six Mig-29s and Su-33s is one of them.

### Avoid "Kill" or "Danger Zones"

The most dangerous areas are near enemy airbases or "hot" areas of enemy activity. Examining trends can identify "Hot" areas, how often fighters are observed patrolling those areas. Killing zones around enemy airbases are particularly dangerous.

When an engagement in this danger area has begun, it's quite probable that additional air support is being readied at the nearby airbase. Given your proximity to the base you will have little time to "get out of Dodge" before reinforcements arrive, this is what makes the area so dangerous. In fact this zone can extend up to 32km from an enemy airbase (effective radio range).

### Defensive Positioning and Air Combat Manoeuvring

While fighters are formidable opponents the well-flown attack helicopter is not defenceless. The helicopter has a major turning advantage.

If the terrain allows the pilot should elect to deploy to cover, hiding in a terrain feature that masks the helicopter. From such a position it may be possible to call for help and slip away at NOE altitude.

However when terrain does not provide enough cover you may have to resort to more aggressive Manoeuvring.

A fighter requires that it position you on its nose for a missile or gunshot. The most dangerous place to be is within the 120 degree "funnel" extending out from the fighters' nose. As the fighter approaches and closes to engage, the helicopter can turn into the fighter and dive, this closes the distance and manoeuvres you out of the into the fighter and diving, you force the fighter to increase its dive angle, the fighter pilot will have to break off earlier to escape from the manoeuvre.

Once the fighter has passed by it will attempt to extend and turn for a second pass leaving the fighter vulnerable for a few seconds. The danger here is that the attack helicopter bleeds too much speed while turning to track the passing fighter. If this happens the helicopter becomes an easy target while it is sitting in the air.

#### General rules are:

- Turn into the fighter and dive.
- Try and maintain high forward air speed
- Shoot 'em in the ass, with cannon as they pass - if possible.

### 3.3 Infantry - MANPADS

Another threat you will have to deal with is the man portable air defence systems or MANPADS, namely infantry with SAMs. These are scattered all over, around factories, refineries, power-stations and in city streets. They tend to be located near landmarks, look out for small objects on the ground. Use your helmet mounted display to try and pick them up.

#### Example MANPAD locations...





If you are flying over city streets and hear your ASE warning or your wingman suddenly expire, then you know you've got trouble with some of these guys.

### 3.4 Dual Cockpit View Memory

This simulation allows you to occupy either crew position. While there is no control functionality advantage to be gained from occupying a specific seat, each position has independently configurable MFDs.

The Moving Map display may be set to different ranges for the pilot and gunner.

The greatest advantage the dual cockpit system has to offer is that each position remembers your view mode. So the rear seat may use a "padlock" view (such as padlock waypoint) while the front seat is for general use, simply hitting the ESC key will toggle between the two views. This also extends to F3 & F4 zoomed MFD views. You can use this "view memory" to quickly switch between forward and heads down.

### 3.5 Padlock Waypoint - Multipurpose

#### ESCORT Missions

When escorting a flight, the "action" or "X" waypoint will always be the escorted flight. Use "Padlock Waypoint X" to quickly locate it.

#### Landing

After mission completion, the last waypoint will be your landing spot. Use "Padlock Waypoint" to find your landing matt / pad.

#### **WARNING !!!**

The pilot and CPG shall perform their armament safety check prior to entering the forward area refuelling point (FARP). Radio transmissions shall be limited to EMERGENCIES ONLY until refuelling has been completed.



## CHAPTER 4

# Stealth, Sensors, Weapons & Countermeasures

### IN THIS CHAPTER

- RAH-66 Comanche LO (low observability)
- Simulating Stealth
- Radar / FCR Operation
- Radar Information Filters Part I - Threat Priority
- Radar Information Filters Part II - ENEMY Filter
- Radar Line Of Sight
- Radar Sweep Periods
- Electro Optical Sensors - Advantages
- Helmet Mounted Sight
- Advanced Gunnery LOAL/LOBL
- Rapid Fire Missile Attack Mode
- Target Persistence
- Ballistic Weapon Attack Modes
- Spooing IR and Radar Guided Missiles

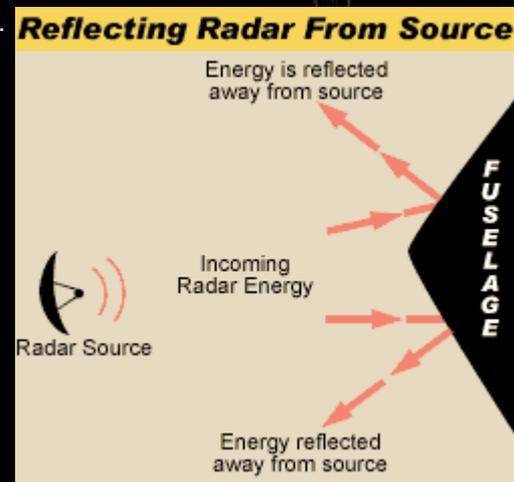
## 4.1 RAH-66 Comanche LO (low observability)

It's generally thought that the RAH-66 is a stealth helicopter, invisible to radar; this is a common misconception. Stealth is not magic bullet or piece of hardware, it is really a set of specifications or "low-observable" concepts which together reduce the visibility of the helicopter.

The Comanche's visibility to enemy radar depends on how "clean" the helicopter is. With gear down, gun deployed and open weapon-bay, the Comanche is just as visible to enemy radar as any conventional helicopter.

Most helicopters are naturally "stealthy" by their low flying nature and using the terrain to mask themselves.

No hi-tech fuselage or radar absorbing material can match the stealth properties afforded by a large hill between a radar and an aircraft.



The Comanche's main mission role is reconnaissance. In the recon role, the Comanche flies in a clean (wingless) configuration which greatly reduces the amount of radar energy it reflects.

The LO properties of a clean "buttoned up" Comanche allow it to get much closer to a target without being detected - but once the gunship goes "hot" then it becomes much more visible. You either have to keep quiet and then go for a surprise attack (shoot & scoot) or retreat to a stand-off position before arming and firing.

The act of arming weapons (even the cannon) results in the weapon bay opening and thus potentially giving away your presence.

### Simulating Stealth

To simulate the effects of stealth characteristics, a lo-observable platform is only visible to search radar's at closer ranges than other platforms. The net effect is that the scan ranges of other vehicles are reduced. i.e.. a vehicle with a

10Km scan range will detect the Comanche at 1.5Km

The "stealth value" of the Comanche is based on its configuration. For each possible configuration there is a cumulative reduction of visibility:

- |                        |                           |
|------------------------|---------------------------|
| a) Stub wings attached | no stealth                |
| b) Gear up             | -35% reduced visibility   |
| c) Bay doors shut      | -50% reduced visibility   |
| e) Radar On            | +10% increased visibility |
| f) IR or ECM Jammer On | +10% increased visibility |

Normal Visibility	100
Gear Up	-35
Bay Doors Shut	-50
Detection Range Modifier %	15 (percent)

Therefore if the Comanche is all tucked into bed, with no radar or jammer emissions, your radar signature will be reduced to a minimum of 15%. Therefore a Mi-28N Havoc with a scan range of 6km will only detect the Comanche at 900 meters. For a list of vehicle scan ranges, see [Chapter 5](#).

All aircraft have 100% radar sig except the Comanche.

## 4.2 Radar / FCR Operation

The radar systems modelled for both the Blue and Red Force helicopters are near identical in functionality. The only real difference being the maximum detection range.

There are subtle methods of operating the radar which enable special forms of missile attack and can increase the crews awareness and survivability.

Simplification of the radar systems were made for the Enemy Engaged series for reasons of accessibility and balancing the gameplay between the two opposing forces. The older Mi-28N Havoc does not have the luxury of shared electronic battlefield information displays such as the Tactical Situation Display modes of the Apache and Comanche.

In multiplayer, it is possible to share target information with human players, but this is not possible with computer AI controlled entities.

### 4.21 Radar Information Filters Part I - Threat Priority

Use the radar priority filter.

The Longbow Fire Control radar system used in the Apache and Comanche (the Hokum and Havoc use similar systems) has the ability to reduce "operator overload" - the display can filter out certain object types. In real life operation, a reflected radar signal is digitally processed by a black box, due to the wavelength of the radar it can be processed in such a way as to derive basic structure information from the reflected energy. This feature is modelled to a small degree in Enemy Engaged.

The radar can determine if the object is a wheeled or tracked vehicle. Also it can detect a "turret" structure such as those commonly found on tanks. Using this information, the avionics automatically classify detected objects and assign them a potential "threat priority" value.

The radar symbol used in Enemy Engaged is the result of this information. Each detected object is assigned a **LOW**, **MEDIUM** or **HIGH** threat priority.

- **High** threat priority is given to anti-aircraft vehicles such as mobile SAM launchers which are of immediate concern to the helicopter crew.
- **Medium** is reserved for armoured vehicles such as tanks and personnel carriers.
- **Low** is assigned to everything else, basic trucks, cars, well defined structures.

Enemy Engaged permits the radar operator to set the threat priority level, this will only display those targets that fall within the selected classification.



Figure 4.2: The target filter set to display only HIGH category - SAMs vehicles.

This feature is extremely invaluable when engaging armoured columns. When the targets are so closely grouped together presenting many targets in such a small area - it is desirable to eliminate the surface to air defences before they can engage you.

By setting the threat filter to HIGH, only those SAMs in the armoured column will be displayed and targeted by the radar. Also, by targeting only medium threat objects, you can ensure you do not waste valuable missiles on non-priority targets.

The priority filter reduces the time spent identifying and cycling through objects and can be used in conjunction with a high re-sweep rate to rapidly degrade enemy response at the beginning of an engagement.

Radar priority settings have no effect in optical sensor modes.

## Radar Information Filters Part II - Air Radar ENEMY / IFF Filter

This filter (only activated while the air radar is active) only displays enemy air contacts on the display. You could consider this as contacts which did not return an automatic response to a coded IFF (Identify Friend or Foe) interrogation signal. You may want to activate this as part of your startup routine.



Figure 4-3: The "Enemy" contact filter of the air radar.

## Radar Line Of Sight

The LOS indicator in the "high action display" or HUD is very important when using the radar pre or post missile attack.

When a missile hits and destroys a target, the radar will continue to display that target until it has been re-swept by the radar. And even then, there needs to be radar line of sight to the destroyed target before the system can remove it (this is assumed to be interaction between the radar system and co-pilot confirming destruction). Unlike many other simulations, dead targets are not magically removed. The operator must keep this in mind, otherwise serious "overkill" may result (Overkill: meaning target is attacked with more munitions than that required to destroy it).

## Apache LOAL Attack Consideration

This makes LOAL missile attacks in the Longbow more difficult as it requires re-establishing visual contact of the engaged targets before destroyed targets can be "confirmed" killed and removed. This enforces a limited method of BDA (battle damage assessment).

## Sweep Periods

The sweep period is another important operator consideration. There is the a reason why there is a sweep angle indicator in the HUD, it's not just eye candy, it provides a visual reference useful during rapid fire missile attacks.

For example, spacing between laser or command guided missiles using the radar as the targeting systems needs to be longer than the sweep period. A destroyed target will remain targeted until it is re-swept by the radar.

If the HUD displays the radar sweep indicator, this can be used as a "metronome" for missile release. Firing a missile each time it hits the left (or right) side will ensure that the target area is re-swept between missiles.

Narrow the sweep for faster updates.

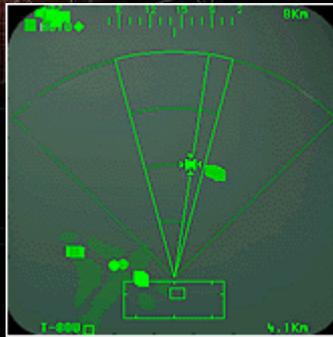


Figure 4-4: Narrow radar sweep for rapid targeting updates during an attack.

When attacking a road convoy, radar line of sight is another reason to narrow the sweep angle. Vehicles can HIDE behind other vehicles. A vehicle hit by a missile can be thrown several meters thus revealing another vehicle behind it. A rapid radar sweep will detect new targets much faster. Some ground vehicles have heavy calibre machine guns which can assault you as far out as 3 km.

*It's not the detected threats that will kill you, it's the undetected ones.*

In urban or built up areas in which there can be plenty of unwanted bridge or supply factory structures in the target list, use the radar range setting in conjunction with the sweep angle to "confine" your desired target area. The Figure below shows the ground radar being used such that the bridge structures on the right are not targeted by the scan volume.

The need to use the sweep angle will vary from situation to situation. Many times it may not be required at all. But the capabilities should be kept in mind, especially with regard to the air radar and the long sweep period required for a 360 degree scan.

When retreating from an area in which an enemy air response may arrive, it may be wise to set the air radar to sweep that rear quadrant. In the time it takes the air radar to sweep 360 degrees, a fighter can fly within weapons range, lock on and fire. Early detection will increase your reaction time and hence your survival.

Also, it is possible to use a rapid fire laser or radio command guided missile attack against multiple air targets \*only\* in conjunction with a narrow scan volume. Only a 45 degree sweep angle will be fast enough to remove downed air targets after multiple missile release. More details on rapid fire missile attacks are covered later in this chapter.

## 4.3 Optical Systems

Lets take a look at the EO (electro optical) modes, their uses and differences.

### Advantages Over Radar Acquisition

There are occasions where the ground radar does not have enough resolution or the correct angle on objects to detect them.

In "noisy" places such as among wrecked vehicles or close to tree canopy, the radar may fail to pick up a potential threat. Optical sensors should be used to double check, by placing the helicopter into a hover and manually sweeping the EO sensor crosshairs around, any live objects can be picked up.

### Notes on coming to a Hover

To quickly come to a hover, activate the autopilot and press **SHIFT H**.

Once you sweep your sensor over a target and the designator box flickers, it has been entered into the target list and can be cycled through or locked up like any radar acquired target. At ranges of less than 5km, enough object detail is perceivable to enable manual target identification without having to wait for the CP/G to identify them.

If your high action display indicates no LOS for a target in poor lighting conditions then smoke may be the culprit.

Black smoke from burning wreckage and purple smoke grenades will hide objects from your EO sensors if it's thick enough.

### Helmet Mounted Sight / IHADSS

This targeting mode is very much tied to your internal cockpit view position, it targets the closest object to the centre of your view automatically. Generally it's good for really dumb close range target strafing and picking off the small vehicles at enemy FARPS and airbases.

Also, once a target is killed it is removed from the target list immediately. Should you have an awkward radar target that it says has no LOS, switching to the helmet mode and looking at it should clear it.

All optical systems are effected by lighting and weather conditions. At dawn or dusk, using the HMS/IHADSS will be ineffective unless the night vision mode is activated.

### FLIR, DTV, DVO, LLLTV, PERISCOPE

Most of these systems are near identical. Differences being the default magnification and ability to handle poor weather conditions. But they do offer an MFD view of whatever you are targeting, even when using the radar you can cycle through the MFD pages and bring up the EO display.

The exception is the Hokum's full-screen Periscope display. This is a direct-optics device and is not fitted with any night vision equipment.

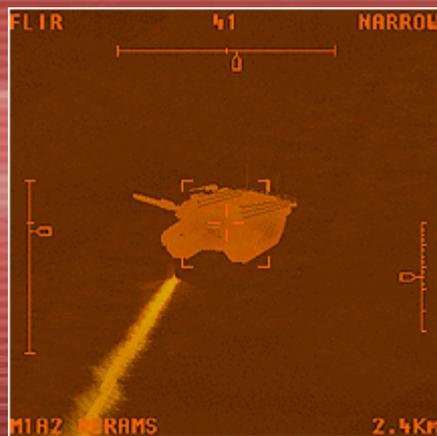


Figure 4-5: Heads down MFD view clearly shows your missiles as fast moving points. Very dramatic.

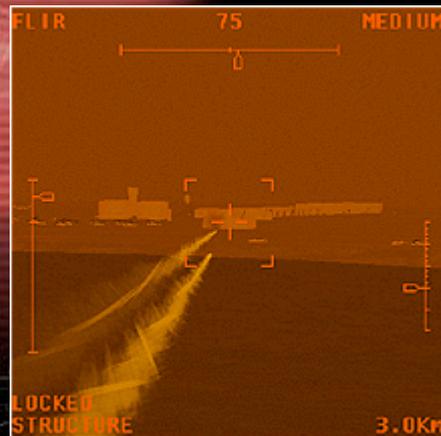


Figure 4-6: During attacks on airfields, use the FLIR views to locate important structures

## 4.4 Advanced Gunnery

Now we will use some of the techniques about radar line of sight and sweep rates and cover their use in various kinds of missile attack.

## Comanche & Apache Specific Launch Modes

First it is important to cover some differences in Hellfire missile launch modes. The Havoc does not have this capability so the following notes about LOAL/LOBL launch modes do not apply.

### LOBL (pronounced: lo-ball)

Lock On Before Launch. The default launch mode and should be the preferred launch mode. The Hellfire follows a direct trajectory and requires the target be in range, in the seekers field of view and be in line of sight. This is indicated by "VALID LOCK" in the head up display. The missiles maximum effective range is 8km.

### LOAL (pronounced: lo-al)

Lock On After Launch. The missile does not require line-of-sight for release. This mode is used to fire a missile from a concealed position without exposing yourself to the target. The firing helicopter can remain hidden throughout the entire duration of the missiles flight. After launch, the missile performs a zoom-climb. This is to clear any obstacles such as hills or buildings in front of you.

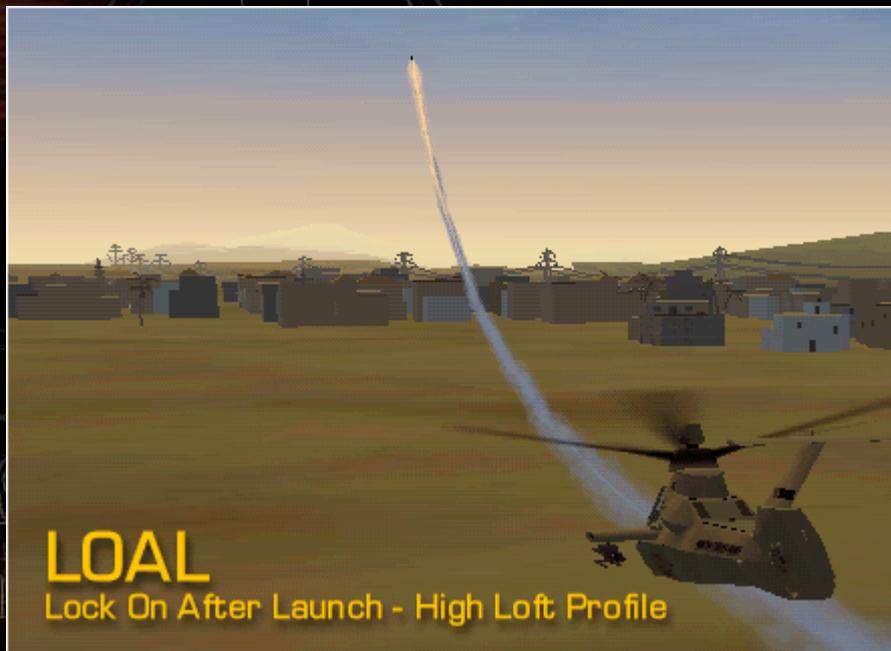


Figure 4-7: Using LOAL to kill targets on the opposite side of a town

However, the climb during the missiles motor burn period reduces the energy to missile and reduces it's maximum effective range to around 5km. It gets worse. If the target is closer than 2.5 km, when the missile reaches the top of it's climb and noses down to hunt for it's target, the missile overshoot since it has too much forward velocity and too much altitude.

The relative height difference between the helicopter and the target will alter the Hellfire's effective maximum AND minimum range.

Because of this, LOAL launch mode should be reserved for situations where it is tactically prudent.

While radar Hellfires are fire and forget, in Enemy Engaged it is possible to switch targets while the missile is still in the zoom climb phase. Once the missile noses over to begin its dive, you can no longer change its target. This is something you should watch out for.

## Rapid Fire Missile Attack Mode (Hellfire, Vikhr and Attacka)

Rapid fire missile attack mode refers to a method of simultaneously guiding several missiles in flight. Each missile in-flight will track the same target. However as each target is hit, a new target is designated and all remaining missiles currently in-flight will change course towards it. It does require that there is enough spacing between missiles so they

can steer towards their new targets.

Designation of targets can be done manually, however it takes longer to steer and requires full concentration which can be difficult in a hover. Narrowing the radar scan volume and using the priority filtering will automate the process (assuming there is line-of-sight throughout the engagement). Should line-of-sight be lost, manual targeting will be required.

## Why should you want to perform such an attack?

### Several reasons:

- Eliminates the time of flight for each missile
- Greatly reduces enemy reaction time and response capability
- Allows for earlier egress from your engagement position
- Clustered vehicles are easy prey

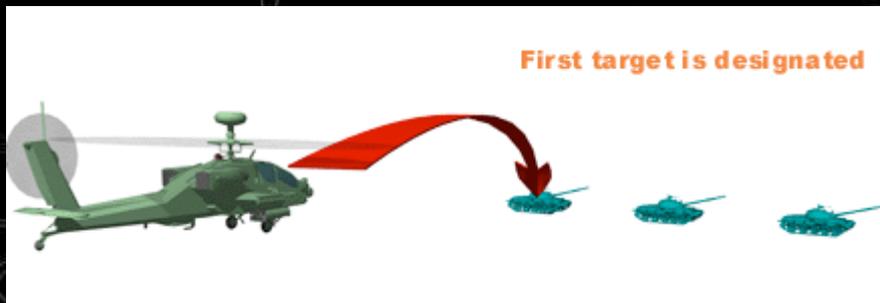


fig 4-8: Animation showing a Rapid Fire missile attack

Both the Apache and Havoc air to ground missile systems are capable of performing this type of attack profile. However this attack can not be performed using the Apache's LOAL mode when there is no line-of-sight. Radar guided Hellfire's can not be redesignated mid-flight in the LOAL mode but they can using the LOBL launch mode. Once a radar Hellfire has been fired, it can not be redirected to new targets unless fired in LOBL mode.

The campaign AI in Enemy Engaged Comanche versus Hokum is reactive, so once you begin an attack, a retaliatory strike will be assigned to available enemy resources. So there may not be time to wait 11 seconds or so between each missile. Each situation is different, it is up to you the pilot in command to determine the best and safest strategy.

## Target Persistence - Destroyed Targets can still appear on Radar

Unlike other simulations, when a target is destroyed and there is no direct line of sight, it will still remain on the target list until there has been visual confirmation of it's destruction - by re-establishing line of sight - when it is removed. In this situation, a radar guided Hellfire can be fired at a target that is unknowingly dead already. Result: waste of a good (and expensive) missile that could have been used against a more deserving target.

While the radar guided missile Hellfire is the only choice against targets without direct line of sight to you, the laser Hellfire and the Attacka or Vikhr are best used in rapid attacks on large target clusters.

## Method

1. Set target priority filter accordingly
2. Adjust radar ground radar to rapidly sweep targeted vehicle group
3. Launch missile
4. Wait a few seconds or wait for the radar's return sweep
5. Repeat from step 3 as required for the number of targets
6. As each missile hits, the radar should re-sweep the destroyed target and remove it. (The missiles "Time Of Flight" indicator in the head up display will show the time until the next missile impact.)
7. The next target should automatically be designated, (if not and "NO LOS" is displayed then select the next target manually).
8. Wait until all missiles have impacted

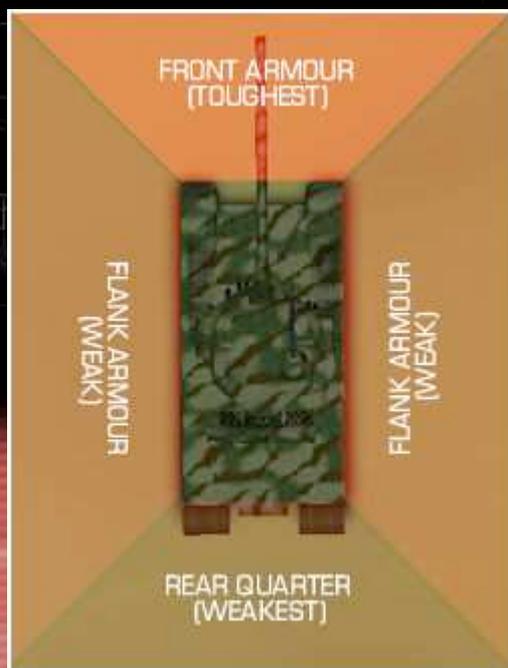
*It becomes quite easy with practice.*

### **Best targets for this attack mode are:**

- Road Convoys
- Parked vehicles at road junctions
- Airbase SAMS using the HIGH priority filter

## Armour Protection

Armoured vehicles, particularly main battle tanks have varying degrees of armour protection. The frontal surface of a tank is built to withstand enormous mind numbing amounts of kinetic energy. Tanks may survive a direct hit from your ATGMs if hit in the front quarter. All vehicles have damage modifier in each quadrant.



To conserve missiles you should reposition and attack such that the missile strikes the side or rear armour.

## 4.5 Ballistic Weapon Attack Modes

There are three main attack methods in helicopter gunnery...

- **Hover Fire**
- **Running Fire**
- **Diving Fire**

These methods describe the motion of the helicopter during the attack. We will take a look at each one in turn.

## Hover Fire

The technical definition of Hover fire is any engagement made below Transitional Lift (TL) speeds. Any attack made from a hovering position is considered as Hover Fire. In a hover, the aircraft is less stable and subject to effects which degrade hit probabilities, such as wind, and fired weapons causing aircraft movement. In Enemy Engaged Comanche verses Hokum, rockets and cannon shells in flight are not effected by wind or gravity effects.

### Here are some general pointers for Hover Fire.

- Use hover hold or cyclic trim to maintain attitude or position.
- If the threat and terrain conditions allow, drift with the wind, don't make things harder by fighting to maintain a position if you don't have to.
- Adding collective will cause the aircraft to briefly yaw to the right, reducing it will cause the aircraft to turn left. This is something you can exploit for fine tuning your aim if rudder controls are too sensitive.
- Hover Fire Rocket attacks in the Havoc is much more difficult since the Havoc's rocket pods are not elevated. Running or Diving Fire attacks are the norm.

## Running Fire with Rockets (or cannon)

Forward airspeed adds stability to the helicopter thus making rocket attacks more accurate. Also, the forward velocity of the aircraft is added to the rockets forward velocity, thus extending its range.

### *The procedure for a Running Fire attack is as follows:*

- Select an initial point (IP) about 8 to 10 kilometres from the target. The IP should be an identifiable terrain feature or waypoint added on the in-flight map. The IP is selected primarily as a function of the desired route to the target.
- The helicopter departs the IP toward the target flying contour, using terrain to mask the approach.
- Approximately 6 km from the target, the pilot starts a climb to achieve LOS with the target. Once the crew acquires the target, the pilot levels the aircraft.
- At 5 km (Hydra rockets) or 1300 m (cannon) from the target, the pilot starts a shallow 3-to 5-degree dive angle and the crew begins engaging the target.  
  
(Havoc crews can engage from 6 km if armed with S-13 rocket pods. S-8 rockets only have a range of 4 km. The Gsh 23mm cannon has a range of 2 km.)
- At 3 km (rockets) or 1 km (cannon) from the target, the pilot begins his break and uses terrain to cover his departure from the target area.
- The crew returns to re-attack on the target or returns to the IP and holds.

The aircraft should NEVER overfly the target even if it appears all targets have been destroyed. At ranges of less than 3km the aircraft becomes vulnerable to return cannon fire.

If playing with a wingman, you might consider multiple attacks by co-ordinating staggered running fire attacks with rockets. For maximum effect, crews should commence their running fire attacks from different locations and directions.

This will confuse the enemy and reduce the chance of possibly hidden targets remaining undetected.

All ships can continue to circle back to their IPs making repeat runs at the target until the engagement is broken off. Care should be taken to ensure that there is enough lateral spacing between ships down the axis of the attack to reduce possibility of friendly fire incidents.

### ***Diving Fire with Rockets***

Again, as with Running fire, the airspeed of the aircraft improves accuracy of a rocket attack. Also you get a better visual and scan coverage of the targets, the high angle will reveal contacts that otherwise would remain partially masked.

The disadvantage of such an attack is the high airspeed - less time to line up the attack and retreating blade stall effects interfering with flight controls.

- Use a careful cross-check because target fixation may cause the pilot to fly the aircraft into the ground. The pilot should complete the recovery from the dive no lower than 500 feet AGL.
- The pilot must plan the dive recovery in time to avoid abrupt recovery manoeuvres. If an abrupt recovery is attempted at high airspeed, "mushing" may occur. When the pilot tries to recover from a dive, the high rate of descent and high power setting cause the controls of the helicopter to become less responsive. Mushing may prevent the pilot from recovering from the dive.

### ***The procedure for a Diving Fire attack is as follows:***

- Establish entry altitude 1,500 feet AGL (above ground level) minimum,  $\pm 100$  feet.
- Establish entry airspeed 100 KIAS (normal) or 50 KIAS (steep),  $\pm 10$  KIAS. (KIAS = knots, indicated air speed)
- Establish a 12- to 15-degree dive angle (normal) or a 30-degree dive angle (steep), +0 to -5 degrees.
- Maintain the aircraft in trim.
- The crew begins engaging the target.
- Recover to level flight before reaching computed  $V_{ne}$  (velocity never exceed) or 500 feet AGL.
- Correctly perform crew co-ordination actions.

If there is some difficulty in recovering then kick hard right pedal (left pedal in the Havoc) and reduce collective to 30%. This should reduce power to the rotors, increase drag and increase the amount of cyclic authority. An unorthodox procedure true but it seems to work. Try to avoid rolling out until the nose is level.

## **4.6 Spoofing IR and Radar Guided Missiles**

In an area where enemy contact is expected keep one eye on my ASE as advanced warning. Any with a connecting line means they've locked on to you and will most probably engage.

When you get a launch warning the ASE or the Havoc's TWD will indicate the type of inbound missile and the number of seconds before impact.

While Apache Havoc has an option for automatic countermeasure launching, do not rely on this to save your hide. By all means leave auto countermeasures turned on, as this takes away the task of manually turning on the jammers. But you should get into the habit of dumping CM stores by hand. Your survival rate will greatly increase.

## Manual Countermeasure Launching

Both flares and chaff have an effective duration of **three seconds** from launch. This means that a flare launched to spoof a missile that's eight seconds away will burn out when the missile is five seconds away. You should also be aware that a spoofed missile can re-acquire you if the countermeasure it is chasing expires.

### I recommend the following:

- Dump a flare or chaff bundle every two to three seconds.
- When a missile is less than three seconds away and still inbound, launch doubles.
- If the missile is one second away, keep hitting the dump key.
- Jink away from the missile, should the missile detonate on your countermeasures while you are nearby, you will suffer damage from the proximity of the blast.

***Do NOT feel you have to conserve chaff or flares, you can't use them once you're dead. It really is a matter of use them or loose them.***

You will know when the missile has been spoofed as the "countdown" will vanish. In the Havoc the "countdown" is the light sequence as pictured in the manual. Get familiar with the symbology if you are not already.

## Accuracy

Travelling perpendicular to a tracking gun or missile will increase the angle of error. This means a greater chance of it missing you since it requires more lead ahead on the part of the tracking gun or missile seeker. All guided missiles in this simulation compute **intercept trajectories**, the further away from the computed intercept point you are with each fraction of a second - the safer you are.

## Ground clutter

Another trick you can use is hiding yourself in the ground clutter. At altitudes of less than 40 feet AGL, radars (such as mobile SAMs) have difficulty tracking you. This is the biggest weakness of remote SAM emplacements, if you are low enough you can approach until they are within cannon range.

## Exploit Lead Pursuit

All guided missiles in the simulation follow a "lead pursuit" trajectory. A dangerous low-level tactic can be employed to exploit this. At low level, a rapid loss of altitude will make the missile nose into the ground as it plots an intercept point that is "below ground". This requires good timing and consideration for the "powered descent" effect. Positioning a hill between you and the incoming missile will cause it to dirt dive.

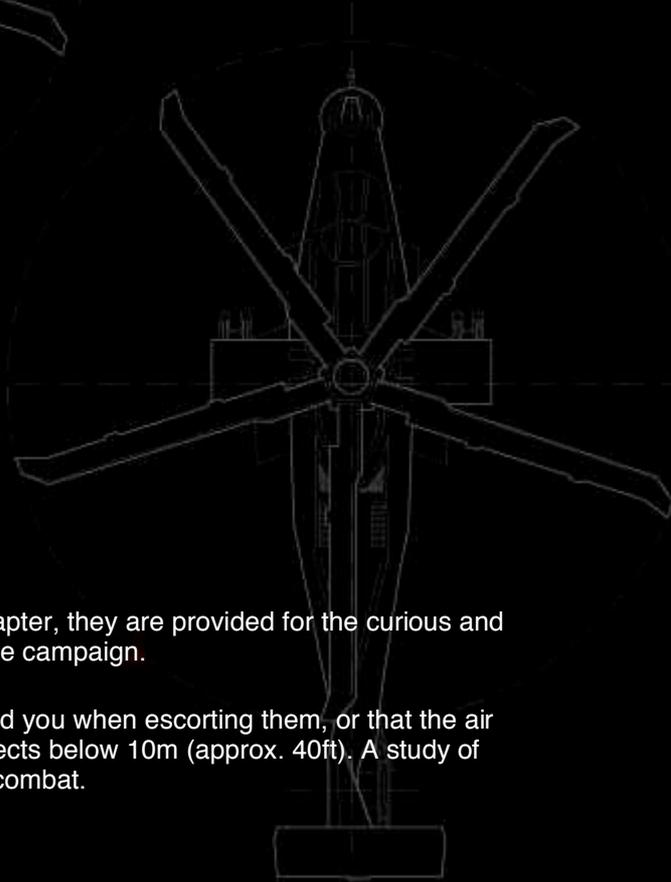
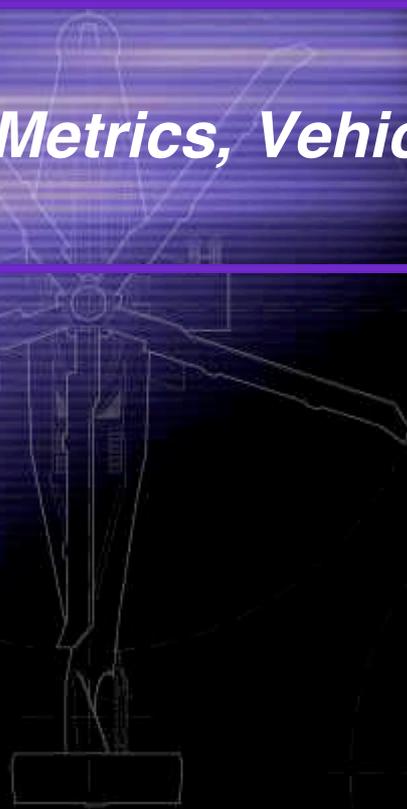


## CHAPTER 5

# Game Metrics, Vehicle Tables

### IN THIS CHAPTER

- Helicopters & Fixed Wing
- Ground Vehicles
- Naval Vessels
- Surface To Air Missiles (SAMs)
- Air To Air Missiles (AIMs)
- Air To Ground Missiles (ATGMs)
- Unguided Rockets
- Ballistic Weapon Data



## 5.1 Vehicle & Weapon Tables

It is not necessary to understand or digest the tables in this chapter, they are provided for the curious and can help explain certain perceived behavior of entities within the campaign.

Knowing that Black Hawk helicopters cruise at 85 knots may aid you when escorting them, or that the air radar detection range of the SA-19 is 8km and can't detect objects below 10m (approx. 40ft). A study of the data can reveal weaknesses which you can exploit during combat.

### Vehicles / Entities

#### Cruise Speed/Altitude

Speed is in knots, altitude in meters for normal cruising flight.

#### Structure Points

The amount of damage an object can take before it is destroyed.

#### Scan Interval

Time in seconds between all sensor sweeps.

#### Air/Ground Threat

The higher the value, the greater the perceived threat. Entities will engage their greatest perceived threat when attacked. Thus a helicopter engaged by a Black Hawk (Air Threat value of 0.8) will continue to retaliate against it until it is attacked by an ever greater threat such as an RAH-66 Comanche (Air Threat value of 1.0).

## Table 1 - Helicopters and Fighter Aircraft

Note: All ranges in Meters unless specified.

Name	Cruise Speed	Cruise Alt	Structure Points	Recon Range	Ground Scan Range	Air Scan Range	Scan Interval	Air Threat	Ground Threat
AH-64D Longbow	110	40	600	5,000	5,000	5,000	10	1	1
Mi-28 Havoc	110	40	600	5,000	5,000	5,000	10	1	1
RAH-66 Comanche	100	40	500	5,000	5,000	5,000	10	1	1
Ka-52 Hokum	90	40	650	5,000	5,000	5,000	10	1	1
UH-60 Black Hawk	85	40	650	5,000	5,000	5,000	10	0.8	1
Mi-24D Hind	80	40	650	5,000	5,000	5,000	10	0.8	1
OH-58D Kiowa Warrior	120	15	600	5,000	4,500	3,000	10	1	1
MV-22 Osprey	280	100	600	3,000	0	0	10	0	0
AH-1T Sea Cobra	110	15	600	5,000	4,000	3,000	10	1	1
AH-1W Super Cobra	110	15	600	5,000	4,000	3,000	10	1	1
CH-53E Super Stallion	85	50	600	3,000	0	0	10	0	0
CH-46E Sea Knight	70	40	750	3,000	0	0	10	0	0
Ka-29 Helix B	75	40	750	5,000	5,000	0	10	0	1
CH-3 Jolly Green Giant	70	40	800	3,000	0	0	10	0	0
Mi-17 Hip	75	40	800	5,000	5,000	0	10	0	1
CH-47D Chinook	70	100	800	3,000	0	0	10	0	0
Mi-6 Hook	70	100	1,000	3,000	0	0	10	0	0
A-10A Thunderbolt	300	700	850	6,000	5,000	5,000	10	0.8	1
Su-25 Frogfoot	300	700	850	6,000	5,000	5,000	10	0.8	1
F-16 Fighting Falcon	450	900	700	10,000	10,000	10,000	10	1	1
MiG-29 Fulcrum	450	900	700	10,000	10,000	10,000	10	1	1
AV-8B Harrier	350	800	700	6,000	5,000	5,000	10	0.8	1
Yak-41 Freestyle	350	800	700	6,000	5,000	5,000	10	0.8	1
F/A-18 Hornet	450	1,000	700	10,000	10,000	10,000	10	1	1
Su-33 Flanker	450	1,000	700	10,000	10,000	10,000	10	1	1
C-17 Globemaster III	240	700	850	3,000	0	0	10	0	0
IL-76MD Candid-B	240	700	850	3,000	0	0	10	0	0
C-130J Hercules II	260	700	850	3,000	0	0	10	0	0
An-128B Cub	260	700	850	3,000	0	0	10	0	0

## Table 2 - Ground Vehicles

Name	Speed	Type	Structure Points	Recon Range	Ground Scan Range	Air Scan Range	Scan Interval	Air Search Min	Air Search Max	Air Threat	Ground Threat
M1A2 Abrams	20	Tracked	1,500	2,000	4000	2,000	15	10	1,000	0.333	1
T-80U	20	Tracked	1,350	2,000	4000	2,000	15	10	1,000	0.333	1
M2A2 Bradley	20	Tracked	1,000	3,000	4000	4,000	15	10	2,000	0.666	1
BMP-2	20	Tracked	1,000	3,000	4000	4,000	15	10	2,000	0.666	1
BMP-3	20	Tracked	1,000	2,000	5000	2,000	15	10	2,000	0.666	1
M113A2	20	Tracked	800	2,000	0	2,000	15	10	1,000	0.333	0
BTR-80	20	Wheeled	800	2,000	0	2,000	15	10	1,000	0.333	0
M1025 HumVee	20	Wheeled	650	1,000	0	0	0	0	0	0	0
BRDM-2	20	Wheeled	650	1,000	0	2,000	15	10	2,000	0.333	0
M109A2	20	Tracked	600	2,000	0	2,000	15	10	1,000	0.333	0
2S19	20	Tracked	600	1,000	0	2,000	15	10	1,000	0.333	0
M270 MLRS	20	Tracked	700	2,000	0	0	0	0	0	0	0
BM-21 Grad	20	Wheeled	700	2,000	0	0	0	0	0	0	0
M163 Vulcan	20	Wheeled	600	2,000	0	2,000	15	10	1,000	0.666	0
SA-19 Grison	20	Tracked	600	6,000	0	8,000	15	10	4,000	1	0
M1037 Avenger	20	Wheeled	600	4,000	0	5,000	15	10	3,000	1	0
M48A1 Chaparral	20	Wheeled	600	4,000	0	5,000	15	10	3,000	1	0
SA-13 Gopher	20	Wheeled	600	3,000	0	5,000	15	10	3,000	1	0
M998 HumVee	20	Wheeled	350	1,000	0	0	0	0	0	0	0
UAZ-469B	20	Wheeled	350	1,000	0	0	0	0	0	0	0
M923A1 Big Foot	20	Wheeled	350	1,000	0	0	0	0	0	0	0
Ural-4320	20	Wheeled	300	1,000	0	0	0	0	0	0	0
M978 HEMTT	20	Wheeled	300	1,000	0	0	0	0	0	0	0
Ural Fuel Tanker	20	Wheeled	300	1,000	0	0	0	0	0	0	0
Infantry	0	Foot	20	1,000	0	5,000	15	5	3,000	1	0

Note: Tanks and other armoured vehicles have between 6 to 8 smoke grenades.

# Table 3 - Ships

Name	Speed (knots)	Structure Points	Recon Range	Air Scan Range	Scan Interval	Air Search Min	Air Search Max	Air Threat	Ground Threat
Tarawa Class	24	12,000	8,000	10,000	15	10	5,000	1	0
Kiev Class	32	15,000	8,000	10,000	15	10	5,000	1	0
Oliver Hazard Perry Class	29	8,000	6,000	10,000	15	10	5,000	1	0
Krivak II Class	32	8,000	6,000	10,000	15	10	5,000	1	0
Landing Craft Utility	8	1,000	1,000	0	0	0	0	0	0
LCAC (air cushion)	8	1,000	1,000	0	0	0	0	0	0
Aist Class	8	1,000	1,000	2,000	15	10	1,000	0.66	0

## Ammunition and Explosives

### Damage Soft/Hard

Objects are categorized as either soft or hard targets. These values indicate the amount of damage they transfer to either soft or hard objects. For example, a Stinger will do 300 points of damage to a soft target such as a helicopter, but no damage to a hard target such as a city block.

### Guidance

- IR Passive Infra-red
- Lsr Active Laser
- R(s) Radar (semi-active)
- RC Radio Command
- Wg Wire Guided

# Table 4 - Surface To Air Missiles (SAMs)

Name	Damage Soft	Damage Hard	Guidance	Seeker FOV	Weight	Min Range	Max Range	Velocity	G Max	Burn Time	Cruise Time
Chaparral	300	0	IR	120	0	500	5,000	850	15	5.437	3.004
FIM-92A Stinger	300	0	IR	80	0	500	5,000	680	15	4.281	5.055
SM-1MR Standard	300	0	R (s)	120	0	500	30,000	850	10	8.155	30.977
Sea Sparrow	300	0	R (s)	120	0	500	55,000	850	10	8.155	60.389
SA-7 Grail	300	0	IR	60	0	500	3,200	510	15	3.126	4.558
SA-13 Gopher	400	0	IR	50	0	500	5,000	510	10	4.689	7.230
SA-19 Grison SAM	450	0	RC	60	0	500	8,000	890	15	5.708	5.974
SA-N-3 Goblet	350	0	RC	90	0	500	24,000	952	10	9.195	20.371
SA-N-4 Gecko	400	0	RC	90	0	500	12,000	850	10	8.155	9.800

# Table 5 - Air To Air Missiles (AIMs)

Name	Damage Soft	Damage Hard	Guidance	Seeker FOV	Weight	Min Range	Max Range	Velocity	G Max	Burn Time	Cruise Time
AIM-92 Stinger	550	0	IR	80	13.6	500	5,000	680	15	4.281	5.055
AIM-9M Sidewinder	1000	0	IR	80	0	500	18,000	850	15	5.437	18.298
AIM-120 AMRAAM	1400	50	R (a)	90	0	500	65,000	1300	15	8.495	45.589
Igla-V	550	0	IR	60	18.2	500	5,200	850	15	5.437	3.239
AA-8A Aphid	1132	40	IR	60	0	500	10,000	1000	15	6.456	6.611
AA-8B Aphid	0	0	R (s)	60	0	500	15,000	1000	15	6.456	11.611
AA-10A Alamo	1220	40	R (s)	60	0	500	40,000	1500	15	9.854	21.575
AA-10B Alamo	1250	40	IR	60	0	500	20,000	1500	15	9.854	8.242
AA-11 Archer	1300	40	IR	60	0	500	30,000	850	15	5.437	32.416

## Table 6 - Air To Ground Missiles (ATGMs)

Name	Damage Soft	Damage Hard	Guidance	Seeker FOV	Weight	Min Range	Max Range	Velocity	G Max	Burn Time	Cruise Time
AGM-114L Hellfire	2,000	2,000	R (a)	60	45	500	8,000	442	10	3.996	15.876
AGM-114K Hellfire II	2,000	2,000	Lsr	60	45	500	8,000	442	10	3.996	15.876
AGM-65D Maverick	3,000	3,000	IR	20	0	500	24,000	340	5	5.912	67.197
AGM-65F Maverick	3,000	3,000	IR	20	0	50	24,000	340	5	5.912	67.197
Ataka	2,000	2,000	RC	50	42.5	500	6,000	400	10	3.568	12.993
Vikhr	2,500	2,500	Lsr	50	0	500	8,000	400	10	3.568	17.993
AT-5 Spandrel	802	802	R (s)	15	0	100	4,000	300	5	5.097	10.360
AT-6 Spiral	744	744	RC	40	0	500	7,000	340	10	2.956	18.893
AT-10 Stabber	440	440	Lsr	20	0	100	5,000	300	5	5.097	13.694
AT-11 Sniper	688	688	Lsr	20	0	100	4,000	300	5	5.097	10.360
AS-10 Karen	1,000	1,000	IR	20	0	500	10,000	340	5	5.912	26.021
AS-14 Kedge	6,354	6,354	Lsr	20	0	500	40,000	340	5	5.912	114.256
M220 Tow 2B	1,017	1,017	Wg	30	0	100	3,750	300	5	5.097	9.527

## Table 7 - Unguided Rockets

Name	Damage Soft	Damage Hard	Weight	Min Range	Max Range	Velocity	G Max	Burn Time	Cruise Time
Hydra 70 M255	500	120	6	100	5,000	850	30	2.718	4.443
Hydra 70 M261	600	400	6	100	5,000	850	30	2.718	4.443
LAU-69/A	450	50	0	100	5,000	850	30	2.718	4.443
S-5	200	30	0	100	3,000	700	30	2.209	3.103
S-8	400	200	11.3	100	4,000	750	30	2.379	4.065
S-13	600	400	68	100	6,000	800	30	2.548	6.146

## Table 8 - Ballistic Weapon Data

### Rate Of Fire/Burst Duration

The rate of fire is the number of rounds capable of being fired per minute. The "Burst Duration" is the length of time this ammunition will be fired, typically 3 seconds.

Therefore a weapon capable of 1,000 rounds per minute fired in a three second burst, will fire 50 rounds of ammunition. Each impacting round will deliver the appropriate amount of hard or soft damage.

### Muzzle Velocity

In meters per second.

Name	Damage Soft	Damage Hard	Weight	Min Range	Max Range	Muzzle Velocity	Rate Of Fire	Burst Duration
12.7mm Round	4	0	0	0	1,800	600	1,000	3
M61A1 20mm Round	12	0	0	0	1,600	884	1,000	3
M197 20mm Round	12	0	0	0	1,600	884	1,500	3
GAU-12/U 25mm Round	15	3	0	0	1,600	1,051	1,650	3
M242 25mm Round	16	6	0	0	3,500	1,000	1,000	3
GAU-8/A 30mm Round	100	100	0	0	1,200	1,030	2,100	3
M230 30mm Round	30	15	495	0	1,200	792	625	3
M75 76mm Round*	450	450	0	2,571	4,000	198	1	0
M256 120mm Round	634	634	0	0	4,000	247	1	0
M284 155mm Round	1,610	1,610	0	0	30,000	542	1	0
M270 227mm Rocket	8,000	8,000	0	15,801	31,600	556	1	0
12.7mm Round	4	0	0	0	1,800	600	1,000	3
9-A-624 12.7mm Round	5	0	0	0	1,500	600	4,000	3
14.5mm Round	6	0	0	0	1,600	600	1,000	3
GSh-23L 23mm Round	25	8	200	0	2,000	930	1,000	3
GSh-301 30mm Round	40	25	0	0	1,600	800	1,000	3
2A38M 30mm Round	25	10	0	0	2,500	1,200	1,000	3
2A42 30mm Round	30	15	0	0	4,000	1,000	300	3
2A42 30mm HE Round	30	15	1,000	0	2,000	1,000	300	3
2A42 30mm AP Round	25	25	1,000	0	2,000	1,000	300	3
2A72 30mm Round	30	15	0	0	2,000	800	1,000	3
AO-17A 30mm Round	30	15	0	0	1,500	1,000	100	3
ADMG-630 30mm Round	30	15	0	0	1,500	800	1,000	3
76mm Round	450	450	0	0	4,000	198	1	0
100mm Round	650	650	0	0	4,000	198	1	0
2K23 100mm Round	650	650	0	0	4,000	198	1	0
BM-21 122mm Rocket	1,400	1,400	0	5,209	30,000	542	1	0
2A46M1 125mm Round	688	688	0	0	4,000	289	1	0
2A65 152mm Round	1,548	1,548	0	0	24,000	485	1	0
Chaff	0	0	0	0	0	25	1	3
Flare	0	0	0	0	0	25	1	3
Smoke Grenade	0	0	0	0	0	6	1	45

### Hokum Ejection Debris Damage

All ejected elements from a Hokum ejection will do 550 points of soft damage.

## CHAPTER 6

# Updates, User Modification & Multiplayer



### IN THIS CHAPTER

- Updates & Patches
- Manual Changes
- Skins
- Command Line Parameters
- Command Line Examples
- Multiplayer
- Author Credit

## 6.1 Updates - Patches & Undocumented Features

All international patches and updates for *Enemy Engaged Comanche verses Hokum* can be downloaded from the Razorworks site at the following URL:

[http://www.razorworks.com/pages/patches\\_txt.htm](http://www.razorworks.com/pages/patches_txt.htm)

At present no updates are available.

### 1st Edition Manual Changes

#### Key Changes

ALT F1	Toggles the HUD resolution scaling
SHIFT 0	Toggles transparent cockpit or toggles cockpit graphics in Apache / Havoc
CTRL K	Havoc HUD enlarge (was ALT K)

#### Patches

At present no patches are available.

#### Skins



It is possible to change the pilot & cp/g faces with your own.

File format : **24bit uncompressed BMP only**

Hi Face	is 128x128
Lo Face	is 32x32
Neck	is 32x32
Skin	is 8x8

## Skin File Locations

### US Crew

Razorworks\cohokum\graphics\skins\USA\PILOT  
Razorworks\cohokum\graphics\skins\USA\CPG

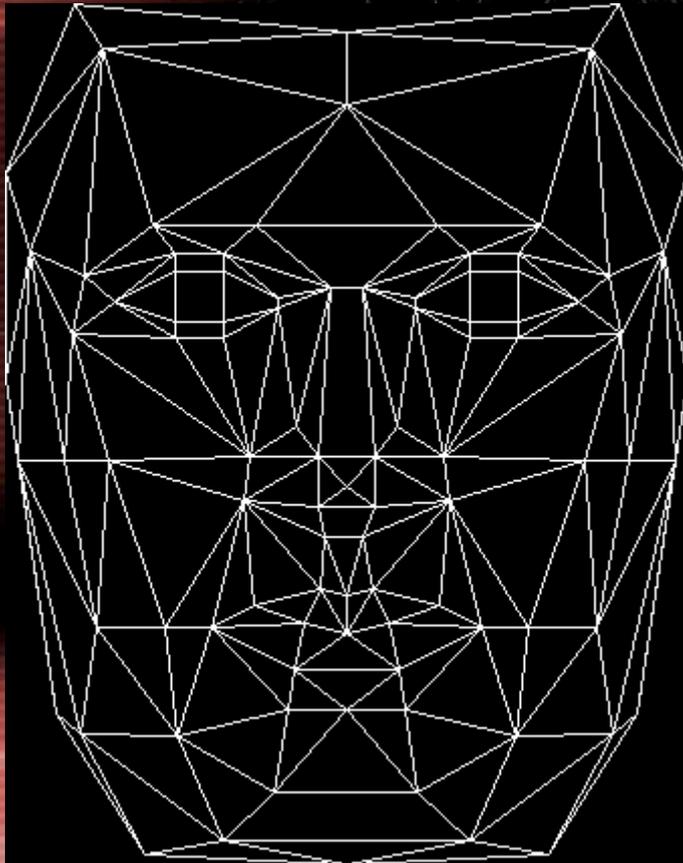
### Russian Crew

Razorworks\cohokum\graphics\skins\RUSSIAN\PILOT  
Razorworks\cohokum\graphics\skins\RUSSIAN\CPG

Backups are provided in case you need to revert to the originals.

## Facial Template

If you want to match up the facial polygons with your artwork, use the template below.



## Flight Model Parameters

It is possible to tinker with the flight model by adjusting the values of the text based **.DYN** (or dynamics) files. To restore the default values just delete the file and a new one will be created when you fly that helicopter again. Each helicopter has its own dynamics data file.

These files are located in the following folder:

Razorworks\common\data

## 6.2 Command Line Parameters

### Shortcuts

*Enemy Engaged Comanche verses Hokum* is customisable to some degree by the user. Some flight model, visual and most communication elements can be altered by passing command line parameters when launching the game. This section includes a full list of some documented and undocumented ones (which can now be considered documented).

Command Line parameters can be entered into a DOS box or program shortcut. Several Windows shortcuts to this simulation with different options included in the Target field (see figure 6-1 below) can be made and renamed to switch between different options.

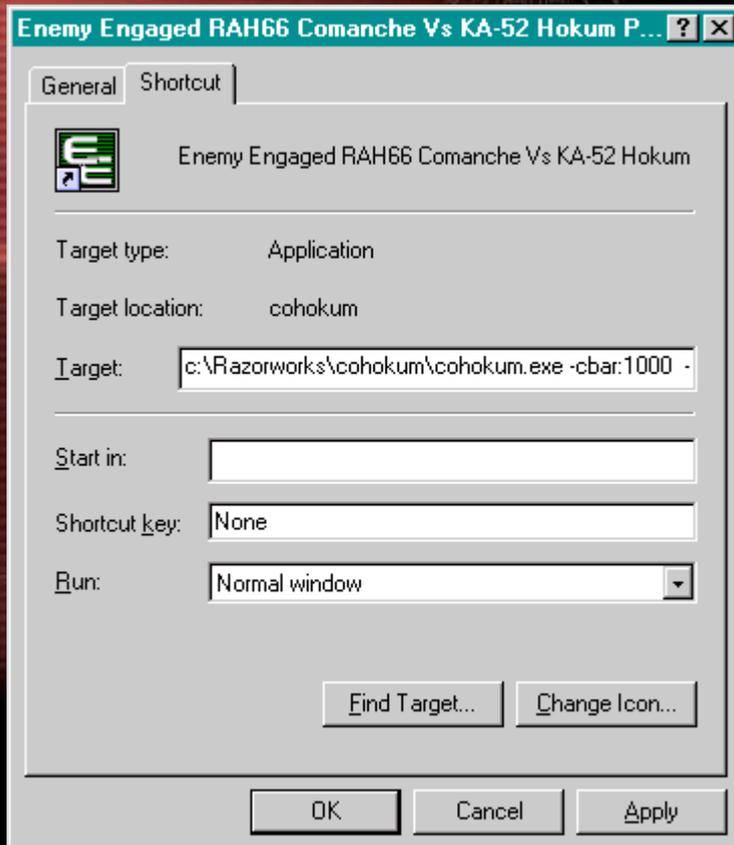


figure 6.1: Shortcut Properties - command line switches in Target box

### Environment Variable

As an alternative to using command line or shortcuts options, you can specify the commands you want with the APACHE\_HAVOC environment variable and SET command.

For example:

```
SET APACHE_HAVOC=/cgs:1 /cig:1 /cbar:1000
```

For more information on using command lines and environment variables, please refer to your computers disk operating system manual or Windows95 user manual.

## Category – Communications

Switch	Meaning	Description
/ipa:n	ip_address	n= TCP/IP address to connect to. A HOST can leave out the value.
/ccrs:n	comms_connection_receive_size	n = Initial guess of campaign data size. If campaign data is larger then this can slow things down (default = 200k)
/cdrs:n	comms_data_record_size	similar to above...
/cpbs:n	comms_pack_buffer_size	similar to above...
/cgs:1	comms_guaranteed_send	Force the comms to use DirectPlay guaranteed send instead of its own. n = 1 (turn on) n = 0 (turn off - default)
/crls:n	comms_resend_list_size	n = Packet history list size, increase if client keeps getting kicked out by server (default = 1000)
/crl:n	comms_rerequest_limit	n = number of times a client can re-request the same packet. Increase this for poor connections (default = 10)
/cpt:n	comms_packet_timer	n = time delay in seconds the comms will wait for a packet before re-requesting it. (default = 5s)
/crt:n	comms_resend_timeout	n = time comms will wait before assuming re-requested packets was lost (default = 2s)
/mur:n	max_update_rate	n = network frame rate for a server, n/a for a client (default = 5fps for TCP/IP, 15fps for IPX)
/cig:1	comms_interpolate_gunships	program will interpolate a players helicopter position for smoother visuals n = 0 (off / default) n = 1 (on)
/cvc:1	comms_validate_connection	removes dead player husks when client crashes n = 0 (off / default) n = 1 (on)
/cptl:n	comms_packet_throttle_limit	mainly for modems this one, governs the flow rate of packets (default = 10)
/cto:n	comms_time_out	the amount of time to wait before removing dead player husks n = 0 (off / default) n = 1 (on)

## Category – Visual

Switch	Meaning	Description
/cbar:n	city_block_approximation_range	n = distance in meters that city blocks resolve from their simple form to complex form (default = 500 meters)
/fs:0	full_screen	Switch for turning off the default FULL SCREEN video mode.
/mfr:n	max_frame_rate	n = Max visual frame rate, (defaults = 30)
/32bit	32_bit	Activates 32bit rendering if your video card supports it
/nrt	no_render_to_texture	Turns off rendering to texture in case of visual problems with MFDs or TADS

## Category – Flight Dynamics

Switch	Meaning	Description
/drbs:n	dynamics_retreating_blade_stall	n = floating point scaling factor for RBS effect (default = 1.0)
/drv:n	dynamics_rudder_value	n = scaling factor for drag on tail rotation (default = 1.0)
/dra:n	dynamics_rudder_acceleration	n = scaling factor for tail rotation acceleration (default = 0.8)
/drd:n	dynamics_main_rotor_drag	n = scaling factor for drag caused by main rotor (default = 1.0)
/dtrd:n	dynamics_tail_rotor_drag	n = scaling factor for drag caused by tail in forward flight (default = 1.0)
/dzd:n	dynamics_cyclic_dead_zone	n = percentage deadzone for the cyclic (default = 0.0)

## Category - Miscellaneous

Switch	Meaning	Description
/goto:1	planner_goto_button	Activates "GOTO" teleport button on the campaign map.
/vfm:1	vector_flight_model	Activates viewer or "UFO" flight mode.
/psr:n	player_start_rank	n = Start rank for new pilots
/ns	no_sound	Bypass soundcard, useful for tracking hardware conflicts
/pitod:n	player_initial_tour_of_duty	Tour Of Duty start timer value
/3dreset	3d_reset	Reset screen resolution to 640x480
/dxtm	directx_texture_management	Should fix "unable to allocate hardware slot" error
/mta:n	max_time_acceleration	The maximum multiplier allowed for time acceleration (default - 4)

## 6.3 Command Line Examples

Perhaps the most useful parameter for users with powerful machines is `/cbar:<meters>`. This extends the distance that city areas resolve from basic shapes into their more detailed versions. This goes some way to eliminate necessary "pop-up" of buildings.

### **Increase City Popup Range**

```
cohokum.exe /cbar:1000
```

The number is in meters. 1000 is 1km which is double the default value of 500.

### **Activate the Teleport feature**

```
cohokum.exe /goto:1
```

This enables a "GOTO" button on the campaign map. It could be considered a poor mans "skip" feature if the flying experience passes you by and you want to get to the action soonest.

### **Run The Simulation in a Window**

```
cohokum.exe /fs:0
```

Some 3D video-cards will run 3D applications in a desktop window. While this simulation is not designed to be fully compatible with windowed operation you may find it useful for running the game while monitoring other desktop applications, such as a contact manager or buddy-list program. To swap focus from the windowed game to the desktop, press either the ALT-TAB key or use the "Window" key then click on an empty area of the desktop.

### **Connect To an Internet Game**

```
cohokum.exe /ipa:198.162.0.0
```

Will insert the above IP address and set TCP/IP for DirectPlay. This can be used to configure "buddy" programs like ICQ to launch Comanche-Hokum as a Telephony program and connect to their games semi-automatically.

## 6.3 Multiplayer

Playing over the Internet or LAN with your friends is a truly great gaming experience. In *Enemy Engaged Comanche verses Hokum* you can what is called "hot-join" which means you can join a game that is already in progress.

Good multiplayer performance requires a Host with a fast connection. ISDN or Cable modems can effectively host campaigns. Guest Players do not need particularly fast connections, a 28kbs modem can suffice, although PING times regardless of connection speed will effect the quality of play.

Hosts with low speed connections such as modem should use play the mini-campaigns called "Skirmishes", these require less host bandwidth.

### **The Network Model**

Perhaps the most useful parameter for users with powerful machines is `/cbar:<meters>`. This extends the distance that in the simulation, only the HOST computer can create objects, this is a permissible server model. CLIENTS "request" permission to fire missiles and the HOST grants that permission. In a campaign there can be anything up to 1,700 objects that need to be doing the same things on all connected computers.

Because of this model, there is a short delay when a guest player presses the fire button or some other action, and the missile or some action taking place. That delay is typically the round trip time for a packet to travel to the HOST and back to the CLIENT.

The faster the PING, the faster the response time. Quality of connection will also play a role. If a link is unreliable, lost packets need to be resent causing additional delays.

### **When Connecting (0)...**

The number you see after the word "Connecting..." is the number of received packets. When joining a game, the campaign is transmitted to the client in chunks. Larger campaigns will require more data and longer wait times. "The Sword In The Sand" campaign may take around 350+ packets, while a Skirmish may only require 50+. This number also includes resent packets so the number may vary.

While the campaigns world data is being transmitted it is also getting out of date - falling behind. Once the player has entered the campaign, the HOST begins a re-sync. It will send missed packets to the client. After a player has joined a game, it is advisable the player wait a short while (say 30 seconds) to allow for correct synchronisation.

Don't forget to use the chat facility, TAB 4 1 is the key sequence to send a message to all players. Voice comms software should work with this simulation. Some software (such as [ShadowFactor's Battlecom](#)) has been tested and works ok.

## Modem Play Optimisation

It is possible to host a campaign over a modem connection. It has been achieved between two 56k modems connected at 44k to the Internet. However every 56k modem is limited to a max 33k *sending* data rate, and as the server is the bottleneck, effectively there is no advantage for the HOST to connect faster than 33k speed.

There are ways in which you can improve your connection:

- 1) Turn off any compression in your dialup properties - Comanche Hokum performs compression itself, and its possible your modem is creating more lag by buffering up data before sending it out.
- 2) Instead of connecting via the Internet, try a modem to modem connection. This has even less lag than the Internet version.
- 3) Improve your framerate - if you're experiencing half a second of lag and you are the server, you could do with upping your frame rate ( decrease resolution, object detail, terrain detail etc. ). Technically in a MP game, the server shouldn't have any lag at all ( just like a single player game ).
- 4) Try a different ISP. Doesn't always make a difference, but one of the things we believe is that Internet routers (things responsible for getting the data from the modem to the other guys modem) can drop packets - and drop more the busier they are. The faster your connection to the ISP, the more tolerant of dropped packets you become.

Hey, be careful out there.

## 6.4 Credit Where It's Due

This strategy guide was designed and written by Richard "Flexman" Hawley with assistance from the jolly crew at Razorworks. Richard Hawley is the author of many helicopter sim utilities and editor of the [CombatHelo](#) section at [SimHQ.com](#).