



SOFTWARE

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# HARRIER

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**NOTE:** From this point on wherever joystick controls are mentioned, the equivalent keyboard commands can be substituted.

When the program has loaded, select practice mode and pilot ability level by pressing SPACE when an \* appears beside the correct option. The screen will show an out-of-cockpit view with the Harrier positioned at the edge of the first landing site.

Select Keyboard or Joystick.

Increase thrust to 80% of maximum.

When your speed has reached 125 knots (just above the second mark on the Air Speed Indicator), ease back on the joystick and adjust it to give a pitch of 20 degrees.

Raise the undercarriage. If you don't, the Harrier will vibrate and a "TOO FAST" message will appear. This vibration will also occur if there is too much power for a given situation, so in this situation reduce power until the appropriate level is achieved.

Fly straight and level, with the pitch at around 0 degrees. The slight oscillation of the horizon gives the impression of movement and perspective.

If you explore your immediate area, you will see your course pattern appear on FOFTRAC. Note the ground details of the small hillocks, mountains enemy targets, and SAM (Surface-to-Air Missile) sites. If you fly above 10,000 feet, you will break through the cloud cover. In practice mode, you can fortunately ignore aircraft attacks, or attack with impunity. If you leave the operational area, you will receive a "FOFTRAC WEAK" signal. To get back, fly on a heading of 045 degrees.

To land, you will first have to locate a suitable ground site. Select 'HOMER' followed by the codes for the prepared landing sites. Alter direction so that the line on the HUD is long and vertical—this gives you the heading to take.

## **A DETAILED GUIDE TO YOUR INSTRUMENTS**

### **HUD (Head Up Display)**

Overlaid on the view from the cockpit is the HUD, which provides vital in-flight information. From left to right, the displays are:

VSI	Vertical Speed Indicator. Shows whether you are gaining or losing height.
ASI	Air Speed Indicator. Shows speed through the air. The scale is graded in steps of 50 knots.
GYRO	Shows the direction in which you are travelling.
SIGHT	Acts both as gunsight and as a roll indicator, showing the position of the Harrier's wings and tail relative to the horizon.
HEIGHT	Height in feet above ground level.
PITCH	Indicates pitch, or attitude, above or below the horizontal.

The HUD can also display additional information when the appropriate key is pressed.

### **Bomb Sight**

Shows the direction and projected point of impact (indicated by a small horizontal line) if a bomb is released. Note that the impact position cannot be computed if the line is at 12 o'clock.

### **Homer**

When in the air, select Homer followed by the code for your chosen landing site. If your first selection does not indicate a landing site nearby, try the other

sections until you find a convenient one. If you find a long vertical line, this indicates that you are heading towards a landing site; a short line indicates that you are heading away from that site—change course until it becomes long and vertical.

If you've landed away from a ground site you can call upon ground staff to prepare your current position as a designated ground site. Select Homer followed by the base code.

### **Missile Sight**

Produces a line indicating which enemy aircraft your Sidewinder Air-to-Air missiles have locked on to. This only operates when you hear the growling sound of your Sidewinders. With multiple targets, it is essential to know which one you have locked onto—it may not be the one you want.

### **Standard Display**

Clear bomb and missile sights and Homer to the standard HUD display.

### **Instrument Panel**

From left to right, the panel shows:

#### **MFD**

Multi Function Display. Operated as a toggle, it shows flight information or weapon status.

Flight information includes:

Thrust or power level

Position of thrust vector (horizontal, 45 degrees, or vertical).

Fuel supply (about 20 minutes at maximum thrust).

Position of under carriage (green for down).

Position of flaps (green for down).

Brakes (green for off).

At take-off, weapon inventory is:  
2 Sidewinder AIM-9L Air-to-Air missiles with a 5-mile range (AAM).  
3 1,000lb. bombs.  
250 rounds of cannon shell with a 2 mile range you can only rearm at a designated landing site. Once landed, reduce power to zero and select 'REARM'.

## **FOFTRAC**

Friend or Foe Tracking Radar. A combined map and updating target display of your area of operation—approximately 24 miles by 12 miles or one square on the map grid.

As Foftrac is a continuously updating display with flashing moving targets, you can use it to track enemy movements and plan your tactics. To clear FOFTRAC of no longer valid tracks, select 'CLEAR FOFTRAC'. The message screen will also show the grid reference of the area.

Note that when you fly into a new combat area, FOFTRAC will not show ground targets until you have flown a reconnaissance mission at about 16,000ft to the centre of the area (marked by a white dot). At this point your camera will automatically photograph the area and FOFTRAC will then operate.

## **AAR**

Air Attack Radar. Indicates the position of enemy aircraft (red) and AAMS (white) and SAMs (green) within a radius of 5 miles and within a height band of plus or minus 5,000 ft. The scale on the left indicates the height of missiles above or below you, and that on the right the height of the enemy aircraft.

## **Message Display**

During your sortie, messages and warnings will be displayed in this panel when necessary.

## **LANDING YOUR HARRIER**

### **1 Vertical Landing**

- (i) Approach your proposed landing area at 500 ft. and 400 knots. Each step on the A.S.I. represents 50 knots.
- (ii) Select the 45 degrees thrust vector and use the joystick to maintain a level flight. Wait until your speed falls to 200 knots.
- (iii) Lower the undercarriage and flaps. Maintain a level flight and wait until your speed falls to 120-100 knots. Do not allow your speed to fall below 100 knots.
- (iv) Push the joystick forwards to lose height. At 200 ft. pull back on the stick to level the plane.
- (v) Select 90 degree thrust vector and you will now be hovering above the ground.
- (vi) Reduce power carefully to achieve a slow, steady descent.

### **2 Short Landing**

- (i) Approach your proposed landing area at 500 ft. and 400 knots.
- (ii) Select the 45 degree thrust vector and use the joystick to maintain a level flight. Wait until your speed falls to 200 knots.
- (iii) Lower the undercarriage and flaps. Wait until your speed falls to 120-100 knots. Keep the pitch between 0 and -6 degrees and make sure your speed does not fall below 100 knots.
- (iv) Adjust power and pitch to keep the rate of descent under 10 feet per second (one mark on the VSI).
- (v) On landing, take off all power and apply the brakes.
- (vi) Select 'REARM' for refuelling, rearming, and any necessary battle damage repairs.

### **3 Conventional Landing**

A conventional landing is possible but very difficult as the touch-down must be at the extreme edge of the landing site.

Don't worry if you find it difficult at first to land accurately at a ground site. The simplest way is to land vertically, then press the Homer key followed by the nearest ground site key to call up the ground crew.

### **Other uses of Vector Thrust**

Vector thrust techniques can also be used in fast forward flight (VIFFing) to useful effect. Experiment by selecting 45 degree thrust, which will cause rapid deceleration combined with an increase in height. Then try the same angle of thrust in a steep bank—this causes a sharp increase in the rate of turn. Both techniques have important implications for certain combat situations.

## **COMBAT**

### **Levels of Difficulty**

On selecting combat mode from the main menu, three levels of skill are available to you—Pilot, Commander and Ace.

#### **Pilot**

This is the basic level, and is recommended for your first few missions.

#### **Commander**

At this level, you will begin to encounter the effects of G forces. If too much backward joystick is applied, you will black out (blood rushing from your head) when you reach 9G positive. If too much forward joystick is applied, then red out (blood rushing to your head) will occur at 3G negative. Carefully apply the opposite joystick movement to correct the situation. More careful fuel management is also required at this level as the rate of consumption is higher.

## **Ace**

In addition to the factors encountered as a Commander, this level requires greater accuracy in aiming and firing cannon, and the cannon's effective range is reduced.

## **YOUR MISSION**

Your mission is to destroy the enemy HQ 500 miles NNE of your starting position.

To reach enemy HQ, you will need first to destroy the enemy tanks threatening your ground sites. When you've done this, your next move is to set up a new ground site in an adjacent operational area. Unfortunately, these will also come under threat from enemy tanks which will in turn have to be destroyed—and so the process goes on. There are a total of 512 operational areas at your disposal, but obviously not all need to be taken to reach your goal.

It is suggested that you draw a map based on a grid 16 squares by 32 high, marked A to P and A to Z with [, \, ], ^, -, £ respectively. The enemy HQ lies in P, £ (top right corner). Your bases lie at A, A (base Q) A, C (base W) B, C (base R) and B, A (base E).

## **Identifying Ground Sites**

When you fly into a new area, begin by making a reconnaissance flight to photograph it so that FOETRAC is available to you. This will enable you to select an area which is relatively clear of enemy ground forces.

## **Setting Up Ground Sites**

Unprepared ground requires a vertical landing with zero horizontal speed. When you've landed, use the Homer to select which of your landing sites you wish to move up. Your ground forces will be automatically moved up by an airborne drop at a speed of around 600 knots.

If you hear a high pitched note when the ground forces have moved up, you know that they will be able to prepare a landing site around you.

If you don't hear the high pitched note then the location you have selected is not ideal and the site has been prepared close by. You should take off again and use the Homer to locate the position of the landing site.

You cannot rearm or refuel until they arrive, so if you have sufficient of both in hand, you can carry out local missions while you wait.

Remember you can pause at any time to stop and plan your next move.

### **Battle Damage**

Damage caused by ground or cannon fire is indicated by the progressive failure of your instruments until you are finally shot down. A missile hit is, naturally enough, terminal.

### **Ground Attack Techniques**

The ground defences stacked against you are:

#### **SAM**

Surface to Air Missiles Radar controlled, they can destroy targets above 2000 ft. They may be fully radar guided right to the target or become an infra red homing device locking on to your heat sources.

#### **AAA**

Anti-Aircraft Artillery. Usually radar-controlled, they are usually located near SAM sites.

#### **Ground Fire**

Small arms fire from ground troops, although unnerving, is unlikely to cause any real damage.

The most effective ground attack method would therefore seem to be approach fast and low at or below 500ft. and weaving. Remember that mountains offer some protection from enemy radar. This can, however mean that you will not see the target until the last minute. A useful alternative might be to approach high and attack low.

Both bombs and cannon can be used to attack ground targets. Bombs are relatively easy to use as the predicted point of impact can be obtained by using the bomb sight. Normally, you would fly over the target after releasing the bomb, but this can sometimes be risky. Cannon are not as flexible, as they entail diving directly towards the target, selecting a pitch between  $-5$  and  $+5$  will help to maintain a constant height.

### **Radar Evasion**

Your Radar Warning Receiver (RWR) will alert you to enemy radar locking on by a warning sound and a message screen. The Harrier has an electronic counter-measure system which will attempt automatically to break or jam the lock. Changing course will help, as will diving to below 500ft.

### **Air Combat**

Ideally, try to position yourself within a 30 degree 'cone' behind the enemy at a range appropriate for your chosen weapon. Having achieved this position, you will also need to be aware of:

1. The characteristics of your own and the enemy's aircraft.
2. The side-effects of certain manoeuvres—your ability to turn tightly is a function of your speed. Too tight a turn at a too low a speed will reduce both height and speed, but at a higher speed, the rate of turn will be slower. Your optimum turning speed should be around 450 knots.

## **Attack**

Once within 30 degree cone, ensure that you also have both a height and speed advantage. This will enable you to zoom away, gaining height, as soon as you have discharged your weapons. Missiles can be used at a relatively fast closing speed, but cannon attack requires a slower approach in order to track the target accurately. But remember that the enemy will of course try to force you to overshoot, reversing the situation in an instant.

## **Defence**

The classic response to an attack from the rear is to turn towards the enemy in a defensive break.

Your attacker can also be forced to overshoot you if you can change direction quicker than he can or by increasing the relative closing speed by deceleration and/or manoeuvring.

If you have real problems shaking off the enemy, you can as a last resort try 'jinking'—altering course repeatedly so that he cannot keep you constantly in his sights. Pick your moment and disengage. Head for the nearest cloud bank as this will also confuse any Sidewinders or SAMs.

The Harrier's VIFFing capabilities can also assist you in getting to a better position for fast evasion and counter-attack manoeuvres.

## **Counters to Defence**

Both you and the enemy aircraft can counter many of the defensive moves described above.

## **The Enemy Aircraft**

Your attacker's characteristics are based on the MIG23, which has a supersonic capability. The Harrier is subsonic, except in a dive. Above 20,000 ft. the MIG has different turn rates, speeds, acceleration and rate of climb, so your best shot is to draw him down below 20,000 ft. and force him to fight on your terms.

Your attacker is armed with cannon and 4 missiles, either Infra Red Homing (IRH) or Radar guided (RG). When he's right on your tail, he will fire cannon or IRH, but RG missiles may be fired from anywhere behind you. In this simulation, although not yet in reality, he may fire "Fire and Forget" missiles when he is ahead of you and flying away.

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## NOTES

Your attacker is armed with a cannon and a rifle. When he's right on your tail, he will fire the cannon or the rifle. But his missiles may be fired from anywhere behind you. In this sense, although not yet in reality, he may fire "fire and forget" missiles when he is ahead of you and flying away.

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