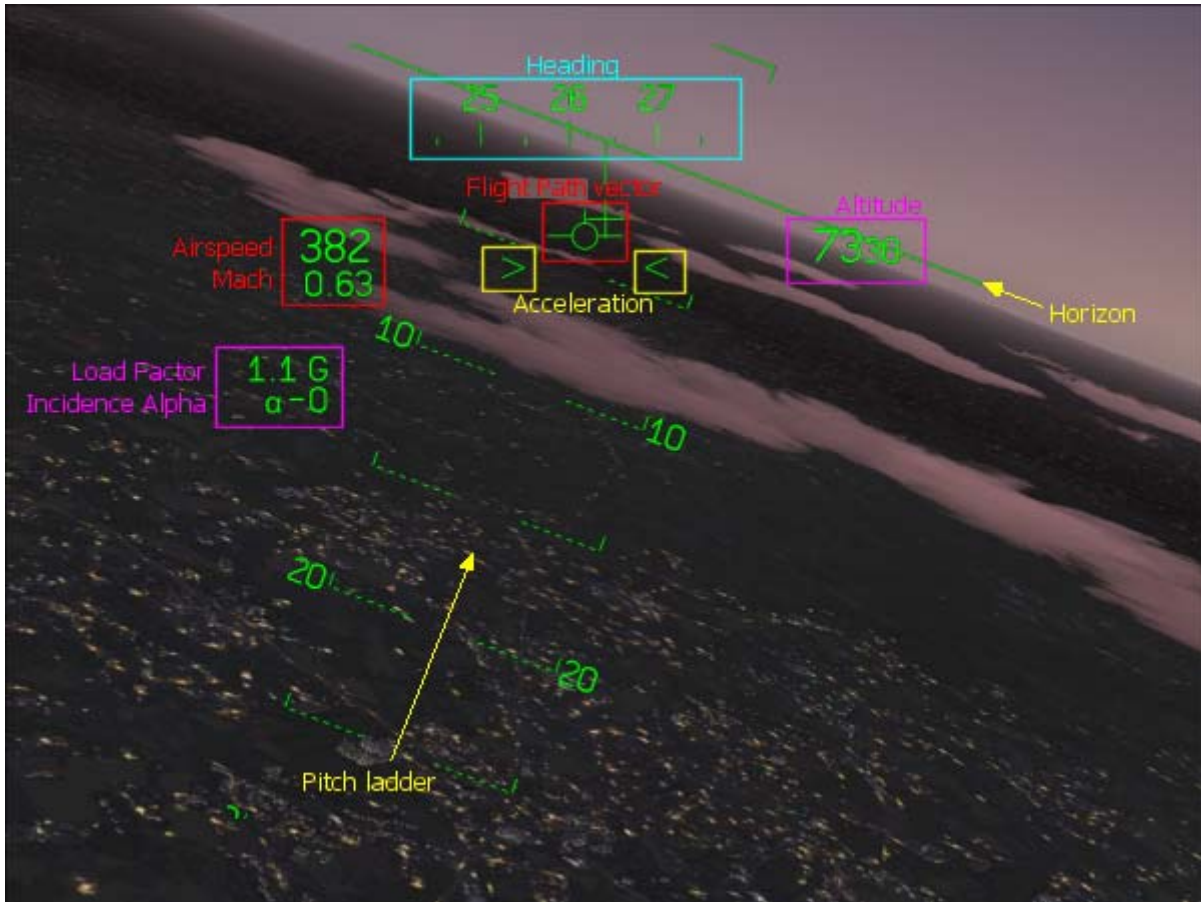


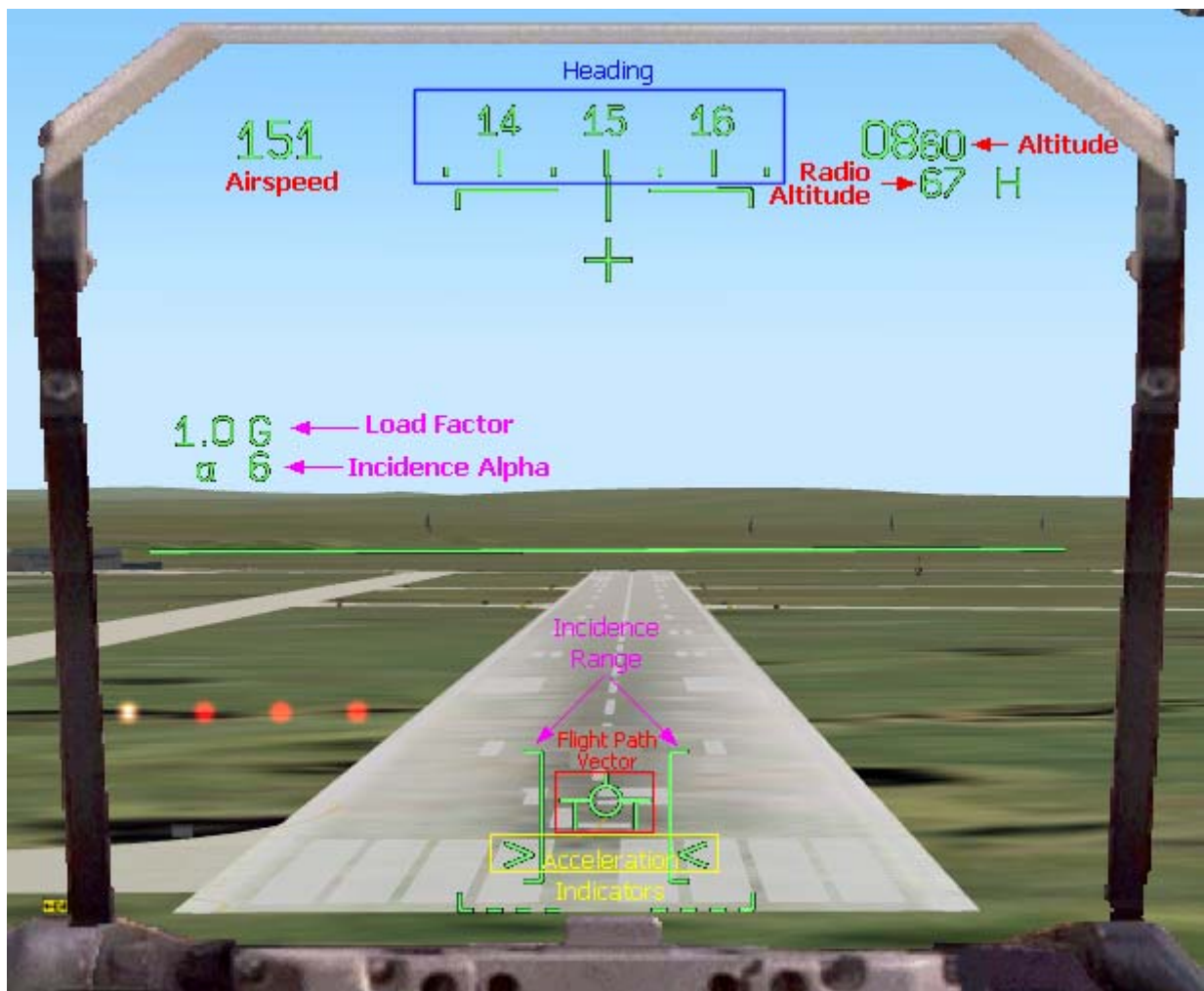
Mirage Head-Up Display

Layout

The HUD information layout is shown on the images below, in 2D panel view and in full-screen view.



HUD layout in full screen mode



HUD layout in landing mode

All the necessary flight information is displayed on the HUD so that you can fly the aircraft while looking outside:

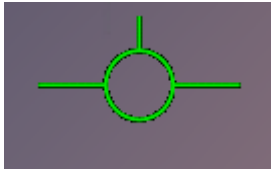
- Airspeed is displayed (in knots)
- Mach number
- Barometric altitude (in feet)
- Magnetic heading with a tape
- Flight path vector (detailed [below](#))
- Acceleration (detailed with the flight path vector [here](#))
- Radio-altitude (in feet), or the height of the aircraft above the ground level, displayed only when the aircraft is close to the ground
- Navigation information (detailed [here](#))
- Target designation box, if the radar is installed (more details [here](#))
- Alert arrow
- Load factor (in G)
- Incidence (Alpha)
- Incidence range for landing

Expert users might be interested in learning how to integrate this HUD in any panel. This section is dedicated to people who know how to edit a panel though the panel.cfg file. If you think you can do this, click [here](#) to access the [HUD integration section](#).

Flight path vector and Acceleration

This is definitely the most important part of the HUD. Unlike classic aircraft instruments, such as the attitude indicator and the compass, the flight path vector shows exactly where the aircraft is flying. You can fly the aircraft through its trajectory. When the flight path vector is above the synthetic horizon, the aircraft climbs. If it is below the horizon, the aircraft descends, even if the nose is above the horizon. The flight path vector is accurate and refreshed in real-time.

On the Mirage HUD, the flight path vector also shows when the gear is down and locked. This allows the pilot to concentrate on the trajectory when landing, without having to look somewhere else.

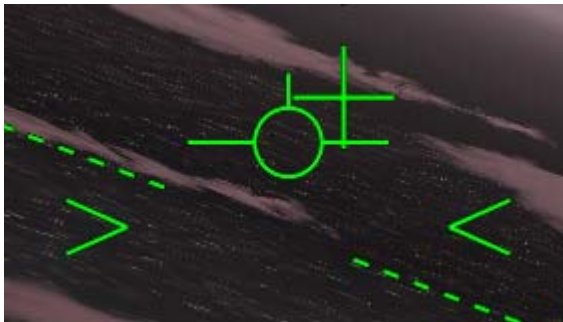


Flight path vector shape when gear is up

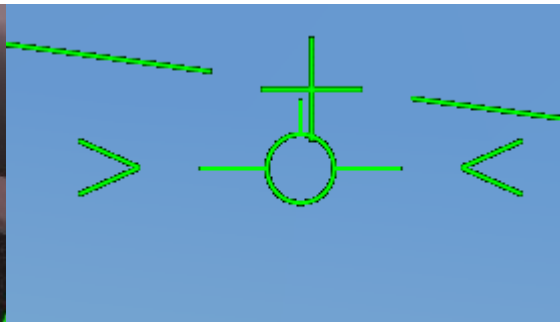


Flight path vector shape when gear is down and locked

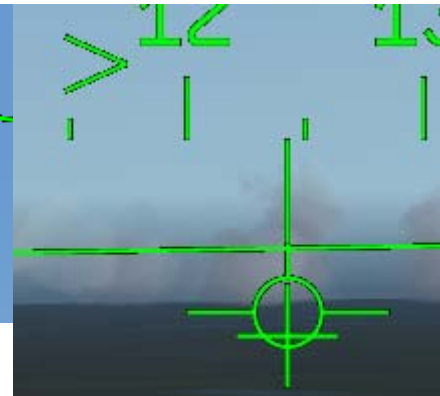
The Mirage HUD also provides information about the acceleration through 2 indicators that move up and down next to the flight path vector. If they are positioned above the flight path vector, it means the aircraft is accelerating. If they are below the flight path vector, the aircraft is decelerating. If the 3 symbols are aligned, the aircraft speed is constant.



Deceleration

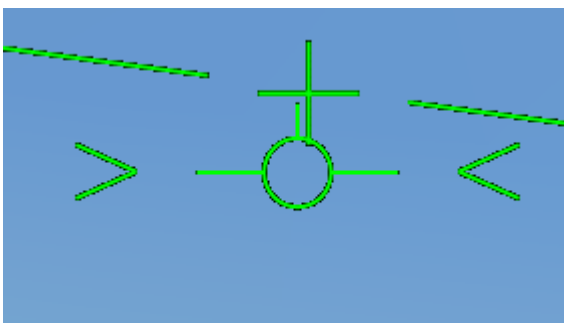


Constant speed



Acceleration

The acceleration symbol shape changes when the afterburners are turned on.



Standard engine power

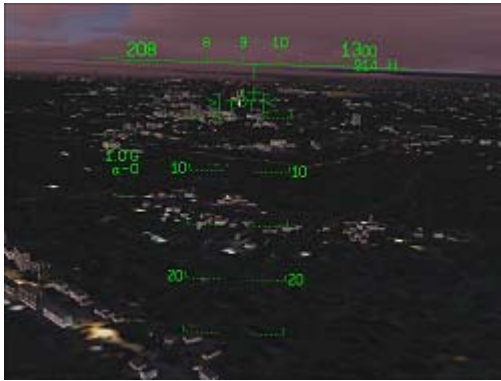


Afterburners on

HUD Landing mode

When the landing gear is extended, the HUD automatically switches to the landing mode. The airspeed and altitude are moved to the upper part of the display, the Mach number disappears and a new symbol appears: the landing incidence guide. It shows the range of correct incidence for landing. You should maintain the flight path vector within this range to make a perfect landing.

When the aircraft is in landing configuration (gear extended, flaps and slats deployed, airspeed around 150-180 knots), the flight path vector has just to be aligned with the runway entry to guide the aircraft to landing.



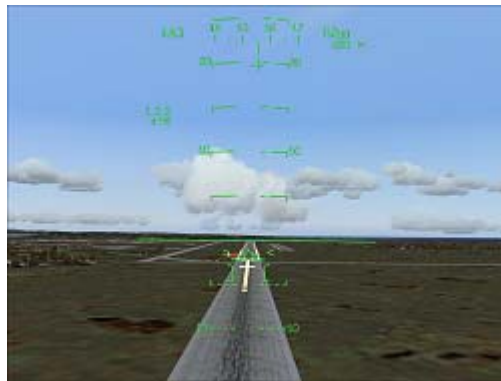
Landing preparation is almost perfect: the flight path vector is in the incidence range, speed is constant, the gear is down and locked. The speed is a little high.



Close to land, the aircraft situation is perfect: airspeed is good, the flight path vector is aligned with the runway and still in the incidence range, the speed is constant and the gear is OK.



The situation is good but the speed vector is almost out of the incidence range.



Bad situation: the flight path vector is out of the incidence range. The incidence is too high and speed is low.



The speed is low and the aircraft is decelerating.

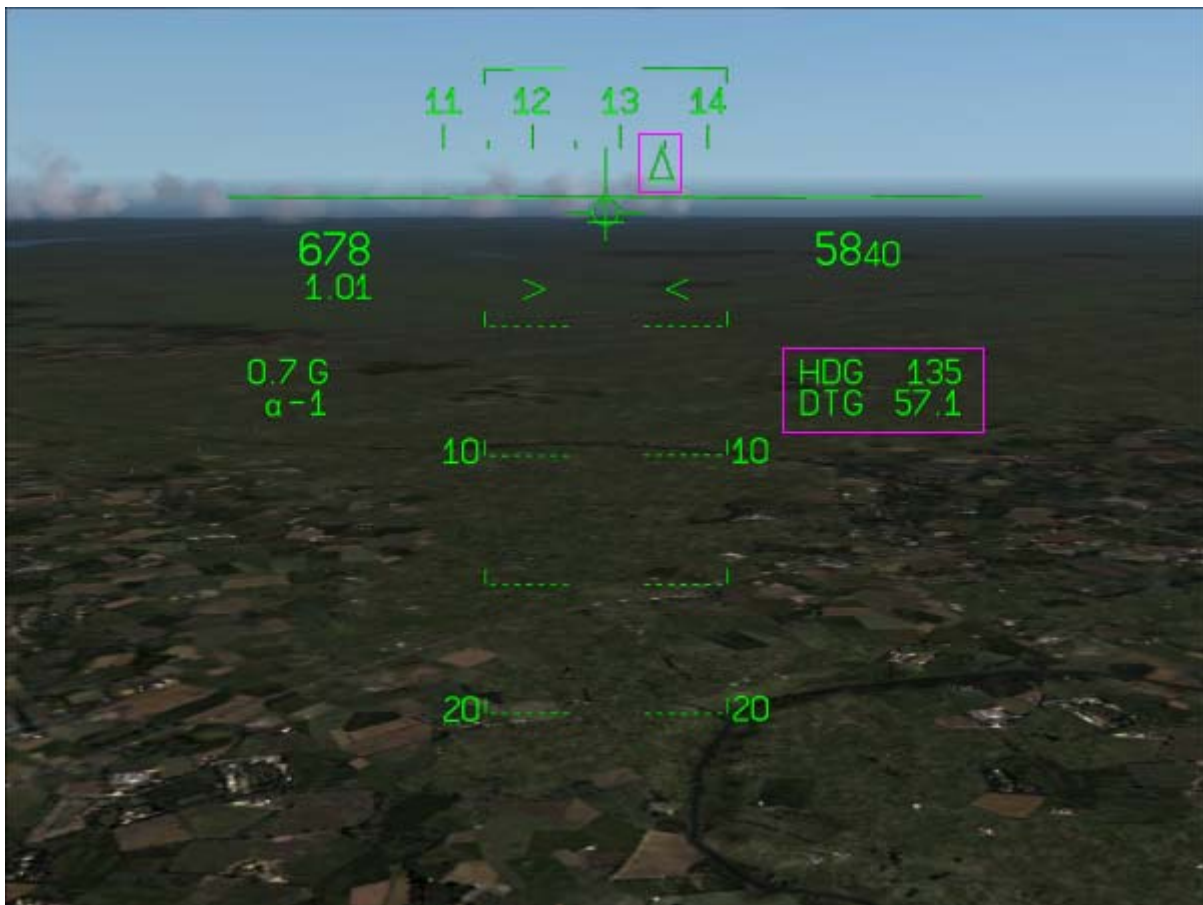
Navigation Information

If a flight plan has been entered or loaded in the GPS, the HUD provides navigation information to fly to the next waypoint.

The bearing and distance to the next waypoint are displayed.

A triangle in the heading tape shows the direction of the next waypoint, if the GPS mode is engaged. If not, the triangle shows the autopilot target heading.

If no flight plan is defined, the bearing and distance are blank.



Target Designation Box

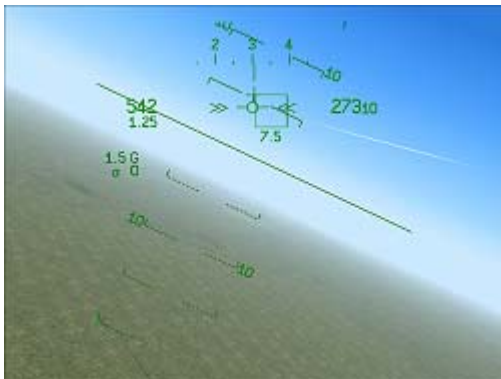
The radar developed by [Eric Marciano](#) must be installed to enable this feature.

The target designation box shows the direction of the target selected on the radar (even if the target is too far to be visible) and the distance to the target (in NM), below the box. It allows you to fly your aircraft to the target for interception.

When the distance to the target is less than 1 NM, the distance stops being displayed.



The target is at 23.4 NM, beyond visual range. The flight path vector is aligned with the target designation box to fly directly to the target.



At 7.5 NM, the target is hardly visible (the contrails are visible), the designation box shows the direction.



At less than 1 NM, the distance information disappears. The target is now visible.

The target designation box is active as long as a target is selected on the radar. If you unselect the radar target, the box disappears.

Alerts

The HUD displays an arrow alert when a collision with the terrain is probable.



The altitude is low and the aircraft is descending.
It triggers a warning shown with the up arrow.

Mirage HUD Integration

The best way to understand the HUD panel integration is to see how it is integrated in the Mirage 4000 panel described [here](#). The integration is exactly the same in FS2004 and FSX.

Basically, the HUD is an XML gauge that is listed in the panel.cfg just like any other gauge. In fact, the HUD provided here has 2 gauges: 1 for the 2D/3D panel integration and 1 for the full-screen usage using the "mini-panel" feature of FS2004/FSX.

In order to have the HUD showing in a panel, edit the panel.cfg and use the following gauges:

- Mirage_4000!HUD Main for the 2D panel or Virtual Cockpit
- Mirage_4000!HUD Full for the mini-panel, designed for the full-screen HUD

Keep in mind that the `Mirage_4000.cab` file must be in the panel directory if you want to have the HUD working.

Here is the example of the Mirage 4000 panel:

```
gauge00=Mirage_4000!HUD Main,362,96,300,290
```

Just like for any other gauge, the HUD is positioned at 362,96 and its size is 300 by 290.

The HUD full-screen integration uses the mini-panel feature of FS2004/FSX. This is why it must be integrated in a separate panel window which identifier is MINIPANEL. Here is how it is done in the F-16 panel:

```
[Window05]
position=8
size_mm=1024,768
child_3d=1
background_color=0,0,0
ident=MINIPANEL

gauge00=Mirage_4000!HUD Full, 190,35,644,660
```

The [window05] section defines this window as a mini-panel, which includes the HUD in full-screen mode. Consequently, the HUD will appear in full-screen when you press the W key. Pressing the W key switches the panel off, which makes the mini-panel appear. Pressing W again switches the mini-panel off, and pressing W again brings the panel back.

For more information about the integration of gauges in a panel, please refer to the Microsoft Panel SDK.