



Profile:

Use the "European space shuttle" Hermes with an Ariane5 launcher to bring new experiments and astronauts to the ISS.

We are launching from Kourou (French Guyana) with a direct insertion ascent that keeps the vessel aligned with the orbital plane of the ISS. Hermes reaches an initial orbit and drops the ascent stage; it will later burn up and splash down in the northern Pacific. The Hermes MTH is then fired to achieve a stable orbit around Earth.

We are then synchronizing our orbit with the ISS and Hermes will approach the space station within six hours. After approaching and docking to the ISS, Hermes will stay docked for nearly three days (65 hours).

After undocking Hermes will drift away from the ISS before performing the de-orbit burn about 15 minutes later. After finishing the de-orbit burn, the retro stage is jettisoned and the Hermes ASH is ready for re-entry.

The re-entry trajectory is set for a return to Rochambeau (near Kourou). After re-entry, starting at a speed of around 3500 m/s, the Hermes uses only its RCS and its nice aerodynamic properties to glide to the runway that is about 600 km away. During landing approach you pass over the launch site (Kourou) at an altitude of 15 km (an eyecandy); Hermes will then land at Rochambeau.

Remarks / Caveats / Bugs:

- Due to limitations in the Multistage DLL, a scenario can not be saved in-flight. So you can't save any of the first three processes and you can't run the whole mission in one go - you need to "continue" the mission by loading a new scenario after reaching a stable orbit.
- During the whole mission, three different vessels have to be managed: From launch to orbit the vessel is handled as an "Ariane5" multistage DLL vessel; from orbit to de-orbit burn the vessel is a spacecraft DLL instance with name "hermesmth3" and re-entry and landing is done for a spacecraft DLL instance with name "hermesash3". This results in one restart of REDSHIFT during mission (when the vessel changes from MTH to ASH changes), the necessity to have two FOP files and the "disrupted" mission that forces a scenario loading. But I think, we all can live with these limitations (which apply to other add-ons as well).

Files:

(relative to Orbiter installation folder)

Flight Operations Plan: .\FOP\Ariane_Hermes.fop (launch to de-orbit burn)
 .\FOP\Hermes_ASH.fop (re-entry and landing)

Scenario folder: .\Scenarios\REDSHIFT\Manned Missions\Hermes_ISS

Add-ons needed:

- Multistage / spacecraft DLLs (by Vinka)
- Hermes/MTFF add-on (by Thomas Ruth)
- Kourou / Rochambeau scenery (by Thomas Ruth)



Launch

00:06:31

Hermes_Launch

The scenario starts on Thu, Mar. 15th, 2001 at 14:40 UTC, around six minutes before launch. We are at launch pad ELA3 at Kourou (French Guyana), sitting in a Hermes shuttle mounted to an Ariane5 launch vehicle. We are ready for launch...

After lift-off the launcher performs a roll to adjust to the launch direction. The launch is complete when the launcher reaches an altitude of 2000 m.

	Description	User interaction
Start-up	Select FOP for mission	Select " Manned Missions ", " Hermes to ISS " and " Launch from Kourou " in the FOP tree list.

Ascending to orbit

00:08:59

After reaching an altitude of 2000 m, the Ariane5 follows a predefined ascent profile. The ascent is a direct insertion into the orbital plane of the target (ISS) and tries to keep the relative inclination between the orbital planes at a minimum. The ascent is complete when the initial orbit touches the Earth surface at periapsis.

The jettisoned last stage will re-enter the atmosphere and splash down near Alaska in the Pacific.

	Description	User interaction
MECO	Orbit achieved	Jettison the ascent stage with the 'J' key. <u>Attention:</u> The next stage starts its main engine automatically, so be prepared to kill thrust as soon as that happens (press the '*' key on the numeric keypad).

Achieve stable orbit

00:13:53

At apoapsis of the initial orbit the Hermes ASH main engine is fired prograde. This lifts periapsis of the orbit to a save altitude (300 km). The Hermes shuttle is now in a stable orbit around Earth.

	Description	User interaction
MECO	Orbit achieved	Quit simulation (don't save). Continue the mission by loading the scenario associated with the next process.



Synchronizing orbits

05:01:39

Hermes_Sync

The scenario starts about 40 minutes before the main engines fire to put the Hermes onto a transfer orbit to the ISS. The transfer orbit will synchronize the orbits so that Hermes will meet with the ISS within six hours. The process will “lock” for interception when a distance of less than 75 km to the ISS is reached; synchronization is complete at a distance of 25 km.

	Description	User interaction
Start-up	Select FOP for mission	Select “ Manned Missions ”, “ Hermes to ISS ” and “ Synchronizing orbits ” in the FOP tree list.

Approach to ISS

00:12:57

Hermes_Approach

The scenario starts when Hermes is about 30 km away from the ISS. The approach starts when this distance is 25 km and will end when Hermes is 1000 meter away from the ISS with nearly no relative velocity.

	Description	User interaction
Start-up	Start SyncOrbit MFD	Start with SHIFT-Y , set the target to ISS (SHIFT-T)
	Wait for approach distance	Watch the distance to ISS displayed on the SyncOrbit MFD. If distance is 25 km, start the approach.
	Start approach	Select “ Manned Missions ”, “ Hermes to ISS ” and “ Approach to ISS ” in the FOP tree list.

Docking with ISS

00:02:16

Hermes_Dock

Hermes is 1000 meter away from the ISS (with no relative velocity) and is ready for the final approach and docking manoeuvres.

	Description	User interaction
Start-up	Select FOP for mission	Select “ Manned Missions ”, “ Hermes to ISS ” and “ Docking to ISS ” in the FOP tree list.



Docked

64:23:40

Hermes_Docked

The Hermes has just docked to the ISS. Guess it is time to open the airlock and to have some fun onboard the ISS.

Undocking from ISS

00:33:41

Hermes_Undock

The scenario starts about 33 minutes before undocking from the ISS. Last chance to check if you have anything forgotten onboard the ISS – airlocks will close soon...

	Description	User interaction
Start-up	Select FOP task	Select “ Manned Missions ”, “ Hermes to ISS ” and “ Undocking from ISS ” in the FOP tree list.

De-orbit burn

00:06:03

Hermes_Deorbit

The scenario starts about 15 minutes before the de-orbit burn will begin. After de-orbiting the retro engine is jettisoned and the Hermes ASH is ready for re-entry.

	Description	User interaction
Start-up	Select FOP task	Select “ Manned Missions ”, “ Hermes to ISS ” and “ De-orbit burn ” in the FOP tree list.
MECO	Re-entry trajectory set	Jettison Hermes MTH retro engine with the ‘J’ key.

The vessel type now switches from “hermesmth3” to “hermesash3”; both of them spacecraft DLL instances. Use the F3 key to select the vessel named “hermesash3”. Your REDSHIFT MFD will restart (for the new vessel). Select “Manned Missions”, “Hermes ASH reentry / landing” and “Reentry” in the FOP tree list to continue the mission.



Re-entry

00:47:04

Hermes_Reentry

The scenario starts just after the de-orbit burn is complete and the MTH stage is jettisoned. Hermes is now on a re-entry trajectory and will stay idle until it hits the upper layers of the atmosphere. It will then keep a defined AOA (Angle Of Attack) until its velocity is reduced to 3500 m/s – Hermes is then about 700 km away from the landing site with an altitude of around 60 km.

	Description	User interaction
Prepare	Prepare for re-entry	Bring up the Map MFD with the 'M' key. Select the landing site (Rochambeau) as target base ('T' key)
Start-up	Select FOP task	Select " Manned Missions ", " Hermes ASH reentry / landing " and " Reentry " in the FOP tree list.

Landing at Rochambeau

00:08:30

Hermes_Landing

The scenario starts when Hermes has finished re-entry and is 3500 m/s fast. Its distance to the landing site is around 700 km with an altitude of 60 km. Hermes will only use RCS and its superb aero-dynamical properties to glide close to the landing site. The final approach lines up the vessel with the runway; Hermes will land with a touch-down (still not working properly, runway is normally missed and the touch-down can be a rough one).

If you start the mission by loading the scenario at this point, make sure you get the first two task of the following list done as quick as possible – the vessel is not in a stable flight attitude and the landing processor should be in control "immediately".

	Description	User interaction
Prepare	Prepare for re-entry	Bring up the Map MFD with the 'M' key. Select the landing site (Rochambeau) as target base ('T' key)
Start-up	Select FOP task	Select " Manned Missions ", " Hermes ASH reentry / landing " and " Landing at Rochambeau " in the FOP tree list.
Final approach	Altitude: 1000 m	Bring down landing gear with the 'G' key.