

Europe's Hermes 2.0 Smart Upper Stage for Innovative Exploration (SUSIE)

Recalling ESA objectives from over 35 years ago...

*ESA's objectives were "to achieve a comprehensive **autonomous European capability** for In-Orbit-Infrastructure (IOI), Space Transportation (STS) and Scientific Programs" (ESA Long Term Plan, Rom, January 1985).*

*ESA to prepare **autonomous European facilities** for the support of man in space, for the transport of equipment and crew and for making use of low earth orbit (Final Declaration, The Hague, 10th November 1987.*

...in 2022 SUSIE looks like another step towards this goal.

To live up to the ESA 1985 Ministerial Conference decision on "an independent European access to low earth orbit" after completion of the successful SpaceLab program a European in orbit infrastructure (IOI) program was proposed.

As can be seen from the 1985 European IOI scenario (Fig. 1) this grandiose proposal included a free flying "Man Tended Free Flyer" (MTFF) to be serviced by a European crew transporter called Hermes. Hermes was to be launched on top of Ariane-5 (Fig 1).

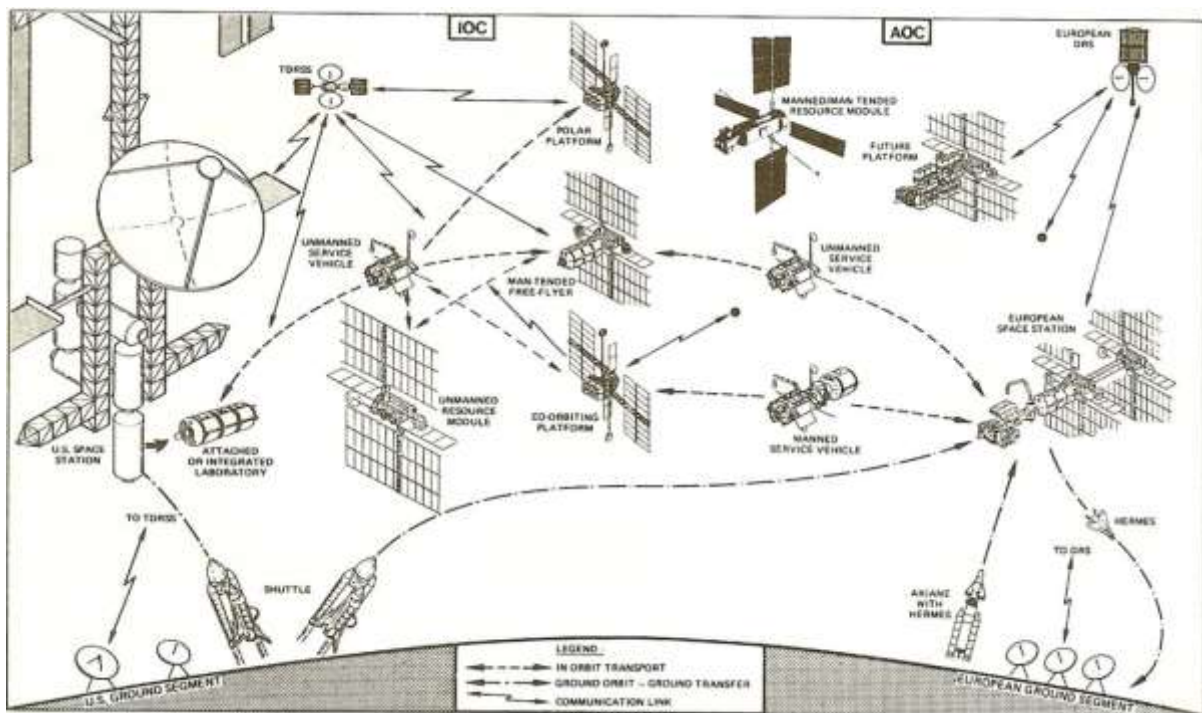


Fig. 1 Columbus System Scenario [1]

ESA's Board of Directors approved the Columbus program in 1985. Like the Multi-Purpose Logistics Modules (MPLMs) and the Automated Transfer Vehicle (ATV) resupply craft, Columbus traces its origins to Europe's Spacelab. The Columbus program was intended to supplement NASA's Space Station Freedom. Initially the Columbus program included three flight configurations:

- > A Human-tended Free-Flyer (MTFF), as a space station element
- > An Attached Pressurized Module (APM), as a crewed space station component
- > An un-crewed serviceable Polar Platform (PPF) for remote sensing and data return [2]

In addition it included the Hermes spaceplane. Hermes was a proposed spaceplane designed by the French Centre National d'Études Spatiales (CNES) in 1975, and later adopted by the European Space Agency (ESA). It was superficially similar to the American Boeing X-20 Dyna-Soar and the larger Space Shuttle.



Hermes on top of AR-5



SUSIE on AR-64

Ariane 5 (AR-5 left)
 Height: 46–52 m (151–171 ft)
 Diameter: 5.4 m (18 ft)
 Mass: 777,000 kg (1,713,000 lb)
 Stages: 2
 P/L to LEO: 16,000 kg (35,000 lb)
 [7]

Ariane 6 (AR-6 right)
 Height: 63 m (207 ft)
 Diameter: 5.4 m (18 ft)
 Mass: 530,000–860,000 kg
 (1,170,000–1,900,000 lb)
 Stages: 2
 P/L to LEO: AR64: 21,650 kg (47,730 lb)
 AR62: 10,350 kg (22,820 lb)
 [8]

In January 1985, CNES proposed to proceed with Hermes development under the auspices of the ESA. Hermes was to have been part of a crewed spaceflight program. It would have been launched using an Ariane 5 launch vehicle. In November 1987, the project was approved; it was to commence an initial pre-development phase from 1988 to 1990, after which the authorization to proceed to full-rate development was to depend on the outcome of this phase. However, the project was subject to numerous delays and funding issues around this period.

In 1992, Hermes was cancelled. This was in part due to unachievable cost and performance goals, as well as the formation of a partnership with the Russian Aviation and Space Agency (RKA), which reduced the demand for an independent crewed spaceplane. As a result, no Hermes shuttles were ever built. During the 2010s, it was proposed to relaunch the Hermes vehicle to serve as a partially reusable air-launched spaceplane launch system, known as SOAR, but the Swiss based start-up company Swiss Space Systems filed bankruptcy in December 2016. [4]

History has shown that from the whole scenario only the Attached Pressurized Module (APM), now called Columbus survived.

In 2022 ArianeGroup at the International Astronautical Congress in Paris (IAC 2022) announced a re-usable Smart Upper Stage for Innovative Exploration (SUSIE), a clever combination of several design principles: capsule, space shuttle, re-usable and versatile usage. With this proposal ArianeGroup aims to support European space efforts in the coming decades.

The overall specifications are ambitious and it remains to be seen how their implementation can be securely guided through the budgetary and political cliffs of our times.

- SUSIE is an entirely reusable stage project which meets the future needs of transport and other missions to and in space.
- SUSIE will be able to function as an automated freighter and carry out crewed missions with astronauts in complete safety, from lift-off to landing.
- SUSIE replaces the launcher fairing and is designed to fly on an Ariane 64 as well as on a launcher of the following generation.
- SUSIE is extremely flexible and is designed to be able to conduct numerous types of missions in space. Its large volume internal bay (40 m³) will make it highly adaptable for cargo or payload transport and for crewed flight.
- Missions made possible by SUSIE include towing, inspecting and upgrading satellites and other payloads, and supplying fuel, food, and equipment to space stations. It will also be able to carry out crew changeovers and facilitate human in-orbit activities. [3], [6]



Hermes separates from Service Module



SUSIE separates from AR-6 upper stage



SUSIE in orbit (credit ArianeGroup) [3]



SUSIE landing (credit ArianeGroup) [3]

If one takes a favorable, “guestimated” development time of 10 years into account, the European dream of **crewed** independent access to LEO would become true after 50 years of its declarations in the *ESA Long Term Plan, Rom, January 1985*.

Three hurdles still have to be taken, settling on a consolidated concept, developing the appropriate European operations infrastructure, qualification of AR-6 for crew transport and last but not least, the budget.

To paraphrase President Kennedy’s words:

We choose to send European astronauts on Ariane-6 into orbit and do the other things, not because they are easy, but because they are hard.



Columbus’ Dreams for IOI in 1992 (500 years after America’s discovery) [5]

References

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- [4] Hermes [https://en.wikipedia.org/wiki/Hermes_\(spacecraft\)](https://en.wikipedia.org/wiki/Hermes_(spacecraft))
- [3] <https://press.ariane.group/download?id=4843&n=Backgrounder%20-%20Susie%20IAC%20-%20EN-pdf>
- [5] DFVLR Brochure: Manned SpaceLaboratories Control Center (MSCC)
- [6] YouTube: <https://www.youtube.com/watch?v=ioJnEW8YOII>
- [7] Ariane-5 https://en.wikipedia.org/wiki/Ariane_5
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