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Space Shuttle Discovery

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Columbus *by Umberto Cavallaro*

The European Laboratory-Module Columbus, that represented a crucial focal point in defining the European space strategy, progressively took shape, along a complex and troubled path that crossed more than a quarter of a century, passing through much rethinking which led to the initial conception of Alpha, the design of the Freedom Space Station and finally to the implementation of the ISS of which Columbus became an integral part. On its development have even impacted the two Shuttle tragedies and historical international events such as the fall of the Berlin Wall.

Actions to address the “post-Spacelab” era and to define future developments started six years before the launch of Spacelab-1. The meeting called by ESA in Paris in October 1977, on the topic “Hints for a Development from Spacelab to Space Station” fired the enthusiasm of the main European companies involved in the Spacelab deal. Even more interested were American Companies, mainly the ones that had lost the Spacelab competition.

In this atmosphere preliminary contacts between ESA and NASA to prepare the European participation to the programme of the American Space Station *Freedom* began.

The space station, whatever would be its configuration and operational goal, would need a “logistics” system to transfer from Earth the required supplies for its upkeep in orbit and for its maintenance, including fuel, spare parts and experiments.

Spacelab became the Basic Building Block or B3 of the Space Station. “The pressurized modules derived from Spacelab” – recalls Prof. Vallerani – “looked like being the ideal vehicles, the natural candidate on which to base future projects, particularly when Shuttle was involved. This transition phase was experienced in Aeritalia as a stimulating opportunity: Aeritalia was in fact seeking a position in the international scenario that better reflected its current experience and allowed to fully capitalize efforts and investments lavished in the development of Spacelab”.

During the preliminary contacts, NASA tabled the opportunity for Europe to deal with the logistic system for supporting the Station: transferring, storing, etc. European interests centred however on the “laboratory module” connected to the Station as a natural extension of the

SPACELAB experience. But things were going slowly and Italy – or rather Aeritalia – led the field and launched a twofold strategy, based on two very ambitious developments for the Station: on one hand the European Laboratory *Columbus*, attached to the Station, to be implemented under the ESA umbrella and on the other hand, the MPLM, to be implemented on the NASA-ASI (Italian Space Agency) bilateral basis.

We will deal with this second programme in a future article. First let’s focus on *Columbus*. As Prof. Ernesto Vallerani recalls, “German Companies involved in Spacelab were still too busy with the final phases of the programme and ESA, though showing interest in the proposals, gave the impression of being more worried about its own position in the medium-term missions than committed in the long-term plans.

“It was evident that without a strong German presence it was not possible to promote a European post-Spacelab plan. I started to envisage an Italian-German Laboratory, derived from the pressurised Spacelab module. We had to form an Aeritalia-Erno alliance, involve the relevant Italian and German Ministries for Research, work out a proposal and then bring a preliminary project to ESA like the French did with Ariane programme, conceived by CNES. With this in mind, in mid 1982, I contacted Manfred Fuchs, then responsible for future activities in Erno, who liked the idea”.

The original idea was a European laboratory able to grow in dimension and to gain some autonomy from the Space Station and become itself a sort of self-standing European mini-space-station.

Actually the system – essentially conceived of as two modules: the pressurized module built under Italian responsibility, and the resource module, built under German responsibility – could be detached from the station and become a “Man Tended Free Flyer” (MTFF), i.e. a free-flying independent module, orbiting together with, and in the proximity of the station itself that could be visited by the crew at given intervals, offering high levels of microgravity, thanks to its separation from the large American *Freedom* Station exposed to disturbances caused by the presence of humans. According to this project, astronauts would access the laboratory only for maintenance and to recover the products and the results of the experiments. Once consolidated the preliminary design and once defined costs and timeline, Italian and German delegations jointly proposed to ESA the “Europeanization” of the project and transferred to ESA the responsibility of completing both design and implementation. Germany and Italy would commit to support the programme respectively with the share of 35% and 25%, and keep the project leadership.



The success of the first flight of Spacelab, in November 1983 increased the enthusiasm and the commitment to go on with the project. In his speech to the Nation, on January 24th, 1984 President Reagan announced the decision to start the implementation of the *Freedom Space Station* and opened to international cooperation.

Deliberately echoing Kennedy's commitment over twenty years before, President Reagan announced that he was directing NASA "to develop a permanently manned space station and to do it within a decade". Rivalry with the Soviet Union was as evident in 1984 as it was in 1961. The project was a "demonstration of free world leadership". Indeed the Space Station was eventually named Freedom. This speech had the effect of speeding up the process of europeanization of *Columbus*, as ESA had no real alternative vs. the Italian-German proposal that, moreover, was funding 60% of the deal. Estimated cost: 2600 MAU (approx 2,6 billion Euro). France and UK took a share in the deal, with the commitment of 15% each.



Cover designed by the American artist Jim Roth (Mission Fiftyseven – USA), whom we thank for the authorization to reproduce the item.

the New World, the Nations of Europe were embarking on a new discovery mission in space. The mission emblem recalls the connection of the space shuttle mission that carries on into space with the exploration started by the Columbus' Caravels.

Allegedly the name of *Columbus* was suggested by the name of the Columbus Hotel that, in the heart of Bremen, had become a sort of headquarters for Italian employees of Aeritalia who – while working on Spacelab – sojourned there during the long integration phase of the modules produced in Turin (Italy) and integrated in Bremen.

The *Challenger* tragedy – which at the beginning of 1986 required a sharp break on all space activities – caught *Columbus* in the very critical phase of programme definition. Discussions on the value of the European participation to the American project were reopened again. Under French pressure the idea of European autonomy was reinvigorated and, at the Hague Conference (October 1987) resulted in the proposal of developing the MTF module (under German responsibility) seen as a component tied to the Ariane launcher, in the development phase at that time, ready to become man-rated.

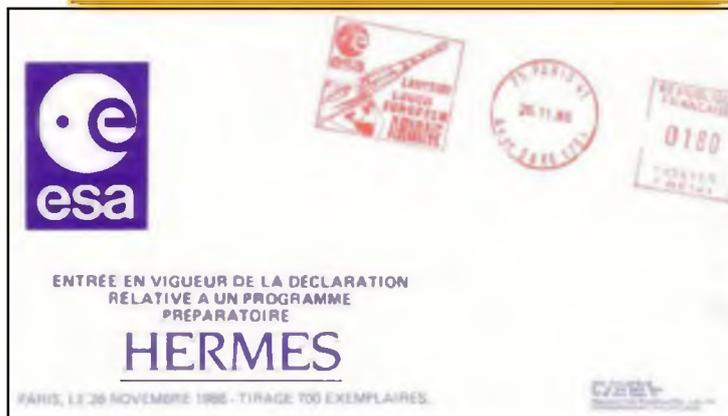
France insisted in considering the three components as parts of a threefold project consisting of Laboratory module, Ariane launcher and Hermes mini-shuttle. Even in Italy *Columbus* was tied with Hermes, as shown in a rare Italian space-themed stamp – actually a "Europa 1991" issue – that features *Columbus* and *Hermes* flying in space.



The project presented in ESA in 1985 integrated 3 components: (1) a pressurized laboratory-module (*Attached Pressurized Module - APM*) that, associated to the Resource module, would at least temporarily form a first component of the European space station; (2) One or more automatic *Manned Free-Flyer* (MTFF) platforms isolated and independent from the space station; (3) A service vehicle periodically flying to the station for maintenance and reconfiguration purposes (*Hermes*).

France, through CNES, took over the management of the *Hermes* project and of data processing system, to be provided by Matra (Astrium-F). The operation was initially planned to start-up in 1992, on the 500th anniversary of the Discovery of America and the programme was dubbed *Columbus*, after Christopher Columbus, thus highlighting that 500 years after the discovery of





The Hermes minishuttle, is an essential component integrated – in the French view – with Ariane and Columbus

Above: two French commemorative covers from the collection of Luc Delmon (France). On the left, the special postmark used in Paris in 1990.



Germany, APM serviced by Italy and *Hermes* managed by France. One of the three had to be sacrificed. After recurring budget reductions, finally the *Hermes* project was cut and MTFF was delayed to 1999. What remained out of the threefold *Columbus* programme was the APM project, under Italian responsibility, first named "*Columbus Orbital Facility*" (COF), and then renamed just *Columbus*.

In order to maintain its leadership, Germany demanded that each partner reduce accordingly their contribution and invented the concept of **PICA** or *Pre-Integrated Columbus APM* that – on one hand – left to Alenia the overall responsibility of the global configuration of *Columbus* and of the implementation of the engineering and mechanical systems, including the survival systems and – on the other hand – reopened the plays for EADS Astrium Space Transportation, as programme manager and overall coordinator, directly responsible for avionics systems and data management.

to see it as an "Attached Module" which could then be detached and gain the autonomy all along pursued by Europe. In the Memorandum of Understanding between NASA, ESA, Canada and Japan for the development and use of the *Freedom* Space Station – finally signed in Washington on September 29th 1988 – the *Columbus* laboratory is mentioned as a major issue of the agreement.

Soon the UK reported serious problems in maintaining its commitment and was forced to resign from the *Columbus* programme. The last years of the 80s were definitely hard ones. Even international events and major historical challenges like the Fall of the Berlin Wall had an impact on the *Columbus* programme.

Western Germany faced with the unexpected opportunity of reunifying the two Germanies – and their markets – decided like a shot to pour out its financial resources in the operation of recovering the Eastern economy, so reducing investment in other areas. Space programmes paid the price, and, in particular, *Columbus*. Germany announced for the decade 1990- 2000 a budget reduction by 15-20%. It was immediately clear that it would not be possible anymore to maintain the three projects: MTFF led by



Events in those years were leading to opening the frontiers to the former Soviet countries. The USSR had a renowned experience in space with 8000 days logged in the Space Station, compared with 2400 of Americans and a few dozen days by European astronauts. In 1993 even Russia entered in the consortium of the Space Station.

Design and cost constraints resulted, towards the end of 1994, in adopting for *Columbus* the structure of the *Mini-Pressurised Logistics Module* (MPLM) implemented in Italy by ASI/Alenia, with the related subsystems. Such approach allowed a reduction in the size of the module so that it could be launched aboard the Space Shuttle, thus definitely giving up with Ariane and the *free-flyer* configuration.

In order to further reduce costs (and make room for new Members) at the beginning of 1995 the decision was taken of reuse the Russian Data Management System planned for the Service Module. As a compensation for the launch costs of *Columbus* aboard Shuttle, ESA committed itself to build and provide Node-2 and Node-3, on the basis of the MPLM modules implemented in Italy, and other structures for the global value of 250 million Euros.

Russian delays in delivering their components led in early 1997 to the decision of delaying the launch of COF to 2002. Several reasons (including the reduction of the flights of Shuttle from 9 to 7 per year) forced to further shift the *Columbus* launch to 2003 and then to 2004.

Learned from the experience of the Spacelab programme – when the Europeans, after designing and implementing the module, had been in fact excluded from every support to the missions and from the deal of the maintenance that, in due course, would represent an amount of work far more significant, compared with designing and implementing the modules themselves – this time ESA had prepared in time an

articulated earth infrastructure system able to properly support Columbus missions.

Since 1985 Italy, responsible a for designing and implementing the Columbus APM – the only one which survived, as seen before, to the budget cuts of the early „90s – presented itself as candidate for establishing in Turin the *APM Centre*, able to support the operational life of the European Laboratory, then envisaged for thirty years, and provide all the collateral required activities, such as the payloads“ preparation and the astronauts“ training. Considering the major contribution of Italy to the project, the proposal was agreed and approved by ESA and activities started for preparing the CCC in Turin – in connection with

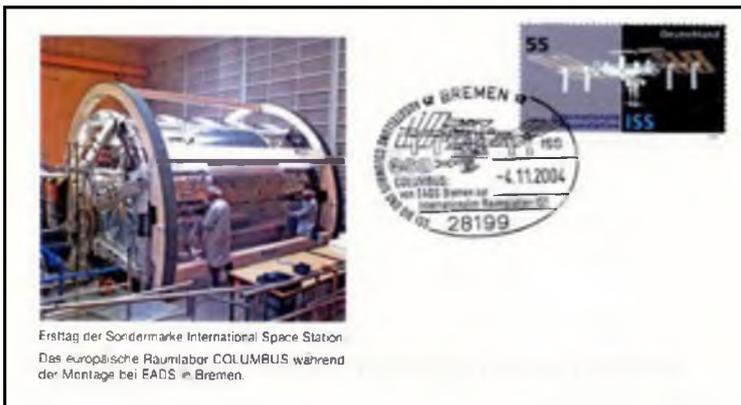


In September 2001 the pre-integrated PICA module was loaded on an Airbus Beluga carrier and delivered from Alenia (Turin) to EADS (Bremen) for the integration with the avionic components and the electrical wiring and for the final tests. Unfortunately the *Columbia* STS-107 tragedy – that in early 2003 again stopped every space activity for more than 18 months – delayed once more the launch date.

Houston – and collecting relevant data and info, studying Missions' requirements and procedures. A new structure, later named ALTEC (*Advanced Logistics Technology Engineering Center*) was set-up in cooperation with ASI (Italian Space Agency) and actually started operations in mid-90s, on the occasion of the historical docking of Shuttle *Atlantis* STS-71 with MIR.

The long and tormented vicissitudes of Columbus had come to a head the issue of the *Columbus Control Centre* (CCC).

As, with the cancellation of MTFF, German partners were deprived of the possibility to set-up in Bremen a similar



MTFF support centre, the internal allocation of tasks within the consortium was again called into question.

The new enforced break, after the *Columbia* tragedy, provided the room for reopening the argument on the CCC which resulted in the agreement, signed on March 31st 2003, by which ESA – with a contract of 37,7 million Euros – established the CCC (Columbus Control Center) at the *DLR* (*Deutsches Zentrum für Luft- und Raumfahrt*) in Oberpfaffenhofen (near Munich, Germany).

On May 28th 2006 Columbus module was loaded aboard an Airbus A300-600 "Beluga" at Bremen airport, (see photo and cover right) and delivered to the Kennedy Space Center. After several further delays, the launch of Columbus aboard Shuttle *Atlantis* (mission STS-122) was defined for early December 2007 and, after a few shifts for technical reasons, happily concluded its long high hurdles and lifted-off on February 7th 2008.

On February 11th the shuttle docked with the ISS, then under the command of Peggy Whitson, the first female commander in the history of the ISS. Connected with Node -2 Harmony, produced in Italy, Columbus is now integrated in the ISS and offers also to Europe the opportunity of "working in the stars" as Americans, Russians and Japanese do.

Finally also Europeans have on ISS their own space multifunctional laboratory for scientific research and the performance of long-term experiments in microgravity condition, in various disciplines, from biology to physics, to material sciences.



Columbus

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A Doubly Dispiriting Experience

During a visit to Brighton in July your editor chanced upon the premises of GUstamps, where the wind was taken out of his sails by the proprietor, who told him (a complete stranger) that what he was collecting was wrong and he should be investing what money he had in a number of GB

presentation packs which he named. Your ed. thanked the gent for his advice, bought some covers and left. Later on examining the GUstamps ad in *STAMP* for August 2013 your ed also noted how little thematic material is valued by this firm, in particular the astro-space material below, but also the music item in the left hand column. Rather sad— isn't it? On the other hand a really good one-off bargain!

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