AD ASTRA
ASSOCIAZIONE ITALIANA ASTROFILATELIA

English Edition **N° 12 – March 2012**

ATV-2/MagISStra flown cover

On February 28th we had the pleasure of presenting to the Italian astronaut Paolo Nespoli the folder containing one of the covers which ATV-2 carried last year to the ISS. Paolo Nespoli had personally recovered from the ATV the covers which were then signed by him and the by the other 5 members of the Expedition 26-27: Dmitry Kondratyev, Cady Coleman, Andrey Borisenko, Alexander Samokutyaev and Ron Garan. Besides the ISS octagonal board "seal", Nespoli also put on the cover his personal MagISStra hand stamp, which after the mission has been made unserviceable.

«*It has been quite an atypical operation* – Nespoli commented, recalling the difficulties of signing all those covers in a weightless environment – *we had to be very careful, because everything was flying away*». The signed covers were then stored in the PMM (Permanent Multipurpose Module) and finally embarked on STS-135, were returned to Earth on the historical last flight of the Shuttle.

The AS.IT.AF. flown and signed cover is presented in an elegant folder designed by the Artist **Alec Bartos** and is reserved for the AS.IT.AF. Members only.

ATV, a crucial supply vehicle for the Space Station and a new challenging topic for Astrophilately collectors

Umberto Cavallaro

"*The arrival of ATV was welcomed in a festive atmosphere by the ISS inhabitants, since it carried fresh meals and some personal presents".* So Paolo Nespoli recalls the docking of ATV-2 to the International Space Station on Feb.16, 2011. "*You know: after a while, after three months of freeze-dried foods and tin cans, all of them have the same taste*".

After the retirement of the Shuttle, the role of ATV has become crucial for supporting ISS activities which now rely on the essential supplies carried by the European ATV, the Japanese HTV and the old Russian Progress, with its one third of the load capacity of ATV.

ATV-1 Jules Verne

Since its first flight, ATV-1 Jules Verne has become a subject for collectors.
The French philatelic Club "La Marianne" (EADS Astrium – France) has issued 4 commemorative covers – offered in a folder – marking respectively ATV leaving the Estec Test Centre (July 13, 2007), Launch of ATV from Kourou (March 9, 2008), tracking by the CELM (March 10, 2008 – cancelled at Biscarrosse, France) and docking to ISS (April 4, 2008 – postmarked at the Control Centre of Toulouse, France).

Two commemorative covers issued by the philatelic Club "La Marianne"(EADS Astrium – France) respectively for the Launch of ATV-1 (Kourou March 9, 2008) and for docking to ISS (April 4, 2008 – postmarked at the Control Centre of Toulouse, Fr.)

Also the ERNO-Philatelie Club (EADS Astrium – Germany) issued 3 commemorative covers respectively for the launch from Kourou (March 9, 2008) and for the docking to ISS (April 4, 2008 – postmarked at the Control Centre of Toulouse (France) and Korolëv Control Center in Moscow, which was in charge of the docking.

Two commemorative covers issued by ERNO-Philatelie (EADS Astrium – Germany) for the docking to ISS (April 4, 2008 – postmarked at the Control Centre of Toulouse, France and at the Korolëv Control Center of Moscow)

ATV-1 also delivered to the ISS a special protective CTB (Cargo Transfer Bag) containing 1200 covers prepared by the French Club "La Marianne" and 550 cards prepared by the German Club "Erno-Philatelie" (EADS-Astrium, Bremen).

On the left, one of the French covers (numbered 1-1200) flown on ATV-1 Jules Verne. Twenty five covers were marked onboard with the ISS octagonal seal and autographed by the Russian Cosmonauts Sergey Volkov and Oleg Kononenko. On the right, one of the German cards, numbered 1-550. All the items were stored in the Leonardo MPLM (Multipurpose Logistic Module) and returned to Earth on November 30, 2008, on board the Space Shuttle Endeavour STS-126 mission which landed at Edwards Air Force Base in California. The CTB, as a non-priority cargo, was recovered from Leonardo on February 4, 2009 and the covers were postmarked at the KSC Post Office.

«Flight Water»

ATV-1 Jules Verne, in 2008, for the first time carried to ISS drinking water for "use in space", the so called "Flight Water". The water used onboard the ISS has to meet the technological and hygienic requirements of the Station's international crew. Two different quality standards have been set, respectively for the Russian Cosmonauts and the American Astronauts. While Russians require highly mineralized water, fluoridated and disinfected with silver, Americans prefer less mineralised and disinfected with Iodine.

According to a contract signed in 2002, the *Flight Water* is supplied by SMAT (Società Metropolinata Acque Torino), the Public Water Company of Turin (Italy) where Thales Alenia Space is based.

Among the different water sources managed by SMAT it was easy to find the waters able to meet both the Russian and American requirements. Hence the spring water from Pian della Mussa mountains is used for the American Astronauts, while the water for the Russians is taken from a well in the western area of the Turin Metropolitan District.

A non-postal stamp was issued to celebrate the "Flight Water" agreement in 2002

ATV-3 will carry again "Flight Water" in space. A special cover has been prepared by AS.IT.AF. (see the cachet above), and will be cancelled in Kourou on the launch date.

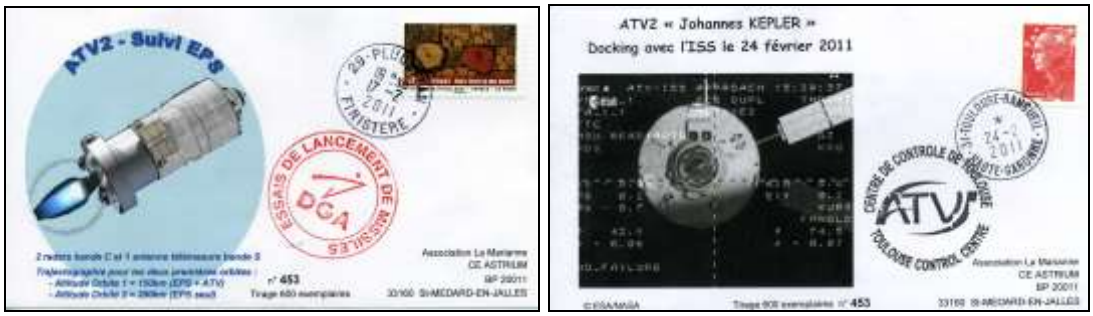
		Launch	*docking*	*undocking*
ATV-001	Jules Verne	9 March 2008	3 April 2008	29 September 2008
ATV-002	Johannes Kepler	16 February 2011	24 February 2011	21 June 2011
ATV-003	Edoardo Amaldi	23 March 2012		
ATV-004	Albert Einstein	February 2013		
ATV-005	Georges Lemaître	February 2014		

5 ATV units are planned.. the structure of ATV-4 was delivered in December last year. . ATV-5 is currently in production in the plants of Thales Alenia Space (Turin, Italy)

3

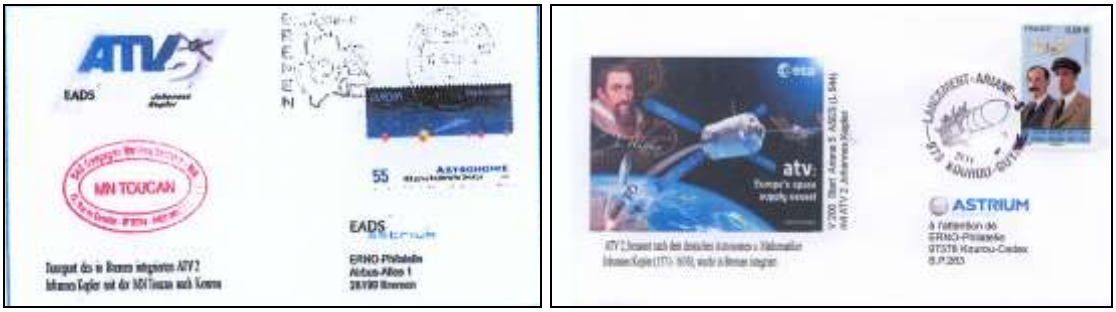
ATV-2 Johannes Kepler

Two commemorative covers were issued by "La Marianne" to celebrate launch and docking.



Two "La Marianne" covers: on the left, tracking of ATV-2 (Feb. 17 2011 – cancelled at CELM, Centre d'Essais de Lancement de Missiles in Pluguffan, France),on the left: docking of ATV-2 with ISS (Feb. 24 2011)

ERNO-Philatelie issued a ship cover and a launch cover.



Cover prepared for the transfer of ATV-2 to Kourou onboard the ship MN Toucan. Pictorial postmark of Bremen on the day of the delivery (11-05-2010: cancelled on the back at its arrival in Kourou on 25-05-2010. On the right launch cover (Kourou 16-02-2011).

ATV-2 also carried to the ISS philatelic items: 600 covers prepared by "La Marianne", 550 cards prepared by "Erno-Philatelie" and 600 covers prepared by Thales Alenia Space.

(A) (B)

(C) (D)

The CTB #1442, stored in the ATV-2 Einstein, contained an ***ISS cover kit*** *(600 covers type "A" prepared by the French club* La Marianne*), a* ***First Day Cover Kit*** *(550 cards type "B" prepared by the German Club* Erno-Philatelie*) and a* ***Italian Cover Kit*** *(Type "C"). Following an Agreement with* La Marianne*, AS.IT.AF. arranged to have 153 covers marked with the octagonal ISS onboard stamp and to have them signed by all the Expedition 26-27 crew. On the first 74 covers the Italian Astronaut Paolo Nespoli also added the stamp of its MagISStra mission (type "D").*

Shortly, on March 23, 2012 ATV-3 Edoardo Amaldi will be launched from Kourou, carrying to the ISS 7 tons of supplies, water, air, spare parts dry cargo and fuel, marking the start of ATV as an annual production-line supply vehicle for the Space Station: the next ATVs, Albert Einstein and Georges Lemaître, will follow in 2013 and 2014, positioning Europe as an essential partner in operating the orbital outpost.
Two commemorative covers were prepared by AS.IT.AF. respectively in December 2010 and December 2011, for celebrating the delivery of the ATV from the premises of Thales Alenia Space in Turin (Italy), where the Pressurized Cargo Carrier is produced, to the prime contractor's EADS Astrium facility in Bremen (Germany), for the final integration.

AS.IT.AF. covers issued for the delivery of ATV-3 (Dec 18, 2010) and ATV-4 (Dec. 27, 2011), leaving Thales Alenia Space's premises for EADS-Astrium. Actually due to technical reasons, the Beluga Aircraft couldn't arrive in Turin and the ATV-4 was stored for two days at the Caselle Airport. The cover was therefore cancelled on Dec. 30 2011, the day on which it was possible to embark ATV on the Beluga and deliver it to Bremen .

Partners of ATV Consortium
EADS Astrium - Bremen (DE)
Programme Management, design, development and production of the Service Module (SM), integration of SM and ICC (Integrated Cargo Carrier) coming from Thales Alenia Space
Thales Alenia Space – Torino (IT)
Design, development and production of the Pressurized Cargo Carrier (PCC), integration of PCC and RDS, delvery of the ICC to EADS-Astrium.
RSC-Energia – Korolëv (RU)
Design, development and production of the Russian Docking System (RDS), RFS (propellant Re-Fuelling system) and RECS (Russian Equipment Control System)

Stamp by Alec Bartos awarded with second prize

The "COSMOS 2011" souvenir sheet designed by our Romanian AS.IT.AF. Member the artist Alec Bartos has been chosen by the National Philatelic Commission among the 3 most beautiful postage stamps which will represent Romania at international competitions in 2012.
"*Considering the artistic conception of the design, their originality and personalization, the harmonization of colours and the correlation with printer requirements*", the "COSMOS 2011" souvenir sheet was awarded 2nd place (See http://alecbartos.com/?p=1154).
Our warmest wishes to Alec Bartos for his future successes.

VEGA: the Italian Proud

by **Paolo D'Angelo**

On 13th of February the Italian-European VEGA rocket was launched for the first time from the European Spaceport in Kourou, French Guiana.

VEGA, an acronym for Vettore Europeo di Generazione Avanzata (Next-Generation European Launcher), is a brand new small solid-propellant launch vehicle conceived, designed and produced in Italy. Its history dates back from the Sixties, when Italy launched its satellites from the equatorial San Marco offshore launch site in Malindi, Kenya, using the American Scout rocket. After the bankruptcy of LTV, Scout-s developer, the team led by Professor Luigi Broglio started to design the San Marco-Scout launch vehicle, an improved version of the American rocket. The project didn't succeed, but the studies were resumed few years later – also with the contribution of Professor Carlo Buongiorno, who recently passed away – and led to the current VEGA.

As the base of the Malindi platform was in a state of advanced disrepair, Italy became involved in the ESA project, which enlarged the participation to half a dozen of European countries, Italy being the main contractor.

Vega, with a height of 30 m, is a launch vehicle for payload masses ranging from 300 to 1500 Kg, in low orbit. Vega has three solid-propellant stages and a liquid-propellant upper module, called AVUM (Attitude and Vernier Upper Module).

Produced by Avio in its facilities in Colleferro, near Rome, Italy, Vega features new technologies like the carbon-epoxy filament-wound motor casing: the largest in the world for a monolithic motor. This initiative is a world first and so is attracting the interest of other competitors in the space industry.

Vega's second and third stages are based on Zefiro solid-propellant motors developed by Avio, respectively called P80FW (first stage), Zefiro-Z23 (2^{nd}) and Zefiro-Z9A (3^{rd}).

In its first qualification launch VEGA carried a passive satellite called LARES (Laser Relativity Satellite), put in orbit on behalf of ASI (Italian Space Agency). The satellite, built by Carlo Gavazzi Space, is a 376 mm-diameter sphere made of tungsten alloy, weighing about 400 Kg, and it is nowadays the heaviest artificial body in the entire solar system. Its operational orbital life is expected in the range of 25.000 years.

VEGA's multi-payload also included ALMASat-1 (Alma Mater Satellite) – a small 12,5 Kg satellite for technology demonstration, developed and built by the University of Bologna, Italy – and seven CubeSat picosatellites: 1 kg, 1 W, 10 cm cubic structures, provided by European universities.

After this technical data, let me spend few words on the emotional aspects of a launch yours truly had the chance of watching live. In the early morning, on a small square called Agami – 7 Km far from the launch pad –half a dozen buses arrived, full of Italian workers and technicians who had been involved in the VEGA-s development, all of them in their dress blues with the Italian flag on the shoulder. On a muggy morning, surrounded by mosquitos, as usual in the French Guiana, we observed the launch, driven – it almost seemed !! - by the incitements of people, even more than by its engines.

A crackling and after few moments, also thanks to its solid propellant, it disappeared from our sight.

All of us could follow the launcher through the large monitors showing the images broadcasted by the Control Centre. All was nominal. At every ignition of the engines of a new stage you might hear enthusiastic ovations and see waving flags. When LARES was released, people got emotional and, with the hand on the heart, struck up the national anthem. And you could catch what the launch of VEGA was meaning for most of them: years of hard work, in adverse conditions, not only because of the tropical climate but also for the disbelief of those who has not been involved in the development of this launcher and had rather enjoyed the schadenfreude of its earlier failures. Not only the Italian rocket – launched in another country, on another continent – was now flying in the sky, but also the heart of each of them. For all of us, an indelible memory, full of emotion for a proud all-Italian.

VEGA at first launch

by **Luigi Bussolino**

With the first successful launch of the "VEGA" missile was concluded a period of design and development that allowed ESA to have a launcher for small satellites and then offer on the market a complete family from the small "VEGA " to the powerful ARIANE 5, passing through the Vostok ex R7.

Italy through ASI is the main sponsor of the Italian programme that became all-European; looking at the movie of the launch in Kourou, it has been a satisfaction for me to see many faces of young engineers and technicians showing happiness for the successful launch (but how much do all those missions cost today?).

I recalled the BPD engineers (former Bombrini Parodi Delfino with whom I had the chance to collaborate for many years such as Messrs. Scolastico, Solfanelli, Baldi, Borsò and many others, who for longtime worked seriously to consolidate the various technological experiences (starting from the solid propellant Flexadyne production, the utilization of carbon fibres for the nozzle and the "filament winding" for the case). All those improvements allowed them to design the solid propellant apogee kick motor of the SIRIO 1 satellite, the motor of IRIS launcher and a series of other solid propellant motors for the P80 and then the P23 of the current "VEGA", notwithstanding the various events connected to the property and organization changes of the former BPD, passed under Snia Viscosa and then to FIAT becoming BPD Defense and Space, later incorporated in 2004 in Fiat Avio, that now includes all the aerospace activities of the large expanded FIAT group.

VEGA has been saluted in the media as the "symbol of Italian genius". We look forward to VEGA launching other payload in space and renew the success of today.

The Vega Story

It was called "the launcher of discords" because from the beginning it was creating discords among the various parts involved in national space programmes. In the 70's Prof. Broglio, who found the American launcher "Scout" perfect for his projects, when LTV-LORAL decided to retire the launcher from the market for obsolescence and proposed to the LTV the development of a more powerful version called "San Marco-Scout". He believed the Italian industries unable to undertake a research and development programme for a launcher already defined by CRA and also be sufficiently economical to involve an American company knowing very well the product. From the other side ASI was delaying the founding and the strategic decision concerning an Italian launcher and the support to the San Marco range in Kenya at Malindi for improving the structures and so extend its life.

ASI in the frame of the National Space Plan (PSN) 1990-94 decided to support the development of an Italian launcher for small satellites and then many people wondered (see an interview of Prof. Carlo Buongiorno to Spazio Italia) if for Italy, even if with big ambitions in space activities both from science as well as technological/industrial standpoint, it was strategic to have a launcher for small satellites, connected to the availability of a range, in which in any case for at least twenty years people were trained to launch and track, but had required investments for the needed improvements.

ASI seemed to support this approach when a specific recommendation to the Italian Parliament in this sense was issued. "The objective was not only to import components and materials from USA - said Prof. Buongiorno - but also to allow the San Marco-Scout to become progressively an Italian product with the chance of further development". PSN at that moment was supporting two programmes: the first managed from the Rome University for a new launcher design and a second for industrial development and further evolutionary studies.

The second programme was given to BPD for an amount of 120 billion liras. In the meantime the discord between ASI and Rome University was growing because the judge forced ASI to complete the payment of 90 billion liras to the University for past activities and then the agreement between ASI and the University "La Sapienza", regularly signed with a initial disburse of 30 billion liras was cancelled, saying that the San Marco Programme as initially proposed was no longer feasible.

The launcher issue did not go to court but rested in a limbo of hope because from one side Rome University was proposing its twenty years of Scout management without any failure, while from the other side BPD, with the money obtained, had already started on the development of a solid propellant booster, able in any case to support both the LTV solution as well as the national version, and to study what became for long time the nightmare of BPD, i.e. the guidance system and its main elements (the launcher's brain).

ASI later, having LTV difficulty in providing Scout elements, no longer required by NASA, started to study another launcher configuration, replacing the second and third stage of the original Scout and introducing the solid propellant motor of IRIS launcher as the fourth stage. At this time it was still possible to integrate the system know-how of LTV-LORAL with the technologies currently available in Italy, such as the solid propellant Flexadyne, for which BPD had a license, the carbon fibre structure made by *"Filament winding*" derived from the MAN experience, the carbon-carbon nozzle and throat with thermal shields of Aeritalia, derived from ELDO.

Prof. Broglio was thinking foolish the Italian engagement in the development of a complete launcher, well understanding the difference between the development of a single engine and the project of a complete launcher, surely requiring many years of activities and large funding… And he was not that wrong…

The BPD undertaking was important: they had experience but not enough to approach the guidance and navigation system development as well as the thrust control, the vibrations and the noise at launch with the direct effect on the missile structures (and this even if they were supported by the rich FIAT of the '90s). The development of the launcher with P80 engine was going slow till ESA,

and mainly France, around 2000 understood the importance of including in the launcher family a small one specially dedicated to small satellites.
In 1995 BPD organized a congress, and I was invited to participate, to discuss the future of the small launcher, showing a dozen possible payloads, demonstrating that there might be possible clients and then convince ESA about the return of their investment; I well recall the happy face of Mr. Procacci of ASI, dreaming future assembly lines for many launchers (forgetting that this was neither the vocation nor the responsibility of the Italian Space Agency).
I believe that industry managers as well as politicians moved and then ASI, even if very generously funding the programme, passed to ESA a hot programme. For sure ESA it has been highlighted from the Ariane 5 development nearing conclusion, a powerful launcher able to deliver together into space three telecom satellites, that there was not an intermediate launcher for single satellite

and then started talks with Russia for having available at Kourou range the old but reliable Vostok, that in 1961 launched Gagarin into space and has been operating with a success percentage near to 99% as measured on one thousand launches. The small launcher was then integrating the family for the clients of ARIANESPACE and here began the final part of the VEGA story, with the P80 first stage based on solid propellant, a second and third also solid propellant stages, and finally a fourth based on liquid propulsion for launch and manoeuvre in orbit.
If I remember correctly, between the first launch of a P80 in Sardinia at Perdasdefogu, in the Salto di Quirra range in 1992 – that step by step was further developed for launching into orbit an initial 700 kg payload that progressively became 1500, and the development of the intermediate stages and of the liquid fourth stage (called AVUM for Attitude & Vernier Upper Module) – a long period of time passed for giving to the launcher the orbit injection performance necessary for competing on the international market. Many years of studies, development and tests that culminated today with the first successful launch of VEGA.

The destiny of the small launcher

It is my personal opinion that, beyond this actual success, the amount of money spent by ASI was excessive for the following reasons.
Let's say that the small satellites that everybody is anxiously waiting for, would be the technological descendants of the present satellites weighing some tons: when in the future advanced technologies will be available, surely the electronic apparatuses will have better performance and reduced size, as in past, and then the structure required to support the various subsystems will be smaller and so a satellite of two or three tons will reach two or three hundred kg or better twenty or thirty kg. An example is provided by the Space Telescope "HUBBLE", whose on board computational capacity was based on a 286 computer technology; after ten years the Shuttle astronauts in EVA activities substituted that with a 386 space qualified computer (when on the ground the technology based on 586 was used) increasing the overall telescope performances of many times……
When we speak about "small satellites" we mean small size satellite but with performances of the bigger one and this today is not yet possible. Perhaps in the next ten years… I was also a sponsor of "small satellites" and in 1994, in occasion of a congress in Tremezzo, I organized a research project, trying to test the opinion of industries but mainly of the scientists; in fact the satellite

several times deployed in orbit scientific experiments created by professors in support to specific researches.
The result of this research was discouraging and resulted in critical comments such as “small satellite = small science “ and similar. The scientists did not appreciate the possibility of flying with lower costs, shorter development periods of time and then many advantages in respect to the current situation where a scientific satellite ,from the proposal stage, the selection , the funding to the construction, launch and operations in orbit requires fifteen to twenty years, Many times for containing cost the Agencies integrated on board the same satellite more than one experiment, having the same bus, but this means satellite became bigger and heavier, exactly the opposite of what was planned.
What is required is a quantum shift in microelectronics and in the “nanotechnologies “ in order to concentrate the performances of a current satellite of some tons into a probe of tenth or hundred Kg; for this reason I would said that they are still in the mind of the God of Space.
Till now some small satellites have been used for the development of new technologies applicable to lunar missions and to Galileo navigation system such as Proba and they have been successful ; in addition to that there are the scientific satellites of SSTL (Space Satellite Technology Limited founded by English Sussex University) and those designed and manufactured by students of aerospace university such as TUB in Berlin and Rome University of Prof. Graziani that weigh 20 kg.
These enterprises are usually not supported by big funding, but have to take advantage of the occasional launch as partners of other larger satellites whose sponsors pay the major part of the launch price or of the first qualification launch of a launcher in development for which no insurance company will accept the risk (as happened to ESA when decided to fly four CLUSTER satellites on the first launch of ARIANE 5 … they were lost together with the launcher).
The VEGA payload for the first launch was formed from seven cube TUB satellites , two Italian satellites (ALMAsat of Bologna University and that of Prof. Graziani) and then the LARES satellite of Prof. Ciufolini in Rome (a satellite called for long time LAGEOS 3 because it had to work in conjunction with LAGEOS 2 launched by Italian IRIS in 1992 and with LAGEOS 1 launched in 1976 (Prof. Ciufolini had to wait for a fifteen years or more before seeing it in orbit).

Another issue unfavourable for VEGA is the cost that in 2010, when I was interested in it for launching a small satellite, was around €30M (perhaps 32…); this price will make hard its life against private American launchers such as SpaceX Falcon 1 to 9 (costing less than one third) and Russian missiles Rockot SS19 type , available in large quantity and to be destroyed at certain dates due to SALT 1 and 2 treaties.

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Italy and Shuttle - Spacelab (part 2)

Umberto Cavallaro

The Spacelab programme was unique for many reasons.
First of all it represented the first European manned space project.

The demarcation of obligations as specified in the two diplomatic MoUs (memoranda of understanding) signed by NASA and ESRO in 1973 left to the European partner the whole financial and industrial responsibility of defining, designing, developing, qualifying and delivering to NASA one prototype Engineering Model (EM), one Flight Unit (FU), ground engineering support for the first two flights and spares/documentation. NASA was to support the European effort, provide general managerial and technical information, monitor ESRO's technical progress, specify interfaces, develop the tunnel, operate Spacelab within the Shuttle Programme and procure a second Spacelab if the first met its design and price requirements.

On the cover, signed by the ESA astronauts Ulf Merbold, Ernst Messerschmid, Reinhard Furrer and Wubbo Ockels, the main contractors are listed, including: VFW-Fokker/ERNO (later MBB/ERNO; prime contractor), Aeritalia (Italy - later Thales Alenia Space - PM structure, Igloo, thermal Control), Matra (France - command/data management), British Aerospace (Pallet), AEG-Telefunken (electrical power system), British Aerospace (pallet structure), Dornier Systems (Germany - environmental control and life support system), Fokker (The Netherlands), SABCA (Belgium) and Kampsax (Denmark)

US-European co-operation on Spacelab was lengthy and complex. Problems of interfaces between Spacelab and the Shuttle had to be solved while schedules and technical features of the Shuttle were progressively changing. On one hand the American programme changed over time and its originally very ambitious scope was reduced, due to a severe limitation of American funds. On the other hand, the Spacelab programme demanded from Europe much more than initially foreseen and "the large number of interface modifications needed and the delivery to NASA of more hardware than initially foreseen, greatly contributed to this increase in expenditures". [1]

In US eyes, for the first time in the history of the U.S. space effort, the design and development of a major element of a manned space vehicle was entrusted to a foreign agency and to a group of countries which had never before built such a system. This choice respected however some of the traditional concerns of NASA in co-operation with foreign countries: the space laboratory had to be self-funded (by Europe), essentially separable from the Shuttle, even if it was an integral part of the post-Apollo programme as a whole, and it didn't require the transfer of highly advanced technical information.
This implied that US assistance would be "limited": if found necessary and appropriate, Europe would be allowed to buy existing American equipment as black boxes.

Seen from the European side, it provided Europe with the systems development and management experience needed to move into the exclusive manned space flight arena.

At the end, in terms of programme costs, ESA completed its part within 140 percent of its original estimate, NASA's development programme was completed within 169 percent of its original

[1] HSR 21, p. 32

estimate, and the NASA follow-on procurement was only 25 percent of the first estimate, primarily because of reduced content and favourable dollar exchange rates.
As a result, Europe had a manned space system capability and the U.S. had a really versatile laboratory system, to use with its Space Shuttle, several years before it would have been possible if the United States had had to fund it on its own. And this is why the Spacelab programme was criticised in Europe as being a 1 billion dollar gift to the U.S. Space Shuttle programme: "Europe's most expensive gift to the people of the United States since the statue of Liberty".[2]

However despite divergences and discussions during the negotiations of the agreements and their implementation, at the end of a decade of development, with the successful completion of the Spacelab 1 mission, all doubts and perplexities were removed. The Spacelab had demonstrated in a convincing fashion its ability as a useful tool capable of expanding the Shuttle's ability to conduct science on-orbit manyfold or, better, capable of transforming the Shuttle into a first generation Space Station.[3]

Spacelab 1

SPACELAB 1, which flew in November 1983 on STS-9. was considered a sort of *verification flight test* (VFT) for the European-built Spacelab system, the primary objective being to verify the Spacelab system and subsystem performance capability and to demonstrate the ability to conduct advanced scientific research in space, with astronauts and payload specialists working in the Spacelab module and coordinating their efforts with scientists at the Payload Operations Control Center (POCC) located at the Johnson Space Center.

Seventy-two experiments in the joint ESA/NASA programme would test the Spacelab system and its onboard crew in a "Multidiscipline mission" with a large scientific programme. The chosen experiments fell in fact into five space disciplines: astronomy and solar physics, space plasma physics, atmospheric physics and Earth observations, life sciences, and materials science. There was something for everyone, including two experiments coming from Italy :

- Three-Dimensional Ballistocardiography in Weightlessness (prof. A. Scano - *Life Sciences*)
- Adhesion of Metals in an Ultra High Vacuum Facility (G. Ghersini, G. Grugni, F. Rossitto, P. Sona - *Materials Science*)

John W. Young, the veteran of five NASA space flights and one of the most experienced astronauts was chosen as the commander of the flight crew for the Spacelab 1 mission. He had flown two Gemini missions, made two trips to the Moon in Apollo, and had commanded the first Shuttle flight in April 1981. Assisting him as pilot would be Major Brewster H. Shaw, Jr., USAF, making his first space flight, although he was an experienced test pilot and flight instructor with 3500 flying hours in over 30 types of aircraft.
Drs. Robert A. R. Parker and Owen K. Garriott would be the Mission Specialists. Both had valuable Skylab programme experience, Parker as Program Scientist on the ground, and Garriott as Science Astronaut on the Skylab *3* mission. Garriott, a ham radio buff, would add special interest to the mission with his planned attempts to communicate to the ground with a small hand-held radio unit. Garriott and Young were prepared to perform any contingency EVA if required. The five Payload Specialists selected by ESA and NASA in 1978 as candidates for this mission had been narrowed to two. Claude Nicollier, one of the early ESA candidates, was in training to become a Mission Specialist and would probably fly on a later mission. ESA had selected **Ulf Merbold** as its Payload

[2] HSR #19, p. 35
[3] HSR #21, p. 3-4

Specialist for this mission. Wubbo Ockels would serve as a backup Payload Specialist and would be located in the JSC Payload Operations Control Center (POCC) during the mission to communicate with the onboard science crew. Dr. Byron K. Lichtenberg would be the NASA Payload Specialist, and Dr. Michael L. Lampton would be his backup, also playing a key support role in the POCC.
This was certainly the most qualified, experienced, and trained flight crew ever selected for a space mission. The scientists had been intimately involved in the selection and preparation of the experiments and in the development and qualification of the basic Spacelab system.

STS-9 was the most ambitious Space Shuttle mission to date, characterized by many "firsts":

- First flight of non-career astronauts (Payload Specialists Merbold and Lichtenberg)
- First flight on a **NASA** mission of a non-American (Merbold, a German)
- Longest Shuttle mission (planned for 9 days)
- Largest Shuttle crew (Commander, Pilot, two Mission Specialists, two Payload Specialists)
- Two shifts for 24-hour operations
- The heaviest payload to date
- First operational use of the Tracking and Data Relay Satellite System

Experiments were already under way during liftoff as Lichtenberg and Merbold wore biomedical headgear to monitor their eye motions during the launch phase. Once in orbit, Lichtenberg activated the lymphocyte experiment and within 3 hours of takeoff the crew was ready to open the airlock hatch and enter the Spacelab.
As in previous manned flights, half the crew experienced varying degrees of motion sickness, which was not discussed in the open press for reasons of privacy.
In fact, some of the experiments would be expected to drive the subjects to the brink of nausea, so a high percentage of such problems in this mission would not have seemed unusual.
After a "very nominal" liftoff (as described by the NASA Launch Manager Al O'Hara) and a highly successful ten-days in space, the STS-9 mission experienced a thrilling conclusion.
During orbiter orientation, four hours before re-entry, one of the flight control computers crashed when the RCS thrusters were fired. A few minutes later, a second crashed in a similar fashion Although the crew did not realize it at the time, leaking hydrazine fuel from two of *Columbia's* auxiliary power units had started a small fire that led to an explosion 15 minutes after landing. Fortunately, no serious damage was done and the crew was in no imminent danger.
It was also the last time the old STS numbering was used until STS-26 (see the 'box" in the next page).
«We, as Aeritalia, were involved – recalls Piero Messidoro, responsible, at that time, for the active Thermal Control System – *as we would have been in any subsequent Spacelab mission, in verifying and monitoring the actual behaviour of both the structure and thermal control subsystem in comparison with the expectations. This activity was carried-out in real time in support of the European team following the mission in NASA. In addition we were requested to analyse and predict the behaviour of the above subsystems for the new missions especially in presence of changes in the basic configuration. Updated values of mass, centre of gravity, moment of inertia for the module structure as well as thermal dissipation for module and pallets thermal control due to the new payloads or to any hardware improvements were calculated and compared with the baseline. If acceptable they became reference points for mission follow-on and post flight analyses».*

Spacelab 3

According to the original plan, Spacelab 1 was scheduled for the 10th Shuttle mission, Spacelab 2 with the 14th and Spacelab 3 with the 20th, in April 1984.

Due to problems with the TDRSS (Tracking and Data Relay Satellite System) and changes in DoD mission plans and, mainly, to the delay in finalizing the Instrument Pointing System essential for the mission's experiments of Spacelab 2, all the planning was completely revised: Spacelab 1 mission was flown on the 9th Shuttle flight, Spacelab 2 was postponed. and Spacelab 3 was scheduled for the seventeenth flight of Shuttle: mission STS 51A.

Spacelab 3 was planned to be the prototype of a NASA-dedicated Spacelab mission. Rather than containing experiments covering a broad range of disciplines as in Spacelab 1, the Spacelab 3 payload would focus on microgravity for most of its investigations, with the Orbiter in a gravity gradient attitude, its tail pointed toward the Earth, to provide the best stability possible. As many as 50 firings per hour of the vernier thrusters would minimize the impact on the Orbiter and its payload to less than one-thousandth of a g-load.

The confusing flight numbering system for Space Shuttle missions

NASA shuttle flight numbers can be confusing. Following STS-9, the flight numbering system for Space Shuttle missions was changed. Thus, the next flight, instead of being designated STS-10, became STS 41-B, the first digit staying for the fiscal year in which the launch was to take place (the "4" being 1984); the second numeral represented the launch site (l for KSC and 2 for Vandenberg AFB, although no shuttles was ever launched from Vandenberg); the letter represented the order of launch assignment, e.g., "B" in STS-41B meant it was the second launch scheduled for fiscal year 1984. After the 1986 Challenger tragedy. NASA returned to the original easy-to-understand numbering system based on sequential flight numbers: the first mission when flights resumed after Challenger was the 26th shuttle and was numbered STS-26. Unfortunately, even the simple scheme became confused when NASA was forced to move flights around in the schedule. With STS numbers assigned 19 months in advance, the agency decided each flight would keep its number through all schedule changes.
It turned out – according to several astronauts' NASA oral histories – that NASA administrator James Beggs suffered from triskaidekaphobia, the fear of the number 13 [4]. STS-41D was supposed to launch on April 13th, which in 1984 was a Friday, and Beggs simply wanted to avoid having an "STS-13" after what had happened with Apollo 13.

[4] vedi www.collectspace.com/ubb/Forum30/HTML/000950.html

Spacelab 2

The laboratory module Spacelab-2 was the primary payload of mission STS-51-F, launched from Kennedy Space Center, Florida, on 29 July 1985, after the first launch attempt on 12 July 1985 was halted with the countdown at T-3 seconds – the main engine had already been ignited – when it was discovered a malfunction of a coolant valve in the number two SSME (Space Shuttle Main Engine). "*It was the longest 3 seconds I've ever experienced"* Commander Gordon Fullerton told reporters later. The launch was rescheduled for July 29.

Like the previous two Spacelab missions, Spacelab 2 was a verification test of the Spacelab system. This time, however, there was no laboratory module or habitable module, but pallets only, and the crew was confined to the Orbiter crew compartment. The Spacelab 2 payload comprised 13 investigations mainly focusing on 3 scientific disciplines: astronomy, solar and plasma physics, and biology (as shown in the mission emblem), aiming at demonstrating to a variety of users the validity of the Spacelab pallet-only mode and the performance of the Instrument Pointing System. The flight marked in fact the first time the ESA Instrument Pointing System (IPS) was tested in orbit. This unique pointing instrument was designed with an accuracy of one arcsecond. Initially, some problems were experienced when it was commanded to track the Sun, but a series of software fixes were made and the problem was corrected. The IPS was fine-tuned in view of its planned use for observing Halley's Comet during the next year (a plan that would be cancelled following the *Challenger* disaster in January 1986).

Despite one of the three French-built Matra computers was totally out of service (and this heightened the old confrontation with the US manager who, since the beginning, intended to use IBM machines), this was a very successful scientific mission. Almost 13 000 commands were transmitted to the Orbiter, exceeding any previous Shuttle flight by 50 percent. Approximately 1.25 trillion bits of data were transmitted to the ground, requiring 230 miles of magnetic tape to store.

Spacelab D1

STS-61A was the 22nd Space Shuttle mission and was the first Spacelab flight entirely funded and controlled by one country: West Germany. Hence the name D1 (for Deutschland 1).
The mission marked the first utilization of the second Spacelab module LM2, purchased by NASA for its own use from ERNO, developed by former Aeritalia (now Thales Alenia Space) and integrated in Germany by ERNO.

Germany reserved this mission, flown in October-November 1985, for use by its universities, (deletion) industries and other research institutions. Germany wished to benefit as much as possible from the Spacelab project in which it had invested 55% of the European budget, sometimes blamed by the other European Partners

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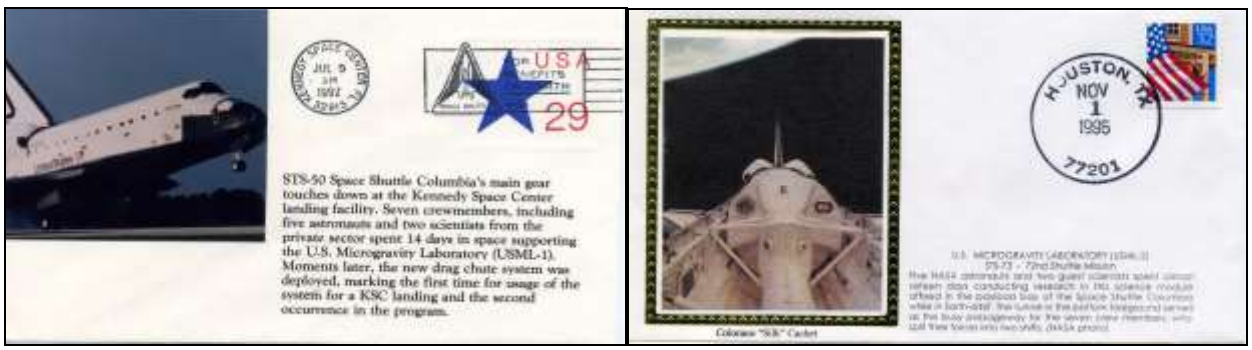
who "did not like to leave too much control in German hands". [5]
Payload operations and scientific research carried out during the seven-day mission were controlled from the German Space Operations Centre in Oberpfaffenhofen, Germany, near Munich, instead of the regular NASA Centre which only operated the Shuttle, and was responsible for overall safety and control functions throughout the flight.
The mission holds other records also, since it was the only shuttle flight to launch with a crew of eight, and still holds the record for the largest crew aboard any single spacecraft for the entire period from launch to landing. On board the Space Shuttle *Challenger,* in its last successful flight. were in fact Henry Hartsfield, Steven Nagel, Bonnie Dunbar, James Buchli, Guion Bluford, Germans Ernst Messerschmid and Reinhard Furrer and ESA astronaut from the Netherlands Wubbo Ockels who became the second ESA astronaut and the first Dutch citizen in space (not the first Dutch-born astronaut, as he was preceded by naturalised American Lodewijk van den Berg, who flew into space five months earlier).
More than 75 scientific experiments were completed in the areas of physiological sciences, materials science, biology and navigation.

22 Spacelab Missions

a similar misdsion, *Deutschland 2* (Spacelab-D2 or DLR-2), was planned in 1988, but after the *Challenger* disaster, was postponed until 1993 (STS-55) e and became the first German human space flight after the German reunification.

Even Japan, in 1992, funded its own Spacelab mission: Spacelab-J on the Shuttle STS-47. on materials science and 20 in life science, mainly sponsored by NASDA, the Japnese Space Agency. Fopr the first time a Japanese astronaut – Mamoru Mohri – flew in space.

Obviously even the United States has its own dedicated Spacelab missions. In particular the missions USML-1 (1992) e USML-2 (1995) were completely devoted to microgravity experiments. In both the mission the module LM1 was used, onboard the Columbia shuttle.

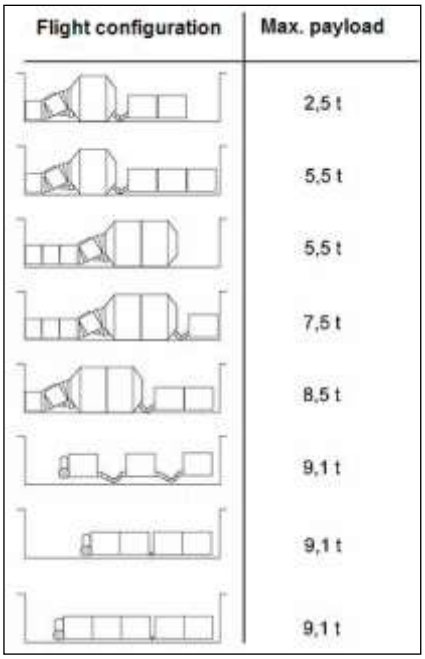


On the left, a cover commemorating the mission USML-1 (STS-50): on the right mission USML-2 (STS-73)

[5] HSR #19, p. 39

USML-1, taking advantage of the long-duration of the mission, Completed 31 microgravity experiments in five basic areas: fluid dynamics, crystal growth, combustion science, biological science, and technology demonstration provided new insights into the theoretical models in use. The mission plan of USML-2, incorporated technical knowledge gained in the previous mission and run 14 experiemnte which enhanced procedures and operations.

A Spacelab LM2 module – onboard of STS-71 – was used in the first joint Shuttle/Mir mission during which Americans and Soviets run a wide range of experiments in 7 disciplines: car-diovascolar and pulmonar physiology, human metabolism; neuroscience; hygiene, sanitation and radiation; behavioral performance and biology; fundamental biology; and microgravity research. The Mir 18 crew served as test subjects for investigations.



Different flight configurations

Different Spacelab configurations flew alltogether in 22 Shuttle missions between November 1983 and April 1998.
After that, the scientific experiments were run aboard the International Space Station, where modules derived from Spacelab exist.
The list of the Spacelab missions is shown in the following table.

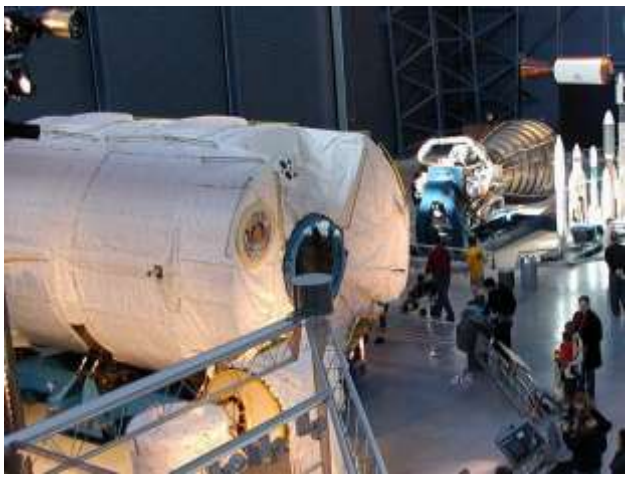
Spacelab: *possible flight configurations*

Official Spacelab flights

Shuttle mission		dates	Spacelab Mission	Module
STS-9	Columbia	Nov. 28 - Dec. 8, 1983	Spacelab-1	LM1
STS-51B	Challenger	Apr. 29 - May 6, 1985	Spacelab-3	LM1
STS-51F	Challenger	Jul. 29 - Aug. 6, 1985	Spacelab-2	Igloo
STS-61A	Challenger	Oct. 30 - Nov. 6, 1985	Spacelab-D1	LM2
STS-35	Columbia	Dec. 2-10, 1990	Astro-1	Igloo
STS-40	Columbia	Jun. 5-14, 1991	Spacelab Life Sciences (SLS)-1	LM1
STS-42	Discovery	Jan. 22-30, 1992	International Microgravity Laboratory (IML)-1	LM2
STS-45	Atlantis	Mar. 24 - Apr. 2, 1992	Atmospheric Lab. for Applic. and Science (ATLAS)-1	Igloo
STS-50	Columbia	Jun. 25 - Jul. 9, 1992	United States Microgravity Laboratory (USML)-1	LM1
STS-47	Endeavour	Sep. 12-20, 1992	Spacelab-J	LM2
STS-56	Discovery	Apr. 8-17, 1993	ATLAS-2	Igloo
STS-55	Columbia	Apr. 26 - May 6, 1993	Spacelab D-2	LM1
STS-58	Columbia	Oct. 18 - Nov. 1, 1993	SLS-2	LM2
STS-65	Columbia	Jul. 8-23, 1994	IML-2	LM1
STS-66	Atlantis	Nov. 3-14, 1994	ATLAS-3	Igloo
STS-67	Endeavour	Mar. 2-18, 1995	Astro-2	Igloo
STS-71	Atlantis	Jun. 27 - Jul. 7, 1995	Spacelab-Mir	LM2
STS-73	Columbia	Oct. 20 - Nov. 5, 1995	USML-2	LM1
STS-78	Columbia	Jun. 20 - Jul. 7, 1996	Life and Microgravity Spacelab	LM2
STS-83	Columbia	Apr. 4-8, 1997	Microgravity Science Laboratory MSL-1	LM1
STS-94	Columbia	Jul. 7-17, 1997	Microgravity Science Laboratory MSL-1R	LM1
STS-90	Columbia	Apr. 17 - May 3, 1998	Neurolab	LM2

Space relics on show

Spacelab **LM1** has been on display, since December 2003, in the Space Science Exhibition Station at the Steven F. Udvar-Hazy Center in Chantilly, VA (USA), annex of the National Air & Space Museum at Dulles International Airport, Washington DC.



Spacelab LM1 in Chantilly, Virginia (USA)

Spacelab LM2 in Bremen (Germany)

Spacelab **LM2**, was returned to ESA in April 1999 and exhibited for ten years in the Bremenhalle at the Bremen Airport (D). In 2010 it was transferred to the Building 4C of Astrium, near the Bremen Airport.
The Spacelab **Pallet** nicknamed "*Elvis*" was transferred to the Swiss Museum of Transport for permanent display on 5 March 2010. *Elvis*, was used during the eight-day STS-46 mission, 31 July - 8 August 1992, when Italian Astronaut Franco Malerba was on board Shuttle Atlantis to deploy ESA's European Retrievable Carrier scientific mission (Eureca), and the joint NASA/ASI Tethered Satellite System (TSS-1).

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[HSR #14] ESA History Study Report 14] evolution of the US-European negotiations on the post-Apollo programme from 1969 onwards

[HSR #19] Arturo Russo, ***Big Technology, Little Science***, ESA History Study Report HSR #21, European Space Agency 1997, pp IV + 52

[HSR #21] Lorenza Sebesta, ***Spacelab in context***, ESA History Study Report HSR #21, European Space Agency 1997, pp III + 108

[SP 487] Douglas R. Lord, ***Spacelab - An International Success Story***, NASA SP 487, Washington DC, 1987, pp. XV + 554

[NP-119] NASA, Marshall Space Flight Center, ***Science in Orbit: The Shuttle and Spacelab Experience, 1981–1986***, NASA NP-119, Washington, 1988 http://history.nasa.gov/NP-119/NP-119.htm

[MoU 1973] *Memorandum Of Understanding between the National Aeronautics And Space Administration and the European Space Research Organisation for a cooperative programme concerning development. procurement and use of a space laboratory in conjunction with the space shuttle system*, 14 August 1973, in HSR #21 p. 79-95

The Secret Mercury Stamp is fifty years

Minutes after Glenn's safe return, an official statement was released and the postmasters were allowed to open the sealed parcel marked “top secret” they had received. And the 4¢ U.S. commemorative stamp was unexpectedly put on sale to the public

Paul Calle “*was to be asked to design the stamp, but he was out of the country and unable to begin design concepts*”, as his Chris Calle declared to me in a private correspondence.

The task was therefore assigned ***Charles R. Chickering,*** an employee at the Washington *Bureau of Engraving and Printing*. Chickering was known as the designer of a dozen of stamps, including the *Fort Bliss Centennial* stamp issued in 1948: which became the first "space stamp", featuring in the center a rocket designed after the V-2.

All the operation for the production of this stamp had to be kept absolutely secret. Had Glenn’s flight failed, probably the stamp would not have been issued.

To keep the project quiet, Chickering worked from home while claiming to be away on vacation. And that would be one of his last jobs before his retirement.

Richard Bower, the picture engraver, also gave the impression he was on leave, but came in the Bureau at night. Howard Sharpless did the lettering on weekends.

Chickering produced first two preliminary designs, both vertical in shape to produce a sense of the endless height of the deep space.

They were returned to him with suggestions for revisions. And he modelled the final design in the requested horizontal format to emphasize the “limitless width of space”.

NASA apparently was unhappy with Chickering’s original designs and others developed by ***Norman Todhunter*** of the *Citizen’s Stamp Advisory Committee*.

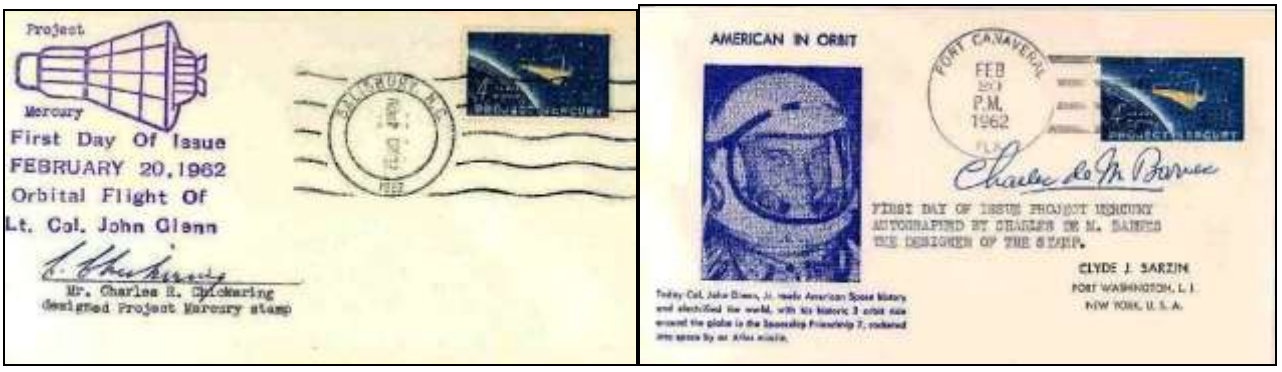
NASA wanted its own vision reflected in the stamp and ***Charles de M. Barnes***, an employee in NASA’s Office of Educational Services, became involved in the project.

Different solution were worked out. Recent studies would credit with him the horizontal sketch featuring Friendship 7 while reentering the atmosphere.

The final stamp features an image of the Mercury Friendship 7 capsule circling the earth, against a field of stars. The face value "4¢" is put aside the wording "U.S. MAN IN SPACE" and the large name “PROJECT MERCURY". Unlike the usual stamps in the Sixties, there is no indication "U.S. Postage". Rumors start to circulate that, because of this, the stamp has no legal value. Post Office immediately clarifies that the wording has been intentionally omitted to focus on the exceptional space event.

Subsequent inter-agency wrangling led to Barnes being ignored as the stamp designer, and Chickering was responsible for modeling the final stamp design (Mark Lerner, *Charles R. Chickering: Cachetmaker - Part I*, in *"First Days, Journal of the American First Day Covers Society"*, # 384 (July 2010), p. 15-16.).

This was the first stamp printed on the new Giori Press – named after its Italian inventor Gualtiero Giori – which permitted two-color or even three-color engraving from a single plate, in one pass through the press. The secret was in the rubber inking rollers. The surfaces were precisely cut, applying each ink selectively to parts of the same plate. Blue and yellow colors were used for this stamp, on white paper.
Since the new press was being used to print the Project Mercury stamp before the mission took place, the Post Office Department kept the stamp a secret in case the mission failed or was cancelled.
It was the first time in history that a previously unannounced commemorative stamp was issued simultaneously with the event it memorialized.
The stamp sheets where secretely packaged to 305 selected postal stations in wrapped packages marked "Classified Material" and "Do Not Open." They were addressed to the attention of the postal inspector, so curious postmasters wouldn't take an early peek. Immediately after the Glenn's safe return, the word was given from Washington to remove the wrappers and place the stamps on sale.



On the left: FDC cancelled in Salisbury, one of the 305 postal offices that received the "secret package" the cover is signed by Charles R. Chickering. *On the right: "FDC cancelled in Port Canaveral and signed by* Charles de M. Barnes.

As news of the stamp spread over radio and television, the public began lining up at their closest post offices that had stock of the now no longer secret issue.
Because the event was deemed so popular, the number of quantities issued totaled more than 289 million, more than twice the average amount of quantities issued for commemorative postage issues of that time
Many collectors drove several miles to have their blank envelopes postmarked with the surprise stamp. By the time the stamp was withdrawn from sale on June 6, 1962, more than three million of the 310 million stamps ultimately produced had been postmarked on collectors' envelopes. By the end of the first day, some 10,290,850 of the stamps had been sold. (http://www.collectspace.com/news/news-022012a.html)

This article is extracted from pages 62-65 of the newly published book: Umberto Cavallaro, "*Propaganda e Pragmatismo in gara per la conquista della Luna*", Ed. Impremix, Torino 2011, 186 pp

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