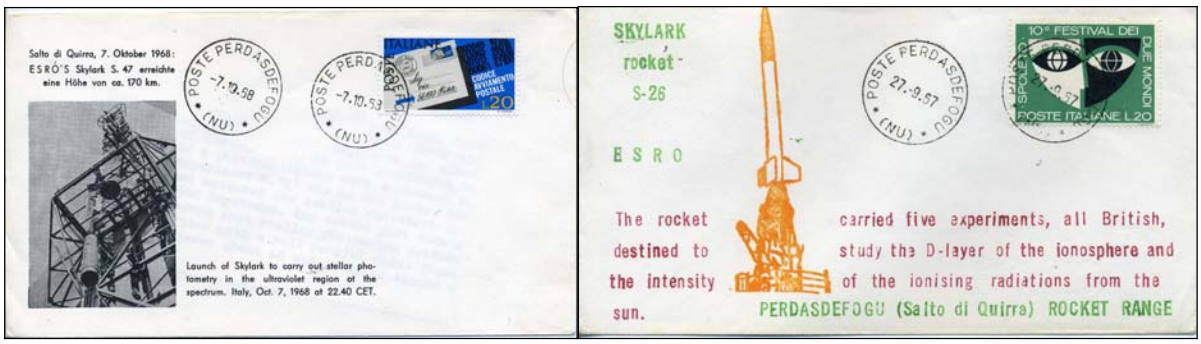
The pioneer of the Italian Astronautics, Father of the first Italian satellite, today would be 100 years old

In memoriam of prof. Luigi Broglio

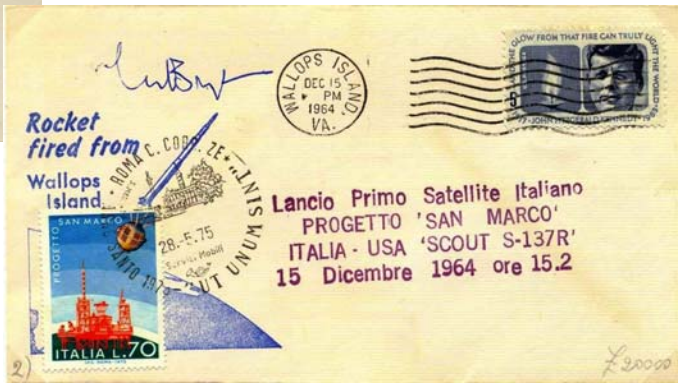
by ***Ing. Luigi Bussolino***

I met him for the first time in 1994 when I was responsible for a project concerning an Italian scientific satellite that was intended for putting in orbit around the Earth a series of scientific experiments from Poland, Czech and the Slovakian Republics (which had just separated), Hungary and the Yugoslavian Republic (which left the project just after the start).
The idea was to use the receiving antennae located at San Marco Equatorial Range for obtaining a good visibility of the satellite and then having a better exchange of data, together with the enormous advantage of gathering data directly through the Italian Space Agency private network.
I stayed in touch with Professor Broglio and his team, including Prof. Ulivieri and Prof. Di Ruscio, for a couple of years until the Italian Space Agency was put into compulsory administration due to its financial problems, with the great disappointment of the participating countries which, in the meantime had been successful in obtaining funds from their governments as well as from the European Economic Community within the frame of the programme for the Restructuring and Conversion of the Defence Industry in East-Central Europe.
In that period I had the opportunity to understand better this solidly-build, closely cropped gentleman who – both as professor of the School of Aerospace Engineering of the University of Rome and as colonel (and then general) of the Italian Air Force – was able to kick-start space activities in Italy while other European states were still waiting.
He didn't have a high regard for the Italian industry which was always kept away from his activities, being able to obtain USA launchers for free (the only one in the world) thanks to his very good relationships with VIPs such as Hugh Dryden, who then became the Director of NASA, Prof. Bruhn, author of an handbook on design of aeronautical structures (who greatly appreciated the rapid and precise computational method invented by prof. Broglio as university teacher).
Thanks to such contacts he was able to send to USA Italian personnel, both from the "San Marco" Project Research (University of Rome) and from the Italian Air Force (*Aeronautica Militare Italiana*, AMI) for training them to operate the Scout rocket and manage the satellite launch.
Chance circumstances in the Fifties had allowed Prof. Broglio to dominate the scene. He was the first professor teaching Aerospace Engineering at the University of Rome La Sapienza, and after that, he was assigned leadership of air-force's ammunition research unit. At the military range of Perdasdefogu (Sardinia) he was involved in weather experiments using American Nike-Cajun rockets to release sodium clouds for successfully studying the winds at the various heights.



This experience encouraged Broglio to propose in 1961 to the Premier of the Italian government Sen. Fanfani, a plan for designing and launching in orbit a satellite entirely conceived and built in

Italy; this plan was at once approved by the government and this entitled him to start a negotiation with NASA as president of Italian Commission for Space Researches.
In 1962 (at Geneva on May 31st and then in Rome on September 7th) the memorandum of understanding was signed between USA and Italy, for a collaboration programme envisaging from the Italian side the design and manufacture of a satellite and on board scientific experiments with related test equipment and from USA the training of seventy people in operating both rocket and satellite, run the flight control room as well as the gathering data (both scientific and technical).



NASA made available its main launcher for scientific satellite (the Scout of LTV Ling Temco Vought with four stages, capable of putting into orbit satellites of about 150-200 kg mass) and for the first time trained foreign personnel until they could cope independently.
It was in fact something unique in the history of the space activities: Italy with the launch of its first "San Marco" satellite from the American range of Wallops Islands in Maryland, performed by Italian technicians on December 1964 suddenly became the third "space power" in the world.
Prof. Broglio was also able to put together at the NASA Goddard Space Flight Centre in Greenbelt, near Washington, (the first NASA centre capable of designing a complete satellite and a complete integrated system) a handful of people of Italian origin, who greatly supported, internally or externally, this international collaboration; I had the luck to know and meet some of them ten years later.
The five San Marco satellites carried out in orbit the renown "Broglio Balance" for studying the atmosphere and its characteristics such as the density at various heights; this instrument largely contributed to the knowledge of the layers which surrounds the Earth in a non uniform way.
The miracle of the first satellite in orbit, and of the first Italian launch range was essentially due to the strong personality and will of Prof. Broglio, who was able to obtain at a very low price an offshore rig utilized by SAIPEM for oil research but about to become surplus to requirements.
The personnel of the Aerospace Research Centre (CRA), supported by the University of Rome, where Broglio was a professor since 1941, and by AMI (in which Broglio became General Inspector of the Aeronautical Engineering) was then able to give a new life to this pile of beams and bolts, aged because of its long permanence in the sea, and to transform them into a launch base and a control centre.
This launch base, suitably located near to the Equator, can operate missiles of about twenty/thirty tons (and it seemed particularly suited for the Scout performances) with the advantage of giving the satellite an additional speed component of about 500 m/s due to the Earth rotation speed at the Equator.

On April 26th, 1967 San Marco 2 satellite was successfully launched in an elliptical equatorial orbit with the support of the American technicians of Langley Research Centre and of NASA GSFC.

NASA started then a deeper collaboration with CRA, which was entrusted to launch four scientific satellites (SAS-A, SAS-B, SAS-C and SSS all dedicated to the astronomy research, with the aim of studying stellar radiations, X and gamma ray and emissions of the stars); the UK also entrusted to CRA's care the launch of its UK 5 "Ariel" satellite.

It has to be noticed that the first of NASA satellites (launched on December 12th, 1970 -- the day of Kenya's state independence and named "Uhuru" that in the local language, Swahili, means independence) made important researches for the Italian scientist Riccardo Giacconi, at that time already well known for his studies on X-band stellar emissions, for which he later received the Nobel prize.

Nine satellites in total have been successfully launched from the San Marco range as well as eighteen rockets of different types.
The specialism of the San Marco platform, later called "Equatorial test range" and then "Professor Broglio test range", is to reach equatorial orbits in an economical way, as it requires less propellant, due to Earth's rotational speed contribution and doesn't require any manoeuvring for changing the orbital plane angle as happens for launches from Cape Kennedy or, worse, from Baikonur.
This advantage has been a constant concern of Broglio together with the reduced mass of the satellites as well as the scientific aim (I was required to study a small satellite with an infrared telescope of Prof. Barbon of Padova University which, however, was not – unfortunately -- implemented).

Two negative issues have however to be outlined in this Scientist who created the Italian way to space: first he never wanted the support of the Italian industries and he only relied with what the University and AMI were able to do, thus preventing the improvement of the national capabilities and, secondly, he relied only on scientific and small-sized satellites.
I was told that when the SIRIO programme started he was invited to manage this project but, thus being a great friend of Prof. Carassa, he refused.

I recall a TV programme in 1981 dedicated to the first flight of Space Shuttle where Mr. Broglio was the space expert invited to describe this sophisticated spacecraft and its mission: while he was explaining with the help of a small Shuttle model, he opened the cargo bay doors and out popped a small model of the SIRIO satellite, which somebody had put inside as a joke. Prof. Broglio, with nonchalance, took out the model, and simply said that this had nothing to do with the Shuttle.

He never had clear relationships with the national industries and he surely preferred the American ones, to which he assigned the task of developing a new improved version of the Scout launcher, with Italian funds. *A posteriori*, from a practical standpoint, we would say that, perhaps, with some few changes in Broglio's approach, we probably had more advantages by working with American companies than by spending lot of money for small national launchers, as it happened later with the VEGA project. Maybe another time I will try to focus on this...
As far as Prof. Broglio is concerned, one thing cannot be called into question: NASA trusted him and relied on him for launching at least four satellites and he never had a failure.
In the nineties Prof. Broglio was involved in a series of disputes related to the funding of the San Marco programme that caused controversies between him and the University and the Ministry of Research and then also with the newborn Italian Space Agency (ASI).
The time of the pioneers, even those with big courage and great personality, was over, and the Italian industries, even allowing for quarrels and various clashes of opinion, were mature enough to be capable of getting job orders from outside and of participating in international large programmes.

Developmental support came from SAS (Service of Space Activities) managed by Prof. Macchia who, after the successful launch of SIRIO -- the first Italian telecommunications satellite -- enlarged and became the PSN (National Space Plan) and in 1988 became ASI. This started a development plan for the Italian space industries starting from BPD (owned latter by FIAT) and then encompassing Selenia Space and Aeritalia, that – completely owned by Finmeccanica Group in 1978, after the spin-off from FIAT which was initially a share holder and owner – in 1991 was merged with Selenia Space and became ALENIA Space.
The above companies were able to obtain projects and programmes while developing proper technologies and improving their capabilities for recovering the technological gap existing with the American and European industries.

This was a pity because the controversies among the Italian industries prevented the San Marco platform from improving and reinforcing its basic structure for supporting new powerful launchers which were appearing on the world market.
Some studies were performed (I was personally involved in the one for launching the "Long March" rocket in a possible cooperation with the People Republic of China but on one hand the cost /benefit ratio played against us and, on the other hand, there wasn't the political willingness of having a national and independent launch base, also because we were engaged with the European Space Agency that did not want cooperation with other nations outside Europe. Therefore no improvement of the equatorial base was approved, for increasing the capability for huge launchers (up to 100 tons) and creating a new ground base; only its telecom capability was improved, and this is why the Malindi base is still active today.

The time for negotiating the above modifications ran out (Europe launched the first Ariane in 1979)... and so, after the last launch in 1988 (which happened eight years after the previous launch from that platform) the ground base operated only for satellite data receipt.
The main results of national space programmes, except for the participation in the ELDO and ESRO consortia, in any case unsuccessful, came only in the 1977 with the successful launch of SIRIO 1, the first Italian telecommunications satellite, that would pave the way towards the national space plan and allow the Italian industries to recover the gap with the other European space companies.
The strong personality of Prof. Broglio perhaps did not allow him to accept any political compromise or to cooperate with the industries and the various institutions and this was really a lost opportunity because the Italian technological development stalled, and lost its primacy in respect to the other European nations.
The old and glorious platform perhaps should have been able to support more in terms of launch numbers in a location so strategic, near the Equator, as the France smartly perceived, moving the ELDO launches in Kourou from 1971 and managing the Ariane programme as it was a national French programme.
On the centenary of his birth (1911 November 6th) and on the tenth year of his death (2001 January 14th) we want to commemorate this great scientist and general of AMI who opened to Italy the doors of the space.
The importance of the impassioned and farsighted activity performed by Prof. Broglio was surely fundamental in opening the doors of our national space activities, putting Italy among the international space powers, just after United States of America and Russia, launching the first Italian satellite in December of 1964, less than seven years after Sputnik and only three years after the first human manned space flight.

BIBLIOGRAFIA
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Launchs of satellites by Broglio's team

BASE	Launcher	Satellite	Date	Remark
W.I.	Shot Put		02/08/1963	
W.I.	Scout	San Marco 1	15/12/1964	
P.S.M	Scout	San Marco 2	26/04/1967	
P.S.M.	Scout	SAS-A	12/12/1970	NASA
P.S.M.	Scout	San Marco 3	24/04/1971	
P.S.M.	Scout	SAS-A	15/11/1971	NASA
P.S.M.	Scout	SAS-B	15/11/1972	NASA
P.S.M.	Scout	San Marco 4	18/02/1974	
P.S.M.	Scout	UK 5 ARIEL	15/10/1974	U.K.
P.S.M.	Scout	SAS-C	08/05/1975	NASA
P.S.M.	Scout	San Marco 5	25/03/1988	
Note	*W.I.*	*Wallops Islands*		
	P.S.M.	*San Marco Platform*		