istituto affari internazionali
88, viale mazzini • 00195 roma
tel. 315892-354456 • cable: intaffari-roma

IAI8617

Joint Project on European Space Policy

ITALIAN SPACE ACTIVITIES

(Revised for London meeting)

1) Goals, Motives, Driving Forces

Italian interests in space activities have been determined primarily by: a)the perception of space as a field of accelerated technological development and competition in such sectors as telecommunications, propulsion and remote sensing, relevant to the country in industrial and strategic terms; b) the desire to maintain its position as a full member of the family of technologically advanced nations.

On the other hand the wide array of costly activities that go under the label of space, some having uncertain or at best long term returns, has appeared out of reach for the financial, industrial and scientific resources at the national level. The philosophy is thus predominantly participatory and looks at international cooperation, European first, then bi- or multi-lateral with the U.S. and more broadly multilateral. This is visible in the structure of the PSN (the National Space Plan, formulated since 1979 under the impulsion of the Ministry of Science and Technology) which evolved from a setting by projects to a setting by technological areas.

The outcome of this pragmatic approach is not entirely disappointing, especially in view of the size of the expenditure. First, in the framework of cooperation and under the pressure the private and public sectors that are particularly dynamic in this field, a de facto priority has resulted for telecommunications. Second, Italian industry and science have performed quite satisfactorily in a number of joint programs within ESA and other international cooperative bodies: propulsion and space modules are exemples. Third, all this has been accomapanied by diplomatic achievements, notably the success of the ESA conference in Rome.

2) Budget .

The budget for space activities has increased constantly in the past few years. The budget for national activities in the period 1986-1991 is expected to be approximately 1870 billion lira. For the same period Italy will spend 1248 MAU (approx. 1720 Billion Lira) on E.S.A. activities. Therefore, the overall aggregate annual budgetary outlay should reach the level of 600 billion lira a year.

This sum is still considered quite low by some, while others assert that today space industry capabilities are already overstrained. They point out that to expand the space industry would necessitate the training and

specialization of more personnel and would require time.

The Italian government established the PSN in 1979 in order to stimulate the space industry and to increase its participation in European Space Agency initiatives. Today the Plan also engages in activities (such as TSS and IRIS) in sectors which are not covered by ESA programs. From 1980 to 1986 the PSN funds were distributed by sector as follows: Telecommunications 36.13% Remote sensing and meteorology 3.85% Geodesy and Geodynamics 5.51% Propulsion 17.86% Scientific research 19.44% (of which 6.6% was used for basic research) Tehnological research and studies for future activities 5.32% CRA (San Marco D/L) 2.66% PSN/CNR management 1.59%; others 7.58%

Approximately 86% of all the contracts allocated by the PSN. from 1980 to 86 went to industry while 9.6% were allocated to the CNR and to various universities.

Projected PSN spending for the period 1987-1991 is as follows: Telecommunications 28.09% Remote sensing and meteorology 7.80% Geodesy and Geodynamics 1.91% Propulsion 7.02% Scientific research 30.42% (of which 6.2 is to be used for basic research) Technological research and studies for future activities 6.76% Development of new sub-systems (S/C) 2.19 Space stations logistic system 9.05% (polar platf. SAR-X, Columbus utilisation, refuel+ammu. prep.) PSN/CNR management 1.56%; other 4.60%

3) Major Activities and Results

3a) Telecomunications. National activities in the field of telecomuncations started with the SIRIO satellite program. The SIRIO satellite was launched August 25, 1977. Today the most important telecomunication program is represented by ITALSAT, Italy's first domestic preoperational telecommunication satellite, with direct broadcast and data relay. It will use frequency bands in the higher part of the spectrum (20-30 GHz) for communication missions devoted to specilized services such as video-conferencing, high density telephony, rapid fac-simile trasmission between computers in full network conditions. Approximately 11000 new telephone channels are expected to be made available. ITALSAT is scheduled to be launched in 1988 and the program will cost 595 billion lira. Outside of the PSN budget but rather under the auspices of the PTT Ministry two more satellites, the Sarit-D for direct broadcast only and the Sarit-M with telecommunication channels, are under consideration. A certain number of ground stations are going to be set up in the ITALSAT program. Italy held fourth place in the Earth Station Market from 1965 to 1982 taken, up 5% of the market shares after the United States (39%), Japan (37%) and France (13%).

2b) Remote Sensing. Italy is mainly involved with receiving stations and processing activities. Remote-sensing data processing analysis techniques, methodologies aimed at producing maps of parameters for general application interest and new architectures of remote sensing data pre-processing are developed by PSN. It also distributes to Italian users the data supplied by Landsat, HCMM, Seasat, Nimbus and Spot satellites. With regard to sensor technology Italy in cooperation with FRG., is carrying out a project for the realization of a Synthetic Aperture Radar, SAR-x. A Shuttle mission originally scheduled for the 90's should take into orbit this new Italo-German instrument, which will cost around 40 billion lira.

3c) Meteorology. The national weather service run by the Italian Air-force, routinely uses satellite information for its forceasts, especially those coming from the European satellite METEOSAT. For better utilization of satellite informations a national network has been created for data acquisition and processing centered at the Primary Data User Station (PDUS) located in Rome. Five secondary data user stations are in operation.

3d) Geodesy and Geodynamies. Italian activities in space geodesy and geodynamics are usually carried out in cooperation with the United States and other countries. A ground station for satellite laser ranging has been installed at Matera in the Mezzogiorno. This station (in conjunction with a satellite network) permits the measuring of the motion of the earth's surface. Fourteen satellites equipped with retroflectors have been launched throughout the world by NASA. One of the kind, the Lageos 2, will be built in Italy in cooperation with the U.S. This new satellite will be completely passive.

3e) Propulsion. The main project in the field of launching systems within the PSN is represented by the IRIS program (Italian Research Interim Stage) which should be used in coperation with the NASA Space Shuttle to place into geo-transfer orbit payloads on the order of 900 kg. IRIS consists of two main modules: the ISS (Iris Spinning Stage) and the ASE (Airborn Support Equipment). The former is an expendable propulsion module equipped with a solid rocket motor whereas the latter is a reusable module which is needed to operate the propulsion module. The limited capacity of IRIS will prevent it from launching even small Delta-class comminication satellites. However, it may be ideal for scientific satellites and small commercial satellites. There are two studies underway at the moment: one is considering the possibility of building an entirely Italian launcher and an alternative to this would be a joint venture with Volvo with the possible use of existing Ariane hardware.

3f) Scientific research. The PSN forsees the realisation of two satellites; the SAX (X-ray Astronomy Satellite) and the TSS (Tethered Satellite System). The SAX is due to explore the Universe in the radiation band between 2 and 200 Kev. It will cost 172 billion lira by 1988 and should be put in orbit by the Shuttle in 1989 according to the original plans. The Italian share in the program is expected to cost 82 billion lira by 1988.The TSS should be launched in 1987. In 1983 Italy performed five experiments on the first Spacelab flight. Another program which deserves mention is the joint Italian/NASA program for scientific research in the high atmosphere, the San Marco proiect.

3g) Technological research. At the present time technological research is being carried out in the following fields: electronic technologies, space telecommunications, robotics, chemical and electronic propulsion, thermal control, and in-orbit altitude and control. In addition, Italian industry has recently entered the field of software research.

3h) Launching sites. The San Marco range in Kenya and the Malindi station are managed by the CRA (Centro Ricerche Aerospaziali) of the University of Rome and by the Italian Air Force. A series of launches have been performed in cooperation with the US and with other countries during the last twenty years. The base also has been used for the San Marco scientific program and will continue to do so according to current plans.

3i) Military activities Since 1980 the Italian Air force has dealt with the problem of telecommunications satellites, developing the AM-136 program. The AM-136 system, which has the capacity of 12,000 telephone channels, will be used for a wide range of services. Its coverage will be centered on Italy and the Mediterranean area and will be oriented towards communications with mobile (aircraft, ships) and fixed stations (Ministries, airports, harbours, etc.). Two satellites, the SICRAL-1A and the SICRAL-1B, are expected to be active in this program, which will not only be used for military and police services, but also for civil protection in case of earthquakes or similia. AM-136 will be put in geostationary orbit in 1991. Its cost amounts to 1006 billion lira. Italy has also decided to participate (15%) in the Frenche suveillance satellite HELIOS.

4) Organisation, Industrial Structure

The number of employees involved in space industry has constantly increased in the past few years. Between the years 1980 and 1985 the number of employees has increased from 1000 to 3000 and is expected to reach 5000 by the end of 1987.

As stated earlier Italian space activities are carried out in two different spheres. On the one hand Italy is an active member of the European Space Agency (ESA) while at the same time it is developing national and bilateral programs. Relations with the ESA are carried out directly by the Minister for Scientific and Technological Research. The National Research Council (CNR) manages space activity at the national level and it is to this purpose that it established an ad hoc structure the SAS (Servizio Attività Spaziali).

The CNR wich organizes, coordinates and finances (with its own funds) scientific research, is a public body which reports directly to the Prime Minister Office. The direction and supervision of the CNR were passed on to the Minister for Scientific and Technological Research with the decree of the 15th of September 1979. The Minister for Scientific and Technological Research has also the job of coordinating national space activity with European Space Agency activities.

Italian space policy is formulated by the Minister of Scientific and Technological Research whose proposals are in turn reviewed by CIPE. (the Interministerial Committee for Economic Planning) which assesses the programs and the budget. After plans and funding are approved by CIPE the Parliament must take the necessary steps to translate all this into law. The Minister for Scientific and Technological Research has no finencial resources of its own and must go trought other ministries in order to obtain funding: ESA contributions for example are appropriated by the Ministry of Foreign Affair.

Also the PTT and the Ministry of Defence deal with space activities.

As far as space industry is concerned Aeritalia, Selenia-spazio and SNIA-BPD are the three most important companies in Italy. They are the prime contractors in several ESA and national projects. In particular Aeritalia, which belongs to the IRI group is prime contractor for the following programs: TETHERED SATELLITE SYSTEM developed in cooperation with NASA; LAGEOS (geodetic satellite); IRIS (construction of the recoverable part of interface with shuttle); AFPM (autonomus fluid phyiics module); IPPARCOS (scientific satellite). Aeritalia is also involved as a sub-contractor in many important programs such as the Columbus (pressurized module), Ariane-4 (liquid-propellant

tanks), Eureca (active and passive thermal control and the primary structures), Olympus (structure-electronic and ground support equipment) etc..

Selenia-spazio is a company of the Selenia-Eksag Group which is controlled by IRI-STET. It is the prime contractor for the development production and integration at system level of the ITALSAT, SARIT and AM-136 satellites. It is also responsible at system level for the OLYMPUS satellite. Selenia has participated in numerous activities at the subsystem level, the most significant of which are the INSAT and the ARABSAT satellites (antennae with carbon fibre reflectors and telecommunication transceivers) and the on board radar altimeter in the ERS-1 program.

In the private sector SNIA-BPD is the largest company. It belongs to the Fiat group and is the prime contractor for solid propulsion used on launchers of the Ariane family and is also responsible at a system level for the expendable vehicle IRIS stage. In the field of liquid propulsion SNIA-BPD is responsible for the propulsion system of the Olympus.

Other state owned, private and multinational companies also are involved in the Italian space activities.

5) Italy and the European Space Agency.

Italy is the third largest contributor to ESA programs. The economic return has been low in the past. Today it is increasing and a recent assessment estimates the return coefficient to be around 0.80. The goal which Italy expects to reach is 0.95. On the other hand, the cooperative activity within ESA framework is considered satisfactory by many because the European organization appears to be taking into account sectors which uphold Italian interests and priorities. Italian participation is relevant in the following projects:

OLYMPUS communication and broadcasting satellite with Italian prime responsability for payload, structure, integration and test of propulsion equipment (the Italian share is greater than 30%).

COLUMBUS is a project which provides for a series of modules which can be connected to the US space Station. Italy holds prime responsability for the pressurized module and will share 25% of the total cost of the program.

ARIANE5 Italy holds prime responsability for the large (190 ton) solid boosters and is going to develop the turbopump for the HM60 criogenic motor of the Ariane V launcher for a total participation of 15%.

EURECA is a European retrievable carrier designed to remain in orbit for six months and is intended for use in microgravity research. The Italian financial contribution amounts to 17.33%.

DRS (Data Relay System) for low orbit platforms and launchers.

Together with these programs Italy participates significantly in the ESR-1 (Remote Sensing satellite) 10,61%, in the ECS telecommunication programs 14%,and in the Ariane 3 (17,55%) Ariane IV (7,75%) launchers. With regard to Italian participation in ESA scientific research programs from a total of 240 experiments proposed by the European scientific community, 15 were Italian, 7 of which have been selected.

REFERENCES

1) This is an unofficial datum in so far as it has not been approved by CIPE.
2) Private document.
3) Private document.
4) OTA (Office of technology assessment) STI-241"Civilian space stations and the US future in space" November 1984; p.194
5) OTA (Office of technology assessment) ISC-239 "International cooperation and competition in civilian space activities" July 1985 p.13
6) AIRPRESS "ITALSPACE": the role of Italy in space programs and technology. Roma, 1985 p. 52.
7) OTA (Office of technology assessment) ISC-239 'International cooperation and competition in civilian space activities" July 1985 p. 165.
8) AIRPRESS op. cit. p. 55.
9) In case of the implementation of one of the two projects it will be possible to cover both geostationary and polar orbits. In the former case the San Marco range would be the most adequate while the latter case the Kiruna base would be used.

10) AIRPRESS op. cit. p. 68.
11) AIRPRESS op. cit. p. 69.
12) AIRPRESS op. cit. p. 61 (part. I)
13) AIRPRESS op. cit. p. 3 (part. II)
14) OTA op. cit. p. 237
15) OTA op. cit. p. 243
16) AIRPRESS op. cit. p. 66 (part. II)
17) 0.95 is only 0.05 more than the lowest limit established in the ESA council resolution adpted the 31th of Jennary 1985. If the return coefficient were 0.90 infact the council resolution established that special measures should be taken to redress the situation.
18) AIRPRESS op. cit. p. 70 (part. I)

AKNOWLEDGMENT

This paper has been written by Roberto Cajati under the guidance of Cesare Merlini. It profited from the contributions of a discussion group, whose participants are thanked here collectively.