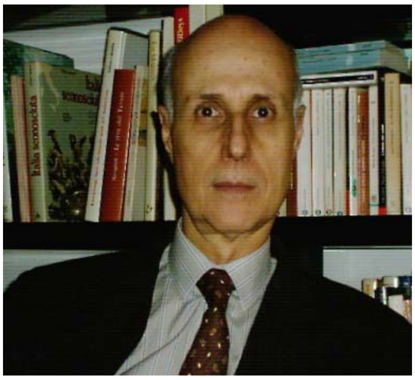
Major Italian Space Telecommunications Programs – Lessons Learned

Franco Marconicchio

Space Systems Consultant



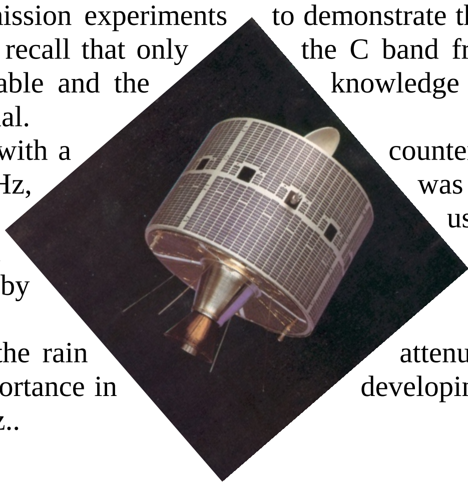
First of all I wish to thank you for being invited to write this article on my personal experience gained in more than 30 years of activity in the space telecommunications field, covering the major government programs conceived and realized in Italy.

Starting around the end of the sixties, Italy has been active in space and has devoted its major effort towards the exploitation of the frequency bands above the 10 GHz to pave the way for the development of the technology and the systems needed to operate in these higher frequency bands.

Major Italian Telecom Programs

SIRIO

The first program, called SIRIO like the celestial star, was conceived to perform experiments in the 12 and 18 GHz bands. The purpose was to acquire experience in the propagation impairments and to run extensive series of communication and TV transmission experiments to demonstrate the viability of these bands for future operational use. It is worth to recall that only the C band frequencies were in use at that time and that the technology available and the knowledge of the propagation phenomena at higher frequencies were minimal.

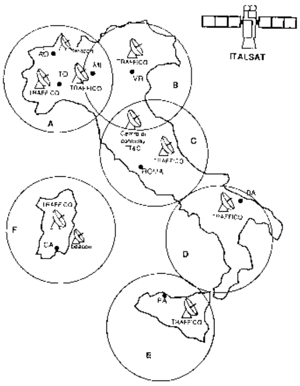


SIRIO, a spinning satellite of 500 kg with a counter-spinning antenna and a communication payload at 12 and 18 GHz, was launched in geostationary orbit in August 1977. The satellite was used up to the end of 1985, running propagation and communication experiments over Europe, across the Atlantic Ocean, and by the end of its life over India and China.

Its contribution to the knowledge of the rain attenuation effects on the communication signals has been of great importance in developing atmospheric attenuation models for frequencies above 10 GHz..

ITALSAT

Following the success of the SIRIO mission, Italy decided in 1981 to develop a more ambitious program called ITALSAT, based on a 3 axis stabilized geostationary satellite at 20 and 30 GHz with an operative domestic telecom mission.



The satellite, launched from Kourou in 1991, was a 2 ton platform with a payload of 6 regenerative transponders covering Italy with 6 spots, each with a 0.4 degree footprint, generated by two deployable antennas. Each spot was served by a redundant regenerative transponder accessed in TDMA by the ground terminals. Each incoming on board data stream was down-converted, processed and switched to the transmitting spots by a baseband commutation matrix.

The sophisticated payload was designed to provide a total throughput of 900 M bits/sec to supplement the public digital telephone network and to connect the many Italian islands to the main land.

In addition to the communication mission, the first ITALSAT satellite carried a propagation package to complement the SIRIO propagation experiments in the 20, 30 and 40 GHz bands.

The first ITALST satellite was replaced in 1998 by a second flight unit. The system remained operational until the end of 2006.

ITALSAT was one of the most advanced operational systems built and launched in Europe and, with NASA's ACTS satellite, one of the most advanced telecom system built in that period of time.

Experience and Lessons Learned

I had the great privilege to work in both programs. In SIRIO, I was responsible for the payload development and communication experiments implementation. In ITALSAT, I was the Program Manager from the beginning of the program and I followed all development phases and in orbit operations for more than 10 years.

The experience gained ranged from the technical and technological aspects to the launcher selection, the orbital position and frequency coordination, the operational aspects during the life of the system, and the final decommissioning.

Many experiences and lessons learned were gained during my long professional career, but I want to discuss only few of them which are still valid today.

The first lesson learned is the importance, during the design phase, to pay careful attention to the future operational aspects of the system.

The second lesson is the importance of the proper identification of the recurring costs to ensure the economic viability of the orbital replacements and as a consequence the successful accomplishment of the mission.

The third lesson is finally to give careful consideration from the beginning of the program to the user requirements. This is of paramount importance to assure that the system will be useful and profitable in fulfilling the customers' commercial needs.

Based on my personal experience, none of the above points are duly considered by the Space Agencies when they decide to develop a new satellite system, since the Agencies are used to focus their efforts mainly on technology development and much less on the success of the commercial exploitation and on customer satisfaction.

The risk in so doing is the expenditure of important resources without properly satisfying the future user needs. In this regard Program Managers need to pay careful attention to the above aspects to ensure the success of their projects.

Conclusion

In conclusion, the Space Agencies, when developing application programs that are intended for commercial follow-on in the areas of Telecommunications, Navigation or Earth Observation, have first to consider the user needs and the program operational costs and then, the technological enhancements which, if not carefully considered and selected, can increase the cost, reduce the reliability and last but not least shorten the program operational life.