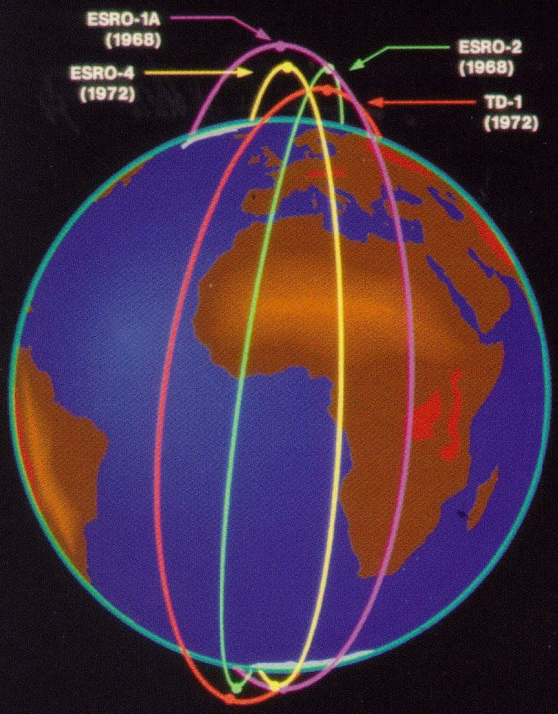
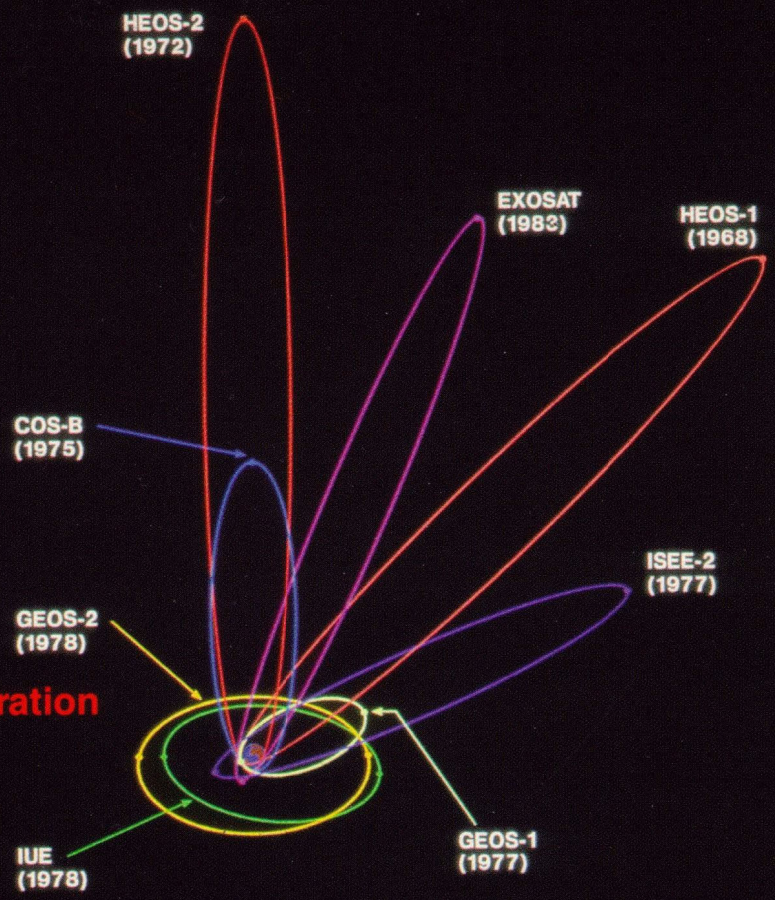
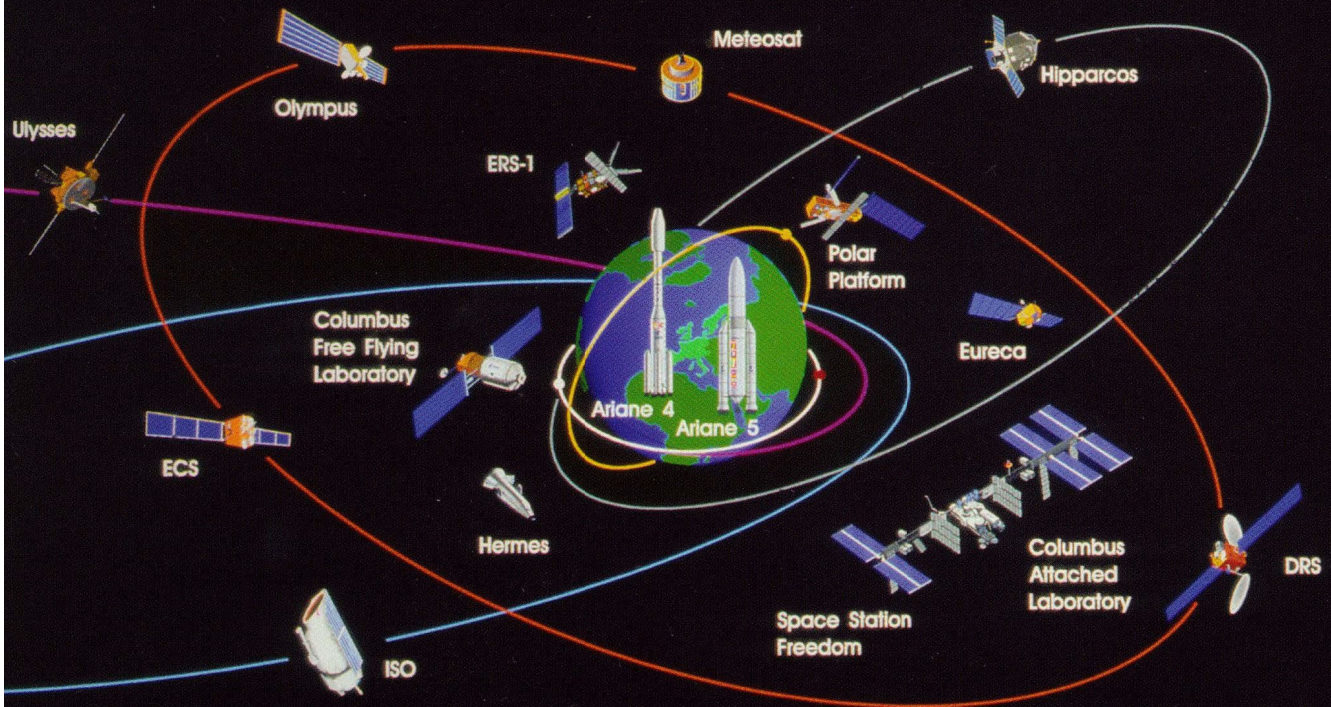
ESA HSR-14
July 1994





United States - European cooperation in space during the sixties

by Lorenza Sebesta



esa
european space agency

The ESA History Study Reports are preliminary reports of studies carried out within the framework of an ESA contract. As such they will form the basis of a comprehensive study of European Space activities covering the period 1959-87. The authors would welcome comments and criticism which should be sent to them at the appropriate address below.

The opinions and comments expressed and the conclusions reached are those of the authors, and do not necessarily reflect the policy of the Agency.

The ESA History Team comprises:

Dr. J. Krige, Department of History and Civilization, European University Institute, Via dei Roccettini 9, I-50016 San Domenico di Fiesole, Italy.

Prof. A. Russo, Istituto di Fisica, Università di Palermo, Via Archirafi 36, I-90123 Palermo. Italy.

Dr. L. Sebesta, Department of History and Civilization, European University Institute, Via dei Roccettini 9 I-50016 San Domenico di Fiesole, Italy.

The project is based at the European University Institute, where the ESA archives are also housed. John Krige is the Project Leader.

Published by: ESA Publications Division
ESTEC, Postbus 299
2200 AG Noordwijk
The Netherlands

US-EUROPEAN COOPERATION IN SPACE DURING THE SIXTIES

Lorenza Sebesta
European University Institute, Florence

Table of contents page

1. Introduction

Euro-American relationships in space have passed through several phases. According to the ex-director general of ESA, Reimar Lüst, during the first, from the early 1960s to the early 1970s, the US exercized "tutorship" of Europe. During the second, which lasted until the beginning of the mid-1980s, Europe became America's "junior partner" while during the third, and current, phase there has been both "partnership and competition"[1].

This paper will deal with the first phase, analyzing the fields of cooperation and the underlying changing patterns of cooperative policy between NASA and ESRO/ELDO from 1958 to 1973. The first section will concentrate on 1959-1968, while the second period (1969-1973) will be dealt with in the second section. Both have appendixes which contain the texts of the main diplomatic instruments which served as institutional and working frameworks for cooperation as well as some tables of relevant quantitative data.

[1] R. Lüst, "Cooperation between Europe and the US in Space", *ESA Bulletin*, n. 50, May 1987, pp. 98-104.

2. Which kind of space cooperation for the post-war period?

Space was chosen as a privileged field of international scientific cooperation as early as 1950 when, under the insightful leadership of Lloyd Berkner[2], an institutional framework to set up an International Geophysical Year (1957-58) was put in place. The IGY materialized in 1957-58 and consisted of a coordinated study of the earth and its cosmic environs involving 60.000 scientists and technicians from 66 nations (among which the US and the USSR). Investigations within its framework mainly dealt with the physics of the upper atmosphere, the earth's heat and water regime and the earth's structure and shape. The first artificial satellites, among which the Soviet Sputnik, were proposed and built to carry out some of the investigations proposed within this framework.

During the IGY, however, "there was no significant **integration** of national programs involving governmental agreement". All the national programs were coordinated by a non-governmental mechanism, whose main body had no supranational authority[3].

Before the end of this activity, much thought was given to the possibility of continuing the coordination of peaceful activities in outer space. Following up the final recommendation of the Fifth General Assembly of the IGY Committee, held in Moscow in August 1958, the International Council of Scientific Unions (ICSU)[4] decided in October to set up a Committee of Space Research (COSPAR) on a provisional basis. Reflecting the dual nature of ICSU, COSPAR had a mixed membership — representatives of 18 national academies (or equivalent institutions) and of 10 international scientific unions being in the Committee. All the countries having a major programme in rocket research (Australia, Canada, France, Japan, USSR, UK and the US) were represented[5].

COSPAR's aim was "to further on an international scale the progress of all kinds of scientific investigations which (were) carried out with the use of rockets or rocket-propelled

---

2 Chairman of the National Academy of Science's Space Science Board, which had a fundamental role in devising US international space programmes: H. Newell, *Beyond the Atmosphere. The Early Years of Space Science* (Washington: NASA History Series, 1980), p.120. See also: A.A. Needell, "From Military Research to Big Science: Lloyd Berkner and the Postwar Era", in P. Galison & B. Hevly (eds), *Big Science* (Stanford University Press, 1992), pp. 290-311.

3 A. Frutkin, *International Cooperation in space* (Englewood Cliffs: Prentice-Hall, 1965), pp. 18-19.

4 Set up in 1931 to coordinate and facilitate the activities of the international scientific unions in the field of natural sciences. National Archives, Washington DC (NAW), RG 359, box 19, Report of the Secretary-General, ad hoc Committee on the Peaceful Uses of Outer Space, International Scientific Organizations, 16 June 1959.

5 *Ibid.*

vehicles". The organization, though, should "not normally concern itself with such technological problems as propulsion, construction of rockets, guidance and control"[6]. It would keep itself informed of United Nations or other international activities in the space field and proposed itself as a forum for exchanging information over the results attained through bilateral or multilateral cooperation. It took one year for the members to agree on the organization's definite charter, which was eventually approved in November 1959. During this time the Soviet Academy of Sciences did not participate in the COSPAR work[7].

The effort to broaden scientific cooperation took parallel and alternative paths during the same period. In the mid-Fifties, consideration was given to the opportunity to extend the Atlantic Alliance — the military alliance that, since 1949, linked Western Europe to the US — beyond the purely defensive aims with which it had been associated since its inception. The increase in cooperation in the economic, scientific and social fields (art. 2 of the Treaty) was accordingly suggested by an official report in late 1956[8]. This led to the creation, in 1958, of the NATO Science Committee, with a full time American Science Adviser, the brilliant nuclear physicist from Harvard Norman Ramsey, who served as its chairman[9].

In November of the same year, speaking in front of the Fourth NATO Parliamentarian's Conference, American Senator Henry Jackson[10] called for an appropriate response to the Sputnik launched by the USSR in October 1957. A shift in the balance of scientific power between the eastern and western bloc was seen by Jackson as an essential component to upset the balance of military power in terms favourable to the West. As a catalyzing element in the quest, Jackson proposed "a satellite for peaceful outer space research, bearing the emblem of the Atlantic Community and circling the earth by 1960"[11].

---

6 H. Massey and M.O. Robins, *History of British Space Policy* (Cambridge: Cambridge University Press, 1986), Annex 2, Charter of COSPAR, p. 449 for the citation.

7 NASA Historical Office, Washington DC, RG 255, 64-A-664, box 1, ICSU, Ninth General Assembly, Report of the President of the COSPAR, 25-28 September 1961.

8 The text of this proposal is in *Department of State Bulletin*, 7 January 1957, pp. 18-28.

9 Library of Congress, Manuscript Division, Washington DC (LCMD), Rabi's papers, box 25, Discussion Meeting Report, Council of Foreign Relations, Science and Foreign Policy, 4 November 1963.

10 Chairman of the Subcommittee on Military Applications of the Joint Committee on Atomic Energy of the US Congress and Chairman of the Scientific and Technical Committee of the NATO Parliamentarian's Conference.

11 National Air and Space Museum, Washington DC (NASM), von Karman's papers, box 36.10, NATO Parliamentarians' Conference, Fourth Annual Conference, 17-21 November 1958.

Soon after (January 1959), the Avionics Panel of AGARD — the NATO Advisory Group for Aeronautical Research and Development set up in 1952 under the aegis of the aeronautical engineer Theodore von Karman — elaborated the proposal and suggested "to make a technical review and study of a satellite as a tool for research" in some specific areas[12].

In the meanwhile, NASA was founded as an independent civilian agency exercising control over the aeronautical and space activities of the US (except those related to military affairs). Its founding act, approved in July 1958, adopted international cooperation as a fundamental principle of US space policy. It provided, inter alia, that "the space activities of the United States shall be conducted so as to contribute materially to (...) cooperation by the United States with other nations and groups of nations in work done pursuant to this Act and the peaceful application of the results thereof" (sec.201)[13].

An official offer of cooperation in space was subsequently extended by NASA to the international community through COSPAR (see Appendix 1). At the March 1959 meeting of the Committee, the National Academy of Sciences representative (R.W. Porter, Chairman of the Space Science Board's Committee on International Relations[14]) was authorized by NASA to offer support for projects intended to orbit individual experiments or complete satellite payloads, of mutual interest, prepared by scientists of other nations. NASA made available launching vehicles, spacecraft, technical guidance and laboratory support for these kind of projects. Resident research associateships at NASA were offered as well.

The idea of a "NATO satellite" was finally dismissed by the Science Committee soon after the COSPAR meeting, in April 1959[15]. All the same, von Karman and the new American Science Advisor inside the NATO Science Committee, F. Seitz, were unconvinced. "The leading

[12] NASM, von Karman's papers, box 35.3, Notes for national delegates meeting, 23/1/1959.

[13] The first director of NASA's Office of International Programs, Henry Billingsley, who, according to Frutkin's testimony, favoured the NATO satellite idea, was soon relieved of his post and substituted, in September 1959, by Arnold Frutkin, who would keep his charge for more than a decade. NASA Historical Office, RG 255, Press Release n. 59-210, 3 September 1959, Arnold Frutkin appointed NASA's Director of International Programs; Interview with Arnold Frutkin, Washington, 8 November 1993 (interviewers John Logsdon and Lorenza Sebesta).

[14] The Space Science Board was established in June 1958 by the President of the National Academy of Sciences to serve as the focus of the Academy's interests in space science, with advisory and consultative functions. Lloyd Berkner had acted as chairman of this body from the beginning. *U.S. Aeronautics and Space Activities, January 1 to December 31, 1960* (Washington DC: United States Government Printing Office, 1961). See also H. Newell, *op. cit*, pp. 205-206.

[15] LCMD, Rabi's papers, box 39, AC/137-D/54, Science Committee, Memo on Space Research by the Science Adviser (Seitz) already distributed to members of the Science Committee in the form of a letter dated 24 November 1959, 9/12/1959.

space research of scientific quality" Seitz explained "will follow closely upon the heels of the development of military vehicles, appropriate modifications in loading, propulsion and instrumentation being made to provide information of basic research interest". As the development of most advanced ballistic missiles and engines would continue to be tremendously expensive in the future, it was considered unlikely that European states, both individually or collectively, could develop such missiles at their own expenses. An independent centre for space science, such as CERN for high energy physics, entirely financed by European funds, was considered to be "improbable and, in fact, impracticable". Duplication would be deplorable between the two sides of the Atlantic. What was alternatively suggested was the establishment of a NATO agency in Western Europe resembling NASA and which could work with it in planning the utilization for scientific purposes of "the best missiles available for space research in the NATO family"[16].

Seitz's reflections brought to the forefront a special feature of space research, whose tools and objectives are partly common to military and science[17]. Two groups were clearly facing each other on the question of which kind of cooperation should be adopted for space. On the one hand there were those who thought it possible for international space science to get benefits from military developments and, for this reason, rejected the idea of extending cooperation via an organization, COSPAR, that had the USSR among its funding members. They were "realist" enough to reject implicitly the idea of the "neutrality" of science and, for practical purposes, saw it much more profitably linked to the already existing military cooperation. However their realism stopped at the scientific and technical field; on the political level, they seemed to be so naive as to think that military secrets were to be kept from the USSR, but not from the allies.

The other group relied on the neutrality of science as a major legitimizing factor of its international character. It also made implicit reference to the necessity, for security reasons, to keep all military-technological information linked to space (those related to launcher and spy satellites, for example) safe from international intervention. Last but not least, there was a wide-spread fear that "a Western cooperative effort based on NATO would be divisive, risking the effect of a Russian countervailing action in the establishment of an Iron Curtain cooperative effort"[18]. If science was neutral, it had to be shared with everyone, not in a politically oriented organization such as NATO. If information related to military-oriented space technology was a

---

[16] *Ibid.*

[17] A. Frutkin, *op. cit.*, p. 5.

[18] NASA Historical Office, RG 255, 64-A-664, box 4, Frutkin Memorandum for the file, 1 December 1959.

national prerogative, it should be shared neither with the USSR nor with NATO allies. Space cooperation could not change this basic fact.

Supporters of this second group were to be found among scientists and politicians (coming from the State Department and NASA[19]) who struggled victoriously, in view of different interests, for the same aim. They were the people who conceived and managed US cooperative space policy in the entire after-war period.

Their efforts gave birth to a hybrid, whereby the intellectual and geographical scope of cooperation in space was somehow artificially limited. First of all cooperation was reduced to its purely scientific aspects (even if the difficulty of drawing the line between civilian and military projects was always recognized at a more general level[20]), meaning by that experiments which had no relevance from a military or a commercial point of view. On the other hand, cooperation was formally offered within an international forum, COSPAR, where the Soviets were theoretically even if not physically present; but, as had happened with much more resonance in 1947 for the Marshall Plan, the offer practically took a "Western" flavour and materialized in a series of US-European bilateral agreements — coupled with some arrangements favouring under-developed countries.

3. The original rationale for space cooperation

US-European cooperation in space had its origins in the aftermath of the "Sputnik crisis" and was conceived by the US as part of a larger space strategy to recover the loss of prestige linked to that event. This strategy had two pillars:

1. staying ahead of the USSR in areas which had a special military or symbolic value (ICBM, ABM and Apollo mission); reaching with them an informal agreement on the acceptability of reconnaissance through satellites and agreeing on some relatively minor goodwill cooperative ventures in civilian space[21];

---

[19] For the State Department position, see T. von Karman with L. Edson, *The Wind and Beyond: Theodore von Karman, Pioneer in Aviation and Pathfinder in Space* (Boston: Little, Brown and Co., 1967), pp. 323-339; M. de Maria, *Europe in space: Edoardo Amaldi and the inception of ESRO*, ESA HSR-5 (Noordwijk: ESA, March 1993), p. 10. For references to NASA's strong opposition to the idea set forth by Senator Jackson, see Arnold Frutkin interview (cf. note 13).

[20] See, for example, RG 255, 64-A-664, b. 3, Frutkin Memorandum for the file, 23 May 1960.

[21] A bilateral Space Agreement was signed in 1962 by NASA and the Academy of Sciences of the USSR, involving the coordinated launching of meteorological satellites, the exchange of data from these satellites and the programme to map the magnetic fields of the earth by means of coordinated launching of geomagnetic satellites and related ground observations. It was implemented by a second Memorandum of Understanding approved by the two organizations on November 5, 1964. National

2. "demonstrating and reaffirming"[22] US political leadership among its allies by engaging them in cooperative ventures in which the US served mainly as the provider of launching facilities, the most technologically sophisticated space devices. Launching services were intended to demonstrate, at a low price, US benevolence and advance with regards to her European counterparts and, at the very least, were to symbolize the benefits of a technologically-oriented democratic society[23].

Political willingness, though, had to be coupled with technical and scientific soundness which was to be the basic criterion for an appropriate cooperative venture. Arnold Frutkin, the main author and executor of NASA cooperative policy, refers to it as reflecting "conservative values"[24]. Speaking in front of the newly created Subcommittee on International Cooperation in Science and Space[25], he clarified in 1971 the guidelines which had inspired NASA's effort during the previous decade.

1. To "work on a project-by-project basis rather than on the basis of generalized programme agreements". Following a well established national tradition in scientific research, cooperation should not be institutionalized, but approved on the basis of projects presented and executed by scientists individually[26]. More to the point, one could not but notice the

---

Aeronautics and Space Council, *U.S. Aeronautics and Space Activities, 1968* (Washington DC: U.S. Government Printing Office, n.d.).

22 K. Pedersen, "Thoughts on international space cooperation and interests in the post-cold war world", *Space Policy*, August 1992, p. 207.

23 For this last concept, R. Colino, "The US Space Program. An International Viewpoint", *International Security*, Spring 1987, vol. 11, n.4, p. 159. See also S.M. Shaffer and L. Robock Shaffer, *The Politics of International Cooperation: A Comparison of the US Experience in space and in security*, vol. 17, book 4, Monograph Series in World Affairs (Denver: University of Denver, 1980).

24 A. Frutkin, *op. cit.*, p. 32; see also S. Shaffer and L. Robock Shaffer, *op. cit.*, p. 49.

25 Created by the chairman of the Committee on Science and Astronautics, House of Representatives, George P. Miller (California) in Spring 1971 "in view of the increasing interest in and activity on the international scene in space, and in science generally, and because there appear to be excellent opportunities in the years just ahead for our Nation to enter into more extensive cooperative ventures in many of these fields". Opening speech by Fuqua, *Hearings before the Subcommittee on International Cooperation in Science and Space of the Committee on Science and Astronautics*, US House of Representatives, 92nd Congr., I Sess., May 18-19-20, 1971, A General Review of International Cooperation in Science and Space, US Government Printing Office, Washington, 1971, p.1. The Subcommittee was formed of Don Fuqua (Florida), Chairman, John W. Davis, Robert A. Roe, William R. Cotter, Morgan F. Murphy, Mendel J. Davis, James G. Fulton, Charles A. Mosher, Alphonzo Bell, Larry Winn jr. On its creation, see K. Hechler, *Toward the endless frontier. History of the Committee on Science and Technology, 1959-79* (Washington DC: US Government Printing Office, 1980), pp. 398-399.

26 For this as being a fundamental characteristic of American research policy as opposed to the European one, where research tends to be institutionalized, i.e. entirely entrusted to universities. J.-J. Salomon, *General Introduction*, in G. Caty, G. Drilhon, G. Ferné and S. Wald under the direction of J-J.

enormous difference in absolute terms of the space expenses in US and Europe taken as a whole, these last being but a small fraction of the first (see Appendix 2). Europe could not be considered an equal partner and, thus, the US could not commit itself to a real partnership, but to a cooperation limited in scope and time[27].

2. To judge the soundness of a project on the basis of its "scientific or technical validity". "We appreciate" Frutkin added "the intangible values of international cooperation, but we believe they are best served by projects valid in themselves";

3. To ask real contributions by everyone involved; a project, in other words, should be valuable for all its participants, with mutual benefits, even if not always in kind;

4. Each nation had to fund it own activities; there would be no "giveaway", thus no exchange of funds.

This concept of cooperation not only fitted in the more general American strategy for space policy, but perfectly suited the European space philosophy as originally set out in the preliminary stage of ESRO and ELDO. It was a space philosophy that emerged from economic contingencies, from a straightforward political willingness to leave military affairs out of any cooperative venture, from a yet unsettled judgement about the soundness of high technology industrial cooperation, and from some entrenched European cultural traditions, best embodied in one of the founding fathers of the European space organization, Edoardo Amaldi[28]. For him, space research should not touch upon anything that could be connected with "interest", military first of all. It was the dominant concept of science at the time, well settled in western scientific culture, that had its adherents, as we have seen, in both the US and Europe. Few were the European voices, among the scientists as well as the administrators of science (Blackett, Snow and Salomon, just to cite a few names), which, on the basis of the world war II experiences, begun to challenge something which had been considered for a long time a permanent assumption[29].

Salomon, *The research system. Comparative Survey of the Organisation and Financing of Fundamental Research, vol.I* (Paris: OECD, 1972), pp. 20-21.

[27] These were but a confirmation of the views already expressed in 1965 in Frutkin's book on cooperation, where he wrote: "Valuable individual and specific technical exchanges and cooperation may be had, together with valuable political impact, but no large-scale sharing of major research and development programs is yet in view". A. Frutkin, *op.cit.*, p. 141.

[28] M. De Maria, *Europe in space: Edoardo Amaldi and the inception of ESRO, op. cit.*

[29] The conceptualization, in critical terms, of the "scientist-gadgeteer" (he who is fascinated essentially by his tools and researches) and the political dangers of this position is skillfully outlined by C.P. Snow in his famous 1962 booklet on *Science and Government.*

4. How US-European space cooperation was put into practice

America's official offer, which had been preceded in some cases by contacts outside diplomatic channels[30], was followed by a series of bilateral memoranda of understanding with western allies. Cooperation covered various fields which can be broadly divided into 1. space segment cooperation — including foreign contributions to US projects and reimbursable launches of foreign satellites; 2. tracking, telemetry and command duties; 3. ground based cooperation in data reception[31].

Attention will be devoted, above all, to cooperation within the space segment, which represented the field in which the majority of cooperative agreements were signed throughout the sixties (see Appendix 3). We will refer primarily to the bilateral agreements signed with Great Britain, France, Italy and the Federal Republic of Germany. Even if not covering all agreements signed by the US with European countries, these were the most conspicuous from a financial point of view.

It must be remembered that, along with the major cooperative ventures described here, these countries were offered, and accepted, from 1962, the opportunity to launch national experiments in NASA scientific programs, such as the orbiting solar observatories or the polar orbiting geophysical observatory (POGO), where COPERS functioned as an administrative filter between NASA and the national teams of experimenters (see Appendix 4).

A. The first **satellites** built under this programme were prepared by the UK and Canada. The UK satellite, S-51 or UK-Q (later named Ariel-1), the world's first international satellite, carried devices to study electron temperatures and concentrations in the ionosphere, and instruments to determine electron densities in the vicinity of the satellite, to measure solar radiation and correlate it with ionospheric phenomena, and to observe primary cosmic rays and study their interactions with the earth's magnetic field. The choice of these experiments was based on previous experience with British Skylark rockets[32]. The selection was made by scientists of the UK "in consultation" with NASA's counterparts. Devices were built by UK scientists, who were responsible for data analysis. NASA designed, fabricated and tested the prototype and flight models. A joint US-British working group was set up after the signature of the exchange of notes

---

[30] NASA Historical Office, RG 255, 64-A-664, Frutkin Memorandum for the file, 3 August 1960. Frutkin makes reference to the cases of Great Britain and Italy.

[31] S. Shaffer and L. Robock Shaffer, *op. cit.*, p. 19.

[32] NASA Historical Office, RG 255, 66-A-508, box 1, Conference Report, Discussion on 20 January 1960 of the proposed British experiments to be flown on the Scout vehicle, 20 January 1960.

in September 1961 and met regularly in order to solve technical problems in design and test requirements[33].

After Ariel I was launched from Cape Canaveral on 26 April 1962 with a Thor-Delta rocket, work went forward in 1962 on a second joint satellite, S-52 (later named Ariel-II) and discussions continued on definition of the experiments for a third one, S-53, to be engineered, built and tested entirely in the United Kingdom, who would eventually deliver a flight-qualified spacecraft to the launching site. Ariel-II, still a US built spacecraft, was to transmit data regularly on galactic radio noise, vertical distribution of ozone, and micrometeoroid flux. By the end of the Seventies, the number of Ariels developed cooperatively would be six[34].

In 1962, Vice President Lyndon Johnson and Italian Foreign Minister Attilio Piccioni exchanged notes in Rome to confirm establishment of the joint NASA-Italian Space Committee project San Marco. The project was divided in three phases and was to culminate with the launching of an Italian satellite into an equatorial orbit from a towable platform off the coast of Kenya, in Africa, to be built by the Italians. San Marco's main objective was to determine the local density of the upper atmosphere in the equatorial planes. Italian engineers began training related to the project and took operational assignments at NASA field centres. Phase I of the project, as was usual in these circumstances, required first the sounding rocket test of satellite components, i.e. of the atmospheric drag balance mechanism, the heart of the San Marco spacecraft; it took place, as scheduled, at Wallops Island on 20 April 1963. As the test was only partially successful (the rocket's despin mechanism failed to operate properly preventing a true test of the sensitivity of the balance), it was rescheduled for late summer. The new successful test flight was conducted on 3 August 1963 on a Shotput sounding rocket launched at the same range by an Italian crew. After testing the operational state of the towable ocean-going platform by launching sounding rockets from it in coastal waters off Kenya in March 1964, Phase II of the cooperative venture took place in December 1964. An Italian crew launched the first San Marco-1 satellite on a Scout vehicle from Wallops Island. The three-phase scientific venture culminated less than three years later with the launch of San Marco-2 from the towable floating Italian platform. This launching site was later used by NASA on a reimbursable basis for the launch of its own rockets[35].

---

[33] *U.S. Aeronautics and Space Activities, 1961*(Washington DC: US Government Printing Office, 1962), pp. 26-27.

[34] H. Massey and M.O. Robins, *op. cit.*, chap. 5. See also *U.S. Aeronautics and Space Activities, 1961, cit.*, pp. 26-27; *Report of the Projects and Progress of the NASA for the period of January 1, 1963 through June 30, 1963* (Washington DC: US Government Printing Office, 1964), p. 134.

[35] *Reports of the Projects and Progress of the NASA for the period July 1 through December 31, 1962* (Washington DC: US Government Printing Office, 1963), p. 144. See also G. Caprara, *L'Italia nello*

Along with the CNES (the French National Centre for Space Studies), NASA agreed in February 1963 to cooperate in a programme for launching French very low frequency (VLF) experiments on Aerobee sounding rockets from Wallops Island in 1963. This was to be followed by the launching of a VLF satellite if these rocket flights should demonstrate their feasibility. FR-1, the first satellite launched in cooperation with France, was duly placed in orbit on 6 December 1965, to provide data on very low frequency electromagnetic waves propagation. Planned to send data over a three months period — the design lifetime of the spacecraft —, in fact it only failed to respond to commands 33 months later, in August 1968. A second satellite, FR-2, was planned for launching by NASA at the beginning of the seventies.

On the other hand, in a unique reversal of roles, NASA made in 1963 plans to fly US payloads on French rockets from a French range, Hammaguir, in Algeria. These launchings were devised to carry joint experiments from the Goddard Space Flight Centre and CNES to measure simultaneously electron and ion temperatures in the upper atmosphere.The launchings took place in 1964: instrumentation prepared by the Goddard Space Flight Centre was launched on two Dragon and two Centaure rockets supplied by CNES[36].

On the basis of a general offer extended by a NASA team travelling in Europe in 1965, discussions begun between NASA's administrator and the German Minister of Scientific Research Stoltenberg in Bonn in September 1966. The aim was to undertake a cooperative solar probe project, (Project Helios), by far the most ambitious US-German collaborative venture[37]. In June 1967 a formal written proposal was received by NASA from the German Ministry. This became the basis for the two-year comprehensive study of the Joint Mission Definition Group. The group's final report in April 1969 led to the signing of a Memorandum of Understanding in June of the same year. Project Helios provided for the launching of two German built probes to within 45 million kilometres of the sun. The Helios solar spacecrafts were designed to contribute

---

spazio. Storia, realizzazioni e programmi della ricerca spaziale italiana (Milano: Valerio Levi, 1992), chaps 2 and 3.

[36] *NASA News*, release n. 63-49, March 11, 1963; *The Tenth Semiannual Report by the NASA for the Period July 1 to December 31, 1963, cit.*, p. 154; *U.S. Aeronautics and Space Activities, 1964* (Washington DC: US Government Printing Office, no date), p. 38; LCMD, Paine Papers, box 33, Summaries of European space activities, prepared for Paine European visit 3-16 June 1969.

[37] The previous cooperative programme agreement was signed in July 1965. It consisted, as was usually the case, in a two-phase project: a series of sounding rocket launchings designated to check out the German satellite (GRS-A, later called Azur) instrumentation, and the launching of the satellite intended to perform an integrated study of the spectra and fluxes of energetic particles in the earth's inner radiation belts; LCMD, Paine Papers, box 34, NASA press kit, release 69-146, 2 November 1969. In general, see A. Frutkin, "International Cooperation in Space", *Science*, vol. 169, n. 3943, July 1970, p. 336.

to an understanding of solar processes and solar-terrestrial relationships. The FRG designed, manufactured and integrated the two spacecrafts, provided seven out of ten experiments (the rest being American), operated and controlled the spacecraft from a German control centre and provided data to all the experimenters. NASA provided two advanced launch vehicles, and the use of its deep-space network to support the mission. Helios-A was placed in heliocentric orbit by a Titan III/Centaur rocket on 10 December 1974; it was followed by Helios-B on 15 January 1976. The interesting feature of the Helios project was that the construction for the spacecraft imposed technical requirements of an advanced character on German industry, particularly for the development of the on-board power system and thermal controls. On-board data-processing systems had also to be highly sophisticated. Scientific payloads had to be supplemented by a large group of experimenters, representing 12 universities and government laboratories in Germany, the US, Italy and Australia[38].

Contacts between NASA and European representatives as a single negotiating agent were already made at the time of the ESRO Preparatory Commission. After discussions held in Washington (December 1963) and Paris (January 1964), Europeans submitted two satellite projects to their NASA counterpart. Soon after the birth of ESRO (March 1964), a Memorandum of Understanding was signed by Auger and Dryden on behalf of ESRO and NASA (July 1964) concerning the preparation, launch and use of ESRO's first two small unstabilized satellites, ESRO-I and ESRO-II (see Appendix 5). The two satellites would be launched with a Scout rocket, free of charge as a "christening gift" for ESRO[39]. In exchange for the launchings, it was agreed that scientific results obtained from these satellites would be shared between the two parties[40].

Responsibilities for the projects were divided between the agencies as follows:

- ESRO would provide the experimental instrumentation; design, construct and test the spacecraft; provide ground checkout and launch support equipment; track and acquire data

---

[38] *A General Review of International Cooperation in Science and Space*, Hearings before the Subcommittee on International Cooperation in Science and Space of the Committee on Science and Astronautics, US House of Representatives, May 18.19.20, 1971 (Washington DC: US Government Printing Office, 1971) p. 86. LCMD, Paine Papers, box 25, Memorandum Frutkin to Paine on Cooperative solar probe project with the Ministry for Scientific Research, Federal Republic of Germany (Project Helios), 23 May 1969. See also J. Krige and L. Sebesta, *US-European Cooperation in Space in the Decade after Sputnik*, paper prepared for G.Gemelli (ed.), *Intellectual Cooperation in Large-Scale Cultural and Technical Systems*, forthcoming.

[39] Historical Archives European University Institute (HAEUI), ESRO/25, 18/7/1964.

[40] M. Bourély, "The legal hazards of transatlantic cooperation in space", *Space Research*, November 1990, p. 325.

from the spacecraft within the capability of its projected network; reduce and analyze all data.

- NASA would train ESRO personnel as mutually determined, provide the Scout launching vehicles and conduct launching operations. NASA would also provide necessary supplemental tracking and data acquisition support[41].

Two years later, while there was intense discussion about the opportunity to carry on building an autonomous European launcher, NASA and ESRO signed a Memorandum of Understanding (30 December 1966) whereby NASA would carry out, against reimbursement, the launching of future ESRO scientific satellites and provide initial tracking and reception of telemetry data from these spacecrafts[42] (see Appendix 6). The drafting of the definitive text was slowed down by one major divergence. It concerned the availability of raw data coming from European satellites launched by NASA: NASA insisted on its right of access to data without reservation, agreeing to provide guarantees about the use (in publications) of such material in order not to compromise the intellectual property rights of ESRO and its experimenters. European scientists reminded US negotiators in strong terms that it was normal scientific practice for such data to be made available only upon request[43]. Finding the proposed clause in conflict with the principles of intellectual property rights, their reaction went from "the deep concern" (expressed by the German delegate) to the description of the US wording as unacceptable (the French delegate). The only opposed view came from the UK, which had experienced the liberal rights of access granted by NASA to the data received by the American tracking station in Great Britain (Winkfield) from US satellites. To this, the French retorted that this was neither an agreement on a telemetry station, nor an agreement of cooperation, relating more appropriately to the purchase of launching vehicles and associated services[44].

As had been made clear since the Autumn of 1966, NASA's inflexibility was based not so much on scientific or intellectual principles, but on a question of national security. NASA should be able to reply to any question about its activities for ESRO[45] — and, more precisely, as was made clear by NASA's administrator Webb, satisfy concerns about the agency's ability "to be

---

41 *NASA News*, release n. 64-178, 22 July 1964.

42 HAEUI, *ESRO/CERS Bulletin*, n. 1, 1967, p. 23; see also M. Bourély, *art. cit.*, p. 325.

43 HAEUI, ESRO/ST/MIN/10, Draft Summary Minutes of ESRO Scientific and Technical Committee, 6 July 1966.

44 For the German reaction, see HAEUI, ESRO/C/MIN/14, 20 January 1967, p. 35; for the French and British views, ESRO/C/MIN/12, 21 November 1966, p. 11.

45 HAEUI, ESRO/C/233, Note by the Secretariat, 14 November 1966.

in a position to report to Congress and the people that it does, in principle, have full access to data acquired by any satellite launched from United States' territory"[46].

The problem was solved by producing a text that, though complying with American wishes, satisfied European desire that data should be provided only "upon request" and gave sufficient safeguards for the intellectual property rights of ESRO and of its experimenters — the period of protection of priority rights of experimenters being identified with that in current ESRO practice (see art. IV c. of the Memorandum of Understanding, reproduced in Appendix 6 at p. 6 of the document).

Another point of conflict, NASA's liability in case of failure of a launch — the case in point was ESRO's accountability as regards reimbursement to NASA of costs resulting from damage to, or loss of, a vehicle —, was solved by charging ESRO with financial responsibility in connection with, and during, **preparation** for an agreed launch, thereby restricting the field of ESRO's responsibility (see art.III of the Memorandum of Understanding, reproduced in Appendix 6 at p. 6 of the document)[47].

In 1968, after almost five years of active cooperation, NASA launched three ESRO satellites. ESRO II (renamed Iris after the launch), designed for the integrated study of cosmic rays and solar radiation, was launched from the Eastern Test Range in May; ESRO-I (renamed Aurorae), launched in October from the Western Test Range, continued to study high-latitude energetic particles and their effects on the ionosphere. It was designed and built in Europe and carried eight experiments from Denmark, Norway, Sweden and the UK to study aurora borealis and related phenomena in the polar ionosphere. They were both launched by Scout vehicles. In December, the Highly Eccentric Orbit Satellite (HEOS-A, then renamed HEOS-I) was launched from Cape Kennedy on a Thor-Delta vehicle for a study of interplanetary physics (plasma, magnetic fields and cosmic rays). This last was launched following the new rules set out by the 1966 Memorandum of Understanding; it was the first foreign satellite to be launched by NASA on a reimbursable basis[48].

---

[46] HAEUI, ESRO/C/233, Memorandum of Understanding with NASA concerning the furnishing of satellite launching and associated services, Note by the Secretariat, 14 November 1966. See also J. Krige, *Europe Into Space: The Auger Years (1959-1967)*, ESA-HSR 8 (Noordwijk: ESA, May 1993).

[47] HAEUI, ESRO/C/MIN/12, 21 November 1966, p. 19; for the exact meaning of the very confused article, ESRO/C/233, Memorandum of Understanding with NASA concerning the furnishing of satellite launching and associated services, Note by the Secretariat, 14 November 1966.

[48] *U.S. Aeronautics and Space Activities, 1968, cit.*, p. 4 and p. 31. For the other ESRO satellites launched by NASA in 1972 and for a detailed description of the first ESRO's scientific satellites, see A. Russo, *Choosing ESRO's First Scientific Satellites*, ESA HSR-3 (Noordwijk: ESA, November 1992).

B. NASA's cooperation focused from the beginning on scientific investigations with **sounding rockets**. They were a relatively cheap and uncomplicated method to get valuable information about the earth's atmospheric envelope and its near-space environment, to test proposed satellite instrumentation and to verify the performance of the proposed experiments.

The first of these launchings took place in Italy, in 1961, and involved the emission of sodium vapour clouds for a measurement of winds and temperatures in the high atmosphere. Bilateral contacts materializing in the launching of sounding rockets were held with France, Norway, Denmark, the Federal Republic of Germany, the UK and Sweden (as far as Western Europe was concerned); their aim was to investigate the ionosphere, the upper atmosphere, and the geomagnetic and auroral phenomena[49].

C. Tracking, telemetry and command systems were also developed from 1959 onwards. Generally speaking, these stations were specialized in tracking the satellites, both during and after the launch; receiving telemetry data back from the satellites providing information on their performance and status; and transmitting commands when necessary to change the position of the satellites or activate onboard.

During 1959, the Minitrack system (composed of a 10-station Minitrack earth satellite network), established for the IGY for tracking earth satellites, began to be expanded to high-latitude coverage and to be placed on a more permanent basis. A network of deep space stations, to provide communications with and control of, spacecraft orbiting at lunar and planetary distances, was begun. It consisted of ground tracking stations spaced at intervals of approximately 120 degrees longitude around the world in California, Australia, Spain and South Africa (together with a control centre located at the Jet Propulsion Laboratory, Pasadena, California)[50].

The European ground segment consisted at first of the Redu tracking station (in Belgium) and the control centre at Noordwijk, ESTEC, in the Netherlands. To extend the tracking network, the stations at Fairbanks, Alaska (USA), Spitzbergen (Norway) and in the Falkland Islands (GB) were added, while the European Space Operations Centre, ESOC, in Darmstadt, FRG, became fully operational in 1968[51]. The ESRO polar telemetry, command and

[49] *U.S. Aeronautics and Space Activities, 1961, cit.*, p. 27. A. Frutkin, *op. cit.*, pp. 51-59.

[50] *U.S. Aeronautics and Space Activities, 1965* (Washington DC: US Government Printing Office, no date), p. 40.

[51] B. Lacoste, *Europe: Stepping stones to space* (Bedfordshire: Orbic, 1990), p. 53.

tracking station at Fairbanks, Alaska, was established in November 1966, by exchange of notes between ESRO and NASA[52]. Major discussions focused on the question of access and use of the raw data received by ESRO from its satellites within this station. They paralleled those taking place at the same time with respect to the Memorandum of Understanding on the furnishing of launching and associated service and were solved by a wording of the relative article which was very similar to the one described above (see point 9, letter Bohlen, reproduced in Appendix 7, at p. 6 of the document).

D. Exchange of technical and scientific information between ESRO, ELDO and NASA was formalized with an exchange of letters in May 1964 (see Appendix 8). Following a generalized concern which has always been at the core of scientific cooperation since the beginning of the twentieth century, a big effort was given to the improvement of the circulation of information[53]. This led, among other activities, to the establishment of a joint ESRO/ELDO Space Documentation Service (SDS) to cover both space research and space technology; exchanges of information with the NASA Information System were begun. NASA STAR (Scientific and Technical Aerospace Reports) and IAA (International Aerospace Abstracts) databanks were maintained by SDS. This single databank, still functioning today, has been continuously updated by American and European partners[54].

E. Personnel exchanges, training programmes within agreed cooperation agreements, **NASA international university fellowships** in space science were initiated in 1961 while NASA Post-doctoral and Senior Resident research associateships had already been set up in 1959[55].

F. A programme of **ground-based cooperation in data reception** was organized in relation to a number of experimental and operational application satellite projects. Some of the most interesting experiences took place in the field of telecommunications. Ground terminals in the UK, France, the FRG, Italy and Spain were built during the sixties for experiments in overseas television, telephone and telegraph transmissions via satellites. Echo I, the first passive telecommunication satellite, reflected radio waves from transmitters in the US to receiving stations in Europe since 1960. With the cooperation of French and British facilities, the

---

[52] LCMD, Paine Papers, box 33, European space activities, Paper prepared for Paine's European visit, 3-16 June 1969. See also G. van Reeth and K. Madders, "Reflections on the quest for international cooperation", *Space Policy*, August 1992, p. 223.

[53] J.-J. Salomon, *Science et Politique* (Paris: Ed. du Seuil, 1970), p. 325.

[54] M. Bourély, "The legal hazards of transatlantic cooperation in space", *art. cit.*, November 1990, p. 325.

[55] *U.S. Aeronautics and Space Activities, 1968, cit.* and A. Frutkin, *op. cit.*, table V.

experiment resulted in the first transatlantic real-time communications by means of an artificial satellite.[56] In July 1962 the first live broadcast of television pictures were received in Europe relayed by Telstar. In 1963, the first experimental geosynchronous communication satellite, Syncom II, was put in orbit, while a transatlantic commercial communications service was inaugurated in 1965 by Early Bird (later renamed Intelsat I).[57] While a sizeable ground station network existed throughout Europe by the end of the sixties, the whole space segment was entirely provided by the US.[58]

Beginning in 1959, another extensive ground-support programme was organized jointly in the field of meteorology. The US played a leading role in bringing to the attention of the World Meteorological Organization (WMO) the operational and research potentialities of satellites and declared their willingness to share the benefits that could come from such a use Meteorological satellites of the Nimbus and Tiros type were developed by NASA (to which Tiros was transferred in April 1959 by the Department of Defense[59]) in order to survey and transmit to earth information about cloud coverage of the globe so as to improve weather forecasting. An extensive network of weather satellite cooperation was established by NASA and the US Weather Bureau following the successful operation in 1960 of Tiros-1, the first US weather satellite. "Tiros-1 could only take pictures by day of zones of non-extreme latitudes. But experts were amazed to see the photomosaic of pictures taken 720 km out in space. Through its tiny TV cameras, Tiros-1 carried the human eye into space so that man for the first time saw cloud from above, riding the backs of invisible winds, the key to global weather systems"[60]. Tiros not only

---

[56] *U.S. Aeronautics and Space Activities, 1961, cit.*, p. 27 and A. Russo, *The early development of the telecommunications programme in ESRO (1965-1971)*, ESA-HSR 9 (Noordwijk: May 1993), p. 7.

[57] A. Russo, *op. cit.*, pp. 13-16. Pleumeur-Bodou n. 1 (located in France), Raisting n. 1 (in the FRG), and Goonhilly Downs (in the UK) stations plus the small antenna in Fiumicino (in Italy) were used from 1965 for commercial service via Early Bird. Spain was also active in the second half of the sixties in the establishment of earth stations within the context of satellite communications systems. A detailed report on the status of the 51 stations-antennas operating by the end of 1970 around the world is given in *Hearings of the Committee on Science and Astronautics*, US House of Representatives, 18, 19, 20 May 1971 (Washington DC: US Government Printing Office, 1971).

[58] In order to coordinate the European position in negotiations on the future Intelsat agreement and to promote European programmes in the field a European Conference for Satellite Communications (CETS) had been established by European countries in 1963. A. Russo, *op. cit.*, pp. 16-21. See also HAEUI, CSE/CM (July 67) 9 Report of Director general of ESRO. Present state of development of the European space research organization and proposals for its activities during the period 1968-1975, 23 June 1967.

[59] *U.S. Aeronautics and Space Activities, January 1 to December 31, 1959* (Washington DC: US Government Printing Office, no date), p. vi.

[60] For the citation, see B. Lacoste, *op. cit.*, pp. 59-60.

revealed the complexities of weather systems with a clarity never seen before, but also previously unknown phenomena. More Tiros satellites followed, with improved cameras, longer lifetimes and increasing applications to weather forecasting. European and extra-European nations agreed to conduct special observations of weather phenomena, to be coordinated with the cloud-cover photographs made by Tiros-2 and subsequent meteorological satellites[61].

The WMO pushed ahead with its plans for a world weather system, while invitations to European and other countries were extended in 1963 in tests of the Automatic Picture Transmission (APT) Systems. The incorporation on subsequent US polar orbiters of the APT system made it possible to receive local cloud-cover images anywhere in the world using ground equipment costing only a few thousand dollars. Any station with a relatively inexpensive receiver might receive these pictures when the satellite was overhead[62].

5. Changing political and technological frameworks

The sixties were a period of great political, social and economic development for Europe. Governments had overcome the phase of post-war economic recovery and reached internal political stabilization by the mid-fifties. They were experiencing economic growth (of production and markets) and a parallel willingness to recover at least part of their pre-war international political assertiveness. Technology had acquired a central importance in this endeavour[63].

The growing attention to technology as an important factor in the economic growth was mainly channelled into and institutionalized by OECD. The Freeman and Young study published in 1965 marked the official recognition of the problem by the organization and functioned as the major detonator of American interest in European disaffection. Related to 1962 data — and, thus, still linked to old "national" statistics[64] — the study referred to the US-European disparity in resources devoted to R and D. It quantified it in terms of the amount of R and D in dollars, in manpower and in patent rights, and concentrated on the dominant position of US firms in research intensive industrial areas such as aircraft, vehicles, electronic and non-electronic

---

[61] *U.S. Aeronautics and Space Activities, 1961, cit.*, p. 27 and A. Frutkin, *op. cit.*, table IV.

[62] R. Barnes, "A useful though incomplete primer", review of J. Johnson-Freese's book, *Space Policy*, August 1991, p. 273.

[63] This is not the place to elaborate on the relationship between technology and political assertiveness; autonomy in the security field is an essential element in it.

[64] In June 1963, the Frascati Conference of experts from member countries of the OECD adopted a manual for "Standard Practice for Surveys of Research and Development", providing for the first time an agreed basis for international comparisons in the field.

machinery, chemicals. These were the same firms that were exporting their capital, but not their know-how, to Europe in the sixties[65].

Some of the conclusions of the study are worthwhile citing: "(...) the existence of a major difference in the resources committed to research between two countries or areas" the authors said "does not necessarily mean that policy should be directed towards its reduction. Circumstances are different in every country, and so are policy objectives. Military, economic and welfare aims will all influence the allocation of resources to research and development, as well as more direct scientific considerations. The balance and the priorities in any one country will depend to a large extent on political decisions. The available resources, especially in scientific manpower, will often be the limiting factor. Some countries, especially smaller ones, will inevitably be obliged to concentrate their effort on a limited number of fields and cannot hope to compete in some very expensive fields of research and development, **except in association with a larger group of countries, or through international organizations**. (...) **The most rapid and widespread dissemination of new knowledge is the fundamental interest of all countries and any policy aimed at limiting this flow or substituting a kind of scientific "autarchy" would damage the prospects of all**"[66].

At the same time, the sixties experienced not only a quantitative growth in the interest in space science and technology , but a progressive, though indecisive, re-orientation of European interest away from "pure" space science toward a kind of activity linked not only to military but also to commercial interests, especially in the field of satellites. This trend was coupled with a greater sophistication in the research itself (from balloons to rockets, from unstabilized to attitude controlled rockets, from small unsttabilized satellites to medium stabilized satellites) and, thus, with rising costs.

Space developments, however, had been almost entirely "the preserve of the US and Russia" since the war. Nowhere else had the requirements been sufficient to support firms exclusively or even largely engaged in space technology. The smallness of national and international programs and the uncertainty which had characterized their development had not created, generally speaking, a propitious climate for growth in Europe[67]. France under the

---

[65] A. Grosser, *The Western Alliance. European-American Relations since 1945* (London: Macmillan, 1980) (original edition in French, 1978), pp. 217-131.

[66] C. Freeman and A. Young, *The Research and Development Effort. Western Europe, North America and the Soviet Union. An Experimental International Comparison of Research Expenditures and manpower in 1961* (Paris: OECD, 1965), p. 70.

[67] HAEUI, CSE/CM (July 1967)9.

energetic leadership of de Gaulle had been the only case in which the state, in the framework of an independent security policy and within a generalized interest for a new public policy for research, had intervened to support both the research and the productive sector linked to space activities[68].

This progressively led Europeans to a double concern.

A. Technological gaps that had arisen between Europe and the US since the fifties were becoming more pronounced "putting Europe in a position where it (would) be impossible to catch up technologically if decisions (were) not taken soon". This stemmed from various factors, above all the lack of leading edge basic research in such fields as high-energy physics, electronics and special alloys, where military financing, in some cases used for space-related devices, had been abundant in the US. In addition, the existence of huge space programmes (like Apollo) had led to an expansion of the field of systems engineering-management, while the absence of such major programmes — and the political restrictions imposed on the main one, i.e. ELDO — had impeded European training in this field. Nor had Intelsat given any impetus to European knowledge, because within its framework European industries could only work as sub-contractors of American companies[69].

B. On the other hand, the growing importance of communication satellites forced Europeans to think about launchers not only as means to send small or larger scientific spacecraft in low orbit, but as a means to place heavy commercial spacecraft in geostationary orbit. Europeans had two choices: a. improve qualitatively and quantitatively their own original ELDO launcher, EUROPA I; b. or rely on the availability of American launchers, inside the framework of Intelsat. In this context, collaboration between Europe and the US in the second half of the sixties became progressively to be viewed by the Europeans, as we shall soon see, as one answer to these concerns.

In April 1965, during his visit to Paris, Soviet Foreign Minister Gromyko accused the US of using international scientific cooperation as a vehicle for domination and a brain drain, and opened prospects for a technological alliance with Europe. French President de Gaulle echoed Soviet proposals, encouraging possible multiplication of scientific and technical contacts with the

---

[68] L. Sebesta, "La science, instrument politique de securité nationale? L'espace, la France et l'Europe, 1957-1962", *Revue d'histoire diplomatique*, n. 4, 1992, pp. 313-341.

[69] Project management was all the more important because in the mid-sixties it began to be used extensively in public policy projects, such as the constructions of motorways and other infrastructures. For the citations, see HAEUI, CSE/CM (July 67) 6, 30 June, 1967, Report by the chairman of the ad hoc working group on programmes (30 May, 1967), Bignier Report.

USSR. In the summer of 1966, these gestures materialized in the signature of a series of bilateral agreements between the two countries, including a space research agreement envisaging the launching of a French earth satellite by the Soviet Union and cooperation in the field of weather and communication satellites[70].

From 1965 to 1967, British Prime Minister Wilson, German Federal Chancellor Erhard, Belgian Prime Minister Pierre Harmel and Italian Foreign Minister Amintore Fanfani took formal and informal actions to counteract the French proposal with ideas of a much more Atlantic flavour. In particular Fanfani, in a proposal delivered to Secretary of State Rusk in September 1965, suggested the creation of a 10-year "technological Marshall Plan" for Europe, while Harmel, in a private talk with Donald Horning (Special Assistant to the President for Science and Technology and Director of the Office of Science and Technology, 1964-1969), referred in strong terms to the technological gap as being a major problem in transatlantic relationships[71]. During a following visit, Harmel handed over to Horning a note in which two alternative courses for future European action were stated:

1. an autonomous one, which Harmel referred to as sponsored by the French;
2. an intensification of the Atlantic partnership, which was offered an the only viable (Belgian) alternative to the previous one.

During this meeting, Harmel stressed the urgency of the problem and the need for effective action by the US[72]. These preoccupations were echoed in a 1967 NATO report on "The Future Task of the Alliance", where Harmel argued in favour of a policy based on the twin pillars of defense and détente. This had to be coupled with an extension of intergovernmental cooperation in the framework of NATO to foreign policy, defence, security and technology.

---

[70] *Keesing's Contemporary Archives*, vol. XV, 1965-66 (Bristol: Keesing's Publ. Limited, no date), pp. 20782 and p. 21545.

[71] In his meeting with Horning, Harmel referred to a paper prepared by Lefèvre, the future European negotiator in post-Apollo negotiations, in which figures on license fees and patent registrations were cited to demonstrate the seriousness of the widening technological gap between Europe and the US. See NAW, RG 359, box 610, Letter Donald Horning to Philip Trezise, US Representative to the OECD, 2 March 1966. For previous information, see B. Nelson, "Horning Committee: Beginning of a technological Marshall Plan?", *Science*, vol. 154, 9 December 1966, pp. 1307-1309.

[72] NAW 359, box 610, Memorandum of Conversation on Technological gap between the US and Europe, between Belgian and American representatives, 20 May 1966.

6. New ideas

These complex shifts in US-European relationships were parallelled by a debate in the US and in Europe over the nature of future space cooperation.

Some sectors of the US administration were inclined to consider space as a privileged laboratory to prove their willingness to help the Europeans bridge the technological gap. The space field represented an advanced technological sector par excellence (high research and development costs, lengthy development time, rapid obsolescence)[73]. Moreover, because it was heavily subsidized by the state, which also functioned as its major buyer, it seemed to be, among all the technological sectors, the most suitable to be used as a political tool.

From 1965 onwards, the State Department, the National Security Council, NASA, the PSAC and the President himself were working on possible solutions to "the frequently-stated European desire for greater participation in the development of space technology"[74]. There was a shared conviction that imagination and thoughtfulness at the highest political levels were needed to study how science and technology could be used for mutual advantages and to improve international relations[75].

Since his meeting with Erhard in December 1965, Johnson had made clear his willingness "to consider cooperative projects of considerably greater magnitude and more far-reaching technological implication than anything proposed here-to fore". The President's specific suggestion of Jupiter or solar probes as possible fields of cooperation, reiterated by an official NASA mission which briefed the European Space Conference in February 1966, should be understood only as examples of what could be done. Values referred to by the Department of State as the core of these attempts were "the contribution major advanced technological exercises can make to the partnership of government, university and industry, to the development of critical management capabilities, to economic security, and to common political objectives of institution-building and western cohesion". The immediate aim was to **"direct discussion toward spacecraft responsibilities for Europe rather than delivery vehicle-related responsibilities"**. American experience and competence would be transferred to European partners through two channels:

---

[73] J.W. Müller, *European Collaboration in Advanced Technology* (Amsterdam: Elsevier, 1990), pp. 8-11.

[74] NAW 359, box 610, Position Paper for Advance Team on European space cooperation, Nesbitt, 7 February 1966; box 458, Memo PSAC from Daniel Margolies to members PSAC, 10 December 1965.

[75] NAW, RG 359, box 564, Memo by Margolies, 3 January 1966.

1. a joint working group at the project level
2. commercial ties between firms, with export arrangements facilitated by the US[76].

Proposals focused around a political mission to Europe, which should include NASA's director. By January 1966 Horning suggested that highly visible pro-European personalities be included, such as John McCloy, "with a view of using space cooperation as a lever to give new vitality to European integration and to strengthen US-European ties in science and technology".

There was, however, strong disagreement about the potentialities of this lever. While there was an inclination, shared by American Ambassador in Paris Cleveland and by Rabi, to frame this offer in a multilateral framework, possibly NATO, Arnold Frutkin thought NATO was disqualified because of its military features. Moreover, he stated, an ambitious programme was "not warranted by realities of possible cooperation in space"[77].

Frutkin's views apparently won, and the NASA team which visited Europe in 1966 was not headed by the director of the agency, but by the person responsible for scientific affairs. The offer of collaboration on a solar or Jupiter probe was coolly received by the Europeans with the exception of the Federal Republic of Germany. In a time of tight finances and difficulties over the re-orientation of the European organization toward commercially-oriented endeavours, the US proposal seemed to avoid, rather than to appeal to, Europe's main worries[78]. It concerned a spacecraft of a higher technological and scientific relevance than the previous satellites put in orbit by NASA on behalf of some European nations; it did not meet, however, any of the new European needs in the fields of application satellites and launchers. As we saw in section 3, the offer was eventually accepted by the Federal Republic of Germany. In this case, however, there seems to have been an important external cause pushing the Federal Republic towards collaboration. Ever since the end of the war the government had to meet "offset" obligations with the US (a sort of compensation for the stationing of American troops on its soil) by the purchase in the US of military items. For several reasons, the German government was now keen to extend its "shopping-list" beyond military material and suggested that space expenses be included in this broader package[79].

---

[76] *Ibid.*

[77] NAW, RG 359, box 564, Memorandum Horning to Margolis on Webb Mission in space, 3 January 1966.

[78] J. Krige and L. Sebesta, *US-European Cooperation in Space in the Decade after Sputnik, cit.*

[79] Johnson's Library, Austin, Texas, NSF, Country File, Germany, box 187, Memorandum for the President, Visit of Chancellor Erhard, September 26-27, 1966. I am indebted to Hubert Zimmermann for passing me this document.

Soon after, during the Summer of 1966, the new "imaginative" US approach to cooperation with Europe became concrete, at least on paper. It was spelt out in an internal document approved by the National Security Council, the body at the top of the decision-making hierarchy on topics related to national security. Focus was shifted, in the document, from collaboration within spacecraft to collaboration within launchers. Three conditions for cooperation were laid down. Launcher vehicles, components and technology sold by the US should not be used:

1. for improving communication satellite capability other than a. to permit participation in the US National Defense Communication Satellite System; b. in accordance with the Intelsat agreements regulating (civilian) telecommunication satellite policy (see below);

2. for improving nuclear missile delivery capabilities;

3. for transmittal to third countries[80].

Intelsat was a consortium for the development and management of "a single global commercial communications satellites system". Its signatories, the telecommunications entities of the countries involved (a rapidly increasing number from the original 12 to 83 in 1972) had been operating a global communication satellite system since 1964 under "interim arrangements". In the American case, the signatory was Comsat, a private corporation which also ran the system from a managerial point of view; in most cases the signatories were the national postal, telephone and telegraph (PTT) administrations. The voting power was based on the percentage contribution to the system. Comsat was guaranteed an absolute majority of at least 50.5% and a veto power over its partners. The interim agreements were to be renegotiated five years later, when the Europeans hoped to have more power to shape the policy of the organization[81]. As things stood they feared that the US would use Intelsat to impede their developing a telecommunication satellite industry. The limits of America's willingness to collaborate with foreign countries in space were being increasingly set by the commercial interest of satellites.

In August of the same year, Europeans were informed about American willingness to support them in the development of a European launch vehicle capability through ELDO. Among the many ways suggested to do this, the US offered:

---

[80] NAW, RG 273, NSAM 354, US Cooperation with the European Launcher Development Organization (ELDO), 29 July 1966.

[81] See A. Russo, *The Early Development of the Telecommunication Satellite Programme in ESRO (1965-1971)*, *cit.*, pp. 10-13; J. Müller, *art. cit.*, pp. 106-109.

1. to enable the procurement of flight hardware in the US, including such items as a miniature integrating gyro (MIG) strapped down "guidance" (auto-pilot) package used on the Scout vehicles;

2. to assist in the long range development of follow-up ELDO projects using high-energy cryogenic upper stages (e.g. ELDO B) through a. technical information and contacts; b. bringing ELDO personnel into close touch with the major problems linked to systems design, integration and programme management of a high-energy upper stage such as Centaur; c. joint use of a high-energy upper stage developed in Europe;

3. to supplement ELDO launch capabilities either by the sale of configurations of Scout, Thor, Atlas vehicles, or by the sale of launch services for scientific and applications satellite projects[82].

7. Unfruitful discussions

The US offer reinforced the necessity, already stressed by various quarters in Europe, to tackle the problem of the nature and extent of ESRO-ELDO space programs.

Asked to analyze this problem, an ESC ad hoc group on programs stressed in 1967 that the choice on whether or not to build a heavy launcher should be made "bearing in mind the need for Europe to retain its political, technological and cultural autonomy, not on the basis of purely economical considerations"[83]. Along the same lines, the Causse report (December 1967) stated that a sound and imaginative European programme was a prerequisite to any "fair partnership" in the design, production and management of space devices. In the words of Causse, "(...) Europe should attempt to achieve independent capabilities of its own in such areas as application and scientific satellites, placing it in a position to share early benefits of space exploration, to become eventually a desirable, respected and essential partner of other space powers in order to share full benefits of space flight activities in the decades ahead". Developing a wide range of space potentialities was both a prerequisite of a more fair partnership with the major ally, the US, and a pillar for European political and cultural autonomy vis-à-vis the Americans. A case in point was, again, the launchers. The capacity of broadcasting radio and television programmes to specific areas being considered one important expression of political and cultural autonomy, the major

[82] HAEUI, Annex to ELDO/CM (July 68)WP/2, Possibilities and Problems of future US-European cooperation in the space field, Remarks by T.H.E. Nesbitt, Deputy Director, Office of Space and Environmental Science Affairs, Department of State, at the Meeting of EUROSPACE, Munich, Germany, 21 June 1968.

[83] HAEUI, CSE/CM (July 67)6, Report by the chairman of the ad hoc working group on programmes (30 May 1967), 30 June 1967, Bignier Report.

space powers could not be allowed to be in a position to exercise control over these opportunities through their monopoly of launching facilities[84].

This position, though, was not universally shared within ESRO and ELDO. There were those who, in the words of British Minister of Technology Anthony Wedgwood-Benn, were "very much alarmed at the thought that because a thing is European, and because a thing is international, this somehow excuses us from applying economic criteria"[85]. European cost estimations at that time made it clear that ELDO launchers were expected to be twice as expensive as their American counterparts[86].

In June 1968, the European Space Conference decided that a mission should be sent to the US to meet representatives from both NASA and the Department of State to discuss matters relating to launchers. The problem was threefold:

1. availability of American launchers
2. possibility of joint development of launchers
3. possible use by the US of European launchers

The mission would comprise the chairman of the Committee of Alternates, one representative each of UK, France, Italy and possibly Switzerland together with a representative of ESRO and ELDO[87].

Some days after this decision was taken, the Department of State representative Trevanion Nesbitt, reiterated August offers in terms of launch vehicles and affirmed the liberal character of US policy about the granting of export licenses, in both the satellites and launch vehicles field. Of a total of approximately 31.000 requests for export licenses received by the Department of State during 1966, only 2%, he stated, were not approved by the Department of State, which was responsible for controlling the export of technology and hardware. The cases

---

[84] HAEUI, CSE/CCP(67)5, December 1967, Report of the Advisory Committee on Programmes, Causse Report.

[85] Cited in J. Krige, "Britain and European Space Policy in the 1960s and early 1970s", in *Science and Technology Policy*, vol. 5, n. 2, 1992, p. 15.

[86] HAEUI, CSE/CM (November 1968)15, Add. 1, Cost Estimates of the experimental satellite CETS-C, 11 December 1968.

[87] HAEUI, CSE/CS(68)39, Note by the Secretariat, Twelfth session of the Committee of Alternates held in Neuilly on 10th and 11th June 1968, 13 June 1968.

not approved related to communication satellites whose relationship with Intelsat had not been clearly defined[88].

Ten days later, in order to focus on the questions to be asked to their American counterparts, ELDO formalized a list of coordinated requests to the US in the field of systems management and launcher systems, mainly guidance and boosters[89]. The meeting was duly organized in mid-July 1968. Problems related to the availability of US launchers for foreign commercial satellites were at the core of the discussions. The necessity for all cross-frontier telecommunication satellites to be submitted to a judgement of compatibility by Intelsat was clearly stated. However, "the possibility of establishing domestic or regional traditional telecommunications systems outside the framework of Intelsat was not ruled out, but they would have to be technically compatible with Intelsat satellites, and, in case of regional systems, not detract from the revenue of the global system".

As a secondary element, to European enquiries about the practicability of the suggestion advanced in 1966 to ELDO on a joint US/European development of a liquid upper stage, NASA replied that the expected number of American missions which would use this stage were too few to justify its development. At the same time, the "joint development of space capabilities" was dismissed on the basis of the problems related to reliability, costs of development process and cost/effectiveness of the overall launcher operation. As an interesting, if marginal aspect of the negotiations, the US representatives defined a broad category of satellites that, by their nature (the communication part not being the essential factor) would not to be submitted to any compatibility judgment by Intelsat. Among them there were meteorological, navigation and air-traffic control satellites. The opportunity for a joint air-traffic satellite project (the future fateful Aerosat) was discussed for the first time and considered to have "excellent possibilities"[90].

American willingness to launch European telecommunication satellites was put to the test three month later, when the directors of the Franco-German programme to construct an experimental telecommunications satellite asked NASA if they could provide launch vehicles and service for two Symphonie satellites then under development. After consulting with the

---

88 *Ibid.*

89 HAEUI, ELDO/CM(July 68) WP/2, Cooperation with the United States, July 10, 1968.

90 HAEUI, CSE/CS(68) 46, Meeting between US representatives and members of the Committee of Alternates, held in Washington on 19 July 1968, 2 September 1968; see also CSE/CS(68) 45 rev., Meeting between US representatives and members of the Committee of Alternates, held in Washington on 19 July 1968, 17 September 1968.

Department of State, NASA replied that it would launch the two satellites only if their experimental (as opposed to operational) character could be demonstrated[91].

Here was a case where Causse report's prophecies seemed to be verified: American willingness to collaborate with foreign countries was clearly in conflict with the rising commercial interests in the field of communication. In April 1969, Ministers of ELDO member states decided in favour of the development of a new launcher system. After stressing the importance gained by application satellites in space policy, Australian, Belgian, French, German, Italian and Dutch representatives decided to support the study of the execution of a programme for EUROPA III launchers, corresponding, in principle, to the launching of geostationary satellites with a mass of 400 to 700 kg, the reputed size of the new generation of communication satellites[92].

At the same time, in view of the approaching European decision on the opportunity to approve the then so called CETS television relay satellite (EURAFRICA or EUROVISION), due to be approved at the European Space Conference in November 1969, the Committee of Senior Officials of the ESC decided that Secretary General of the Space Conference, Hermann Bondi, should make inquires on the prospects of American launcher availability for this satellite. A meeting was held in Washington in August 1969 between NASA and State representatives, on the one hand, and Bondi on the other. At the same time he was enquiring, on behalf of the organization which he represented, over the issue of launcher availability. American's basic attitude was in favour of the supply of launchers for any peaceful satellite, provided that it was not in contravention of their international obligations. Due to the fact that the treaty then ruling the use of telecommunications satellites was in the process of being revised, the US could hardly be anything other than non-committal as far as these obligations were concerned. At a very general level, while for domestic systems only technical compatibility was requested (in terms of frequency, etc.) for regional international systems, some test of economic compatibility would be required in order to verify that they posed no economic harm to the existing organization's members. As for the nations which would join the regional system (the European regional system, in European eyes, extended to Africa and the Middle East), no nation could have joined it until after it had joined the Intelsat network[93].

---

91 LCMD, Thomas Paine Papers, box 26, Paine to Clinton Anderson, 9 September 1970.

92 HAEUI, ELDO/CM (April 1969) 8 Final, 15/4/1969, Resolution 3, Studies on Future Programme.

93 HAEUI, CSE/HF(69)32, Report on the Secretary General activities resulting from instructions given to him by Senior Officials on 28/29 July 1969, 10 September 1969.

In the course of another meeting during the same visit, Bondi was briefed by Frutkin about the future US programme and showed much enthusiasm for the prospective new post-Apollo programme, mainly consisting at the time of a space station and a shuttle. It seemed to be a shared assumption for both Bondi and his counterpart, the Administrator of NASA Thomas Paine, that European willingness to build its own launcher arose from the fear that the US could block any expansion of future European telecommunication satellites by simply not providing the launching facilities. If Europe could abandon its "trouble-plagued and obsolescent vehicle programme", Paine suggested, and reorient itself toward the purchasing of US launchings, "European funds would be freed for more constructive cooperative purposes", i.e. the post-Apollo programme[94].

Discussions that took place during the second part of the sixties, even if unfruitful, set the stage for a broadening of perspective within US-European cooperation. The so-called post-Apollo negotiations showed how painful and controversial this process was. The second section of this paper will be devoted to an analysis of the various interlocking elements that influenced the outcome of these negotiations and the contents of the two agreements signed in 1973 to set the legal framework for cooperation on Spacelab.

[94] LCMD, Thomas Paine Papers, box 23, Letter Paine to the President, August 22, 1969 and Interview with Arnold Frutkin, Washington, 8 November 1993 (interviewers J. Logsdon and L. Sebesta).

LIST OF APPENDICES

Appendix 1

Formal offer of international co-operation by the USA through COSPAR, March 1959

Formal offer of international co-operation by the USA through COSPAR

March 1959

COSPAR has a truly historic opportunity to become an effective force for international co-operation in space research. This co-operation will be most fruitful and meaningful if the maximum opportunity to participate in, and contribute to, all aspects of space research can be provided to the entire scientific community. In this regard, COSPAR can serve as an avenue through which the capabilities of satellite launching nations and the scientific potential of other nations may be brought together.

The United States will support COSPAR in this objective by undertaking the launching of suitable and worthy experiments proposed by scientists of other countries. This can be done by sending into space either single experiments as part of a larger payload or groups of experiments comprising complete payloads.

In the case of individual experiments to become part of a larger payload, the originator will be invited to work in a United States laboratory on the construction, calibration, and installation of the necessary equipment in a US research vehicle. If this is impossible, a US scientist may be designated to represent the originator, working on the project in consultation with him. Or, in the last resort, the originator might prepare his experiment abroad, supplying the launching group with a final piece of equipment, or 'black box', for installation. However, this last approach may not be practical in most cases.

In the case of complete payloads, the United States also will support COSPAR. As a first step, the delegate of the US National Academy of Sciences is authorized to state that the US National Aeronautics and Space Administration will undertake to launch an entire payload to be recommended by COSPAR; this payload may weigh from 100 to 300 lb and can be placed in an orbit ranging from 200 to 2000 miles altitude. It is expected that the choice of the experiments and the preparation of the payload may require a period of one-and-a-half to two years. NASA is prepared to advise on the feasibility of proposed experiments, the design and construction of the payload package, and the necessary pre-flight environmental testing. The US delegate will be pleased to receive COSPAR's recommendations for the proposed payload when they can be readied.

In further support of COSPAR, the US delegate would like to call attention to the availability of resident research associateships at the National Aeronautics and Space Administration in both theoretical and experimental space research. These provide for stipends of $8000 per annum and up.

Source: H. Massey and M.O. Robins, *History of British Space Policy* (Cambridge: Cambridge University Press, 1986), Annex 4, p. 462. The original document can be found in NASA Historical Office, RG 255, 64-A-664, box 1 in the form of a letter sent by Richard W. Porter to Professor H.C. van de Hulst, President, COSPAR, 14 March 1959.

Appendix 2

Space expenditures 1963-1977

Table 3: Exchange rate between AU and US $*

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
One Au in US$	0.93	0.93	0.93	0.93	0.94	0.97	0.98	0.98	0.95	0.89	0.89
Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	
One Au in US$	0.84	0.81	0.77	0.91	0.88	0.81	0.75	0.93	1.04	1.15	

Table 4: Space expenditure at current cost (in MAU)*

Country	1963			1964			1965		
	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total
Belgium	na**	na	na	na	na	na	na	na	na
Denmark	na	na	na	na	na	na	na	na	na
France	10.7	19.9	30.6	16.4	30.1	46.5	21.9	36.7	58.6
Italy	0.6	1.4	2.0	6.9	2.2	9.1	9.5	1.7	11.2
Netherlands	na	na	na	na	na	na	na	na	na
Spain	na	na	na	na	na	na	na	na	na
Sweden	na	na	na	na	na	na	na	na	na
Switzerland	na	na	na	na	na	na	na	na	na
United Kingdom	14.4	1.3	15.7	26.1	1.9	28.0	34.8	4.9	39.7
West Germany	1.2	2.4	3.6	15.3	12.9	28.2	21.0	16.2	37.2
Total	26.9	25.0	51.9	64.7	47.1	111.8	87.2	59.5	146.7
Japan			na			na			na
USA			5,080.3			6,385.2			6,502.1
USSR			8,400.0			9,300.0			10,300.0

*Expenditures for Europe include ESRO and ELDO from 1963 to 1974 and ESA from 1975 to 1983. Expenditures for Japan include NASDA, ISAS and others. Expenditures for USA include defence, NASA and other civilian programmes. The NASA expenditures exclude the air transportation programme. Expenditures for USSR include civil and military activities whereby 70% of total expenditures are attributed to military programmes. The expenditure estimates for USSR are considered to be conservative.

**na stands for not available.

Country	1966			1967			1968		
	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total
Belgium	na	na	na	5.7	0.8	6.5	6.0	1.1	7.1
Denmark	na	na	na	1.0	0.5	1.5	1.1	0.6	1.7
France	25.0	41.1	66.1	28.8	67.7	96.5	33.0	85.47	118.4
Italy	11.3	1.6	12.9	14.8	5.8	20.6	16.8	1.8	18.6
Netherlands	na	na	na	5.6	1.0	6.6	6.2	2.1	8.3
Spain	na	na	na	1.2	1.8	3.0	1.7	1.3	3.0
Sweden	na	na	na	2.4	0.8	3.2	2.0	0.8	2.8
Switzerland	na	na	na	1.6	0.1	1.7	1.6	0.6	2.2
United Kingdom	38.5	23.1	61.6	33.2	29.0	62.2	36.2	7.0	43.2
West Germany	24.7	16.8	41.5	32.0	33.0	65.0	36.8	40.8	77.6
Total	99.5	82.6	182.1	126.3	140.5	266.8	141.4	141.5	282.9
Japan			na			na			na
USA			6,515.2			6,331.6			6,367.1
USSR			11,200.0			11,300.0			11,700.0

Country	1969			1970			1971		
	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total
Belgium	5.4	2.6	8.0	5.5	6.3	11.8	6.4	1.5	7.9
Denmark	1.1	0.6	1.7	1.2	0.7	1.9	1.4	0.8	2.2
France	29.5	74.3	103.8	33.1	63.7	96.8	35.7	67.0	102.7
Italy	11.9	8.2	20.1	7.9	13.2	21.1	9.9	15.4	25.3
Netherlands	5.5	2.4	7.9	4.1	4.2	8.3	4.6	7.0	11.6
Spain	0.4	1.7	2.1	0.8	1.0	1.8	1.4	1.3	2.7
Sweden	2.2	0.8	3.0	2.7	1.2	3.9	3.1	1.1	4.2
Switzerland	1.7	0.6	2.3	1.9	0.6	2.5	2.1	0.7	2.8
United Kingdom	32.6	47.1	79.7	13.1	47.1	60.2	16.6	39.6	56.2
West Germany	33.2	49.7	82.9	37.8	53.4	91.2	44.1	97.5	141.6
Total	123.5	188.0	311.5	108.1	191.4	299.5	125.3	231.9	357.2
Japan			na			40.2			42.2
USA			5,846.3			5,224.9			4,524.9
USSR			11,700.0			11,700.0			11,500.0

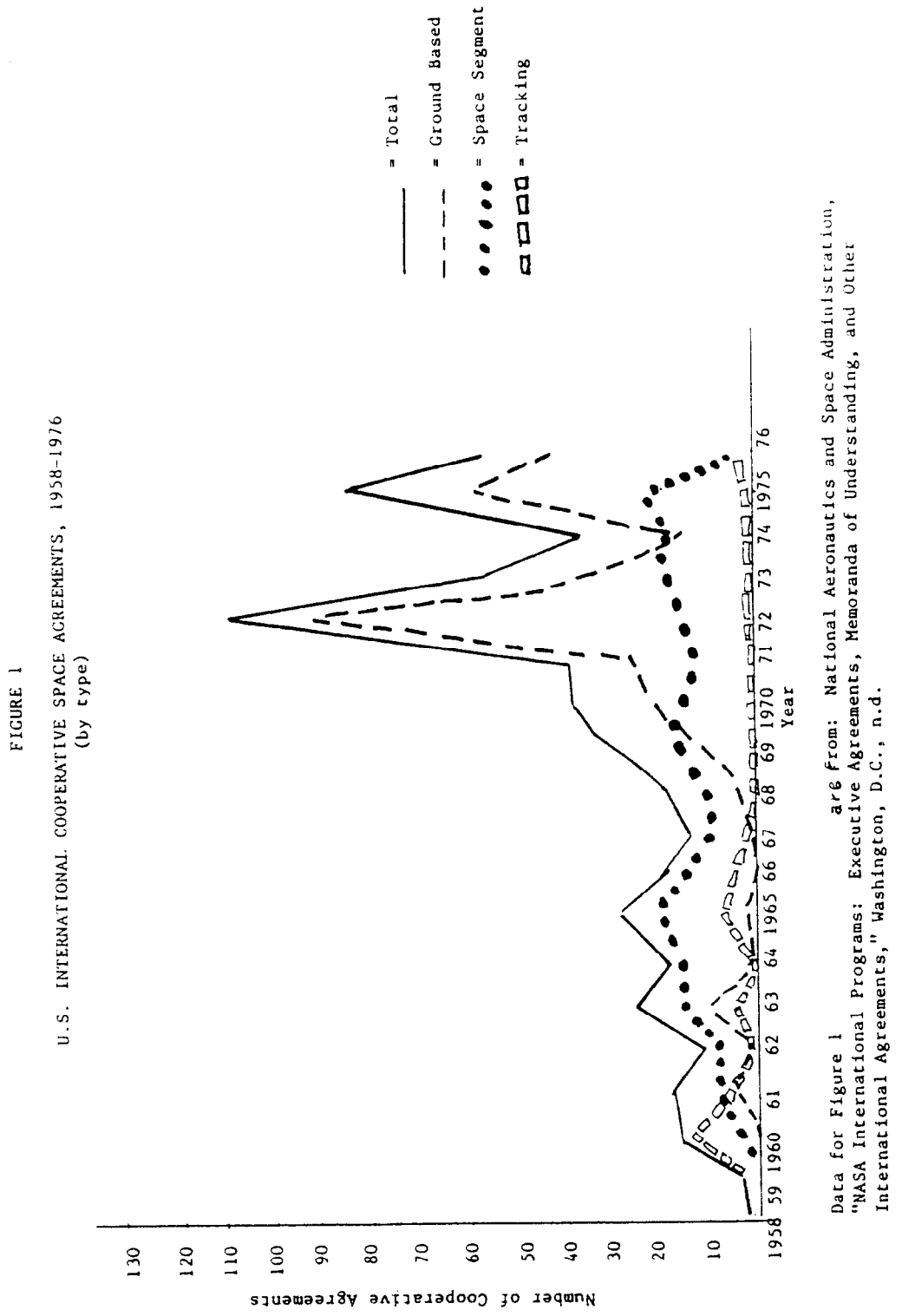
Country	1972			1973			1974		
	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total
Belgium	8.0	3.4	11.4	6.0	1.1	7.1	8.3	1.2	9.5
Denmark	1.7	0.9	2.6	2.3	1.0	3.3	3.4	1.0	4.4
France	42.6	93.2	135.8	57.1	99.6	156.7	56.2	95.67	151.8
Italy	8.7	8.6	17.3	15.3	14.3	29.6	21.3	18.0	39.3
Netherlands	3.9	8.1	12.0	3.9	8.4	12.3	6.1	5.4	11.5
Spain	1.4	1.3	2.7	3.8	2.4	6.2	3.9	2.3	6.2
Sweden	3.5	2.1	5.6	4.5	2.4	6.9	6.8	2.8	9.6
Switzerland	2.2	0.2	2.4	4.0	0.9	4.9	4.9	1.0	5.9
United Kingdom	13.9	37.1	51.0	19.6	28.7	48.3	31.2	19.3	50.5
West Germany	48.3	90.6	138.9	64.1	95.1	159.4	57.2	108.3	165.5
Total	134.2	245.5	379.7	180.6	253.9	434.5	199.3	254.9	454.2
Japan			70.5			109.7			165.4
USA			4,078.3			4,574.9			3,890.3
USSR			11,100.0			11,100.0			11,500.0

Country	1975			1976			1977		
	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total	Eur'n	Nat'l	Total
Belgium	9.5	1.7	11.2	16.4	2.7	19.1	18.5	0	18.5
Denmark	5.2	1.2	6.4	5.6	1.4	7.0	6.3	1.5	7.8
France	105.1	95.7	200.8	138.1	72.5	210.6	150.1	76.3	226.4
Italy	30.5	13.2	43.7	54.1	8.6	62.7	45.3	11.5	56.8
Netherlands	9.6	5.3	14.9	13.7	8.1	21.8	12.6	10.0	22.6
Spain	5.2	2.3	7.5	10.3	2.1	12.4	10.4	1.0	11.4
Sweden	12.0	3.9	15.9	13.1	5.3	18.4	10.6	5.8	16.4
Switzerland	9.4	1.3	10.7	10.2	1.2	11.4	5.9	0	5.9
United Kingdom	39.1	0	39.1	61.6	0	61.6	55.6	41.8	97.4
West Germany	90.4	73.5	163.9	118.1	74.8	192.9	122.6	75.6	198.2
Total	316.0	198.1	514.1	441.2	176.7	617.9	440.9	223.5	664.4
Japan			209.5			265.5			310.4
USA			3,960.4			4,084.7			5,447.0
USSR			11,100.0			9,600.0			11,400.0

Source: J.W. Müller, *European Collaboration in Advanced Technology* (Amsterdam: Elsevier, 1990), pp. 379-381.

Appendix 3

U.S. International Cooperative Space Agreements, 1958-1976 (by type)



Source: S.M. Shaffer and L. Robock Shaffer, *The Politics of International Cooperation: A Comparison of U.S. Experience in Space and in Security*, vol. 17, book 4, Monograph Series in World Affairs (Denver: University of Denver, 1980), p. 20.

Appendix 4

European Preparatory Commission for Space Research — Scientific and Technical Working Group: Participation of European scientists in the NASA orbiting solar observatories programme, 19 November 1962

COPERS/GTST/62
Paris, 19 November 1962

EUROPEAN PREPARATORY COMMISSION FOR SPACE RESEARCH

SCIENTIFIC AND TECHNICAL WORKING GROUP

Participation of European Scientists in the NASA orbiting solar observatories programme

The letter attached to this document has been received by the COPERS Secretariat from the office of International Programs, National Aeronautics and Space Administration, Washington 25, D.C., U.S.A.

All proposals concerning experiments to be carried out in orbiting solar observatories should be sent to the COPERS Secretariat, who will submit them to the appropriate "ad hoc" groups for consideration.

The deadline given in this letter (30 November 1962) refers only to the first satellite to be instrumented. Proposals will be accepted from now onwards.

R/791.

COPERS/GTST/62
page 2

Dear Professor Auger:

The National Aeronautics and Space Administration is planning to launch a series of satellites similar to the Orbiting Solar Observatory launched March 7, 1962, and to the two additional units of this type for which payloads have already been assigned. It is our hope to launch the satellites in this series at approximately six-month intervals, starting early in 1965. Prototypes of experiments for the first of these should be available by March, 1964. These satellites will be launched into a near circular orbit at an altitude of 300 nautical miles and an inclination of approximately 33°. The major characteristics of the spacecraft are described in the attached summary description.

Each of these satellites is designed to carry several experiments. Since this series provides an excellent occasion for detailed study of the sun, there may be European scientists who would like to have an experiment considered for flight. We should appreciate your informing potential investigators of this opportunity. Proposals should be submitted through COPERS to the Office of International Programs (Code AI), National Aeronautics and Space Administration, Washington 25, D.C.

All proposals will be evaluated by the NASA Space Sciences Steering Committee. Should an experiment proposed under your auspices be selected for flight, NASA would expect to arrange with you for its inclusion on a no exchange of funds basis.

Proposals should describe the experiment briefly and discuss the scientific objectives. Any supporting measurements or other simultaneous observations that are essential or desirable should also be covered. Weight, volume, power, and telemetry requirements should be estimated as well as possible. Special requirements such as continuous operation, or operation by command or program, data storage or command read-out, should also be defined.

In order to be considered for the first satellite in the projected series, thirty copies of each proposal should reach the Office of International Programs by November 30, 1962. Proposals submitted subsequent to that date will be considered for later satellites in the series. Additional technical information can be obtained by writing to Dr. Nancy G. Roman, Chief of Astronomy and Solar Physics (Code SG), National Aeronautics and Space Administration, Washington 25, D.C.

Sincerely yours,
Arnold W. Frutkin
Director, Office of International Programs

Source: Historical Archives, European University Institute, COPERS/GTST/62, 19 November 1962.

Appendix 5

Memorandum of Understanding between the European Space Research Organisation and the United States National Aeronautics and Space Administration on the preparation, launching, and use of ESRO-I and ESRO-II satellites, 8 July 1964

MEMORANDUM OF UNDERSTANDING BETWEEN THE

EUROPEAN SPACE RESEARCH ORGANISATION

AND THE

UNITED STATES NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

1. The European Space Research Organisation (ESRO) and the United States National Aeronautics and Space Administration (NASA) affirm a mutual desire to undertake a cooperative program of space research by means of satellites. The objectives are to (a) perform an integrated study of the polar ionosphere with particular emphasis on auroral events and (b) measure solar and cosmic radiation.

2. It is planned to accomplish this cooperative program through the preparation, launching, and use of two satellites which are scheduled tentatively for launching in 1967.

(a) The polar ionosphere satellite, to be known as ESRO I, will contain experiments to perform an integrated study of high latitude particles and their effects on the polar ionosphere, including optical, heating, ionization, and large scale dynamic effects involving currents and magnetic perturbations. It will also include a beacon experiment for measurements of the total electron content between the satellite and ground observers. A near-polar eccentric orbit within the capability of the present Scout launch vehicle is planned for ESRO I.

(b) The solar astronomy and cosmic ray satellite, to be known as ESRO II, will contain experiments to measure solar and cosmic radiation including X-rays, He II line, Lyman Alpha, trapped radiation, solar and Van Allen belt protons, cosmic ray protons, alpha particles, and high energy electrons. A near-polar eccentric orbit within the capability of the present Scout launch vehicle is planned for ESRO II.

3. It is understood that this program is experimental in character and therefore subject to change in accordance with altered technical requirements and opportunities.

4. ESRO will be responsible for the following:

(a) Providing the experiment instrumentation.

(b) Designing, constructing, testing, and delivering to the launch site two flight qualified spacecraft for each mission.

(c) Supplying spacecraft ground checkout and launch support equipment.

(d) Providing such tracking and data acquisition support as may be within the capability of the projected ESRO network.

(e) Reducing and analyzing the data.

(f) Supporting such trainees as may be assigned pursuant to 5(a) below.

5. NASA will be responsible for the following:

(a) Making available project-related training for periods providing mutual benefits within the limits of resources in facilities and personnel.

(b) Reviewing the acceptance tests of satellite flight units and the results of these tests. Final determination of the suitability of flight units for launching will be by joint ESRO/NASA decision.

(c) Providing the Scout launch vehicles, including heat shields and spacecraft tie-down and separation mechanisms, required for launching the two satellites.

(d) Conducting the launch operations, including tracking to the point where an initial orbit is established.

(e) Supplying necessary additional tracking and data acquisition support, with reimbursement by ESRO of any incremental costs such as those occasioned by special equipment and data tapes.

6. ESRO and NASA will each bear the cost of discharging its respective responsibilities including the costs of travel by personnel and transportation charges on all equipment for which it is responsible.

7. It is intended that this project proceed by mutual agreement between ESRO and NASA. The responsibility for accomplishing this will rest with project managers to be named by ESRO and NASA. Assisted by a Joint Working Group with appropriate membership, the ESRO and NASA project managers will coordinate the agreed functions and responsibilities of each agency with the other.

8. ESRO and NASA will use their best efforts to arrange for free customs clearance of equipment required in the program.

9. ESRO and NASA will exchange all scientific information resulting from this cooperative program and make the results freely available to the world scientific community.

For the European Space Research Organisation

For the National Aeronautics and Space Administration

July 8, 1964
Date

Source: NASA Historical Office, *NASA News*, release n. 64-178, 22 July 1964.

Appendix 6

Memorandum of Understanding between the European Space Research Organisation and the United States National Aeronautics and Space Administration concerning the furnishing of launching and associated services, 6 January 1967

ESRO/111
Attached: ESRO/C/198, rev. 1
Paris, 6 January 1967
(Original:English)

EUROPEAN SPACE RESEARCH ORGANISATION

MEMORANDUM OF UNDERSTANDING
BETWEEN THE EUROPEAN SPACE RESEARCH ORGANISATION
AND THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONCERNING THE FURNISHING OF LAUNCHING AND ASSOCIATED SERVICES

Member States are hereby informed that the Memorandum of Understanding, concerning the furnishing of satellite launching and associated services, following the Council's decision, taken at its 14th Session and after further negotiations between NASA and the Secretariat, has been signed by Mr Webb, the Administrator of NASA, and the Director General of ESRO. It entered into force on the 30th December 1966.

The attention of the Member States is drawn, in particular, to the final wording of clause IV.C. of the Memorandum of Understanding, which has been the subject of discussions in the last Council Session. The final text of the Memorandum is attached hereto (ESRO/C/198, rev.1).

P/5780.

ESRO/C/198, rev.1.
Paris, 6 January 1967
(Original: English)

MEMORANDUM OF UNDERSTANDING BETWEEN THE EUROPEAN SPACE RESEARCH ORGANISATION AND THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION CONCERNING THE FURNISHING OF SATELLITE LAUNCHING AND ASSOCIATED SERVICES

Affirming their mutual interest in peaceful space research, the European Space Research Organisation (ESRO) and the United States National Aeronautics and Space Administration (NASA) set forth in this Memorandum of Understanding their general understanding as to the conditions under which NASA will furnish to ESRO launching and associated services for scientific spacecraft, on a reimbursable basis, and as to the responsibilities of the parties in connection with the launchings. ESRO and NASA intend that, at appropriate times in the future, they will enter into separate launching contracts, expressing the specific terms and conditions under which NASA will furnish launchings and associated services for each set of launchings requested by ESRO, and which shall be in accord with the general understandings set forth in this Memorandum.

P/5781.

Article I - RESPONSIBILITIES

A. ESRO will be responsible for:

1. Furnishing advice to NASA of its requirements for a particular set of launchings at as early a date as possible and in any event sufficiently in advance (minimum 18-24 months) of the target date of the first launching to accommodate financial, procurement, and operational requirements of both parties. Such advice will include details as to the spacecraft mission, payload description, orbital characteristics, launching parameters, planned launching dates and back-up launching requirements, and other information needed by NASA for planning purposes.

2. Incorporating provisions in the spacecraft design specifications and test programs to assure and demonstrate spacecraft compatibility with the launch vehicle physical constraints and in-flight environment and with tracking and data acquisition facilities.

3. Providing flight-ready spacecraft at the launching range, in accordance with the time schedule established under the launching contract.

4. Furnishing all ground-support equipment (GSE) peculiar to the mission and personnel required for its operation except for certain items of GSE which NASA may specifically agree to provide and/or operate.

B. NASA will be responsible for:

1. Furnishing launch vehicle and tracking and data acquisition specifications necessary for ESRO to carry out its responsibilities under Article I, A.2. above.

2. Scheduling the ESRO launchings within the general time period requested by ESRO, subject to the requirements of United States programs. If such requirements should arise NASA will so notify ESRO as soon as possible.

3. Providing Thor-Delta or other appropriate U.S. launch vehicles. The parties shall jointly select the vehicle to meet ESRO mission requirements.

4. Providing necessary facilities and support, including launch crew services, for pre-launch integration of ESRO spacecraft at the launching range, and for ESRO's check-out of the spacecraft.

5. Launching the spacecraft from a U.S. range.

6. Furnishing tracking and telemetry data reception from the spacecraft to ascertain achievement of orbit and vehicle performance, using existing U.S. facilities. Additional NASA tracking and data acquisition support may be arranged at ESRO request on a non-interference basis. Additional or unique equipment, if required, will be supplied by ESRO.

7. Performing initial orbital calculations.

8. Furnishing other mutually agreed services and/or GSE in support of specific or general ESRO launch requirements.

Article II - IMPLEMENTATION

A. Each party will designate a Project Manager for each set of launchings, to be responsible for coordinating the agreed functions and responsibilities of each party with the other, pursuant to the detailed arrangements established under the launching contract. The ESRO Project Manager will be concerned primarily with the spacecraft and the NASA Project Manager will be concerned primarily with the vehicle. Together they will be responsible for the spacecraft/ vehicle interface.

B. NASA will have operational authority over the vehicle, the launching, and associated services. ESRO will have operational authority over the spacecraft until it is mounted on the final stage motor, at which time it will become NASA's responsibility until separation in orbit. In accordance with normal practice, the ESRO Project Manager can place a "hold" on the launching operation at any time. In carrying out their respective responsibilities, both parties will be subject to the safety and other operational regulations and procedures of the range from which the launching takes place.

C. Arrangements for the furnishing of supporting services by NASA in connection with a specific launching or set of launchings will be provided for under the launching contract. NASA may also furnish, on a reimbursable basis, minor services in support of general ESRO launching requirements, at ESRO's request and under arrangements to be agreed upon separately.

Article III - FINANCIAL PRINCIPLES

A. ESRO will be responsible for all costs incurred by it in carrying out its own responsibilities, and will reimburse NASA for costs incurred by NASA in connection with furnishing the requested launching and associated services, and any other supporting services provided at ESRO's request. The general principle under which reimbursement will be made will be that ESRO will reimburse NASA for all identifiable additional direct costs incurred by NASA in connection with and properly allocable to the services furnished by NASA for the purposes of any scheduled ESRO launching, whether or not such launching actually occurs or is successful, plus an additional amount, to be agreed upon in advance, covering NASA's indirect costs and other costs which are not readily identifiable. NASA may also charge an agreed rental for the use of equipment loaned to ESRO.

B. Reimbursement of NASA's costs will be made initially on the basis of an estimate to be furnished by NASA in advance, under a payment schedule to be established in the launching contract. The amount paid by ESRO on an estimated basis will be adjusted subsequently to reflect the costs actually incurred by NASA in connection with each launching. In the case of costs incurred by NASA which are not accounted for on a per launch basis, such as for launch vehicles and launch crew services, NASA may, in determining its actual costs, allocate costs for a particular launching on a pro-rata basis.

C. ESRO will be exempted from reimbursing NASA for certain costs which might otherwise be payable under the general principle stated in Paragraph A above, such as costs incurred by NASA as a result of payment of claims of third parties for injuries, death, or damage to or loss of property; or such as costs incurred by NASA as a result of damage to or loss of U.S. Government property, except for damage to or loss of a vehicle being used in connection with or during preparation for an agreed launch.

Article IV - DOCUMENTATION AND REPORTS

A. NASA and ESRO will exchange, through their respective Project Managers, all documents and information necessary for the successful completion of the agreed missions.

B. Immediately after each launching, ESRO will provide NASA all data from the satellite necessary for ascertaining the performance of the launch vehicle.

C. ESRO shall, upon NASA's request and at NASA's expense, provide NASA with any raw data received by ESRO from the satellite and any reduced data therefrom. Any use of unpublished data by NASA within the time period protected by ESRO rules shall be subject to prior permission by ESRO. In any use of this data, NASA will respect the ESRO rules relating to intellectual property rights.

Article V - REVISION

It is understood that this Memorandum of Understanding can be amended by mutual consent.

Dated .....

For the	For the
European Space Research Organisation	National Aeronautics and Space Administration

Source: Historical Archives, European University Institute, ESRO/C/198 rev. 1, 6 January 1967.

Appendix 7

ESRO-NASA Exchange of letters concerning the establishment and operation of a satellite telemetry/telecommand station near Fairbanks, Alaska, 28 November 1966

November 28, 1966

M. Pierre Auger
Director General
European Space Research Organization
Paris, France

Dear Sir:

I have the honor to refer to discussions which have recently taken place between the Government of the United States of America and the European Space Research Organization concerning the establishment and operation of a satellite telemetry/telecommand station near Fairbanks, Alaska, in connection with peaceful and scientific space activities to be undertaken by the Organization.

The Government of the United States (hereinafter referred to as the United States) desires to cooperate with the European Space Research Organization (hereinafter referred to as ESRO) in these activities as part of their mutual efforts to foster international cooperation in the peaceful uses of outer space, and agrees to the establishment by ESRO of an earth station on United States territory for space telemetering and telecommand purposes. In furtherance of this objective the United States will use its best efforts to facilitate the necessary local arrangements by ESRO in connection with its activities in Alaska. The United States proposes that this station be established and operated in accordance with the following principles and procedures:

1. ESRO may acquire by lease an area of land and obtain appropriate easements for the establishment and operation of an earth station for space telemetering and telecommand purposes, to be located in the vicinity of the City of Fairbanks. The

United States will seek to facilitate arrangements for the lease of the land and appropriate easements and will help resolve any problem which may arise in connection with the use of such land and such easements.

onstruction the Station

2. ESRO will arrange for the construction of the station which is the subject of this Agreement. The costs of constructing, installing, equipping and operating the station will be borne by ESRO, including the cost of constructing or improving roads and other means of access, except to the extent that contributions may be made by State or local authorities to serve public needs.

perating ency

3. The National Aeronautics and Space Administration (hereinafter referred to as NASA) is designated by the United States as Cooperating Agency with ESRO on matters pertaining to the implementation of this Agreement.

escription of Station

4. The ESRO station will consist of installations for:

Reception and recording of spacecraft telemetry signals (e.g., telemetry receiving antennae with automatic tracking receivers, pointing gear and radome, telemetry receiving assembly, PCM decommutators and display equipment, coded time generator with decoders and display equipment, graphic and magnetic recorders);

Transmission of telecommand signals to spacecraft (e.g., transmission antenna and pointing gear, radome, telecommand coder and transmitter);

Telecommunications with ESRO Control Center (e.g., teleprinter and associated equipment, telephone link);

Processing of information, maintenance of equipment, scientific and technical measurements on the ground and other tasks ancillary to the above activity (e.g., measuring instruments, antenna command and control desk, calibration tower with antenna and associated equipment);

Accommodation of staff, equipment and stores; emergency power supply station, transformers, water supply and other services.

As program requirements develop, additional equipment may be added, or existing equipment changed, at the station, consistent with the terms of this Agreement. ESRO shall notify the United States in advance of any major addition to or change in station equipment.

5. ESRO will select a contractor who will obtain, in accordance with applicable United States law, appropriate authorizations for the construction and operation of the radio transmission facilities, which authorizations will be granted by the United States subject to compliance by the contractor with applicable United States and international telecommunications regulations.

The United States will act with respect to this station, in all matters concerning the International Telecommunication Union in conformity with the International Telecommunication Convention.

The United States recognizes that an essential characteristic of the station is its need for freedom from harmful radio interference, including interference caused by air-ground communications, and recognizes the importance of measures to maintain this freedom insofar as practicable against the operation of radio interference-producing devices. The United States will take precautionary measures insofar as practicable to eliminate or minimize harmful interference to the extent such devices are subject to the control of or by the United States. In addition, ESRO will seek appropriate arrangements with the State of Alaska insofar as measures for the control of such interference fall within the jurisdiction of the State of Alaska.

The area to be protected from radio interference is that area enclosed by the following points, as determined from U.S. Geological Survey Fairbanks D-1 and D-2, Alaska, 1:63, 360 Scale Topographic Maps:

Latitude	64° 55'4"	N,	Longitude	147° 32'30"	W,
"	64° 56'38"	N	"	147° 32'30"	W,
"	64° 56'38"	N	"	147° 31'00"	W,
"	64° 57'21"	N	"	147° 31'00"	W,
"	64° 57'21"	N	"	147° 27'30"	W,
"	64° 55'4"	N	"	147° 27'30"	W,

Status of ESRO

6. ESRO shall, to the extent consistent with the instrument creating it, possess the capacity in the United States to contract, to acquire and dispose of real and personal property, and to institute legal proceedings.

Privileges and Immunities

7. ESRO and its personnel shall be accorded the status, privileges, exemptions and immunities indicated in the following subparagraphs:

Customs duties

A. The United States will, upon request, take the necessary measures to facilitate the admission into the United States of material, equipment, supplies, goods or other items imported by or for the account of ESRO in connection with the station and ESRO programs. Such shipments shall be accorded such exemption from customs duties and internal-revenue taxes imposed upon or by reason of importation, and such procedures in connection therewith, as are accorded under similar circumstances to foreign governments.

Title to property

B. Title to all materials, equipment or other items of property used in connection with the station and ESRO programs will remain in ESRO. Material, equipment, supplies, goods or other property of ESRO may be removed from the United States at any time by ESRO free of taxes or duties.

Inviolability and immunity from search

C. The archives of ESRO shall be inviolable. The property and assets of ESRO shall, subject to police and health regulations, and applicable United States regulations with regard to radio station inspections, be immune from search, unless ESRO expressly waives such immunity, and from confiscation.

[illegible]

D. ESRO, its property and assets, shall enjoy the same immunity from suit and every form of judicial process as is enjoyed by foreign governments, except to the extent that ESRO may expressly waive its immunity for the purpose of any proceedings or by the terms of any contract.

[illegible]

E. ESRO shall be exempt from the following taxes levied by the United States: federal income tax; federal communications taxes on telephone, telegraph and teletype services in connection with the operation of the station; and federal tax on tickets for air transport of ESRO officers and employees which are purchased by ESRO or ESRO officers and employees in connection with official travel to and from the station.

[illegible]

F. The United States will facilitate the admission into the United States of such ESRO officers and employees and their families, as may be assigned to or visit the station. ESRO and its officers and employees shall have the same privileges and immunities as those accorded by the United States to officers and employees of foreign governments with respect to laws regulating entry into and departure from the United States, alien registration and fingerprinting, and registration of foreign agents. Officers and employees so assigned shall not exceed in number those necessary for the construction and effective operation of the station. ESRO will communicate their names to the United States in advance of entry.

Baggage and effects of ESRO officers and employees assigned to the station may be admitted, when imported in connection with the arrival of the owner, into the United States, and may be removed from the United States free of customs duties and internal-revenue taxes imposed upon or by reason of importation. Such effects having a significant value shall be sold or otherwise disposed of in the United States only under conditions approved by the United States.

Such ESRO personnel shall be exempt from the payment of United States income tax and federal insurance contributions on wages and expenses paid by ESRO. The privileges and immunities set forth in this subparagraph shall not apply to citizens of the United States or foreign nationals admitted into the United States for permanent residence. However, officers and employees of ESRO, whatever their nationality, shall be immune from suit and legal process relating to acts performed by them in their official capacity and falling within their functions except insofar as such immunity may be waived by ESRO.

Automobile Liability

8. ESRO will ensure that adequate automobile liability insurance is obtained for any of its personnel who operate automobiles in Alaska and will obtain such insurance for any automobiles which ESRO may purchase, lease or borrow. Notwithstanding any other provision of this Agreement, ESRO will waive any immunity which it might otherwise claim with respect to any suit or legal process alleging liability covered by such insurance.

Availability of Data

9. ESRO shall, upon request of the United States and at its expense, provide any raw data received by ESRO at the station and any reduced data therefrom. The United States may make use of this data after a period consistent with existing ESRO practice. Any earlier use of this data by United States shall be subject to prior permission by ESRO. In any use of this data the United States will respect the ESRO rules relating to intellectual property rights.

Station Use

10. Apart from utilizing its station for its own satellites, ESRO may utilize its station for the support of satellites of one or more ESRO member states, and, with the prior consent of the United States for the support of other satellites.

Final Clauses

11. Supplementary arrangements between the United States and ESRO may be made from time to time as required for the carrying out of the purposes, principles and procedures of this Agreement.

This agreement may be revised by mutual consent at the request of either party.

The United States and ESRO recognize the desirability, in accordance with international practice, of arbitrating any difference which may arise under this Agreement.

This Agreement shall continue in effect until February 29, 1972, and can be extended for an additional term by prior written agreement.

If the foregoing principles and procedures are acceptable to the European Space Research Organization, I have the honor to propose that this note, together with your note to that effect, shall constitute an Agreement between the United States of America and the European Space Research Organization on this matter which shall enter into force on the date of your note in reply.

I wish to present the renewed assurances of my highest consideration.

Charles E. Bohlen

Source: Historical Archives, European University Institute, ESRO temporary file 50577.

Appendix 8

ESRO-NASA Exchange of letters on cooperation and exchange in the field of scientific and technical information, 28 May 1964

EUROPEAN SPACE RESEARCH ORGANISATION
36, rue La Pérouse, Paris 16e

28 May 1964

Dear Dr. Dryden,

Thank you for your letter of March 13, 1964 on the subject of co-operation and exchange in the field of scientific and technical information. May I say at the outset how much I and my staff appreciate the very helpful attitude of the NASA officials who have taken part in the discussions, and how much we look forward to continuing contacts of this kind as the programme develops.

As you probably know, some small revisions to the points of understanding expressed in your letter of March 13, have meanwhile been agreed between Mr. Page and Mr. Frutkin (see Mr. Frutkin's letter of April 13, 1964).

Finally, the points of understanding are the following:

1. ESRO will provide to NASA abstracts of scientific and technical reports originating from European sources, these abstracts to be processed in a form suitable for inclusion in NASA's Scientific and Technical Aerospace Reports (STAR).

2. NASA will provide ESRO with a limited number of copies of STAR which may be used by ESRO in connection with further distribution.

3. NASA and ESRO will make available to each other single copies of microforms (at such time as ESRO commences production of microforms) or, in their absence, single copies of documents representing the material covered in the abstracts published in STAR. ESRO will service European requests for NASA reports announced in STAR, in cases when NASA does not have an existing bilateral arrangement.

4. NASA and ESRO have agreed in principle to exchange material for computer searches at such time as ESRO has established facilities for processing the European input and utilising the material concerned. The precise requirements for such an exchange will be the subject of further detailed arrangements noted in 6 below.

5. There will be no transfer of funds between NASA and ESRO in this programme.

6. Further detailed working arrangements necessary for the implementation of this co-operation will be made by the appropriate staffs of NASA and ESRO.

7. It is understood between the parties that this co-operative arrangement could be amended by mutual consent; it may be terminated on reasonable notice by either party in writing.

I consider that you will find these points acceptable. Therefore, your letter of March 13, 1964, as revised by Mr. Frutkin's letter of April 13, 1964, and this confirming reply constitute an Agreement between NASA and ESRO.

Sincerely yours,

Pierre Auger
Director General

Mr. Hugh L. Dryden,
Deputy Administrator,
National Aeronautics and
Space Administration,
Washington 25, D.C.

Source: *ESA Bulletin*, n. 39, August 1984, p. 28.

European Space Agency
Agence spatiale européenne

Contact: ESA Publications Division
c/o ESTEC, PO Box 299, 2200 AG Noordwijk, The Netherlands
Tel (31) 71 565 3400 - Fax (31) 71 565 5433