



InsSciDE Work Package 8:

Space: European science diplomacy for cooperation in a global space competition

Case Study n°8.1	Science diplomacy in the Cold War: a socio-historical study of French-Soviet cooperation in Space research, 1960s-1970s
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Abstract

Developed from the 1960s on, the diplomatic strategy of rapprochement between France and the Soviet Union was founded on an extensive policy of “scientific and technical cooperation”. Signed in 1966, during General de Gaulle’s visit to the Soviet Union, the scientific cooperation agreement aimed to facilitate and reinforce international links between the two countries, even in periods of diplomatic tension. Indeed, the agreement boosted new international collaborations between scientists in a number of fields, even in such sensitive areas as space research, treated as a “lead sector”. How were these collaborations rendered possible despite the intense competition and the political and even military opposition between East and West? My InsSciDE case study will provide a detailed socio-historical account of this French-Soviet space cooperation, one of the founding experiences of French (and later European) science diplomacy, and thus offer a reflection on science diplomacy *acting* in a tense diplomatic climate.

Introduction

Today, international scientific cooperation is given high policy priority in all Western states looking to redefine the boundaries of their zones of exchange and to reinforce their position in the international arena. In fact, diplomatic use of scientific cooperation became prominent as early as the 1950s. Rooting in an extensive policy of “scientific and technical cooperation”, the 1960s strategy of rapprochement between France and the Soviet Union was in that respect a founding experience of French (and later European) science diplomacy. A major science cooperation agreement was signed in 1966 during General de Gaulle’s visit to the Soviet Union, with the intention to facilitate and reinforce international links between the two countries, even in periods of diplomatic tension.

This “scientific and technical agreement” led over time to important scientific results and boosted new international collaborations between scientists, in particular in space research areas – considered the “lead sector” of this cooperation. However, these collaborations were far from self-evident, because the geopolitical tensions between the two countries remained strong. How were they made possible, despite the intense competition and the political and even military opposition between East and West? What were the obstacles to cooperation and how were they bypassed? To what extent did these collaborations allow a genuine scientific internationalisation? To what extent did they help realize the initial objective of breaking the bipolar logic of the Cold War?



With these questions in mind, my case study will provide a detailed socio-historical account of French-Soviet scientific space cooperation at its beginnings (1960s-1970s), and thus offer a reflection on science diplomacy *acting* in a tense diplomatic climate. This case study will open a perspective on tensions inherent in science diplomacy, viewed as a complex interplay that involves various scales (local, national, international, transnational) and different types of actors, with diverse, and often contradictory, interests and professional identities.

Actors

Promoted for political and diplomatic reasons, the policy of scientific and technical cooperation between France and the Soviet Union had to be endorsed and implemented by scientific actors and institutions in order to succeed. On the French side, it involved primarily the National Centre for Space Research (*Centre national d'études spatiales*), the National Centre for Telecommunications Research (*Centre national d'études des télécommunications*), the Directorate of National Meteorology (*Direction de la météorologie nationale*) and various research laboratories (affiliated with CNRS, the National Centre for Scientific Research and universities). Key actors on the Soviet side include the Academy of Sciences and its institutes (mainly IKI, the Space Research Institute) and also some closed design bureaus linked to the highly secretive military-industrial complex.

Detailed study of the interactions between diplomatic and scientific actors aims to identify the initial discrepancies in the French case between diplomatic strategies and the interests and expectations of the scientific milieu. What tensions did the science/diplomacy interface give rise to in this historical case, particularly during periods of political tension between the two countries? How did political and scientific interests align?

Fields and disciplines, interfaces with technology

While the scientific and technical cooperation agreement signed in 1966 between French and Soviet governments concerned many scientific disciplines, space research was considered from the outset as a lead sector. This research area, however, touched on technologies and knowledge whose circulation between East and West were very limited because of the military and strategic uses they might imply. My case study will provide new insight on the paradox of Space research as both as a crucial diplomatic instrument and an issue of national security and sovereignty.

Politics and policies

Although French-Soviet Space cooperation was strongly controlled by state institutions of both countries, it led to the formation of a zone of transnational circulations between Soviet and French scientific milieus. This study will reconstruct the contours of this transnational zone by analysing the processes and the flows (of people, technologies, knowledge, instruments and so on) that took place. A comparative study of the first French-Soviet joint scientific projects, some of which succeeded while others failed, will aim at understanding how a collaborative dynamic was set in motion, leading to the formation of durable scientific networks between East and West.

Disciplinary/methodological approach

To tackle these questions, my socio-historical investigation will draw on the study of archival documents from French and Soviet (political and scientific) institutions in charge of the negotiation, definition, implementation and control of the policy of space cooperation in the 1960s-1970s. This study of archival materials will be complemented by memoir literature and also by face-to-face semi-structured interviews with French and Soviet scientists who took part in joint projects. As far as possible, I will take equally into account the Soviet and the French perspectives and points of view.



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InsSciDE Work Package 8: Space: European science diplomacy for cooperation in a global space competition	
Case Study n°8.2	Space Racks Diplomacy for Earth: Orbital laboratories producing European Diplomacy for intercultural cooperation in the global Space competition
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Abstract

Aboard the International Space Station (ISS), space racks are the international standard payload racks containing miniaturized scientific instruments used for experiments in micro-gravity. They permit advances in life sciences and in health experiments, and lend insight on environmental issues, for instance the science of fluid dynamics and the control of energy exchanges between space and Earth. Embarking these miniaturized laboratories represents the outcome of a multidimensional negotiation engaged from the start of conceptual development of the space station in the 1970s. These “machines”, scientific research tools, represent and symbolize an international negotiation not only inside the European Space Agency between the scientific communities of different ESA member states, but also at global level between Europeans and other countries engaged in space research, or which need to conduct experiments in microgravity. Usually the participants in such experiments have space capabilities or high level financing. Can space racks represent an international arena for a European diplomacy aiming to include scientists from countries without space and financial capabilities in order to develop a real global space network? This question may be strategic for the European Union and ESA in view of acquiring a political role in the next most relevant step for space exploration, Mars. The historical analysis of who, why, and how space experiments have been organized and managed may suggest a track for a Space Racks Diplomacy.

Introduction

Since the beginning of human space flight in the 1960s, the US and URSS thought of bringing in spacecraft biological experiments on the cellular and organismal effects of weightlessness, as well as of studying human life in outer space by analyzing astronauts’ body modifications (ageing, osteoporosis, balance disorders, and muscle loss). A first experiment in materials science was conducted in October 1969 aboard the Soviet space probe *Soyuz-6*, with US research started immediately afterwards in the Apollo program. Launched in May 1973 and lost five years later, US orbital laboratory *Skylab* was a strategic step for outer space science, but only for the American scientific community in regard to the selection and management of experiments. Concerning international cooperation, the real turning point was the Euro-American laboratory *Spacelab* designed to be flown by the future US re-usable shuttle. This ten-day mission laboratory was a future cornerstone of any space station, opening the US space experiments to Western cooperation but more generally constituting a tool for US space diplomacy between cooperation and competition. Various Multifunctional Logistic Modules (MLM) were developed for NASA and in cooperation with Europeans, with Italy's Donatello, Leonardo, and Raffaello programs, and by two European consortia led by German industries.

In 2008, NASA published an analysis of more than 400 experiments conducted in the first ten years of the ISS; CNES, GSOC and ASI as well as ESTEC listed their national or multilateral experiments. Since February 1971, the “prestige” series of *Saliut*, and then more rapidly by the real station *Mir* launched in February 1986, Soviet



and Russian experiments represented a “propaganda” competitor to be tested by Europeans as a concrete alternative in the winding down of the Cold War.

Actors

By tracing the operating life of these space laboratories – from the call for experiments and the simulation in ESTEC by ESA up to the control of the experiment by the Crew Interface Coordinator in the ISS – and by paying particular attention to the European nationalities participating in the space experiments, it’s possible to define the practices of negotiation, the modes of interplay, and above all the actors themselves. By observing their interplay with institutional stakeholders at national and international level, we intend to distinguish a sort of techno-science diplomat or diplomat scientist from among the complexity of traditional actors of foreign policy on science and technology: ministers, diplomats, scientists, military, managers of public or private firms, national and international officials, astronauts, specialized journalists.

Fields and disciplines, interfaces with technology

Several scientific disciplines are engaged in outer space experiments, as well as the design and construction of modules needing an exchange with the scientific community to standardize and organize these space laboratories. Historians have to enter a real interdisciplinary cooperation with their scientific colleagues in order to select the more significant experiments, and to understand their meaning for the scientific community, as well as their possible applications for the next steps of space exploration. The Center for Space Studies and Activities “Giuseppe Colombo” (CISAS, Padua University) may guarantee the needed interdisciplinary network, as well as a vision on new program perspectives thanks to the Padua University Mars Exploration Team.

Networks and communication

A recent history project of Padua University, “ExPost: Experts and Politics on Science and Technology in Europe since 1960s” (2015-17), allows us to apply some conceptualizations to key actors of space racks diplomacy. These concern firstly the interplay between experts as advisers and political stakeholders in foreign policy making and more specifically multilateral negotiations, and secondly networking activities inherent to transnational politics as seen in the history of European integration. By combing these conceptualizations, we propose to assess the “transdisciplinary” expert and “diplomat scientist” as a key actor of a European space racks diplomacy.

Politics and policies

Exploring the inevitable tension between competition and cooperation, the relationship with third countries, and the subjects of the experiments may suggest how this “diplomacy” linked to the use of a common scientific language in Outer Space creates an interlinked community of networks, starting from the European scientists acting as a sort of diplomat, but engaging scientists from third countries too, and not only from the big powers: USA, China, Japan, India. We will seek to identify the role and the originality of a European space diplomacy facilitating an actual cultural exchange focused less on techno-industrial competitive challenges and more on cooperation in the face of global challenges: climate, security, communication, Earth evolution and the new horizon for space exploration, Mars.

Disciplinary/methodological approach

We need an interdisciplinary approach interconnecting history of international relations with histories of science, technology, economics, industry, culture and society. History of European Integration as well as history of international organization will provide a useful framework. The first examples of research interconnecting science and technology with international history are the history projects on CERN and ESA. Rooted in national and international archival material, these studies led by John Krige influenced all subsequent research. Despite some essays, diplomatic history and more generally the history of international



relations have received only recently the opportunity to use science and technology as interpretative keys useful for new conceptualizations serving political science as well.

Our case study will rely on ESA and EU archives and some national and private archives in Europe and USA, as well as on interviews. Thanks to a special post-doctoral fellowship the Russian point of view will be explored.

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InsSciDE Work Package 8:	
Space: European science diplomacy for cooperation in a global space competition	
Case Study n°8.2b	Space Racks Diplomacy for Earth: Orbital laboratories producing European diplomacy for intercultural cooperation in the global Space competition
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Abstract

Our InsSciDE case study explores the political and techno-scientific organisation of the science programme of European human spaceflights, from its pioneering French-Soviet roots in the 1970s to its institutionalization today. Remarkable in its continuity, the science programme implemented by astronaut-scientists working in plurinational cooperation schemes helped to overcome various political tensions menacing its stability. We will analyse two French-Soviet science and technological missions realized aboard orbital laboratories in 1982 and 1988, which conducted experimental fieldwork in microgravity science and technology in parallel with those conducted by US NASA and the European Space Agency. While many historians and actors have documented the conduct of research in microgravity, the diplomatic issues related to the programme level have received less attention. We will discuss non-technical dimensions such as issues of crew compatibility and interaction in long-duration orbital flight which could possibly interfere with the conduct of experiments. With reference to the model of scientific diplomacy developed by the Royal Society and AAAS (2010), we will examine the influence exerted by political will in shaping and implementing the scientific object of the human space missions.

Introduction

As of 1979, an additional protocol to the 1966 French-Soviet general science and technology agreement integrated a new space activity: human spaceflight. From that time France began to develop diplomatic bonds with the Soviet Union in view of conducting research in microgravity.

The science programme of human spaceflight missions is understood here, on the one hand, as comprising experiments in physics, biology and space medicine conducted by French and European laboratories selected by the space agencies, and on the other hand, by the involvement of astronauts operating experiments in liaison with ground-based scientists (PI-Principal Investigators) and support personnel. We suggest that the structures put in place by the institutional actors to enable this programme were challenged by the initially established hierarchical relationship between the transporting nation (the USSR) and the transported nation (France). Actors promoted a *modus operandi* accepting adjustments to the military/secretcy regime of selection, training and support of payload scientist-astronauts.

Experiments aboard orbital stations are fieldwork of generative science diplomacy, at the interface of governmental wills and the internationalisation of sciences. Operational planning is a site of negotiations (Bonting, 1996). We will develop a historical chronology to lay out facts and identify institutions. However, a holistic approach must be applied to reveal the process of achieving cooperation missions in situations of ideological adversity. Starting with the first international human spaceflight Apollo-Soyuz Test Project (ASTP,



1975), a world famous diplomatic success, little room was left for scientific experiments. ASTP cooperation reveals organizational and cultural aspects that contributed to shaping a specific approach to governance. Today, the scientific and technological archives of the Russian Federation (partially opened in 2010) allow us to understand not only the technical, but also the non-technical issues raised by ASTP during the space race: technological trust, intercultural management, relations with industry, tensions between Intercosmos vertical hierarchy and NASA horizontal management.

Building on the diplomatic achievement of ASTP, in 1976 the Soviet Council Intercosmos launched an international human spaceflight science programme within the Eastern bloc in reaction to the NASA recruitment of plurinational crews on Spacelab Shuttle flights. An opportunity to reassert political alliances within the socialist bloc, the Intercosmos agreement promoted scientific experiments operated *by and on* cosmonauts themselves onboard orbital stations as a shared action aiming at a common productive goal. A turning point was reached in 1976 with the decision to launch payload-specialists (USA, ESA) or *kosmonavt-experimentatel'* (USSR), implementing astronomy and bio-medical experiments on national orbital laboratories. Spacelab-1, built in Germany, operated by ESA astronauts (but without the French), gives the measure of the tensions between national interests at stake in the Spacelab programme and ESA representation in space.

However, bilateral negotiations between France's Centre national d'études spatiales (CNES) and Intercosmos reinforced space science diplomacy: the 1982 French-Soviet "Premier Vol Habité" (PVH, first manned flight) was labelled a "scientific mission. In order to transcend the political tensions of the 1980s, CNES and Intercosmos mission planners had decided to set up a strategy focused on science benefits. A thorough analysis of the selection of the PVH French astronauts, their training at Star City documented by their instructors, as well as the process of selecting scientific experiments and their conduct in orbit is expected to produce fresh insights on the diplomatic aspects of this East-West scientific cooperation.

Actors

One of the A consequence of the scientific manned flight mission PVH was to make CNES visible on the international stage. Since that time, governmental and intergovernmental space agencies (CNES, NASA, ESA) developing science programmes in cooperation depend not only on public funding, but also on the interests and needs of the society for science operated in orbit. Facing the disapproval by a fringe of distinguished scientists and politicians sceptical of the utility of such programmes, the promotion of science in orbit, and especially human spaceflight, had to be reevaluated and extended. Although science was the key element, unfortunately not many scientists gained in notoriety through space experiments. Overshadowing them, the figure of the astronaut transcends debates and intellectual conflicts as he or she stands in the light. A national citizen, humankind's envoy into outer space, or ambassador to the nations on Earth, the astronaut symbolizes the mass of fellow-citizens and triggers the motivation of the young generation. The astronauts' scientific tasks still indicate however that the construction of a science programme is an object of political concern at the core of the human spaceflight mission.

Beside the central figure of the astronaut, we plan to investigate the decision making underlying the selection and training of ESA-European astronauts. The selection process, producing a crew strongly identified nationally yet with a role of world representation, is a platform of negotiation placing the highest demands on diplomacy. The Archives of the preparatory works for selection and training in USA, Russia and ESA dedicated training centres will allow us to reveal the actors and practices of deliberation and decision.

Networks and communication

- > Study of the formal communication structures set up and implemented during the bilateral cooperation: minutes of annual meetings, work package meetings, etc.
- > Study of the informal means of communication through interviews with major actors and participants.



Politics and policies

- > ESA intergovernmental cooperation and competition on national space programmes of their member states (France, Italy, Germany, UK, etc.) should constitute one axis of observation of tensions where diplomatic practices are visible.
- > ESA Member states interacting independently with partners in association at different levels (Canada, Russia, India, Israel, China...) will be treated as a specific form of negotiation structuring science policy.
- > Interfering in the general landscape of cooperation is the emergence of continental European countries (PECS) showing willingness to participate in ESA science programmes. We refer to ESA exchanges with Ukraine, a former Interkosmos partner with USSR through their Academy of Sciences. In that respect, the real or imagined persistence in the actors' mind of former structures of the Soviet Union should not be forgotten when analysing the interfaces between current institutional scientific bodies (IMBP, IKI, TsPK) founded under the Soviet regime, and the occidental entities.

Disciplinary/methodological approach

This work roots in a thesis involving the history of space science and technology, international relations of the space faring nations during the Cold War, and to a lesser extent, the ethnology of orbital stations, focused on the study of capacity to collaborate in quasi-paradoxal situations. Dealing with very contemporary issues, the case study will draw mainly on political history and socio-historical tools.

The thesis provides a sub-corpus of material composed of selected archives from NASA, CNES, ESA and from Russian funds on the selection process and technical training of astronauts. Taking into account the formal process of protocolling, especially in the former Soviet Union, a series of interviews with institutional actors (active and retired diplomats, scientists-administrators, test- and pilot-astronauts, payload-scientists) and intermediate personnel (engineers, technicians, interpreters, instructors, security agents) will complement, enrich or challenge the official facts.

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InsSciDE Work Package 8:	
Space: European science diplomacy for cooperation in a global space competition	
Case Study n°8.3	Strengthening Scientific Cooperation and Visibility of Europe Labs: The European Space Agency Council, the Space Council and Microgravity Labs
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Abstract

Choices in European Space policies have always reflected the will to cooperative in achieving significant technical and scientific projects of geostrategic interest. The creation of the ESA aimed at overstepping the problems that remained unsolved by the division between organizations devoted respectively to launchers and satellites (ELDO/ESRO). Recently, European Union-level ties have been reinforced in order to reach a “United Space in Europe” (2016). However there is no linearity in the integration of national policies into a single European policy. A long-term analysis of shared objectives and dissonant priorities offers a means to learn from both failures (Hermes Space plane) and successes (Franco-Russian manned flight missions, and the cautiously built and finally efficient collaboration on the ISS). Studying ministerial-level Council transactions since the 1970s, our InsSciDE case will examine the role and practices of transdisciplinary experts as key actors in broad scientific and industrial integration and the construction of international scientific communities. It will investigate how the development of Outer Space exploration was supported by symbolism transported notably by the media, tracing how European scientists have defended their experiments to space agencies, policy makers, and public opinion with such hybrid politico-educational objects as physics experiments planned for Spacelab.

The historical analysis of space diplomacy in Europe, by underlining the evolution and expression of decision-making processes through various times and contexts, will provide useful insights for inventing a shared science diplomacy for Europe that could embrace in the most efficient way the divergent interaction of cooperation and competition in space affairs.

Introduction

The strong capacity of Europe to develop, since the very beginning of the Space Age, a truly independent and autonomous space policy thanks to an institutionalized organization of scientific, industrial and technical cooperation between regional, not to mention international, partners, offers a highly valuable case for the study of European science diplomacy. Indeed, from the ESRO/ELDO era to the creation of ESA and its current activity, choices in European space policies and prospects have always combined the will to communally achieve significant technical and scientific projects, that could not be conducted on a singular national scale. These policy choices have also favored geostrategic interests dictated both by regional diplomacy and the international, not to say global, context (from the Cold War to the participation in the ISS). Such a complex dialectic, closely articulating cooperation and competition, should be analyzed within the ongoing process of political integration at a supranational level.

Following the lead of John Krige's work on the construction of a unique regional identity through the creation of a strong political, technical, scientific and industrial network, we intend to explore and discuss the original path Europe followed in the acquisition and development of space capacities. Since the ties between the European Union and the European Space Agency have been reinforced through the Framework Agreement of



2004 and confirmed with the recent Resolution “Towards Space 4.0 for a United Space in Europe” on 2 December 2016, a long-term analysis on the evolution of space policies would certainly offer a clearer and much relevant view, detailing shared objectives and dissonant priorities. Our case study will also deliver insight on how the conception of manned flight Europe has developed since the 1970s into a flexible strategy based on bilateral cooperation with extra-European actors in order to acquire knowledge through embedded laboratories and experiments, or launches of European astronauts in American or Russian infrastructures.

Thus, we will take cooperation and competition as a key interplay: within a context of diplomatic competition, European space activities could either lead to successful scientific cooperation (Franco-Russian manned flight missions, Spacelab) or be radically compromised (Hermes space plane). A cautiously built diplomatic consensus can result in a model of efficient outer-space collaboration, implying a broad scientific and industrial integration as well as the construction of international communities of scientists and engineers (the International Space Station).

Actors

To understand the mechanisms used by science diplomacy in the construction of European space policies, we propose to focus on a specific series of events: The Council of ESA at Ministerial Level since 1977, preceded by the European Space Conference of ESRO / ELDO and completed by the Space Council since 2004. The Council associates ministers representing the European Union and ESA Member States, to effect an overall European space program. These conferences are showcases of active and ongoing science diplomacy, since they are the place where its practitioners meet, but are also the gathering point of diplomatic imperatives and possible means of cooperation on various scales. This privileged object of study will allow us to analyze practices and actors through observing discourses, composition of delegations, cultural practices of involved ministers, hierarchy between scientists and diplomats in the task groups, and interactions with other instances of negotiation (such as the Council of ESA at Delegate Level). One of the main concerns of the case study will be to identify precisely and analyze the role of transversal actors, those moving for instance from the scientific community to the political arena of dialogue.

Fields and disciplines, interfaces with technology

Additionally, the conferences on which our study focuses exemplify how regional political competition and scientific cooperation can generate, on a global scale, a coherent space policy that contributes to fully integrating Europe as an independent and supranational actor on the geopolitical world stage. The case study thus aims at using approaches and conceptual frameworks that belong both to the history of technology and the history of international relations. Along with the conduct of doctoral research at Sorbonne University, our review should not only offer a critical analysis for the understanding of diplomatic and decision-making processes at ESA, but also undertake the comprehensive exploration of what the development of closer ties between EU and ESA in terms of techno-scientific and space related policies would encompass.

Networks and communication

Studying ministerial-level Council transactions since the 1970s, the case will examine the role and practices of transdisciplinary experts as key actors in broad scientific and industrial integration and the construction of international scientific communities. It will investigate how the development of Outer Space exploration was supported by symbolism transported notably by the media, tracing how European scientists have defended their experiments to space agencies, policy makers, and public opinion with such hybrid politico-educational objects as physics experiments planned for Spacelab. How scientists, politicians and institutions communicate around highly valuable technological programs will be treated as a significant issue.

Politics and policies



Competition and cooperation are the two main points around which a specifically European science diplomacy in principle should revolve, raising many questions: how did a state of competitive cooperation lead both to a successful program like Spacelab and to the stalemate, then abandonment, of such an ambitious technological program as the space plane Hermes? By which diplomatic means were divergent or even conflicting visions harmonized and intertwined within a unified intergovernmental space policy? What does the creation of a Space Council (2004) at the European level mean in regard to the growing implication and influence of the European Union on European intergovernmental space affairs?

Disciplinary/methodological approach

This case study will rely on archival material linked to the preparation and execution of ESA Council at ministerial level since 1977, and on a series of interviews with major actors and diplomatic practitioners. To tackle this question, the case study will focus on 4 main aspects:

- 1/ Understanding the interaction of French and German visions regarding human spaceflight within the negotiating arenas of ESA, by analyzing the differences and similarities of bargaining strategies used in the promotion and adoption of two programs, that have known dramatically different destinies: Spacelab and Hermes space plane.
- 2/ Analyzing diplomatic dynamics linked to the Europeanization of major technological programs, from the national scale to the industrial and managerial integration on regional level, using the example of Hermes space plane.
- 3/ Measuring the power of the scientific and industrial communities to influence the decision-making process in Europe, questioning the nature of their involvement in the delegations in charge of the preparation of ESA Council at ministerial level.
- 4/ Identifying the political impact of bilateral and multilateral technological space cooperation on the international level, from the on-board experiments to the flights of European astronauts. How do they contribute to the visibility of Europe as a legitimate space power?

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