Chapter 4

The View From France: An Alternative Perspective

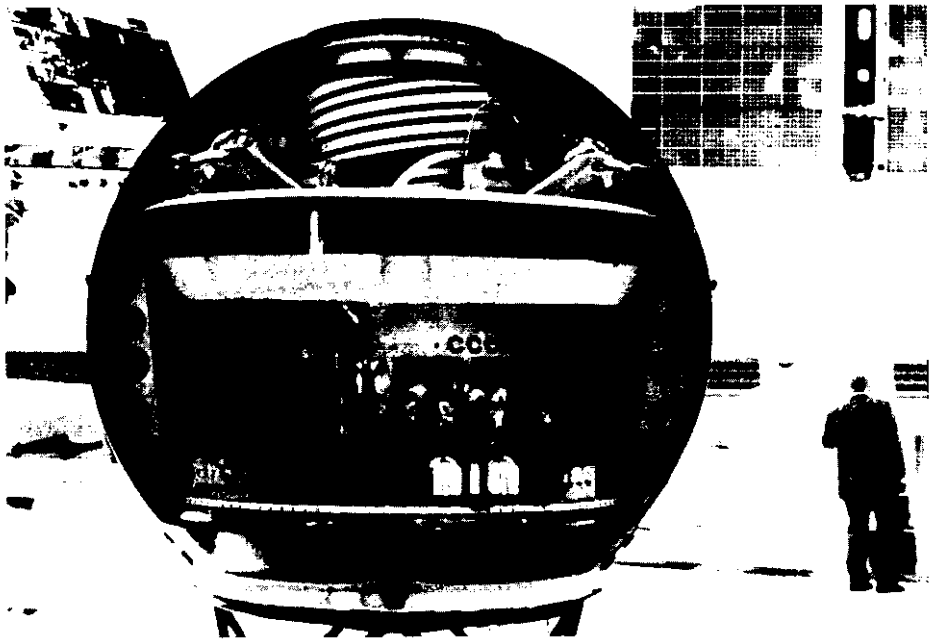


Photo credit: Charles P. Vick, Paris Air Show, 1985

Display module of Venera type landing craft of VEGA I and II, carrying experiments from France, the United States, and other countries.

Chapter 4

The View From France: An Alternative Perspective

U.S,-Soviet cooperation in space does not occur in a vacuum. Other Western countries have entered into cooperative arrangements with the U.S.S.R. and have faced serious issues and debates of their own. Although these countries are grappling with the same basic issues as U.S. planners, their approaches to cooperation with the U.S.S.R. have been quite different.

Before discussing issues facing U.S. planners, therefore, this chapter examines the approach of another country towards cooperation in space with the U. S. S. R., with an eye towards assessing:

- possible alternative approaches to the policy issues associated with U.S.-Soviet cooperation in space; and
- the potential impact of renewed U. S .-Soviet cooperation on our allies.

France was selected as a focus of study, since of all Western countries, it has had the most continuous and most extensive cooperation with the U.S.S.R. in space science research. Although our focus is on France, it should be kept in mind that cooperation with the U.S.S.R. is a relatively controversial issue in other Western countries involved in space programs of their own.

The following discussion is based largely on interviews conducted by OTA in France in July 1984, and subsequently in the United States, with representatives from a number of scientific, foreign policy, and defense agencies, including the Centre National d'Etudes Spatiales (CNES), the French Ministry of External Relations, the Secretariat General de la Defense Nationale (SGDN), and the European Space Agency (ESA). * After a brief discussion of the background of French-Soviet cooperation in space, this chapter examines the policy issues associated with potential future cooperative projects, how the French approach these issues, and the implications this may hold for U.S. policy.

'Unfootnoted quotations have been taken from these interviews.

BACKGROUND

French-Soviet cooperation in space dates back to 1966, with the visit of Charles de Gaulle to Moscow and the signing on June 30 of an open-ended ended Inter-governmental *Accord on Scientific/ Technical and Economic Cooperation*. The inclusion in this agreement of a large segment on French-Soviet cooperation in "the exploration and peaceful uses of outer space" provided the framework for formal cooperation in space activities generally. An umbrella agreement with no specific time frame of its own, the accord provided an institutional framework within which further agreements could be negotiated. The agreement created a *Grande Commission,* comprised of the President of CNES, I the President of the Advisory Board to the U.S.S.R.'s Interkosmos, and working groups in four key areas of space re-

I Created in 1962, CNES is charged with five pri mary missions. As described by CNES officials, these are: 1) to assist French governmental services in the establishment of French space policy;2) to take the requisite actions to implement this policy and manage the associated programs: 3) to create the appropriate facilities and develop the necessary know-how: 4) to orient the French space industry in order to make use, especially on foreign markets, of the experience and competence acquired and the resources set up over a period of *20* years; and .s) to develop international cooperation on both bilateral and multilateral bases, and to promote scientific and commercial utilization of space technology. CNES is comprised of four main centers: the Paris head office: the Evry Center concerned with launch vehicles: the Toulouse Space Center: and the Guiana Space Center in Kourou, French Guiana. Today, CNES boasts a staff of over 2,000 people, located in four centers, more than half of whom are engineers.

search: scientific studies of space; spatial and aeronomic meteorology; space medicine and biology; and space telecommunications. Annual meetings of the commission were to provide a forum for assessing ongoing programs and initiating new ones. [z] By the early 1980s, one-third of the more than 2,000 space researchers and technicians in France was working in some way with French-Soviet cooperation in space.

Today space research has grown to a considerable level in France, and cooperation with the U.S.S.R. has grown commensurately, As the main agency in France responsible for national space policy and programs, CNES is in charge of developing international cooperation on both bilateral and multilateral bases. As table 4-1 illustrates, in 1984 CNES'S budget was almost $600 million (4, 763 million francs), of which almost half was designated for bilateral and multilateral cooperation. While most of the funds budgeted for such cooperation are directed towards ESA, approximately 51 million francs each year, or about 10 percent of the bilateral budget, is budgeted for cooperation with the U.S.S.R. By comparison, about 83 million francs per year are budgeted for cooperation with the United States.

If cooperation with the U.S.S.R. is significant, however, it is concentrated in a relatively small number of areas. Table 4-2 shows the breakdown of funding for French bilateral cooperative projects by country and category in **1984.** The level of French-Soviet cooperation in space is not far below that of French-U. S. cooperation. But while French cooperation with the United States is more diffuse—spread out in Earth observation data collection, scientific experiments, and manned flights– French-Soviet cooperation is largely concentrated in the area of scientific experiments. Indeed, cooperative efforts with the U.S.S.R. account for over **60 percent** of the total budget allocated for French cooperative space science experiments generally.

[z] The presidents of CNES and Interkosmos meet annually, alternately in France and the U. S. S. R., to examine the progress of French-Soviet cooperation in space and to decide on new projects for the following year. The results of such work are presented by the two presidents to the *Grande Commission* which oversees French-Soviet scientific /technical and economic cooperation.

Forms of cooperation between France and the U.S.S.R. have ranged from exchange of data and information to a joint manned flight in 1982. The lion's share of cooperation has fallen in data exchange and Soviet hosting of French experiments. But the first manned space flight is also viewed as a valuable landmark in French-Soviet cooperation. While the next flight of a French spationaute on a foreign spacecraft was on the U.S. Shuttle, when Patrick Baudry joined U.S. astronauts in June 1985, French planners envision another French-Soviet manned space flight if feasible.

Table 4-3 outlines the main scientific programs being undertaken by CNES as of late 1984. According to CNES, projects with the U.S.S.R. are now emphasizing four areas:

- astronomy;
- solar system exploration, including:
  - —plasma physics, mainly in the ionosphere and the magnetosphere; and
  - —planetary exploration, primarily of Venus and the Comets;
- materials processing in space; and
- life sciences.

While most of these projects are listed in appendix A, some of the major research areas and projects are as follows.

Astronomy

Space observatories provide French scientists with the means to pursue research in modern astronomy and astrophysics from a point beyond the interference of the Earth's atmosphere. Along with ESA, the U.S.S.R. is one of France's chief partners in these endeavors.

One of the key projects in cooperation with the U.S.S.R. is the gamma-ray astronomy project *Sigma.* The *Sigma* program (Systeme d'imagerie gamma a masque aleatoire), representing a new French-Soviet Gamma Ray and X-ray Space Observatory, calls for the joint French-Soviet manufacturing and placing into orbit of an astronomy satellite which will study the universe with X-ray and gamma-ray telescopes. The French *Sigma* telescope will utilize a Soviet platform, *Astron II,* which will be a modified version of the *Venera*

Table 4-1 .— Budget of the French Space Agency: Breakdown of Funding
(State subsidies and Centre's own resources)[a] (in million francs)

By program category	Amount 1984	Percent 1984	Percent 1983
European prograrr	1,901. 200	39.91	36.12
Bllater,il programs	540.450	11.35	1226
National programs	984.130	20.66	24.32
Proqram support	641.050	13.46	11.12
General operating costs	696475	14.62	16.18
Total	4,763,305	10000	100.00

By type of system	Amount 1984	Percent 1984	Percent 1983
Launch vehicles	847.900	17 80	14 84
Satellites	1,654.930	34 74	37 92
SPACE LAB	90.300	1 90	1 46
Balloons	18.200	0 38	0.50
Scientific experiments	1,32 500	2 78	2.91
Applications systems and experiments	66.100	1.39	1177
R&D	132.500	278	350
Program support	1,820.875	3823	37 00
	4,763.305	100.00	100.00

By category of objectives	Amount 1984	Percent 1984	Percent 1983
Sciences	425 100	8 92	9 38
Applications	2.384 830	50 07	49 93
Telecommunications	612 330	12 86	12 66
Earth observation and data collection	924 600	19 41	22 43
Launch facilities	847 900	17 80	14 84
R&D	132 500	2 78	3 60
Program support	1 820 875	38 23	37 09
	4 763 305	100 00	100 00

[a]Sums taxes ***excluded***

SOURCE CNES Budget and Programmes of the Centre National d Etudes Spatiales for 1984 p 5

Table 4-'2.—Breakdown of Funding for Bilateral Cooperative Projects (in million francs)

Country or organization concerned	Scientific experiments	Telecommunications	Earth observation data collection	Major Scientlflc programs	Export actions	Manned flights	Total
U.S.A.	22.000	—	51.200	—		10.000	83.200
U.S.S.R.	47.850	—	—	—		2.700	50.550
ESA	7.800	—	1.100	—	—	6.400	15.300
FRG	—	358.400	—	—	—	3.100	361.500
Sweden	0.650	0.450	—	—	—	—	1.100
Other countries	—	—	—	—	3200	—	3.200
To be distributed	—	—	—	25.600		—	25600
Total	78.300	358.850	52.300	25.600	3200	22.200	540.450

SOURCE: CNES, Budget and Programmes of the Centre National d'Etudes Spatiales for 1984, p. 24.

Table 4-3.— French Space Program: Main Scientific Programs

Astronomy:
Hipparcos (Astrometrical Satellite)– ESA
ISO (IR Astronomical Observatory)-ESA
Space Telescope–U.S.A. /ESA
French Astronomy Program on SPACELAB 1 with:
- Telescope UV Fause — Program in cooperation with Us.
- Very Wide Field Camera— ESA

Sigma (Gamma Ray Astronomy Project) in cooperation with Soviet Union
A program of balloon-borne equipment in IR and UV astronomy

Planetary exploration:
VEGA—Mission to Venus which will also fly by Halley's Comet in cooperation with the Soviet Union
Giotto– European mission to Halley's Comet– ESA

Plasma physics:
Arcad launched in September 1981 in cooperation with the Soviet Union
Interball —a new project in cooperation with the Soviet Union

Oceanography—meteorology:
Poseidon (Oceanographic satellite using an altimeter for the study of the general circulation of the ocean) either on SPOT 3 or in cooperation on TOPEX (U. S. A.)
Design and development of a passive microwave radiometer to be placed on board the European ERS-1 Earth Resources Satellite.

SOURCE OTA briefing at CNES, July 1984

type adapted for astronomy.[3] Scheduled to be launched at the end of 1987, the satellite will be equipped with a French-made gamma telescope, a Soviet-developed X-ray telescope package to be mounted on the side of the gamma-ray telescope tube, and X-ray and gamma-ray burst detectors. The Sigma mission will permit gamma-ray emitting objects to be located with a far greater degree of precision (in the range of about a 2 minute arc) than is presently attainable. Sigma was originally conceived as a French project; the French then proposed joint conduct with the U.S.S.R.

The Sigma program is an outgrowth of several cooperative efforts in astronomy in the past. For example Signe 3, a French Earth satellite launched by a Soviet rocket on June 17, 1977, was accorded a great deal of acclaim for its mission to detect and locate the sources of "gamma flashes, " a type of cosmic radiation seldom studied.[4] A joint French-Soviet launch of the astronomy satellite *Gamma 1* is scheduled for 1986 to carry three scientific experiments: a large Gamma telescope, *Gamma 1;* an X-ray telescope, *Spectre II;* and a smaller Gamma telescope. *Gamma 1* is a high-energy gamma radiation study designed to determine the structure of the galaxy and the origin and distribution of gamma sources. Mounted on the same satellite as *Gamma 1, Spectre II* will examine galactic and extra galactic X-ray and gamma sources, as well as "burster" sources in these wavelengths. The study of gamma ray bursts is a key area of cooperation between France and the U. S. S. R., and the collaborative program in this area is recognized worldwide as one of the leading ongoing initiatives in high-energy astrophysics.

[3]The satellite will be placed in a very elliptical orbit of *2,000* km perigee and *200,000* km apogee, inclined between 51" and 60", depending on whether the satellite is launched from Baikonur or Kapustin-Yar. See Pierre Langereux, "Pro jet franco-sovietique de satellite d'astronomic SIGMA, " ***Espace,*** Oct. 12, 1983; and "French, Soviets Define Observation Platform, " ***Aviation Week and Space Technology,*** Feb. 20, 1984, p. 55.

[4]Joseph G. Whelan, "Soviet Attitude Toward International Cooperation in Space," in Congressional Research Service, *Soviet **Space Programs; 1976-80,*** prepared for the Senate Committee on Commerce, Science and Transportation, CXX, No.8(Washington, DC: U.S. Government Printing Office, 1982), p. 286.

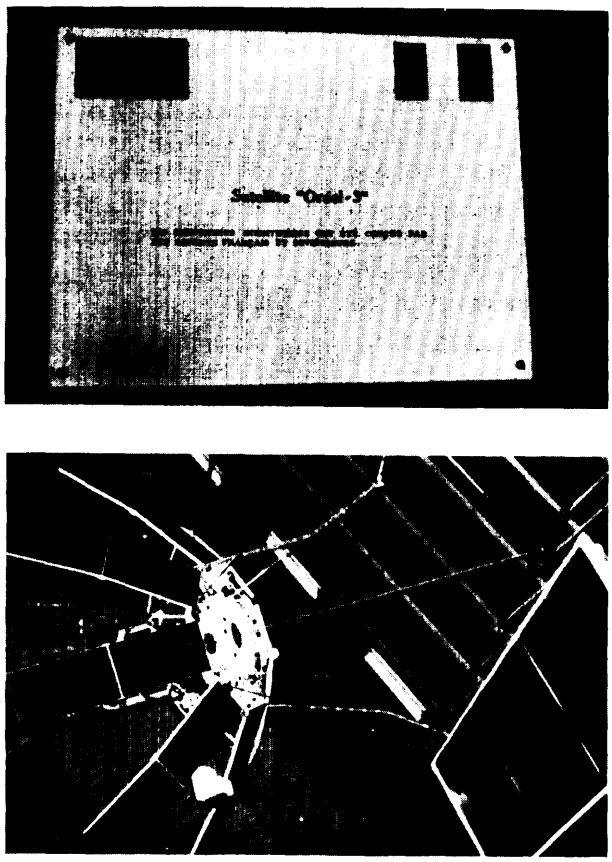


Photo credit Charles P Vick

Oreol 3 as displayed at French Pavillion, Paris Air Show, 1985, with Salyut Solar Panel and gravity gradient boom

In the area of optical astronomy, the U.F.T. project in ultraviolet astronomy is another key French-Soviet joint effort. The project consists of a French ultraviolet spectrometer placed in the focal plane of a Soviet telescope to study the ultraviolet spectrum of the stars. The U.F.T. was launched on a Soviet craft on March **24,** 1983, to examine the stellar atmospheres in ultraviolet (wavelengths ranging from 1200 to 2500-A). It was designed for coordinated ground-based measurements of the interstellar medium to be made through an 80 cm, telescope located at an observatory in the Soviet Crimea, and from a high-resolution spectrometer in the Laboratoire d'Astronomic Spatiale (L. A. S., or space astronom, laboratory) in Marseille, France.

Solar Terrestrial Physics

Solar terrestrial physics is an important area of cooperation between France and the U.S.S.R. Particular areas of emphasis are the terrestrial magnetosphere and ionosphere and the interplanetary environment. A key joint effort in this area was the launching *on* September 21, 1981, of the French *Arcad 3* satellite by a Soviet launch vehicle. The purpose of this project was to study the physical parameters (especially wave characteristics) of the lower magnetosphere at high latitudes. The project was an outgrowth of the launchings of Oreol 1 and Oreol 2 in 1971 and 1973, which carried scientific equipment to explore physical phenomena in the Earth's upper atmosphere. At present, the operational phase of *Arcad* 3 is continuing, using the French Tromsoe ground station for receipt of data. Results of *Arcad 3* are scheduled to be discussed at an international symposium to be held in Toulouse, France, in May 1986.

Araks and *lnterball are* two other significant joint French-Soviet efforts in the area of solar terrestrial physics. In the *Araks* project a French rocket placed a Soviet electron accelerator into orbit to study the nature of the aurora borealis, or Polar lights, by injecting electrons into the Polar region of the ionosphere. *]nterball* is a new project in French-Soviet cooperation to study the solar wind, and the terrestrial magnetosphere-ionosphere relationship.

Life Sciences and Materials Processing

The first French-Soviet *manned fright* of a French spationaute, Jean-Loup Chretien, on a Soviet spacecraft from June 24-July 2, 1982, was hailed as a great step forward in French research in the fields of the life sciences, and especially in the area of human physiology. Four key experiments were conducted: *Echographic, Posture, Cytos 2,* and *Biobloc 3.* Echographic experiments provided information on blood circulation and blood volume distribution, as well as a visual representation of heart pumping characteristics. Information of this type is necessary for understand-

ing the way liquid is pumped through the body in a weightless environment. The *Posture* experiment involved the use of French-designed neurophysiological measurement equipment to collect data relating to the influence of gravity on movements and equilibrium. Spationaute Jean-Loup Chretien participated actively in all of these experiments.

In addition to furthering research in the life sciences, the joint flight also provided valuable information for materials processing in space. Materials processing is viewed as an important area for future development in France, a key part of what the French see as the future economic value of space applications for a broad-based, high-technology economy. One of the key tasks of the Chretien mission was to produce certain metal alloys unobtainable on Earth. This was a follow-up to other experiments, such as the Kristall experiment, which had been conducted with French hardware by Soviet cosmonauts aboard the Salyut 6 space station.

Analysis of the results of experiments conducted in both areas during the joint manned flight have continued well into 1985. In addition, cooperative experiments in the material and life sciences continue within the framework of later flights aboard Soviet spacecraft. In addition to the experiments conducted during Chretien's flight, for example, CNES has also been cooperating in biological research with the U.S.S.R. both on Cosmos satellites and *Salyut 7,* examining such questions as the influence of cosmic rays on biological organisms, and the effect of microgravity on cell growth. One program, Biocosmos, has been studying the behavior of a primate under weightless conditions aboard a Soviet biosatellite. Using French-supplied equipment, Soviet cosmonauts on *Salyut 7* have continued to conduct experiments begun by French principal investigators in conjunction with Chretien's flight.

Overtures have been made to conduct another joint manned flight in the near future. One year after Chretien's flight, French officials are quoted as having stated: "We still are in favour of this idea, especially for long duration flight which will permit us to carry out further biomedical research. "[5] Following the meeting of the *Grande Commission* in Samarkand, U.S.S.R,, in October 1984, Frederic d'Allest, Director General of CNES, was quoted as stating "the French delegation reaffirmed its great interest in conducting a long duration flight of a French spationaute , . . on board a Soviet orbital station."~ He stated that the flight was envisioned to last about 4 weeks, to take place around 1987-88. And OTA interviews with French

'Jean-Paul Croize,"Unsatellited astronomic" etdesprojetsambitieux vers Venus et la Lune:L'espace franco-sovietique," *Le Figaro,* Oct 5, 1983.

[5]See Pierre Langereux, LaFranceinteresée par un voldelongue durée avecl'UR S. S , *Air et Cosmos* No 1018 (Oc t. 13, 1484), p 55.

PhoIo *credIt* Centre Nationale d'Etudes Spatiales

Salyut 7: Echography experiment

Photo credit: Centre Nationale d Etudes Spatiales

French "spationaute, " Jean Loup Chretien on board Salyut 7

officials in July and December 1984 suggest that this desire has not changed.

As of late 1984, however, while a number of projects have been adopted for joint French-Soviet cooperation in the near future, there has not been a commitment from the U.S.S.R. to the prospect of hosting another spationaute on a Soviet flight. This suggests that an agreement for another joint manned flight may be less a French decision than one determined in Moscow.

Planetary Exploration

Undoubtedly one of the largest cooperative ventures in planetary exploration between France and the U.S.S.R. is the VEGA, or Venus-Halley Mission. This project represents a multilateral venture with extensive French-Soviet cooperation. The mission involves two Venus landers and atmospheric balloons, as well as a probe toward Halley's Comet. Launched from the U.S.S.R. in December 1984, the mission rendezvoused with Venus in June 1985, and is scheduled to flyby Halley's comet in **1986.** The study of Venus involves bilateral cooperation between the U.S.S.R. and France, while the mission to Halley's Comet is an international program in which Hungary, Austria, Bulgaria, Poland, Czechoslovakia, East Germany, and West Germany are also officially participating. Experiments being flown on the balloons, landers, and the Halley probe fall mainly in the following areas:

- study of the Venus atmosphere (pressure, speed, temperature, chemical and isotopic composition, study of the constituents);
- study of the chemical and isotopic composition of Venus soil;
- study of the nucleus and environment of Halley's Comet (physical characteristics, temperature of the molecules, and gas composition);
- observation of solar wind plasma waves;
- study of the interplanetary environment and the intensity of the Lyman emission of hydrogen and deuterium from comets, with the help of an absorption cell multiphotometer; and
- examination / determination of the composition of the gas which comprises the coma and the tail of the comet.

Several French experiments will also be carried out by the Giotto probe, to be launched by the European Space Agency to rendezvous with Halley's Comet in 1986.

In addition to VEGA, the meeting of the *Grande Commission* in October 1984 highlighted some potential future areas of French-Soviet cooperation in planetary research. According to one report, the Commission discussed a potential new mission of an interplanetary probe, *Venera 91,* envisioned to be launched in 1991 to study the planet Venus and asteroids. ' According to *another*, the Soviet Union has proposed to France to participate in its "Planet F" project to launch a Soviet probe to Mars and the Mars moon Phobos in 1988.[8]

Space Applications

In the area of space applications, a key cooperative effort is illustrated by *Sargos,* the French contribution to the France-American-Canadian SARSAT system which works in conjunction with the Soviet COSPAS system for the search and rescue of ships and aircraft in distress. France is presently supplying three Sargos detector units to SARSAT for the reception of **406** MHz signals, to be placed onboard NOAA satellites. As one of the SARSAT member parties, France participated in the joint demonstration phase, just concluded, which involved an extended checkout of the interoperability of SARSAT with the Soviet COSPAS system. France is also party to the new agreements which continue the system through 1990.

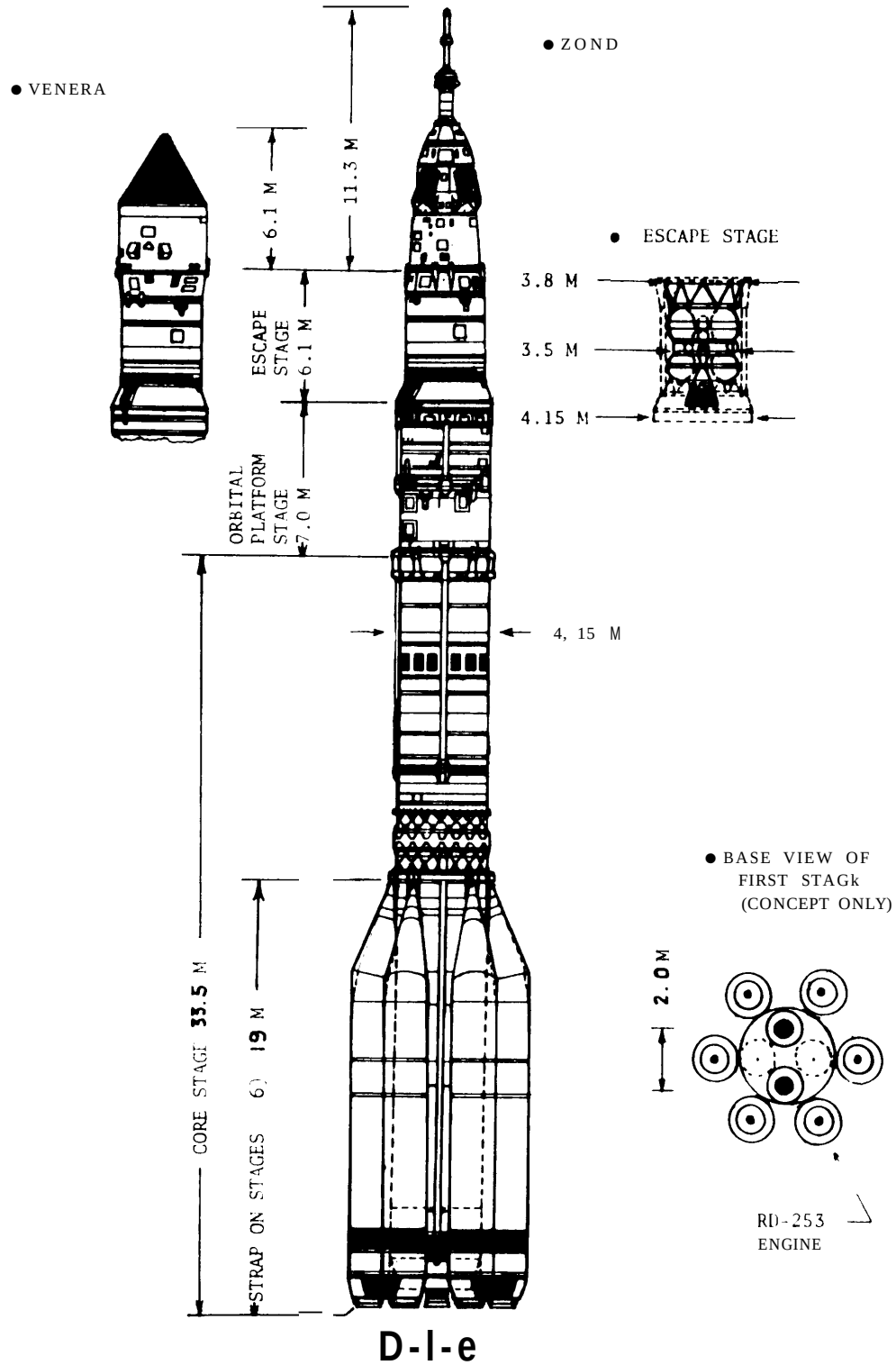
Evaluation of French= Soviet Projects

The French tend to stress the relative strong points of previous space cooperation with the U.S.S.R, and generally support continued cooperative efforts. French scientists appear to have run up against less in the way of harassment, visa problems, time delays, or other logistical problems which have frequently confronted their Amer-

'Ibid,

'See Pierre Langereux and Serge Berg, "Planet F, pro jet franco-sovietique de survol de Mars et Phobos," *Air et Cosmos, No.* 1019 (Oct. 20, 1984), p. 80.

Figure 4-1 .—Soviet Proton Launch Vehicle



D-1-e Proton launch vehicle, offered by the U.S.S.R. for the launching of various geosynchronous spacecraft, is also being used in cooperation with France and other countries with the Venus/Halley's Comet mission.

SOURCE Charles P Vick, 1982-85

ican counterparts. Access to data and information also appears to have been better than for other Western countries. And French planners believe that the informal contact established between the two scientific communities is also beneficial for the longer term.

Nonetheless, French cooperation with the U.S.S.R. has not escaped other problems which challenge other Western countries cooperating with the U. S. S. R., and substantial difficulties remain in implementing cooperative agreements. Chief among these are the many barriers in gaining access to people and information. The French stress, however, that these barriers are not only an outgrowth of Soviet politics and the closed nature of Soviet society, but are also a function of bureaucratic problems endemic to the Soviet system. For example, whereas scientists in the West tend to see all aspects of a scientific problem, they underscore that Soviet scientists, by virtue of a more compartmentalized scientific establishment, are often confined to a more limited view. The French therefore do not see access problems as primarily political issues, and feel it is worth the effort to keep cooperation alive with hopes that the U.S.S.R. will become increasingly easier to work with.

KEY ISSUES AND POLICY APPROACHES

Because of a somewhat different approach towards cooperation with the U. S. S. R., the issues concerning France-Soviet space cooperation today are quite different from those facing U.S. planners. Whereas in response to the Soviet invasion of Afghanistan and the declaration of martial law in Poland U.S. planners allowed space cooperation with the U.S.S.R. to lapse, French planners decided that such cooperation should be sustained. Whereas the key issue in the United States today, therefore, is whether space cooperation should be *reestablished,* the key issue in France has concerned the degree to which space cooperation with the U.S. S. R. should be *maintained.* Perhaps because of this, the issue of France-Soviet space cooperation has not been as much a focus of public debate in France as it has been in the United States.

This is not to suggest that France-Soviet cooperation in space has been without controversy. Some joint projects have been the target of opposition in the past, and others are the focus of French internal debate today. Probably the greatest controversy, for example, surrounded the flight of Jean-Loup Chretien in 1982, when a large segment of the French scientific community opposed the flight of a French spationaute on a Soviet spacecraft at the same time that the Soviets were flagrantly violating human rights at home and abroad. As illustrated above, French scientists or other communities may well oppose another potential joint flight in the future. And at present, there is also evidence that some scientists may be declining to travel to the U. S. S. R., and may be withholding from Soviet scientists invitations to their own laboratories.

Opposition to cooperation has generally stemmed from humanitarian concerns, i.e., expressing support for Sakharov, opposition to the Soviet invasion of Afghanistan, etc. Opponents of joint manned missions, for example, have argued that the implicit acquiescence of French scientists to Soviet violations of scientific integrity and human rights at home, and the political profits which the U.S.S.R. inevitably accrues on the international stage more than offset any possible benefits of such projects. Others contend, however, that the scientific and economic benefits of such missions far outweigh the political costs, and that France should pursue as many joint manned missions as possible, regardless of whom the partner may be, Europeans in general, these proponents argue, are looking forward to several joint manned missions before the end of the century, not only with the U. S. S. R., but with the United States and potentially with the European space station *Columbus.* The French are also looking forward to their own manned vehicle called Hermes, a small space plane which could be used in association with satellite deployment or space station maintenance and operation. The more exposure French scientists can get to manned space flights and training, these

proponents argue, the more they can apply that to the development of their own programs.

Despite these working level debates, however, a fairly consistent policy approach has been pursued in France regarding interaction with the U.S.S.R. in space activities in particular, and in scientific and technical cooperation generally. Cooperation with the U.S.S.R. was begun essentially with political aims paramount. French planners viewed scientific and technical cooperation generally, and space cooperation in particular, as a means of broadening relations with the U.S.S.R. and offsetting political tensions in other areas.

As the political climate has become less opportune for promoting such cooperative efforts, however, and as the scientific requirements of the French space program have grown, scientific and economic aspects have been increasingly emphasized. Today, the scientific and economic benefits of cooperation in space are stressed as the central reason for continued cooperation, although French planners agree that it is impossible to ignore the political background against which cooperation occurs.

Current French policy decisions, therefore, represent a mixture of political, scientific, and economic aims, which have varied in relative importance, but together have created a mainly stable and consistent policy approach. Today, French planners are attempting to maintain the political will for cooperation in spite of political differences, but are trying to keep cooperation itself on a scientific level.

Scientific and Economic Issues

In light of the existing structure and present level of funding of the French space program, French planners assert that their space research requires cooperation with other countries, and that the U.S.S.R. is a good partner for answering those needs. The force of this argument was intensified with the cutbacks in NASA's budget in the early 1980s and the consequent curtailing of NASA's participation in some international projects. The French—interpreting the cutback in U.S. participation in the International Solar Polar Mission (ISPM)' in political rather than budgetary terms—reasserted their view of the U.S.S.R. as a viable partner for many areas of space cooperation. Regarding a possible joint France-Soviet mission to }'enus, for example, one French scientist stated:

> This has been the only possibility for French scientists to go into the planetary programs. There are some individuals like me who have had instruments on U.S. spacecraft but we'd like to have a larger constituency and the only way for our scientists to go to the planets is through this cooperation with the Soviets. 10

Although Chretien's flight was politically controversial, it was viewed as an important step for the French space science program: France did not have its own craft for sending a man into space, so required a joint mission with another country which did. The mission was considered beneficial for developing the life sciences in France, and provided new data for further space research unavailable elsewhere.

From cooperation with the U.S.S.R. today, France continues to obtain payload opportunities that it might not otherwise be able to acquire. And even though, as mentioned above, French scientists have sometimes opposed cooperation with the U.S.S.R. on humanitarian grounds, they have generally favored cooperative efforts such as the present mission to Halley's comet, where French participation has been on a low level and the potential scientific benefits are large.

The economic benefits of cooperation with the U.S.S.R. have also been substantial. Being able to place experiments on another country's spacecraft, and sharing costs in joint ventures have reduced French expenditures considerably. According to *Le Figaro* (Oct. 5, 1983), for example, the *Sigma* project, if conducted by France alone, would have cost the French at least 400 million French francs, or about $5o million. In cooperation with the Soviets, who will be mainly respon-

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[9]See Robert Reinhold, "U.S. Dismays Allies by Slashing Funds for Joint Science Projects, " ***The New York Times,*** May 10, 1981, p. 1.

[10]Thomas O'Toole, "France and Soviets Will Aim Wind Balloons at Venus, " ***Washington Post,*** Dec. 17, 1978, p. A 31,

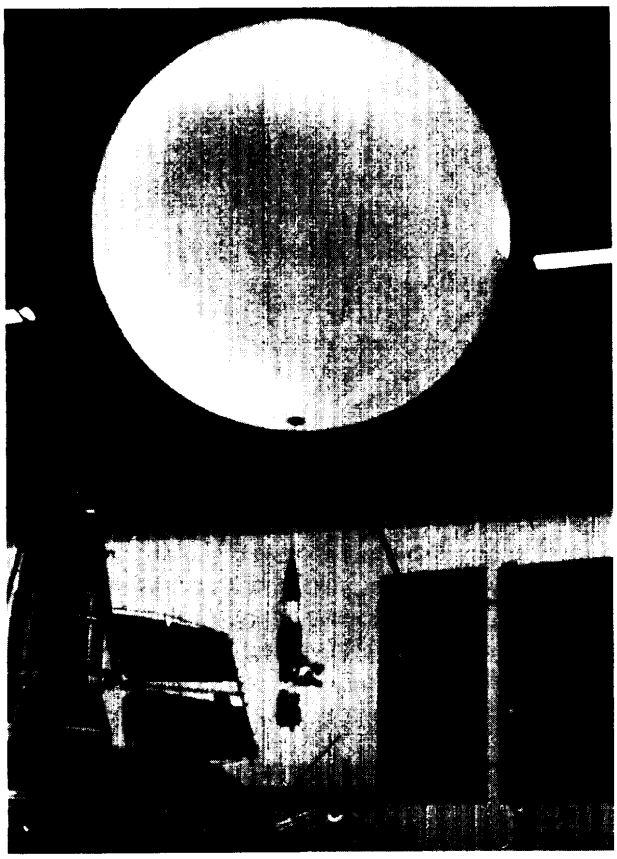


Photo credit Charles P Vick. Paris Air Show. 1985

French Atmospheric Balloon carried on Soviet Venus-Halley Mission

sible for the launching operations, it is now expected to cost France only about 80 million French francs, or about $10 million for the first 5 years until 1987 or 1988 when the satellite is projected to be placed into orbit.

Foreign Policy Issues

Although France today emphasizes scientific and economic benefits as the basis for cooperation with the U. S. S. R., French-Soviet cooperation in space has consistently been buttressed by the foreign policy community. Decisions have consistently been made at the higher political levels for cooperation to continue, emphasizing the conviction that such cooperation can be useful in attaining certain foreign policy goals as well as scientific ones, and that little would be gained from curbing or terminating it.

A key goal of French-Soviet cooperation in space, for example, concerns the position of France on the international stage., i.e., maintaining and reinforcing French independence. [11] As the French space program grows and becomes more sophisticated, cooperation with both superpowers allows France to avoid the dependency which French planners fear could result from relying on just one or the other for payload capabilities and expertise, By maintaining a balance between the U.S.S.R. and the United States, or by playing one superpower off against the other, the French believe that they occupy a better bargaining position in determining the shape of future cooperative ventures.

French planners also view France-Soviet cooperation in space as important in working towards a number of more elusive objectives, such as reducing tensions worldwide, and keeping communication open with the U.S. S. R. As in other areas of France-Soviet relations, they have found it difficult to evaluate just how effective space cooperation may be in achieving these ends. But even if cooperation does not minimize tensions, they argue, the alternative—curtailing or terminating dialog–would isolate the U.S.S.R. from the world community, force it to expand its own indigenous capabilities, and ultimately increase tensions worldwide. In the French view, therefore, cooperation is a means of keeping channels of communication open, perhaps of most importance when the overall political climate is so dismal.

Another French objective of cooperation in space is the opportunity to learn more about the U.S.S.R. A key example is the intimate view the two French spationautes, Jean-Loup Chretien and Patrick Baudry, believe they acquired of both the Soviet space program and of Soviet society while training with Soviet cosmonauts in preparation for the joint manned mission in 1982.

If cooperation in space is indeed beneficial in these ways, then in a certain sense cooperation

[11] See for example testimony of Hubert Curieu, President, CNES, in hearings before the House Science and Technology Committee, *International Space Activities*, May 16, 17, 18, 1978 [No.74](Washington, DC: U.S. Government Printing Office, 1979), pp. 2-3:

> It is a policy which strives to ensure our independence to the full extent necessary and to establish ties of effective cooperation with the space powers especially the United States

with the U.S.S.R. is also viewed as a means of simply sustaining the mechanisms for cooperation itself. Bureaucratic and political constraints have impeded all areas of France-Soviet cooperation—selecting areas for cooperation, negotiating agreements, and implementing them efficiently and effectively. Because it was so difficult for France and the U.S.S.R. to reach the present level of cooperation, French planners assert that it would be counterproductive to destroy the fruits of these efforts—especially if the French were to want to rebuild to this level sometime in the future when the climate may be more opportune. Some degree of consistency is regarded as important, if only to ensure that the window for cooperative activities remains open.

"Every country, " one French planner stated, "must find areas for cooperation. " The French, he added, "through prudent and determined effort" have decided on space as an area of cooperation which can be kept insulated from the dangers of technology transfer (see below), but which can offer mutual benefit to the countries involved.

Despite this overarching commitment to continuing cooperation with the U.S.S.R. in space science research, concern over two issues was expressed by some in the French foreign policy community. One of these issues concerns the degree to which such cooperation may affect French relations with other Western countries. Although the French believe that France-Soviet cooperation so far has not affected relations with other countries in any lasting way, there was some concern expressed that it could affect relations in the future, especially with the United States. This view was buttressed by the belief expressed by several French planners that NASA's curtailed participation in the International Solar Polar Mission (ISPM) was motivated more by political than budgetary concerns. But French planners hope that continued cooperation with the U.S.S.R. will not affect their relations with the United States—and argue that it should not.

A second issue concerns the degree to which France-Soviet cooperation in space should be "linked" to other foreign policy considerations, either to affect or to protest Soviet behavior which they may consider politically or morally egregious. French planners discussed the moral attractiveness of using cooperation as a lever to effect change in Soviet society, or to send a moral message to protest Soviet actions which might have some bearing on Soviet behavior in the future. But scientific and technical cooperation, they believe, can only have an impact if the cooperative project is something which the U.S.S.R. perceives as important to its own interests, and the majority of French programs in space cooperation do not fall into this category. According to one French official, some scientific and technical cooperative programs with the U. S. S. R., such as in nuclear physics, were curtailed or stopped in response to the Soviet invasion of Afghanistan and the exile of Andrei Sakharov, and other potential future areas of cooperation have been "put on the back burner. " But whether the intent is to affect Soviet behavior or to protest, they argue that curtailment or termination of cooperative projects in space would have little impact on Soviet policy at large while having a large negative impact on the French space program. They therefore believe that space cooperation should not be held hostage to Soviet actions in other areas, and that any displeasure with Soviet actions should be shown in other ways.

Indeed, some planners asserted that cooperation **may** even make it easier for France to protest Soviet actions, by providing a mechanism through which displeasure can be conveyed. Just as French President Mitterrand, when visiting Moscow in the spring of 1984, was provided more

of an opportunity than many other Western leaders for voicing his concern over the persecution of Andrei Sakharov, some French scientists argue that by being involved in cooperative projects, they may find it easier to discuss questions of political and humanitarian concern than if there were no interchange at all. There is no evidence, however, to indicate whether this approach may have been any more successful in affecting Soviet behavior than that of others in the West who terminated cooperative ventures.

In short, although the link between scientific cooperation and political relations with the U.S.S.R. cannot be ignored, French planners are attempting to "de-link" the two by downplaying the use of science for political ends, While no area of cooperation with the U.S.S.R. can be totally de-politicized, French planners argue that it is important to seek an area for cooperation where political considerations are reduced as much as possible, but where mutual scientific benefit can be substantial.

Military Technology Issues

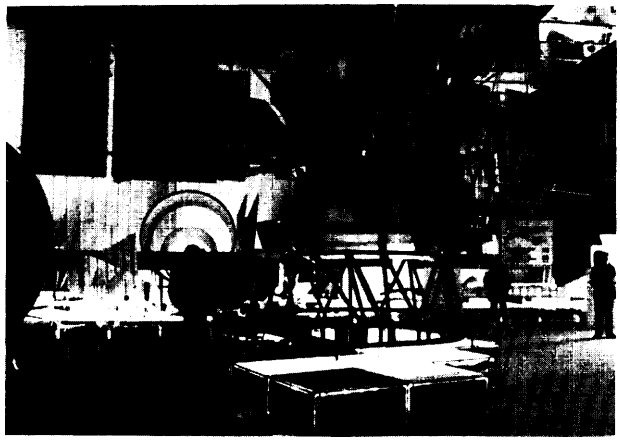
In light of the overall policy to pursue substantive cooperation with the U.S.S.R. in space research, questions of the potential transfer of militarily sensitive technology loom large. While France enjoys many scientific, economic, and political benefits from cooperation, the French agree that the Soviets are vigorously pursuing an aggressive campaign to gain access to Western technology and know-how, and that they are undoubtedly acquiring technical capabilities from space cooperation with France beyond those which they already possess. This was highlighted by the expulsion of 47 Soviet technological spies in 1983, and by the 1985 "leak" by French intelligence services of secret Soviet documents which illustrate the breadth and scope of Soviet industrial espionage activities in the West, especially in the aeronautic sector. [12] In interviews with OTA, French planners stated that the Soviets may gain some technical know-how via space cooperation —e. g., from French data processing—and are also able to use French instrumentation that they otherwise might not have had.

The key question for French poIicymakers, however, is the actual *value* of these new capabilities to the U. S. S. R., and it is here where they differ markedly from present U.S. policy. Defining "militarily sensitive" technologies as only those with direct military application—as opposed to more extensive U.S. definitions* —they argue that stringent controls are in place to avoid their transfer into Soviet hands, As in the United States, a list of sensitive technologies—the Missile Technology Control List—governs technology exports from France, and an inter-ministerial group of specialists is assigned to examine every new project proposal—in the space field as well as in others—to ensure that no violations of the list occur. With input from the *Secretariat General de la Defense* Nationale (SGDN) and various ministries, this interministerial committee, the *Commission 1nterministeriel d'Examen des Exportations du Mate' riels de Guerre* (CIEEMG), reviews technology transfer possibilities in space-related areas and is charged with the final approval of proposed projects. Thus, each project proposal in France is evaluated for its technology transfer potential, and depending on the ultimate assessment, access to people, techniques, and/or equipment may be curtailed.

Once a project has been accepted, moreover, French planners argue that still other systems of verification remain in place. According to officials in the Ministry of Foreign Affairs, "certain procedures guarantee that any potentially sensitive equipment is protected, and information flow is carefully monitored. " For example, protective packaging may be used to prevent the Soviets from gaining access to particular items that may be sensitive. And French scientists and partici-

[12] These \ \, erepublished in part in two editions of the French newspaper Le *Monde*. *See* Edwy Plenel and Christian Batifoulier, "Un document secret sovietique," *Le Monde,* Mar. 30, 1985, p. 8; and Edwy Plenel, "L' Espionage sovietique a l'ouest: Les mysteres de la VPK, " *Le Monde,* Apr. 2, 1985, p. 7.

● The United States is the only OECD countr, that defines strategic goods as includin, products and technologies with only indirect military implications, that views the weakening of the Soviet economy as an appropriate factor in determining policy, and that includes "foreign policy criteria" in export licensing or the imposition of embargoes and sanctions. See John P. Hardt and Donna L. Gold, "Trade Sanctions and Controls, " in ***East-West** Technology **Transfer: A Congressional Dialog** With **the Reagan Administration,*** a dialog prepared for the use of the Joint Economic Committee (Washington, DC: U.S. Government Printing Office, 1984), p. 99.



pants in cooperative projects are generally briefed before a project begins on the "myth" of the separation of the Soviet civilian and military space programs, and on precautions to be taken in cooperative projects to counteract Soviet efforts to acquire Western technology and know-how. "If international cooperation, " one such briefing concludes, "presents numerous advantages (rather inexpensive access to sophisticated space equipment, knowledge of Soviet technology), it also presents risks. It is necessary to recognize these risks of transferring sensitive know-how, so as to take the precautions that are necessary in exchanges with the U. S. S. R."

Key criticisms from supporters of a more stringent U.S. policy are that the French definition of what may be "militarily sensitive" is not extensive enough —i. e., it does not include dual-use technologies but is limited to technologies with direct military applications—and that French mechanisms for limiting Soviet access to Western technologies, such as protective packaging, are not always effective. But French planners stated strongly, if not defensively, that "while there will always be some transfer, we do not believe the Soviets are acquiring any militarily significant technology as a result of this cooperation. " Especially in the realm of space, French planners assert that France has not aided Soviet military capabilities "because of their [Soviet] advanced state of development" in certain of these areas, and because of French "vigilance" in others.

Disagreements with the United States over technology transfer, the French believe, do not stem from a fundamental difference of opinion, but only of degree. In the grey area of technology where the degree of military sensitivity is in question, these disagreements stem from the fact that the French yardstick tends to be more liberal, often guiding French planners to draw the "technology transfer line" in a different place from their American counterparts. These "yardsticks" have been the subject of considerable discussion, both within COCOM and in other forums. But the French feel certain that their yardstick is an appropriate one and, as in the area of commercial trade, question the wisdom of American planners in evaluating the technology transfer potential of individual French-Soviet projects more harshly.[13]

[13] "For a discussion of these issues in the commercial realm, and debates within COCOM, see OTA'S Technology ***and East West Trade: An Update*** (Washington, DC: U.S. Government Printing Office, OTA-ISC-209, May 1983), esp. pp. 63-72.

IMPLICATIONS FOR U.S. POLICY

French planners emphasize that their approach to cooperation with the U.S.S.R. cannot and should not be perceived as a model for U, S. planners. They believe that French policies would not be appropriate for another country with more financial and human resources invested in an already sophisticated space program of its own, and with superpower status. U.S. space requirements and political relationships are too different from France's for French policies to work for the United States. Scientifically, the American space program does not have the same needs as the French space program, which is newer, less extensive, and operates on a smaller scale. The U.S. space program does not face the same financial limits as the French program. The United States at present does not have the same governmental communications mechanisms in place for sharing information with

the U.S.S.R. on a steady basis, as illustrated by the direct lines for transmitting data between the Toulouse Space Center and Moscow. And from a political vantage point, the French believe that whatever the project, it is by nature easier for France to cooperate with the U.S.S.R. than the United States: U.S.-Soviet cooperation, they believe, automatically has a much higher political significance attached to it simply by virtue of the two countries' competitive status as world superpowers.

But even though individual French planners were reluctant to draw lessons from their own experience for U.S. planners, a few common views emerged during discussions there. These include the view that, while U.S.-Soviet space cooperation is potentially beneficial, it should be approached soberly and with lower expectations than in the past; the United States should not focus on large-scale joint projects, which both countries would want to use for political ends, but should focus on small-scale projects where scientific and/or economic concerns are paramount; and that space cooperation should be de-linked from politics as much as possible, so that regardless of what happens in the political arena, cooperation and channels of communication can be sustained. Some suggestions included more joint projects in the area of planetary research and compatibility between space stations and transportation systems—areas in which there have already been some preliminary discussions. "The more scientific you are, the more successful you'll be, " one planner noted. They also stressed the importance of being involved in the planning stages at the very beginning of any particular cooperative mission; the importance of keeping joint efforts stable, without disruptions due to unrelated events; and the importance of diminishing the drama which has sometimes accompanied U. S.-Soviet exchanges,

French planners would look with favor on renewed U.S.-Soviet cooperation in space, for the broad reasons of promoting world peace. In addition, some suggested that increased U.S.-Soviet space cooperation might also be in France's own interest, in that it would allow France to cooperate with the Soviet bloc in a freer atmosphere, and reap the benefits of both the U.S. and Soviet space programs more easily. Some concern was expressed on the part of some French officials that there could be drawbacks to U.S.-Soviet cooperation: Some feared that U.S.-Soviet cooperation might carve out space as a superpower domain; others, that further French-Soviet cooperation in space could hurt French-U. S. relations. But neither of these ideas appears to be widespread.

The official French point of view expressed most often is that there is always some uncertainty in relations with the U.S.S.R. The lesson for any country to learn from this, however, is not to terminate cooperation. Instead, it should be to approach cooperation soberly, with caution, without grandiose expectations, but still with the hope that it will contribute to the pursuit of space research in a positive manner, and perhaps to achieving broader objectives as well.