JPRS L/8968

10 March 1980

West Europe Report

SCIENCE AND TECHNOLOGY

(FOUO 4/80)

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

For further information on report content call (703) 351-2811 or 351-2501 (Greece, Cyprus, Turkey).

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200060009-4

JPRS L/8968

10 March 1980

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

(FOUO 4/80)

CONTENTS PAGE

INTERNATIONAL AFFAIRS

PLANS FOR 'ARIANE' PROGRAM IN 1980'S OUTLINED

Paris AIR & COSMOS in French 12 Jan 80 pp 39-43

[Article by Pierre Langereux: "The Ariane System of the 1980's"]

[Text] The "Ariane" rocket that has just made its first flight has been conceived for very different missions, from launchings into low orbits to sending probes through the solar system. It can put 4.8 tons into low circular orbit at 200 km altitude, or 2.5 tons into heliosynchronous circular orbit at 840 km (inclined at 98.76°), or it can send 1 ton to the moon, 790 kg to Venus, or 660 kg to Mars, using a hyperbolic trajectory of 250 km perigee (inclined at 5.23°). It is also possible to add a fourth stage[1] in order to carry out certain missions beyond the reach of a conventional three-stage rocket, in circular orbits at all altitudes or in elliptical orbits with high perigee. This will be the case with the European scientific satellite "Exosat," which will be launched by "Ariane" in 1981 with the upper stage of the French "Diamant B.P4" launcher, already qualified in flight, as the fourth stage.

However, "Ariane" has been optimized especially for launchings of geostationary satellites. The present version of the European launcher (Ariane 1) can put a 1.75-ton payload into geostationary transfer orbit (200-35,800 km) from the equatorial launching range of Kourou in French Guyana, and it can do so under economic conditions comparable to those of the American NASA with the reusable "shuttle" which will be the main competitor of the "ariane" rocket during this decade.

But it now appears that the market for satellites--especially geostationary telecommunications satellites--is going to develop extremely fast in the coming years. This change is already perceptible. The mass of the "medium" satellites of the "Delta" (or semi-Ariane) class is being increased with transmission capacity, as is true also of the big satellites of the "Atlas-Centaur" (or Ariane) class for telecommunications (future INTELSAT satellites) or the direct television that is beginning to appear. The European launcher must therefore go with this evolution.

1. Rather than develop an engine reignitable in flight for the third stage --a possibility abandoned at the beginning of the program, in view of the missions planned for "Ariane."

Tripling Performance Capabilities in 10 Years!

This is why the CNES [National Center for Space Studies] has been preparing since 1977 a "plan of evolution" for the "Ariane" rocket which exploits all of the rocket's potential for improvement and the resources of European space technology.

The objective is to increase the launcher's performance capabilities (masses and volumes of the payloads) considerably, as well as the scope of its missions--going so far as to envision the launching of automatic orbital stations ("Minos" project) or of recoverable habitable vehicles ("Hermes" minishuttle)--while at the same time reducing launching costs dramatically, so as to remain competitive. For geostationary launchings, the price could drop from the present Fr 180 per kg to less than Fr 75 per kg.

The ambition of the CNES is to improve the European launcher to the extreme limit during the decade of the 1980's--but to do so through a program of complementary developments scaled in time to as to reduce the risks of technical and scheduling uncertainties, as has already been done for development of the present rocket. The plan is to improve the launcher in successive stages (Ariane 1 to Ariane 5), each of them adapted to the market of the moment while at the same time preparing for the following stage.

The "Ariane system" as thus conceived will make it possible in 10 years to triple the performance capabilities of the European launcher for geostationary orbit (from 1.75 to 5.5 tons) and to double the capabilities for low orbit (from 4.8 to 10 tons).

The development of this system is planned in three stages for creating the increasingly powerful versions of "Ariane":

--in the short term, to the end of 1982-beginning of 1983, the "Ariane 2" and "Ariane 3" versions will be able to put 2 tons and 2.4 tons of payload, respectively, into geosynchronous transfer orbit;

--in the medium term, beginning of 1985, the "Ariane 4" version will be able to launch 3.5 tons into the same orbit;

--in the long term, 1990, the most powerful version, "Ariane 5," will make it possible to launch 5.5 tons into geosynchronous transfer orbit or 10 tons into low earth orbit (200 km), particularly for construction or operation of future European orbital stations.

These are the most recent data concerning the evolution of this system since AIR ET COSMOS presented the elements of it for the first time in June 1979 (cf AIR ET COSMOS, No 769).

"Ariane 2" and "Ariane 3"

The preparatory phase of the "complementary development program" for the European launcher, for creation of the new "Ariane 2" and "Ariane 3" versions has already been approved by the member states of the ESA [European Space Agency] at the meeting of its Council on 26 July 1979, after the program's objectives had been defined by the "Ariane" steering committee on 7 February 1979.

This complementary development program is a special program of the ESA, delegating to the CNES the same prime-contractor responsibilities as for the development of "Ariane 1"; moreover, the CNES has already named Mr Vangaver as the "Ariane 2 and 3" project chief. A large proportion of the engineers of the CNES Launchers division at Evry will be assigned to this work. This program will cost about Fr 360 million for building the two versions, and France has already devoted Fr 37 million to the 1980 CNES budget to finance its part of the operation.

It is now up to the member states to decide--by March 1980 at the latest--to proceed with complete development of these new versions that will be derived directly from "Ariane 1" by means of a number of improvements easy to introduce without upsetting the configuration of the present rocket. The "Ariane 2 and 3" versions will completely replace "Ariane 1," which thereafter will no longer be used.

The "Ariane 2" version will be a three-stage rocket, more powerful than the present launcher because of improvement of the performance characteristics of the engines of the three stages. The thrust of the four "Viking 5" engines of the first stage (L 140) and of the "Viking 4" engine of the second stage (L 33) will be increased by 9 percent to 10 percent by an increase from the present 54 bars to at least 58 bars) of the base pressure of the engines' combustion chambers; the other characteristics of the lower stages remain unchanged. The specific impulse of the HM 7 cryogenic engine of the third stage (H8) will be increased 4 seconds by raising the rate of expansion of the combustion gases; the rate will go from the present 60 to 70 by an increase of the nozzle section ratio produced by lengthening the divergent nozzle (by 170 mm). The combustion pressure will also be increased, from the present 30 bars to 35 bars, but with the flows kept constant (slight narrowing of the chamber), which will not increase the thrust of the HM 7 engine. On the other hand, the mass of cryogenic fuels (liquid hydrogen and oxygen) of the third stage will be increased 25 percent (from the present 8 tons (H8) to 10 tons (H10), by a 1.25-m lengthening of the tanks, which makes it possible to stay within limits compatible with the internal dimensions of the existing launching tower.

The "Ariane 3" version will have all these improvements of the "Ariane 2" version with, in addition, two booster rockets (accelerators) attached to the first stage. These solid-fuel boosters, developed cooperatively by SNIA [expansion unknown]-Viscosa (Italy), MAN [expansion unknown] (FRG) and

CASA [expansion unknown] (Spain), will be charged with about 7.3 tons of solid fuel each (specific impulse of 230 seconds). They will deliver a thrust of 70 to 90 tons for 28 seconds at takeoff, and will separate before the rocket goes into the transonic-flight regime (at Mach 0.85).

The "Ariane 3" rocket will have a thrust of 410 tons at takeoff, including 140 tons furnished by the boosters and 270 tons by the improved "Viking" engines of the first stage, for a total weight of about 230 tons (the 210 tons of "Ariane 1" plus 2 tons of cryogenic fuels and 18 tons of boosters).

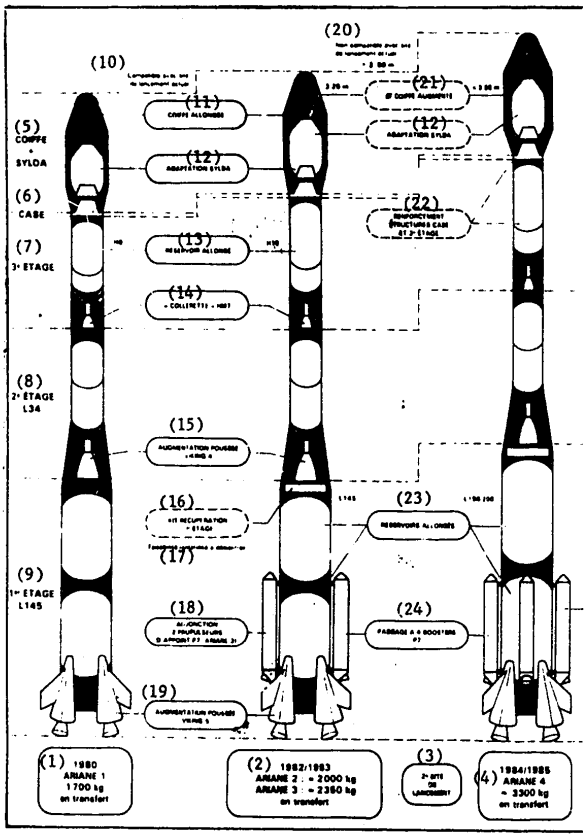
The "Ariane 2" and "Ariane 3" launchers will in principle retain the present nose section of the "Ariane 1" rocket, contrary to what was initially envisioned. But the nose cone of the nose section of the new versions will be redesigned to improve the aerodynamics. A new nose section will be adopted only with the following version.

These "Ariane 2 and 3" rockets, which will be available in 3½ years, in mid-1983, will be able to launch, respectively, 2 and 2.4 tons into geosynchronous transfer orbit (200-35,800 km) from the Kourou rocket range. "Interim" versions--"Ariane 2A" and "Ariane 3A"--could even be available a little earlier, in October 1982, with slightly lower performance capabilities, bor they would not have the benefit of all the improvements planned (same engines as Ariane 1).

In relation to the present rocket, "Ariane 2 and 3" will offer gains of 14 percent and 37 percent in performance capabilities for only 8 percent of additional development expense (over the initial program).

Recovery of the First Stage

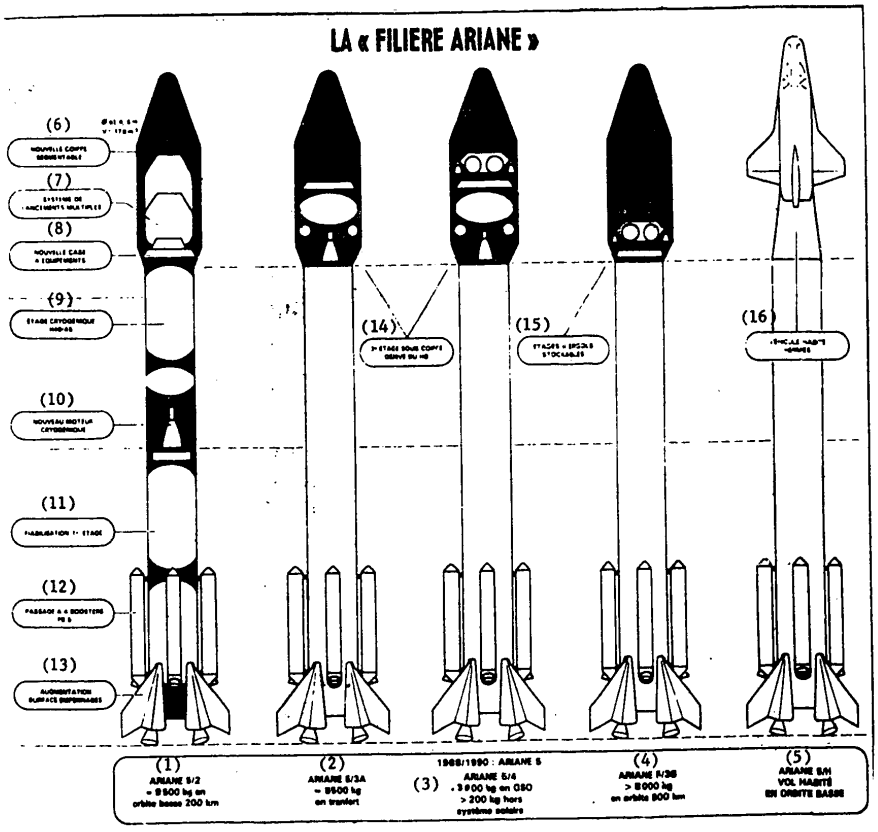
Profitability could even be increased by recovery of the first stage, which represents about one-third of the production cost of the rocket. These partially recoverable versions, "Ariane 2R" and "Ariane 3R," which would be available after mid-1983, could launch, respectively, 1.9 and 2.3 tons into transfer orbit, or a little less than the nominal versions, because of the mass of the recovery devices (parachutes, floats, etc). A decision in principle on the program fro recovery of the first stage is to be made in March 1980, and a series of feasibility tests would then be started, including tests of separation of a stage (fuel-mockup stage), in the port of Le Havre, stage-towing tests in the English Channel, and tests on a reduced-scale model in the Carenes Basin. This test program will cost Fr 12 million in 1980. The operation seems feasible, to judge by the behavior of the first stage of the "Ariane" rocket launched in December 1979: although it was ripped open by the self-destruction device in flight (after separation) and made a free fall of 40 km into the Atlantic Ocean, it was possible to rapidly locate the first stage of this rocket with sufficient precision for it to be reached by a launch while it was still afloat.



[Key]:

1. 1980-Ariane 1: 1,700 kg in transfer orbit
2. 1982/1983-Ariane 2: 2,000 kg; Ariane 3: 2,350 kg, in transfer orbit
3. Second launching site
4. 1984/1985-Ariane 4: 3,300 kg in transfer orbit
5. Nose section + SYLDA adapter
6. Case
7. 3rd stage
8. L34 2nd stage
9. L145 1st stage
10. Compatibility with present launching site
11. Lengthened nose section
12. SYLDA adaptation
13. Lengthened tank
14. HM7 "collar"
15. Increase of Viking-4 thrust
16. 1st-stage recovery kit
17. Feasibility/profitability to be demonstrated
18. Addition of two P7 boosters (Ariane 3)
19. Increase of Viking-5 thrust
20. Incompatibility with present launching site
21. Nose-section diameter increased
22. Reinforcement of case structures and 3rd stage
23. Lengthened tanks
24. Transition to four P7 boosters

The "Ariane System"



[Key]:

1. Ariane 5/2 = 9,500 kg in low orbit (200 km)
2. Ariane 5/3A = 5,500 kg in transfer orbit
3. Ariane 5/4 = 3,000 kg in geostationary orbit
   200 kg outside solar system
4. Ariane 5/3B 8,000 kg in 800-km orbit
5. Ariane 5/H - manned flight in low orbit
6. New segmentable nose section
7. Multiple-launching system
8. New equipment case
9. Cryogenic stage H40/45
10. New cryogenic engine
11. 1st-stage feasibility program
12. 4-booster transition P8.5
13. Increased empennage surface
14. 3rd stage under nose section derived from H8
15. Storable-fuels stages
16. Hermes manned vehicle

"Ariane 4"

The medium-term phase (1985) anticipates the development--also, in principle, under European cooperation--of a new, even more powerful version, "Ariane 4," which would be added to the "Ariane 2 and 3" versions, production and use of which would continue.

"Ariane 4" constitutes, according to the CNES, "a significant improvement" of the European launcher and the intermediate phase toward the realization of the most powerful launcher of the series (Ariane 5). The performance capability of "Ariane 4" in geosynchronous transfer orbit would reach 3.3 tons at the minimum, and more probably 3.5 tons, or double the capacity of the present rocket, and for a launching cost 63 percent lower. This rocket could thus launch very large satellites--in the class of the INTELSAT 6's, which will make their appearance at the end of 1985[2]--while at the same time further improving the competitiveness of the European launcher vis-a-vis the American "shuttle." These performance capabilities of "Ariane 4" would be especially advantageous for a double launching: the rocket could launch simultaneously a big direct-TV satellite of 2 tons and a 1.1-ton telecommunications satellite, or two big telecommunications satellites of 1.4 tons each, with a new "SYLDA" double-launching system which is presently under study. On condition that certain structures (adapter, case, etc) are strengthened, the capability could reach 4 tons in circular heliosynchronous orbit at 800 km altitude (instead of 2.5 tons with "Ariane 1") and 7 tons in circular equatorial orbit at 400 km.

To achieve this new "Ariane 4" three-stage version, a number of important improvements will be necessary; they will concern principally the first stage, the upper part of the new launcher (second and third stages) being the same as on the "Ariane 2 and 3" versions, except for the nose section, whose diameter could be increased to 3.6 m or 3.8 m, depending on the needs.

The mass of fuels (UDMH [unsymmetrical dimethylhydrazine], N_2O_4) of the first stage will be raised to 210 tons as against 145 tons (Ariane 1 to 3), by lengthening the tanks by about 6 m. The CNES recently decided on this L210 first-stage option in preference to a stage smaller than this, but on condition of the compatibility of the new stage with the big PF 20 test bench of Vernon and with the installations of the Mureaux Launcher Integration Site. "Ariane 4," on the other hand, will be equipped with four solid-fuel boosters, with the same characteristics and performance as the two boosters of "Ariane 3" (7.3 tons of solid fuel and 70 pounds of thrust) , but capable of being improved later (filling with 8 or 8.5 tons of solid fuel).

The "Ariane 4" rocket will weigh 315 tons (18 tons of boosters and 67 tons more in fuels and structures than "Ariane 3"), and the thrust at takeoff

---

2. Cf AIR ET COSMOS, No 794.

with the four engines of the first stage and the four boosters will reach 550 tons, or double the thrust of the present rocket. Furthermore, it will be possible to make the guided phase of "Ariane 4" begin earlier (at the end of first-stage flight rather than the beginning of the second stage), since the L210 first stage will take the rocket to an altitude of 60 km (instead of 40 km as at present).

We note that the building of the "Ariane 4" launcher will necessitate the construction of a new launching complex (ELA ["Ariane" Launching Complex] 2) at Kourou, for the dimensions of the new rocket will be incompatible with those of the existing installations. This second launch pad could be available toward the end of 1983 or the beginning of 1984.

"Ariane 5," Multipurpose Launcher

In the long term, the CNES is proposing to its European partners the building of a new rocket, "Ariane 5," with very superior performance capabilities (60 percent more than "Ariane 4"), which would be a "multipurpose launcher" capable of being used both for geostationary launchings and for low- or medium-orbit missions (up to 1,000 km altitude). This powerful "Ariane 5" launcher would make itpossible, in particular, to launch automatic orbital stations (Minos) or a manned hypersonic glider (Hermes).

"Ariane 5" will be a new two-stage launcher of 308 tons (and 57.5 m height) which will be derived from "Ariane 4" by a complete change of the upper part (stages), the first stage of "Ariane 5" being the same as that of "Ariane 4" (L210). It will also receive the four new additional boosters, each charged with 8.5 tons of solid fuel. The thrust of "Ariane 5" at takeoff will therefore be identical to that of "Ariane 4" (550 tons).

The second stage of "Ariane 5" will be entirely new, and will be sized to optimize the low-orbit performance capabilities (10 tons). It will replace the two upper stages of the preceding versions. It will be a cryogenic stage (the biggest built in Europe) carrying 40 to 45 tons of liquid hydrogen and oxygen and equipped with a new high-thrust engine--60 to 80 tons (HM60). The concept presently under study is for building a stage with a single turbopump engine, reignitable in flight (contrary to HM7), whose nominal thrust would be modulable within quite a wide range--between 45 and 60 tons or between 60 and 80 tons.

The choice of the operating cycle of this new high-thrust cryogenic engine is scheduled to be made soon, in February 1980. The tendency in principle is toward a low-pressure engine with open (or shunted) cycle, in which the gases from the generator are not reused in the engine but ejected via the nozzle[3].

---

3. Contrary to the "shuttle," whose cryogenic engines must function in the atmosphere from takeoff, then in a vacuum, the upper stage of "Ariane 5" will function under vacuum only. Thus it is not necessary to use a high-pressure closed-cycle engine, which does of course have higher performance but which is also very difficult to tune.

In practical terms, the development of this new high-thrust cryogenic stage makes it necessary to begin now the predevelopment work on the most critical components of the engine (seams, bearings, etc) and study of the testing means. This predevelopment program will last about 3 years. The two European engine-specialist firms, SEP [European Propellant Co] in France and MBB [Messerschmidt-Bolkow-Blohm] in the FRG, should be associated in it. The decision to undertake complete development (over a 7-year period) of the cryogenic engine and stage is to be taken in 1983, so as to be able to begin the flight tests in 1988 and have operational availability in 1990.

The "Ariane 5" rocket will have a constant diameter of 3.8 m for both stages, the CNES having abondaoned the idea of a 4.6-m diameter for the second stage, as had been envisioned previously. On the other hand, in the present conception "Ariane 5" still has a new nose section of 4.8-m diameter and a useful volume of 170 m^3, or half the volume of the hold of the "shuttle."

This will make it possible to launch very big payloads: 9.5 to 10 tons in low circular orbit at 200 km altitude, inclined at 30°. A new payload adapter will also make it possible to do multiple launchings and to offer certain services of the American "space shuttle." This new two-stage configuration with nose section optimized for low-orbit launchings is designated "Ariane 5/2."

Depending on the needs, it will also be possible to equip the rocket with a "complementary propulsion system" placed under the nose section. It will be composed of:

--either a new cryogenic third stage derived from the present third stage (with the same HM7 engine of 6 tons thrust), to optimize the launching of heavy payloads (5.5 tons) into geostationary transfer orbit, yet still with the possibility of double launching. This is the "Ariane 5/3B" configura tion;

--or a new storable-fuels (UDMH and N_2O_4) third stage, equipped with the propulsion system of the "Hermes" vehicle, for launchings into medium orbits (more than 8 tons into circular heliosynchronous orbit at 800 km). This is the "Ariane 5/3B" configuration;

--or a combination of the two complementary stages below the nose section (cryogenic third stage and storable-fuels fourth stage), to form a four-stage rocket. This configuration, intended for geostationary launchings (3 tons at 36,000 km) or the launching of planetary probes, is christened "Ariane 5/4."

Dornier Proposal for Modular Cryogenic Stage

The FRG firm Dornier, presently participating in construction of the second stage of the European launcher, proposes a new-formula high-energy upper stage for the future "Ariane 5" version, within the framework of the studies for complementary development of the rocket.

Thus, Dornier proposes replacement of the liquid-hydrogen and liquid-oxygen third stage of the present rocket ("H8," with 8 tons of fuels, and "H10," with 10 tons of fuels, of the "Ariane 2 and 3" versions) with a new modular cryogenic stage containing 12 to 15 tons of fuels and 3.8 m in diameter, which would use the HM7-engine propulsion set of the present rocket, with 6 tons of thrust, but with possibility of reigniting in flight. This modular-stage concept revives the idea of a group of parallel tanks separable in succession, already proposed by Dornier in 1971 within the framework of the Space Tug studies of the former European space oranization ELDO [European Launcher Development Organization].

The interest of this proposal is also that it permits double use of this stage, foth for the European "Ariane" rocket and for the Amercian "space shuttle as a transfer stage (OTV), in conformity with FRG space policy, which is oriented simultaneously toward European and transatlantic cooperation.

For a later phase, Dornier recommends replacement of the present second stage by an "H32" cryogenic stage containing 32 tons of fuels and 3.8 m in diameter, which would make it possible to build a launcher of uniform diameter (3.8 m), with the improved first stage and the 15-ton modular third stage. This launcher could put a payload of 2.85 tons into geosynchronous transfer orbit.

"Ariane 5H - Hermes"

Finally, the "Ariane 5H" version of the rocket will make it possible to launch a manned vehicle, "Hermes," into a low circular orbit of 200 km altitude (inclined at 30° or less), to assemble and service orbital stations (cf AIR ET COSMOS, Nos 767 and 771). "Hermes" is a proposed delta-wing hypersonic glider with a total mass of 10 tons (twice as large as an "Apollo" cabin). It could carry a maximum of five astronauts or only two "passengers" and 1.5 tons of freight to an orbital station and remain in orbit for a week. The machine would be launched from Kourou by the "Ariane 5H" lrocket (without nose section) and recovered, like the "shuttle," on a landing strip on which the glider will set down. The guidance and piloting of this aerospace vehicle would be entirely automatic. It would be reusable for several missions.

The "Ariane 5H" launcher intended for launching this manned vehicle would apparently be similar to the other "Ariane 5" vehicles. But it would in fact be very different "inside" because of the extensive "reliability" work that would be necessary in order to give the launcher every guarantee of proper functioning, as required by the presence of astronauts on board. This operation would in particular necessitate very expensive improvements and redundancies not needed on the other versions.

Characteristics, Performance Capabilities and Costs of the "Ariane System" (January 1980)

Launcher	Ariane 1	Ariane 2A	Ariane 3A	Ariane 2	Ariane 3	Ariane 4	Ariane 5
Placement in Service	April 1981	October 1982		Mid-1983		Beginning 1985	1990
Total height	47.4 m	48.7 m	48.7 m	48.7 m	48.7 m	55.2 m	57.5 m
Diameter of first stage	3.8 m	3.8 m	3.8 m	3.8 m	3.8 m	3.8 m	3.8 m
" " second stage	2.6 m	2.6 m	2.6 m	2.6 m	2.6 m	2.6 m	3.8 m
" " third stage	2.6 m	2.6 m	2.6 m	2.6 m	2.6 m	2.6 m	--
" " nose section	3.2 m	3.2 m	3.2 m	3.2 m	3.2 m	3.8-4.0 m	4.8 m
Nose-section volume	40 m^3	40 m^3	40 m^3	40 m^3	40 m^3	85 m^3	170 m^3
Payload:							
Geosynchronous transfer orbit	1.75 t	1.9 t	2.3 t	2.0 t	2.4 t	3.3-3.5 t	5.5 t
Low orbit, 200 km	4.8 t	--	--	4.9 y	5.8 t	7.3 t	10 t
Mass at takeoff	210 t	212 t	230 t	212 t	230 t	315 t	340-360t
Thrust at takeoff	245 t	245 t	385 t	270 t	410 t	550 t	55o t
Reduction of launching costs	--	10%	25%	15%	30%	43%	57%
Development cost*	4,300 million francs			360 million francs		400 million francs	Comparable to Ariane 1

* At 1978 prices.

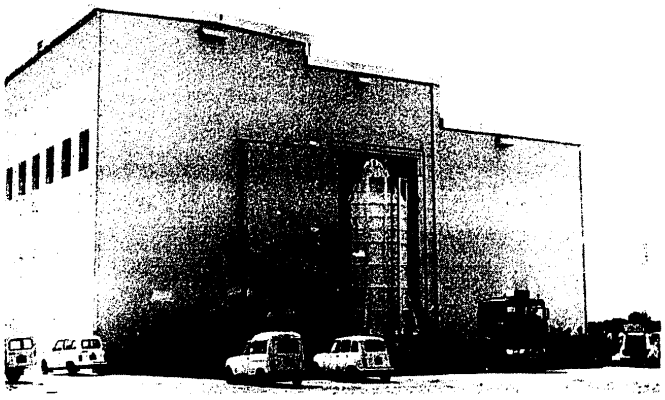
11267
CSO: 3102

PREPARATION, SUPPORT FACILITIES FOR 'ARIANE' PROGRAM

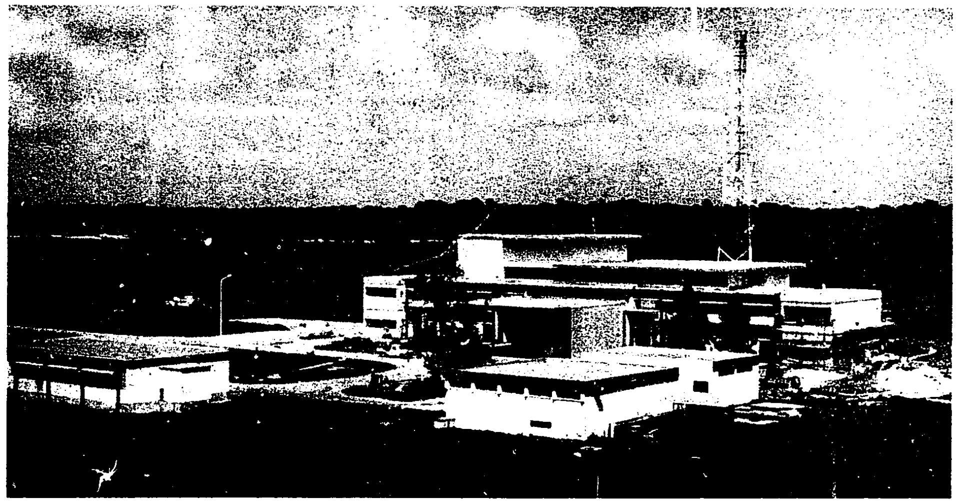
Paris AIR & COSMOS in French 12 Jan 80 p 38

[Article by Pierre Langereux: "The Facilities for Preparing the Payloads"]

[Text] The Guyana Space Center makes available to the users of the "Ariane" rocket a Payload Preparation Facility (ECPU) that makes it possible to prepare satellites compatible with the maximum performance characteristics of the European launcher, from arrival to launching, and for either single or double launchings. The ECPU includes a group of structures, a large part of which is already completed and which will be entirely ready and equipped for the first operational launchings at the beginning of 1981. These installations, which we were able to visit in the company of the chief of the ECPU, Mr Desobeau, are modern, vast and functional. They easily rival the best installations that we have been able to see in the United States, and satisfy the most demanding users, such as INTELSAT.



Exit of the tractored payload container from the building for final assembly and integration of satellites at the CSG. This clean container (classe 100 000) has an internal volume equal to that of the nose cone of the "Ariane" launcher. It was built by ACMH [expansion unknown] and has already been used for the first payload of the LO1 launching in December 1979.



Overall view of the big S1 building (Venus) used for preparation and checking of satellites before launching. The tower provides for radio connection between the testing equipment, which stays inside the building, and the satellites on the rocket ready for launching. Photos by Pierre Langereux.

The ECPU is composed essentailly of four buildings. The big S1-Venus building is for preparation and checking of satellites (two at a time) upon their arrival at the CSG [Guyana Space Center], with the test benches, in a vast clean room (class 100 000) of 460 m^2 (32 m X 14 m and 11 m high) surrounded by four rooms (of 50 to 60 m^2) for the testing equipment, which can stay in place (there is radio connection with the satellites on the rocket). This building will go into service in 1980 for the L03 launch program.

The S2-Titan and S4-Cygne [Swan] building, located in the ELA ["Ariane" Launching Complex] assembly zone, are, respectively, for storage and checkout of solid-ruel apogee motors, in two air-conditioned rooms of 98 and 42 m^2 comprising an adjacent pyrotechnics shop (with all the pre-

scribed protection), as well as the solid-fuel rocket-engine radiography in an armored building (walls 1.35 m thick) that contains a powerful X-ray machine and a 10-m^2 cold chamber ()° C) for cooling the rocket engines befor the operation. The S2 building is completed, and the S4 building will be ready at the end of 1980.

The S3-Janus building, also located in the ELA assembly zone, is the building for final assembly of the satellites and apogee motors (coming from S1 and S2). It is composed of three clean rooms (class 100 000), of 172, 110 and 72 m^2, one of which is for filling the satellite motors with liquid fuels (hydrazine, etc), with a wide array of precautions. A double room separated by a common lock chamber is used for simultaneous integration of two satellites, including composites of more than one satellite and the adaptor (SYLDA [expansion unknown]) for double launchings. The height available under the stanchion (13 m) will make it possible to integrate even the payloads of the future "Ariane 3" version. An adjacent room is for balancing the satellites. The S3 building is presently completed.

11267
CSO: 3102

LAUNCHING FACILITIES FOR 'ARIANE'

Paris AIR & COSMOS in French 12 Jan 80 p 44

[Article by Pierre Langereux: "A Second Launch Pad (ELA 2) at Kourou for 'Ariane 4'"]

[Text] The present "Ariane" Launching Complex (ELA 1), made up of certain installations (launch pad, launching tower, umbilical tower and launching center) from the old launching complex for the "Europa 2" rocket, has been adapted for the dimensions of the "Ariane" rocket (210 tons and 47 m high). It will be possible to use this "ELA 1" launching complex again for the new "Ariane 2 and 3" versions of the European launcher, whose dimensions will not be very different from those of the present rocket.

On the other hand, construction of the "Ariane 4" version, which will be still more powerful and of distinctly bigger dimensions (315 tons and 55 m), will require the building of a second launching complex, "ELA 2," at Kourou. This "ELA 2" second launch pad is also justified by the planned rate of frequency of "Ariane" rockets during the coming years, so as to increase the launching cadence--one per month--and to provide against accidental damage to the present launching complex, which would seriously reduce the rocket's availability.

This new "ELA 2" launching complex intended for the "Ariane 4" rocket (which is to be available about the end of 1984 or the beginning of 1985) will of course also be compatible with the preceding versions, "Ariane 2A and 3A" which are to go into service in October 1982), as well as with the improved "Ariane 2 and 3" versions (which will be operational in mid-1983).

The availability of two launching complexes at Kourou would make it possible to launch 12 "Ariane" rockets per year, including 4 per year with the "ELA 1" first launching complex for the "Ariane 2 and 3" versions and 8 rockets per year with the "ELA 2" second launching complex for the "Ariane 2, 3 and 4" versions.

The CNES [National Center for Space Studies] intends to proceed resolutely with construction of the "ELA 2" launching complex, design of which began at the Space Center of Toulouse in July 1979. A review of project defini-

Aerial view of the "ELA 1" first launching complex (with the "fuels mockup" coming out of the launching tower). The "ELA 2" second launching complex will be built about 600 m south of the first one (at the lower left of the photo), which will make it necessary to detour the national highway that passes nearby (800 m). The assembly buildings and the new launching center will in effect be on the other side of the highway. The relative disposition of the rocket in relation to the "ELA 2" launching tower will also be different: the rocket will be to the west of the tower (so as to be pushed by the prevailing winds), and to the north, it will be positioned as on the present lauch pad.

tion is planned for next June, and the CNES would like the civil-engineering work to begin at the end of 1980, in order for the lauching complex to be available at the end of 1983 or the beginning of 1984--that is, a little after the placing in service of the new "Ariane 2 and 3" versions and at a time when the European launcher market should be expanding strongly.

The "ELA 2" launching complex will be near (about 600 m) the present "Ariane" launching complex, so as to benefit from a number of joint auxiliary services.

"ELA 2" will comprise some new installations--launching area, launching tower, umbilical tower, preparation center, launching center, shops, etc--which will be very different from those of the first launching complex, for they will be optimized for the future "Ariane" rockets. They will make it possible to reduce the time that the rocket speends on the launch pad to prepare two rockets simultaneously, in the vertical position, in a large building that has two assembly docks. The rocket will be assembled, and set up on its launching ramp, in this building. It will then be taken out of the building (on an air cushion) and placed on a rail tractor which will take it to the launching area, near the launching tower. The rocket will then be enclosed in a vast air-conditioned cell attached to the launching tower, the rear part of which will include a whole series of shops (with the necessary tooling) so as to facilitate the work of the crews on the rocket access platforms. A pedestal system is planned for adapting the different rockets --mainly when one goes from "Ariane 4" to "Ariane 3" and vice-versa--to the tower's installations, especially in order to maintain access to the umbilical connections.

The construction cost for the "ELA 2" second launching complex is estimated at about 400 million francs, two-thirds of which is reported to be financed by France.

11267
CSO: 3102

FEDERAL REPUBLIC OF GERMANY

FEASIBILITY, COSTS OF COAL GASIFICATION, LIQUEFACTION

Hamburg CAPITAL in German Jan 80 pp 132-136

[Article: "Gasoline From Coal: Struggle for Tax Monies"]

[Text] If the Germans are to escape from the oil countries' blackmail noose, they will have to make gasoline out of domestic coal. However, the interested parties from the areas of politics and industry are arguing over the best technology. This is because billions of marks are available for distribution.

The Trial

The Bonn stage is preparing for the great coal act. First night is expected in the second half of the eighties, and the chief factors from mining, petroleum and plant construction are rehearsing already. The name of the show is already known: "The Trusting Citizen and the Alcohol Promoters, or Get Free From Crude Oil."

Chancellor Helmut Schmidt, a pastmaster of the performing arts, is available for the prolog: "We shall submit work plans and projects of an uncommon order of magnitude--uncommon with respect to financing requirements as well." In the closing scene the people's chorus is to appear and play a classic part: Shout with joy and foot the bill.

However, the actual subject of the play is not yet accurately known to anyone. In any event, the head of Ruhrkohle, Dr Karlheinz Bund, already knows long passages of the dialog by heart: "If 'away crude oil' is the right way," he likes to repeat to politicians and entrepreneurs, "this can happen only by replacing these crude oil products--heating oil, diesel oil and gasoline--with liquid products from coal. For, as matters stand, the bottleneck is in liquid energy suppliers."

How to go about putting the domestic coal reserve on liquid measure is, however, fiercely disputed. The planned expenditure of billions for the new technology threatens to turn out to be a gigantic misdirected investment.

Up to now, reports Prof Dr Werner Peters, general manager of Bergbau-Forschung [Bergbau Research] GmbH Essen [GmbH = company with limited liability], "Two fundamentally different initial processes" for producing gasoline from coal are being presented, namely:

--Hydrogenation: With this process, high-grade brands of coal are ground and next enriched in hydrogen at a high pressure of more than 300 atmospheres, thus being liquefied. During the following further processing in specialized refineries, heating oil and in addition diesel oil and gasoline are formed preponderantly.

--Gasification: With this process, low-grade brands of coal or inexpensive brown coal are subjected to extremely high temperatures. Steam at more than 900° C forces the conversion of carbon into gas molecules. This synthesis gas can be processed further to the simple alcohol methanol, which with present technology is usable as an additive to gasoline.

Key:

1. 5 million metric tons of coal . . .
   Gasification

2. First step: Coal lumps are placed in contact with hot water vapor (more than 900° C) and are dissolved to become gas.

3. Second step: The coal gas thus obtained is transformed to 4 million metric tons of methanol (simple alcohol).

4. Third step: The Mobil process separates from the methanol 1.7 million metric tons of gasoline. Water remains behind.

5. Pro:

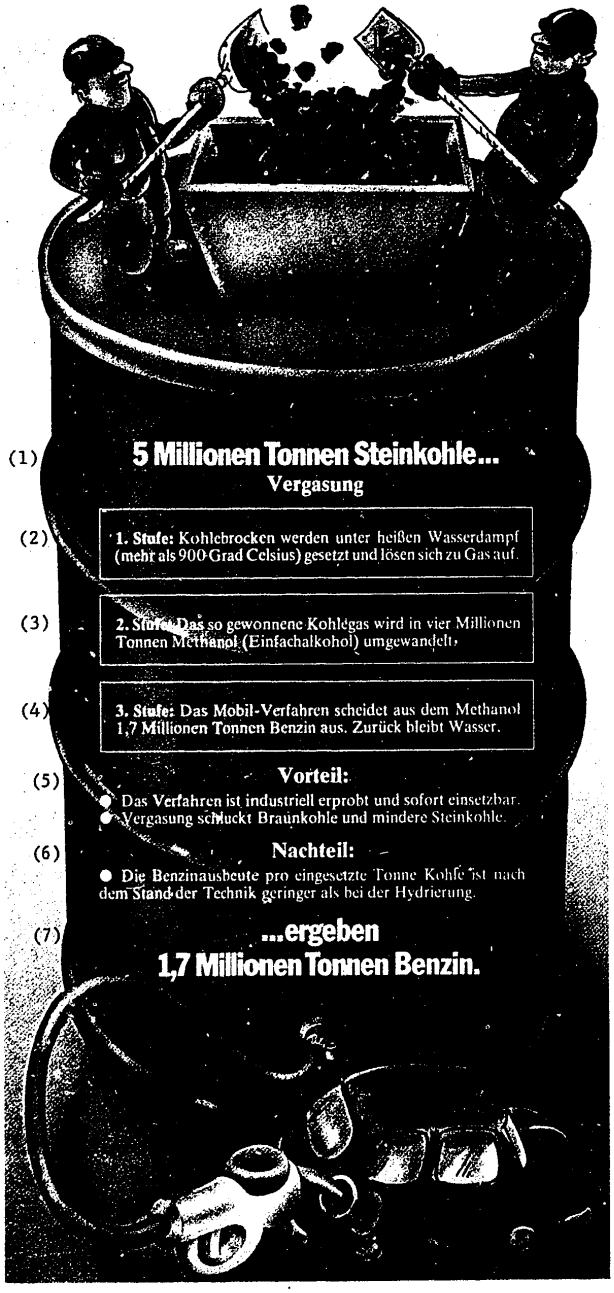
   --The process is proven industrially and can be installed at once.
   --The gasification consumes brown coal and lower grade coal.

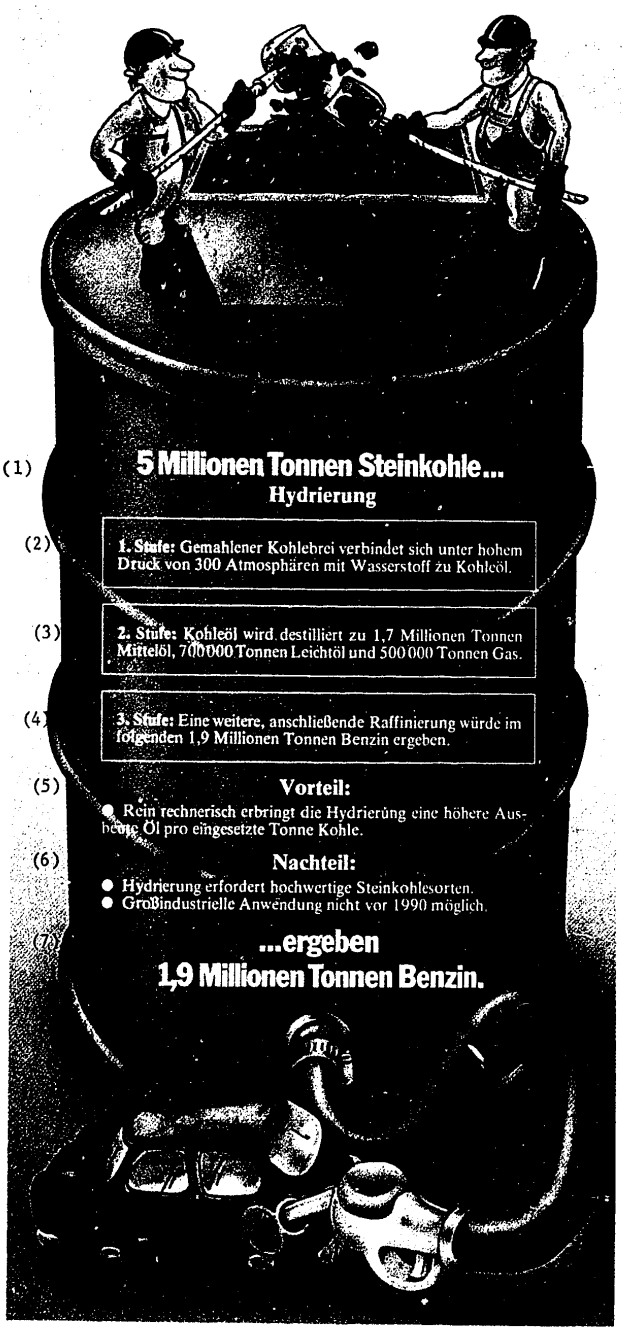
6. Con:

   --The gasoline yield per metric ton of coal used is lower with state-of-the-art technology than for hydrogenation.

7. Yield:

   1.7 million metric tons of gasoline.





Key:

1. 5 million metric tons of coal . . .
   Hydrogenation

2. First step: Ground coal slurry reacts with hydrogen to coal oil at 300 atomospheres of high pressure

3. Second step: Coal is distilled to 1.7 million metric tons of middle oil, 700,000 metric tons of light oil and 500,000 metric tons of gas.

4. Third step: Subsequently, 1.9 million metric tons of gasoline are supposed to be produced by the next further refining.

5. Pro:

   --Purely by calculation, hydrogenation gives a higher oil yield per metric ton of coal used.

6. Con:

   --Hydrogenation requires high-grade brands of coal.
   --Large-scale commercialization is impossible before 1990.

7. Yield:

   1.9 million metric tons of gasoline.

Although the interested parties stress that they are leaving open both routes to the big coal refining deal, it nevertheless appears that the switches are set in the direction of hydrogenation; this is also apparent from a look at the North Rhine-Westphalia "Energy Technology Plan." In accordance with this plan, six different test installations for coal gasification are supposed to cost not more than DM 47.3 million up to 1983.

On the other hand, the construction and operation alone of a coal oil test installation at Bottrop, which liquifies 200 metric tons daily by means of a further-developed hydrogenation process from the time of World War II, will consume 6 times this amount of money, DM 286.2 million, up to 1983.

Hydrogenation technologists owe this preferential treatment to Horst-Ludwig Riemer (FDP), long-time economics minister of North Rhine-Westphalia. Until his fall in November, this liberal concerned about his popularity took advantage of the public's inaccurate memory of the Third Reich's 12 hydrogenation plants in which, during the war, production costs did not matter at all. In resumption of supposed great deeds of yesterday, Reimer promised his Ruhr-German fellow countrymen five hydrogenation plants, each of which was to produce gasoline from 6 million metric tons of coal. Yet this coal quintet costing DM 20 billion in investment would not even contribute 8 percent to the annual FRG oil demand.

However, since the high-grade coal found in the Ruhr district is particularly suited to hydrogenation, Riemer soon found an ally: Ruhrkohle chief Bund, who stimulates the Bottrop Test Plant with DM 280 million, the largest amount of money for research for a single project of the coal colossus. Veba AG [Corporation], the energy combine deeply rooted in the heating oil business and, what is more, the biggest shareholder in Ruhrkohle (capital share: 27 percent), joined up with this hydrogenation league, because in the long run it does not want to miss out on a deal with so-called coal heating oil.

The oil companies and a few automobile manufacturers indicated that they sympathized with the hydrogenators. Both industries were unable to get enthusiastic over coal gasification because up to now it suffers from a birth defect. Unlike hydrogenation, no gasoline is formed, but only the simple methanol, called methyl alcohol by the chemists.

To be sure, extensive test runs with Volkswagen motor cars have proved that 15 percent methanol can be mixed with motor fuel to economize on gasoline. Nevertheless, the oil industry resists installation of additional pumps expressly for methanol at their gasoline stations. The remaining automobile manufacturers saw problems because methanol attacks plastic parts, which are increasingly used in vehicles. To avoid this, the design of automobiles would have to be changed.

On the other hand, the chemical industry has maintained genteel neutrality on the "hydrogenation or gasification" question up to now. Nevertheless, BASF AG, for instance, is already experimenting with methanol, and Hoechst AG, through its subsidiary Uhde GmbH, wants to participate in the earnings of coal refining plants--whatever kind they may be. As a matter of fact, the managers of the chemical industry have only the one aid of always being able to obtain crude oil (BASF chief Dr Matthias Seefelder: "too valuable to burn") as a raw material for chemical products. Thus, Dr Rolf Sammet, chairman of Hoechst, cautioned: "To return again to coal as the raw material of the chemical industry would be an extraordinarily expensive, energy-intensive and for that reason uneconomical way."

For Economics Minister Riemer it was consequently easy to give precedence to hydrogenation, although a good number of critics of coal liquefaction also came forward. For instance, 74-year-old Dr Kurt Gruber, who was technical head of Mannesmann-Meer AG until 1971, still knows the hydrogenation plants of the Third Reich from his own experiences, because his company supplied the high-pressure compressors for that purpose. And Gruber cautions: "In hydrogenation to fuels the ratio of expense and effect is unjustifiably high."

Also, Dr Wilhelm Keim, director of the Institute for Applied Chemistry and Petroleum Chemistry at the Aachen School of Technology, predicts misdirected investments in the billions: "I am afraid we are going up a blind alley." Inasmuch as the Bottrop coal oil plant is intended to be the nucleus of a mammoth plant which will eventually cost DM 3.6 billion with an annual

throughput of 6 million tons of coal, Keim is afraid that the course of action decided upon would be irreversible even if it proved to be wrong: "Once amounts of this magnitude are paid out, this course will be pursued." Not last, even the Bonn Ministry of Research resists the .ired-up expectations for hydrogenation: "The impression occasionally produced that within a short time coal can be liquefied by means of the technology of World War II skirts reality."

Nevertheless, the prospect for politicians and entrepreneurs finding the way back to reality has grown since Riemer had to cede his position to his fellow party member Liselotte Funcke and since an American invention started attracting increased attention.

The American Mobil Oil multinational corporation developed a process which converts methanol directly into gasoline and thus invalidates all objections made to date by the motor fuel companies on account of the additional pumps and by the automobile manufactures on account of the expensive design changes in vehicles. It is therefore clear to Keim, the neutral Aachen energy professor, that coal gasification followed by the Mobil process is "the most elegant solution" for the production of coal gasoline.

Riemer's successor Funcke could even refer to a timely example if she wanted to switch from hydrogenation to gasification. For just now Bonn Research Minister Volker Hauff, the American energy administration (DOE) and the Mobil Research and Development Corporation in Paulsboro, New Jersey, have signed a 5-year contract for the construction of a pilot plant to produce gasoline by the Mobil process. Bonn bears one third of the costs: DM 20 million. So far, in Mobil's Building 19 in Paulsboro there is only a laboratory-scale plant which produces daily 238.5 liters of gasoline, 397.5 liters of water and some residual gas from four barrels (636 liters) of methanol. Mobil's reforming tool is a catalyst with the secretive standard designation ZSM-5, a light-colored mineral with the chemical designation aluminum silicate.

This could be the crucial step in the economical production of gasoline from coal. For there should be no lack of the intermediate product methanol (from coal), as stated by Heinz Hiller, general manager of the Lurgi Company in Frankfurt: "Methanol can be produced commercially with high efficiency from coal by way of the intermediate operations of coal gasification and gas purification." Today 16 Lurgi pressure gasifiers are already in operation all over the world. An additional 77 installations are in the erection or planning stage. The Bonn Ministry of Research likewise judges: "Methanol synthesis has no technical problems."

However, the hydrogenation fans are far from throwing in the towel. Their technology, they say, promises a higher yield. Scale-up calculations by the Ministry of Research for a large-scale hydrogenation plant--which will be ready for operation only in 1990--give an expected oil yield of 60 percent of the coal used, which will consequently be higher than for a coal gasification plant (45 percent). But this gas production from coal is already in large-scale commercial operation.

Moreover, for gasification, inferior and consequently inexpensive coal supplies are adequate, while expensive special coal is required for hydrogenation. The low-cost Rhenish brown coal may soon be able to give an advantage pricewise to the methanol-gasoline plan making use of the Mobil sleight of hand. At present too, the development work of Rheinische Braunkohlenwerke AG [Rhenish Brown Coal Works, Inc.] Cologne, a subsidiary of RWE [Rhenish Westphalian Electricity Works, Inc.], is already aimed at gasification of brown coal.

Rheinbraun head Peter Speich hopes for "availability and testing of prototype plants on an industrial scale as soon as possible." In the mid-eighties such an energy plant is to produce a billion cubic meters of gas from brown coal annually. Pumped by pipeline to Union Rheinische Braunkohlen Kraftstoff AG (UK) [Union of Rhenish Brown Coal Works and of Fuels, Inc.] (a subsidiary of Rheinbraun-Mineraloel [Rhenish Brown Coal-Crude Oil]), in Wesseling, the gas would there be converted to methanol and next further processed by the Mobil process to gasoline.

The Lurgi plant constructors have already made a firm alliance with Mobil, according to Hiller, who says: "Lurgi is working on a combination of the Mobil Oil process with the Lurgi methanol process for optimum production of gasoline from coal by way of methanol." Hiller is firmly convinced that: "For the production of standard gasoline, this process has a genuine competitive advantage over the coal liquefaction processes."

In any event, Hiller and his assistants hope that Research Minister Hauff will be able for the time being to avoid the urgency decreed by the chancellor and delay his decision until spring on which direction to take. Hiller's manager colleague Dr Otto Garkisch promises in any case: "Within 3 months we can offer the optimum."

5586
CSO: 3102

FRANCE

DRAFT RESEARCH BUDGET FOR 1980

Paris LE PROGRES SCIENTIFIQUE in French Sep-Oct 79 pp 23-31, 41-45

[Excerpts] General Presentation

The appropriations proposed for the research package in the draft budget for 1980 are as follows:

--creation of 709 positions, including 374 researcher positions;
--Fr 8,513 million for established operating measures;
--Fr 984.496 million for new operating measures;
--Fr 6,644.241 million in program authorizations;
--Fr 6,286.984 million in payment credits.

In addition, prosecution of the policy to integrate within the normal framework of the organisms those personnel not coming under the normal regulations is leading to the creation of a final block of 597 supplementary positions, the financing of which is covered by the credits previously used to pay these personnel.

Thus it is proposed to create a total of 1,306 new positions in 1980 in the research package.

Budget Preparation Conditions

The purpose of the procedure for interministerial coordination of the research package is to propose, through the diversity of the organisms and disciplines, a coherent scientific policy expressed in objective terms and in terms of programs, making it possible in particular to make the necessary budget choices with maximum clarity.

In order to improve this horizontal approach characteristic of interministerial coordination, the secretary of state for research has asked the Advisory Committee for Scientific and Technical Research (CCRST) and the General Delegation for Scientific and Technical Research (DGRST) to make, before starting on the budget procedure, two complementary studies: one to evaluate the state of the French sciences and technologies, and the other on choices of scientific policies for 1980.

The work on the state of French science and technology is the subject of a report which has been published and which constitutes a first step toward the maintenance of a permanent review of French research. This evaluation effort will be amplified and systematized in future in order to strengthen the foundations of national scientific policy.

As regards the work on the choices of scientific policy for 1980, their purpose is to propose options for 1980 on the basis of the results of the evaluation work and taking into account the present research situation and the programs and operations in progress. Thus, even though these choices fall into a longer perspective, they cannot be confused with planning work.

The analysis carried out in terms of programs has been based on 10 objectives that seemed to correspond best with the major present areas of concern. These objectives are the following:

Space

This objective corresponds to that part of the research-package credits earmarked for carrying out the French space program and allocated to the National Center for Space Studies (CNES).

Ocean

This objective encompasses all research relating to the ocean, on both the fundamental level and the level of applications (fishing, aquaculture, mineral resources, environment, pollution, technology).

Energy and Raw Materials

As regards energy, this objective covers all the programs related to the production, transport and storage of energy--both nuclear and other energy sources--and to energy-saving. In the area of raw materials, it concerns the research programs related to the prospecting, evaluation and mining of deposits, treatment of ores, water resources, rational utilization of raw materials, and recycling.

Industrial Research

This objective covers, on the one hand, the research in the field of data-processing, including the electronic components, and on the other hand, the research in the area of mechanics and the transformation industries.

It does not, however, involve the credits related to the data-processing industries and applications (chapter 66-05 of the budget for industry), although these credits are accounted for in the research package.

Life Sciences

This objective encompasses all research on living beings aimed at increasing basic knowledge of these systems (fundamental biology), applying the

results obtained to fundamental human problems (biology applied to medicine and agronomy), and finally, developing a technology by and for the living human (biotechnologies, agricultural and alimentary industries, biological and medical engineering, pharmacology, industrial and agricultural microbiology).

Environment and Management of Space

This objective covers the programs related to knowledge and evaluation of pollution as well as to abating nuisances after the fact, meteorology, natural hazards, and management of space (building and construction, infrastructures, and transportation systems).

International Cooperation

This involves all research conducted in cooperation with the developing countries and the research carried on in international cooperation with the developed countries.

Social and Human Sciences

This secotr covers all fundamental or purpose-directed research in the social and human sciences: work-training-employment, French and international population, knowledge and preservation of the cultural patrimony, city planning and transportation, violence-criminology-delinquency, the socioeconomics of health, agricultural production and the rural world, analysis of monetary and financial phenomena, economy of foreign countries and international economic relations, analysis of private firms and of industrial sectors.

Basic Physical Sciences

This objective covers all research in the fields of physics (nuclear and particle physics, physics [as published]), chemistry (research not aimed at other objectives), knowledge of space (stellar universe, sun, solar system), the earth sciences (deep zones of the planet), and mathematics.

Others

This heading covers certain general research means difficult to assign to a particular objective (computer facilities of the universities, scientific and technical information), and the nonprogram facilities of the Atomic Energy Commission.

The draft budget was prepared on the basis of these objective.

Appropriation Modifications

In order to make the credit appropriation within the research package more stringent and to take certain evolutions into account, modifications have been made in the credit appropriations in the draft budget for 1980. Thus,

for the Atomic Energy Commission and the National Center for Space Studies, only the credits corresponding to personnel expenditures are now entered under Title III, as was already the case for the public establishments as a whole that figure in the research package.

Likewise, the operating credits as such for the Data-Processing Technical Center attached to the Data-Processing and Automation Research Institute, previously enetered under Title III, will henceforth be entered as program support under Title VI.

As regards the subsidy granted to the Pasteur Institutes (Paris and overseas), the proportion of personnel expenses that it covers, appropriated until 1979 as program support under Title VI, will be entered in 1980 in a chapter of Title IV. With regard to the universities, the conference credits, which in 1977 had been transferred from chapter 36-15 to chapter 66-71, will again be assigned to chapter 36-15 as of 1980.

Finally, the data-processing expenditures of the universities, previously entered entirely in Title VI, will in 1980 be entered in Title III when they involve lease credits and in Title V in the other cases. Likewise, the data-processing expenditures of the national meteorological service will henceforth be assigned to a chapter of Title III.

As for the budgets for the environment and for living conditions and transportation, the credits allocated to research activites have in each case been grouped in two chapters.

Regarding the budget for culture and communication, a modification of the contours of the research package has been proposed so as to include in the package the technical personnel in excavation who, like the curators, carry on research activity full-time. This measure results in the inclusion in the research package of 41 new job positions, the financing of which is covered by credits from outside the research package. In the other hand, two positions involving nonresearch activities have been removed from the research package. A total of 39 supplementary positions have been added to the research package.

The Broad Outlines of the Draft Budget

Changes by Sector

The evolution of the research-package program authorizations from 1979 to 1980 is as shown in the table on the following page.

The changes that appear in the table have to be corrected as regards space and the other programs. As regards space, in addition to the increase evident from comparison of the 1979 and 1980 program-authorization allocations, there is a further increase from amendment of the budget allocations for the CNES. The allocation provided for in 1980 actually corresponds to application of the decisions taken in 1977 and 1978 regarding the establishment of

	1979 (millions of francs)	1980 (millions of francs)[2]	Change (%)
Space	991.1	1,164.0	17.4
Ocean	206.5	231.2	12.0
Energy and Raw Materials	838.6	980.6	16.9
Energy	(788.8)	(926.5)	(17.5)
Raw Materials	(49.8)	(54.1)	(8.6)
Industrial Research	851.4	933.6	9.6
Basic Physical Sciences	750.4	819.0	9.1
Life Sciences	831.1[1]	932.0	12.1
Social and Human Sciences	199.0	215.9	8.5
Environment and Management of Space	254.1	263.2	3.6
International Cooperation	128.1	150.6	17.6
Others	494.0	581.3	17.7
	5,544.3	6,271.4	13.1

1. In anticipation of the reform of personnel-credits appropriation for the Pasteur Institutes of Paris and overseas.
2. Before deduction for integration of personnel in the data-processing industries and applications (Computer Plan) who are not covered by the normal regulations and not covered by credits.

a ceiling for space-program expenditures. As regards the other programs, the evolution relates essentially to the increase in the CEA [Atomic Energy Commission] tax burden.

In these conditions, the priorities of the draft research-package budget for 1980 are for the research in the areas of energy, the life sciences, international cooperation, and the ocean.

Within each objective, a number of priority orientations have been defined.

Space

Within the framework of execution of the space program, a special effort will be made in 1980 in favor of research and development programs, development of the satellite network, and improvements of the "Ariane" launcher. In addition, an allocation is provided for financing the CNES's participation in the venture capital of a company to produce and market "Ariane" launchers.

Ocean

The 1980 draft budget provides an increase in the credits for exploitation of the sea facilities managed by the CNEXO [National Center for Exploitation

of the Oceans]. There will be a distinct priority in favor of research concerning exploitation of living matter and research relative to the marine environment.

Teh allocation planned for the CNEXO, which falls entirely under this objective, is to permit completion of the Mediterranean operational base and continued construction of the craft that can submerge to 6,000 meters (CYANA [expansion unknown]).

As regards the ISTPM [Scientific and Technical Institute for Ocean Fishing], the credits proposed for 1980 should make it possible to build a new laboratory at Arcachon.

A special effort is also planned as regards the universities and the CNRS [National Center for Scientific Research].

Energy and Raw Materials

Important priority is assigned to energy in the draft budget for 1980.

As regards nuclear energy, emphasis will be placed on the programs aimed at ensuring national autonomy in the area of light-water reactors, as well as on research linked to the breeder reactors (technology and reprocessing) and mastery of the nuclear-materials cycle (enrichment and reprocessing).

In addition, a special effort will made for the safety of the nuclear installations of the nuclear-materials cycle, transportation, and wastes.

As regards the other energy sources, the rapid increase in the means being devoted to solar energy will be maintained, making possible, in addition to the solar thermodynamics program, the development of programs related to biomasses, photovoltaic energy, and residential use of solar energy.

The program authorizations for the COMES [expansion unknown] will grow by 18.8 percent in 1980 over 1979.

The research programs on energy-saving will also receive favored treatment in 1980 within the field of the industrial, transport and construction sectors as a whole.

On the subject of raw materials, the effort will bear mainly on the prospecting of deposits (geology and study of the characteristics of deposits, geophysical prospecting) and will be carried out essentially by the BRGM [Bureau of Geological and Mining Exploration].

Industrial Research

In this area, the draft budget for 1980 is aimed at ensuring a balance between the development of research on the applications of data-processing and automation and the development of research in the other industrial sectors,

mainly those which should make it possible to accompany the diffusion of data-processing applications in these sectors [as published].

The effort started in 1979, by redeployment, in favor of research on the applications of data-processing will be continued in 1980.

In the other sectors, a new procedure for aid to innovation will be implemented, replacing all aid to development and aid to predevelopment. It will be managed by the ANVAR [National Agency for Exploitation of Research], which will also be responsible for distributing the innovation bonuses.

As regards the different sectorial programs of aid to research, the programs for industrialization of building (construction plan) and for innovation in transport will receive special support.

Finally, with regard to exploitation of the results of research, greater responsibility in this area will be given to the big organisms (CNRS, INRA [National Institute of Agronomic Research], INSERM [National Institute of Health and Medical Research]), which have received supplementary allocations for this purpose. If they so desire, these organisms will be able to sign agreements with the ANVAR for this purpose.

Basic Physical Sciences

The credits planned for 1980 under the heading of the basic physical sciences, for the CNRS, the CEA and the research mission of the Ministry for Universities, are to make it possible to begin improving the facilities of the laboratories.

The allocations planned for the CEA and the CNRS are to permit continuation of the building of the National Large Heavy-Ion Accelerator (GANIL) and completion of the "Orphee" reactor.

In addition, it will be possible for the CNRS to start the building of the Institute of Millimetric Radio Astronomy.

Finally, the equipping of the hydrodynamics and physical mechanics laboratory of the Higher School of Physics and Industrial Chemistry of the City of Paris will be started.

Life Sciences

In the life-sciences sector, special priority will be assigned to fundamental biology, in which the main lines of development are cellular and molecular biology, the biology of intercellular formation, the biology of reproduction and development, and the interactions between living organisms and their environment. This effort will be especially marked at the Pasteur Institute of Paris and at the CNRS.

In medical research, in which the allocations for the INSERM will rise by 14.7 percent in 1980, development of the big health programs will be continued (malignant tumors, cardiovascular afflictions, care of mother and child) and accentuated in the field of mental health.

Clinical investigation and research in public health will also be favored.

In the field of agronomy, in addition to development of the programs in fundamental biology, the research in bioclimatology, mastery of genetic diversity, and soil cartography will be given special emphasis. The allocations for the INRA will go up by 15.4 percent in 1980.

Lastly, as regards the biotechnologies, the research in the pharmaceutical field, biological and medical engineering, and the agricultural and food industries will be sustained. The effort in the area of genetic engineering (Pasteur Institute, CNRS, INRA, INSERM) will be increased. Special attention will be given to the techniques for exploiting the nation's resources of wood and cellulosic substances.

Social and Human Sciences

Contract policy as a whole in the social-sciences sector was subjected, at the beginning of 1979, to a reexamination aimed at defining new utilization of the stimulative resources so as to ensure better distribution of the available means in multiyear programs assigned to the most dynamic teams. In this new framework, an essential role will be played by the research fund of the DGRST.

In addition, a significant effort in the area of knowledge and conservation of the patrimony is planned (Ministry of Culture and Communication).

Environment and Management of Space

For this objective, whose programs concern essentially the organisms and procedures coming under the Ministry of the Environment and Living Conditions and the Ministry of Transport, the draft budget for 1980 provides for only a limited and selective increase for several programs (building and construction, transportation systems), reflecting the fact that this sector is presently being reorganized.

International Cooperation

As regards research being conducted in cooperation with the developing countries, the priorities of the 1980 draft budget are for animal production, management of natural environments, medical research (communicable diseases and nutrition), and technical research.

In addition, the training effort started in the past will be continued.

Finally, the creation of a reception position in ORSTOM [Bureau of Overseas Scientific and Technical Research] and in the GERDAT [expansion unknown] will make it possible to organize better participation of the big organisms of metropolitan France in the cooperation programs.

A special effort will be made in 1980 to favor the development of scientific and technical cooperation with our principal partners. To this end, a program contract will be made between the Ministry of Foreign Affairs and the DGRST.

Others

This heading covers mainly the general infrastructure equipment for research. The 1980 draft budget provides for a significant increase in the means devoted to scientific and technical information, the programs for which that are of an interministerial nature will be sparked by an interministerial mission attached to the secretary of state for research.

Operating Credits

The new operating measures that correspond to the credits in Titles III and IV of the State Budget come to a total of Fr 984.496 million, which breaks down as follows:

--Fr 871.895 million for adjustment of remuneration credits. This credit takes into account the transfer to a chapter of Title IV of the remuneration credits included in the state subsidy to the Pasteur Institute of Paris and to the overseas Pasteur Institutes (Fr 44.554 million), which up to 1979 were attributed to the Title VI subsidy granted to these organisms;

--Fr 16.700 million in credits for scholarships and conferences, including Fr 10.300 million for research allocations;

--Fr 84.656 million for creating 670 new positions, including 374 researcher positions, which represents a research-position creation rate of 2.7 percent, and 296 technical and administrative engineer positions, representing a 1.1-percent increase in personnel.

While the 1980 draft budget maintains a normal rate of creation of research positions, it also represents a special effort at achieving better balance between creation of researcher positions and creation of ITA [expansion unknown] positions.

In addition to these positions created, there are 39 positions in the culture and communication budget that correspond to a modification of the contours of the research package for this ministry. These positions are being financed (Fr 3.898 million) through an internal transfer in the ministry involving nonresearch credits, and this financing is included in the credit mentioned under the heading of modifications of budget allocations:

--Fr 46.362 million from transfers of Titles V and VI credits corresponding to the creation of 597 committed positions so as to permit integration of personnel not covered by the normal regulations within the normal frameworks of the research-package organisms;

--Fr 8.775 million that makes it possible to carry out position transformations in the CNRS, in the universities, in ORSTOM and in the INED [National Institute of Demographic Studies] so as to permit a more regular career for established research personnel, both researchers and technicians;

--Fr 34.0 million to cover the international commitments involving the French contributions to international research organisms.

The breakdown of position creation and new operating measures is recapitulated in Tables I and II, appended.

The allocations planned for priority action program No 25, "strengthening the country's scientific potential," involve Fr 239.719 million for new operating measures and the creation of 406 positions (208 researchers and 198 ITA).

Certain of the measures related to status of personnel correspond to implementation of the orientations adopted by the government in the area of scientific and technical employment.

In this field, the government has started to work out an overall plan the first measures of which will be applied in 1980.

The reforms envisioned follow from the report on scientific employment made by Mr Massenet and concentrating on research personnel. The main orientations of these reforms are as follows:

--restoring and drawing the benefits from the notion of a probationary period upon entry into the research organisms by lowering the age limit for entry into these organisms to 27 (with various exceptions) and limiting the duration of this probationary period to 4 years;

--modifying the recruitment procedure in the direction of greater clarity and greater selectivity. In this regard, it is planned to dissociate judgment about the candidate from judgment about the laboratory. The probationary period would be done in a laboratory designated as a "training laboratory," and the research would then be assigned, subject to special exception, to another laboratory designated as a "recruiting laboratory";

--amendment of the rules relative to promotion of researchers with a view to enhancing their mobility and their availability;

--creation or restoration of procedures aimed at breaking down partitions in researchers' careers: for example, restoration of the reciprocal-assignments procedure, development of reception positions, and possibilities for mobility toward the private-firms sector.

Program Authorizations and Payment Credits

The research-package program authorizations for the 1980 draft budget total Fr 6,644.241 million: that is, Fr 6,225.599 million for the research package strictly speaking, and Fr 418.642 million for the data-processing industries and applications (chapter 66-05 of the budget for industry), accounted for within the research package but not subjected, for preparation of the 1980 draft budget, to the interministerial coordination procedure.

The program authorizations of the research package increase by 10.5 percent in 1980 over 1979, and the authorizations for the research package in the strict sense rise by 11.5 percent.

The breakdown of the program authorizations is recapitulated in Table III, appended.

The analysis and evolution of these allocations by type of expenditure are given in the following table:

(in millions of francs)

	1979	1980
CEA	1,400	1,642.8
Research	(1,109.4)	(1,262.8)
Nonprogram expenditures	(290.6)	(380.0)
CNES	991.1	1,157.7
Other organisms	3,193.1	3,425.1
Program support	(1,250.4)	(1,358.5)
Contracts	(1,328.3)	(1,417.7)
Computing equipment and facilities	(526.4)	(560.5)
Real-estate operations	(88.0)	(88.4)
Total	5,584.2	6,225.6
Data-processing industries and applications	430.7	418.6
Grand Total	6,014.9	6,644.2

As regards the Atomic Energy Commission and the National Center for Space Studies, the evolution of the credits allocated to them takes into account, in addition to the financing of the programs that they carry on, the budget-attribution modifications to which these credits relate.

Because of this, the allocations planned for 1980 are not strictly comparable to those for 1979.

As regards the other research-package organisms, the 1980 draft budget provides for an increase faster than average credit growth for the credits to the support programs, which ensure the day-to-day functioning of the laboratories.

As for the equipment credits, they will increase at the average growth rate for the credits as a whole.

On the other hand, the computer-facilities credits written into the program authorizations are decreasing relatively, because of the modificati n of the budgetary attributions to the budgets for the universities and for transport.

Real-estate operati ns are kept at the same level as in 1979, while at the same time making it possible to carry out several new operations, particularly in the CNRS, the INRA and the CNEXO.

The credits assigned to priority action program No 25, "strengthening the country's scientific potential," come to Fr 1,559.9 million in 1980 as against Fr 1,392.6 million in 1979--an increase of 12 percent.

The Titles V and VI payment-credits allocation for 1980 comes to Fr 6,286.984 million--that is, Fr 5,983.342 million for the research package in the strict sense and Fr 303.642 million for the data-processing industries and applications.

Siting of Research Activities

The policy on siting of research activities, aimed at better distribution of the activities throughout the country, remains one of the priorities of national research policy. This policy, striving to promote a better balance among the various regions, has the purpose of strengthening the general level of French research.

Two types of action are carried on for this purpose:

--action of an incentive type is aimed at the teams in the Paris region, which are decentralizing toward the regional research centers. This action, conducted in association with the DATAR [Delegation for Territorial Development and Regional Action], has been carried on for several years already. Exceptional localization credits are granted to certain of these teams from a joint DGRST-DATAR fund. They are used to defray some of the temporary additional cost of a decentralization;

--more specific and more direct action is taken to the benefit of teams located in the various regions. On the basis of regional-initiative projects which comply with the orientations of national research policy, operations cofinanced by the research fund and the regional public establishments are thus undertaken that permit concerted development of the research potential in the regions. In like manner, the secretary of state for research has

since 1977 participated, within the framework of interministerial committees for territorial development, in activities that bring other ministries into association, in the area of industrial research and technology. All of these activities are financed from a reserve included in the research fund especially for this purpose.

In order to ensure better coordination of these various initiatives and strengthen concertation, the secretary of state for research is preparing to attach to each of the regional prefects a mission official responsible for the research problems, in conformity with the decisions made on the occasion of the central planning council meeting of 2 April 1979 on territorial development.

APPENDIX

Table I--Program Authorizations (Equipment Credits)

(millions of francs)

Ministries and Organisms	Program Authorizations 1979 (1)	Program Authorizations 1980	Rate of Change (%)
Secretariat of State for Research	415.515	436.241	
DGRST			
--Research Fund	370.015	436.241 (4)	17.9
--Aid to development	45.500	(2)	
Industry	3,112.701	3,602.330	15.7
--CEA	1,400.000	1,642.834	17.3
Research	(1,109.400)	(1,262.834)	(13.8)
Nonprogram	(290.600)	(380.000)	(30.8)
--CNES	991.067	1,157.680	16.8
--CNEXO	149.368	164.983	10.5
--IRIA [expansion unknown]	35.099	39.187	11.6
--School of Mines	6.200	5.900	- 4.8
--IRCHA [National Institute for Applied Chemical Research]	8.650	8.650	--
--BRGM	26.660	30.660	15.0
--COMES	63.266	75.170	18.8
--Chapter 56-00	6.202	5.352	- 13.7
--Chapter 66-01 including ANVAR	426.189	471.914	10.7
Article 51	--	401.700	
Article 52	--	15.000	
Cooperation	77.690	86.690	11.6
--ORSTOM	36.090	40.790	13.0
--GERDAT [expansion unknown]	41.600	45.900	10.3

Ministries and Organisms	Program Authorizations 1979 (1)	Program Authorizations 1980	Rate of Change (%)
Agriculture	166.896	189.713	13.7
--INRA	147.896	170.713	15.4
--CNEEMA [National Center for Studies and Experimentation on Agricultural Mechanization]	3.680	3.680	--
--ACTA [Association for Agricultural Technical Coordination]	5.320	5.320	--
--IAA [expansion unknown]	10.000	10.000	--
Environment and Living Conditions	83.334	82.673	- 0.8
--CSTB [Scientific and Technical Center for Building]	13.380	16.380	22.4
--LCPC [Main Highway Department Laboratory]	13.890	10.890	- 21.6
--Programmed activities	56.064	55.403	- 1.2
Transport	191.565	186.078	- 2.9
--ISTPM	7.900	8.600	8.9
--IRT [Transportation Research Institute]	27.672	27.170	- 1.8
--DM [expansion unknown]	22.330	20.530	- 8.1
--Meteorology	133.663	129.778	- 2.9
Health and Social Security	276.531	278.880	
--INSERM	204.689	234.690	14.7
--SCPRI [expansion unknown]	6.485	6.480	--
--Pasteur Institute of Paris	59.177	29.750 (3)	--
--Pasteur Institute of Lille	2.010	4.010	99.5
--Overseas Pasteur Institute	3.210	2.490 (3)	
--Curie Institute	0.960	1.460	52.1
Universities	1,203.728	1,308.919	8.7
--CNRS	796.510	874.199	9.8
--Research Mission	407.218	434.720	6.8
Culture and Communication	18.286	19.373	5.9
Other Ministries	37.922	34.702	- 8.5
--DOM-TOM [Overseas Departments and Territories]	17.700	17.700	--
--Interior	4.347	2.800	--
--Justice	2.219	--	--
--Labor	5.975	6.898	15.5
--Plan	7.681	7.304	- 4.9
Total for research package	5,584.168	6,225.599	11.5

Ministries and Organisms	Program Authorizations 1979 (1)	Program Authorizations 1980	Rate of Change (%)
Data-processing Industries and Applications	430.739	418.642	
Grand Total	6,014.907	6,644.241	10.5

1. Initial Finance Act.
2. Credits transferred to Ministry of Industry.
3. After transfer to Title IV of Fr 39.852 million for the Pasteur Institutes of Paris and Overseas (Fr 37.62 million and Fr 2.225 million, respectively.
4. Taking into account the amendment of the tax system of aid to the private sector.

Table II--Credits (Program Authorization + Operating Expenses) for the Research Package (total credits)

(millions of francs)

Ministries and Organisms	Program Authorizations + Operating Expenses 1979	Program Authorizations + Operating Expenses 1980	Rate of Change (%)
Secretariat of State for Research	529.258	603.287	
--DGRST	153.743	167.046	8.7
--Research Fund	370.015	436.241	17.9
--Aid to Development	45.500	(1)	
Industry	5,690.277	6,390.172	12.3
--CEA	3,532.600	3,952.834	11.9
--CNES	1,207.067	1,369.380	13.4
--CNEXO	211.299	239.190	13.2
--IRIA	96.045	110.945	15.5
--COMES	67.266	81.375	21.0
--Others	576.000	636.448	10.5
Foreign Affairs	394.908	429.858	8.9
Cooperation	438.749	498.112	13.5
--ORSTOM	274.367	314.376	14.6
--GERDAT	164.382	183.736	11.8

Ministries and Organisms	Program Authorizations + Operating Expenses 1979	Program Authorizations + Operating Expenses 1980	Rate of Change (%)
Agriculture	824.640	947.446	14.9
--INRA	783.523	904.044	15.4
--CNEEMA and research bonus	21.977	23.743	8.0
--ACTA	9.140	9.659	5.7
--IAA	10.000	10.000	--
Environment and Living Conditions	176.205	187.503	6.4
--LCPC	47.653	47.895	0.5
--CSTB	48.169	57.092	18.5
--Programmed activities	80.383	81.516	1.4
Transport	276.552	281.345	1.7
--ISTPM	38.908	43.702	12.3
--IRT	52.098	54.749	5.1
--DM	50.837	51.771	1.8
--Others	134.709	131.123	- 2.7
Health and Social Security	636.913	741.705	16.5
--INSERM	546.232	631.886	15.7
--SCPRI	19.768	21.328	7.9
--Pasteur Institute of Paris	59.177	71.816	21.4
--Pasteur Institute of Lille	2.01	4.01	99.5
--Overseas Pasteur Institute	3.21	4.978	55.1
--Curie Institute	6.516	7.687	18.0
Universities	3,700.609	4,245.761	14.7
--CNRS	3,229.013	3,729.802	15.5
--Research Mission	471.596	515.959	9.4
Culture and Communication	45.958	55.961	21.8
Other Ministries	81.115	81.994	1.1
--Trade and Crafts	1.349	1.349	
--DOM-TOM	29.926	29.770	- 0.5
--Interior	4.644	3.097	
--Justice	10.188	9.087	
--Labor and Participation	25.602	29.566	15.5
--Plan	9.404	9.123	- 3.0
TOTAL for Research Package	12,835.184	14,463.144	12.7
Data-Processing Industries and Applications	430.739	425.122	
GRAND TOTAL	13,265.923	14,888.266	12.2

Table III--Research Package: Personnel Strength, 1979; Creation of Positions, 1980

Ministries and Organisms	1979 Personnel Strength Researchers	ITA	Total	1980 Creation of Positions Researchers	ITA	Total	Rate of Change (%) Researchers	ITA	Total
I. Positions Specified in the Budgets									
Secretariat of State for Research									
DGRST	--	185	185		13	13	--	70	70
Industry									
CNES	273	792	1,065	--	--	--	--	--	--
CNEXO	96	328	424	3	10	13	3.1	3.0	3.1
IRIA	200	225	425	5	2	7	2.5	0.9	1.6
School of Mines	117	136	253	4	2	6	3.4	1.5	2.4
BNM [Bureau of Mechanics Standardization]	--	10	10				--	--	--
BNIST [National Bureau of Scientific and Technical Information]	--	6	6		- 2	- 2			
Central Administration	--	3	3						
COMES	--	30	30		12	12		40.0	40.0
Cooperation									
ORSTOM	614	666	1,280	15 (1)	2	17	2.4	0.3	1.3
(including GERDAT)	(14)	(3)	(17)	(7)	--	(7)			
Agriculture									
INRA	1,171	5,845	7,016	35 (2)	90	125	3.0	1.5	1.8
(including GERDAT)	(19)	(10)	(29)						
CNEEMA	38	114	152	--	--	--			
Environment and Living Conditions									
Environment	9	21	30	--	--	--			
Living Conditions	15	34	49	--	--	--			

Ministries and Organisms	1979 Personnel Strength Researchers	ITA	Total	1980 Creation of Positions Researchers	ITA	Total	Rate of Change (%) Researchers	ITA	Total
Transport									
Meteorology	118	107	225	2	2	4	1.7	1.9	1.8
ISTPM	117	154	271	--	2	2		1.3	0.7
DFCEN [expansion unknown]	--	2	2						
Health and Social Security									
INSERM	1,328	2,148	3,476	55 (3)	30	85	4.1	1.4	2.4
SCPRI	--	127	127	--	--	--			
Universities									
CNRS	8,297	13,856	22,153	239 (4)	104	343	2.9	0.8	1.5
Research Mission	4	581	585	4	10	14		1.7	2.4
Culture and Communication	128	93	221	6	45 (5)		51	4.7	
Labor and Participation									
INED	42	88	130	2	2	4	4.8	2.3	3.1
EEC	23	26	49	--	2	2		7.7	4.1
Commission for the Plan	--	7	7	--	--				
Justice	11	64	75	--	2	2		3.1	2.7
Total I	12,601	25,648	38,249	370	328	698	2.9	1.3	1.8
II. Nonbudgetary Positions									
Industry									
BRGM	170	173	343	--	--	--			
IRCHA	35	89	124	--	--	--			
Cooperation									
GERDAT	447	466	913	--	--	--			
Agriculture									
ACTA	23	22	45	--	--	--			
Environment and Living Conditions									
LCPC	106	241	347	2	4	6	1.9	1.7	1.7
CSTB	99	162	261	2	3	5	2.0	1.9	1.9

Ministries and Organisms	1979 Personnel Strength			1980 Creation of Positions			Rate of Change (%)		
	Researchers	ITA	Total	Researchers	ITA	Total	Researchers	ITA	Total
Transport									
IRT	100	96	196						
DOM-TOM									
TAAF [French Austral and Antarctic Lands]	40	47	87						
Total II	1,020	1,296	2,316	4	7	11	0.4	0.5	0.5
Total	13,621	26,944	40,565	374	335	709	2.7	1.2	1.7
CEA	2,978	6,771	9,749						
Grand Total	16,599	33,715	50,314						

1. Including 10 reception positions.
2. Including 5 reception positions.
3. Including 10 reception positions.
4. Including 25 reception positions.
5. Of these, 39 are positions now included in the research package and previously financed outside the package.

END

11267
CSO: 3102