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Science and Technology Perspectives

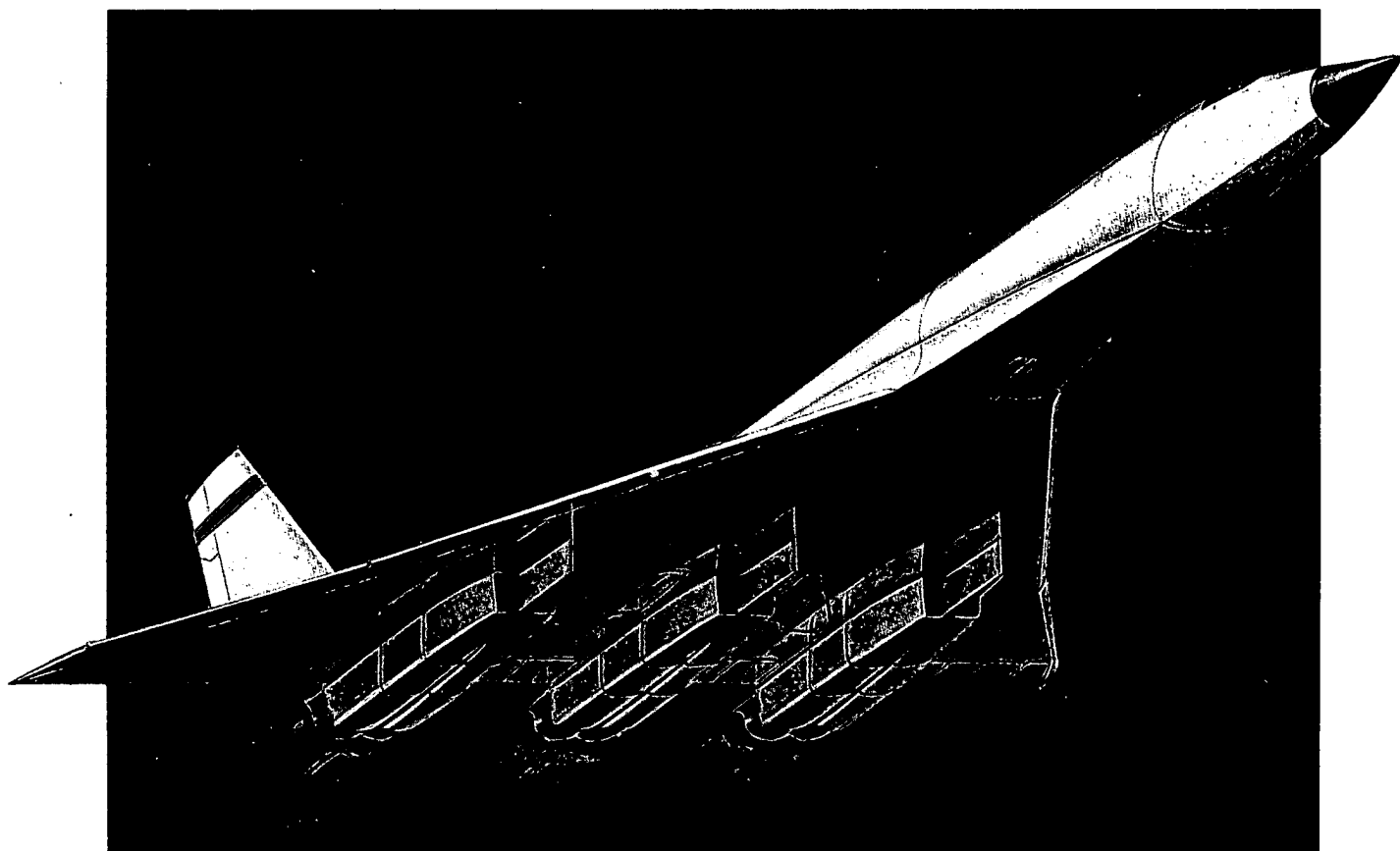
DEVELOPMENTS

Joint Venture

(FRG/Thailand) In an effort to acquire FRG technologies, the Thai Government will propose in October some 20 areas for possible joint ventures, including petrochemical, biochemical, pharmaceutical, plastics, and printed circuit production. Further information on the Thai proposals can be obtained from the DEG (German Development Association) in Koln, Tel. 0221-4986405. (Duesseldorf HANDELSBLATT 15 Jun 87) Elli M. X2519

..... Continued on Page 1

FEATURED IN THIS ISSUE: Aerospace Technology Contents Inside Cover



Designed for hypersonic transport, the French AGV (shown above) will also serve as a technology demonstrator for the STS 2000 orbital aircraft. (See Feature Article.)

FRANCE: Hypersonic, Orbital Aircraft Page 4

Three major French aerospace firms are jointly developing a hypersonic transport and an orbital aircraft whose advanced aerodynamic designs feature leading-edge engine technology.

USSR: New Booster Key to Space Transport System Page 7

Reportedly equipped with the world's most powerful rocket engines, the new Energiya booster, which was test launched in mid-May, has been designed as an integral part of the Soviet space transport program.

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PERSPECTIVES selections are based solely on foreign press, books and journals, or radio and television broadcasts. Some of the materials used in this publication will appear as abstracts or translations in FBIS serial reports. Comments and queries regarding this publication may be directed to the Managing Editor (Craig M. [redacted]) or to individuals at the numbers listed with items.

STAT

FOR OFFICIAL USE ONLY**DEVELOPMENTS**

DEVELOPMENTS highlights worldwide S&T events reported in the foreign media. Items followed by an asterisk will be published by FBIS. The contributor's name and telephone number are provided.

- Aerospace** (FRG/Italy) Microgravity experiments in combustion technology, materials research, and biotechnology will be conducted at the FRG's first free-fall tower (138 meters high and 8.5 meters in diameter) at the University of Bremen's Center for Applied Aerospace Technology and Microgravity Research. In addition, FRG and Italian researchers are jointly designing an unmanned spacecraft to be used in microgravity experiments. The vehicle reportedly will be launched from a platform off the coast of Kenya. The vehicle's reentry capsule, designated TOPAS, has a 240 kilogram payload capacity. A second capsule is also being built. (Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG 3 Jun 87) Elli M. X2519
- (South Korea/West Europe) South Korea's Ministry of Science and Technology will spearhead a project to develop a domestic launch capability for telecommunications and scientific satellites weighing up to a half ton. Although no decision has been made on the launch pad location, work will soon begin on a ground station scheduled for completion in 1991. South Korea's first satellite, which will be a 50-50 collaboration with as yet unidentified West European research institutes, is slated for launch in 1996. (Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT 27 May 87) Elli M. X2519
- Ceramic Engine** (Japan) The Ministry of International Trade and Industry (MITI) has launched an eight-year joint R&D project with Toyota, Nissan, and Mitsubishi to develop a ceramic gas-turbine engine. The engine's combustion chamber and turbine will be made of a heat-resistant ceramic (not further identified). Prototypes of a 2,000cc sedan and a 6,000cc truck engine will be tested at combustion temperatures of 1,350°C in an effort to obtain a 40 percent increase in fuel efficiency. Anticipating 20 billion yen in development costs, MITI will request that the Finance Ministry include the expenditure in the 1988 national budget. (Tokyo NIHON KEIZAI SHIMBUN 4 Jun 87) Akiko S. X2726
- Computers** (Japan/USSR) Japan's Toray Management Research Institute is conducting a one-year survey of Soviet synthetic/chemical fiber plants in order to collect material for a report on computer software and hardware requirements. Toray estimates that their recommendations could cut these facilities' energy bills by half and save the chemical fiber plants alone \$600 million annually. (Tokyo NIHON KEIZAI SHIMBUN 9 May 87) Junko A. X2726
- (Hungary/FRG) SZAMALK (Computer Technology Applications Enterprise) has purchased the AKSA (Automatic System for Kinematic Analysis) software package from the FRG firm IKOSS at a cost of some 10 million

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forints. The package includes the FEMGEN (Finite Element Method Generator) and the FEMVIEW pre- and post-processors. The program is already running on SZAMALK's IBM mainframe computer. (Budapest COMPUTERWORLD SZAMITASTECHNIKA Nos. 10-11, 18 May 87) Sari P. X2907

Ion Sensor

(France) Researchers at the Lyons Ecole Centrale have developed a chemical sensor that detects silver ions and has applications in fine chemical analysis. Based on ISFET (ion sensitive field effect transistor) technology, the miniature sensor is made by implanting silanes in a silicon dioxide thin film on a silicon substrate. The silanes contain ion clusters that act as ion-sensitive grids. ISFET sensors for detecting other ions are under development. (Paris L'USINE NOUVELLE 18 Jun 87) Antwerp Unit/Eva L. X2519

Microelectronics

(Hungary/USSR) In April, the Hungarians and Soviets jointly established the Interomos Microelectronics Limited Liability Company in Budapest. It will have 56 million forints in start-up capital, 30 percent of which will come from the Microelectronics Enterprise (MEV) and 20 percent from the Hungarian Communications Engineering Cooperative while the Soviet Development-Production Association Scientific Center and the Elektronzagranpostanka All-Union Association will provide 45 percent and 5 percent respectively. The company will establish an IC manufacturing facility by 1989. (Budapest FIGYELO No. 12, 18 Jun 87) Sari P. X2907

New Materials

(Japan) Kobe Steel has developed carbon/carbon (C/C) composites using nonwoven carbon fiber fabrics. The new material's bending and pressure resistance is more than three times that of conventional C/C composites made by CVD (chemical vapor deposition), and it is good to a temperature of 2,000°C. The new method is less expensive than CVD and can be used with other elements, such as copper and aluminum. The breakthrough has applications in the aircraft and aerospace industries and in semiconductor production. (Tokyo NIKKAN KOGYO SHIMBUN 19 May 87) Junko A. X2726

(Japan) The Science and Technology Agency's Aerospace Technology Institute will establish a research project on "gradient functional materials." The result of institute and University of Tohoku research, these materials are made by combining compounds such as metals and ceramics at the atomic or micro-particulate level by means of CVD and powder metallurgy. Tests have been conducted on composites of zirconium oxide with tungsten, silicon carbide with carbon, and titanium boron with copper. The composites are intended for use in space vehicles and nuclear reactors. (Tokyo NIKKEI SANGYO SHIMBUN 8 Apr 87) Junko A. X2726

(Bulgaria/USSR) In a joint venture with the USSR, Bulgaria's Friedrich Engels Machinebuilding Combine in Kazanluk has opened a small enterprise for the manufacture of synthetic industrial diamonds. Some 60,000 carats have already been produced. An agreement was also signed calling for the establishment of a Bulgarian-Soviet laboratory that will develop equipment and technologies for the increased production and application of synthetic diamonds. (Sofia ROBOTNICHESKO DELO 7 Jun 87) Rita S. X2609

Superconductive Boat

(Japan) The Japan Shipbuilding Promotion Foundation is evaluating a "superconductive electromagnetic propulsion boat," which it plans to test in 1990. The boat, which is 25 meters long with a 150-metric-ton displacement,

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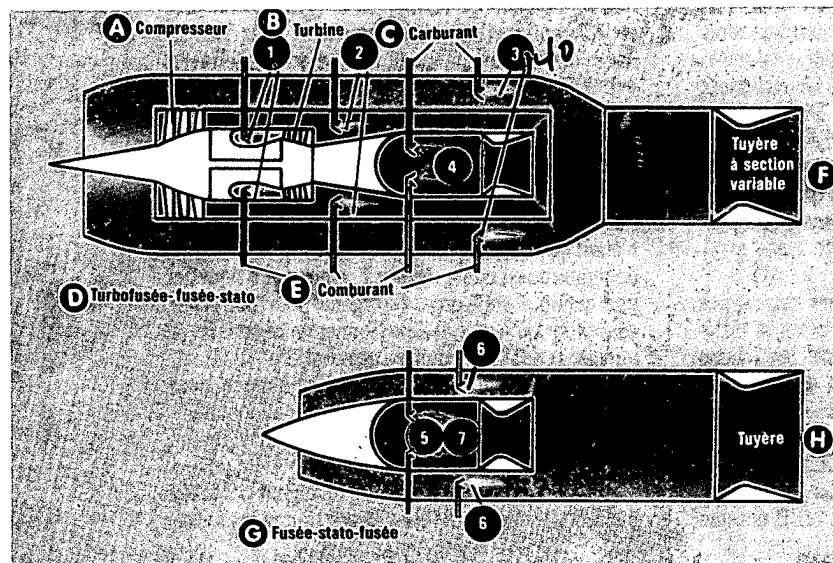
uses superconductive wire made of niobium-titanium and niobium-tin. Tests have produced a 19-tesla magnetic field. The boat requires neither a conventional engine nor a propeller, making it both noise and vibration free. It currently can attain speeds of only 10 knots. (Tokyo NIKKEI SANGYO SHIMBUN 18 May 87) Junko A. X2726

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FRANCE: HYPERSONIC, ORBITAL AIRCRAFT

Key Points: The French are designing two new aircraft: the STS 2000, a horizontal takeoff and landing orbital vehicle, and the AGV, a hypersonic transport that will also serve as a technology demonstrator for the STS 2000. These aircraft will feature combination turbojet-ramjet-rocket engines, according to June reports in AIR & COSMOS, SCIENCE & VIE, and FLUG REVUE.

French research on the STS 2000 (Space Transportation System for the 21st Century) is being driven by the need to develop an aircraft with improved thrust-to-weight ratio capable of carrying heavier payloads. Current plans call for a 300- to 400-ton aircraft with a thrust-to-weight ratio of 0.6 or 0.7 and a 7-ton payload capacity. It would take off horizontally, attain Mach 6 at an altitude of 30,000 to 35,000 meters, and then accelerate to an orbital speed of Mach 25 to reach low orbit at an altitude of 300 kilometers. Crucial to this capability is a propulsion system that combines features of air-breathing and rocket engines. As a result, Aerospatiale, ONERA (National Aerospace Studies and Research Office), and SEP (European Propulsion Company) are studying two "hybrid" designs that incorporate turbojet, ramjet, and rocket features in a single engine. R&D on the scramjet (supersonic combustion ramjet) has reportedly been abandoned.



Hybrid engines proposed for the STS 2000

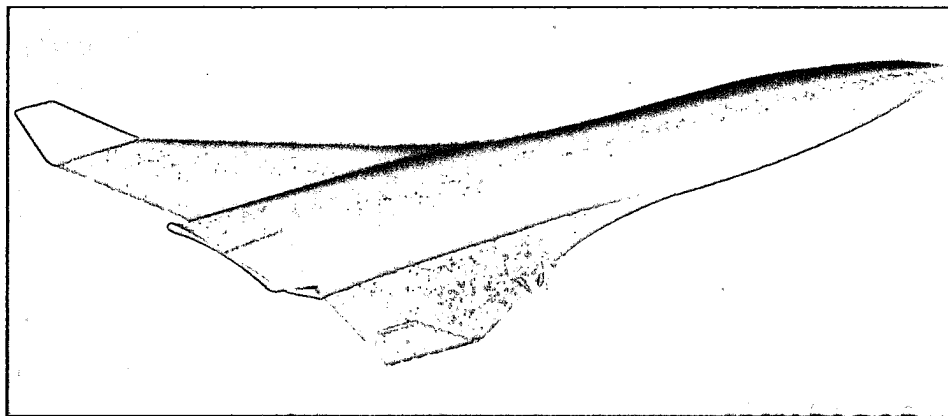
Key: a. compressor	e. oxidizer
b. turbine	f. variable section nozzle
c. fuel	g. rocket-ramjet-rocket
d. turbojet-ramjet-rocket	h. nozzle

One design under consideration is a turbojet-ramjet-rocket. At takeoff and up to about Mach 2, it functions as a turbojet (1,2), accelerating the vehicle to Mach 2. At this point the engine becomes a ramjet (3), which requires no mechanical air compressor because the forward motion of the engine compresses the air sufficiently for combustion. At Mach 6 (at an altitude of about 40 kilometers) the rocket engine (4) ignites, fueled by onboard liquid hydrogen and oxygen.

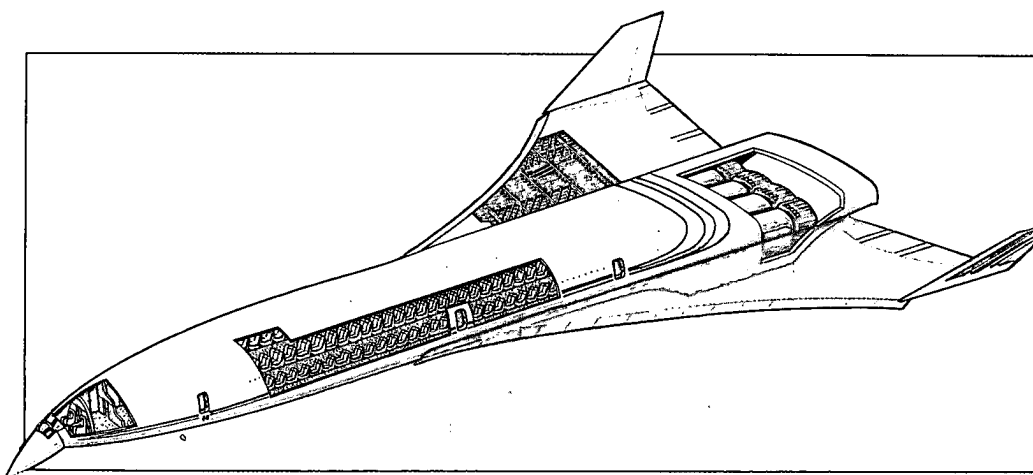
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The second proposed hybrid engine is a combined rocket-ramjet-rocket. It operates up to Mach 2 as a rocket (5), then becomes a ramjet (6) for propulsion up to Mach 6. At Mach 6 the rocket engine (7) is restarted to accelerate the aircraft to an orbital speed of Mach 25.

The engines and aerodynamic design of the STS 2000 will have much in common with the AGV hypersonic passenger transport, a second aircraft being developed by a 30-member research team at Aerospatiale. Designed for a cruising speed of Mach 5.5 at an altitude of 30,000 meters, the 300-ton AGV will carry 200 to 250 passengers and have a range of 10,000 to 15,000 kilometers.



The AGV wind tunnel model. Unlike the AGV model shown on the cover, this design features winglets. The proposed aerodynamic profiles of the AGV and STS 2000 are similar.



Design concept for AGV seating, engine, and wing configuration

The AGV will have 4 or 6 turbojet-ramjet engines providing a total thrust of 120 tons. The engines will be positioned on the lower aft fuselage, taking maximum advantage of external air compression. The turbojet and ramjet sections of the engines will use liquid methane and have common air inlets and nozzles.

The AGV will be a control-configured vehicle with an automatic flight control system to compensate for aerodynamic instability and provide greater maneuverability than in conventional aircraft. Aerodynamic efficiency and lift will be maximized by an elliptical fuselage profile that allows improved wing-to-fuselage attachment. Alternative design proposals feature winglets and canards.

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Researchers are studying the use of tantalum and niobium, which can withstand temperatures of 1,650°C, for aircraft structures subject to high temperatures. Consideration is also being given to cooling the aircraft's outer surface with the onboard liquid hydrogen or liquid methane.

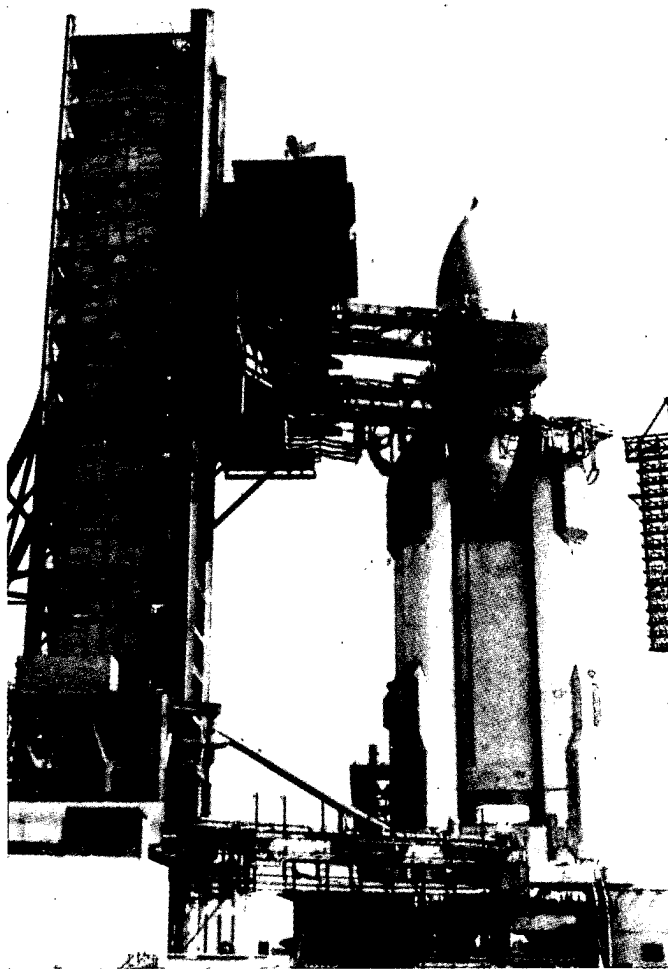
According to an ONERA expert involved in both programs, prototypes for the AGV and STS 2000 are projected for the year 2010. He also noted, without further explanation, that the AGV could be used "more for military purposes than passenger transport."

Eva L. X2519

FOR OFFICIAL USE ONLY**USSR: NEW BOOSTER KEY TO SPACE TRANSPORT SYSTEM**

Key Points: The Soviets have hailed the first launch of the Energiya heavy-lift booster as a major step toward creation of a new multi-use space transportation system. The Energiya's increased payload capacity (five times that of the Proton) will enable the Soviets to launch their space shuttle—designed specifically for joint operations with manned orbital complexes.

The first flight test of the USSR's new heavy-lift booster vehicle Energiya (Energy) took place at the Baykonur cosmodrome on 15 May. According to the TASS launch report, the new "universal" booster is intended for orbiting both shuttle spacecraft and large space vehicles with scientific and economic missions. The two-stage booster (core stage plus four strap-ons) carried a side-mounted "mockup satellite" with the weight and dimensions of an actual payload. The two booster stages operated successfully, but the satellite payload failed to achieve orbit due to a guidance system failure that forced it to splash down in the Pacific Ocean. Despite the failure of the payload section, TASS emphasized that "the goals and tasks of the first launch were fully achieved." In an unusual note, the TASS announcement stated that, in addition to scientific, design, and production organizations, "military specialists" were also involved in developing and testing the new booster. On 16 May, Moscow Television Service broadcast a video of the Energiya launch that included a sequence shot prior to the launch which provided unprecedented coverage of the facilities at Baykonur.



The Energiya booster at Baykonur

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Soviet coverage to date has provided the following technical specifications for the Energiya booster:

Liftoff weight: 2,000 tons

Liftoff thrust: 4,000 tons

Payload (to low Earth orbit): 100 tons

First Stage: 4 liquid-fuel strap-ons

*Propellant: kerosene -
liquid oxygen*

Thrust: 800 tons

First stage total thrust: 3,200 tons

Height: 60 meters

Maximum cross section: 20 meters

Diameter of second stage (core): 8 meters

Second Stage (Core): 4 liquid-fuel engines

*Propellant: liquid hydrogen -
liquid oxygen*

Thrust: 200 tons

Second stage total thrust: 800 tons

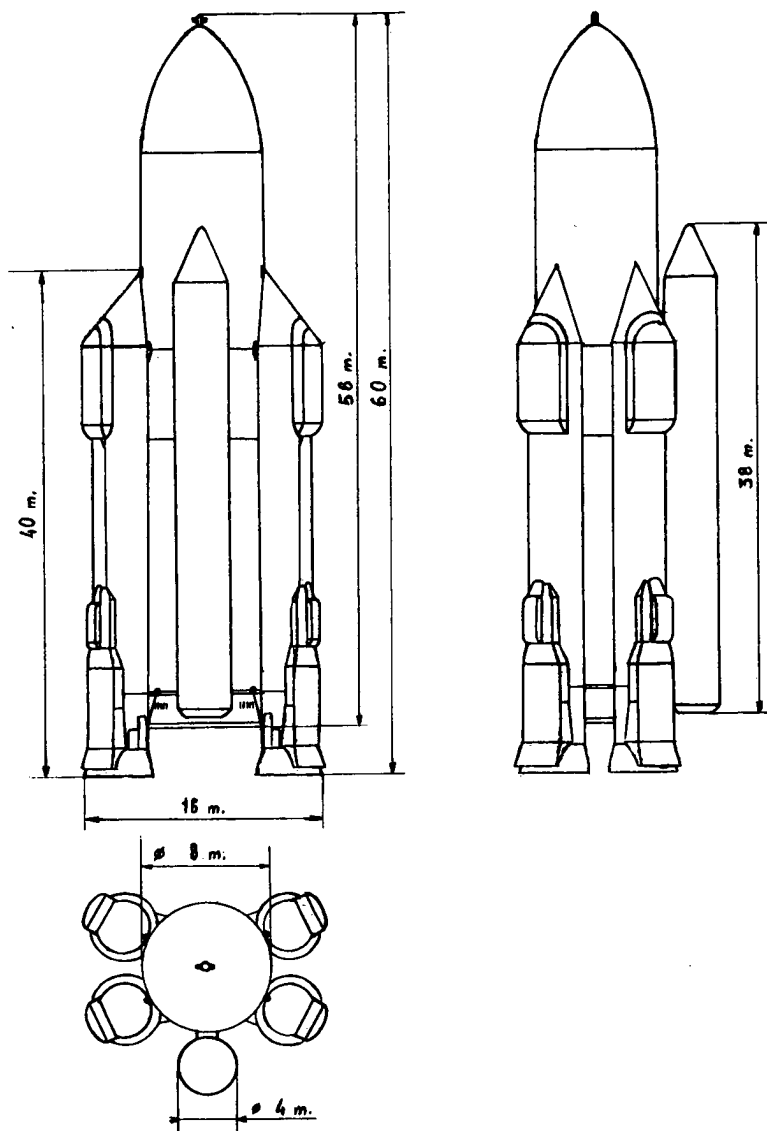


Diagram showing three views of Energiya

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The new booster's 100-ton payload capacity is approximately five times greater than that of the Proton, currently the USSR's largest operational launch vehicle, and would represent a single-launch delivery of a mass approximately twice that of the four-spacecraft complex presently in space (Mir station-Kvant module-Soyuz TM-Progress). The Energiya first-stage strap-on engines reportedly are the most powerful rocket engines in the world. The total power of the booster engines is said to be equivalent to 170 million horsepower. Sergey Grishin, deputy chief of the Flight Control Center, has stated that all eight engines of the first and second stages are ignited at launch and that the Energiya could deliver a payload of 32 tons to the moon or 27 tons to Mars or Venus. The French aerospace journal AVIATION MAGAZINE INTERNATIONAL (1-14 Jun) published a diagram of Energiya (see above) that gives a dimension of 38 meters for the side-mounted payload canister.

In a feature article in the 12 June issue of IZVESTIYA, doctor of technical sciences V. Karashtin discussed the computerized system used for the Energiya preflight and launch control operations. According to Karashtin, new programming methods were employed which made it possible to develop the hardware and software for the Energiya system even though some specifications for elements of the new booster had not been finalized. Emphasizing the high degree of automation in the fueling and checkout procedures, Karashtin pointed out that the entire system uses Soviet computers, both series-produced models and units specially designed for the Energiya complex. The system reportedly is programmed to automatically handle over 500 irregular situations in the pre-launch sequence.

Authoritative commentators in the Soviet press have discussed a number of near- and long-term applications for the new booster. An article in the 22 May SOTSIALISTICHESKAYA INDUSTRIYA by Guriy Marchuk, president of the USSR Academy of Sciences, focused on the role of the new booster as "the fundamental component of a multiple-use transportation system being developed in the USSR." In contrast to previous negative assessments of the US shuttle and noncommittal public comments regarding Soviet research on shuttle spacecraft, Marchuk declared:

We regard such systems as a promising means of transport and we are studying questions of their efficient use for performing wide-ranging research and the systematically planned habitation of space.

Prior to the 15 May launch of Energiya, a commentary in the 7 April issue of TRUD contained the most specific reference to the USSR's shuttle program to date. A TRUD correspondent at the Flight Control Center concluded a standard commentary on cosmonaut activity on the Mir station complex with the assertion that Soviet scientists are working on a space shuttle system and that they had taken into consideration the problems which were apparent in US spacecraft such as Atlantis, Columbia, and Challenger. He went on to say that several special shuttle landing strips have already been constructed at Baykonur and that in an emergency they could be used by US shuttle craft. According to Marchuk, manned orbital stations will remain the main direction for the Soviet space program. However, new large stations and modules are also being developed. For this reason, he stated, the Soviet shuttle is being designed with the specific purpose of joint operations with future manned orbital complexes. Marchuk added that the Soviets will continue to use their inventory of expendable boosters so that Earth-orbit transport will be facilitated by an optimum combination of boosters, spacecraft, and interorbital tugs.

Space scientist V.S. Avduyevskiy emphasized in May that the launch of a Soviet shuttle craft will not necessarily take place in the near future. He pointed out that a careful reading of the Energiya launch announcement shows that the new booster can be used for launching large scientific modules as well as shuttle spacecraft. The payloads that will be given priority, he maintained, will depend "on the direction in which the development of space proceeds." Marchuk similarly concluded that the future of the Soviet space program "will depend to a great extent on the actions of the American side."

A.I. Dunayev, head of the new Soviet space agency Glavkosmos, stated in June that the next phase of the Soviet space program will require a new type of space transportation system. In Dunayev's view, the growing industrialization of space with heavier cargo flows to and from Earth orbit will require a system combining high capacity and economy of operation. He maintains that the key to

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economy lies in reusability of all system elements: partially or fully reusable boosters, shuttle spacecraft, and space tugs for transport between low and high orbits. Soviet commentators have long argued that the current system of space station plus expendable transport and resupply ships was superior to the US shuttle system on economic grounds. According to Dunayev, the technical base for creating a reusable system has already been demonstrated by the achievements of the Soviet rocket building industry. Reusability of main rocket engines has been shown by multiple test-stand firings of high-thrust liquid fuel engines with both high-boiling and cryogenic fuels. Although Dunayev makes no reference to reusability of any Energiya booster components, he does state that the engines are test fired on ground stands prior to launching. In an apparent reference to the Soviet shuttle orbiter test program, he states that successes have been achieved in development of structural and heat insulating materials and that significant theoretical and experimental data have been obtained on aerodynamic and thermal characteristics of "aircraft returning from orbit over a wide range of velocities in the atmosphere."

Apart from the role of Energiya as the launch vehicle for a space shuttle, Soviet commentaries have noted the following possible applications for the new booster, some restating previously discussed long-range space goals, others breaking new ground:

- *Placing heavy communications satellites in geostationary orbit*
- *A solar probe mission*
- *Missions to Jupiter and the outer planets*
- *Orbiting of large stations and modules*
- *Deployment of solar power units for orbital manufacturing operations*
- *Creation of complexes in orbit for assembly, refueling, repair, or launching of spacecraft*
- *Manned lunar bases*
- *Expeditions to Mars, including landing of large mobile laboratories on the surface of the planet.*

A 1 June TASS report quotes Glavkosmos head Dunayev to the effect that the Energiya booster could be made commercially available to foreign partners once it is fully developed.

John C. X2725

FOR OFFICIAL USE ONLY**REPORTS**

REPORTS surveys science and technology trends as detailed in articles, books, and journals. It also includes summaries and listings of articles and books which may serve as potential sources for future research. Conference proceedings will occasionally be presented in this section.

SUPERCONDUCTIVITY UPDATE**JAPAN: PATENT APPLICATIONS**

The firm Sumitomo Electric Industry has applied for 600 superconductivity technology-related patents, according to the Tokyo press. By applying for these patents, the company hopes to be able to cross-license should superconductivity patents be obtained by US firms. The Sumitomo applications break down into 25 percent for materials technology, 25 percent for process technology, and 50 percent for marketable products (not further identified). The firm annually applies for about 2,000 patents. By the end of this year, over half of these applications will be in superconductivity-related fields. (In addition, Sumitomo has allocated 1 billion of its total 20 billion yen R&D budget to superconductor research. Similar increases in superconductivity R&D are taking place at Hitachi, Toshiba, Showa, Furukawa, and Fujikura.) Prior to this latest round of patent applications, Sumitomo had submitted 30 superconductivity patent requests while the Polymer Chemical Research Institute had filed seven applications.

Junko A. X2726

PRC: LATEST RESEARCH RESULTS

Unlike previously announced single occurrences of superconductivity (see PERSPECTIVES Vol. 2, No. 6 pp 5-6), several PRC universities and government research institutes recently demonstrated stable, repeatable results in which superconductivity was achieved at critical temperatures between 77K and 95K using a yttrium-barium-copper oxide ceramic. Produced by double sintering or vapor deposition, the ceramic was tested in bulk sample, thin film, and rod form, according to May reports in the PRC press.

A research team composed of members of the Departments of Chemistry, Electronics, and Physics at Nankai University used double sintering to make a bulk sample which achieved superconductivity at 91.6K and had an initial transition temperature above 118K. The Chinese Academy of Sciences' Institute of Physics reportedly confirmed these results.

Beijing University produced a thin film (0.5-1 microns), using vapor deposition, that achieved a critical temperature of 84K.

The Shanghai Silicate Institute produced a bulk sample 100 millimeters in diameter (the largest to date in China) that attained a critical temperature of 95K and an initial transition temperature above 100K.

A research team led by Zheng Jiaqi at the Chinese Academy of Sciences' Institute of Physics used vapor deposition to develop a 1-micron-thick superconducting film with a critical temperature of 77K and an initial transition temperature of 96K. The film demonstrated diamagnetic characteristics.

Researchers at the No. 903 Plant and the Applied Physics and Computer Science Research Institute (both subordinate to the Ministry of Nuclear Industry) produced a large number of superconductor rods

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11 millimeters in diameter and 110 millimeters in length that displayed a critical temperature of 90K with an initial transition temperature between 105K and 106K.

Arlene A. X2676/Parker H. X2726/Tom C. X2726

JAPAN: DEEP-SEA RESEARCH VESSEL

The Science and Technology Agency's Oceanic Science and Technology Center has contracted with Mitsubishi Heavy Industries to build the SHINKAI 6000, a deep-diving research vessel, according to NIKKAN KOGYO SHIMBUN (18 Apr). The 25-ton vessel will be capable of diving to 6,500 meters which will enable scientists to survey 36 percent of Japan's 200-mile economic zone (6 percent more than that reachable by the SHINKAI 2000). The vessel is slated for completion in 1989 at a cost (including construction of a mother ship) of some 19 billion yen.

The SHINKAI 6000 will incorporate seven tons of titanium in its cabin and use fiber reinforced plastics in its hull. Power is supplied by silver-zinc batteries, and an AC/DC converter developed by Mitsubishi Heavy Industries and Mitsubishi Electric will be used with insulation oil to eliminate the need for a pressure-resistant container. An improved vessel configuration will enable the SHINKAI 6000 to reach maximum depth in 2.5 hours.

Junko A. X2726

HUNGARY/AUSTRIA: JOINT CAD-CAM VENTURE

On 1 June, Hungarian and Austrian industrialists and bankers officially chartered the Flexys Production Automation Share Company (to be established in Budapest), according to FIGYELO of 4 June. Created as part of Hungary's effort to facilitate the transfer of research results to industrial production (for related reporting on this topic, see PERSPECTIVES Vol. 2, No. 7 p 11), the firm will draw upon Hungarian R&D expertise and Austrian CAD-CAM technology. The firm, which will have a Hungarian staff of some 1,000 specialists, will develop and market CAD-CAM systems, devoting 40 percent of its efforts to producing systems for the Hungarian market, 40 percent to producing systems for Bloc countries, with the remaining 20 percent of company capacity devoted to troubleshooting engineering problems and writing software packages for Western consumers (primarily in Austria). Flexys will also act as prime contractor in component design and development projects and will conduct cooperative research with Hungary's SZTAKI (Computer Technology and Automation Research Institute).

Flexys, which will be under the direction of Laszlo Edelenyi with Istvan Eeszes (formerly of SZTAKI) as business manager, will have a registered capital of 150 million forints with stock shares valued at 500,000 forints. Seventy percent of the firm's shares will be held by SZTAKI, the Bank of Budapest Share Company, and TRANSMERX (a subsidiary of the Oesterreichische Laenderbank of Vienna). Other Hungarian shareholders include INVEST Bank, the Intercooperation Share Company, and the Orient Share Cooperative. Some shares are also held in the US.

Flexys is currently working on several foreign and domestic CAD-CAM projects (for the Ikarusz Bus Company, the Diosgyor Machine Factory, the Bakony Works, and the Machine Tool Industry Works) that had been assigned to SZTAKI and Hungary's Mechanical Engineering R&D Association in 1985.

Sari P. X2907

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PREVIEWS

PREVIEWS is an annotated list of selected science and technology items being published by FBIS. The list may also contain previously published items of wide consumer interest.

SCIENCE & TECHNOLOGY/EUROPE & LATIN AMERICA

R&D STRENGTH OF 17 WEST EUROPEAN STATES COMPARED

The article presents a brief comparative study of the S&T potential and policies of 17 West European countries prepared by scientific attache services of the French embassies in Europe. (Paris SCIENCES & TECHNIQUES Jun 87)

EUREKA'S 108 PROJECTS SURVEYED

Following a brief introduction, the titles, participants, duration, and cost of EUREKA'S 108 projects are outlined. (Paris SCIENCES & TECHNIQUES Jun 87)

AEROSPATIALE: CAD/CAM EMULATION LANGUAGE FOR AIRCRAFT INDUSTRY

Article details Aerospatiale development of a standard data communication language (called SET or Exchanges and Transmission Standard) which permits communication between CAD software and hardware of different kinds. It would allow communication between Europe's major aircraft manufacturers. (Paris L'USINE NOUVELLE 11 Jun 87)

HUNGARY'S COMPUTER BASE, TRADE OVERVIEWED

The article presents a survey of computers in Hungary: the existing computer base, hardware production, East-West trade, and computer smuggling. (Amsterdam COMPUTERWORLD 16 Jun 87)

NEW ESD MANAGER EXPLAINS STRATEGY

In an interview, Bertrand Daugny, new CEO of Electronique Serge Dassault, talks about the company's product and R&D strategy, cooperation with Thomson, and military and civil activities. (Paris L'USINE NOUVELLE 18 Jun 87)

SUB-SAHARAN AFRICA REPORT

GUIDE TO SOUTH AFRICA'S CSIR

Excerpts from the 1985 edition (the latest available) of the DIRECTORY OF SCIENTIFIC RESEARCH ORGANIZATIONS IN SOUTH AFRICA contain a detailed breakdown of the government's science and technology arm, the Council for Scientific and Industrial Research (CSIR). The organizational structure of each group, foundation, program, laboratory, and service in the CSIR is provided. Also included for each unit are the names of top staff members, areas of research, and publications.

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