

# L5 NEWS

December 1978



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**Cover:** Artist's concept of a lunar mining base. The four horizontal cylinders contain the base habitat, maintenance facility, soil packaging plant, and loading facility. For details on obtaining free metals from the lunar soil, see "Mining the Moon", by William N. Agosto, page 11. (Artwork courtesy NASA.)

# RA-SHALOM

## **Name of Newly-Discovered Asteroid Honors Camp David Peace Conference**

by John Phillips

A team of scientists led by Dr. Eleanor Helin at the California Institute of Technology recently reported the discovery of a large, Apollo class asteroid which may be of the carbonaceous chondritic type. The find may prove to be highly significant for any possible future program of space industrialization.

Asteroids represent an alternative to lunar resources as a supply of raw materials for space manufacturing enterprises. The carbonaceous chondritic type are of special interest due to the presence of significant quantities of nitrogen, hydrogen, and carbon, elements required to establish life support systems for space settlements. If these elements can be obtained from extraterrestrial resources, lift costs to bring them from Earth can be avoided. This would enhance the economics of space industrialization considerably. Furthermore, the use of extraterrestrial sources of life support system elements removes major constraints in the design of such systems.

Assuming an abundance of nitrogen, hydrogen, and carbon will be available from processing carbonaceous chondritic asteroids, life support systems can now be designed around extended food chains. Abundant supplies of foods derived from traditional agricultural and livestock species can be anticipated. System stability and reliability can be assured by designing redundancy into the space farm. Surplus production can be stored, and some might even be shipped to outposts too small or temporary to justify having their own agricultural systems. Most important, life support systems need be only partially closed with respect to recycling of materials. Toxic heavy metals, for example, can be concentrated by water-hyacinth plants, shown above, in an aquatic wastewater recycling system. The dried plants can be processed through an incinerator and the ash containing the heavy metals can be jettisoned or sent to the space manufacturing facility as raw material.

Eleanor Helin has given the newly found asteroid the name "Ra-Shalom" in honor of the Camp David Peace



*Above: water hyacinth plants can aid in an aquatic wastewater recycling system by concentrating toxic heavy metals. Below: lettuce is grown without soil, under space farm conditions.*

Conference. "Ra" is the name of the Egyptian Sun-god, symbol of enlightenment. "Shalom" is the traditional Hebrew greeting meaning "peace". Many individuals involved in the space settlement and industrialization movement have commented that this enterprise may well be the key to achieving

peace on Earth. As we all look forward to the Christmas holidays this year with raised hopes that peace might finally be achieved in the troubled Middle East, we can also reflect upon the discovery of Ra-Shalom and hope "Ra-Shalom, shalom aleichem," which is to say, "Ra-Shalom, peace be with you."

# International Astronautical Federation Conference

by Frederick H. Osborn, Jr.

Garrison, N.Y. - October 13, 1978. Sunday evening October 1 upwards of eight hundred registrants at the XXIXth Congress of the International Astronautical Federation (IAF) filed into the festively decorated conference hall of the Libertas, the prestige hotel of Dubrovnik, Yugoslavia. While the Ansambl Dubrovnik Folk Band played at the south end of the room, the registrants from thirty nations passed down the receiving line, shaking hands with Tatomir Andjelic, President of the Yugoslav Organizing Committee for the Congress, and Marcel Barrere, President of the IAF. Large tables loaded with native canapes filled the center of the room, and in each corner stood a well-tended bar. Near the north end, four excited students winners of American Institute of Aeronautics and Astronautics awards, shook hands and shared hugs with Soviet Cosmonauts for the benefit of the press and swarms of amateur photographers. Small groups gathered and dispersed throughout the room, being photographed, performing introductions, renewing old acquaintances, or just conversing. It was a warm and friendly scene.

Monday morning President Barrere presided over the formal opening ceremonies in the same hall. This time the registrants were seated. Most of the 816 were there, 526 participants, 147 observers, 41 students, 82 representatives of the press (50 from Yugoslavia, 32 from other countries), and 20 members of organizing committees. They came from 30 countries and the United Nations, 189 from the United States, 115 from Yugoslavia, 97 from France, 89 from West Germany, 71 from the Union of Socialist Soviet Republics, 22 from Italy, 15 from Japan.

Andjelic, his face as craggy as his native Dalmatian mountains, and Monsieur Barrere, who is as round and stocky and French as Andjelic is tall and spare and Balkan, gave welcoming speeches. So did Dr. Ikonic (on behalf of President Tito), Drs. Valjalo and Perek, and the Honorable Peter Jankowitsch.

The theme of the Congress, as proclaimed in large white letters on a blue banner hanging on the east wall, was "ASTRONAUTICS FOR PEACE AND



XXIXth Congress of the International Astronautical Federation, Hotel Libertas, Dubrovnik, Yugoslavia, October 2, 1978. At the rostrum, delivering a speech of welcome is the Honorable Peter Jankowitsch, Austrian Ambassador to the United Nations and Chairman of the United Nations Committee on the Peaceful Uses of Outer Space. Seated l. to r. Dr. Lubos Perek (Czechoslovakia), Chief of the Outer Space Affairs Division of the United Nations, and Dr. C. Stark Draper (USA), President of the International Academy of Astronautics.

## HUMAN PROGRESS."

Following the welcoming speeches, Academician Leonid I. Sedov, a distinguished, graying gentleman with heavy glasses and courtly manner, delivered the 9th IAF invited lecture on the subject of "Astronautics for Peace and Human Progress."

He spoke of photographs of the far side of the Moon and of the human presence in space. He told us that space efforts included attempts to end pollution and that space science offered the possibility of eliminating hunger from certain parts of the Earth. He proposed that space achievements can take partial credit for the world being without a major war for 30 years. Space safety is being developed. We have landed on the Moon and have landed probes on Venus. International cooperation is becoming increasingly important because of the depletion of Earth resources, the power crises, etc. Scientific outposts in space

should continue to be developed, as should radio and communications, weather and hurricane forecasting, and geographic research. He maintained, however, that many of these activities will have to be regulated.

During the opening speeches, which were in Serbo-Croatian, French, English, and Russian, simultaneous translation was provided through individual transistorized receivers equipped with earphones like those passed out on transatlantic flights. At the end of Academician Sedov's lecture, which was in Russian, President Barrere announced that the language of the Congress would be English, and turned the meeting over to Dr. George E. Mueller (USA), former Director of Space Flight for NASA, who chaired a Forum on ongoing space activities.

Dr. Roy Gibson (Britain), Director General of the European Space Agency (ESA), and soon to become IAF President,

was the first speaker. He reviewed five areas of European space activity. First, there is the scientific, as exemplified by GEOS II which flies with a European-built attitude control, the IUE (International Ultra-violet Explorer) which will be launched January 26, the NASA space telescope for which ESA is furnishing the faint object camera, the EROS infra-red satellite, which will be launched in cooperation with the

rector was, in effect, the mayor in medieval times). Freely translated, it reads: "Forget what is good just for you. Think about the general well-being."

Academician Boris N. Petrov, Chairman of the Inter-Cosmos Council of the USSR, and Chief of the USSR delegation to the IAF, spoke next. He said that the USSR attaches great importance to cooperation with other countries and that the USSR is

all week for a total of 46 sessions on twenty subjects at which more than 500 authors presented some 345 papers. To cover it all was physically impossible. English was the language of the Congress, but many of the efforts at translation from Slavic and Oriental and some of the European languages were beyond comprehension. A Norwegian police chief, for instance, in the Safety and Rescue Symposium, quite unwittingly introduced a religious note when his translator called rescues "salvations"! Japanese attempts to "raunch saterrites" would have been hilarious if the delivery were not so strained and sincere as to melt the heart. On the buses which shuttled between the half-dozen hotels that housed the participants it sounded like the Tower of Babel.

Supporting the general sessions, which were held in six areas of the Hotel Libertas, were administrative meetings, committee meetings, meetings of IAF member societies (there are 58 of them), the International Academy of Astronautics, the International Institute of Space Law, the International Programme Committee for the XXIXth Congress, the Yugoslav Organizing Committee for the XXIXth Congress, the Ladies Committee, plus press conferences, receptions, and special meetings of varying degrees of formality. No wonder almost everyone was exhausted by the end of the week!

Principal media coverage for the Congress was **The Reporter**, an eight page illustrated daily in English (the back page was Serbo-Croatian) put out by an intelligent and remarkably energetic crew of young Yugoslavs. Some of the grammar was quaint (on the masthead: "cliches made by. . .") but on the whole it was an excellent paper.

At 5:30 Monday afternoon the first current events session was held. It was a USSR report on Salyut 6. Lasting two hours at the end of an arduous day, it was almost more than mind and body could bear. Russian spacemen are not orators. They are not showmen. They are plodding persistent, dogged, determined doers. They are fascinated by the space program. They have the enthusiasm that our youngsters have for it, and they want to tell everyone all about it, down to the last infinitely insignificant detail. Academician Petrov led off in Russian. Every few sentences there was a pause for translation. He introduced a galaxy of cosmonauts, engineers, and academicians. Upon introduction each star rose to his feet. There was applause. The applause drowned out the interpreter, so we never knew who the rising stars were. Then Petrov sent a string of cosmonauts to the rostrum to tell about their experiences in



XXIXth Congress of the International Astronautical Federation, Hotel Libertas, Dubrovnik, Yugoslavia, October 2, 1978. Left to right, Marcel Barrere (France), President of the IAF, Tatimir Andjelic (Yugoslavia), President of the Yugoslav Organizing Committee, Leonard Jaffe (USA), past President of the IAF, Leonid I. Sedov (USSR), Vice President of the IAF.

Netherlands in 1981, and OTS II (Orbiting Test Satellite) which has been in orbit since February. Next he reviewed communications, as exemplified by PCS I which will be flown in 1981 and PCS II a year later, both owned and operated by EUTELSAT. The third area reviewed was observation, as exemplified by MAROTS, the European Maritime Communications satellite. Fourth was Spacelab, which has a \$650,000 budget in 1978 and which, he said, generates two monetary units in business for every monetary unit raised through taxes and contributions. Lastly, he reviewed the development of European launch capability through the Ariane Project which is expected to make its first test flight in 1979 from French Guiana. Funding is assured and the work is progressing well.

ESA, Dr. Gibson said, is a cooperative venture which includes other than member states and is as much of interest to underdeveloped countries as to those with space capability. ESA's biggest problem, he revealed, is money, which is much scarcer than good ideas.

In closing, Dr. Gibson urged removal of artificial barriers to international communication and quoted a Latin inscription in the upper gallery of the rector's palace in old Dubrovnik (the

getting ready to launch a second satellite for India. He showed a number of slides illustrating various scientific aspects of the Soviet space program.

Your correspondent lunched in the "Old City" of Dubrovnik, one of the few walled medieval cities still intact. Its five hundred year old buildings, on streets often less than six feet wide, are surrounded by a towering wall encrusted with glowering guard houses and battlements. Fantastically picturesque, it is a living example of how hard life was for our ancestors and, consequently, a splendid launching pad for space-related hopes for our descendants.

Monday afternoon there were 5 simultaneous sessions with 30 scheduled papers on subjects ranging from "Scientific Goals and Technical Realization of Near-Earth Experiments by Members of the Cosmic Physics Working Group Within the Intercosmos Cooperation" by Dr. H.J. Fischer of the Academy of Sciences of DDR (Deutsches Demokratische Republik) to a survey of "Space Flight Safety Systems" by N.E. Brown of ORI, Inc., Silver Springs, Maryland.

The formidable schedule of 5 sessions every morning and afternoon continued (except for a recess Wednesday afternoon)

Salyut, a Czech first, who felt it his duty to tell all of us (through the hard working interpreter) all about how he was selected and trained, how he felt, what it was like, what apparatus was used. As the sessions progressed, we learned a lot more than we wanted to know, and much of what we might have wanted to learn was lost through the interpretation and the gap between interpretations, like foreign language commercials interrupting TV. A 16mm uncut film taken aboard Salyut 6 was shown — fascinating stuff — and two whole reels of 35mm. The 35mm projector was cantakerous, first because the projectionist had apparently gone to sleep in the back, then because its lamp was so dim that the picture could hardly be seen. Alexei Leonov, Hero of the Soviet Union, Cosmonaut Extraordinary, the first human to walk out into space, strode down from the dais with a retinue of Petrov's subordinates. There was much incomprehensible talk. The projector was moved closer to the screen. A longer extension cord was sent for. Interminable questions and answers were thrown into the hiatus. Finally the last half of the 35mm was run through and those who had stuck it out staggered from the conference hall for a drink and supper.

From the films Salyut 6 appeared much smaller and confined than Skylab, and the equipment less complex and sophisticated. There was considerable discussion of the effects of weightlessness, the cosmonauts saying it required intensive physical training to adapt to it. Academician Petrov summarized that science cannot say today how long a human may stay in space.

In answer to a question regarding how to avoid space sickness, one of the cosmonauts said that most important were the selection and training of the cosmonaut, and exercise. He said that special medicine was carried in Salyut, but never used, while a pressure suit was used at times to redistribute the blood by putting pressure on the lower limbs and so increasing the flow to the upper limbs, chest and head. The suit was shown in use in the films both on the ground and in Salyut 6. The ingredients of the special medicine, however, were not disclosed; indeed singularly few technical or scientific details were disclosed during the session.

Tuesday there were 10 more sessions and 90 more papers.

Four of the 41 student registrants were Stan Kent from Stanford University, whose tiny blonde bride was the darling of the Congress, Andy Bellenkes from the University of Delaware, Jess Murph from Auburn University, Alabama, and Rex

Ridenoure from Iowa State. They had won the opportunity to present their papers at the Congress in a nationwide contest sponsored by the American Institute for Aeronautics and Astronautics. Kent's paper #78-ST-09 on "The Space Shuttle External Tank as a Re-entry Module" won first prize and the Hermann Oberth Gold Medal for the best undergraduate paper at the Congress' closing banquet Friday night. Bellenkes' paper, #78-ST17 on "Space Medicine—A Prognosis for Future Research", won second place in the graduate category. Rex Ridenoure's excellent paper, #78-ST-07, "The Collection of Lunar Mass Driver Payloads in Earth-Moon Space," won second place in the undergraduate category.

Late in the week Kent presented Gordon Woodcock's challenging paper #78-231 on "Low-Cost Transportation of the Future" so competently that Woodcock will do well to look to his laurels. (It was one of the students, incidentally, who observed that some people were more interested in useful pieces than in peaceful uses of outer space.)

Tuesday morning Dr. Dono Indarto, of the Department of Communication, Djakarta, Indonesia, presented a paper (78-A-65) at the second session of the 11th

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*Fear. . . is the principal cause of failure of global peace. . .*

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International Space Rescue and Safety Symposium. A paper presented Monday at the first Communication Satellite session (78-239, H. Soetaya et al) had described the Indonesian Palapa System. Indonesia has 13,000 islands, 7,000 of which are uninhabited. Communication between them via satellite would be a boon, but western science must be introduced with care in order not to disturb social and political stability. For example, local custom in many villages decrees that a message is urgent only if the messenger carries a chicken feather in his hand. The idea of giving high priority to rescue messages delivered in technical language through a loudspeaker or headset is hard to get across.

Tuesday evening at 5:30 there was an excellent French presentation with slides and film on the current status of Ariane, the launch vehicle being developed by EAS, and an Italian report on the Spacelab program. This was followed at 8 P.M. by superb folk dancing and singing by the Lindjo troupe in a barrel-vaulted medieval hall in Dubrovnik's Old Town.

Wednesday morning the first session of the 21st International Space Law Colloquium was held (16th session of the

Congress). It was chaired by Mrs. I.H. Diederiks-Verschuur of the Netherlands. L-5's distinguished Board Member, the Honorable Edward R. Finch, Jr., presented paper #78-SL-03 on the subject of "Outer Space Global Interdependence and the Geostationary Orbit".

Referring to the theme of the Congress—"Astronautics for Peace and Human Progress"—he said that, because of the precedents set by Gemini and Soyuz-Apollo and the 1967 Treaty on the Peaceful Uses of Outer Space, until 2100AD no more regulation of geostationary orbit in outer space should be needed.

Fear, he explained, is the principal cause of failure of global peace. The 1967 Treaty banned nuclear weapons testing and military manoeuvres in outer space and its provisions have been followed. Verification by viewing the Earth from outer space is a way for a nation to protect its sovereignty and national security and lessen fear of attack. The UN Committee on the Peaceful uses of Outer Space (COPUOS) helps keep the peace by its sponsorship of the four major space treaties and by encouraging remote sensing.

The United States and the USSR have agreed, he revealed, to open talks on "killer" satellites.

The fear that GSO is becoming overcrowded is unfounded, Finch explained. To limit the geostationary orbit to 180 satellites (one satellite every 2 degrees) as has been suggested, is unnecessary. With 10-20 kilometer spacing between satellites, well over 1800 satellites could be placed in GSO without interfering with one another. Until after the year 2100 there need be no scientific or legal fears of overcrowding, even without considering antenna farms.

The claims of equatorial countries to the outer space above them on geostationary orbit, Dr. Finch asserted, are not valid. Outer space (beyond a not yet determined distance from the surface of the Earth, but probably at 100-110 kilometers altitude) is part of the "freedom of outer space" for the benefit of all.

In subsequent papers and in discussion, Ed Finch's thoughts were supported and amplified. Dr. K. Wieworouska of Poland held that space in Geostationary orbit was not subject to national sovereignty, and that, although the definition of outer space is not clear at present and may be set somewhere between 70 and 700 kilometers from the Earth's surface, most people agree that GSO is outer space.

Dr. Haanappel of Canada noted that Colombia, which is claiming the portion of GSO which lies above it, is not a signatory of the Outer Space Treaty; he held that GSO is a limited resource which

must be regulated, not de facto monopolized. He felt that satellites in GSO should be no closer than 2 degrees apart, which allows room for only 180 satellites.

Dr. Rudolf Perek (Czechoslovakia), Chief of the Outer Space Affairs Division of the UN, said that the principle of "first come first served" was still in effect at the ITU (International Telecommunications Union) and that some people feared this principle would be abused. But spots on geostationary orbit, Dr. Perek believed, should be used the way sidewalks are used, shared with others, and not individually owned.

President Diederiks-Verschoor (Netherlands) presented a paper (78-SL-15) on the "Legal Regime of International Space Flight," in which she posed the problem of the legal rights and obligations of the commander, crew, and passengers of spacecraft. Strict regulations, such as those guiding commanders of aircraft, do not as yet exist for spacecraft, but should be considered now in preparation for the day when they will be needed.

More than 40 papers on space law were presented. In Finch's opinion, space law at the present time is the pacesetter for the evolution of international law and is progressing much more rapidly than the law of the sea.

Later in the week one of the benefits of the Congress, the ability to once in a while bring corridor discussion to session debate, appeared in a question period in the Thursday afternoon session of the Space Law Colloquium. Dr. Yuri M. Kolosov, Soviet Representative on the UN Committee on the Peaceful Uses of Outer Space, said that peace in outer space is inseparable from peace on the surface of the Earth, and that the reasons that we have avoided World War III are sociological and political. Astronautics may help provide peace on Earth, but only political decisions can provide for peace and human progress. If there is no peace, Dr. Kolosov said, there can be no human progress.

In the vernacular of international space law, "stabilizing" apparently means peaceful, and "destabilizing" means hostile. Was broadcasting from orbit to other countries stabilizing? No, said Dr. Kolosov. Was first come first served use of geostationary orbit stabilizing? No, he said; GSO should be used under the ITU in cooperation with other nations. Was obtaining solar energy from space stabilizing? Yes, he said, it was, but like all goods obtained from space it should be shared with others. Satellite solar power stations, Dr. Kolosov said, could clearly contribute to peaceful human progress. Now whether he said this because the Soviets are about to embark on an SPS program themselves, or because they hope

that the United States will start building power satellites without adequate research, or because he really believed power satellites would be benign, is a mystery shrouded in an enigma. But at least he said it, and in a public session.

Finch asked why direct broadcasting from a satellite is destabilizing. Dr. Kolosov replied that direct broadcasting was not acceptable to a receiving state unless the receiving state's prior consent had been received. He further said that remote sensing by satellite was destabilizing if the information obtained was made available to other than the state doing the sensing or the state being sensed. At the next day's Colloquium there was lively discussion on the benefits of freedom of information versus prior consent.

Thursday afternoon at 5:30 Dr. Robert A. Frosch, Administrator of NASA, appeared on schedule. His talk was meticulously careful and, to this correspondent, uninspiring. Perhaps this is unfair. It may just have been his manner of delivery.

Dr. Frosch said President Carter's policy was that the United States will continue its leadership in space, that the space program

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*Satellite solar power stations...could clearly contribute to peaceful human progress.*

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is in a time of transition, as aviation was 20 years after the Wright brothers' first flight, and that there is now a shift from a single goal (going to the Moon) to multiple objectives involving extending technology, developing applications in such things as communications and remote sensing, and in the scientific field exploring the solar system, supporting, on the one hand, cosmic astronomy, and the environmental relationship between the Earth and the Sun.

Satellite Power Stations are not in NASA's operational program, and permanent space stations are not either. According to Frosch, NASA is taking the evolutionary view rather than jumping in before all the details are understood.

Dr. Frosch said it is difficult to characterize NASA's present posture in a single sentence or simple objective because we are maturing in space matters. As opportunities for the use of space come along we will be able to grow with them, continuing the growth of the peaceful uses of space for human purposes.

Dr. Frosch's talk was followed by an excellent slide show and film narrated by Lee Scherer, Director of the Kennedy Space Center, describing the development and

present status of the Shuttle Program. The main engine problem is apparently under control, and the first flight to orbit should be next September if the present "success oriented scenario" continues.

Friday morning Session 34 was on "Space-Based Power Systems for Earth." Clark Covington of NASA's Johnson Space Center in Houston, delivering paper #78-185, led off with a magnificent report on "Satellite Solar Power Stations." Covington is owl-like and balding, stocky, and not particularly impressive to look at, but spoke with conviction, vigor, and enthusiasm. It was refreshing and worth the trip to Dubrovnik to hear him. NASA, Covington said, is responsible for system definition. The Department of Energy is responsible for evaluation, environmental health and safety. In September, 1980, the decision will be made to either drop the idea of solar power satellites or go ahead. Covington expects the technology to construct SPSs from Earth materials to be available by 1990, and the first commercial SPS could be delivering 10 gigawatts to Earth surface grids by the year 2000.

He said NASA had looked at Brayton, Rankin, and other power conversion systems as well as silicon and gallium arsenide solar cells, and believed photovoltaic the best bet at present. The five to ten gigawatt size is best for physical reasons, such as the power density in the ionosphere and the need for cooling the one kilometer diameter transmitting antenna. A silicon cell SPS would be 5 by 10 kilometers on each side, feeding to a 10 to 13 kilometer diameter rectenna on the ground. Power density would be 23 mW per cm<sup>2</sup> at the center of the rectenna, less than 1 mW per cm<sup>2</sup> at the edges.

Research, development and testing costs will probably be \$39-40 billion spread over 15 years (in 1978 dollars). The first power satellite will probably cost \$32 to \$43 billion, and succeeding satellites \$12-17 billion each. Transportation will be approximately 40% of the cost.

David Akin (a colleague of L-5 reporter and guest editor Eric Drexler) presented paper #78-186 in collaboration with Professor Rene H. Miller at MIT. It was on the "Logistic Costs of Satellite Solar Power". Carefully researched and brilliantly presented, it took the line approach to costs (rather than the NASA point approach), but arrived at similar conclusions, that solar power satellites are economically feasible. If more than 5 satellites were built, he said, it would be cheaper to build them from lunar materials.

R. Fleisig of Grumman Aerospace, in paper #78-188, presented a scenario for building a test SPS in space from Earth materials and showed slides of a pilot

model of an automated beam builder which has successfully built 100 meter beams from rolls of aluminum.

Marcel Toussaint, Director of Eurospace, delivered paper #78-190 on European energy needs, saying satellite solar power stations would be welcome, particularly in the \$10 billion cost range.

Leafing through the 84 page Programme during the after the Congress was an exercise in frustration. So much to hear, and so much to miss! There was no paper on constructing our Society's conference hall at L-5, (the one where we will assemble in a decade or two), but there were many papers on building large structures in space and on the various aspects of living there. There was, for example, Pres Layton's (USA) excellent "Progress Report on the IAF Working Group on Space Energy and Power (#78-37) in which he showed many of the slides of power satellites and space colonies which are in the L-5 collection. Several Soviet papers, such as #78-A-56 on "Man's Adaptation to the Operator's Work Under Stressful Conditions of Space Flight"; #78-47, "Preliminary Medical Results of Salyut 6 Manned Flights"; and #78-55, "Study of the Cabin Environment: Composition of Toxic Gas Containment as a Function of Specific Volume" applied to living in space. Three sessions discussed Bionautics (#28, #39 and #45). A session (#37) discussed materials and structures and a joint paper (#78-SL-38) by Patricia M. Sterns and L.I. Turner from Arizona dealt with the "Art of Living in Space". There was considerable reference to space manufacturing, particularly in Session 34 on "Space-Based Power Systems for Earth," but little tying the need for personnel to build and repair things in space to where and how the personnel might live. Perhaps some L-5 member will present a paper on this subject next year! This correspondent sensed that, after Skylab and Salyut, maybe most Congress participants felt that living in space, when it becomes necessary, will not be a serious problem.

Friday night, at the closing banquet in the Hotel Libertas, Christopher C. Kraft, Jr., Director of the Johnson Space Center at Houston, received (in absentia) the 1978 Daniel and Florence Guggenheim International Astronautics Award of the International Academy of Astronautics for his outstanding contribution to space research and exploration during the past five years.

The 1978 Allan D. Emil Memorial Award for international cooperation in space was presented to Glynn S. Lunney of NASA and Konstantin Davydovich Bushuyev of the Institute of Space Research in Moscow.

The International Institute of Space Law presented awards to Dr. V.S. Vereshchetin (USSR) and Dr. N.M. Matte (Canada) for outstanding and distinguished contributions to the evolution of the international law of outer space and in recognition of their efforts for world peace through international law and understanding.

On Saturday morning, the last day of the Congress, Stan Kent, winner of the first prize for a student paper, delivered Gordon Woodcock's paper on "Low Cost Space Transportation of the Future". He said costs of space travel should come down to compare with travel by jet today. A market is needed, he said, for a reusable vehicle. SPS provides this market, and a reusable heavy lift launch vehicle (HLLV) should bring costs down to \$34 per kilogram from the Earth's surface to low Earth orbit. This should come down further, to \$15 per kilogram as new technology develops.

G.C. Hudson of Foundation Inc., St. Paul, Minnesota, presented paper #78-233 on Advanced Propulsion Systems and Solar System Spaceships. Up to this point few papers assuming substantial advances

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*The Soviets have put up four times as many satellites as we have over the past two years, and their Salyut flies mockingly above us.*

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in science and technology had been presented. Hudson's paper described some possibilities that will arise if some of the theories now being researched could be reduced to practical hardware. Progressing from Project Orion, a system for propelling very large space ships with small nuclear fission bombs, through adaptations of the fusion process to the manufacture and use of antimatter, he showed slides and diagrams of possible space ships of the future. They would be about the size of a DC-9, and capable of carrying passengers or cargo for \$5 a pound with a 3½ to 4 hour transit time to the lunar surface.

Closing speeches were delivered at noon Saturday in the conference hall. Monsieur Barrere courteously thanked our Yugoslav hosts, and a bone-weary, but still game Professor Andjelic accepted on behalf of an also grateful Dubrovnik, and said a message from the Congress would be sent to the cosmonauts who, having spent more than 100 days in space, were at the time still orbiting above us in Salyut 6.

Looking forward to seeing all registrants in Munich next September 17-22, Monsieur Barrere announced the

election of Dr. Roy Gibson as the new President of the IAF and closed the conference.

To your neophyte correspondent it was a sometimes confusing, often enlightening, always challenging experience, not yet digested, but nonetheless vastly satisfying. The second echelon of American talent in space was well represented at the Congress and distinguished itself with a series of brilliant performances, but there was concern that the top American leadership, the Administration and some members of Congress in Washington, were less than enthusiastic, and that perhaps the country's top creative talent was dropping out of NASA and DOE.

There is reason for concern. Partisans like Proxmire, Abourezk and Ottinger remind me of those who criticized "Crazy Red" Jefferson's purchase of the Louisiana Territory, Seward's "folly" in buying Alaska, and Theodore Roosevelt's "outrageous" expenditures on the Panama Canal. Proxmire's "golden fleece" awards, by hobbling the space program, are fleecing us of our birthright!

Fortunately, however, as history has repeatedly demonstrated, a relatively few dedicated and determined souls can still change the world. There were many of them at the XXIXth Congress of the IAF. It is unrealistic to ask that everyone, or even that every U.S. citizen join in opening the new solar system frontier, but it is reasonable to ask our government to help build highways to orbit, to assist space homesteading and to aid space manufacturing with the use of extraterrestrial resources of the solar system. Except for the infinite amount of space available and the lack of hostile natives, the new frontier fundamentally resembles those that have been opened before.

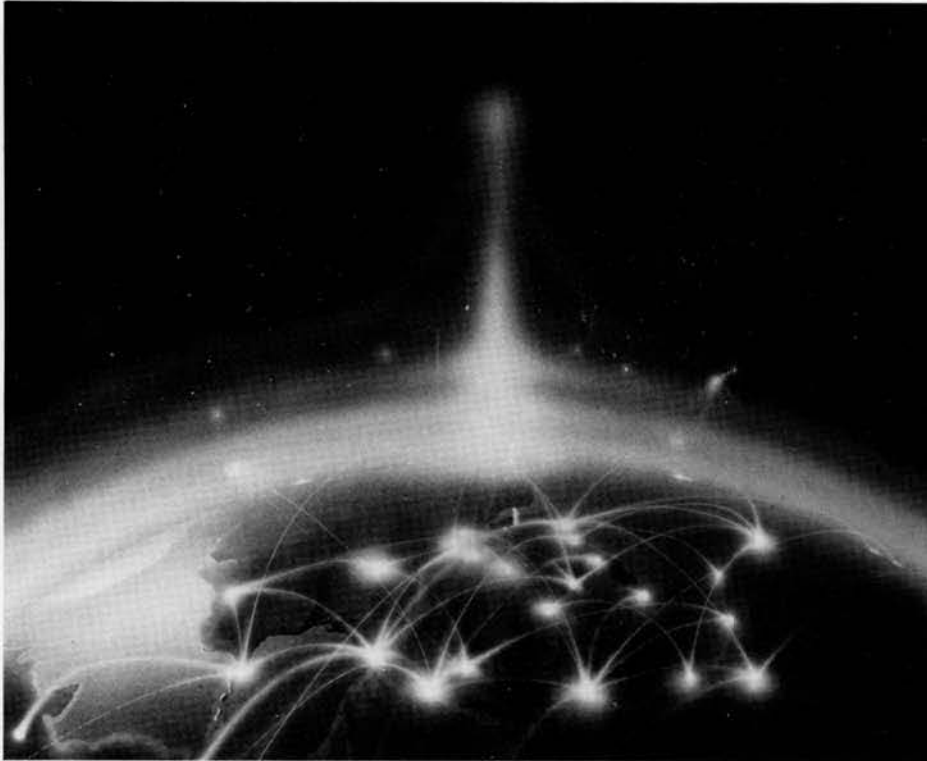
Russia is trying to assume the leadership we seem to be relinquishing. The Soviets have put up four times as many satellites as we have over the past two years, and their Salyut flies mockingly above us. Yet they often fumble the ball. As overheard in a side-bar conversation at the Congress, it is very difficult to develop high creative technology in a dictatorship. (God knows, it's hard enough in a bureaucratic democracy!)

In the opinion of this correspondent, in the many different faces at the Congress there were eyes looking to America, as eyes the world over have looked to us for 200 years, as the brightest hope for humankind.

Failure of leadership in the American space effort could be a calamity to our species, a catastrophe for our country, and a tragedy beyond all speaking for those who believe that dreams can come true.



# Theatre for the Future



The Theatre for the Future is a one-hour and fifteen minute computerized multi-media presentation. Barbara Marx Hubbard serves as "conductor" of a tour that covers the fifteen billion year drama of our evolutionary history through the present period of radical change. It culminates with "previews of coming attractions"—positive images of the future based on our growing capacities in all fields . . . what it might be like if everything worked!

It is one of the first post-modern visions of the future based on the achievements of Western Civilization—in religion, science, industry, technology — which affirm our faith in humanity.

"Previews" traces a logical rationale for hope based on the pattern of crisis, apparent limits, innovation and transformation which has operated from the creation of the material universe, through the formation of our solar system and Earth, single celled life, plants and animals, Homo sapiens to the present age, pointing to the year 1945 as the beginning of the new transformation. It provides a new, overarching perspective to understand the long-range directions for human growth and development.

Barbara Hubbard quotes Teilhard de Chardin: "the philosophy which will prevail is the one which calls us to action." She believes that the future is a contingency, not an inevitability. "In our society we have learned to organize against

injustice and problems. Now we must learn to organize for possibilities. The Theatre for the Future is a stage upon which to envision action for the future."

By condensing our fifteen billion year past into a rapid continuum of transformation, a "photo-genesis"—she identifies the patterns in the process of change and uses those patterns as indicators to enhance our roles as conscious and successful designers of the future.

In its performances to date "Previews" has played to a cross section of audiences and has demonstrated its appeal to a wide variety of people, from space scientists to government officials to humanistic psychologists.

Quotes about The Theatre for the Future:

"A flight of fancy? No. A consummate perception of reality mounted in a fanciful frame. A penetrating work that examines the existence of the universe minutely and offers humankind a valid reason for being and continuing to be. Tomorrow is provocatively promising for all humanity in Barbara Marx Hubbard's concept." (Margaret Adams, Public Affairs Editor, Good Housekeeping Magazine)

"The Theatre for the Future is very exciting and important. I feel very glowing about it." (Liz Campbell, Executive Officer, Assoc. of Humanistic Psychology)

"The presentation gave a message of hope. In addition it represented a unified

and well integrated approach to the future and has a message of critical importance for all people." (Dr. Frank Kapper, Science Advisor to the Joint Chiefs of Staff)

"I cannot recall ever having remained so still for two hours for anyone! The audio-visuals were beautiful and interestingly done, but diminished substantially in impact compared with the substance of your message." (George Robinson, Washington attorney)

"The Theatre for the Future is a compelling and creative answer to the seemingly omnipresent philosophers of doom in our society whose constricted imaginative powers enable them to see only famine, pestilence, and economic contraction on the horizon." (Congressman David Stockman, D-Michigan)

The production is designed to accompany Ms. Hubbard, providing her the freedom to address the specific interests of her audience. For example, she has recently completed her sixth keynote presentation to the U.S. Civil Service Commission's series of Executive Seminars, for government policy makers, applying the evolutionary perspective to long-range decision-making. The director of the conferences has asserted that he doesn't want to start a seminar without her—because she opens participants' minds to possibilities which transform their interpretation of the crisis they face.

"Previews" combines the familiar and the new to keep the audience engaged. Preproduced sections such as "the Divine and Secular Dialogue" on the creation of the universe, and the "Dawn of Human Consciousness" add theatrical excitement to the Theatre.

"The Theatre for the Future is more than theatre and more than a single idea," said Marvin Goldman, Washington, D.C. businessman and president of the National Association of Theatre Owners. "It is an experience which has changed my whole outlook on the present and the future."

Over the next year the Theatre will be booked for one-week stands in Washington D.C., Minneapolis, San Francisco, Houston, Atlanta, Los Angeles and New York. It will be available for organizations and special presentations with dates set for the International Convention of the Girl Scouts in Denver in October and the Association of Humanistic Psychology's national gathering on the theme: "Between Dreams—Toward a New Mythos" in Toronto in August.

*For more information, write to Theatre for the Future, 2325 Porter St. NW, Washington, D.C. 20008*

# Golden Sheep Drop honors cheap shots

This column normally appears only in a single newspaper and cannot, of course, hope to reach the audience available to a representative or a senator who issues a release to national media representatives. Sen. William Proxmire — Wisconsin's pride — can consequently count on an enormous audience when he makes his monthly Golden Fleece award (established in March of 1975) for the "most outrageous and ridiculous" waste of taxpayer dollars.

This column herewith establishes a Golden Sheep Drop Award, which will be conferred from time to time on the member of the legislative branch who has taken the cheapest shot at the easiest target for the purpose of getting his name in the media. The first award, a special triple-life-size, handsomely mounted specimen, goes to the foremost master of the cheap shot, William Proxmire himself.

There is indeed a horrendous waste of taxpayer's dollars, which can be traced back all the way to the expense accounts Gen. George Washington submitted to the Continental Congress. The proportion of tax dollars wasted has been fairly constant over the decades, rising as the population has grown, simply because systems coping with larger numbers become more complicated, and thus more subject to abuse. And the system that can't be abused has yet to be devised.

A percentage of waste is inherent in any large system, and while waste is outrageous — and can easily be made to look ridiculous — it is rarely deliberate. Most waste cannot be foreseen and occurs as the result of an honest effort to get something done that needs doing.

## When in Washington D.C. explore the planets

The National Air and Space Museum's new Exploring the Planets Gallery opened November 7. The Gallery takes visitors on a tour of the solar system via space missions and observations from Earth.

Photography, film footage and special displays illustrate how human beings and their machines have explored the planets and what has been learned.

Among the special exhibits is a "Flight Over Mars." Parts of the Martian landscape have been sculpted onto rotating cylinders which, when viewed through special windows, allow visitors to feel that they really are flying over Mars.

Visitors also may make a "Descent to Venus" in a simulated cockpit of an

Governmental waste has a peculiar cycle. It starts with a popular demand for government to assume a function — to do something — which is then enacted and funded by the legislative branch. It is then turned over to a bureaucratic entity — newly established or already existing — for implementation.

This organ — a department, bureau, agency or whatever — is a creature of the legislative branch, which has established it. Legislators have determined how many people, of what grade, can be hired, how much money is to be spent and what is to be done. The people who try to do it — our civil service — come from the same backgrounds all of us do; they are reasonably intelligent people trying to do what is often a difficult and always a thankless job as best they can. The legislative branch, which is responsible for all of it, spends an inordinate amount of its time picking at this work, jeering at the civil service, accusing it of waste, corruption, dishonesty and general malleasance, acquiring in the process a reputation (from an appallingly uncritical media) as vigilant guardians of the public purse, knowing all the while that the targets are not in a position to make any answer.

Proxmire's latest Golden Fleece went to NASA — for mounting a two-year, \$2 million program to communicate with other planets. (Proxmire is obviously referring to planets in other star systems.)

The same day as Proxmire's award, this newspaper carried an editorial pointing out that our country has been in a slow decline in scientific research for some time, because federal investment in research and

interplanetary spaceship, circa 2150. On this sightseeing tour, a computer voice gives landing instructions to the pilot as the Venutian landscape grows nearer on the "capsule's" video screens.

The Gallery includes an animated film on the planets for children, six computer terminals where visitors can take a quiz on the planets and videotaped weather reports from the other planets—by one of Earth's meteorologists, Gordon Barnes. There also is an area devoted to the emerging field of comparative planetology, comparing such factors as atmosphere and volcanism on different planets.

All the planets are presented in the Gallery and information panels, models,



by Donald Morris

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The Houston Post

development has dropped 77 percent since 1965. It is the cheap-shot artists in the legislative branch — led by the Proxmires — who can claim the lion's share of the credit for that. It is they who choke the funds, and in between ridicule the existing projects in basic research, playing for the indignant outrage of ignorant and anti-intellectual constituencies.

In the present case, the world's scientific community is overwhelmingly certain that intelligent life exists elsewhere in this galaxy. Scientific (as opposed to popular) belief is also overwhelmingly certain that no extraterrestrial beings have yet landed on our planet, and equally certain that mankind will not be able to travel beyond the limits of this solar system within the framework of our current technology (i.e., for a number of centuries to come). The chances of extraterrestrial beings reaching — or at least communicating — with us are thus considerably better than the chances of our being the first.

A program to cope with interstellar communications is thus reasonable and sensible and on the current modest scale no waste at all — certainly not an "outrageous and ridiculous" waste. Imagine the outcry (and guess who would lead it), if the millenium were to arrive with an indubitable encounter and there we were, with our bare faces hanging out and not a vestige of a framework for responding.

How long will it take this nation to realize that the real misgovernment, the real waste, the real clowning, is not lodged in either the civil service or the executive branch?

photographs and special exhibits give their vital statistics summarizing what is known or deduced today. As new data is gathered, the exhibits will be changed.

The final section in the Gallery is entitled "Unanswered Questions." Superimposed on illuminated photographs are a set of questions that have stumped scientists for centuries, such as "is Pluto an escaped moon of Neptune?" or "what is Jupiter's red spot?" In several years, hopefully, the name of this particular section may have to be changed to "Answered Questions."

The National Air and Space Museum is open seven days a week from 10 a.m. to 5:30 p.m. Admission is free.

Ученым НАСА удалось перевести терявший высоту «Скайлаб» на более высокую орбиту. ↑ Курс доллара продолжает падать на всех биржах мира.



— Поднять курс доллара? Здесь наука бессильна, сэр!

Рис. В. Фомчев.

Caption at top: "NASA Scientists were able to fix the falling height of "Skylab" ... the course of the dollar continues to fall on all world markets." The rocket is labeled "Skylab", the meteor trail is labeled "market course". The remark at the bottom says "Correct the course of the dollar? Here science is helpless, sir!" (Reprinted from *Izvestia*, August 1978, courtesy James Oberg.)

# NASA Squelches US/USSR Cooperation Talk

*News flash — December 18 NASA announced that the US "save Skylab" mission has been cancelled due to excessive solar storms, difficulties with Skylab control systems and shuttle development delays which have pushed back the first date for a rescue to April 1980. Some NASA insiders claim, however, that the Soviets could reboost Skylab if we were to initiate a joint rescue mission soon. The following is the text of the NASA Memorandum, dated September, 1978, which has muzzled proponents of a Soviet aided Skylab rescue.*

*(Text of a NASA memorandum dated September 7, 1978)*

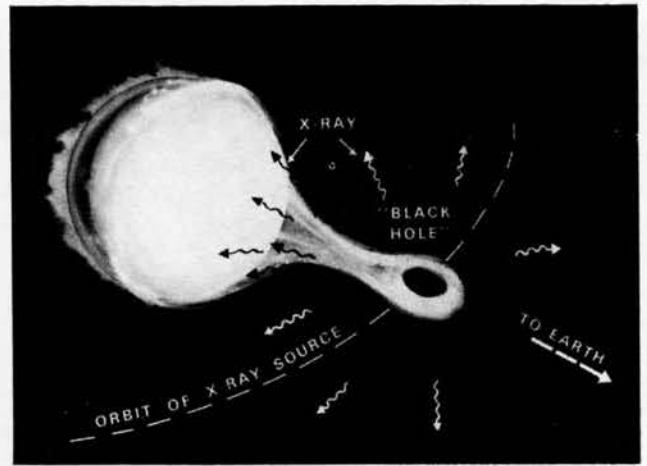
There have been recent press inquiries concerning future US/Soviet space cooperation. In view of the sensitivities of this subject, any response you make to such inquiries should be along the following lines:

"We have had a successful program of space cooperation with the Soviet Union for several years. This program has included the jointly-manned Apollo-Soyuz Test Project and a wide variety of unmanned activities of the two sides. A 1977 agreement between NASA and the Soviet Academy of Sciences calls for a study of the objectives, feasibility and means of carrying out a joint experimental program involving the US Shuttle and the Soviet

Salyut. Preliminary discussions on this subject were held in Moscow last year. No further discussions have been scheduled pending a comprehensive US interagency review of the entire subject. We cannot predict when this review will be completed or what the outcome will be."

Any inquiries which might take you beyond this statement should be discussed and cleared with NASA Headquarters Public Affairs and International Affairs.

One other different kind of comment—in general, we should not comment on successes or failures of foreign space activities without NASA top management approval.



**Space Phenomenon under Study**—The structure of a black hole as envisioned by scientists shows the gas clouds of a visible star swirling around and into the X-ray source or black hole. It sucks in vast quantities of matter as it orbits the star.

## Copernicus Finds Second Black Hole

After a two-month search, the Goddard Space Flight Center's Copernicus satellite has located what may be a second invisible "black hole" in the universe in the constellation Scorpio. The satellite's X-ray experiment found the black hole, believed to be a super-dense collapsed star with such strong gravity that not even light can escape it.

"This is the second black hole found in our galaxy," said co-investigator for the project Glen Pollard. "It is much more active and convincing than the first, Cygnus X-1."

The invisible black hole is orbiting Scorpio V-861, a super giant star which can be seen with the naked eye from Earth. It is gradually siphoning away the larger star's atmosphere.

The massive amounts of X-rays released from matter as it is transported from the giant star led the scientists to what another co-investigator, Ronald Polidan, calls "the best black hole yet."

Most importantly, the scientists say, the discovery has given astronomers their first opportunity to study a black hole as it passes behind its companion star. The new data will give astronomers a chance to test some of their black hole theories. Pollard hopes the new information will define the shape of the cloud of stellar material being sucked into the black hole, thus revealing some of the dynamics of black hole systems. It also may provide a measure of the quantity of material being removed at speeds up to 3.2 million kilometers per hour.

Studying black holes also will extend astronomers' knowledge of physics into realms of laws not observable on Earth—the Physics of Relativity.

# Astronaut Candidates Learn Water Survival Techniques

Sixteen astronaut candidates from the Johnson Space Center spent July 31 to Aug. 4 in training at the Homestead Air Force Water Survival School in Florida. Most of the 35 astronaut candidates had experienced the water survival training before entering the NASA program. Included among the 16 are the 6 female astronaut candidates now in training.

Each day's activities during the course included classroom lectures on water survival techniques plus actual training in the water environment. Briefings on procedures preceded each activity.

The training also covered jumping from a tower while wearing a tethered parachute harness, and sliding down a wire to a landing in the water. The candidates also were towed through the water in a parachute harness, a simulation of being dragged across the surface by parachute and having to accomplish release.

Other exercises required astronaut candidates to be towed aloft under a parasail canopy, land in the water and be picked up by boat. On the final plunge into the water suspended from the parasail, astronaut candidates came down with full survival gear. A helicopter picked them up from a life raft.

The Air Force Water Survival School is operated by the 3613th Combat Crew training squadron with headquarters at Fairchild Air Force Base, Wash.



**Splashdown!**—An astronaut candidate hits the water after sliding down the wire from a 13-meter tower. Afterward, the student must release from the parachute harness, swim under a parachute canopy and climb into a life raft.



**Determined Effort**—Candidate Sally K. Ride swims toward the dock in a Florida canal at the water survival training site after the "drop and drag" phase of training.



**No Bellhops Needed**—Astronaut candidate Judith Resnik carries training gear to a large freshwater tank at Turkey Point, Fla. to clean saltwater from equipment, a program requirement.

# Mining the Moon

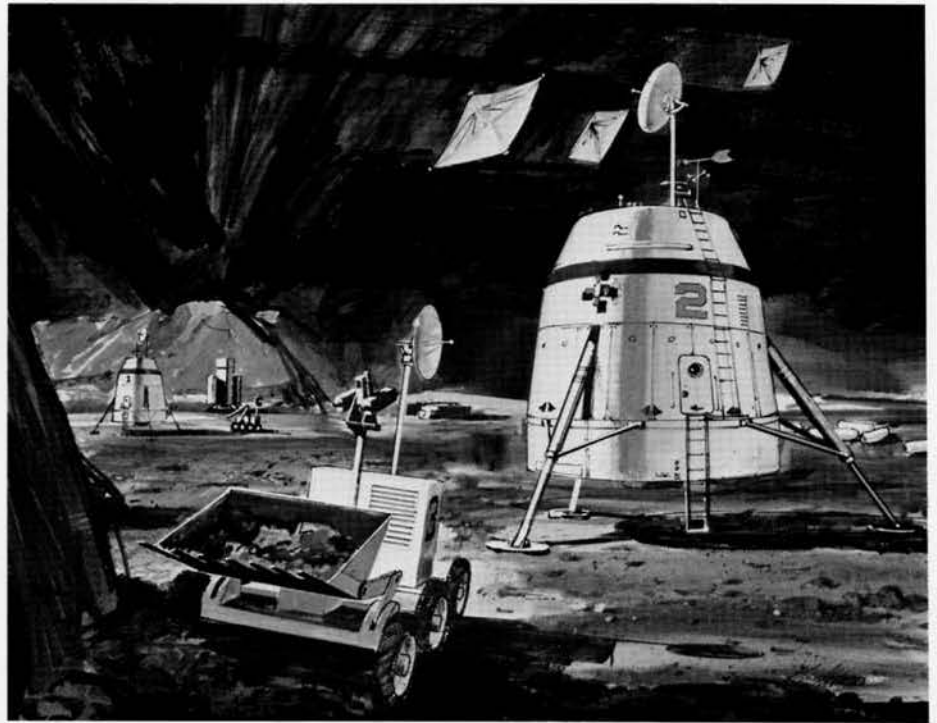
by William N. Agosto

Most of the studies I've seen on processing lunar materials for industrial use focus on smelting metal out of oxides and silicates in lunar soil. But there is a much more accessible metal resource on the Moon. It is metallic nickel-iron powder which makes up about a half of a percent by weight of the finely divided lunar soil. About 10% of Moon soil metal is in the form of free standing metal particles without silicate or other non-metallic attachments. That means that approximately 2 billion metric tons of pure nickel-iron powder are available in the top 10cm of soil over the entire lunar surface. And there's more below. The idea that high energy chemical engineering has to be used to obtain structural metal from the Moon is probably Earth metallurgical chauvinism. There is, after all, no free iron to speak of in the Earth's crust. But on the Moon, you can scoop it up with a magnet.

Nickel-iron is the most magnetic fraction of lunar soil. Several magnetic passes at the proper field strength may extract soil metal to 98% purity (1). And there are electrostatic techniques for separating soil metal as well. One method called tribo-electrification was reported by Ion Inulet of the University of Western Ontario at the Lunar Planetary Conference in Houston last spring (2). Tribo-electrification separates particles according to size, dielectric constant and conductivity. It has been used to separate hematite iron ore from slag and carbon from fly ash in industrial exhausts. It can be automated, uses little power, and works best at low humidity. In the dry lunar environment, it could be a very effective soil separating process, not just for iron, but other particulate minerals as well.

The metal powder thus obtained can be fabricated into machine parts and tools by powder metallurgical techniques which mold the finished product directly without machining. As a matter of fact, in the dry lunar environment it might be possible to substantially reduce powder sintering temperatures and pressures of about 800°C and 10,000 psi used on Earth (3). Alternatively, the metal powder could be melted in solar furnaces, residual slag skimmed or vaporized, and the metal parts evaporated directly onto core molds using the techniques proposed by Drexler and Henson (4).

The high nickel content of the powder alloy (about 10%) will toughen the finished product and probably more than



*An artist's concept of a lunar mining base.*

compensate for residual non-metallic inclusions. There is very little chromium (less than 0.1%) and correspondingly more phosphorus (about 5%) in lunar metal. But anticorrosive components like the chromium in Earth stainless steel may not be necessary in space metal under the low oxidizing conditions of most cislunar applications.

Extremes of processing temperature can be readily maintained on the Moon, for example, in underground cryogenic (super cold) chambers. Molten metal could be poured directly into lunar cryogenic pits to achieve the precipitous cooling rates necessary to make metallic glass (one million degrees C temperature drop per second). Metallic glass has many desirable properties. It is far more corrosion resistant than standard crystalline metal of the same formulation. It has three times the tensile strength of steel and withstands 50% more shear stress. It also has very versatile electromagnetic properties that make it suitable for magnetic memory and superconducting applications (5). Metallic glass could be made on the Moon and might become the ideal source of superconducting magnets for mass driver operations in space.

The more you look at the Moon, the better it looks from the industrial point of

view. There are abundant stores of aluminum and titanium ores in an already finely subdivided state. There are implanted volatiles and carbon from the solar wind in the soil and a host of glass making components. But Moon metal is probably the most accessible space structural resource of them all.

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# Carter Sets Space Policy

by Leonard David

*Carter space program "will reflect a balanced strategy of applications, science and technology development."*

President Jimmy Carter has released the long-awaited official space policy for the Nation, designed to "set the direction of U.S. efforts in space over the next decade." The ink had hardly dried on the document before space critics complained of its inadequacies, and two senators introduced separate space policy bills.

The White House U.S. Civil Space Policy comes as a result of a four-month interagency review requested by the President back in June of this year. Many Washington, D.C. space watchers, both official and unofficial, have given the Presidential policy a C-, pointing to its lack of goals and deficiency in establishing a base for America's space future.

The Carter policy centers on three principles, with prime interest given to a space program which "will reflect a balanced strategy of applications, science and technology development," according to a White House press statement. The key elements of this program emphasize Earth applications, such as climate, weather, pollution, and resource monitoring satellites and a space science and exploration program that is vigorous, yet provides for a "short term flexibility to impose fiscal constraints when conditions warrant." Also outlined are supportive statements of space cooperation with other nations, as well as the need to take advantage of the Space Shuttle's flexibility to reduce the cost of operating in space.

A second specific aspect of the policy notes that "more and more, space is becoming a place to work—an extension of our environment. In the future, activities will be pursued in space when it appears that national objectives can most efficiently be met through space activities." The policy's third theme is bound to put a damper on those ready to dip into zero-gravity swimming inside a space colony anytime soon. States the policy, "It is neither feasible nor necessary at this time to commit the U.S. to a high-

challenge space engineering initiative comparable to Apollo. As the resources and manpower requirements for Shuttle development phase down, we will have the flexibility to give greater attention to new space applications and exploration, continue programs at present levels or contract them. To meet the objectives specified above, an adequate Federal budget commitment will be made."

As for power-generating satellites, the Carter policy is equally as direct. "It is too early to make a commitment to the development of a satellite solar power station or space manufacturing facility," relates the policy, "due to the uncertainty of the technology and economic cost-benefits and environmental concerns." But, as if to give space colonizers something to hang their helmets on, the

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*"More and more, space is becoming a place to work—an extension of our environment."*

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Policy continues on to suggest that "there are, however, very useful intermediate steps that will allow the development and testing of key technologies and experience in space industrial operations to be gained. The U.S. will pursue an evolutionary program that is directed toward assessing new options which will be reviewed periodically by the Policy Review Committee (Space). The evolutionary program will stress science and basic technology—integrated with a complementary ground R & D program—and will continue to evaluate the relative costs and benefits of proposed activities."

As for the Space Shuttle itself, the Carter Administration appears willing to support incremental improvements in the Shuttle's system, with "decisions on extending the Shuttle's stay time in orbit and future upper stage capabilities (e.g., the reusable

space tug and orbital transfer vehicle) to be examined in the context of our emerging space policy goals.

Following on the heels of Carter's Policy comes S. 3530, a bill introduced by Senator Adlai Stevenson III (D.-Ill.). Stevenson's "Space Policy Act of 1978" calls for extensive use of the Shuttle during a 10 year period for "the design and construction in space of a first generation of structures for the purpose of communications, remote sensing, experiments in electric power generation, human habitation, and other applied and scientific uses."

Solar power satellites are discussed in the Senator's bill which entails "the design of prototype systems for generation of electric power to be transmitted to Earth and, upon a favorable determination of the effect on humans and the environment and favorable economic and reliability comparisons with alternative energy systems, testing in space of such prototype systems." Not quite a full blessing, but a start. Additional trappings of the Stevenson policy include standard support of space science and Earth-oriented application programs.

By far the most wide-ranging space policy bill comes from someone who has been out there and back, Apollo 17 astronaut, and now Senator, Harrison Schmitt (R.-N.M.).

Schmitt, who just barely squeezed out the bill before Congress locked its doors until next session, details a 30 year plan that would make every space-hungry colonizer sign up for action. Labeled "The National Space and Aeronautics Policy Act of 1978," Schmitt's policy is based on a "World Information System," an "Orbital Civilization," and a "Second Solar System Exploration Decade." These building blocks would be integrated with "the development of other space and aeronautical activities in order to preserve and expand the leadership of the U.S. in

space."

Schmitt's bill is largely based on a speech he presented in late September at the annual gathering of the Institute of Electrical and Electronic Engineers (IEEE). At that time, Schmitt called the Carter Administration's "no-vision" policy for space a "disaster." "Rather than exerting the leadership that the American people and the world expect, Carter has continued and appears on the verge of accelerating the policies of retrenchment begun by Nixon," asserted Schmitt.

In his space policy plan, Schmitt focuses on a space cooperative consisting of private, governmental and international ventures to the year 2010. The first phase, to the year 1990, calls for the creation of an operational "World Information System," which includes expanded telecommunication operations and a weather & ocean forecasting network, coupled with an operational Earth resources monitoring system.

By the year 2000, basic facilities and capabilities will be developed to create an "Orbital Civilization" in the near-Earth space. These facilities will foster orbital research, space and Earth power production and generation, education, manufacturing, health care, and "space recreation opportunities for as broad a spectrum of human beings as possible."

Senator Schmitt's policy states that by the year 2010, a base with eventual permanency will be constructed on the Moon; exploration of Mars with establishment of bases on the red planet will have been accomplished along with missions of explorers to the planet Venus. The settlements on the Moon and Mars would be, in part, if not largely, supported by the commercial sector, becoming self-sufficient within 10 years or less.

Space observers categorize Schmitt's policy as over-ambitious. "He's still a newcomer to the game," states one Capitol watchdog. Others see the Stevenson policy as more palatable, established on "fiscal realities of the day." Some call Carter's space policy as the best to expect, given the economic climate of the country, and see a need for cost & technical evaluations of Shuttle capabilities. In other words, the Office of Management and Budget holds the reins on future space growth.

An important element which runs through all three policy statements is the ever-increasing concern of maintaining America's world leadership in space, while establishing and fostering cooperative international space projects. Also, with the rise of anti-satellite testing, the policies promote the assurance that space will remain safe and peaceful, void of claims of sovereignty.

## Carter's Pilgrimage To the Stars

By Leonard David

"I am often asked about space factories, solar power satellites and such other large-scale engineering projects in space. In my judgement, it is too early to commit the nation to such projects. But we will continue the evolving development of our technology, taking intermediate steps that will keep open possibilities for the future."

So said President Jimmy Carter, October 1 at the Kennedy Space Center in Florida. Celebrating his 54th birthday and NASA's 20th, Carter reflected on the past and future of the space program during a twenty minute speech before several thousand Space Center workers and their families.

The occasion also marked the presentation of the first Congressional Space Medals of Honor to five veteran astronauts and the widow of Virgil Grissom who was killed in the testing of an Apollo spacecraft in 1967.

In general terms, the President lavishly praised the Nation's space program, stating "... there is nothing in scientific and technological experience to compare with the enormous leaps we have made in the brief span of the two decades of the space age. We have performed what any generation would have considered miracles. We have taken the stuff of fantasy and dreams and we have turned it into accomplishment and reality."

Carter paid tribute to a wide range of space projects, from the Apollo program to Skylab, Pioneer 10, and the Viking landings on Mars, but focused primarily on the new view spaceflight has given of our planet Earth. "Through the eyes and the cameras of the astronauts," commented the President, "we saw our world as a single delicate globe of swirling blue and white, green, brown, from the perspective of space; our planet has no national boundaries. It is very beautiful, but it is also very fragile. It is the special responsibility of the human race to preserve it. Of all the things we have learned from our exploration of space, none has been more important than this perception of the essential unity of our world."

In contrasting the last two decades of space exploration with the Shuttle era, Carter emphasized that the future looks "... as exciting as anything that has gone on before." "With the ability to lift a payload

of up to 32 tons into orbit on mission after mission, the Shuttle will give us regular frequent and economical access to space. Like the sea, the land and the air, space will become an environment in which human beings can live and work for the welfare of their own species," the President stated.

Quoting a \$100 billion pricetag for our American space program to date, Carter remarked that "it is now time for us to capitalize on that major investment even more. We have already reaped many practical benefits from space. Over the next generation, these benefits will increase geometrically."

While casually tipping his hat to communication, weather, and Earth resource satellites, and the services they render, Carter dropped a diplomatic bombshell by acknowledging publicly this country's use of spy-in-the-sky satellites. Becoming the first President to officially announce their existence, Carter called them "an important stabilizing factor in world affairs in the monitoring of arms control agreements." He also stressed their "immense contribution to the security of all nations. We shall continue to develop them."

With a backdrop comprised of a towering simulator of the Space Shuttle, the President stood within the space center's huge, eight-acre Vehicle Assembly Building and described the period of Saturn-Apollo missions as "pilgrims in space, ranging far from home in search of knowledge. Now we will become shepherds tending our technological flocks, but like the shepherds of old, we will keep our eyes fixed on the heavens."

For the 1980's and 1990's, Carter said that the United States will continue direct investigation of our solar system and, using the space telescope, new discoveries may lead to a "... quantum growth in our understanding of the basic nature of time, matter and energy." In the closing moments of his presentation, the President declared that "in the coming generation, the scope and the range of our space activities will reflect the range of our requirements and interests as a vigorous, responsible and free society. Those activities will be measured against all the needs of our country. We will be encouraging other countries to participate both in the work and in its benefits. But we will not give up the leadership of the United States in space."

*Leonard David is Director of Programs for the Forum for the Advancement of Students in Science and Technology.*

# Announcements:

# \$100,000 Mitchell Prize

## 4th Princeton/AIAA Conference on Space Manufacturing

### *Call for Papers*

The 4th Princeton/AIAA Conference on Space Manufacturing will be held at Princeton University May 14-17. Topics to be covered include:

- space manufacturing facilities
- trajectories
- asteroidal resources
- propulsion and mass drivers
- chemical processing
- industrial operations
- systems, economics and products

habitat design & scenario development  
life support and space agriculture  
life sciences  
social sciences and humanities.

Abstracts of papers are due by Jan. 12. Authors will be notified of acceptance by mid-February. March 16 photo-ready manuscripts are due.

Send abstracts to: Prof. Gerard K. O'Neill, Princeton University, Box 82 Princeton, NJ 08540.

Houston, Dec. 11, 1978 — Guidelines were announced today for the 1979 Mitchell Prize, which offers \$100,000 in cash to individuals "demonstrating the highest degree of creativity in designing workable strategies to achieve sustainable societies."

The Mitchell Prize, established five years ago by George and Cynthia Mitchell of Houston, will be presented at the third Woodlands conference on Growth Policies, which is scheduled for Oct. 28-31, 1979, at The Woodlands, a new town near Houston.

One first place award of \$10,000 and eight awards of \$5,000 each will go to winners of an open competition which seeks to encourage "creative, constructive thinking about the nature of sustainable societies."

Another \$50,000 will be given for specially prepared papers on themes directly related to the agenda of the 1979 Woodlands conference. These papers will be commissioned by the conference sponsors.

The Mitchell Prize is being administered by the University of Houston System, and winners will be selected by an independent panel of judges. The first round of judging will be based on written summaries of proposed entries, which may take the form of research, a scholarly paper, film, engineering drawing, working model, computer model, or any other appropriate medium. Maximum length of each summary, which must be in English, will be 2,500 words. Initial entries must be postmarked by Feb. 28, 1979.

Background information, significant rules and application forms — which must accompany all entries — are available from: Woodlands Conference, University of Houston, 312 C & O, Houston, TX 77004.

Participation in the Mitchell Prize competition is being encouraged in more than 150 countries around the world. In addition to receiving cash awards, the winners will be invited to take part in the Woodlands Conference on Growth Policies, and their papers or entries will be included in publications that are expected to emanate from the October 1979 meeting. The conference is part of a ten-year series of international biennial assemblies aimed at stimulating research and discussion into problems associated with growing demands for the earth's available resources.

## \$2,000 SPACE SCHOLARSHIP

### OFFERED BY NATIONAL

### SPACE CLUB

The National Space Club has announced that they are offering a \$2,000 scholarship for studies in the field of space research for the 1979-1980 academic year. Applicants must be U.S. citizens in either their junior or senior year of college.

Anyone wishing to apply for the scholarship should send the following:

1. Transcript
2. Letters of recommendation from faculty members.
3. Accomplishments which demonstrate personal qualities of creativity

and leadership.  
4. Scholastic plans.  
5. Personal financial needs.  
Applications must be sent before January 15, 1979 to this address:

Mr. James M. Murray  
c/o National Space Club  
Suite 700  
1629 K St. N.W.  
Washington, D.C. 20006

The lucky winner of the scholarship will be announced March 30, 1979.



# Congress Views Space

by Paul J. Werbos

*Congress is taking a serious look at space. Proper information could be a key factor to the outcome.*

This year, the economic exploitation of space has "taken off" in Congress. Many bills were introduced last year, and many bills are planned for next year, to make sure that the full economic benefits of space are actually realized.

So far, it has been a case of idealism and science colliding with political and economic reality. No major bills have passed so far, though many have come close. The Maryland Alliance for Space Colonization (the regional branch of L-5) has been closely involved in many of the discussions between supporters of space and Congressional advisers. It is our impression that really major bills *can pass* this year, if we face up to the lessons of the past year. MASC has learned lessons in three broad areas—grand strategy, strategy and tactics—which may be of use to other branches of L-5.

First, grand strategy: what kinds of bills will really lead to the exciting kind of future advocated by O'Neill?

One thing we should *not* do is maximize the number of bills passed; major speeches by the President might help focus attention on the "vision" of space, but bills which "support" space without mandating action or funds are not likely to be of much value. Furthermore, bills which require government departments to assess the possible value of space for their department may generate a lot of last-minute guesswork but very little serious analysis, unless funds and procedures are specified.

Second of all, we must not imagine that every dollar voted for space will really help our long-term goals. There is a definite parting of the ways shining in between Glaser's current concept of Earth-launched Space Solar Power Satellites (SSPS) and O'Neill's concepts of the "high frontier." For awhile, it looked as if Glaser's concept might be a useful here-and-now steppingstone to O'Neill's goals.

No one expects Congress to commit us to O'Neill's concept of large-scale space habitats; people in NASA are almost paranoid about the public relations aspects of the idea.

However, there is a better steppingstone available: the notion of space manufacturing. Space manufacturing, even with the use of extraterrestrial materials, is much closer to the real world, as perceived by NASA. O'Neill's schedule for space settlement (Astronautics, March and April 1978) requires that we concentrate money in these two areas—space processing and extraterrestrial materials—for several years and for billions of dollars into the future, before we do anything more. A serious program of space industrialization would *fully implement* this schedule, just as efficiently

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*...bills which "support" space without mandating action or funds are not likely to be of much value.*

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as if O'Neill himself were free to spend the money on his own plan. It is a perfect steppingstone.

On the other hand, the Glaser plan may be a very poor steppingstone. First of all, it does not put any money at all into the two major areas required for O'Neill's objectives. If the concept ever received funding on a large scale, this would commit our country to heavy expenditures on space which *do not* help us reach our long-term goals; it would make it much, much harder to get the billions we need.

As long as we are discussing small-scale funding, however, we do have something to gain by establishing a coalition with Glaser supporters; the present Sunsat bill may allow funds to be divided between the Glaser and O'Neill versions of SSPS, and it

can be very helpful with the problem of energy transmission as opposed to power generation. Even the aerospace companies now behind the Glaser concept are likely to become open to better alternatives, if they decide that people in Congress are serious about wanting to look at the alternatives.

So much for the grand strategy. If we can agree that space manufacturing, with the use of lunar material and the option to build SSPS in space, should be our main priority, then how do we convince Congress?

North American Rockwell has put together a detailed report on the possibilities of space manufacturing. This report has excited a number of Senators, who have begun to write bills to implement the Rockwell plan. The report has been studied by a number of high-level government economists, who have come back with some very hard questions. In facing these questions, we must remember that most people in Congress have not really made up their minds about space activity; if we treat people as enemies simply because they ask questions about incomplete arguments, then we will generate enemies.

The biggest three problems they found with the Rockwell report were as follows: (1) Why shouldn't private industry pay for all these programs, if they are indeed profitable? Since private industry has enough money for each small project, since it has more technical expertise than the government does in manufacturing, and since they are maximizing profit in a way which reflects the national economic interest, then why should the government become involved? (2) Isn't the discussion of jobs and economic multipliers an appeal to the naive and the pork barreller? Yes, there is a "multiplier effect" in getting new jobs, but couldn't we just as easily spend the money somewhere else (or in a tax cut) to get the same effect? There are so many

small, unrelated options that it begins to look like a "fishing expedition" or a "Christmas tree wish list." The political and economic issues with *each one* of the manufacturing options require detailed analysis, and a bill which incorporates a more complete plan than just dollars for hardware.

After an analysis of the Rockwell report, and of preliminary versions of new bills, these economists did *not* come up with a negative view of space manufacturing on the whole. However, they felt that legislation should be written in a different direction, to emphasize the real economic possibilities of space manufacturing rather than the current interests of technical people. Also, they felt that there should be new reports and analyses to fill the holes on the economic side. They emphasized three large economic payoffs which can justify large-scale government spending on space manufacturing:

(1) An "insurance policy" in the energy field. There is no source of energy at all which is *guaranteed* to produce energy at a bearable price, safely, in adequate quantity, when the world supply of oil begins to get tight. Thus it is a major national goal to try to minimize the probability that our economy falls apart 20 or 30 years from now. Well-trained economists recognize that classical interest rates and capital theory *do not* adequately recognize this kind of objective; thus private companies, acting on classical incentives, do not have enough incentive to minimize this probability.

Space manufacturing opens up *two* energy options (or more) for the price of one: (a) SSPS made in space, as suggested by O'Neill; (b) large quantity, low cost manufacturing of solar cells for use in space or *Earth*.

Uncertain as these payoffs may be, these options still have a major value as a "hedge" against the failure of fusion, the thorium breeder, etc., to work out at a low enough cost. The "insurance policy" approach would also argue for expanded funding for other alternate energy sources, not a reallocation away from them to space.

When it comes to supplying the entire U.S. and the world, we can afford only one major source of electricity, not dozens of options; however, for medium-scale demonstration, it is essential that we *do* develop as many options as possible, so that we can be sure that the best option will be known and available to us to supply our expanding needs quickly. It was strongly recommended that these points be developed in detail, both to minimize the "fishing expedition" impression and to put ourselves on firmer economic ground.

(2) *Spurring innovation* in US industry. Due to a lack of competition, legal problems, and many other factors, the rate of innovation and research has declined dramatically. These "structural problems" reduce industry's ability to exploit *any* opportunities for innovation, in space or on Earth. Many top economists are very scared about what Japanese, Europeans and even Russians might do to our economy five to ten years from now; the present problems of the dollar could become the first push of a tidal wave.

In the 1960's, NASA established a large, firm and measurable record as a stimulus to innovation. (Some economists ascribe *half* the innovation in the US economy in that period to NASA stimulation; indeed, one need only think about microcircuitry, and what has happened since NASA phased down, to see that this makes sense.) A broad-based program of research in manufacturing techniques, coupled with an applications program, is certain to work as well or better than Apollo in this area. Other strategies have been tried, but none of them has been nearly as effective as NASA. At any rate, a program in space manufacturing would complement other

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*. . . extra spending on space manufacturing may create or maintain jobs, not inflation.*

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strategies to spur innovation, not compete with them.

A "NASA" strategy, unlike a simple taxbreak strategy, would make it realistic for small new firms to sell products or exploit techniques which the larger companies stall on. Given how urgent the innovation problem is, it is important that the "NASA" strategy to spur innovation has been tried and proven to work on a large scale; any attempt to use a watered down version of this strategy would risk failure.

(3) *Mobilizing resources and helping us adapt to lower defense expenditure.* A dollar of government expenditure generates two or three dollars of demand. This "multiplier effect" is about the same with space as with any other area of government spending; thus it is not true to say that "space generates more jobs because of the multiplier effect."

It is realistic to expect that space will create more jobs, but not because of the multiplier effect. In technical terms, there is an issue called "sectoral balance." When you spend a dollar to pay a salary to someone who otherwise would be unemployed, you generate more work and more output. When you spend it to buy

something which is already being produced at maximum capacity, you bid up the price; you generate inflation, not more production. (Also, secondary demand can be "tuned" to make sure we get 100% benefit from the difference.) *The only real "cost" of government spending is the inflation which it generates; when you can use the money to mobilize unused resources, the real "cost" is mostly an illusion.* In the aerospace sector, it seems likely that the nation still has unmobilized resources, and will continue to have them, especially if we continue to reduce weapons expenditures as a percentage of GNP. Lunar materials certainly constitute a large unmobilized resource, central to what we are proposing.

Aerospace people *could* be given employment in make-work projects, in places like Seattle and California, but their output under those conditions would not be nearly as high (in "dollars", which is the basis of our program cost evaluation) than it would be in their own field. Thus *even when total government expenditure has reached inflationary levels in the social services sector, extra spending on space manufacturing may create or maintain jobs, not inflation, in addition to providing direct economic benefits.*

Finally, the Congress is very concerned about international cooperation, finding a role for the Third World without upsetting them, etc. Some of these questions are so complex that they should be explored *concurrently* with the technical research, and given significant funding as part of any space manufacturing bill. Perhaps as part of any new space bill, the President should receive an explicit mandate to negotiate the possibility of internationalizing some or all of these efforts at the earliest possible time, with "ERTS" and other surveillance activities under the UN, energy-related activities connected to the International Energy Association, etc.

On the tactical level, many people have admonished us to keep 100% quiet about the idea of space habitats and to avoid at all costs concepts like "creative evolution," etc. This we have found to be a half-truth.

As a practical matter, we would now recommend a 25-50-25 strategy: 25% discussing innovation (as above) and related nitty-gritty issues; 50% discussing energy security and the "insurance policy" idea; 25% discussing O'Neill's idea, *as an option* to be kept open and as a way to overcome forever the limits to growth. Many economists in industry and labor are dead-serious about making sure that the "limits to growth" are indeed overcome.

We have found it essential to work closely with groups, like B'nai B'rith, which are seriously concerned about

energy security and energy independence. Congress is also surrounded by hordes of social climbers, and it may be tempting for the novice to take the attitudes of these people too seriously; in general, however, it is not worth wasting time with people who care more about preserving their cliques than about the content of what you have to say.

Even a handful of articulate constituents can easily get the attention of their Congressman's staff, enough for you to be very important in the process, *if* you are willing to listen and do your homework. Even one well-written letter to your Congressperson can make a big difference. *After* you know what questions your Congressperson has about space industrialization (check his or her testimony before taking up anyone's time!), you may find it possible to serve as an "unpaid staff member" and obtain answers to these questions by your own detective work.

This spring and summer, letter-writing will be very important, both in the House and the Senate. Those of you who are willing to learn to become speakers should plan now to sharpen your skills, and try to be ready to speak to a variety of other groups and clubs this spring; in this way, we can get letters or letter signatures from many more people than L-5 members proper.

## US Space Legislation Roundup

Solar power satellites ended up with \$2 million more than OMB's request; the extra money is attached to the NASA budget, a compromise between the House's \$3 million and the Senate's none. This is in addition to the \$3,341,000 DOE is spending in-house in FY '79 and \$1,300,000 it is contracting out through NASA.

Advanced Programs had \$2 million tacked on to the OMB \$5 million request, bringing its FY '79 funding up to the level of FY '78. This is less, however, than the House request for a total of \$12 million, the size of the FY '77 budget.

Search for Extraterrestrial Intelligence received \$2 million, in spite of "Darth" Proxmire's Golden Fleece award.

Lunar Sample analysis had \$4.5 million cut from its budget.

Spacelab II lost \$1.2 million.

The teleoperator retrieval system received the entire \$20.5 million of the Senate request. However, NASA may only commit \$10 million of this until it can prove that Skylab can be saved.

The "High Frontier" amendment passed, but the money appropriated with it

was deleted. Chances that the heads of NASA, NSF, DOE and the President's science advisor will approve diversion of NSF's funding to space colony research are almost nil, according to a House Science and Technology committee staffer.

The Solar Power Satellite Research, Development and Demonstration Act died in the Senate committee. Rumor has it that the chief staffer for the Energy R&D Subcommittee, Pete Smith, wrote Sen. Abourezk's anti-SPS testimony. Please note, however, that arguing with a Senate committee staffer is usually worse than hopeless.

The "High Frontier" resolution, HR 451, also died in committee.

A \$4.5 million general reduction in NASA's budget was mandated. However, Congress required that no cuts be made in any of the programs whose funding they had increased over the OMB request.

If you would like to receive first class mailings on actions in the US Congress, write to the L-5 Space Legislation Hot Line, 1620 N. Park, Tucson, AZ 85719.



### Space Farm Topics

Future space farmers will want to attend the annual meeting of the American Association for the Advancement of Science in Houston January 3-8. Jack M. Spurlock of the Georgia Institute of Technology is chairing a session on "Agricultural Systems for Space Habitats" Jan. 6 in the Houston Marriot Hotel. Papers will be presented by Mike Modell and Marc Karel of the Massachusetts Institute of Technology, John Phillips of Arizona Research Associates, and David Draper of North Carolina State University.

### Vancouver L-5

Ms. Camile H. Dionne is interested in starting a Vancouver, B.C. local chapter. If you wish to help with the project, please call her at (604)987-3940 or write to her at 51 S. Hendry Ave., North Vancouver, B.C. V7L 4C6, Canada.

### West European L-5

The West European Branch has had offers from members willing to start up groups within Germany and Finland. Any members wishing to assist or simply join the new groups are asked to contact either:

Uli Lochner, Pfaffstr 16,  
7500 Karlsruhe 41  
West Germany

or:  
Ari Harenko  
Valskarinkatu 1 B 43  
00260 Helsinki 26  
Finland

### Northwest Chapter

Members of the Northwest L-5 Society were unhappy to note that we were not

included on the list of local chapters in the October L-5 News.

The Northwest L-5 Society currently has 35 members in the Seattle and Western Washington area and meets on the third Wednesday of each month, usually featuring a speaker on space industrialization. We'd like other interested persons in the area to join us. We also publish a monthly newsletter which gives the times and locations of upcoming meetings and events. For further information contact:

NW L-5 Society  
c/o Tom Buxton  
928 18th Ave. W.  
Kirkland, WA 98033  
(206) 822-5979  
or  
c/o Hugh M. Kelso  
550 Bellevue Way SE.  
Bellevue, WA 98004  
(206) 453-1139

### Virginia Tech

Virginia Tech L-5 has a new on campus address:

VA Tech L-5  
c/o Cindy Hartman, President

4038 West A.J.  
V.P.I. & S.U.  
Blacksburg, VA 24061

## High Frontier

The High Frontier Society is the name of the newest local chapter. Interested members in the Pittsburgh area should write to:

High Frontier Society  
321 O.E.H.  
Univ. of Pittsburgh  
Pittsburgh, PA 15260

## Alternate Energy

"Congressional Outlook," which appears on Channel 22 (WAPB) in Washington, D.C. broadcast a program on November 14, 1978, concerning Congressional interest in alternative energy sources. The informative narrative touched on domestic solar, SPSS, windmills, alcohol, and fusion sources. Seven members of Congress (Durkin - NH, Jackson - WA, McClure - ID, Bayh - IN, Glickman - KS, McCormack - WA, and Matsunaga - HA) presented their own perspectives regarding the specifics of the sources. A five-minute discussion of SPSS including graphics and comments by Senators Durkin and Jackson was also included.

Transcripts of the program are available (specify program #106, "Alternate Energy") for one dollar from:

Congressional Outlook  
1414 22nd Street, N.W.  
Washington, D.C. 20037

## Letters

Recently I received my copy of L-5 and was very stimulated to be able to pursue what many thought and still think to be a viable alternative for the prisoner. The article was titled "The Prisoner in Space."

David Joseph Ambrose  
Prisoner No. 042347  
Raiford, FL

Just a short comment about the article "The Prisoner and Space" in the October L-5 News. In my opinion, someone who was serving a jail sentence for manslaughter would be the last one I'd send into space. True, in the past prisoners were used to colonize new territories, but only because there was no one else who

wanted to go. In the event of an L-5-type colony being started however, I seriously doubt that there would be any shortage of volunteers. The growth of the L-5 Society should be ample evidence of that.

As for the comment concerning the prisoners on death row and their willingness to go, so what's to know? Between the death penalty and a ticket into space, I wouldn't have to think it over very long! No, leave the prisoners in the prisons and let some law-abiding folks have a turn for a change.

Dan Molitar  
Yakima, WA

I agree that space colonization might truly be our last frontier, but why aren't we allocating more funds for oceanographic research? True we are exploring the ocean depths, though not to the extent of the space program. Since the Earth is covered by 71% water it would seem foolish to overlook this potential human habitat. The ocean could become another frontier for habitation with the help from the Government and private industry.

Dominick Albanese  
Menands, NY

I heartily agree with Michael Strong's letter in the September issue of the L-5 News. However, I suggest Sen. Proxmire be given the FIRST ANNUAL CAPON & STEER AWARD for the man who takes the most pride in castrating the American effort in space R&D.

If in the distant future SETI should get proper funding, the first ET we encounter will probably be broadcasting in Japanese or Russian.

Rhonda Allen  
Benton Harbor, Michigan

Please stop this hopeless socialism of begging the government to help us! The L-5 power stations will pay good energy dividends which will be better than money in the near future. We should get started and not complain to the public or to Congress or to ourselves.

Maitland McLarin  
Mountain Lakes, NJ

One thing I would like to discuss re. "Space Mines" and "Response to 'Space Mines'" is the idea that the United States agree to take only a few percent of the solar system's resources in order to get the third world countries to accept our mining of space. I would not be too quick to suggest that the United States sign away any resources from space. First of all, how are we going to decide which few percent the

United States may mine in cases where there is a limited supply of some resources? But more important in the long term is the question of limited resources. That's right, limited resources even in the entire solar system. I seem to recall reading that when the New World was first being colonized people were saying that the resources would last thousands of years. And yet here we are only a few *hundred* years later with most of the New World's resources gone. I think we should recognize that the solar system's resources are not infinite and that they could be exhausted quite rapidly. In fact I suspect that they could be used as fast as the New World's were, it's only a matter of scale. Even a cursory glance at man's history should show that we have an unlimited ability to grow and expand to fit any ecological niche no matter how large. And I don't think this is necessarily bad. The more we expand, the more energy we control, the more likely we are to survive. Once the solar system's resources are gone we can always look to the stars (see the British interplanetary Society's **Project DAEDALUS** book just out—a description of an unmanned starship probe that could be built with technology not too far in advance of the present state of the art. This book represents the work of many engineers and scientists during the last few years and is well worth getting (and recall that the BIS in the 1940's did much of the preliminary research that made Apollo possible)).

Because of the above I would like to suggest that the L-5 Society not plan on disbanding the minute we reach L-5. There will still be work to be done. For instance, I can easily see a solar system civilization being unwilling to conduct interstellar exploration and colonization for many of the same reasons that the United States is unwilling to conduct planetary exploration and colonization. And in many ways interstellar colonization is much more important than interplanetary colonization (except as far as the second must come before the first is possible).

Donald Robertson  
Sacramento, CA

Have you noticed the amount of copy and editorial support the **Christian Science Monitor** has given to the space program in the last six months? It never misses a chance to urge SPS, mining, and exploration. It might be worthwhile to pass the word on to members. It is an all around excellent daily paper that is received in the mail daily by subscribers.

William Cole  
Portland, OR