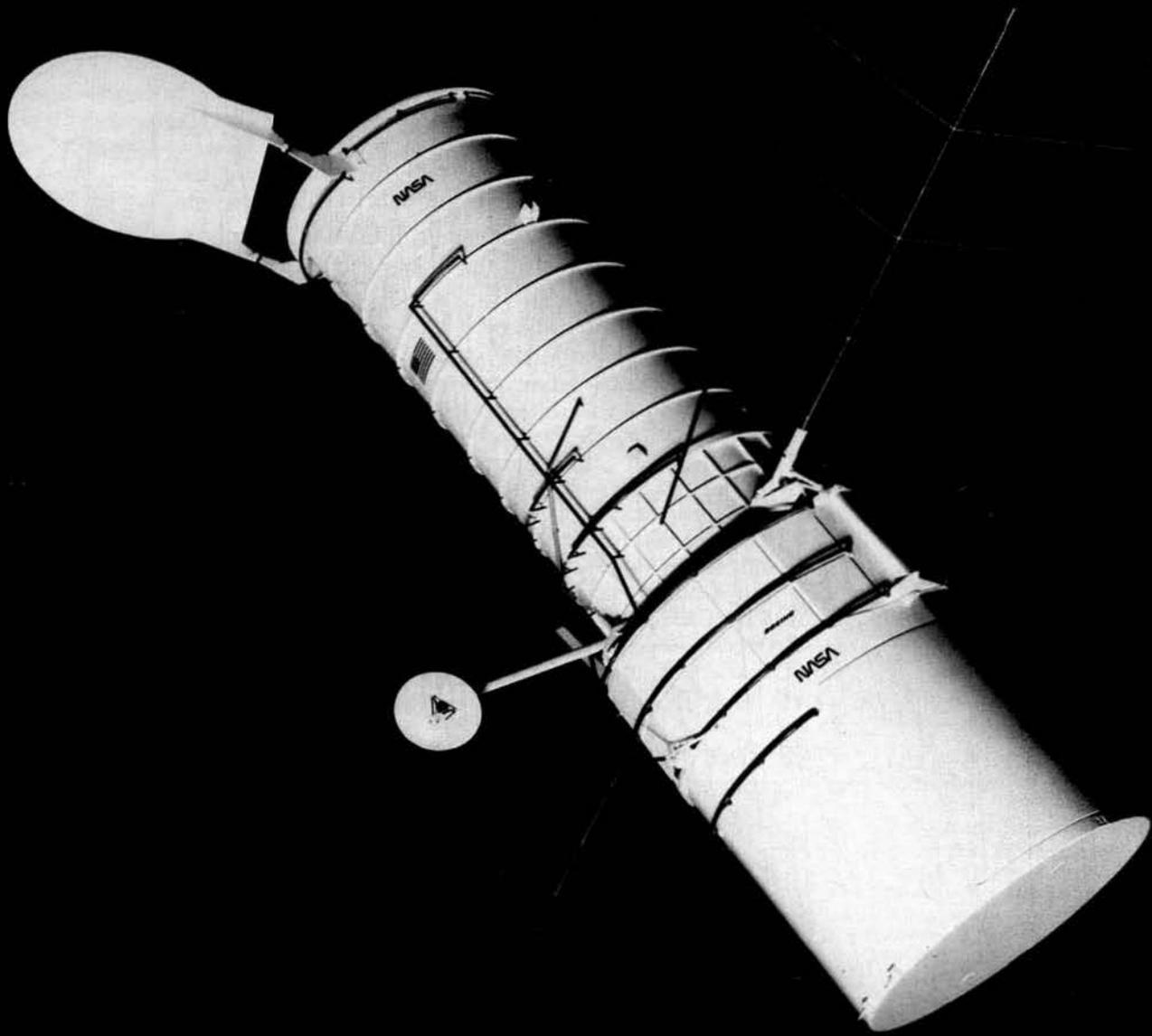


L5 NEWS

JANUARY 1978



L-5 NEWS

A PUBLICATION OF THE L-5 SOCIETY

Carolyn Henson, *Editor*

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Cover: the NASA/ESA space telescope. See related story page 5. (Photo courtesy Dr. Bachall, Princeton, University).

OTA to Study SPS, Space Colonies?

by Carolyn Henson

Veteran Washington space lobbyist Barbara Marx Hubbard is one person who isn't fazed by Carter's lack of interest in space. If one branch of the government seems unresponsive, her tactic is to turn to another: the U.S. House of Representatives and Senate.

With the assistance of several local L-5 chapters, in particular the Washington group, Hubbard organized a seminar on solar power satellites and space colonies for Congresspeople and their staffs. Held October 28 and 29 in the Rayburn Building, it featured Princeton professor Gerard K. O'Neill and Apollo-era NASA administrator Thomas O. Paine, as well as a constellation of other space researchers. Their message? If we choose to do so, we can establish cities in space producing satellite facilities which will provide abundant solar power to Earth by the early 90's.

Who heard that message? Representatives Dave Stockman (R-MI) and Barbara Mikulski (D-MD) attended, as well as House of Representatives staffers Rebecca Tidman for Dante Fascell (D-FL), Steve Kolterman for Richard Schulze (R-PA), Daren McRumel and Mary Beth Paladino for Richard Nolan (D-MN), Jean Marie McCarthy for Stan Lundine (D-NY), Ellen Burton for Joel Pritchard (R-WA), Bonnie J. Poore for Harold Johnson (D-CA), Morry B. Markowitz for Hamilton Fish Jr. (R-NY), Jane D. Woodlin and Gary R. Bachula for Bob Traxler (D-MI), Robert Wiekowski for Don Edwards (D-CA), Martin Wattenberg and Andrea Pamfilis for Pat Schroeder (D-CO), Jan Tavislan for Jim Johnson (R-CO), Guy Cavalo for Elliot Levitas (D-GA), Hal C. de Celly for Janice Whitten (D-MI), and Robin Weiss for Thomas Downey (D-NY). Tim Lynch for George Brown (D-CA), Paul Parshley and Bill Anderson represented the House Interior and Insular Affairs Committee (chaired by Morris Udall [D-AZ]), Darrell R. Branscome, Ezra D. Heitowitt, and James W. Spensley represented the House Science and Technology Committee (chaired by Olin Teague [D-TX]). The U.S. Senate was represented by Jacqueline Merson for Jacob Javits (R-NY), Costas Avrokotos for John Heinz (R-PA), and John G. Stewart and Allan Hoffman for

the U.S. Senate Commerce Committee's Science, Technology, and Space Subcommittee (chaired by Adlai Stevenson [D-IL]). The Office of Technology Assessment, which provides the House and Senate at their request with in-depth analyses of technical and scientific issues was represented by Dennis Miller, Bill Mills, and Gretchen Kilsrud.

The upshot of Hubbard's seminar is House Concurrent Resolution 451, introduced by Olin Teague. (House Concurrent Resolution 447, introduced at the same time by Lindy Boggs [D-LA], Dave Stockman, and Barbara Mikulski, is identical to Teague's.) It calls for the Office of Technology Assessment (OTA) to "determine the feasibility, potential consequences, advantages, and disadvantages of developing as a national goal for the year 2000 the first manned structures in Space for the conversion of solar energy and other extra-terrestrial resources to the peaceable and practical use of human beings everywhere."

If passed, the resolution will initiate the first study of space colonies and solar power satellites ever conducted by OTA. If you would like a copy of the resolution, or to make comments, or request more information, write to Mikulski, Boggs, Stockman, or Teague, U.S. House of Representatives, Washington, D.C. 20515.



*Note: Barbara Marx Hubbard is author of **The Hunger of Eve**, an autobiography which includes fascinating tidbits from her activities as a Washington lobbyist. She is a Director and one of the major financial supporters of the L-5 Society.*

*What is OTA? It is a research arm of the U.S. Senate and House of Representatives. Following are some details on OTA, lifted straight from the **Congressional Directory** (available from the U.S. Government Printing Office, Washington, DC. Addresses below which don't include the city are in Washington, DC.)*

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House, Senate Plan Hearings

O'Neill, Hubbard to Testify

The House Science and Technology Committee Space Science and Applications Subcommittee will hold hearings titled "Future Space Programs" this winter. They are tentatively scheduled for Jan. 24, 25 and 26. Princeton physics professor Gerard K. O'Neill and space activist Barbara Marx Hubbard, among others, will testify. For more information, call committee staff member Darrel R. Branscome, 202/225-6371 or write to: Subcommittee on Space Science and Applications, U.S. House of Representatives, Washington, DC 20515.

The Senate Commerce, Science and Transportation Committee, Science, Technology and Space Subcommittee plans a hearing, "Long Term Space Policy" Feb. 7. It will be held in the form of a round table discussion by top researchers.

The morning session will cover applications: space industries, solar power, etc. The afternoon will be devoted to space sciences: planetary probes, astronomical facilities, etc.

The speakers at the symposium have not yet been determined (at the time of the writing of this article). For more information, contact committee staffer Allan Hoffman, 202/224-5115 or write to the Subcommittee on Science, Technology and Space, U.S. Senate, Washington, DC 20510.

The public is encouraged to attend both the House and Senate space hearings. They will provide both information on what the researchers think we should do for our future space activities, and what Congress thinks should be done with the researchers' aspirations.

News from the Opposition

In a recent speech given before the Council of Scientific Society Presidents Dr. Frank Press, who also holds the position of Director of the Office of Science and Technology Policy in addition to Advisor to the President, announced that he and his staff are working to "enunciate a national space policy." While Dr. Press did not specify when such a policy would be formally presented for consideration by appropriate legislative committees, he did mention that the Earth applications project would be given top priority.

When asked if advanced projects, such as space settlements, would be included in the plan, Press responded, "You're talking about a \$100 billion program . . . you won't see it in this century."

Despite such statements on the near-term impracticality of space settlements from the Administration and top NASA officials, the concept is enjoying increased grassroots support and mass media attention. In October, a non-profit organization called the Committee for the Future sponsored a two-day seminar on space settlements for members of Congress and their staffs. The program's message was that settlements of "ordinary" people could be living in space within 20 years and beaming solar electricity to Earth -- if Congress encouraged such a project to begin now.

Reprinted from FASST Tracks,
1785 Mass. Ave. NW,
Washington, DC 20036

The following letter was sent in by James Greer of Milwaukee, WI.

Dear Mr. Greer:

Thank you so much for your letter responding to my reaction to the 60 Minute L-5 by 95 space fantastic.

You make an excellent point about the need for further study with the possibility of using solar power stations to provide electrical power from space at a more economical rate than would occur from earth based power systems.

That makes sense. Potential benefits are clear and I certainly favor that kind of study.

What I do not favor is developing a program that, in my view, would cost hundreds of billions and perhaps trillions of dollars to place a relatively few people -- 10, 15 or 20 thousand -- in a space capsule. Not only would the capital cost be appalling, the annual operating cost would be outrageous.

This is something that might be done 10 or 20 thousand years from now. But for the next 30 or 40 years your proposal for solar power stations makes far more sense.

Sincerely,

William Proxmire,
U.S. Senate

Deep Sea Mining: A Model for Extraterrestrial Resource Mining?

by H. K. Henson

Many of us closely concerned with space industries and habitats are beginning to see private enterprise as our best hope for rapid developments. (Rapid in this context means before the end of the century!) A great many obstacles lie in the path of such an enterprise. Beyond the obvious technical ones are such factors as the sheer cost of an extra-terrestrial resources (ETR) project. Whether lunar materials or asteroids are used, the guesses center around 75 ± 25 billion. Another factor is the possibility of vigorous objections of the USSR to capitalism escaping the planet. Still another, which will retard acceptance of such entities as the staging company proposed by C. Basler, is the lack of a legal framework for a private ETR development company. Legal opinion is divided as to whether or not such a company could mine the moon, and if so, what should be the disposition of the products or profits created. A large part of the legal difficulty lies in the vagueness of the "common heritage of mankind" (was womankind left out?) wording of the 1967 Outer Space Treaty.

This kind of treaty language, as opposed to the old "devil take the hindmost" custom, is peculiar to the later half of the 20th Century. It is probably more a result of the larger powers agreeing not to squabble over something worthless than to altruism toward the developing countries. Antarctica, the deep seabed beyond the continental shelves, and outer space are subject to such agreements. However, advancing technology changes our opinion of "worthless." Political and legal strains then develop as people, be they socialist or capitalist, start thinking of how to exploit "new" resources to make their lives easier.

Deep seabed mining, after 15 years and \$100 to \$150 million of research, is at this point of commercial development. Several companies, including Kennecott and Deep Sea Ventures, are prepared to spend some \$300 million each to get into the business of scooping up nodules containing manganese, nickel, copper and cobalt from under 3 miles of ocean.

Relevant legal events are the bogged down law of the sea conference and U.S. legislation, the Deep Seabed Hard Mineral Resources Act (HR3350), now wending its way through Congress. U.S. based L-5 members interested in a private investment approach may want to follow this legislation as its precedent would make passage of similar laws for ETR development much easier.

The following is quoted from House Report 95-588, part 1: (page 14)

PURPOSES

The purposes of the Deep Seabed Hard Mineral Resources Act are fourfold. First, it is intended to encourage and regulate the development of hard mineral resources from the deep ocean floor. However, it is clearly intended that the legislation only be an interim measure pending the adoption of a superseding international agreement that will be applicable to such activity and to which the United States becomes a party. Secondly, the legislation is designed to insure that the development is carried out in a manner that will protect the quality of the environment.

A third purpose is to encourage the successful negotiation of a comprehensive Law of the Sea Treaty that will legally establish the meaning of the phrase "common heritage of mankind." In an effort to show the good faith of the United States and its desire to work toward the legal establishment of the concept of the common heritage of mankind, assuming, of course, that a definition is established that is acceptable to the United States, the act proposes to establish a special fund, the proceeds of which are intended to be shared with the international community under the terms of an acceptable Law of the Sea Treaty binding on the United States. Finally, the act is designed to permit the continued development of the necessary technology for the expeditious development of hard mineral resources from the seabed.

• • •

(page 20 & 21)

III. THE NEED FOR SECURITY OF TENURE

Such a provision, according to Mr. C. Thomas Houseman of the Chase Manhattan Bank, is an important prerequisite to obtain project financing. He stated in testimony before the Subcommittee on Oceanography that --

in order for financial institutions to consider participating in such a venture, it will have to stand up under a critical evaluation of risk factors . . . A firm concession with security of tenure to a specific mine site would appear to me to be an absolute requirement for the project financing of an underseas mining venture -- without it, a lender could assume neither the reserve nor production risks.

It is extremely important to understand here that H.R. 3350 does not in any way provide property rights to the seabed to ocean miners. The provisions are entirely consistent with international law.

For licensees and permittees, H.R. 3350 merely provides assurance that other U.S. citizens or citizens of reciprocating nations will only operate within the mine site in which they are authorized to operate. As noted by Mr. Houseman, this is an important provision to prospective mining companies and their investors. In addition, the security of tenure provision included in H.R. 3350 will facilitate environmental assessment and monitoring of mining operations.

• • •

An aspect peculiar to deep seabed mining is the design and construction of special equipment for mining and processing. These design and process specifications will be predicated upon specific mine site attributes including topography of the ocean floor, depth, ocean currents, weather conditions, and the size and composition of the nodules. There can be significant variance in this set of attributes depending on the location of the mine site. It is during the exploration phase of a deep seabed mining project that data are collected to determine mine site character-

istics. According to a study conducted by the Department of the Interior, the exploration phase is expected to cost between \$75 and \$150 million.

Considering the degree of dependence of a deep seabed mining investment on a particular mine site, and the need from an environmental monitoring and assessment standpoint to have a defined area in which mining can occur, the committee recognizes the need for the establishment of a legal framework providing security of tenure to particular areas of the seabed for mining operations.

(pg 24 & 25)



STATUS OF INTERNATIONAL LAW

I. EXISTING INTERNATIONAL LAW

Questions have been raised about whether the bill, which establishes a licensing and regulatory scheme for the development of the hard mineral resources of the deep seabed beyond the jurisdiction of any nation by U.S. citizens, would violate the generally recognized principles of international law. The committee is convinced that the bill does not violate customary international law and, in fact, is legal and proper under it. This conclusion is based on several premises.

The first and most important of these is the doctrine of *res nullius*, which means that resources are the property of no one, are subject to appropriation by anyone, and that ownership exists only after the resources are reduced to possession. Nodules, like fish, and oil and gas beyond the jurisdiction or control of any nation, clearly fall under this doctrine. Thus ocean mining is a freedom of the high seas which presently exists with or without domestic legislation. . .



In its deliberations, the committee has not ignored the concept of the "common heritage of mankind." The United States supported the concept in the United Nations when it voted affirmatively in 1970 for United Nations General Assembly Resolution 2749 (xxv) which espoused the doctrine that the ocean resources beyond the jurisdiction of any nation belong to all mankind. However, it has consistently been the policy of the United States that the concept would be legally defined and clarified under the terms of a future comprehensive Law of the Sea Treaty. No such clarification has taken place thus far.

It is recognized that the developing countries contend that the concept prohibits the United States, or any other nation with the technological ability to do so, to develop these resources or reduce them to possession. However, the committee is convinced that the Resolution 2749 is neither binding on any nation at

Because That's Where the Money Is

by Marc Boone

Why are so many L-5 people interested in lobbying the U.S. government? One reason is that is where the money is - our tax money. Also, even if the money needed for the large scale space projects so dear to our hearts can be raised privately, the government could still stymie the effort just by passing a law. Moreover, the opposition to the use and habitation of space, as exemplified by John Holt, has already been using all available political avenues to suppress the issues before they can be properly studied. We have a right as citizens to have a portion of the government budget spent on our interests; to do so we must make our views known.

Essential skills for lobbyists are common sense and the ability to empathize with people who might not immediately agree with your point of view (such as Senator Proxmire). These skills are needed in all aspects of lobbying, from writing a simple letter to mounting a complex campaign.

Knowledge is strength. You need knowledge on both the cause you are promoting and the audience you are trying to reach. The more you know about each, the better reception you will get. Having plenty of facts at the tip of your tongue is the best way to earn other people's respect and avoid being pigeonholed as just another space nut.

But be careful to be interesting as well as completely accurate. Use pictures and charts. Slide in jokes where relevant. If you are dull, the audience will be bored at best and at worst suspect you of dishonesty. If you can't help being dull, encourage someone who has a talent for keeping audiences awake to do the talking. You'll still have more than enough to keep you busy researching the issues for your friend who's doing the talking.

the present time, nor sufficiently defined to justify the conclusion that the taking of nodules under international law is not permissible at the present time. Therefore, this bill merely enacts a system for allocation of access among U.S. citizens and provides the procedures that must be followed by such U.S. citizens in the development of the nodules. It in no way asserts any territorial or sovereignty claim to the existing resources nor does it assert an exclusive right to remove the resources

The audience can be divided into three groups: the representative you wish to influence, the media, and the public. If you work as a group, different members can specialize on different parts of the audience. The challenge is to make sure that the information you present and the people you're trying to reach are keyed to each other. Stress business statistics when talking to chambers of commerce; labor statistics to union groups; economic impact of SPS on third world nations to church groups; and ecological benefits to conservation groups.

When dealing with the press, remember their impact on public opinion. At all costs, do not alienate them. Remain courteous, friendly and uncritical even when your local newspaper editor is pouring salt into the knife wounds all over your back. Even when reporters and editors appear to be unfair, remember, they can always get much worse!

With the public and press it is usually pretty easy to know what their attitudes are. With Congresspeople, it is often much harder. If you don't know how your representative leans, just write a short, clear, courteous letter stating what you would like supported or voted on. Often, when there is no other input to a representative on an issue, one letter may change a vote. Writing a letter takes as much time as a cup of coffee and costs far less. Of course, the better the letter, the more impact it has. At the least, all mail gets counted; but a well written letter gets read.

Where can you get the information you need in order to be an effective lobbyist?

For an understanding of the concerns of environmentalists, *Space Colonies*, edited by the CoEvolution Quarterly's Stewart

as against another nation or its citizens. Until an international agreement is ratified or custom changes the existing international doctrine or *res nullius* as it applies to deep seabed mining, such activity is permissible and a proper exercise of a freedom of the high seas under customary international law.

Copies of HR 95-588 are available from Congressman Murphy (D-NY), Suite 2187 Rayburn, Washington, D.C. 20515.

Brand, is required reading. Some sources of information on Congress-folk are the Congressional Quarterly Almanac (CQ) which is compiled from Congressional Quarterly Weekly Reports. The CQ Almanac is a thorough review of the past year's activities in the U.S. Congress. It includes the yearly NASA budget fight, which usually runs two to six pages in length, and includes voting records and important speeches. For a few dollars you can copy the entire Congressional history of the NASA budget. The CQ Almanac is available in most libraries. Another source of information often available in libraries is the Ralph Nader Congress Project. These are fairly unbiased studies that run about 20 pages apiece on each member of Congress. They include information on their background, lifestyle, support, beliefs and voting record (including the Senate space shuttle votes).

The important thing in any lobbying effort is to generate the widest and most intelligent support possible, and to make sure your government is politely notified of it. If someone writes a good letter to each of their Congresspeople, and one to the President for good measure, fine. If a dozen or more people in the same district write intelligently to them, great. If it's a letter and/or a press release from some prominent community organization and they get the local newspaper to publish an articulate letter to the editor, that's fantastic. If you can get this orchestrated to all happen at the same time a crucial vote is coming up, you've probably won. If not this year, then maybe next.

With a little work, tact and patience we'll get to L-5 yet!



Royal Observer of Space Shuttle -- His Royal Highness, Prince Charles of Great Britain with David Scott (former director of the Dryden Space Flight Center) to his left and Lee Sherer, director of the Kennedy Space Center at far left. The occasion was the fifth free flight of the Space Shuttle orbiter at the Dryden center, Oct. 26, 1977.

News from NASA, ESA

Space Factory Study

by Carolyn Henson

Moon mines, space factories, Pittsburg in the sky -- are these in our future? Stan Sadin at NASA Headquarters, saying he wants a "cold, calculating analysis," is sponsoring a four part study which may answer that question.

The Lunar and Planetary Sciences Division of Johnson Space Center, in conjunction with Houston's Lunar Science Institute and Universities Space Research Association will study the mining of lunar ores and their conversion to primary metals. Dr. Richard J. Williams at Johnson Space Center will manage the study.

Once you've got ingots of metal in space, what are they good for? George F. von Tiesenhausen at Marshall Space Flight Center is managing the portion of the study which considers how to turn raw metals into wave guides, electrical conductors, silicon cells, beams, etc. Parameters such as throughput and investment needed will be considered.

How do you move people, supplies and products around in space and on and off the lunar surface? Fred Teren at Lewis Research Center will identify advanced propulsion systems which may be available. Gerard O'Neill's mass driver using pelletized shuttle tanks for reaction mass, and a metallic oxygen rocket using lunar refined fuel will be considered, as well as more conventional rockets using fuel shipped from Earth.

The fourth part of the study will tie together the whole "space factory" package. Study manager Earle Crum of Johnson Space Center will establish three alternate futures. One assumes a large scale solar power satellite (SPS) construction program. The second assumes less activity in space: a public service platform, large communications satellites, etc. but no SPS. The third alternate future assumes an exceedingly small presence in space.

Then a "best case" analysis will be made of how these futures can be accomplished using only system elements of Earth origin. Next the assumption is made that only lunar derived oxygen is available as a result of the moon mine operation, and its impact on all three alternate futures is studied. Then Crum's team will assume that mass drivers using spent shuttle tanks for reaction mass and/or metallic oxygen rockets using fuel of entirely lunar origin are available. Earle Crum hopes to thereby define what level of space activities and what transportation systems are necessary in order to justify "space factories."

The four parts of the study have been put up for bid; proposals were received by Dec. 23. Sometime in late January or early February the winning proposals will be announced.

Those of us who hope to get jobs in those space factories someday will be watching this four part study, a study which could make or break our plans for the future.

ESA/NASA Summit

In early October, Administrator Dr. Robert A. Frosch, concluded a week-long, highly successful first visit to Europe as Administrator. At a meeting with the Director General of the European Space Agency in Paris, the annual Spacelab program review was concluded. The \$600 million European Spacelab development program was found to be proceeding well and on schedule for a 1979 delivery to NASA of the first Spacelab units, to be flown in 1980.

After visiting ESA headquarters in Paris, Frosch went to Holland, where he signed a cooperative agreement for the Infrared Astronomy Satellite project with Dutch space officials. IRAS will conduct the first astronomical survey of the entire sky at those infrared wavelengths undetectable by Earth-based telescopes because of the obscuring effects of the atmosphere.

Scheduled for launch in 1981, the Earth-orbiting observatory will employ a large infrared telescope furnished by the United States, a spacecraft built by the Netherlands, and a ground operations facility supplied by the United Kingdom. All three nations are participating in providing the scientific instrumentation of the satellite and in the observation program.

Frosch then visited Germany, where he signed a cooperative agreement on the Jupiter Orbiter Probe with German space officials. This planetary exploration mission, scheduled for flight in early 1982, will be the first planetary spacecraft to be carried aboard the Space Shuttle.

The probe is designed to conduct the most detailed scientific investigation of Jupiter and its environment and moons, including the first direct measurements of the atmosphere of the planet. The mission is composed of an orbiter that will circle the planet for at least 20 months and a probe that will plunge deep into Jupiter's atmosphere. Under the agreement, Germany will provide a retro propulsion module designed for injection of the orbiter probe spacecraft into orbit around Jupiter. It also will provide not only selected scientific instruments for integration into the scientific payload, but the services of selected scientific investigators.

The several new cooperative agreements will result in total European expenditures of some \$180 million in the three space science programs over the next few years.

Senior NASA officials accompanying Frosch on all or some of his visits were: Dr. Walter Williams, NASA's chief engineer; Arnold W. Frutkin, assistant administrator for international affairs; Walter P. Murphy, NASA's European representative Douglas R. Lord, NASA director of the Spacelab program; and Richard J. H. Barnes, director for international planning and programs, office of international affairs.



Historic International Agreement Reached -- At the Paris headquarters of the European Space Agency, NASA Administrator Dr. Robert A. Frosch and ESA Administrator General Roy Gibson signed a memorandum of understanding stating the terms for cooperation

ESA to Provide Space Telescope Components

The European Space Agency has signed an agreement with NASA for participation in the space agency's 1983 space telescope mission. A memorandum of understanding was signed on Oct. 7 in Paris by Dr. Robert A. Frosch, NASA Administrator, and Roy Gibson, Director of ESA.

Scheduled to be carried into Earth orbit by NASA's Space Shuttle, the space observatory will be used to study the universe with the highest possible resolution.

Under the agreement, ESA will provide a major scientific instrument and a spacecraft subsystem, participate in the in-orbit operation and maintenance of the telescope, and arrange for participation of ESA-sponsored European astronomers in the observation programs.

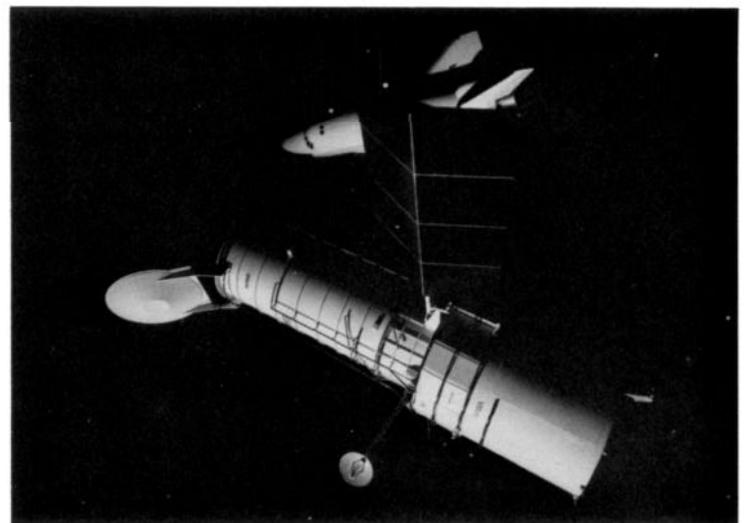
The scientific instrument to be provided by ESA is called the "faint object camera" to be used for high resolution imagery in the ultraviolet, visual and near infrared portions of the spectrum; the spacecraft system to be contributed is the solar array, to provide all power for the observatory.

The 2.4-meter diameter space telescope will be capable of accommodating up to five different instruments at its focal plane. It will weigh about 9,070 kilograms and will orbit the Earth at an altitude of about 500 kilometers above the obscuring effects

of the atmosphere. Once placed in orbit, it will be operated remotely from the ground but will be designed to allow for maintenance and the change of instruments by a space-suited astronaut. It will be retrievable by the Space Shuttle for return to Earth for extensive overhaul and subsequent re-launch. These features should allow the space telescope to serve as an in-space astronomical observatory for more than a decade.

The space telescope is expected to help scientists to solve some of the mysteries relating to the structure, origin, evolution and energy processes of the universe -- processes that defy solutions through use of observatories below the obscuring veil of Earth's atmosphere. The space telescope should allow astronomers to observe some 350 times the volume of space than can be seen now with the largest ground-based telescope.

NASA's Marshall Space Flight Center will have overall management responsibility for the space telescope. NASA's Goddard Space Flight Center will be responsible for managing the development of the scientific instruments and for the operational aspects of the observatory. The European effort will be managed by the European Space Technology Center at Noordwijk in the Netherlands.



between the two agencies in the NASA Space Telescope Program. Seated at Dr. Frosch's right is H. Kantenecker, of ESA, at his left Gibson. Observers standing behind the three men are not identified.

Eye of the Gods: the space telescope, planned to go into operation in 1983, will be able to observe 350 times the volume of space visible to even the best of ground-based instruments. Some scientists believe it will be able to observe the birth of the Universe.

Shuttle Orbiter Tests Completed

The world watched the beginning of a dream come true as the U.S. Space Shuttle moved from theory to reality in a series of trials during the past several months. Hundreds of NASA and contractor people formed a team that made the daring and complex venture seem almost commonplace as test after successful test was carried out.

Astronauts Fred W. Haise and C. Gordon Fullerton made a bouncy but successful landing of the Space Shuttle orbiter on its fifth and final free-fall flight test in late October on a hard surface runway at Edwards Air Force Base.

In their straight-in approach, which took only two minutes, Haise and Fullerton aimed for a touchdown about a third of the way down the runway and planned to bring the craft to a stop at the 3,000-m mark. That would be similar to landings of a Shuttle returning from orbit to the runway of the Kennedy Space Center. The pilots overshot their landing point by more than 300 m, but managed to steady the craft and stop it well before the end of the runway.

The *Enterprise* bounced back into the air after first hitting the runway and dipped a wing noticeably. It bounced at least two more times before settling down on the runway and rolling to a stop.

During a postflight press conference held at the Dryden Space Flight Center, Haise attributed the rough landing to higher-than-expected speeds during the final seconds, saying he had to "force" the *Enterprise* down onto the runway.

Chief of the Shuttle approach and landing tests Donald K. Slayton said at the same conference: "We have accomplished all the objectives we set out to accomplish.



Historic Moment in Space Shuttle Testing -- The fifth and final free-fall test of the Space Shuttle orbiter took place Oct. 27 at the Dryden Space Flight Center. This photograph shows

the 747 and orbiter just before separation took place, with one of six chase planes in view. Below is the Mohave Desert.

"I'm very happy with the way it's progressed."

This was the first landing on a hard-surface runway and the second time the orbiter flew without its tailcone. The tailcone provided smooth airflow and reduced drag of the 747-orbiter combination during its climb to separation altitude. But orbiter astronauts reported the level as acceptable without its aid although the 747 tail surfaces were subjected to buffeting.

Inside the 747, pilot Fulton said the buffeting was not as much as anticipated. The damper located in the nose section of the jumbo jet was turned on to alleviate the lateral vibration caused by buffeting around the 747 tail. The damper can best be described as a 450-m, spring-loaded weight, and it did improve the ride up front.

In four additional tests that took place in November at the Dryden center, the mated aircraft underwent ferry-configuration flights. Then it was back to the barn, at Dryden until March, when the paired craft will fly to Huntsville, Ala. Marshall Space Flight Center personnel, under the direction of project manager Robert Lindstrom, will then subject the orbiter to a six-month-long series of ground vibration tests with rocket boosters and external tank attached.

In all interim between the final tests and delivery to Alabama, members of the Dryden team will continue to work on the orbiter, rewiring its electronics and completing other chores to ready the spacecraft for the next set of grueling trials, doing their utmost to prepare the *Enterprise* for additional successes as testing at Marshall continues.

Astronaut Corps - Or Space Soldiers?

by Robin Snelson

Bill Good is a big supporter of the space program, so he doesn't like to have to make trouble for NASA. It's just that he wants to save the space agency from rekindling public disaffection and international suspicion. He is considering filing an injunction under the Civil Rights Act to stop NASA from hiring a new cadre of astronauts. All in the best interest of NASA's image, you understand. (NASA has rescheduled the new astronaut selection announcement for sometime in January because Dr. Frosch is too busy with budgetary matters to finalize the decisions of the JSC selection board.)

Braniff pilot and New York University business student Bill Good is glad NASA is hiring astronauts again because he'd like to be one himself. He says he first decided he wanted to be an astronaut in the early 1960's when he was a sophomore in Vienna because, "I noticed the Europeans were most impressed by two things about America--the Kennedy presidency and the space program."

Good believes the space program still has the potential to transcend nationalism and spark international cooperative efforts.

But if NASA ends up with an astronaut corps dominated by active duty military men again, and that's the way it's shaping up right now, Good thinks the prospects for international cooperation are on shaky ground.

He also wonders how the American public will react to another group of astronauts who work for the Department of Defense.

In the early days of manned space flight NASA insisted on astronauts who had test pilot experience in high performance jet aircraft. The only people who get that kind of experience are those who come up through the military system 'and get into test pilot school. That's why the first astronauts were all white males on active military duty.

Later the National Academy of Sciences lobbied for scientist astronauts and screened candidates for NASA. The agency subsequently hired several scientists to fly into space. Coincidentally, they too were all white males.

This time NASA is hiring two kinds of astronauts to work through 1985 -- pilots and mission specialists. Women and minority candidates were encouraged to apply.

Since August, 128 finalists for mission specialist positions were interviewed at Johnson Space Center in Houston. Candidates for the scientist astronaut jobs are a diverse group--research scientists, professors, students, doctors, astronomers, government employees, some military people. That group of 128 includes 21 women, six blacks, three Hispanics, two orientals and one American Indian.

There were 1,261 applicants for the pilot positions. According to Duane Ross in the astronaut recruiting office at Johnson, almost half the pilot applicants didn't meet basic qualifications like 1,000 hours of first pilot jet time and advanced science or math degrees.

But 127 of those pilot applicants came to NASA recommended by branches of the armed forces. Among 80 finalists interviewed for the pilot jobs, only four are not active duty military men from that prescreened group. Two of the four civilian finalists work for the Federal Aviation Administration, the other two work for NASA. All have completed or are currently enrolled in test pilot school. The pilot finalists consist of 77 white males and three black males. None are airline pilots.

Bill Good wants to know why no pilots from the private sector made the first cut. Obviously he has a vested interest in NASA's answer, but his question is an interesting one.

The official NASA reply is that jet test pilot experience is a preferred qualification for astronauts who will fly the space shuttle.

But Good and others question the wisdom of that particular requirement. Is test pilot experience a reasonable criteria for operation of the space shuttle, the vehicle NASA has been calling the "space truck" the space craft that is supposed to usher in the commercial era of the space age?

For one thing, the shuttle 'will be outfitted with automatic systems so sophisticated that it can actually be landed

without a pilot, if necessary, by ground control.

And if trips to earth orbit become as routine as NASA says they will -- on the order of 50 to 60 cargo-ferrying round trips per year by the mid-80's -- do all the space shuttle pilots really need experimental aircraft proficiency? Does a civilian transport system which is seeking commercial customers in both domestic and foreign industry really need specialized jet jockeys on military payroll to drive its "space trucks"?

Wouldn't some commercial pilots be able to do the job?

Bill Good thinks it's a clear case of discrimination against pilots from the private sector. More importantly, because no women and few minorities have graduated from military test pilot schools, the very nature of that criteria excludes certain groups from consideration.

Bill Good is white, male and an ex-Marine pilot who flew close support for ground troops on his Vietnam tour. At age 31, he has logged over 9,000 hours of flying time and his computer expertise would be a valuable skill for a pilot astronaut, since the space shuttle flies with the aid of complex computers.

But there is no law which guarantees equal employment opportunity for private sector people in a federal program.

Houston lawyer and aerospace specialist Arthur Dula says, "If there is anything about which NASA has almost unlimited discretion, it is the selection of pilot astronauts for the shuttle." He doesn't rule out a challenge to NASA's decision, but he points out that suing a big federal agency is a terribly expensive and drawn out operation.

"The courts are very reluctant to review this kind of case. In an area where the agency is assumed to have special expertise, the court will usually leave this kind of highly technical judgement to the agency."

However, if any of NASA's selection criteria are arbitrary and not really related to what the job requires, and if those criteria have the effect of discriminating on the basis of race, sex, creed, etc., the court might decide to generate a lot of paper-



Airline Pilots demand shuttle jobs: Braniff pilot Bill Good and American Airlines pilot Angela Masson hope someday to be flying a route into space. Continental is also getting into the act, at least at the fantasy level, as this airbrush retouch of a shuttle picture demonstrates.

work for NASA by ordering the agency to justify those criteria.

If anybody succeeds in halting NASA's selection process at this late hour, it will likely be under the Civil Rights Act or specific equal opportunity regulations within the space agency. And since Bill Good hasn't been the victim of discrimination on the basis of sex, race, creed or color, his latest tactic is to find other pilot astronaut applicants who can argue that point.

NASA won't release the names of applicants who were turned down, but Bill Good has found at least one who is

interested in taking NASA to task for the test pilot requirement.

Angela Masson is an American Airlines pilot with 3,500 hours flying time, two masters degrees and a Ph.D. Her doctoral dissertation was a study on the exclusion of women from pilot duty in the military, and the resultant barriers for women in the airline industry and, ultimately, as astronauts.

At the time of this writing it remains to be seen if Good and Masson can marshal the financial resources necessary to seek a restraining order against NASA's astronaut selection. But the question raised by

both is an important one: Is it in the best interest of the civilian space program to have an astronaut corps dominated by pilots on active duty for the military? Is the test pilot school requirement a valid selection criteria?

A former scientist astronaut, now resigned from NASA, is blunt about the astronaut selection board's military preferences. "The problem is how deeply entrenched the old-boy network is within NASA. It's like a private fraternity of military pilot astronauts--and they want to keep it that way."

Penthouse Slams OTRAG

by Carolyn Henson

Another voice has joined the chorus denouncing the private West German rocket company OTRAG. In a press conference held Dec. 15th, Penthouse magazine announced that their March issue will feature Tad Szulc's expose of U.S./German collusion to use OTRAG and its Zaire facilities as a blind for cruise missile development.

Szulc asserts that the German government, apparently in order to circumvent the 1954 Treaty of Brussels, which forbids the development of missiles on German soil, has secretly funded OTRAG's activities in Zaire at \$50 million per year. He adds that the U.S. has agreed to supply guidance systems for the German cruise missiles.

Szulc is hardly the first to come to the attack. For several months the Soviet press has been raising hell over OTRAG, and cruise missiles are high on their agenda of fears. Even though 32 years have passed since the end of World War II, the Soviet press remains hypersensitive to German activities. A veteran U.S.S.R. space program observer Jim Oberg notes, "The Russians have been beating on the same drum for 30 years. Sometimes it's a new tune -- OTRAG's one -- but it's still the same drum."

It is easy to dismiss the Soviet flap as just another episode of anti-Nazi hysteria. But why would Penthouse, which has never been particularly concerned over the "Teutonic menace", join OTRAG's chorus of critics? Is there more to the story than recycled Pravda clippings?

A top U.S. NATO Alliance official states that "there is just no rational reason" for the U.S. to develop cruise missiles through a West German blind. Although ongoing SALT negotiations include a protocol restricting the deployment of cruise missiles, development and testing is another matter. He points out that "We are quite capable of testing in our own territory. Why we would have to go to Zaire is beyond me." The official U.S. diplomatic stance is a flat denial of the Penthouse and Pravda stories: "There is absolutely no substance to these allegations."

Being forbidden by treaty to develop missiles, the West German government does have a motive to use OTRAG as a front. But is OTRAG even capable of developing cruise missiles? "It would make more sense for the Germans to use a jet aircraft company" asserts one DOD observer. Cruise missiles fly long distances at low elevations, so it is necessary for them to use airbreathing engines. U.S. cruise missile research is baselining turbofan jet engines attached to an airframe. OTRAG, on the other hand, is developing direct ascent rocket engines.

The blaze of publicity which OTRAG has sought and succeeded only too well in receiving is another contraindication of secret weapons research. Why do they pass out pictures and press releases and advertise the existence of their African base if they rely on secret weapons funding for their livelihood?

One NASA observer admits that the enormous size of their test range is suspicious. "Why on Earth do they need 100,000 square kilometers?" A block of land 100 km square could hide a great deal. OTRAG asserts they need the area. To rephrase an old truism, whatever goes up but does not achieve orbit must come down, and they are not anxious for one of their stray boosters to flatten a village.

One way OTRAG's protestations of innocence could be checked out is by inspecting Landsat photos of the area. A check between the U.S. Federal Aviation Administration's records of known airstrips in the Manomo, North of Shaba area and the Landsat observations would detect any secret airstrips. It is believed that ground transportation in the area is sufficiently poor that an airstrip would be an essential adjunct of a secret weapons facility. (Landsat photos can be bought by both U.S. and foreign citizens from EROS Data Center, Dept. of the Interior, Sioux Falls, South Dakota.)

In the meantime, rumor has it that OTRAG's innovative booster research has ground to a halt due to lack of funds. It would be ironic if OTRAG's publicity efforts, apparently designed to attract new investors and public sympathy, have succeeded only in making them the villain of both the Soviet and U.S. media.

Earthport Update

by Mark Frazier

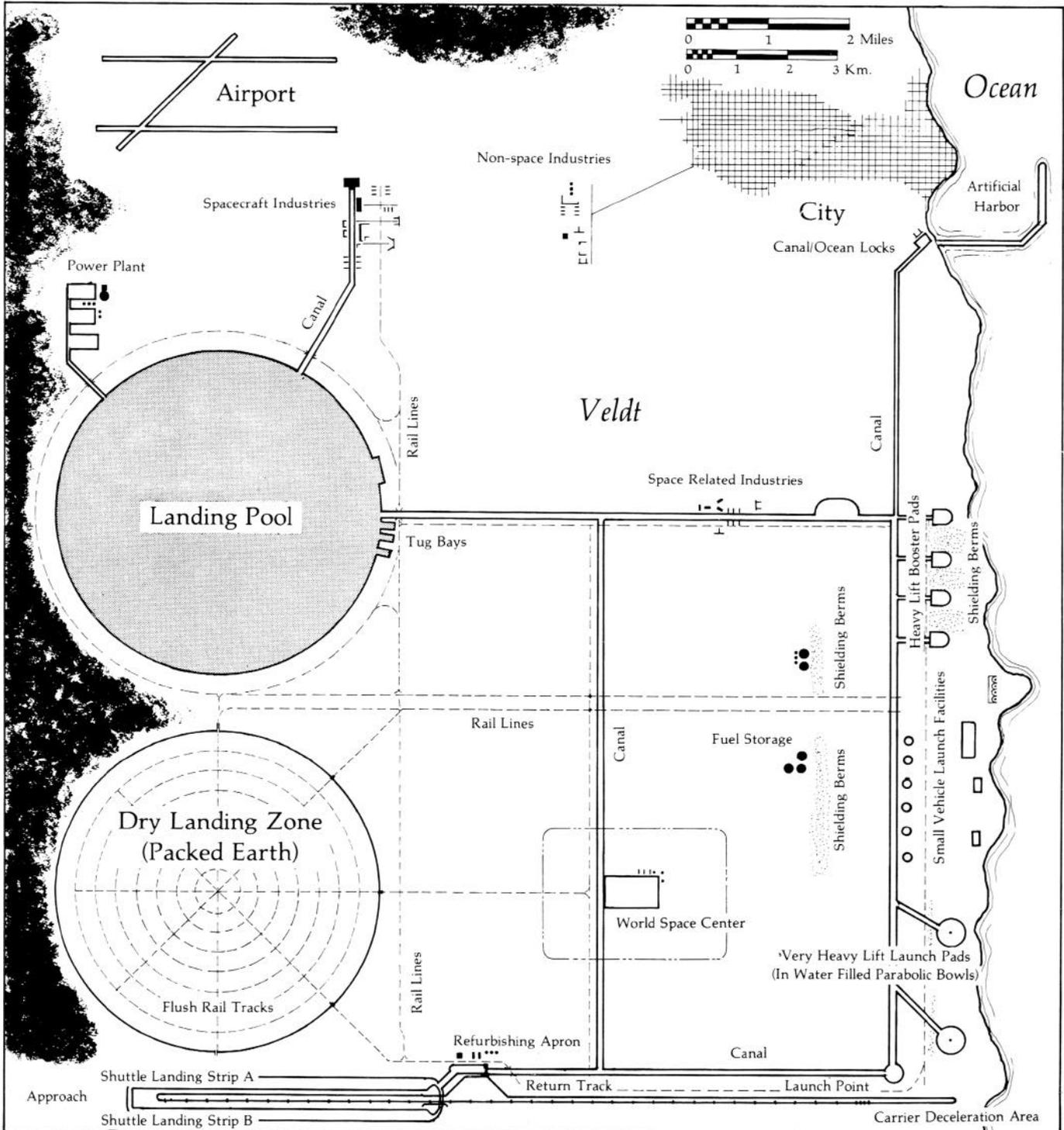
Fears of secret military use of space launch facilities are on the rise. Mark Frazier's planned international space port open to all who wish to use its facilities or to monitor other user's activities may be a step toward easing these tensions.

After several quiet months, the Earthport project has encouraging news to report. Our financial situation has improved greatly. Thanks to the generosity of a New York philanthropist, we are now moving ahead in a variety of areas.

1. Interest by equatorial countries. To date, officials of five equatorial governments have expressed a desire to have an Earthport or Earthport tracking facilities considered for their countries. Formal letters of interest have been received from the Pacific island of Nauru, a wealthy equatorial nation, and the government of Rwanda in Africa. Similar letters are expected soon from Kenya, Surinam, and perhaps Colombia, as a result of meetings with their United Nations representatives.
2. New participants. The Earthport project welcomes a number of new members. In the past few weeks, Robert Heinlein and Buckminster Fuller have agreed to join the advisory board. Other new advisors include Barbara Marx Hubbard, of the Committee for the Future; Marcel Barrere, president of the International Astronautical Federation; and Ed Finch, chairman of the aerospace law committee of the American Bar Association. While we are delighted with the new advisors, we regret the loss of Arthur C. Clarke, whose retirement has prompted him to disengage from a wide range of space activities. In an otherwise most enjoyable meeting last October in Washington, Clarke told Earthport study director Mark Frazier that he would give Earthport materials to his longtime friend the prime minister of Sri Lanka, who is an advocate of free trade zones in the equatorial nation.
3. Leasing projections. Professor Alvin Rabushka, a senior fellow of the Hoover Institution at Stanford and a specialist in freeports, has prepared an estimate of rental income at a 200-square-mile free trade zone/space launch center. Assuming that only half of the area would be ultimately leased, annual revenues would amount to \$373 million, at rates no higher for land than in existing free trade zones.

Preliminary Earthport Design

(To accommodate a wide range of future as well as present launch providers, an Earthport would have protected sites for heavy lift launch vehicles, and dry and wet recovery areas).



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Earthport would therefore generate substantial sums for payment to the host country, and for administration of the site. An estimated \$100 to \$125 million per year would also be set aside for a World Space Center, to subsidize use by developing countries of Earthport - based commercial launch providers. Copies of Rabushka's Leasing Income at an International Space Freeport are available from the Sabre Foundation.

4. International base. After a meeting of seven key Earthport study participants in Santa Barbara on December 1, a decision was made to incorporate a non-profit "Earthport Authority" in Austria. The move reflects a desire to give the project a wider international base, and is a prelude to a world-wide conference on Earthport to be held in Vienna within the next 16 months.

5. Freeport Design Committee. Beginning in January, the Freeport Design Committee will begin preparation of a report on approaches for creating a prosperous international launch center. Historical research on free trade zones will be conducted by Earthport director Mark Frazier, in conjunction with his graduate studies in international relations at the University of California, Santa Barbara. Professor Alvin Rabushka, chairman of the Freeport Design Committee, will write the sections of the report dealing with contractual resolution of disputes and provision of services. Technical aspects will be dealt with by Dr. Michel Bader of the Ames Research Center in Palo Alto, who is one of several high-ranking NASA officials exploring the international launch center concept.

6. Publicity. *Astronautics and Aeronautics*, a leading aerospace magazine, has accepted an article on Earthport and private launch providers for a forthcoming issue. Former astronaut Dr. Philip Chapman, of Arthur D. Little, is co-authoring a longer and more technical treatment of the Earthport concept with Mark Frazier. The article will be adapted from a paper delivered by Frazier in October to the American Astronautical Society's conference in San Francisco on space industrialization. The winner of *Playboy's* 1976 nonfiction writing award, Jim Davidson, has been asked by the magazine to submit a proposal for an article on Earthport.

7. Corporate interest. Earthport advisor James Hagler, of the International Business Council, has agreed to arrange a mailing about the project to the organization, which consists of long-range planners for 50 multinational corporations. The mailing will explain the potential benefits to business of an international free trade zone. Hagler, who has been instrumental in the creation of two

free trade zones in the United States, has also found support for the concept by foreign business executives. Other organizations whose officials have expressed a strong interest in the Earthport project in recent weeks include the World Trade Centers Association, and World Peace Through Law.

8. New Materials. A color, 15 page brochure has replaced the initial pamphlet describing the advantages of an international space freeport. In coming weeks, by arrangement with the Minneapolis-based Foundation Institute, the Earthport project will produce a new document on the benefits of an Earthport to industry. A fund raising prospectus will also be made available before February 1, the date of the next meeting of Earthport study group leaders in Santa Barbara.

Please call Mark Frazier at 805/965-7947, or write the Sabre Foundation, 221 West Carrillo Street, Santa Barbara, California, 93101, if you desire further information.

EXPERIMENTAL MODEL OF A SPACE SETTLEMENT

At the Institute of Biomedical Problems, USSR Public Health Ministry, Doctor of Medical Sciences Ye. Ya. Shepelev has completed a 1½-month experiment of human existence in a closed ecological system -- a miniature model of a future space settlement.

The hermetically closed space contains a greenhouse with allotments to grow wheat, cabbage, peas, beets, and carrots. Before the experiment, the plants were grown on a schedule to the stage when they could be harvested each week of the experimental period. They provided food and oxygen and consumed the carbon dioxide and minerals regenerated by microorganisms in fermenters from human waste.

The assortment of plants was such that, with one man in the system, a full balance was achieved without any additional physico-chemical equipment for air purification. However, when after one month of operation a second man was brought into the system it became necessary to connect the "Siren" ("Lilac") -- an additional biological system -- a chlorella-growing installation.

Dr. Shepelev describes the experimental model as simplified, since it does not include fauna representatives; he plans to eliminate this restriction in future experiments.

The water cycle was self-sufficient, although it required a severe restriction -- the complete exclusion of detergents and soap, demonstrating the sensitivity of the biosphere to certain man-made pollutants.

Reprinted from Pravda, March 18, 1977, p. 6.

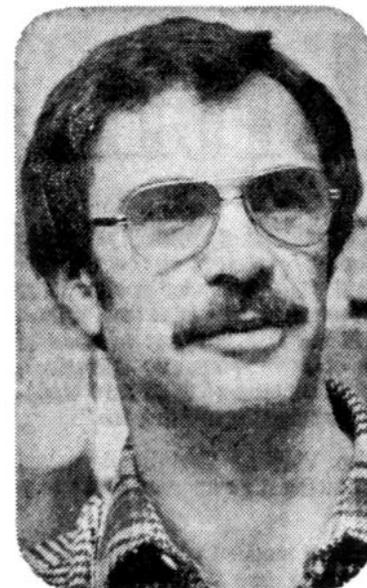
Brown Foundation Funds SPS Work

Rice University in Houston, Texas, has received a \$100,000 grant from the Brown Foundation to study solar power satellites (SPS). Rice physics professor John W. Freeman, Jr., who is the study director, says "What we want is to make certain there are no shortstoppers. We want to make sure there are no problems so impassable the whole concept has to be thrown out."

Freeman reports that the work will cover:

- Energy conversion techniques on the satellite.
- Effects of cosmic rays on the satellites and the crews working on them.
- Effects of the satellite on the Earth's magnetosphere and ionosphere.
- Microwave antenna and receiving station rectenna designs.
- Effects of lightning on the rectenna.
- Alterations in Earth's heat balance due to the added energy input from SPS.
- Economic impact of SPS, including what the effect will be if the program is not undertaken.
- National and international social, political, legal and implementation aspects of SPS.
- Environmental impact.

Freeman adds that if Rice can locate an additional \$100,000 by February, the Brown Foundation will provide another \$100,000. The Brown Foundation is funded by Brown and Root, an industrial construction firm.



Study director John W. Freeman, Jr.

Bibliography Update

I'm writing in regards to the review of my book *Time Out For Tomorrow* that appeared in your September issue of L-5 News as reviewed by Conrad Schneiker. I found his review to be honest and forthright and very interesting. I particularly agree that we covered many of the topics too lightly. Of course, this was intentional. The book has been used to a great extent in schools as a primer for future living and the study of value systems. However, for a technical group as the L-5 certainly tends to be, the book is a little bit light in the technical area. We are trying to correct that problem in the next book, *Time Out For Tomorrow - Volume 2*, which will focus extensively on man's future in space. It is also an optimistic sketch of what tomorrow will bring, but dealing much more with what we will be able to do once we get outside the atmosphere of Earth.

Norm Avery
Penrose, CO

A mind-boggling, yet realistic view of the future is presented in *Time Out For Tomorrow* by Norman Avery. The quality paperback has just been released by T.H.A.R. Institute of Raynesford, Montana.

The concepts of future living outlined in *Time Out For Tomorrow* are not the result of crystal ball gazing, nor are they plucked from the air by an over-active imagination. Rather they are based on what has happened in the past, what is happening today and the logical extension of this technology into the future. The text is supported by 70 photos, many in color.

The author is an articulate, humorous lecturer on future living. He serves as a space consultant to both government and industry, besides addressing over 400 audiences each year.

Avery's background also includes work as a university audio-visual instructor, a radio news director, and a public relations director and consultant in the space field. He is an active member of the American Institute of Aeronautics and Astronautics, World Future Society, L-5 Society (space colony development project), and the Society of Motion Pictures and Television Engineers. He is listed in Who's Who in the West, and Who's Who in American Aviation.

Col. James B. Irwin, the eighth astronaut to walk on the moon, says of Avery's book, "The future belongs to those who prepare for it. I believe that Norman Avery's *Time Out For Tomorrow* will give you a look at the future -- the promises and the challenges."

Time Out For Tomorrow is available in book stores for \$6.95, or from THAR, Box 505, Belt, Montana 59412.

by Conrad Schneiker

"The Potential of Satellite Solar Power"
P.E. Glaser
Proceedings of the IEEE, August, 1977

Yet another article by the father of Satellite Solar Power. This invited paper deals with the major facets of SSPS implementation, including the microwave system, power generation, economics, environmental impacts, legal status, space transportation requirements, orbital assembly, maintenance & manufacturing.

"System Impact Of The Dual-Expander Engine"
Robert Salkeld
Astronautics & Aeronautics, November, 1977

This letter points out that dual-expander engines, applied to horizontal-takeoff SSTO (Single Stage To Orbit) vehicles "increases payload-to-dry-weight ratio by 131%." It continues "such a potential surely merits serious attention." Indeed. This achievement is due to a modest weight savings (due to use of the dual-expander engine), giving increased liftoff velocity, allowing lower platform area (since lift increases as the square of velocity), allowing the entire vehicle to shrink.

"Space Age Review"
378 Cambridge Ave.
Palo Alto, Calif. 94306

This new magazine plans publication 12 times a year (possibly bimonthly for a short while). The 2nd issue is 12 pages long. The cost is \$1/issue or \$10/12 issues. It contains many short but interesting news items related to space, illustrated with black and white photographs. The articles in the second issue concern California's space day, the shuttles first free flight & excerpts from a speech by Nichelle Nichols (better known to Star Trek fans as Communications Officer Uhura).

"Space Colonies: One Step Closer"
Science News, August 13, 1977

Major point made: if shipping of the first habitat material started in 1985, then by "1991 the first colony-manufactured, solar-power satellite could be finished and producing enough electricity for a city the size of Los Angeles."

"Living in Space"
Gerard K. O'Neill
AIAA Student Journal, Summer 1977

Gives O'Neill's vision of how people will live and work in space in the near future. It could serve as a brief summary of his book "The High Frontier."

BOUNDARY RESISTANCE



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Life Extension Magazine: Drug research, gerontology, futurism, life-extension and (if all else fails) cryonics. A very active field with some surprising successes. Bimonthly.

L-5 News: Monthly newsletter for the international L-5 Society. Summaries and original articles on studies investigating the practicality and economic viability of various means of colonizing near-earth space with existing technology.

Earth/Space News: Published by Earth/Space Inc., engineering consultants for private space ventures. Developments and applications of techniques for private space flight. Bimonthly.

New Libertarian Weekly: Weekly newsletter of the most individualistic, pioneering movement in existence. News, philosophy, reviews, calendar of events, science-fiction column. Self-liberation - not politics.

Individual Liberty: Monthly newsletter of the Society for Individual Liberty. Editorials and news briefs on the activities of freedom seeking individuals and groups of all types.

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“Space Law”

George S. Robinson
Technology Review, October/November, 1977

This article is a “broad brush review of space law.” It presents a myriad of unresolved problems in this field. “The progress so far has been sketchy -- with a lot of wishful thinking.” It is interesting to note many of the legal issues revolve around philosophic questions, e.g. “should space societies be considered independent communities or colonies of earthkind?” The author answers by proposing a “Magna Carta” for space communities. This is one field that cries out for involvement by L-5ers.

“GSSPS - Taking A New Approach To The Space Solar Power State”

Leopold J. Cantafio, Vladimir A. Chobotov, Malcolm G. Wolfe
Astronautics & Aeronautics, November, 1977

In trying to improve on “brute force” SSPS design, the authors present a gravitationally stabilized SSPS (GSSPS) design. It consists of 24 pairs of 385m x 2km solar panels attached to a 72km-long, 2m-diameter circular waveguide. While having a few problems of its own, it overcomes a host of problems with “conventional” SSPS designs. Advantages: reduction of stabilization propellant needed, lower radio frequency interference, increased reliability and reduced system weight. The authors claim “the GSSPS will greatly advance the field toward an economically viable system by the turn of the century.”

“The Dual-Expander Rocket Engine -- Key To Economical Space Transportation”

Rudi Beichel
Astronautics & Aeronautics, November, 1977

The dual-expander engine allows parallel burn of two propellant combinations (using 2 combustion chambers) during the initial flight phase, followed by a sequential burn at high altitude. Due to tradeoffs in tankage weight, etc., this engine yields major performance increases. “The cost per unit weight into orbit for the space shuttle is \$470/kg (\$213/lb) and . . . the corresponding cost for a new vehicle design utilizing [these] new propulsion system concepts is \$12/kg (\$5/lb).” “This engine, its operation, construction, and advantages are discussed. The author concludes “this article has concerned that word ECONOMICAL. Although only a modest step beyond the state of the art, the technical advances described in this and my previous A/A articles present the only known means of obtaining an economical space transportation system.” Doubters, note well -- the author directed the development of the V-2 power plant at Peenemunde.

“Space Applications For Terrestrial Resources”

Brian O’Leary
AAIA Student Journal, Summer 1977

“Testimony . . . before the Science and Space Subcommittee . . . [of the] United States Senate.” Builds a case for the space manufacturing approach to SPS, using asteroids towed into Earth orbit. “The

total cost . . . would be many times less than the several hundred billion dollars of projected capital expansion of coal and nuclear power plants.”

Skylab: Our First Space Station

Edited by Leland F. Belew. U.S. Government Printing Office. 1977. NASA SP-400; Stock # 033-000-00670-5. \$7.00. 164 pp. Hardbound.

As is becoming tradition with the NASA SP series, this book is lavishly illustrated with many color photographs. It is also an excellent popular history of the successful mission. It describes the design history of Skylab; its problems, and successes; and the scientific results from nearly six months in orbit.

Space Settlements: a Design Study

(NASA SP-413), recently was published by NASA’s scientific and technical information office. It describes in vivid terms and illustrations the construction and operation of permanent settlements in space where as many as 10,000 people at some future time may work, raise families and live out their lives. The 185-page volume is based on a study sponsored by the American Society of Engineering Education and NASA, held at the Ames center and Stanford University, in which 31 engineers, scientists and students participated. The book is priced at \$5.00, on sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20301 (stock number 033-000-00669-1).

William Sims Bainbridge, *The Spaceflight Revolution*, Wiley, 1976
by Vidvuds Beldavs

Bainbridge has written a highly informative book that traces the development of spaceflight as the result of a social movement. It is his thesis that spaceflight followed a pattern explained by Thomas Kuhn in the *Structure of Scientific Revolutions*. In effect, Von Braun, Oberth, Tsiolkovski, Goddard and other pioneers in the spaceflight movement acted on irrational, perhaps mystical impulses during the revolutionary stage of development of spaceflight. The post Apollo effort is no longer revolutionary science and technology but rather follows the pattern of normal science with incremental advances. With NASA spaceflight has become institutionalized and the bulk of research, development and publications deal with narrowly defined technical problems.

Initially the Space Movement was heavily influenced by science fiction. As real developments occurred in space the influence of science fiction declined and the typical SF fan became alienated and disenchanted from real events in the development of space technology. During the early stages many amateur societies sprang up in Germany, England, USSR and the U.S. advocating spaceflight and rocket technology. Within the U.S. the American Interplanetary Society soon became transformed into the American Rocket Society and later the American Institute of Aeronautics and Astronautics reflecting the voice of government and business involved in aircraft, rocketry and space.

In Germany the Spaceflight Movement effectively exploited the Nazi war machine to advance the development of spaceflight through weapons development. Apparently at no time was Von Braun seriously interested in weapons development but rather made every possible effort to gather resources and scientists to advance the cause of spaceflight. The usual topic of conversation at Peenemunde was how to get into space and not how to strike targets in England more effectively. Bainbridge presents evidence that technical incompetence, irrationality and political gamesmanship among the Nazi leadership led to the tremendous investment in the V-2 at a time of great crisis to the German nation. More than 200,000 people were involved in the V-2 program in the 1944-45 period. The program cost an estimated 2.5 billion dollars and at one time or another absorbed the efforts of one third of Germany's physical scientists and

advanced engineers. The liquid fueled V-2 was a far less effective weapon than solid fueled rockets, jet planes, or other weapons that Germany could have developed.

According to Bainbridge a similar pattern occurred in the U.S. and Russia after the war with spaceflight advocates selling their respective governments on massive space programs. With the success of the moonflight and the development of Space Shuttle "the Spaceflight Movement in America has ceased to be a movement and has become institutionalized as a part of the standard government-industrial structure. The Spaceflight Movement has matured, and in succeeding, has lost its power for revolutionary growth."

Bainbridge examines the Committee for the Future as an example of how the Spaceflight Movement has continued but finds that the Committee for the Future became less and less interested in space per se and more and more interested in "pop futurology" and world planning. Bainbridge feels that groups like the Committee for the Future and SF fans do not relate to the technical realities of spaceflight as is currently being carried out by the U.S. and other governments. In effect we are in for a long period of normal science which may be followed by a Second Spacecraft Revolution. Bainbridge says,

"My overall contention is that the next 20 to 50 years will be marked by a gradual upward coasting of space-technology capabilities-a period of normal technological change. Somewhere soon after the turn of the century there is a real possibility of a Second Spaceflight Revolution."

A very interesting idea presented by Bainbridge is that there are cultural redoubts which allow for the preservation of ideas which the broader society may find useful at a later time. According to Bainbridge:

"Culture preserved in a redoubt may later emerge into the larger society. Spaceflight itself may be the best example of an idea protected and developed to some extent within science fiction and later brought to practical realization and full acceptance in the larger society. SF may contain other ideas that might not survive outside the redoubt at the present time, but may emerge strong and compelling at some future time when the conventional consciousness has changed."

Bainbridge has done an excellent job of covering the historical development of the movement. The book is weakest in its treatment of the future prospects of space flight, exploration and industrialization. He sees no sign of significant economic, military or scientific activity that would accelerate the movement into space. The considerable literature, conferences and

courses on space industrialization indicate that the Space Movement has already entered the Second Space Revolution. This time the movement appears far broader and more deeply rooted than the one that took man to the Moon. Bainbridge says "there is a minor movement afoot to build floating cities in Earth orbit, an interesting if somewhat frivolous idea." This comment does not reflect a grasp of the realities and potential involved in space industrialization. Finally, we are within sight of the point where space can bring significant returns to private investors. We are on the threshold not only of a scientific and technological revolution but rather something far broader including Stine's "Third Industrial Revolution," and Leary's "Migration," Hubbard's "New World," and a restructured world order.

ABSTRACT

"Spaceflight, Colonization, and Independence: A Synthesis".

Michael A. G. Michaud

Journal of the British Interplanetary Society, March, 1977 (Part One), June, 1977 (Part Two), September, 1977 (Part Three).

An overview of the human colonization of our solar system and other star/planet systems. Part One, "Expanding the Human Biosphere," describes the limits which the Earth may impose on the human future; the escape from these limits offered by spaceflight and extraterrestrial colonization; some approaches to the colonization of our solar system (including space colonies); the eventual need to migrate beyond the solar system; the search for colonization sites near other stars; the problems of interstellar flight; and some generalizations about interstellar probes. Part Two, "Manned Interstellar Flight and the Colonization of Other Systems," discusses the problems of piloted interstellar flight; design considerations for interstellar colonizing missions; the establishment, growth, and problems of interstellar colonies; further waves of expansion; and a new status for *Homo sapiens* in the universe. Part Three, "The Consequences of Colonization," discusses the characteristics of the early colonial generations; the influence of extraterrestrial environments; the psychology of the new frontier; social and biological changes within the colonies; the need for adaptive variety; a probable trend in the colonies toward separatism; political-military interactions; the colonies' relations with and impact on the Earth; some long-term implications of human expansion into the universe; contact with other intelligences; and a possible role for Galactic Humanity if we are the galaxy's only intelligent species.

The following papers are included in **Space Manufacturing Facilities, II**, the collection of the proceedings of the May 1977 Princeton Conference on Space Manufacturing Facilities. Reviews by Conrad Schneiker.

“Technical Innovation and Social Exploration in Economic Growth and Energy Development”, L.P. Gerlach

Three approaches to technoeconomic operations are discussed: BIG, SMALL (is beautiful) and HIGH (frontier) as means for economical growth. “Our research enables us to explore social factors which influence resistance to, or innovation and acceptance of these approaches.”

“Space Industrialization Studies-An Overview”, C. Priest, R. Bradford

If one adds “from NASA’s point of view”, the title sums it up. Compared to other proposals for space manufacturing operations, the given time scale of activities seems stretched out and slow.

“Controlled-Environment Agriculture and Food Production Systems for Space Manufacturing Facilities”, J.M. Phillips, M.R. Fontes

“In this paper, the terrestrial experience with CEA (controlled-environment agriculture) systems is reviewed, and probable adaptations of this technology to the problem of designing a food production system for O’Neill’s model I space settlement are discussed.”

“Physiological Parameters in Space Settlement Design”, John Billingham

Reviews physiological design requirements for the O’Neill/NASA-Ames type colony designs. Discusses the need for a sensitivity analysis of costs for departing from these (conservative) requirements.

“Ecopsychiatric Aspects of a First Human Space Colony”, Jay T. Shurley, Kirmsch Natani, Randal Sengel

“This paper considers the potential psychosocial problems facing the first technology satellite crew. These include anxiety, depression, hysteria, ineffectual performance, substance abuse., etc.” “The authors conclude that a full-scale simulation prior to launch and deployment is the best method to test hypotheses and to discover new and emergent behavior patterns.”

“Anthropological Considerations”, A. Harkins

“Among the difficulties in joining anthropological traditions to the creation of space communities are: 1) the lack of a UNIVERSAL ETHNOTHEORY amenable to CULTURAL DESIGN and POLICY FORMATION; and 2) an apparent disinterest among many

anthropologists in advanced hardware technologies. Suggestions are offered for the selective employment of new trends in anthropology which could cope with 1 and 2.”

“Economic Management Systems: Growth Prospects For The United States Over The Next 50 Years,” W.F. Thompson, K.D. Wilson

This paper reviews a large socio-economic study of the prospects for economic growth in the United States over the next 50 years. Significant use of space solar power systems have been left out of the picture until around 2025 and are discussed very briefly. Apparently lack of funding isn’t the reason as “Most forecasts conclude that about 20 percent of total capital funds generated in the nation over

the next 15 to 20 years will go to the energy industry. About half (or 10 percent of the total) will be needed by electric utilities.”

“Environmental Impact of Space Manufacturing”, Richard R. Vondrak
Concerns “The natural environment of the earth, the moon, and cislunar space. . .” As one example, there is a discussion of how lunar atmospheric interference and incomplete discharging of lunar mass driver payloads affects aiming accuracy of the lunar mass driver.

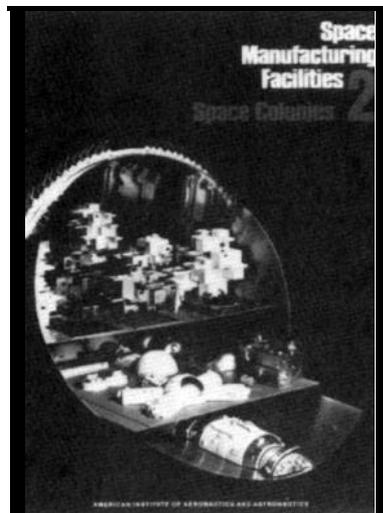
“Microwave Energy Transmission”, William Brown

In addition to discussing many facets of microwave energy transmission systems, the author presents a plan for a series of progressively larger tests of such systems.

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The second volume on Space Manufacturing

SPACE MANUFACTURING FACILITIES, II (Space Colonies)

The Proceedings of the May 1977 Princeton/AIAA Conference
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This *new* hard cover book, an essential companion volume to *Space Manufacturing I*, presents the most up-to-date and comprehensive information available today on the exciting prospects for space-based industry.

Space Manufacturing II, the Proceedings of the May 1977 Princeton/AIAA Conference on Space Manufacturing and Space Colonization, contains the 34 presentations of that Conference in the following categories:

- Transport: Rocketry and Trajectories**
- Transport: Mass Drivers**
- Material Resources**
- Industrial Operations in Space and Large Space Structures**
- Human Factors**
- Products**
- Systems**
- Social System Interactions**

Also included are four thoroughly and clearly written reviews by Gerard K. O’Neill, Jerry Grey, Stephen Cheston, and James R. Arnold, that summarize the voluminous contents.

This volume has been rushed to press by the AIAA to update you on the two years of effort since the previous Conference.

Huntsville Conference to Feature Space Capitalist

Friday afternoon, Jan. 27, Christian O. Basler will present a paper at the Huntsville Explorer Anniversary Conference entitled "Introduction to the Staging Company Approach to Space Industrialization." A staging company is a closed-end management investment company that converts to an operating company after its research and development have brought space industrialization to the point of full commitment. As an investment company it would accumulate capital and invest in the securities of companies likely to profit from space industrialization and would spend the income from its investment portfolio on research and development, to be contracted out, for the most part, to these same companies. The object of the research and development would ultimately be firm

bids for the systems being developed. Until it has accumulated enough capital, through a series of public offerings and appreciation of its portfolio investments, to proceed with full-scale space industrialization, the investment company would spend only the income from its portfolio on research and development.

After reviewing the basic concept of a staging company as first presented at the Industrialization of Space conference in San Francisco, Basler will present several aspects of staging company structure and operation not discussed in the original paper, including integration of tax shelter joint venture investment during the R & D/investment co. phase, contractual relationships between the staging company and contractors (aerospace com-

panies?) and legal problems and solutions.

Basler will give a second paper Saturday afternoon entitled "The Economics of a Staging Company." It will include a year by year analysis of the interaction of possible R & D profiles, total costs, potential earnings, and other economic factors, focused on return on investment for initial purchasers of stock in the staging company and joint venture investors. A step-by-step description of how stock in a staging company can be sold in a series of public offerings and how other forms of financing can be utilized will also be given.

For more information on the conference, contact Prof. Donald E. Tarter, Dept. of Sociology, University of Alabama in Huntsville, Huntsville, AL 35807.

1978 Goddard Memorial Symposium

March 8, 9, 10 Washington Hilton Hotel, Washington, DC

Sponsored by the American Astronautical Society, American Institute of Aeronautics and Astronautics, Forum for the Advancement of Students in Science and Technology, National Space Institute, Institute of Electrical and Electronics Engineers, (Washington section) and the L-5 Society.

The theme of the 1978 Goddard Memorial Symposium is "Space shuttle and Spacelab utilization: what is the near-term and long-term potential benefit?" Topics covered will include student experiments, solar power satellites, space factories, space medicine, the search for extraterrestrial life, space law, science fiction, moon and L-5 bases, the Japanese, Indian, USSR, Chinese, and Canadian space programs as well as the nitty gritty details on the U.S. space shuttle and European Space Agency Spacelab.

Social activities are offered to give relief

to those whose heads begin to reel from information overload. Wednesday, March 8 at 7:30 p.m. a tour of the Naval Observatory is offered. Thursday at 7:30 p.m. there will be a "Washington After Dark" tour (\$11.00); and Friday noon conference attendees have the choice of the AAS/DGLR Luncheon (\$12.00) or the 21st Annual Goddard Memorial Banquet (\$40.00). Conference survivors who can drag themselves out of bed and get ready by 10:00 a.m. Saturday may take a tour of the National Air and Space Museum.

If you wish to attend, you must register

by Feb. 26. Please use the registration form below (another registration form with more details on the conference will be mailed shortly via third class bulk mail to U.S. L-5 members, but if it fails to arrive in time you can use the form below). Hotel reservations should be made directly with the Washington Hilton Hotel by Feb. 14. Look in your local phone book for the toll-free Hilton number if you live in the U.S.; otherwise write to them at 1917 Conn. Ave. & Columbia Rd. NW, Washington, DC 20009.

Registration Form:

1978 Goddard Memorial Symposium

Enclosed is (check one):

- \$25.00 non-member
- \$20.00 member (*if you are an L-5 regular member, please check this item*)
- \$5.00 student

Please make check payable to the American Astronautical Society.

Please mail to:

American Astronautical Society
Goddard Memorial Symposium
c/o Martin Marietta Aerospace
Baltimore Division
103 Chesapeake Park Plaza
Baltimore, MD 21220

Name _____

Address _____
Street

City

State

Zip

Inside the L-5 Society

L-5 is alive and well at Virginia Polytechnic Institute and State University - better known as Virginia Tech - where interest in the prospect of space settlement is steadily expanding.

Initiative toward a chapter of L-5 Society began in the spring, becoming a reality this October. Membership stands now at about 47, the goal being "as many as possible" in the words of economics major Kimber Smith who was elected to the chapter's presidency in November.

"We want to help increase public consciousness of space settlements," Smith explains. "We want to make a contribution to the educational effort. L-5 needs to reach a lot of people, and a lot of people need to reach L-5. Popular participation is the only way to go, and it starts with our local chapters.

"Virginia Tech is a 20,000 member community," Smith adds, "and every one of them is a potential member of our chapter, as we see it."

L-5 vice president at Tech is David Jones, a 5th year architecture student. Secretary is Cindy Hartman (public administration), and Lemar Roberts (biology and psychology) is treasurer.

Faculty advisor to the chapter is political scientist Jack Salmon (also a member of the L-5 Society's board of directors).

While serving as a forum for discussion and a center for the distribution of materials, Tech is taking a look at several chapter project possibilities. One member (Dave Jones) is busily fashioning a model (inside and out) of a large habitat. At last report, Jones was making mountains.

November's meeting focused on the evolution of habitat architectural design.

"We believe in cooperation," Smith notes, "so we hope to be working with the College of William and Mary L-5 on some joint projects. The people in Williamsburg have some interesting ideas about public education and political lobbying, both of which are much needed nowadays."

If you have any ideas or suggestions about projects we could consider this academic year, please send them to us.

Virginia Tech L-5 Society
c/o Kimber Smith
4016 W. Pritchard, VPI & SU
Blacksburg, Virginia 24061

The concept of space settlement has firmly taken root on the campus of America's second oldest institution of higher learning, and the historic community surrounding it.

Beginning in September (at registration itself) with an appeal to "make space settlement an assumption of the whole university," a chapter of the L-5 Society has already become conspicuous at the College of William and Mary, Williamsburg, Virginia.

Over 100 students and faculty members from 17 different schools and departments became involved in chapter activities in 1977, and many more were reached by a series of preliminary educational and media efforts aimed at the general public -- including a major news-feature in the Richmond Times-Dispatch, reporting on "a major worldwide movement."

"Everything we've done so far," says Bill Bryant, an organizer of the chapter, "is just a prelude to the work we plan to do in '78. A great citizens movement is forming, obviously, and we do intend to be very actively supportive of it. We feel that the time has come for doing -- for taking this thing to the people."

The chapter's schedule through May includes:

- Four general meetings, plus a "floating" six-week discussion (focusing on technology, philosophy, education, social science, business and international relations).

- Anticipated special programs featuring Gerry O'Neill of Princeton and Barbara Marx Hubbard of Washington, to be broadly co-sponsored.

- Involvement with Sun Day.

- Sponsorship of a Citizens Petition for the Future (to be shared soon with all L-5 chapters), starting on the campuses.

- Preparation of a tabloid newspaper, videotape programs and a comprehensive study guide (designed for extensive classroom use).

- Sponsorship of a special fine arts competition and showing ("Visions of Humanity's Tomorrow").

- Presentations to other groups, both on campus and in the community (ranging from Richmond to Norfolk).

The chapter is making a liberal use of

flyers, broadsides and posters, combined with regular objective reports to all local news media, to promote its own activities and the greater cause.

"It's definitely a people's cause," states Clint Wolf, the chapter's executive director. "That's why we're trying to put together a program that will reach a lot of people, with responsible information."

In addition to Bryant and Wolf, the chapter's directors are Kathy Hickey, Tim Hall, Leslie Siegmund, Karen Pitts, Jeff Strang, Libby Patten, Jeff Parker and Glen Gross.

Seven of the chapter's members participated in the special Congressional seminar in October.

Communications with the chapter should be addressed to:

Clint Wolf
Executive Director
Williamsburg L-5
P.O. Box 718
Williamsburg, Virginia 23185



The above sticker represents one of my current personal efforts to spread awareness of the space option. Shunning a timid or ambiguous message, I've combined a number of specific concepts in the hope of grabbing the attention of the average disinterested person. Judging by the reaction so far I think I am succeeding. The unusual combination of ideas generate a lot of comment and discussion. Many people are clearly dislodged from their familiar mundane orientation to issues concerning energy, resources and the environment.

Since my purpose was to reach as many people as possible I had ordered a large print run to keep the price of the sticker within a reasonable range (I hope! to break even on my expenses). It is printed in three colors (blue, green and black over white) on glossy stock 3 1/2" x 1 1/2" and varnished. I am making the stickers available to anyone interested, especially to organizations with established distribution arrangements.

Here are the prices:

| | | |
|-----|---------------|-------------------------------------------|
| 1 | - \$1.00 | (1st class envelope; sticker folded once) |
| 1-9 | - 1.00 ea. | +75¢(1st class box) |
| 10 | - 9.00 | (1st class box) |
| 50 | - 29.00/30.00 | (3rd/1st class box) |
| 100 | - 52.00/54.00 | (3rd/1st class box) |

-Larger quantities are available at reduced unit costs. L-5 chapters please note resale possibilities! (Or: Send one order and distribute the stickers to members at a lower price.) Send orders to Jon Alexander, Box 216, Point Pleasant, PA 18950.

Space Colonies Topic of Columbia Colloquium

Jan. 23 Columbia University's Teacher's College in New York City is sponsoring a colloquium at which L-5 Director Romualdas Sviedrys will speak on the topic of psychology of space colonies research. The public is invited to the

colloquium. Although at the time of the writing of this article the time and room had not been determined, this information can be obtained from Dorothy Thorne, 212/678-3247.

Please note that we have formed an L-5 chapter at the University of Maryland. The headquarters for now will be located at my house, which is a short walk from campus. The forms required by the university have been registered and filed. The name of the chapter is "Maryland Alliance for Space Colonization." We have an executive committee of five now set up, including two undergraduates, one graduate student in biochemistry, one graduate student who also works for the state government and was Student Government Association president for the University of Maryland Baltimore Campus when he was an undergraduate, and myself. (Back in 1973, I set up the Harvard Committee for a Space Economy, when I was a grad student there, and we had Mark Hopkins and Siegler as members; however, when I quit as General Secretary, and turned it over to them, because of thesis and job demands, it didn't last much longer.)

For further information, please contact Paul J. Werbos, 8411 48th Ave., Berwyn, MD 20740.

Any Society members near Midland, Texas who would like to start a local chapter should contact:

Brad Wright
3515 Gulf
Midland, Texas 79703
Phone: 915-694-0867

An Omaha, Nebraska L-5 Chapter has been formed. Interested people can contact Jay S. Moynihan, 3328 California St. Apt. 5, Omaha, NB 68131.

Canadians interested in an L-5 Chapter which will translate the L-5 News into French for further distribution are encouraged to contact Andre Fontaine - Gagnon, Ph.D., coordinator, Quebec Chapter, 1185 Ave. Brown #3, Quebec, QC G1S 3A1.

Beat Those Proposal - Writing Blues

A report has been released that may be of interest to L-5 Society members who prepare proposals for government contract support. The report is *The Evaluator Preference Survey* by Bob Dycus. The report presents the results of an attitude and evaluative judgement study of 33 experienced government proposal evaluators.

The unique feature of this report is that it presents empirical data on the reaction of proposal evaluators to submitted proposals. How to effectively write proposals is a highly subjective area with considerable differences of opinion among writers. Most writers rely on intuition which is developed on the basis of past

Notes from the Editor

L-5's stable of anonymous authors put in a virtuoso performance last issue with *German Space Capitalists Under Attack* and *NASA Virtues Under Carter*. Those of you of the literary critic persuasion may enjoy sleuthing through back issues in search of articles with similar styles which include bylines. That's all the clues we can give you - we promised not to tell!

We appreciate it when you send in items. Newspaper clippings, conference proceedings, press releases, hot tips and even rumors are the raw material from which L-5 News stories evolve.

Are you an undiscovered Great Author? Would you like to be discovered? Consider T.A. Heppenheimer. He first appeared in print in the L-5 News, and as a result of this exposure was able to catch the eye of a publisher. His first book, *Colonies In Space*, was snapped up by several book of the month clubs and is coming out in paperback shortly. So, even though the L-5 News pays rotten (writers usually donate their articles), if you're really good, publication in the L-5 News could be that big break you've been waiting for.

What do we look for in an article? It should be accurate; packed with details, facts and, if appropriate, quotes; accurate; relevant to the goals of the L-5 Society; accurate; entertaining; and accurate.

We're serious about that "be accurate" business. We check facts, everything from what state Senator Mosstop represents to the surface gravity of the Moon. At the first factual error we hit, the manuscript hits the wastebasket. We have discovered that an article rarely has just one error; it's either completely accurate, or else the

author is out of his or her depth and flounders in errors and misconceptions the whole way through. *Know your topic.*

Details, facts, and, when appropriate, quotes are the lifeblood of an article. Tell us who, what, where, when, why and how. Without them it's simply an opinion piece. (We enjoy your opinions. But they belong in the Letters to the Editor section, and shouldn't run over 400 or 500 words. The probability of having your opinion printed is inversely proportional to its length. Come up with a pithy one liner and we'll love you forever!) If you can supply photographs or illustrations, excellent. We realize they can be expensive to make; let us know what they cost, and if we use them, we'll send you a check.

Be relevant! We don't care if reading the Book of Oskwash will enlighten the souls of L-5ers; the connection is too tenuous. Interviews are great only if they are with well-known personalities or major space researchers, and only if they are discussing things relevant to the human habitation of space. You may think Joe Blow in Arkansas has fascinating thoughts about space colonies, but we can't justify spending \$400 on typesetting and printing so that Society members can hear about them.

Be entertaining-or, if that's not your style, at least be undull. The lead sentence is the most important. Examples of good leads from the last L-5 News are "Nobody seems to trust poor Lutz Kayser," "There is apparently no substance to the rumor that Christian O. Basler is the emissary of an advanced and beneficent spacefaring species. . ." "Keep slugging and pushing." If you can't come up with a real "grabber" for the lead, the next best thing is something plain, but to the point. Examples (again from the last L-5 News) are, "One of the best, and certainly least expensive, generally available sources of information for the lobbyist is . . ." "Our topic, near Earth resources, is something new." Whatever you do, get to the heart of the subject quickly. To paraphrase the Southern preacher's dictum, "If you can't hit oil in the first paragraph, quit boring." Resist the temptation to indulge in complex figures of speech, flowery adjectives and involved jokes. For the L-5 News, less is more. Remember the professional writer who complained, "Gee, if I'd known I had more time, I would have written less." Happy writing!

-Carolyn Henson

Letters

“Recruit Lao Tzu”

I believe that we can recruit Lao Tzu for the cause. In your November issue, a quote ascribed to him was placed among some others critical of space colonization. The quote was: “As for those who would take the whole world to tinker with as they see fit, I observe that they never succeed.” He has correctly observed that the world is too complicated to deal with. Any attempts to tinker with it are more likely to cause harm than good. Such an insight leads to the conclusion that a simpler place for man’s experimentation is required. This place is space. Any social or ecological error made on one space habitat is correctable at finite cost. Such errors made on the one and only earth can be fatal. So, as I see it, space colonization should be warmly embraced by all extreme environmentalists.

I believe that you should move Lao Tzu from the column of those who say no to the column of those who say yes. Since he is dead, he can’t protest anyway.

George Fredericks
Colorado Springs, CO

“Star Kings”

I came across the following clipping in my papers from the period I was living in Hawaii. It was in the *Honolulu Advertiser*, part of a regular column done by a hereditary Prince from one of the most prominent old Hawaiian families, then doing time in Folsom on a bum check rap. The chant came from the old religion of the old Polynesian stock on the Islands, from the priestly chants of the Order of the God Lono:

We have looked upon the shining depths of Earth in the dark night.
We have set our feet upon her breast,
and she has embraced us as her own.
Yet we are strangers to this Earth, and alien to this sun,

For our home lies athwart the barriers of time,

And in the long flood of night,
And far beyond the calling stars
And our lords are the star-kings.

Our juggled Prince told his readers they could make of it whatever they would, but he himself was willing to take the next bus to Alpha Centauri, if they were willing to take a check.

It may interest some readers; after all, it might be nice if Lono’s pals had a bus stop next time. Incidentally, the Prince is out now.

David Murphy
Carbondale, IL

L-5’s Achilles Heel?

The Satellite Solar Power System can provide “clean” energy to any point on earth, end the energy crisis, raise the standard of living for all people on this planet, and pave the way for colonies in space. It will cost only a fraction of what the U.S. utilities would have to spend between now and the year 2000, and is based on technology we now have or expect to have in the ’80s.

ERDA is currently working on the deep drilling technology that will allow us to tap the enormous heat reserves a few miles below our feet. Deep well geothermal plants which extract heat from water pumped into these deep wells can provide “clean” energy anywhere on earth, end the energy crisis, raise the standard of living, cost a fraction of what would have been spent on more conventional plants, and will be based on technology we now have or expect to have in the 1980s. This system will not pave the way for colonies, however, because it will not require many billions of dollars “up front” for lunar mass drivers, “construction shacks”, and the like. Since each plant will be essentially modular and will not require massive investment for transportation, mining, etc. it could offer a more attractive investment opportunity for Washington or Wall Street than the SSPS.

If something like deep well geothermal or OTEC (which uses the temperature differences in the oceans) becomes available as a possible solution to the world’s problems, and can be shown to cost the same as or less than the SSPS, how are we going to sell the concept of powersats to Congress or private industry? And if we

cannot sell the SSPS, how do we justify the billions of dollars necessary to build space colonies? Congress and private industry are notorious for their short-sighted outlook and willingness to follow the path of least resistance.

Is anyone out there looking into other economically-justifiable (i.e., profitable) space projects besides the SSPS which can generate the billions of dollars needed to get space colonization “off the ground”? I do not want to see the whole concept of space settlements go down the tube because we hitched our wagon to the wrong horse. Any comments from the members of the L-5 Society?

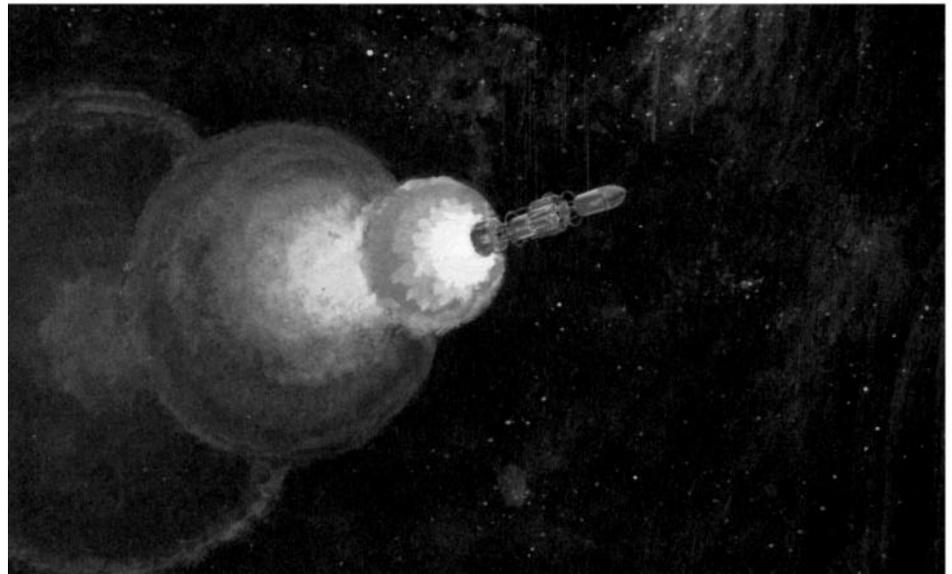
Robert G. Lovell, Jr.
Shawnee, Kansas

Stogies in Space

I do not think that the matter of smoking in space colonies is very simple.

For one thing, the increasing size of non-smoking areas in airplanes, restaurants, and the like indicates one trend. Secondly, so far as I know none of the astronauts were smokers and we therefore have no notion as to what the physiological effects may be on a person undergoing daily changes from O-G to 1-G. Thirdly, it is obvious that those in the construction areas of O-G will not be able to smoke. Fourthly, I can not imagine that any tobacco firm will pay \$160 per kilogram freight charge nor do I think that many colonies will have enough agricultural space that they will devote some to the raising of tobacco.

Kirk H. Stone
Research Professor
University of Georgia



Bus to Alpha Centauri: Pictured here is the Orion nuclear pulse jet interstellar ark, a 400,000 ton vehicle which uses 300,000 small fusion bombs for propulsion. Attaining 1/30 the speed of light, it can make the trip to Alpha Centauri in 130 years. (Photo courtesy Hughes Research Laboratories.)

Comment on Goldwater

Barry Goldwater clearly represents an extreme political viewpoint. I believe that his election, at least without that of a "counterbalancing" democrat, could hurt the L-5 Society's cause.

Paul Patton
Green Bay, WI

Convey my best wishes to Senator Goldwater. On the issue of space industrialization I find myself, a "liberal democrat," in total agreement. If the subject can unify the two of us, it certainly can unify the world! Darth Proxmire, take note!

Gary D. Miloglav
Piedmont, CA

Maybe Barry Goldwater should think of running for U.S. President on the L-5 ticket with Dr. O'Neill as his VP.

Roy S. Furst
Baldwin, NY

Hasn't that been tried before? -- MB

Lobbying Notes

The article in the October issue of the L-5 News entitled "So You Want to Lobby" was extremely informative. However, the article did not list two very important People which a person could write. They are:

- 1) President Carter, of course.
and
- 2) Acting Director James T. McIntyre, Jr. Executive Office of the President Office of Management and Budget Washington, D.C. 20503

Respectfully,
G. M. Wannamaker
FPO NY

L-5 Graphics

For your information, I received the November 77 issue of L-5 News today. Your graphic organization is getting much better. (On the subject of space colonies it is important to have a professional look to the graphic layout in order to make a favorable impression on intelligent people.) Thanks for putting the mailing label on the back cover this time. (I preferred envelope mailing.)

-Jon Alexandr
Point Pleasant, PA

Corrosion Questions

I wish to raise the question of the corrosion of space colony structural materials. Corrosion on the external side which is in contact with vacuum may be negligible, though radiation damage, erosion by micro-meteorites and evaporation of heated surfaces may take place. However, on the internal side, the structural walls will be in contact with air and/or soil at levels of humidity, acidity and oxidizing potentials similar to those under terrestrial conditions. The rate of corrosion of metals under these conditions is not necessarily negligible. In turn, corrosion will lead to weakening of the wall materials, which may become serious in view of the strain exerted on the habitat structure. Corrosion damage may thus result in lifetimes for these habitats which may be more limited than we intuitively tend to assume. In this case amortization of the habitats will have to be taken into account in the economic evaluation of space colonization. In any event, the corrosion problem will have to be taken into account in the design of structural materials.

Michael Mautner, Ph.D.
The Rockefeller University
New York, N.Y.

Social Models Needed

The aspect of the human colonization of Space that really intrigues me is the unprecedented psychosocial environment in which we will be living. Historically, settlers of new realms have encountered problems and effected solutions unknown in their old environment. Clearly -- and especially -- human Space colonies will not be simple cultural transplants from Earth.

As John Sotos observed in his letter (August, 77), "Space habitation cannot afford to be trial and error." The internal (psychological, spiritual) and external (Physical, social) tools for manifesting clear, sharp and exceedingly satisfying human interactions -- suitable for the conditions of Space living -- exist today. Yet, to my knowledge, no teams of people employing these techniques in daily living, with the goal of adapting them to the Space environment, currently exist. Let's get busy now establishing these social models, so when the technology materializes out there we'll have living teams worthy of occupying them! These exemplary communities, fundamental to human life in Space, would be another benefit to the Earth from this great venture.

Ron Lichtwardt
Honolulu, HI

"Too Much Idealism"

On the question of the military uses of outer space I would like to say that too much idealism has been shown by the comments in the Newsletter. Space activities should be kept peaceful, but not at all costs. Not at the cost of liberty and individual freedom. As George Orwell wrote in "Looking Back on the Spanish War", "For the truth is very simple. To survive you often have to fight, and to fight you have to dirty yourself. War is evil, and is often the lesser evil."

Lawrence Boyle
Chicago, IL

L-5 SOCIETY MEMBERSHIP FORM (please type or print)

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I am am not interested in being active locally. Phone (optional) _____

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