

# L5 NEWS

MARCH 1978



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**Front Cover:** A "heliogyro" solar sail approaches Halley's Comet, due to enter the inner solar system in 1986. Its next scheduled visit is in 2062. See related story page 1. (Artwork courtesy Jet Propulsion Laboratory.)

**Back Cover:** Schematic representation of the solar system showing the sun, the orbit of the Earth, the orbit of Halley's Comet, and the trajectory a solar sail mission would follow in order to catch up with the comet. (Artwork courtesy Jet Propulsion Laboratory.)

# OMB's Plan for NASA

## *Enterprise, Halley's Comet Mission, LPO to Bite the Dust?*

by Carolyn Henson

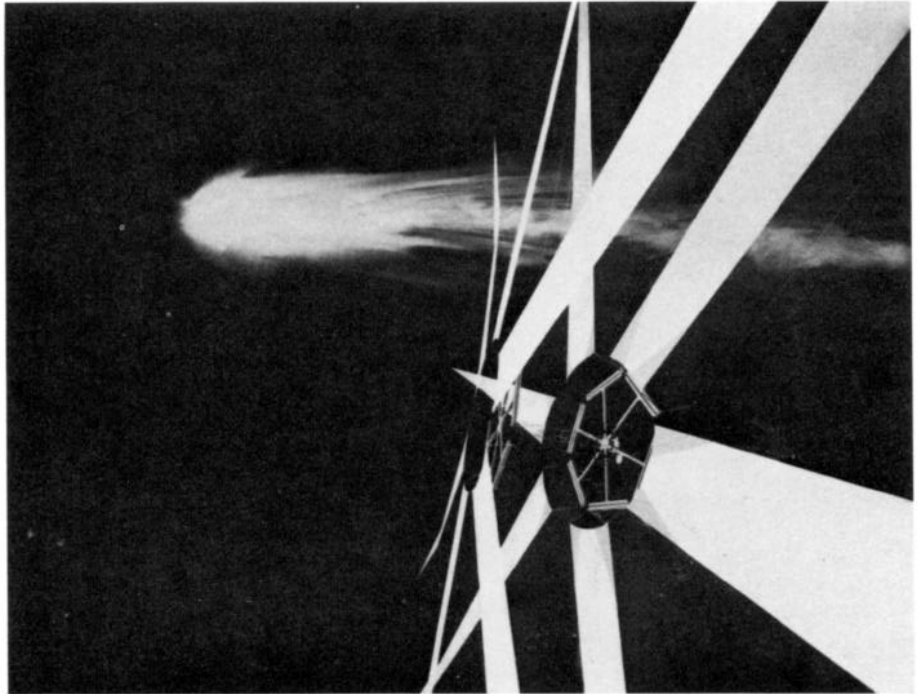
If the Office of Management and Budget (OMB) has its way, it looks like slim pickings for NASA in fiscal year 1979. OMB guidelines allow \$4.371 billion for NASA's budget. This represents an 8% increase over last year's budget, barely enough to keep pace with inflation.

Budget increases are slated for the Jupiter Orbiter Probe, solar-polar out-of-ecliptic mission, Earth radiation budget spacecraft, halogen occultation experiment and solar mesospheric explorer. On the other hand, OMB decided to ground the Enterprise and decrease spending on Earth resources and communications, space transportation advanced planning and solar power satellites. The Halley's Comet mission will be cancelled, and the Lunar Polar Orbiter (LPO) failed to win approval for the third year in a row.

The Lunar Polar Orbiter is considered a vital step in developing extraterrestrial resources. Scientists suspect that glaciers of ice, nitrogen and carbon dioxide may be hidden in permanently shaded areas of the Moon's poles. The LPO would be able to detect and locate such glaciers, which, if they exist, could provide space settlers with elements which are almost totally non-existent on the lunar plains. Otherwise, settlers will have to import hydrogen, nitrogen and carbon from Earth at great expense.

Space industrialization and settlements may suffer a delay if LPO misses the boat again this year. However, if the Halley's Comet Mission gets the gate, we're going to have to wait another 76 years after its visit in 1986 in order to see close up motion pictures of gossamer veils boiling off the solar system's most spectacular comet.

The only other comet whose arrival date is expected before the end of the century is Comet Encke. (Other comets, "unexpected visitors," will almost surely show up, but we will only have a few months warning of their arrival -- too short a time for a spacecraft to-catch up with one.) Comet Encke has been in the solar system a long time, so long, in fact, that it has become a burnt-out rock with no hint of the flaming tail which has made Halley's Comet an object of fear and beauty. But OMB wants us to check out Encke instead. Sigh.



*Halley's comet: wait until 2062 for a closeup view?*



*Enterprise: headed for the hangar -- permanently?*

# NASA Budget Plan

## Space Transportation Systems

	(Thousands of Dollars)	
	FY 1978	FY 1979
<b>Space Shuttle</b>	<b>1,349,200</b>	<b>1,439,300</b>
Design, development, test and evaluation .....	(1,307,500)	(985,300)
Orbiter .....	800,500	536,500
Main engine .....	219,900	176,700
External tanks .....	82,200	80,500
Solid rocket boosters .....	97,300	63,500
Launch and landing .....	107,600	128,100
Production .....	(41,700)	(454,000)
Orbiter .....	38,700	397,000
Main engine .....	3,000	18,000
Launch and landing .....	-	11,000
Spares and equipment .....	-	28,000
<b>Space Flight Operations</b>	<b>267,600</b>	<b>311,900</b>
Space transportation system operations capability development .....	59,700	110,500
Development, test and mission operations .....	176,400	163,000
Advanced programs .....	10,000	5,000
Space transportation system operations .....	17,700	33,400
Planning and program integration .....	4,000	-
<b>Expendable Launch Vehicles</b>	<b>134,500</b>	<b>76,500</b>
scout .....	17,000	16,000
Centaur .....	55,900	21,000
Delta .....	55,300	38,600
Atlas-F .....	6,300	-
<b>TOTAL SPACE TRANSPORTATION</b>	<b>1,751,500</b>	<b>1,627,700</b>

## Space Science

<b>Physics and Astronomy</b>	<b>224,200</b>	<b>265,500</b>
High energy astronomy observatory .....	18,400	11,400
Solar maximum mission .....	30,600	16,200
Space telescope development ..	36,000	79,200
Solar polar mission development .....	-	13,000
Shuttle/Spacelab payload development .....	28,900	38,300
Explorer development .....	23,896	29,800
Mission operations and data analysis .....	27,004	32,400
Research and analysis .....	33,400	35,900
Suborbital programs .....	26,000	29,300
<b>Lunar and Planetary Exploration</b>	<b>147,200</b>	<b>167,100</b>
Pioneer Venus .....	18,100	-
Voyager .....	-	-
Jupiter orbiter/probe .....	20,700	78,700
Mission operations and data analysis .....	84,500	84,400
Research and analysis .....	23,900	24,000
<b>Life Sciences</b>	<b>33,300</b>	<b>40,600</b>
Life sciences flight experiments .....	9,000	12,400
Vestibular function research .....	1,500	3,800
Research and analysis .....	22,800	24,400
<b>TOTAL SPACE SCIENCE</b>	<b>404,700</b>	<b>513,200</b>

## Space and Terrestrial Applications

	FY 1978	FY 1979
<b>Space Applications:</b>	<b>234,600</b>	<b>274,300</b>
<b>Earth Resources Detection and Monitoring</b>	<b>(106,945)</b>	<b>(151,500)</b>
Landsat-C .....	3,200	700
Landsat-D .....	48,200	97,500
Shuttle/spacelab payload development .....	3,370	6,000
Shuttle/spacelab mission design and integration .....	2,240	6,900
Integrated payload planning ..	(4,000)	4,000
Applications research and technology development .....	49,735	36,400
Follow-on data analysis and operations .....	200	-
<b>Earth Dynamics Monitoring and Forecasting</b>	<b>(7,200)</b>	<b>(8,600)</b>
Tectonic plate motion .....	2,200	2,100
Applications research and technology development .....	3,100	5,400
Follow-on data analysis and operations .....	1,900	1,100
<b>Ocean Condition Monitoring and Forecasting</b>	<b>(16,950)</b>	<b>(12,400)</b>
Seasat-A .....	11,400	3,000
Applications research and technology development .....	2,750	4,200
Follow-on data analysis and operations .....	2,800	5,200
<b>Environmental Quality Monitoring</b>	<b>(26,190)</b>	<b>(20,200)</b>
Nimbus-G .....	13,900	2,800
Halogen occultation experiment .....	-	6,100
Shuttle/spacelab payload development .....	3,140	2,900
Applications research and technology development .....	8,150	7,400
Follow-on data analysis and operations .....	1,000	1,000
<b>Weather Observation and Forecasting</b>	<b>(25,115)</b>	<b>(22,600)</b>
Tiros-N .....	4,100	-
Shuttle/spacelab payload development (ACPL) .....	2,700	4,400
Global atmospheric research program .....	5,000	5,800
Severe storm research program .....	5,600	6,500
Global weather program support .....	5,815	5,100
Follow-on data analysis and operations .....	1,900	1,000
<b>Climate Research</b>	<b>(2,500)</b>	<b>(12,200)</b>
Earth radiation budget satellite system .....	-	8,000
Applications research and technology development .....	2,500	4,200
<b>Materials Processing in Space</b>	<b>(15,200)</b>	<b>(20,400)</b>
Space processing applications rocket project .....	3,900	3,600
Applications research and technology development .....	5,000	4,400
Shuttle/spacelab payload development .....	6,300	12,400
<b>Space Communications</b>	<b>(21,200)</b>	<b>(22,000)</b>
Search and rescue mission .....	5,600	8,000
Shuttle/spacelab payload development .....	1,000	1,200
Technical consultation and support studies .....	3,100	3,100
Application research and technology development .....	7,700	5,200

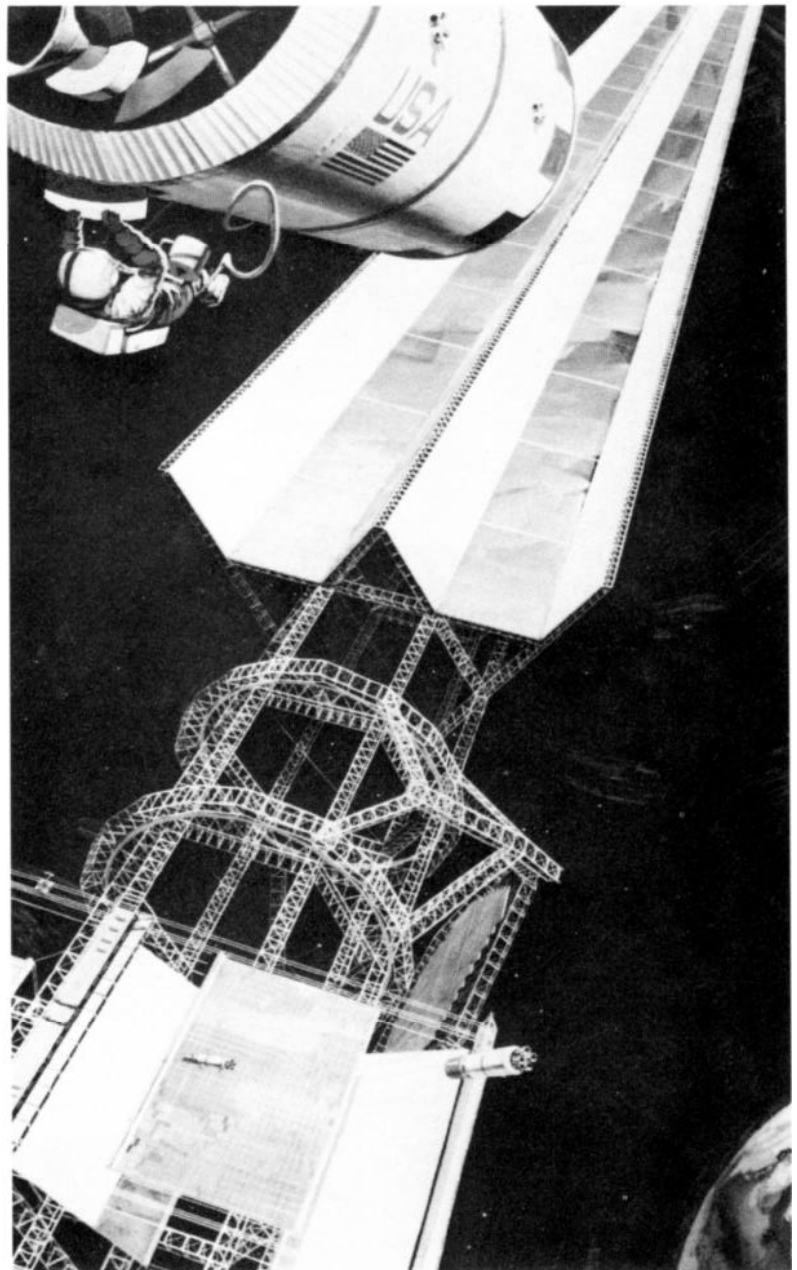
	(Thousands of Dollars)	
	FY 1978	FY 1979
Follow-on data analysis and operations .....	3,700	4,500
Cooperative applications satellite-C .....	100	- -
<b>Applications Explorer Missions</b>	<b>(13,500)</b>	<b>(4,200)</b>
Heat capacity mapping mission .....	600	300
Stratospheric aerosol and gas experiment .....	2,400	- -
Magnetic field satellite .....	10,500	3,900
<b>Technology Utilization</b>	<b>9,100</b>	<b>9,100</b>
Industrial applications .....	3,715	3,715
Technology applications .....	4,110	4,110
Program control and evaluation .....	1,275	1,275
<b>TOTAL SPACE AND TERRESTRIAL APPLICATIONS</b>	<b>243,900</b>	<b>283,400</b>

## Aeronautics and Space Technology

<b>Aeronautical Research and Technology</b>	<b>228,000</b>	<b>284,100</b>
Research and technology base .....	96,660	109,200
Systems studies .....	3,000	3,000
Systems technology programs .....	75,090	85,645
Experimental programs .....	51,250	66,255
(Aircraft energy efficiency technology included in systems technology and experimental programs) .....	(70,200)	(97,400)
<b>Space Research and Technology</b>	<b>97,700</b>	<b>108,300</b>
Research and technology base .....	65,900	71,700
Systems studies .....	2,000	2,000
Systems technology programs .....	5,600	7,900
Experimental programs .....	15,000	17,700
Low cost system program .....	9,000	9,000
<b>Energy Technology Applications</b>	<b>7,500</b>	<b>3,000</b>
<b>TOTAL AERONAUTICS AND SPACE TECHNOLOGY</b>	<b>333,200</b>	<b>375,400</b>

## Space Tracking and Data Systems

<b>Tracking and Data Acquisition</b>	<b>278,300</b>	<b>305,400</b>
Operations .....	228,600	254,200
Systems implementation .....	40,400	41,300
Advanced systems .....	9,300	9,900



*Large space structures: not this time, folks.*



*View of San Francisco: California's budget surplus nearly equals NASA's proposed budget.*

# Senate Symposium Commentary

by Jon Alexandr and Ken McCormick

The eventual mass movement of humanity into space was an idea that seemed to be almost taken for granted by participants in the Senate Science, Technology and Space Subcommittee's February 7 'Symposium on the Future of Space Science and Space Applications.' The emphasis, however, was on the potential economic benefits to the earth-bound citizen of the industrialization of space.

Apart from discussion of Lunar, Martian, and space colonization, speakers tended to focus on applications of space technology which have been studied in some detail, already. Large, heavy communications satellites, for instance, would make possible electronic mail transmission, delivery of health care to remote areas, electronic commuting by teleconferencing, wrist radios, personal emergency "panic buttons" for summoning help, and continuous electronic tracking of nuclear fuel shipments. A global information network could make the contents of the great libraries of the world available for electronic retrieval by receiving stations in homes and small libraries.

Observation satellites could provide instant dial-up images to individual farmers and other users, provide information for earthquake prediction, monitor pollution, fisheries, and crops, and detect forest and brush fires within seconds after they start.

Lifesaving chemicals and super-strong metals which cannot be produced in the strong gravitational field of the earth could be manufactured in space.

Satellite solar power stations were discussed, as well as the possibility of microwave transmission, via satellite, of energy produced in remote areas of the earth.

Dr. William M. Brown of the Hudson Institute saw space tourism as a trillion-dollar growth industry of the twenty-first century. Lower and lower transportation costs to orbit will eventually make space travel as accessible to the ordinary citizen as long-distance travel is today, said Dr. Brown.

Dr. George Van Reeth, director of administration of the European Space Agency, said that the sponsor nations of ESA had great interest in the commercial applications of space, as well as in resource satellites. ESA will seek an increase in its \$600 million budget, and will continue to cooperate in the future "mainly, but not exclusively" with the U.S.

The large initial capital investment of space industrialization ventures was a

source of concern. For instance, the cost of orbiting a satellite which would make available a "Dick Tracy" wrist radio system to the public was seen as about a billion dollars by Ivan Bekey of Aerospace Corporation. However, with the wrist radios available to consumers at about \$10 each, and a charge of 10 cents per minute for use of the satellite facilities, the billion-dollar satellite should produce about a billion dollars per year in revenues, said Mr. Bekey.

NASA administrator Frosch placed the cost of an SSPS system at \$500 billion, and said that while this was comparable to the capital outlay for other systems, such as coal and nuclear fission, the other systems could be purchased in small chunks, whereas the SSPS system would have to come all in one package. If he could not get agreement on relatively cheap information and communications satellites, Frosch asked, how was he ever going to get the huge investment for SSPS? Other speakers, such as Space Global president Krafft Ehrlicke, stressed that we would approach our large goals in space by small, profitable increments.

Economist Dr. Klaus Heiss said he regarded SSPS as "a feasible option to pursue" once research on large structures in space has been carried out. He noted that in the case of fusion research we are putting \$400 million this year "into the pursuit of a technology that by all economic estimates will at that be operationally useful by the year 2025 or maybe the year 2035. Space-based power systems . . . certainly have a similar potential over such a long time horizon. We should pursue them, but we are not putting any similar funding into the pursuit of a space based power option."

A subject of great concern to speakers and senators, alike was the problem of the shrinking NASA budget. Dr. Heiss suggested that if a poll were taken which first explained to respondents that we are spending \$126 billion for defense, and \$160 billion for the department of Health, Education and Welfare, and then asked how much we are spending for space, most people would guess that we are spending tens of billions of dollars, rather than the four billion which is actually allocated.

It was felt that there is wide support in Congress and among the public for the space program, but that NASA projects always ran into trouble with the "budgeteers" in OMB and the congressional appropriations committee. The antidote for this was seen to be congresspersons and the public becoming aware of

practical economic benefits which derive from the space program. "Right now, space is the only major technological area where we are creating the leading edge of technology. Every industry in this country benefits over a relatively short period of time from the fact that we stay at the leading edge of technology," said Senator Harrison Schmitt.

Krafft Ehrlicke saw the center of world power as shifting away from Western civilization as non-Western populations expand and the third world nations industrialize. He pointed to foreign imports which are currently driving the U.S. out of some industries as indicative of the shape of things to come. To maintain a competitive economy, said Ehrlicke, the U.S. must maintain technological pre-eminence. A "Space America," using lunar resources and the industrial potential of space was seen as a road to jobs and job security.

Dr. Brown pointed out that there are many other nations in the world today, such as Japan, Brazil, or China, which would be capable of becoming the number one space power within twenty-five years, should they choose to invest in that direction.

"I think that it is self-interest -- hard-nosed economic interest -- that . . . today offers the United States an opportunity in space," said economist Heiss. "I do think, right now, we are underinvesting in space as to what the potential promise might be of space. Once economics takes over . . . economic self-interest will get us to the great vision that was offered by some of the other speakers, today."

Senator Donald Riegle, a rapidly-rising politician with presidential ambitions, drew flak from Harrison Schmitt and Dr. Frosch when he announced that although he had taken his son to see "Star Wars" for the sixth time, he wondered whether we should be spending so much money on space when there is so much to be done here on earth. Dr. Frosch argued that we will not solve the problems which now face us with the same set of beliefs and capabilities which created the problems to begin with. Just as has been the case throughout history, said Frosch, we can expect new definitions and new solutions to problems to come from totally unexpected areas as we gain new knowledge and new capabilities.

The concepts which have been put forward by Gerard O'Neill were referred to several times during the symposium, although Dr. O'Neill was unfortunately not present to explain his own views.

Professor James Arnold of the University of California termed the prospect of lunar mining "very exciting," and found the study which has been done so far "encouraging." He said he thought it was something which should have "enormous interest" for us.

Dr. Brown of the Hudson Institute, on the other hand, said he agreed with Dr. Frosch "that we as engineers don't want to spend too much time in the near term working out those problems." He acknowledged that "space colonies are a very popular item among certain select groups today -- 'cults,' if you wish," and that some of the work which has been done by "interested young students" as a hobby has been a "bonus" to NASA. "They're building these little mass drivers . . . and they're studying the various problems that they can foresee, and thinking about how you get solutions and, as I understand, most of them do it for free, and some of the work I think is really very good work."

Dr. Brown made it clear that he expected O'Neill-type colonies to be built, regarding the timing as the only real question. After pointing out that Dr. O'Neill sees colonies as feasible "by the end of the century," Brown said that he disagrees with this, believing that colonies "might not be feasible except after 50 years."

Brown acknowledged O'Neill's work in the area of a feasible time scale, however, saying, "I'm not putting myself up against him, because I certainly don't know what I'm really talking about, except as second-hand information." Brown did not make it clear what the basis was for his contradiction of O'Neill's time scale.

In his summary remarks, subcommittee chairman Adlai Stevenson III questioned the wisdom of the Carter administration's proposal to reduce the size of the space shuttle orbiter fleet to four orbiters. Pointing out that Congress authorized a fleet of five orbiters last year, Stevenson made it plain that he would like to see funds for the fifth orbiter restored to this year's budget. Stevenson noted that there was some question as to whether four orbiters would be enough to perform the tasks already envisioned for the 1980's, and that procurement of a fifth orbiter at a later date would cost \$200 million more than the procurement of the fifth orbiter on the original schedule. He suggested that the proposal to cut the orbiter fleet could prove to be "a 200 million dollar mistake."

In his final remarks, Sen. Stevenson returned again to a theme that he had repeatedly stressed throughout the symposium; the current experimentation with space warfare techniques, he said, could lead to an expansion of the arms race into space. This, he felt, would be a development which could interfere with all the great goals that had been discussed.

## "We Have Friends in Congress"

by Howard Gluckman

"We have friends in Congress!" With those words, space consultant G. Harry Stine introduced his talk on space industrialization at the AIAA/World Future Society symposium: "Our Extraterrestrial Heritage -- From UFOs to Space Colonies." The program took place at the California Museum of Science and Industry on Saturday, January 28.

Mr. Stine refrained from reading his prepared paper, and instead told the suddenly awakened audience about the recently completed hearings on "Future Space Programs" in the House Committee on Science and Technology. He told of the good reception that he and fellow witnesses Gerard O'Neill, Barbara Marx Hubbard, and other space industrialization proponents received, and of the chastisements that met Carter administration representatives Frank Press and Robert Frosch.

Stine then read the testimony that he presented to the committee. In it he called for major changes and improvements in the way our space endeavors are handled. He urged Congress to let NASA do what it does best -- research and development, and space science; and to let them contract out or relinquish control of what it does poorly -- public relations, and management of an operational space transportation system. His talk was received enthusiastically by the symposium audience.

Mr. Stine's speech was the highlight of an otherwise ordinary symposium. The morning program concentrated on UFOs. The topics ranged from close encounters (the Zeta Reticuli episode), to instrument detection of UFOs, to the Search for

Extraterrestrial Intelligence (SETI) project. German rocket pioneer Krafft Ehrlicke gave a speech on space industrialization that was unfortunately cut short by lack of time. Ehrlicke was followed by Charles Gould of Rockwell International who presented a long discussion of the details of space industrialization. He was followed by Stine and Richard Johnson, Deputy Director of the NASA/Ames Space Colonization study. Johnson, who was put on the defensive by Stine, tried to bring everyone down to Earth by detailing the problems that have yet to be solved, but it was to no avail. The program ended with a space-scenes slide show presented by the museum, and a special videotape showing of a television program produced by the World Future Society on the public's reaction to space.



View of North America.

## . . . Or Do We?

Dear Mr. Carley:

I appreciate hearing from you about the CBS program 60 Minutes and my comments regarding space colonization.

My position is based on economics and good sense. A plan to place 100,000 or one million people in space on a permanent basis cannot be justified by any known analytical study incorporating cost effectiveness criteria. On earth we have land, water, and an environment that if not plentiful at least is available for use without artificial construction. A space station for one million inhabitants would require financial resources beyond anything currently imaginable without any prospect of economic return.

Therefore, I have concluded that any funds spent on space colonization is simply a waste given the massive problems remaining to be solved here on earth.

The Administrator of NASA has informed me that their planning for the foreseeable future is NOT directed at permanent settlements of people in space since there are no calculations of the benefits that could be derived. He also has said that this space plan has no priority at NASA.

I agree with both of these positions. Our limited federal funding can be put to much better use here on earth.

William Proxmire.  
U.S. Senate

# Testimony of Dr. Gerard K. O'Neill

*in support of House Concurrent Resolution 451*

*before the committee on Science and Technology, House of Representatives, Jan. 25th, 1978*

Thank you for the opportunity to present these views. I'm here to report to you on great progress that's been made, on a unique opportunity that we now have to benefit this country and the world, and finally to point to a very big job still to be done. At the start I want to thank the several Congressional committees that have recognized the significance of this work from the start; and the hundreds of scientists and engineers in government, the universities and industry that have brought the paper study phase to a most successful conclusion; and the private citizens' groups, of which Mrs. Hubbard's is an outstanding example, that have supported this work from its first public discussion.

Humanity is now faced with urgent problems that far transcend in scope and timescale the duration of one American presidency. How to solve growing shortages of energy, how to reverse the present worldwide sink toward poverty, hunger, and military confrontation over diminishing resources. There are two alternative approaches:

One is to accept the inevitability of catastrophe, and do nothing except to monitor global resources, slow the pace of decline by conservation, and be ready to accept the harsh limits on human freedoms that an eventual global steady-state will impose. That is the counsel of the "limits-to-growth" apologists. It was expressed well in the article "After the Deluge, the Covenant" in Saturday Review-World. That article imagines as a good solution a history of these next decades in which 65 million people die by starvation, many millions more die in nuclear wars, and ultimately nations such as our own surrender sovereignty to a worldwide Authority with control over all our nuclear weapons and power to equalize world food supplies by shipping American food abroad with or without our consent. Let me emphasize that I share with many people a belief that a reduction of population growth rates is a good thing. The fact is, though, that the only peaceful way that reduction has ever come about is by individual free choice, in an affluent, well-educated society. No one who calls himself human could regard as an acceptable alternative the enforced death of millions of children by famine.

The second approach to the global problems is, I believe, far more in keeping with our American tradition. That is to use all the science and engineering knowledge we now have in a vigorous,

immediate attack on these urgent problems, in a way that will leave us the individual freedoms we have fought for during the past two hundred years. And in the course of that solution, to preserve and protect the fragile biosphere of our Earth.

The fatalism of the limits-to-growth alternative is reasonable only if one ignores all the resources beyond our atmosphere, resources thousands of times greater than we could ever obtain from our beleaguered Earth. As expressed very beautifully in the language of House Concurrent Resolution 451, "this tiny Earth is not humanity's prison, is not a closed and dwindling resource, but is in fact only part of a vast system rich in opportunities, a high frontier which irresistibly beckons and challenges the American genius."

My own background is in pure science, in the search for scientific truth such as the measurement of the size of the electron. Yet I believe that efforts of pure science, with no practical application for many decades, must be accompanied by the immediate application of science wherever possible to humanity's urgent problems.

I'm reporting on an apparent solution to the limits-to-growth problem, based on fundamental facts of science that will never change: First, that while we search desperately for new energy resources here on the Earth, a few thousand miles above our heads there streams by constantly, night and day, a flood of high-intensity solar energy far greater than we could ever need.

Second, that already we know of materials resources, for large-scale industrial activities in space, thousands of times greater than we could ever obtain from the Earth without despoiling it completely. We spent, in today's dollars, fifty billions on the Apollo project. As a result we know that the lunar surface is one third metals, usable for manufactured products, one fifth silicon, ideal for solar cells and electronics, and more than forty percent oxygen, essential in life-support. I say we should use that knowledge, not throw it away or ignore it.

Already we know that there are special groups of asteroids, with orbits close to the Earth, that are rich not only in the minerals found on the Moon but also in the organic-chemistry building-blocks needed for a complete industrial economy.

Last of three basic scientific facts, we

know that the cost in energy to transport materials from the lunar surface into free space, where it can be used by a totally solar-powered industry, is less than a twentieth as large as the energy cost to transport similar materials up from the Earth.

It makes sense to put at least a small fraction of our total national effort, perhaps one part in ten thousand of our federal budget, into exploring over the next several years how we can use these basic scientific facts to break through the limits to growth and solve the urgent worldwide problems.

In addition to the eternal truths of science, there are facts of current events that must be heeded in any practical program.

First, the Shuttle is the only vehicle system that will be operational for at least the next decade, and that can give us a toe-hold on the High Frontier. If used efficiently, as an airline uses its aircraft, the Shuttle could transport a little less than two thousand tons of equipment per year into orbit.

Second, events are changing much too rapidly for us to foresee now just which industrial products will be the first to benefit from a program of manufacturing in space from nonterrestrial materials. Right now the idea of satellite solar power stations, in synchronous orbit where the sun always shines, beaming down low-density microwave energy for conversion to ordinary electricity for Earth, looks like an ideal candidate. The need is great, and the demand can be estimated as a worldwide market of over 200 billion dollars by the turn of the century. Clearly the use of materials already at the top of Earth's gravitational mountain could reduce transport costs by a large factor, as well as avoiding environmental impact questions that would be raised by the alternative of launching rockets through the atmosphere from Earth, with a total traffic that would be two thousand times larger in tons per year than the shuttle traffic.

But it may be that by the time the High Frontier is opened the satellite power concept will be dead, either because of some insoluble problem in the engineering, or because of environmental impact, or because during its development some other energy technology will have become less expensive. It makes sense therefore to preserve generality in the assault on the High Frontier, to develop the fastest, least expensive



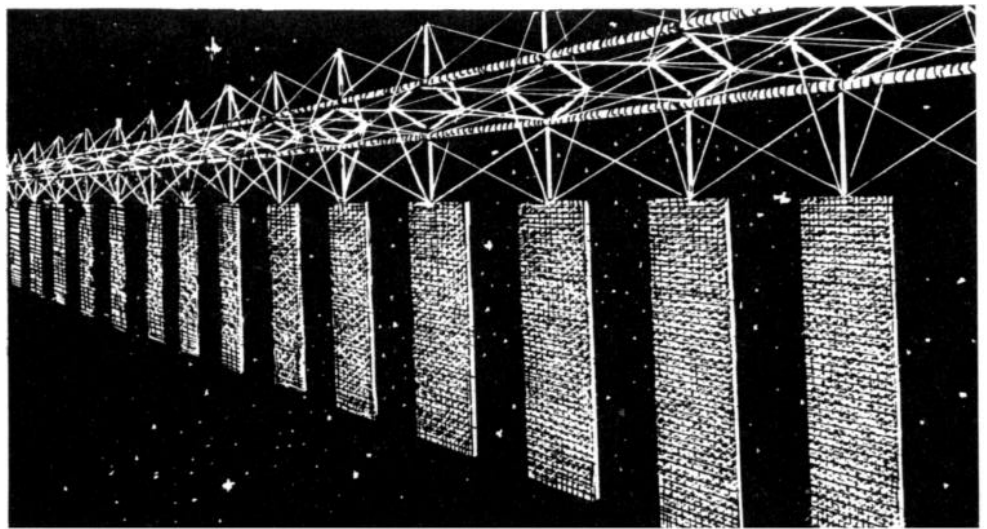
approach to nonterrestrial resources of energy and materials for use in space. By the time we have broken through the limits to growth, it will be clearer how first to exploit the breakthrough.

In the past three years there has been great progress in the scientific and engineering studies of the High Frontier concept, and that progress is now well documented, in proceedings of conferences published by the American Institute of Aeronautics and Astronautics, in publications of the Edison Electric Institute, and in a disarmingly slim volume with the technical articles from a 1976 NASA study. These articles have gone through the entire scientific process of peer-review. Last summer a massive study more than four times as large as this one was completed, and its results, in 16 peer-reviewed technical articles, will shortly be published by NASA.

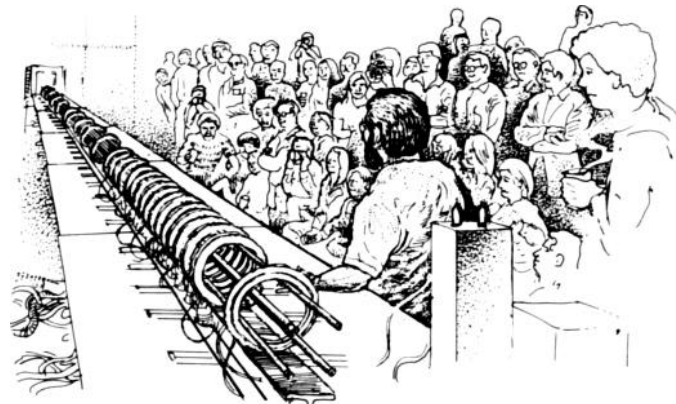
Our present best estimate of the quickest, most economical road to follow is contained in that final study, and is condensed in a special section of the journal "Astronautics and Aeronautics" to be published this March. To show you how much has been accomplished with very little, here are a few pictures of one special device that may be a key to reaching the High Frontier within the limitations of the Shuttle. The device is a new type of electric motor called a mass-driver. It would be used initially as a reaction engine, a tugboat to lift accumulated shuttle payloads of equipment to geosynchronous and lunar orbit. A first working model has already been built, by a group of student volunteers under the direction of Dr. Henry Kolm. The machine was demonstrated at several locations, one of them the final briefing at our 1977 NASA-Ames study. The tests were entirely successful, and the model accelerated a one pound load from zero to 85 miles per hour over a six-foot length.

A mass-driver reaction engine could be carried into orbit in sections, by the Shuttle, to an orbital workbench of a kind already studied by NASA-Johnson Space Center. The reaction engine could lift over 700 tons of accumulated shuttle payloads to lunar orbit, using powdered external tanks from the shuttle to provide the push. Unless we use them those tanks will otherwise be allowed to burn up in the atmosphere over the Indian ocean, an unpardonable waste.

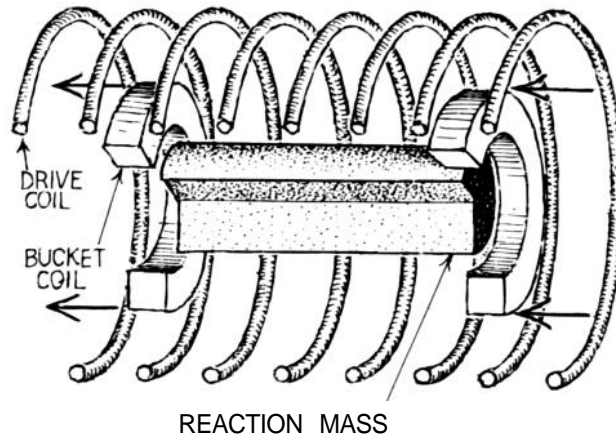
Less than two years' worth of shuttle payloads, lifted to lunar orbit by the mass-driver, would give us all the equipment needed for a lunar base, and all the propellant to soft-land it on the lunar surface. A second mass-driver would be part of that equipment. Located on the lunar surface, it could bring out 30,000 tons/year of lunar materials to a precise point in space; that is, twenty times as much tonnage as the shuttle could lift. One year more of equipment



Tugboat in space: the mass driver.



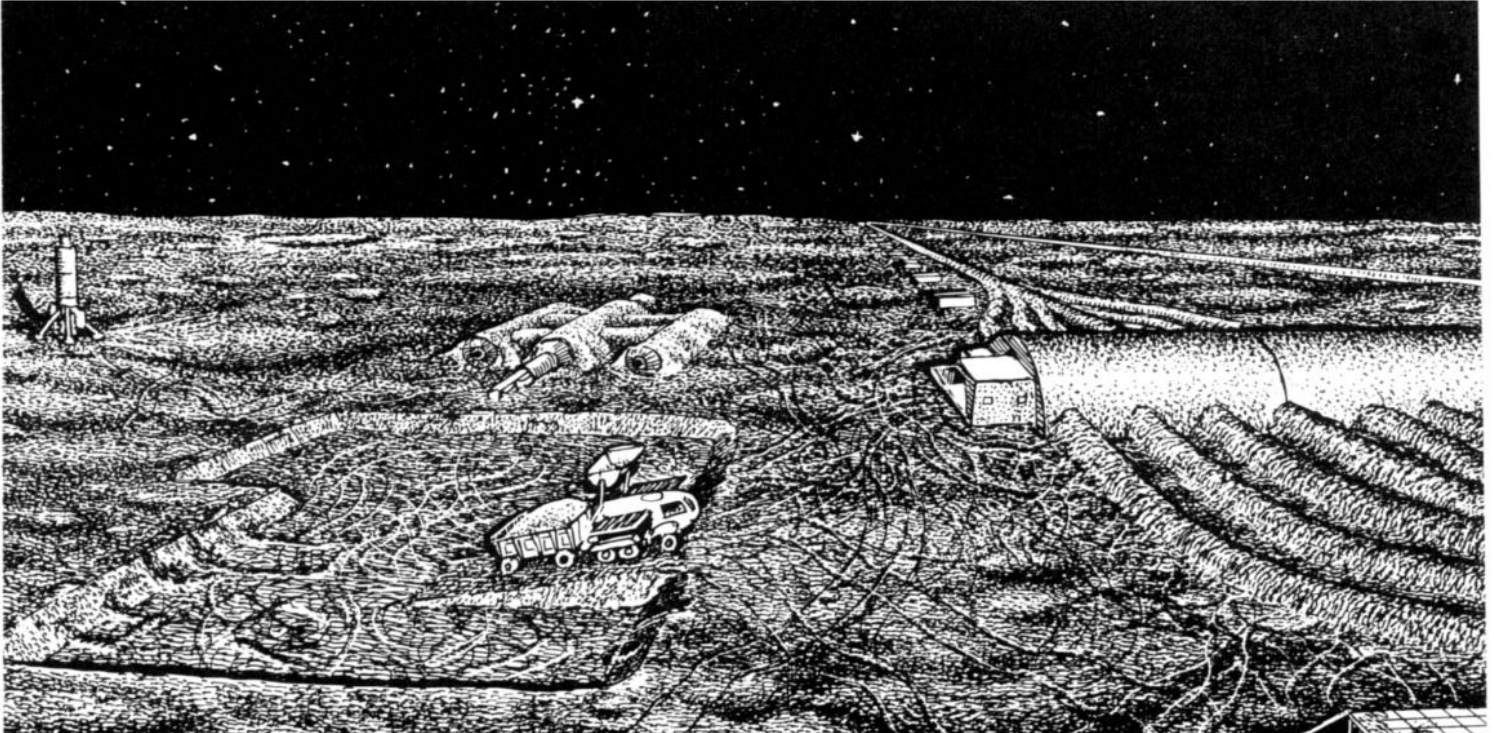
High-acceleration working model of mass-driver.



Mass-driver: Current in drive coils makes magnetic field that pushes on currents in bucket coils, giving acceleration.

Lunar mine and mass-driver. Crew habitat and machinery tunnels covered by lunar soil for shielding.

Illustrations courtesy Don Davis. They appear in the paperback version of *The High Frontier*, by Gerard K. O'Neill, Bantam Books 1978.



lift would give us the capability of chemical processing of those lunar materials in space.

We don't need large-size space-colonies as a precondition for that industrial activity; studies show that comfortable apartments can be built within the shuttle external tanks, for use both in space and on the lunar surface: it appears that within a time of seven years from first liftoff, in a traffic model of 60 shuttle flights per year, we could bootstrap our way to a productivity in space of more than two hundred thousand tons per year of finished products, from about three times that quantity of raw materials.

If those products were the components of solar power stations, to be sold to all those countries that need energy, their value would be over twenty billion dollars per year in hard-currency earnings. That should mean a lot to our country, that had a deficit just this past November of over three billion dollars in balance-of-payments.

Because of the shuttle and our headstart in space technology, the United States is now in a better position than any other nation to seize this opportunity and profit by it, while still benefiting other nations. But no opportunity waits forever, and the chance we now have can be lost within a few years. The Russians didn't seriously compete with Apollo, but quietly they've now gone far ahead of us in studying the maintenance of a workforce in space for long periods of time. They've completed tests lasting over a year, in which groups of three people grew wheat and other grains in a closed

environment, baked their own bread, and lived comfortably. In the Salyut space station, food plants have already been grown, and several of the life-support systems have already been operated successfully in closed-cycle form. What we're still arguing about, they're already doing.

That isn't our only competition. Japan has averaged a 10% annual economic growth rate for decades, and markets its products aggressively and successfully here in America. As a result, by 1990 Japan's standard of living is calculated to surpass our own. It may be no accident that of the many translations of my book, *The High Frontier*, the first to be completed and published is the Japanese edition.

If I may give some good news, *The High Frontier* recently won the Phi Beta Kappa award as the best science book of 1977. I don't think it's because I'm another Ernest Hemingway, but rather that the basic idea is a powerful one.

We need not fear that these concepts are of no interest to the general public. Just during a few weeks there are, for example, the excellent Associated Press article announcing the House Concurrent Resolution, a New York Times magazine article to be published next Sunday, a NOVA educational television one hour special to be shown on February 2nd, three BBC Television specials, and dozens of other articles and interviews.

We have accomplished a great deal so far on a limited amount of funding. If the whole NASA budget is represented by a stack of books two feet high our share corresponds to only a single sheet of

paper. In the uncertain first months of the new Administration, even that small share has been reduced; fortunately, private donations to the Space Studies Institute in Princeton have allowed us to push ahead vigorously even in the absence of funding from the executive branch.

It is premature to talk of exact schedules and exact plans. During these next three years we need most of all a strong effort on working models, bench-top pilot-plants, and critical-path analysis. I recommend that Congress entrust that effort to the guidance of the Universities Space Research Association, a group of 55 universities with headquarters in Houston, Texas. In parallel, we need an unbiased, objective, independent analysis of what the High Frontier program could do for this country, in jobs, economic growth, and the preservation of the environment. The Office of Technology Assessment is well able to carry out such an analysis.

With this intensive effort, by 1980 we should be in a position to decide whether to reach for the High Frontier, or whether to remain forever limited by the resources of our planet. That reach would then require an Apollo-scale program of engineering and science, but if it is as successful as the Apollo project was, by the late 1980's the first lift of equipment could begin, and productive payback could occur by the 1990's. We can only know for sure that if we close off that option, there is no alternative but the bleak, authoritarian future of the steady-state society.

# News from NASA

## United States and Soviets Talk About Space

NASA and the Soviet Union's Academy of Sciences held discussions Nov. 14 to 17 in Moscow concerning further cooperation in space. The talks are a result of an agreement reached by NASA and the Soviet Academy of Sciences May 11, 1977, following a meeting of representatives of the two agencies in Washington.

The U.S. delegation was headed by Dr. Noel Hinners, Associate Administrator for Space Science, NASA headquarters. The Soviet Delegation was led by Dr. Boris Petrov, Chairman of the Intergovernmental Council of the Soviet Academy of Sciences.

The Moscow meetings were exploratory, aimed at selecting and appraising joint scientific programs for the 1980s that might be mutually advantageous. Emphasis was on 'fields of study that could take advantage of the different attributes represented by spacecraft such as the U.S. Space Shuttle and the USSR Salyut.

The delegates met as two working groups; one on science and applications, chaired by Dr. Hinners, and one on operations, chaired by Dr. Glynn Lunney, manager of the Shuttle payload integration and development program office at NASA's Johnson Space Center.

The two working groups will seek to fix upon scientific subjects for possible experimentation that might benefit from the flexible delivery capability and large

capacity of the Space Shuttle and the capability for longer stay time in orbit represented by the Salyut.

In another U.S.-USSR cooperative space program, the eighth annual meeting of the NASA-Soviet Space Biology and Medicine Working Group was held Nov. 19 to 25 at NASA's Wallops Flight Center. Before the formal meeting, a workshop on simulated weightlessness was held Nov. 16 to 18 in Bethesda, Md. The workshop and meeting are part of a continuing program under the 1971 Science and Applications Agreement between NASA and the Soviet Academy of Sciences.

The meeting focused on biomedical results, including the preliminary results of the Soviet Cosmos 936 flight on which U.S. experiments were flown; a briefing from the Soviets on Salyut 5/Soyuz 19 missions; and a U.S. briefing on a Spacelab missions demonstration test. Participants discussed forecasting man's health state in weightlessness and the research approach to studying space motion sickness.

The U.S. delegation at the formal meeting was headed by Dr. David Winter, NASA director for life sciences. Dr. Rufus Hessberg, director of space medicine, headed the U.S. workshop participants. The Soviet leader at both meetings was Dr. Nikolai Gurovsky of the USSR Ministry of Health.

## Space Social Impact Study

The National Aeronautics and Space Administration, with the help of a team of social scientists at Georgetown University, is starting to think about the impact of future commercial activities in space.

"Maybe we ought to try to anticipate some of the social and cultural impacts early enough to be ready for them," said a space agency official who is overseeing a \$15,000 grant to the Georgetown graduate school for the project.

For a start, said Jesco von Puttkamer, the NASA official, the agency would like to find out how many scholars are interested in the social implications of the use of space.

Dr. T. Stephen Cheston, associate dean of the graduate school and head of the project, and two colleagues, Courtney Stadd and Timothy Hart, have started cataloguing social science articles dealing with space exploitation.

They are also considering starting a quarterly journal tentatively titled Space Humanization Review.

"We may have been a little bit negligent in the last three or four years," said Puttkamer, "talking about space transportation systems, getting people into space and getting the benefits of space down to Earth without being really too much aware of . . . the social needs."

Cheston said the study was focused on the problems and possibilities of the next three decades.

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# Studies Aimed at Microwave Solar Energy

Two studies are being conducted to determine the negative or harmful effects of transmitting solar energy in the form of microwaves to earth stations, which would convert them into electricity. Both studies are being handled by Battelle Memorial Institute's Pacific Northwest Laboratories, Richland, WA, at the request of the Dept. of Energy and NASA.

The microwave transmissions would come from a proposed series of satellites in stationary orbits around the earth. Solar energy, caught above the earth's atmosphere would be converted into microwave energy on the satellites. Researchers have calculated that 20 to 25 satellites could have provided all of the United States' power needs in 1975.

But what problems would crop up with these microwave transmissions? One Battelle study group will try to find out if any electromagnetic or radio interference trouble would stem from such transmissions. The other group will try to uncover any potential harmful effects on the earth's environment. All work is expected to be completed by September, 1978.

# Salyut-6 / Soyuz-26 Joined by Soyuz-27

by *Phill Parker*

At 17 hrs 6 mins., Moscow time, on the 11th of January, 1978, the piloted Soyuz-27 spacecraft rendezvoused and docked with the orbiting Salyut-6/Soyuz-26 spacecraft to form a major space complex in earth orbit. The Soyuz-27 crew were Vladimir Dzhanibekov and Oleg Makarov. They joined their partners in space, Grechko and Romanenko, the latter having been in space for over a month at that stage. The two visiting cosmonauts were planning a five day stay at the Salyut-6 station, according to Soviet Union news sources. Their own ferry vehicle, Soyuz-27, docked with the hatch on the Salyut transfer compartment -- which had given trouble for an earlier mission, Soyuz-25, and which was successfully checked out by the Soyuz-26 crew during an EVA in December 1977.

After transferring from their Soyuz-27 vehicle, Dzhanibekov and Makarov joined in with Grechko and Romanenko in toasting the historic link-up with cherry juice from tubes and by holding a 15 minute television session with earth. The two visiting cosmonauts brought mail from Earth, copies of 'Pravda', letters, books and more research equipment.

Konstantin Feoktistov, commenting upon the link-up, stated that it was another step toward creating large 'sophisticated engineering complexes in terrestrial orbit' and that these would carry out 'scientific and national-economic tasks'. On the docking, Feoktistov commented that some people had feared that multiple docking of spacecraft might lead to 'switching effects', or, break-up of already docked units. However, the Soyuz-27 docking had revealed that this did not occur and the resonance experiment, carried out by Grechko, also confirmed that this did not take place. The Soyuz-27 vehicle had been launched at 15:26 Moscow Time on the 10th of January, 1978.

Prior to the docking of Soyuz-27 with Salyut-6, the Soyuz-26 crew of Grechko and Romanenko had spent over a month in orbit. They had celebrated New Year with a fir tree and prepared a special New Year meal, as well as holding a press conference with the flight control centre. One of the flight directors, Alexei Yeliseyev noted that the operation of the 'delta' automatic navigation system of Salyut-6 was one of the most important engineering achievements of the flight.

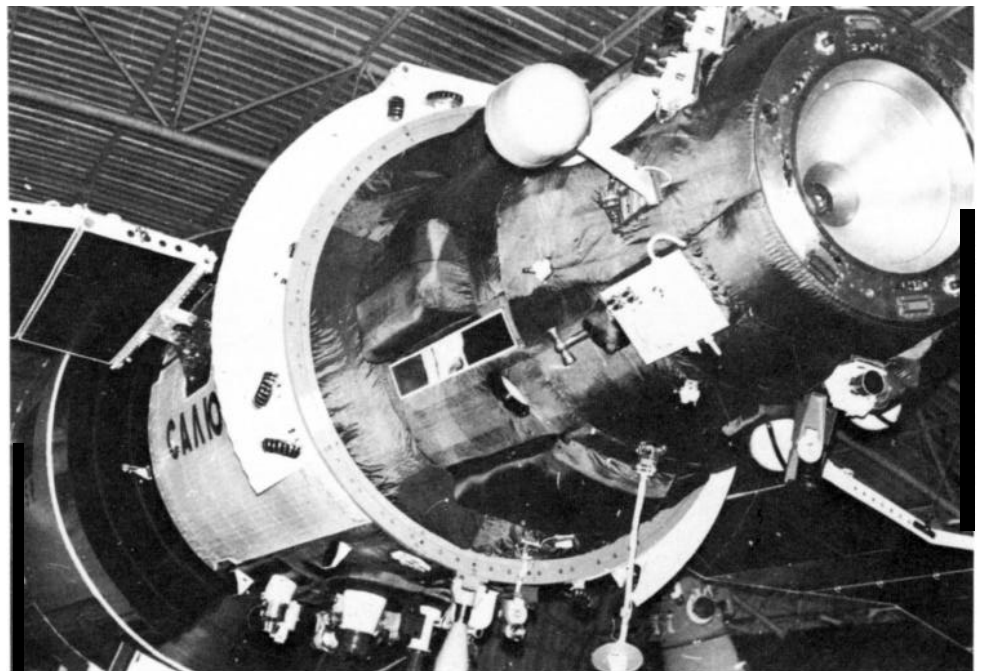
During the first week of the New Year, the external radiation sensors had not

recorded any evidence of solar flares and reported that the space weather was quiet for the station. Soviet biologists were also conducting a space experiment, called "Medusa", to do with the origin of life in the universe. The purpose of the experiment is to determine the changes caused by the spectrum of space radiations in elementary living cultures. Samples are mounted on the exterior of the space station while control samples are kept inside the station. Analysis of the samples will be carried out back on earth. Meanwhile, during the first month in orbit, life for the two cosmonauts had settled into a routine of observations and experiments, after the initial excitement of Grechko's spacewalk on the 20th of December, 1977.

The first Soviet space walk (EVA) from a Salyut space station took place on the 20th of December, 1977 when Georgi Grechko opened the hatch to begin his space walk to investigate the docking port of Salyut-6. Firstly, the crew entered the transfer compartment and put on a new type of semi-rigid, full-pressure suit, checked the autonomous life-support regeneration equipment and then closed the hatch between the transfer and working compartments. The transfer compartment was then fully depressurized. The crew worked in both illuminated and shadowed portions of the orbit.

Grechko had a color television camera with him and sent back to earth close-up views of the docking elements and parts of the Salyut station. Grechko, using special assembly, control and adjusting tools, checked around the area of the transfer compartment and the docking unit, assessing the conditions of the joints, guiding pins, fasteners and sealing surfaces for damage. However, the crew was able to report that the docking unit was in working order. During the walk the two cosmonauts also checked new methods and concepts for making space walks. The space walk lasted 1 hour and 28 minutes.

In a press release Professor Konstantin Feoktistov (pilot cosmonaut aboard Voskhod-1 in October 1964) described some of the new features of Salyut-6. He noted that the addition of a second docking port had meant some design changes. This was mainly modifying the station's propulsion plant to make room for this second docking port. The two docking ports are identical in design and the automatic link-up is the same in both cases. The only difference is that the Salyut turns to the approaching spacecraft, depending upon which docking port is being used. Other innovations are that the thermo-regulating and attitude control systems are now in their final form, unlike previous missions where



*Salyut space station (photo courtesy Theo Pirard)*

they were experimental. The space station also has a water regeneration system and an effective portable line teletype. There are more television cameras, too. Inside, there are two black-and-white and one color, while three cameras are mounted outside. The cameras are the same as those used in the joint US/USSR Apollo/Soyuz mission. Also, more crew comforts have been added, including a small folding polythene cabin shower unit. The instrumentation has also undergone great changes making it possible to conduct more extensive and more advanced astrophysical and biological studies as well as investigations of natural resources and tests on new technologies. The space station is also carrying equipment for monitoring the meteorite situation in the vicinity of Salyut-6, recording strikes by particles weight fractions of a milligram. The orbit of Salyut-6 is apogee: 365 km, perigee: 335 km, period of revolution: 91.4 minutes and inclination: 51.6°.

# Spacelab Candidates Chosen

On the 22nd of December 1977 the European Space Agency (ESA) announced its candidates for the first Spacelab mission, now scheduled for December 1980. The four candidates are:

1) Franco Malerba (age 31) -- an Italian engineer working in the computer field;

2) Ulf Merbold (age 36) -- a German research worker at Max-Planck Institute for Metallforschung;

3) Claude Nicollier (age 33) -- Swiss researcher and pilot working at ESA's ESTEC;

4) Wubbo Ockels (age 31) -- Dutch physicist at Gronigen University.

The four candidates chosen had to meet the Level II criteria used by NASA to select permanent mission specialists. Eight other potential candidates were rejected on medical grounds, though ESA's Director General, Roy Gibson, said that the selection procedure should not be allowed to obscure the very high quality of European candidates.

On the first Spacelab mission about 70 experiments will be carried out in the fields of stratospheric and upper atmospheric physics, materials processing, space plasma physics, biology, medicine, astronomy, solar physics, earth observations, thermodynamics and lubrication.

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## SALYUT-6 STRIDES ON

by *Phill Parker*

The launch of the unpiloted ferry vehicle "Progress 1" by the Soviet Union on the 20th of January, 1978, to automatically rendezvous and dock with the Salyut-6 space station was another step forward towards the creation of a permanent inhabited platform in space.

It appears that "Progress 1," which was launched by a standard Soyuz launch vehicle, was a highly modified Soyuz spacecraft containing food supplies and other technical equipment. It appears, therefore, that the two cosmonauts aboard Salyut-6 are settling in for a long duration flight that may exceed the record 84 days in space set by America's Skylab-4 flight astronauts.

According to Soviet sources, the Salyut-6 space station with two Soyuz-type spacecraft docked is over 30 meters long, weighs 32 tons and has a habitable volume of 100 cu. meters. It is interesting to note that this matches the sizing developed in paper studies for NASA of the so-called Manned Orbital Facility (MOF) by several aerospace companies in America. The MOF, which would have taken its first flight in 1985 (seven years after this Soviet success!) would have featured several modular style units. There would have been four units termed the Habitable Module (HM), the Service Module (SM), the Logistics Module

(LOGM) and the Payload Module (PM). Each unit would have fitted in the cargo bay of the Shuttle Orbiter. The overall docked length of the LOGM/SM/HM/PM would have been 30.7 meters and had a habitable volume of about 115 cu. meters in the combined SM/HM. The space complex would have supported up to four crew members rotated at 90 day intervals. The cost for the combined SM/HM alone would have been \$157 million for R&D and some \$197 million for production costs. The LOGM (ferry vehicle) would have been \$38 million for R&D and \$29.3 million for production costs. I think the comparison of the MOF against the achieved Salyut-6/Soyuz-26/Soyuz-27/Progress-1 mission gives an indication of the magnitude of the achievement in capability of the USSR. Admittedly, the Salyut-6 and ferry vehicles (bar descent modules) seem irrecoverable (unlike the Shuttle/MOF scheme) but, of course, if the Soviet Union develops a space shuttle -- well, anything could happen!

During the joint USA/USSR Apollo-Soyuz flight in 1975, the Soviet Union released some details about their Soyuz spacecraft and launch vehicle. Although the present Soyuz spacecraft and the Progress-1 vehicles may differ in specialized areas it was interesting to note that the automatic docking mode for a Soyuz was

quoted as from an approach rate of 0.05 to 0.3 metres/second with longitudinal axes displacement up to 0.3 meters. A misalignment of 7° was allowed for pitch, roll and yaw and angular velocities of 1°/second (active role of docking craft) and 0.1°/second for a passive craft. I would suggest that similar values have been engaged for the Progress-1 spacecraft. Precise tracking of the Salyut-6 spacecraft and guidance trajectory updates to Progress-1 would have required accurate tracking by ground stations and, no doubt, tracking stations at major Soviet stations (like Djusali, Evpatoria, Ulhan-Ude, Kolpashevo and Tsbilisi, as well as ocean going tracking ships) would have been used. The use of the major Soviet control centre at Yevpatoria indicates a major stride forward in the computing capability of the USSR for space missions. (Not many years ago, they used orreries and charts and maps, longhand style!)

It appears, therefore, that Salyut-6 is a real, major step forward for astronautics and brings the dream of permanent habitats in space that much closer. The techniques of automatic ferry, rendezvous and docking, accurate tracking of multiple objects, and hosts of other items that will be needed for space manufacturing facilities will be much nearer due to Salyut-6.

# The Cosmos-929 Enigma

by James E. Oberg

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Looking for puzzles in the mysterious Soviet space program? Well, you've come to the right place.

How about the spectacular Salyut-6 mission? Outside of the series of firsts in space -- double dockings, duration records, new spacesuits, orbital refuelling, water recycling, etc. -- the Salyut-6 is a respectable but not really very baffling event.

How about the Cosmos-954 debacle? True, the top secret nuclear-powered ocean spy satellite did fall out of orbit following a malfunction the Russians hoped the world wouldn't notice, but here, too, much of the mystery has evaporated. A Soviet propaganda campaign has attempted to distract attention from the satellite's top secret mission (spotting US missile submarines in preparation for a Soviet nuclear surprise attack, many experts postulate) and from the critical point that the Soviets tried to keep the nuclear nature of the vehicle secret, and from all similar 'anti-Soviet hysteria' (Pravda's term, not mine). But it turns out to have been a good exercise in space law and space object recovery/analysis.

Nor was the Cosmos-955 radar eavesdrop satellite much of a puzzle either. Launched from the supersecret Pletsetsk space center north of Moscow, last September the midnight high lob trajectory resulted in a flurry of "jellyfish UFO" news reports from western Russia before Moscow realized that a security leak of giant proportions had occurred, clamped down, issued a bald cover story ('reentering satellite'), and hustled the unfortunate cub reporter from Petrozavodsk somewhere way way east (and north) of Suez (would you believe Yakutsk?).

No, the mystery in space last year and early this year was Cosmos-929. On February 2 it dived back into the atmosphere after a baffling two hundred day excursion that left Western observers scratching their heads, consulting their computers, and speculating wildly.

What was Cosmos-929? What was it doing? And, most significantly, what was it a precursor practice mission for???

Cosmos-929 was launched last July 17 from the Tyuratam-Baikonur space center in Kazakhstan. A standard Soviet cover story was issued, claiming it was another scientific satellite aimed at the peaceful exploration of outer space for science and the national economy, a canned an-

nouncement usually reserved for military spy satellites, failed interplanetary probes, or advanced systems tests. Within hours, Western observers knew it was something special. Radio signals were similar to Soyuz and Salyut piloted (or unpiloted test) vehicles; the orbit had an inclination and altitude consistent with piloted space hardware; and within a few days, visual observations suggested that the object was of a large size, Salyut class or larger, twenty tons.

"We ran out of guesses," complained one veteran amateur space watcher later. "First we thought it was a new model Soyuz test. Then it could have been a secret automatic Salyut, or a broken Salyut, or a component of a multi-modular Salyut. Desperately, we toyed with a stuck interplanetary or lunar probe, and even considered some new weapon system. But in the end we were driven to one conclusion: it was 'none of the above'".

Cosmos-929 provided a series of subtle clues. A month after launching, one major telemetry stream ceased permanently and the other changed subtly, still indicating a twinned or dual nature of its radio system. Major orbital changes began, raising the altitude once at T+30 days and then again in December, five months into the mission. Then on February 1 the Cosmos, still hooting away on its constant radio channel, actually lowered its orbit from a circular one 450 km up to an elliptical path dropping to within 320 km of the earth (that was the altitude of Salyut-6, but the two vehicles did not seem to be related since they were 75 degrees out of plane). The following day, Cosmos-929 committed space suicide by firing its propulsion system yet again and plunging to its fiery destruction above the Pacific.

Over the two hundred days of operation, it had used more than nine hundred feet per second of velocity change. "It's a flying gas tank!" marveled a space radio listener in Fort Worth.

Other hints were found in the Soviet press. Two years before, a top Soviet space designer had discussed Soviet plans for the assembly of space stations from Salyut-sized components launched separately (the maximum Soviet space payload weighs little over forty thousand pounds). Rather than launch each section with its own rocket, power, and rendezvous/docking control system, the scientist described how a 'space tugboat' or KOSMO-BUKSIR would be used. It would stay in orbit for months, seeking out each component

as launched, and docking with it. Then it would push the component over to the assembly orbit and would gently dock it to the structure, before pulling away to await the next launch.

Could the Cosmos-929 be a space test of this KOSMO-BUKSIR, 'space tugboat'? Considering its lifetime and velocity change capabilities (and the recent refuelling operation of Progress-1, which could work just as well for a 'space tug'), it seems the last choice open . . . and a not unlikely one. Perhaps, too, it was connected with an equally mysterious Soviet space shot in December 1976. According to Moscow, two satellites called Cosmos-881 and Cosmos-882 were launched by the same rocket and completed their missions before the end of the first orbit. Observers were mystified.

The prestigious "TRW SPACELOG" annual satellite review reported that Cosmos-881/882 was launched by a 'Proton' rocket, Russia's biggest, and presumably the same type which seven months later launched Cosmos-929. The dual nature of Cosmos-929 radio signals, which was illustrated by its switching from one telemetry system to another almost identical one every thirty minutes, might be connected with the actual double satellite hardware of the earlier launch. But many questions remain.

If indeed these two shots involved the space tryouts of new Soviet human-related hardware, it will be the first new class of vehicle in more than seven years. Past practice has been to flight test a vehicle from 18 to 36 months prior to its actual piloted utilization, which would put the operational assembly of a two or three module 'super-Salyut' eight-person space habitat in the 1979 time frame, contemporarily with the Space Shuttle.

So the mysteries of Russia's space program remain, and even grow deeper. One fact is not obscure, however. The space hardware now on hand, and in various stages of flight testing (whatever Cosmos-881/882 and Cosmos-929 really are), demonstrate the Soviet Union's high level commitment to permanent habitation of near-Earth space in the immediate future. Scheduling themselves around their occasional endurable setbacks, the Soviets are moving ahead with all the hardware needed for space stations.

There will be Russians in space not just today and tomorrow, but from now on. Forever. The commitment and the hardware are there.

# Military Pilot Astronauts Defended

by Jim Oberg

I'd like to make some comments about the issues raised by Robin Snelson regarding selection of NASA pilot astronauts. The fifteen men picked last January seemed to confirm her worst fears: all but one military pilots, and the one exception an ex-Navy pilot who works for NASA. What about commercial airline pilots? What about people in non-military programs, such as Angela Masson (3500 hours flying, PhD -- apparently in some branch of sociology or political science, I should add).

I want to argue that the selection criteria are valid. It's hard to tell people that they are not what is needed, when they have wanted to be astronauts for all their adult lives. That's tough. They guessed wrong ten years ago. The key is not 'military' duty, since commercial pilots probably have the same discipline and commitment. The 'test pilot' requirement is justified, as well as another NOT

mentioned by Snelson: the jet experience should be in high-performance jets, fighter aircraft. Why? Because the Space Shuttle is a 'hot' vehicle that flies like a clipped wing F-104, not like a 727. Let me point out that no military transport pilots were selected -- that is an important point not realized by Snelson. It is a key point, too.

(The Soviets have chosen transport pilots among their cosmonauts, but the Soyuz does not fly like an airplane of any sort -- and I hate to have to say it, but the two transport pilots who did fly, Sarafanov and Zudov, just happened to be on missions where the rendezvous/docking maneuvers were unsuccessful. I hasten to add that it happened to other pilots too, and there is no indication of pilot error!)

The argument that the Space Shuttle pilot does not have to know how to fly such 'hot' aircraft because the spaceship can land automatically is a specious one:

our whole space experience has shown that piloting capability and training makes all the difference between successful missions and failures, even tragedies. Hence the entirely reasonable desire to have men who have flown similarly behaving vehicles for many years. And how about test pilot work? This, too, is quite relevant. Few people realize just how closely astronauts work with design and planning groups in the reputation of the mission and of the hardware itself. The Space Shuttle is not routine and will not be for several years. People with experience testing and flying new aircraft, especially those in which there is a very real possibility that design errors and pre-flight oversights will mean death, are the kind needed. I do NOT believe that commercial pilots, however safe I feel putting my life in their hands on travel, have these qualifications. Again, sorry about that, you guys and girls. Seriously, maybe next time.

## More on Military Shuttle Pilots

by George S. Quin, Jr.

After reading the article entitled "Astronaut Corps -- Or Space Soldiers?" in the January issue of L-5 News, I realized that several of the points raised need definite clarification.

Mr. Good is obviously unaware that the Space Shuttle Program is an international effort. Spacelab, being constructed under the auspices the European Space Agency (ESA), by several Western European corporations is an integral part of the Space Shuttle Program. By agreement with NASA, ESA personnel will also be included as mission specialists and astronaut scientists in several projected missions. Nor has the number of active duty military astronauts affected NASA's excellent relations with the Soviet, Canadian, Japanese, or other national space agencies.

As for public reaction to military astronauts -- when has a significant public sector protested their backgrounds? Instead, one can't help noticing the number of "ticker tape parade" type ceremonies honoring them and the spectator packed luncheon/dinners enthusiastically applauding these men at the conclusion of their popular talks. In short, our society has idolized these men as "all-American" -- what few boys didn't say at one time or another that he was going to be an astronaut when he grew up? The public clearly accepts their military backgrounds as necessary and I'll show you why for pilots it is.

First, let's look at the background to Mr. Good's statistics. NASA is under federal mandate to be an equal opportunity employer and has made extensive efforts to recruit minorities and women. But the fact remains that few are initially qualified and even fewer can meet the necessary technical requirements even as a mission specialist. What is not mentioned is that of the twenty mission specialist candidates recently selected -- six are women, three are black, and one is Japanese-American. I strongly doubt that even the U.S. Supreme Court would consider itself competent to determine personnel ratios in the astronaut corps because of the technically explicit nature of the occupation.

NASA needs military test pilots. The terms "routine" and "space truck", that Mr. Good is mistakenly building his legal case on, are only PR imagery words. The Space Shuttle is a very complex space vehicle (not a diesel rig!) designed to operate in an extremely hostile environment (far from rescue) where mistakes are lethal. As for automatic systems and ground control, no machine can be 100% reliable. The Apollo 13 explosion and the Skylab repairs are typical of the importance of man's role in space. The Space Shuttle represents a multi-billion dollar investment -- the taxpayers and the flight crew deserve the best pilots available to protect human lives and tax dollars.

The military test pilot represents the

cream of his pilot peers. His position comes only through self dedication, skill excellence, and their recognition by his superiors.

Since the Department of Defense is scheduled to be one of NASA's primary customers, its requirements for the Space Shuttle Program had to be met. Besides specifying that the payload bay be large enough to accommodate a "Salyut-size object", it also has stringent personnel security requirements that only active duty military astronauts can meet. Especially when the Shuttle crew will be handling the deployment of a high energy laser ABM system, military communication/reconnaissance satellite networks, and "defensive" hunter-killer satellites. In theory, military involvement in space will reach a critical point by the late 1980's and NASA may be right in the middle of it because of economics.

In 1981, the first women will graduate from our service academies with training and at an expense equal to their male classmates. Because of this, several Congressmen are already working on legislation to allow women to assume combat roles, notably that of fighter pilots. Eventually this may lead to an "optioning" of the military test pilot requirement or its removal altogether. But only time and public interest groups shall determine the future of the American space program and astronaut corps.

# *Inside the L-5 Society*

## **Annual Elections on Horizon**

The L-5 annual election for the Board of Directors is coming up in June. If you would like to nominate someone for the Board, send your choice to: Nominating Committee, L-5 Society, 1620 N. Park, Tucson, AZ 85719. Please send a resume and/or a brief writeup on why your candidate should receive approval by the nominating committee. Be sure to get your candidate's permission to be placed in the election -- most folks look askance on being run for office without their acquiescence!

Who are the nominating committee? At least three must not be current members of the Board. If you would like to serve on that committee, write in to the Board at the Tucson L-5 address immediately, if not sooner. The Board selects the nominating committee members.

What if your candidate is turned down by that committee? In the past, reasons for disapproval have focused on lack of qualification and excessive controversiality. Their position has been that the burden lies upon the candidate to show that he or she will benefit the Society as a Director. However, if rejected candidates insist or running, it has been past policy to offer the membership list to them so they can make their own appeal.

What does the Board do? All authority is held by it. Note in the bylaws that the L-5 President has no duties or powers except as assigned by the Board. The Board elects the President (currently Carolyn Henson), Secretary (Carol Motts) and Treasurer (Bill Weigle); authorizes expenditures, sets policy guidelines, determines who can be official spokespeople for the Society, and conducts the elections.

What powers do the members have? First, all Board members must receive a majority of the votes cast in the election. Second, any bylaw change requires approval by 2/3 of the members voting.

The Board is working on some proposed bylaw changes. If you would like a copy of the bylaws write in and we will send you one! In the June issue we will publish the complete bylaws and proposed changes. Do you want to propose changes?

Please note: at the request of some Tucson L-5 members a meeting was held last October to consider bylaw changes. However, no one showed at the meeting! Apathy may run rampant at times, but bylaws are important.

## **L-5 WE Conference on Space Settlements & Space Industries -- A Note About the Proceedings**

The L-5 Society (West European Branch) had hoped to publish the full Proceedings of the Conference on Space Settlements and Space Industries that was held on the 20th of September, 1977 at Queen Mary College, London. However, the financial cost of typing, duplicating and distributing the full Proceedings of this Conference, unfortunately, outstrips the available funds in the Branch account. Various quotes for typing the estimated 100 pages plus of text would have been from about £300 up to nearly £1,500!!

In view of this, the plans for publishing the full text have been abandoned at this time. However, a new plan is in operation to publish an Abstracts Report that features highlights from each paper (together with some commentary to place readers in the 'picture' about each paper) and containing the text of the Keynote Address (by Mr. John Disher, NASA) and some detailed reference sources for further data. This latter section will feature names/addresses of the authors of the papers (for those people who would

like to acquire the full science/technical texts for research utilization) and a reference to the L-5 Reports Service. It is hoped that a copy of each paper, in full, will be placed with the L-5 Society HQ where copies could be obtained for a reproduction cost. It is hoped that this new plan will satisfy the requirements of those people who eagerly await the proceedings of the first L-5 Society (WE Branch) Conference and trust that they will understand the economic constraints placed upon the branch.

The Branch Director, Phillip Parker, is undertaking the job of typing and reproducing the Abstracts Report and he states that this is well advanced and should be ready for publishing in February 1978 with distribution that same month. All inquiries on this matter should be addressed to him at his home address: Phillip J. Parker, AFBIS, Director, L-5 Society (WE), 40, Lamb Street, Kidsgrove, Stoke-on-Trent, ST7 4AL, England, UK.

## **Branch Director on Italian TV**

The West European L-5 Society Branch Director, Phillip J. Parker, did a major television filmed interview for national Italian television (RAI -- Radiotelevisione Italiana) on the 10th of January, 1978. The filmed interview, produced in London by RAI's UK Correspondent, Sandro Paternostra, with a film crew lead by John Metcalfe, was relayed to RAI's Rome offices via the Eurovision network. The filmed interview, featuring details about the L-5 Society and space colonies, was to form a major part of a 1-hour television documentary on spaceflight being broadcast by RAI, in Italy, on Saturday, 14th January 1978 under the series titled "All About Yourself". RAI's potential viewing audience was reported to be about 50 million, since the program was at the peak viewing time of 5:30 p.m.

The interview with Phill Parker centered around describing the wheel-shaped space colony (good use being made of Phill's space colony model!) and describing the space shuttle (again using to good effect a scale-model of the shuttle). Close-up shots were taken of the models and these were spliced together with close-up views of paintings of the NASA-produced studies of the space colony showing interior views of a colony, to give a very good overall concept of life in space c.2000.

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## **Quebec L-5 News**

Andre Fontaine recently gave a 30 minute television interview on space colonies for CJPM-TV in the Chicoutimi area (about 130 miles northeast of Quebec City). A second program on the subject will be aired shortly.

For more information, please contact J. Andre Fontaine G, 1185, Avenue Brown, #3, Quebec, QC, GIS 3A1.

## **Huntsville, Texas Chapter Formed**

A branch of the L-5 Society has been formed in Huntsville, Texas at Sam Houston State University. They call themselves PIIOS (pronounced pi-ose) the Put It In Orbit Society. The president is George Bigham.

PIIOS has already formed liasons with the Austin, Texas and San Marcos, Texas Chapters. Current PIIOS projects include a presentation at the Quality of Life conference, where they will field speakers on SPS and L-5 colonies, an Earth resources exhibit loaned to them by NASA, as well as well as showing video tapes, films and slides.

For more information, please contact Tim Bigham, Rt. 2 Box 82, Huntsville, TX 77340.



## Ann Arbor Action

The Ann Arbor L-5 group has initiated a monthly newsletter, *The Missal*. It is available for \$3.00/year from L-5 Society, Box 126 Michigan Union, Ann Arbor, MI 48109. The first issue carries articles on "Object Kowal" (a possible new planet) and hazards of exposure to vacuum (disarmingly titled "Outer Spaced") as well as news on space action in Congress and local Michigan L-S activities. *The Missal* is entertaining, informative, and carries items you won't catch if you restrict your reading to the L-5 News.

## Maryland News

The Maryland Alliance for Space Colonization has initiated a bisemester publication, *Outlook*. It carries news, articles, bibliography and local events. Membership in MASC is \$2 for students, \$5 for regular members. Please send membership dues to: MASC, c/o Gary Barnhard, 4323 East-West Highway, Bethesda, MD 20014.

## Williamsburg News

The following activities are scheduled for the L-S Williamsburg, VA group:

April 3 -- "The Transition from Science Fiction to Reality," with guest speaker Frank Kelly Freas of Virginia Beach, the dean of science fiction illustrators, with a companion display of the artist's work, in Small 109 at 7:30.

April 21 -- "Social Factors in Space Humanization," an address by Stephen Cheston, associate dean of the graduate school at Georgetown University, in Small 109 at 7:30.

### IMPACT!

On six consecutive Saturday afternoons -- March 18 and 25, April 1, 8, 15 and 22 -- the L-5 Society will sponsor discussions focusing on the prospective impact of space settlement in six general areas: Technology, Government and International Relations, Social Science, Commerce, Education, and Philosophy. In special cooperation with the Departments of Physics, Government, Sociology and Philosophy, and the Schools of Business and Education. Details to be announced. Contact L-5 Society, Box 1795, Williamsburg, VA 23185 for more details.

Previous Williamsburg L-5 activities have included talks on space colonies by Bill Bryant and Brian O'Leary, "Theatre of the Future: A Preview of Coming Attraction," premiere of a multimedia presentation of the evolutionary perspective featuring Barbara Marx Hubbard, co-founder of the Committee for the Future, and a lecture on the space shuttle by Lester B. Taylor.

## News from Philadelphia

I am planning a unique promotional scheme to publicize our public lectures. It will involve as many L5ers around the Phila. Pa. area as possible. We can launch an ad campaign as large as the big corporations are capable of. By operating on a strictly voluntary basis, those who feel that they want to help can do so at minimal cost to themselves. By acting as a group we can dissipate the costs of this far reaching ad campaign.

We here in Phila. are planning a lecture, slide show and a movie "The Libra Colony" for:

Marple Township Pub. Library, Springfield and Sproul Rds., Broomall, Pa. 19008, April 1, 1978 at 2 p.m.

Phila. Pa. Central Library on the Parkway, Wed. May 3, 1978 at 7 p.m.

Frankford Y.W.C.A. 4606 Leiper St. Phila. Pa. 19124 Sat. June 3, 1978 at 1 p.m.

Please choose as many or all of these to advertise as you wish.

What we want L5 members to do is to start their own ad campaign for us on a local basis. Rack your brains and think of as many groups of people that you can reach. Ads in college newspapers, high school newspapers, trade journals, local or specialized magazines, community newspapers, town and city newspapers, posters on billboards in churches, libraries, schools, offices, Y.W.C.A.'s, Y.M.C.A.'s and public places. By each of us advertising according to our own expertise and spending as much as each of us can afford, we can reach a maximum number of people and we can hope for a good turnout.

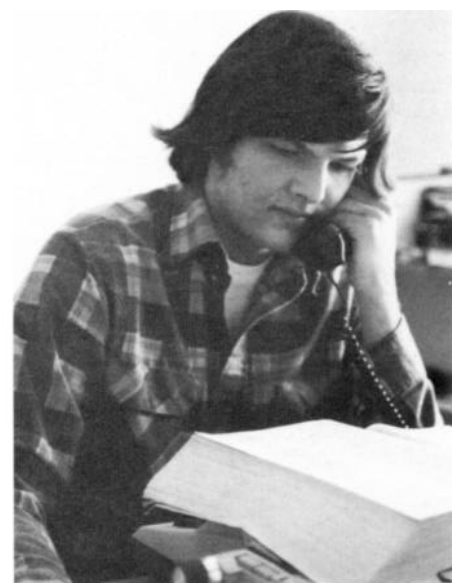
An ad in most newspapers costs less than three dollars. A hand made poster costs less than forty cents. Word of mouth costs nothing. Come and bring all your friends, lets make these shows an L5-IN. Our sheer numbers will impress those outsiders who attend. This will be your first chance to see the new Libra Colony movie at a public showing. Admission is free. -- Richard Bowers, president; Space Futures Society, 3059 Cedar St., Philadelphia, PA 19134, phone 739-7780.

Fellow L-5'ers. I just got through with reading the recently-published Space-Based Manufacturing From Nonterrestrial Materials. This is Volume 57 in the American Institute of Astronautics and Aeronautics series. As a member of the A.I.A.A., I can get this volume at a reduced price (\$15 vs. \$23 list). If anyone would like me to pick them up a copy (enclosed in the original plastic with invoice), send me a check for \$15.00 plus a couple of bucks for postage depending on where you live [ask the post office]. My address is: Elliot R. Royce, 86 Rowayton Ave., Rowayton, Ct. 06853.

## Lobby Vacuum

Do you want to lobby? The L-5 Society has a special fast news service covering space related political activities in the United States -- the Society won't tell you what to do -- but we'll give you the information necessary to make intelligent decisions and take effective action.

If you want to get wired into the L-5 hot line, send in your name, address, and if you are willing to accept a collect call in an emergency, your phone number. We also would appreciate a brief essay on your qualifications and ideas on how to take political action as well as a history of any previous political activities. Please let us know if we have permission to pass your name on to responsible space lobby groups.



Marc Boone on the "hot line."

The following states have no people receiving the L-5 Society space legislation hotline: Alabama, Arkansas, Delaware, Nebraska, New Hampshire, North Dakota, Tennessee, Utah, Vermont, Wyoming, and West Virginia.

It is vital that at least one person in each of these states take the responsibility to keep their Representatives informed of the status of SPS, space industrialization and utilization, and whatever bills are relevant to these subjects, even if only by writing letters. Often one letter from a constituent to an uncommitted Representative is enough to swing a vote. You may influence the course of history! To get on the hot line, write to Marc Boone, L-5 Society, 1620 N. Park Ave., Tucson, AZ 85719.

## Private Enterprise Boosters

One comment on December's issue. Lutz Kayser of OTRAG and Christian O. Basler have the right idea when it comes to space industrialization. With the world caught up in the energy crisis -- rich U.S. poor nation competition, most governments are unable to afford or unwilling to consider the possibility of energy from space, except as a long term alternative, safely booked beyond the year 2000. My suggestion to Christian Basler is to investigate what products could be competitively produced in space (as a first step) and by that I don't mean taking Ultra-Brite up on the shuttle, then advertising it as the toothpaste that flew in orbit. Once the staging company has a product line, capital could be secured to build the plant. A private enterprise approach is the only way space industrialization will happen within the next 20 years.

James Kempf  
Tucson, AZ

I believe that space colonization is a perfect solution the world's biggest problem: government control over the lives of individuals such as taxes, victimless crime laws, and business regulatory bureaucracy. Once we colonize space, it will be impossible for a government to exercise control over the entire surface of a sphere with a radius of 93,000,000 miles, not to mention the asteroid belt. For the first time in history, we will have a true *laissez faire* market place where all trades are decided solely between the buyer and seller. Its only cost will be 8 billion dollars per year for twenty years to the American taxpayers. When it begins to turn a profit, each of the taxpayers can be given a share of stock in the company to make it into a private corporation, just as economist Milton Friedmann proposed to do with government corporations today.

Michael M. Doty  
Houston, Texas

I have a suggestion for those who may be thinking in terms of a non-governmental space industry/colony. Policy should be that, provided the applicants were qualified, job preference would go to stockholders on the basis of number of shares owned and length of time held. If we have to dig into our own pockets to finance the chance to go into space, this

policy would only be fair. Besides that, a lot of stockholders on the scene might keep down cost (after all, it's your dividend). Some of the most successful companies, such as Sears, are largely employee owned. We needn't worry about only rich people going into space, because there aren't that many millionaire welders (or gardeners, or cooks). One NASA official held (at the '75 SMF conference) that space workers would be hard to find. He was taken to task by a future L-S member who thought the problem would be prospective workers bribing the selection committee. Bribe early, buy a share of the FAR OUT Company.

H.T. Watcher  
Tucson, AZ

## Lobby Comments

Being a Texan, I am "frontier oriented." Having been involved in large realty projects with their energy systems, capital costs, and expenses, I know firsthand of the certain-future industrial breakdown if new, environmentally acceptable, permanent energy resources are not found. Having oil & gas properties, I knew firsthand about "depletion." Nothing is so graphic as having monthly checks decline, then stop coming (sorry, all gone). So, the SPS alone has immediate and great appeal. But further, I'm sold that SPACE IS THE NEW ECONOMIC FRONTIER. We (the U.S., the West in particular) must develop as quickly as possible the capability for working, living and operating in this vast, new, enormously rich environment.

Politically, to get it done we in L-S must stress heavily the economic and resources potential of space. Personally, I fully support the "human adventure" aspect. But the nation is not about to fund a costly "subdivisions in space" adventure for a select group of fairly well skilled and educated adventurers -- not in an era when capital formation is certain to be our greatest economic problem. We must emphasize that space is the new ECONOMIC frontier for energy and resources, and that the nation can ill afford NOT to do it. We must develop the capability to exploit this new frontier as an essential condition of underwriting our common, universal future and preservation of Western democratic civilizations.

Sam Dunnam  
Austin, TX

I commend the L-5 News for the several excellent articles in the last few issues which discussed lobbying, and would like to make two additional comments. First, as a non-profit corporation, the L-5 Society is prohibited from substantial efforts "attempting to influence legislation". Therefore, when con-

tacting Congressional or other legislative personnel, we should represent ourselves as individuals, not as L-S Society members. I suspect that this is more effective as well as more appropriate.

Second, a concise list of your Congress-people is available from most Federal Information Centers, which are listed in the phone book under U.S. Government. By calling and asking for a copy, you'll receive a mimeographed mailing and avoid having to get the information on the phone. Be sure to ask what district you live in if you don't know; the lists cover fairly large areas and thus may have more than one Representative. The lists appear to be available from many Federal Information Centers; they apparently get this question often enough to justify mailing it out.

As an L-5 Society member, I encourage the L-5 News to continue their excellent coverage of events surrounding space-related decisions in government. As an individual, I urge all readers to lobby the hell out of their Congresspeople!

Strive for L-5  
Jay Vivian  
Boston, MA

They're killing the goose that laid the golden eggs. That was my first impression at seeing details of the \$4.371-billion NASA budget request for Fiscal 1979. The 8% increase in NASA funding over Fiscal 1978 has been eaten up by an 8% inflation rate, leaving the Space Agency with no overall growth in capability.

Among other things, NASA is limited to the same number of employees it already has. The Office of Management and Budget (OMB) has reduced funds available for earth resources and communications supporting R & D. The Carter Administration has cut advance planning funds for space transportation systems, large space structures, and advanced manned flight systems. According to Aviation Week & Space Technology (Jan. 30, 1978), "NASA officials believe the Administration is concerned that too active advance planning in these areas could lead to future requests for larger programs in space such as manned platforms or even a U.S. space station." Read that last sentence over a few times and grok its implications. . .

Gone from FY'79 are the Lunar Polar Orbiter, Mars 1984 Viking Rover, Halley's Comet Rendezvous/fly-by, and funding for the fifth Space Shuttle Orbiter. Orbiter 101, the "Enterprise," will remain a "hangar queen."

There will be several new space craft starts in Fiscal 1979, including the NASA/ESA Solar-polar out-of-ecliptic missions. There is a sizeable increase in the Office of Aeronautics and Space Technology research and technology base; however, many of the increases in NASA's FY'79 budget are the results of funding peaks in on-going programs such

as the Space Shuttle, Large Space Telescope, and Jupiter Orbiter Probe.

The Carter Space budget request is the action that speaks louder than words. It is barely adequate to support on-going programs and is dangerously lacking in long-range goals. NASA FY'79, as proposed by the Carter Administration, is a prime example of "penny-wise, pound-foolish," and should be increased if at all possible (Hint: the President proposes; Congress disposes. Have you told your elected representatives what you think yet?).

The FY'79 Space Program proposed by Carter represents less than 1% of his record-breaking budget of 500 billion dollars, a drop in the Federal bucket. Those of us who want to see an expanded Space Program had better start doing something about it. If we don't, who will?

Robert G. Lovell, Jr.  
Shawnee, Kansas

In the Letters column of November, Robert Lovell suggested that the budget-cutting "enemies of space" would be out to "get" NASA. I don't think that'll happen. Any member of Congress knows that losing on controversial issues is something that happens all the time; you take your defeats gracefully and try again next time. NASA has its share of critics, but there are few if any in Congress who are so strongly opposed to its mission that they would be called "enemies". True, Sen. Proxmire is one if anyone is. But he's just one Senator. And even though he chairs the committee with oversight responsibility for NASA's budget, there are enough friends of NASA on that committee to prevail. He's headed that committee for several years now, and has had more bark than bite.

The December issue also carried a description of forthcoming SPS research, noting that it will receive \$19.5 million over the next four years, "compared with fusion research at \$400 million next year". Those of us who are old fusion

hands will read that with amusement. Fusion was first funded in the early 1950's. By the late 1950's it was at about \$30 million per year -- and there it stayed, for some fifteen years. I recall a 1971 review in Scientific American, in which the author stated that fusion was to get only \$38 million, and wistfully hoped that more would come.

The difference is that late in 1971, fusion proponents had become sufficiently secure in their understanding that they were able to go and request more -- which they soon got. So this fact, that fusion funding increased tenfold in a few years, should give SPS proponents hope. Do not despair. Your time will come.

T.A. Heppenheimer  
Heidelberg, West Germany

A note or two on the contents of the Dec. issue of L-5 News. First of all, I think that the remaining Shuttle Orbiters ought to be named for the cosmonauts and astronauts that been killed to date in operations. The Kamarov, and perhaps the Grissom. Or perhaps, to take a different tack, the Goddard and the Von Braun. The Oberth, so on.

Secondly, I find the labeling of Senator Proxmire as 'Darth' appalling. This is the same thing, if you will recall, that the Nixon administration fell into, and that caused its excesses of power: the identification of a differing political view as the posture of an enemy rather than an adversary. Senator Proxmire is a man to be opposed, but not 'fought.' He is not the enemy, but he is most certainly the opposition. One can be opposed to something and not be an evil person; perhaps merely a misguided and short-sighted person, but not evil per se! If we, as space enthusiasts, expect to operate successfully in the political arena (as we must if we expect to obtain a more expanded space program) it behooves us to do so with some manners and a modicum of decorum.

Tim Kyger  
Dayton, OH

Let's get someone clearly on the other side of the political spectrum to become a board member too! (Jerry Brown?) If the public associates our goals only with people like Goldwater & Heinlein we may be cutting our own throats. We must stress that benefits from space help everyone, and that ordinary terrestrial political affiliations do not define the ideological scope of the utilization of space.

Jon Coopersmith  
Point Pleasant, PA

## Space Colonies Make Strange Bedfellows?

In general I find the L-5 News great. But please forgive me the statement that I always felt uncomfortable whenever Timothy Leary appeared on the pages, and just 10 minutes ago I first was shocked and then got mad at the nonsense T. Leary is writing in "The Psychological Effects of High Orbital Migration" (L-5 News, Sept. 1977, pg. 18). I have lived in the U.S. for two years and in South America for three years, and know from my own personal experience that T. Leary's arrogant characterization of the South American individual and social character is quite wrong. There are people who would even name quite a number of reasons why one should exchange several characterizations between 1 and 2.

Please do not put Gerry O'Neill in company with Timothy Leary. O'Neill and space colonization deserve better.

Prof. R. Kummel  
Universitat Wurzburg  
West Germany

*A quick scan through the letters section in this and past issues shows that the L-5 News often has carried articles that members have disagreed with. If we were to restrict the contents of the L-5 News to items on which everyone is sure to agree, it would be far shorter, and certainly less interesting -- CH.*

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

1620 N. PARK AVE.  
TUCSON, AZ 95719

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY/STATE/ZIP: \_\_\_\_\_

AFFILIATION/TITLE OR POSITION: \_\_\_\_\_

(OPTIONAL)

I am  am not  interested in being active locally. Phone (optional) \_\_\_\_\_ - \_\_\_\_\_

Please enroll me as a member of L-5 Society (\$20 per year regular, \$10 per year for students). A check or money order is enclosed. (Membership includes L-5 News, \$3 to members; the balance -- \$17 or \$7 -- is a tax-deductible donation.)

Please enter the above as a nonmember L-5 News subscriber (\$20 per year). A check or purchase order is enclosed.

Enclosed find a donation of \$ \_\_\_\_\_ (Donations to L-5 Society are tax-deductible.)

