L5 NEWS

SEPTEMBER 1979

L-5 NEWS

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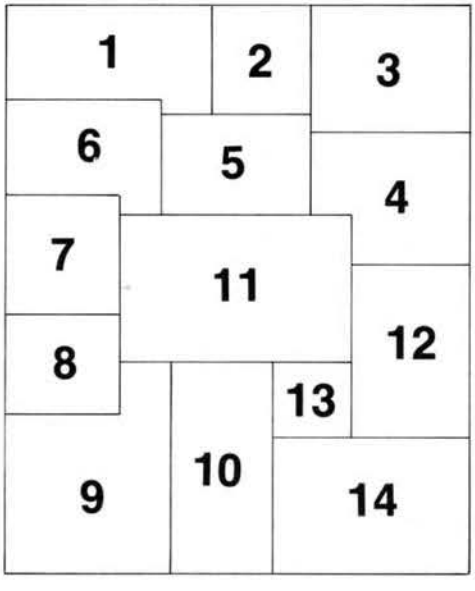
In this issue:

Cover: The L-5 Society celebrates Space Day! (See articles beginning on p.5.)



(1) Displays by the Boston L-5 (2) Eric Drexler, New England L-5 (3) Chris Peterson, New England L-5 (4) Al Ladne (behind the booth), Boston L-5 (5) Rosemary Shields, Boston L-5 (6) Mike Stopa, a speaker for the New England L-5 (7) Professor John Lewis, a speaker for the New England L-5 (8) Kathy Scribner, New England L-5 (9) Wayne Jefferson and Kathy Scribner of the New England L-5 with Frank Kendig, editor of **Omni** (10) Charlie Lurio, New England L-5 (11) The Space Futures Society's ice cream cake (photo by Charles Divine) (12) Boston L-5 displays (13) The sign outside of Burlington Mall (14) Bill Rudow (left) and Rick Shields of the Boston L-5.

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Robert C. Truax: Crackpot or Pioneer?

By Carolyn Henson

Some people, in response to Bob Truax's novel (i.e., cheap and privately financed) astronaut program, have written him off as a nut. After all, what "professional" would plaster his rocket with ads or, in this post-Nader culture, let his astronauts face a several percent probability of death?

Truax graduated from Annapolis in 1939. By 1942 he was given charge of the Navy jet propulsion project. Later, through the Naval Research Laboratory, he developed the Navy's rocket capability.

Truax, as head of the American Rocket Society (now known as the American Institute of Aeronautics and Astronautics, the professional organization of aerospace engineers) generated a recommendation in 1957 to U.S. President Eisenhower to develop a strong non-military space program. Eisenhower agreed and created NASA.

In 1960 Truax became head of advanced development for Aerojet Engineering Corp. While there he pushed for ocean recovery of reusable rockets — a concept finally adopted for the space shuttle's solid fuel engines.

In 1974 he convinced stunt artist Evel **Knievel to try to jump the Snake River in the rocket-powered "Sky-Cycle." Either the** mission abort parachute opened by itself, or Evel chickened out—who can say? But Truax's Sky-Cycle flew just fine.

Truax certainly doesn't fit in the grey NASA/aerospace mold. But, whatever the fate of his X-3 Shuttle program, Bob Truax already has a solid place in the annals of the evolution of the space age.

First Private Enterprise Astronaut Selected

By Carolyn Henson

Daniel Correa, a pilot and skydiver, has agreed to finance $100,000 of the costs of his planned launch as the first private astronaut. Correa will make a more than 80-km-high suborbital flight in the X-3 shuttle, a vehicle designed by rocket pioneer Robert Truax.

The X-3 is vertically launched. A centrally located hold-back restrains the rocket until full thrust is reached. At liftoff the thrust-to-weight ratio is 1:3. Burnout occurs at 34,442 m after 60 seconds of powered flight, at which point maximum velocity of approximately 1000 m/sec has been reached.

The X-3 coasts to apogee, then falls back to Earth. Upon reaching a descent speed of 1000 m/sec and an altitude of between 30,480 m and 45,720 m, a drogue chute opens to stabilize the rocket tail down and slow it to 45 m/sec velocity.

At 6,100 m the main canopy will open, slowing the X-3 to 20 m/sec at splashdown in the ocean. The spacecraft and astronaut will be located by the combination of an AN/MPQ-10 radar tracking system and an on-board transponder. A 38 m cutter with a helicopter platform on the stern will be stationed in the landing area. A helicopter will rendezvous with the spacecraft using radar and transponder data. Visual contact will be aided by dye released into the surrounding water by X-3.

Two frogmen will attach a hoist to the rocket, which will be lifted by the helicopter for transportation with the astronaut still inside back to the launch area. There he will finally emerge.

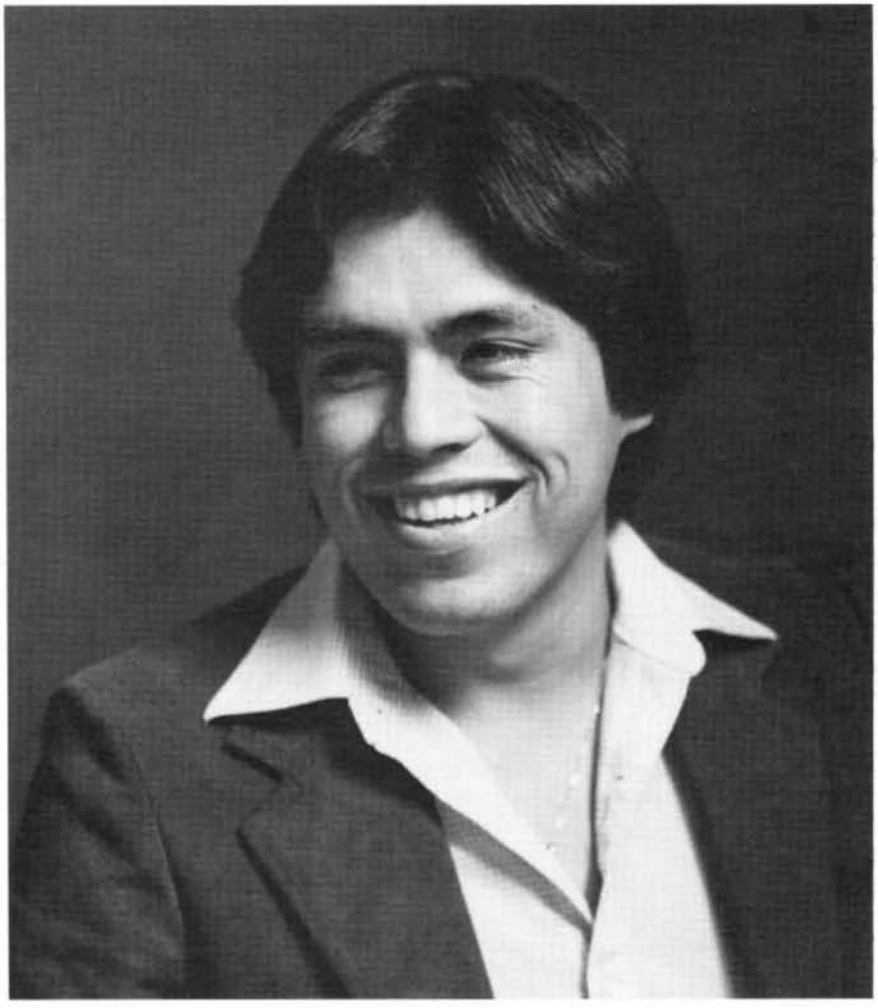
How will the astronaut stay alive during this hop? Oxygen and compressed air bottles will replenish the air supply. However, X-3 designer Truax admits that his astronauts will face greater risks than those working for the U.S. Government.

The overall project cost is estimated at $875,725. Daniel Correa has no firm launch date as not all the needed funding has been raised. However, tests and construction are already underway.

If the X-3 "Volksrocket" is successful, it will represent a major cost breakthrough and vindicate Robert Truax's assertion that the key to inexpensive space flight is held by private enterprise.

For more information, write: Truax Engineering, Inc., 12401 Green Meadow Lane, Saratoga, CA 95070.

Truax's rocket showing the name of one of its commercial sponsors.



Daniel Correa, the astronaut for the Volksrocket.

Technology and the Humanization of Space

by Ed Bas

There was a lot of celebrating, a lot of recognition and remembrance the week of July 16-24. In Michigan, it was proclaimed Space Exploration Week in honor of the first footprints on the Moon. Speeches were made and special programs planned at universities, space museums, etc.

But is the excitement over? Technology itself isn't exciting. Neil and Buzz will forever be remembered, but can the same be said for the hardware? And while people will whistle appreciatively as the space shuttle rolls by, don't expect everyone to yell "Spend! Spend!" to their Congress-

Technology itself isn't exciting. Neil and Buzz will forever be remembered, but can the same be said for the hardware?

people over it. The American public needs heroes, not idols—and humanization of space, not just industrialization.

Example: according to an article in the **Journal of Contemporary Business**, we are now in an information phase of space technology. From the 1960s to the 1990s, the space program has centered around Intelsats, Domsats, Tiros, Geos, Landsat, Seasat, etc. Disposable chemical rockets were used as launch vehicles, for a total cost of around $75 billion (1975-adjusted).

The reaction of the American public has been an unappreciative yawn. And a 1976 study by Chase Econometric Associates says this shouldn't be. "NASA R&D spending increases the rate of technological change, improves productivity, reduces the rate of inflation and expands employment." Yet how many people think of productivity when you mention the space program? It means nothing without that necessary humanization.

The Chase study went on to estimate that a $1 billion increase in NASA spending raises the Gross National Product some $2.1 billion the first year and $2.5 billion the second year—a common "multiplier" effect which eventually translates into "lower prices, higher levels of unemployment and greater real income."

In short, money is spent on Earth, not in space. And it's spent on people.

This is known as "macroeconomic impact" in that spending spans some 33 fields from chemical to electrical engineering. Shuttle spending goes to high-technology industries (as much as 70% anyway) compared to 6% for residential construction and 10% for consumer spending. The same can be said for employment: 68% employed by the shuttle program are in technology-intensive industries, compared to only 5% for the other two programs.

In Sterling Heights, Mich., a bunch of high-technology Vought Corp. workers are about to hit the pavement looking for new work—the $40 million per year ground-to-ground Lance missile is going out of production. One veteran of the program commented that he wasn't really worried about finding another job, nor was he surprised because it is the nature of his trade to go from one contract to another.

If only he could be put to work on solar satellites instead of waiting for the next "defensive weapon" contract to come along.

Isaac Asimov once remarked that "cost is a false issue" when it comes to space colonization. Which is true, because the charts and graphs on economic return, unemployment rates and labor productivity mean nothing, unless you suspected them all along. Or unless you put it all in understandable terms. But then, NASA has never been well-known for its eloquent and colorful language.

In 1978, I listened while a Michigan farmer told me the procedures for applying for federal disaster relief for his drought-devastated corn crop. It was nothing new to him. He'd gone through it before to save his $150,000 harvester/combine—one without the air-conditioning or stereo you see in the Life magazine pictorials. NASA couldn't help him that year, and maybe it never will.

But in 1970-71, the dramatic if obscure "Corn Blight Watch Committee" was formed by NASA and cooperating universities. Some 210 selected corn fields in seven states were given flybys at 60,000 feet with remote sensing equipment. If the corn blight of 1970 were to strike in '71, it could be detected early and something salvaged with a Paul Revere cry to plant soybeans instead.

The blight didn't materialize so the situation never grew as dramatic as it might have. But if you talked to my farmer friend today about NASA and remote sensing, I'm sure he'd listen. It means more than how the GNP is affected or how many high-technology jobs are saved in a year.

Technology shouldn't have to be defended, yet NASA seems to consider it necessary to do so. So much so, in fact, that the term "spin-off technology" sometimes takes on a negative connotation, as though it is an excuse—even a ruse. Technology has to be explained, and explained in human terms that give it meaning.

The Vought workers should be hard at work building powersat components. The Michigan farmer should know what remote sensing does for him. Only then will NASA share some of the "hero" honors with Neil and Buzz.

"NASA research and development spending increases the rate of technological change, improves productivity, reduces the rate of inflation and expands employment."

Will magazine covers a decade from now celebrate the beginnings of space industrialization that took place in 1979? They might. Stranger things have happened. After all, Americans fell in love with the Model T. But that doesn't mean they'll ever lose sight of the American hero. Once NASA connects the high technology with 21st century people, outer space will open up as a new frontier, not as a new factory.

Clearing the Way for Innovation

by Ken McCormick

What's happening to American ingenuity? A new bill could help the government make its policies more favorable towards innovation.

Technological innovation, the key to industrial productivity growth, has clearly been lagging in the United States for more than a decade. There has been a dramatic decline in the formation of new small, high-technology companies which introduce a large share of new products and manufacturing techniques. The proportion of patents issued to American inventors has steadily declined. Productivity gains have ground to a virtual halt, so that the United States now ranks last among the 11 major industrialized nations in the rate of growth.

America's rise to a position of preeminence in the world was fueled by abundant capital, energy and raw material resources, and by cheap labor. All that has now changed, and the U.S. is increasingly dependent on the introduction of new technology to maintain its high standard of living.

The 25 years following World War II saw impressive strides by the United States in the development of nuclear energy, aircraft, computers, space technology, communications technology, and electronics. Other nations, concerned about the "technology gap" between the U.S. and themselves, created special science ministries and intensified governmental support for research. Today, America maintains a clear lead only in space technology, and that lead is slipping rapidly. The industrialized nations are in a race for new technology as they face growing competition from developing countries where labor is cheap and the need for development often overrides concern for social benefits.

President Carter has reversed the decline of governmental support for research, but expenditures remain 16% lower today than a decade ago.

Senator Adlai Stevenson III of Illinois has introduced into Congress the "National Technology Innovation Act of 1979" as a first step towards a determined effort to revive technological innovation in the United States. The bill would create within the Department of Commerce an "Office of Industrial Technology." There are entire departments of the government concerned with natural resources, food, energy and labor, but no agencies with an overall responsibility in technology.

Today, America maintains a clear lead only in space technology, and that lead is slipping rapidly.

The office would provide an ongoing assessment of international and domestic trends, creating a foundation for policy-making in both government and the private sector. The government would use the office's analyses in establishing trade, antitrust and patent policy. Private firms would find the information useful in formulating market strategies and in utilizing innovations of foreign origin.

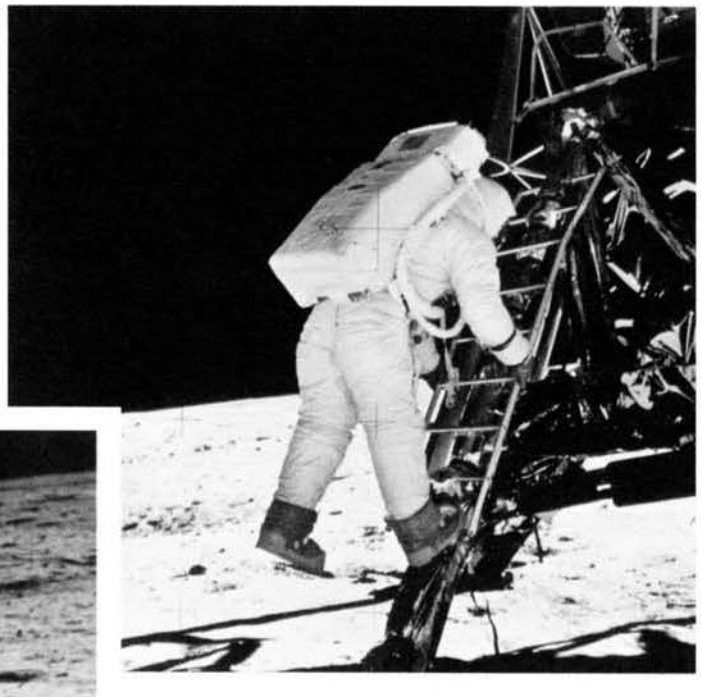
In addition, the office would provide assistance for the establishment of university- or nonprofit-affiliated "Centers for Industrial Technology." Such centers would cooperate with industry in generic research which is now undersupported in the U.S. Would-be sponsors are unable to appropriate all of the benefits which arise from such research, but the *total* benefits tend to far outweigh the costs. Support from society as a whole would be in the society's own interest. The cooperation of the centers with industry would facilitate a better flow of technological information from universities to industry. The centers would also provide education and training in entrepreneurship and technology innovation.

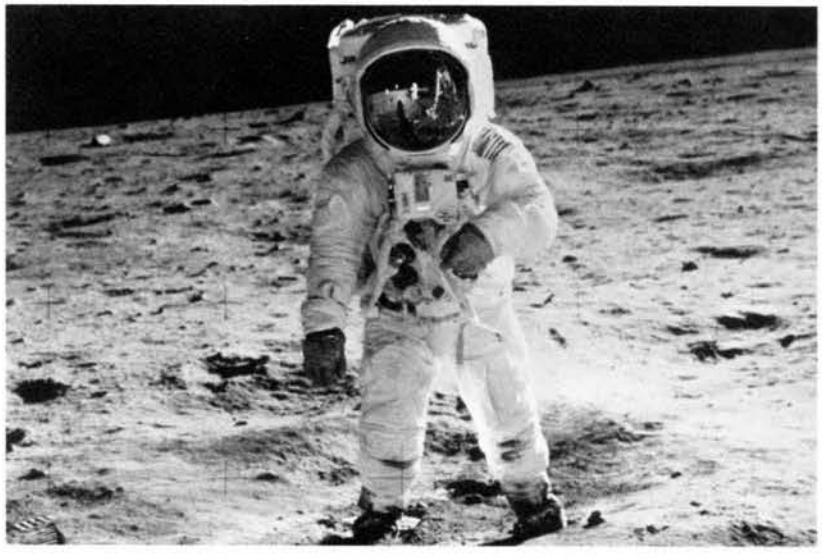
Leaders in the field of research praised the bill in hearings on June 21 and 27, but emphasized that this bill represents only one of the steps which must be taken. A complex set of political, economic, social, institutional, and even religious factors were blamed for the creation of a business environment in which entrepreneurship is discouraged.

Dr. David L. Morrison, director of the Illinois Institute of Technology Research, complained that our foreign competitors do not have to contend with interference from "environmentalists, anti-progress groups, and government regulations, "but instead are stimulated by favorable treatment on taxes, investments, and antitrust regulations.

Witnesses agreed that the United States cannot simply emulate the foreign institutions which have been so successful, but will have to develop arrangements suited to its own social structure. Tax and regulatory policies were identified as areas in which great changes would have to be made if the purpose of the bill was to be achieved, for while the bill provides for the creation of new inventions, it still does not provide an atmosphere in which those inventions may be developed into marketable products. Without that favorable business climate, the government would simply be financing innovations which would be developed and exploited abroad.

Space Day





Looking Back on Apollo 11

By Jim Loudon
Reprinted from **Michigan Space Log**, *July 6, 1979 issue*

Friday, July 20, 1979, 10:56 p.m.: the tenth anniversary of the first human step onto the Moon (or, for that matter, any object other than Earth) by the left foot of Apollo 11 Commander Neil Armstrong. Lunar "soil" (actually rock ground fine by billions of years of meteorite impacts, large and small) is tricky to walk in; the upper fraction of an inch is loose and slippery, while the material below is too firmly packed to provide much support. The overall feeling is like walking in freshly-plowed Earth soil except that the lunar material is more slippery. Your feet sink in about an inch. This is a measure of how much less geologically active the Moon is than the Earth—the Moon is not "dead," as it's so often oversimplified, but it's much less active. A typical inch-deep astronaut footprint should remain visible for 20 million years. What finally destroys it after this length of time—immense by the standards of everyday living but short by geologic time scales—is bombardment by small meteorite impacts.

The scientific findings of Apollo came mostly from the later flights; Apollo 11 was devoted largely to engineering (find out *how* to land on another world, a thing that had never been done before, and get back to Earth before your inevitable errors had accumulated to a fatal level). Science had to take second priority on this first attempt. Where science really came in was on the last three missions (by which time the media had largely lost interest and, tragically, on the three missions that should have come after them but were cut to "save money." Each Apollo flight brought back about as much information as the *sum* of all its predecessors, so the deletion of Apollos 18 through 20 cut the data return to 1/8 of what it could have been...in order to save 5% of the budget. This is known as "cost-effectiveness" in the trade. Nevertheless, although Apollo 11 (for all its symbolic significance) was the least important mission scientifically, the mere fact that it was the first guaranteed that it would make some major

discoveries. Here are a few:

The dark areas which make up the "face" on the Man in the Moon (i.e. the maria—rhymes with "aria"—as opposed to the highlands, or brighter areas that comprise the rest of the lunar surface) are gigantic lava flows of the rock called basalt (accent second syllable: ba-SALT). In fairness, that was already known from the unpiloted spacecraft Surveyor 5 which had landed not far from the Apollo 11 site less than two years earlier. It means that the Moon (to the surprise of many geophysicists) is differentiated; that is, during or soon after its formation, the entire globe melted. Its heaviest substances fell to the bottom and the lightest ones floated to the top, forming the lunar crust when the Moon solidified.

What Apollo 11 added to this was that Moon basalts (that's those rocks you watched the Apollo 11 crew pick up—samples of the particular set of lava flows called Mare Tranquillitatis) are similar to those on Earth but not identical—their trace-element composition is different. By "trace elements" I mean the tiny percentages of contaminants, such as gold or lead or europium, that occur in any rock along with the major substances it's composed of. Substances of this sort with low boiling points are less abundant on the Moon than on Earth (e.g. there's very little gold there). Trace substances with high boiling points are more abundant on the Moon than on Earth. Lunar basalts, especially those around the Apollo 11 site, are so rich in titanium that any Apollo 11 rock is a commercial grade of titanium ore by present-day Earth standards—a fact that will be very important as humanity begins to use space resources more and more in the decades and centuries to come.

There's *no* water in the lunar rocks in any form—not liquid, solid, or even water of hydration (water chemically combined with atoms in the minerals that make up the rocks). Yet in the Universe as a whole, water is the single most common chemical compound. The Moon, or the material which was to become the Moon, was evidently intensely heated sometime during or just after its formation. This process drove off all the water and much of the other substances with relatively low boiling points.

The dark areas on the Moon are basalt, a rock that is common on Earth, Mars, Mercury, and probably Venus. The brighter areas that make up the rest of the Moon's surface are a rock that is rare on Earth: anorthosite (an-ORTH-o-site). This finding was a shock. We think now that the anorthosite formed during the time when the Moon melted and differentiated; it consists of the very lightest materials in the Moon which floated to the top and formed a scum. That may mean that the Earth's original crust was anorthosite too—rather than the granite which makes up today's continents, out of which we dig our minerals, and whose origin has been a major geologic puzzle for over a century.

Apollo 11 Moon rocks.

The Moon's craters have not been forming steadily through geologic time; instead, nearly all of them formed during a period of intense meteorite bombardment that was over by the time the Solar System was one billion years old. It is now 4.6 billion years old, so for more than 3-1/2 billion years, the meteorite activity has been relatively low. But *before* that . . . well, the entire surface of the Moon—except where buried by mare lava—is covered by overlapping craters 50 miles across or bigger. Each one formed in an explosion equal to two billion Hiroshima atom bombs. There is no spot on the Moon that has not undergone at least one such explosion.

The "soil" of the Moon is simply smaller rocks; unlike Earth soils, its particles are little modified by processes that occur after they form. This is one of the biggest gifts that nature has given us towards an understanding of the Moon. It means that each crew of astronauts brought back not just a few dozen rocks but tens of thousands of "rocks". Most of them were under 1/100 inch in size, but they could be studied as well as if they were ten-ton boulders. Even the rarest rock types at any given landing site would be represented in such a huge collection.

A brand-new kind of rock, never seen on Earth, neither igneous, sedimentary, nor metamorphic (the three classifications into which all Earth rocks can be placed) occurs on the Moon and was discovered by Apollo 11: "soil breccias" or microbreccias (breccia rhymes with getcha). These are "soil" particles welded together by meteorite impacts.

Natural glass, also produced by meteorite impacts, is a major constituent of the lunar soil. We've never seen such glass on Earth. It determines the appearance of any given spot on the Moon, and it is what welds together the soil breccias. A large fraction of the soil is microscopic perfect spheres of glass, apparently droplets of rock melted by impacts, that froze while in flight after being splashed out of newly formed craters.

The economic effects of Apollo were profound, according to easily available yet virtually unpublicized studies by economists on the effects of space spending. Apollo was never as expensive as was believed by most of the public (our current yearly spending on discotheques averages 2-1/2 times what we spent in a year on Apollo) but the returns were immense. Spinoff alone (new technology resulting as an accidental by-product of space engineering) returns to the economy $14 for every $1 we spend on space or more than a third of a trillion dollars for the $25 billion total Apollo cost. A third of a trillion dollar bills, piled up, would reach 1/10 of the way to the Moon!

Apollo 11 Reunion

by Jody Rawley

On Friday, July 20, 1979 the crew of Apollo 11 was reunited in Washington D.C. The astronauts met at the Smithsonian's new Air and Space building, climaxing the festivities which included special exhibits and video-taped replays of the first lunar landing. The museum's televisions brought the original Apollo transmission to visitors. The ladder descent and first step were at 10:56.20 p.m., exactly when it happened 10 years ago.

Neil Armstrong, Buzz Aldrin, and Michael Collins held a morning press conference in front of the Smithsonian's Apollo 11 lunar landing display, then posed for pictures in front of their Columbia command module. At 11:15, they each spoke in a public ceremony at the museum's mall entrance. At the press conference Neil Armstrong was asked "Do you and your crew harbor any great faith in a revival of America's interest in space, and do you believe that there will be an L-5 before the year 2,000?" He answered that all three looked forward to a revival of national interest in space with the shuttle program and that he hopes public interest does *not* reach the enthusiastic heights it did for Apollo 11. Armstrong explained that exploration should mature into a "respectable, professional, and routine," endeavor, and not be a spectacular oddity. He then said that "perhaps a smaller scientific research space station might have more immediate advantages, but an L-5 definitely should be looked into."

One NASA official cited this National Space Exploration Day as "beginning an era, the era when America moves from one Columbia to another Columbia," referring first to the Apollo 11 command module and then to the first Shuttle slated for launch and orbit. The crew of the Shuttle Columbia, John Young and Robert Crippen, also attended the outdoor ceremony and presented Neil Armstrong with a model of their spacecraft.

Below: Armstrong, Aldrin and Collins (left to right) shake hands in front of the Smithsonian's Apollo 11 display. (Photograph by Charles Divine.)

Right: Neil Armstrong cheerfully conducts a morning press conference, a photo of his 1969 ladder descent behind him. (Photograph courtesy of Jody Rawley.)

Lower right: In the command module Columbia, 1969, Neil Armstrong, Michael Collins and Edwin "Buzz" Aldrin (left to right).

The Big Event

by Marcia Allen

In July, Boston's popular Quincy Market, with its cobblestones and endless modern boutiques, paused in its usual hectic activities to witness a unique event — Space Week '79. Focusing on humanity's efforts to reach out into the universe, Space Week was a celebration of the 10th anniversary of Neil Armstrong's "one small step."

Space Week was also *our* first **Big Event**!

For the week-long celebration we planned a variety of activities. We scheduled about 16 speakers and at least as many films *and* set up a New Space Program information booth as well. The preliminary planning (to find out who would speak on what when); the hectic last minute rush (to find a printer at 11 PM Sunday night) — all this was for us a real *first!* By the 15th we were bug-eyed with excitement, anticipation — and terror. Was it really going to happen?

July 16th came and so did Space Week. Although quite different from our first distant visions, Space Week more than repaid our efforts. Our programs and activities gave us countless opportunities to "get out" and see what people really think of space — and of us. And more than that, it gave us a chance to find out what we could do.

Designing a twenty-hour, three-day program at Faneuil Hall that would appeal to the public was our biggest challenge. We were fortunate to have many fine speakers offer their services without charge and to have more than enough films loaned to us. The challenge, however, was to put it all together. We did one better; we not only had our Faneuil Hall program but had enough to spare to put on two special evening programs at the Boston Public Library.

In doing all this we discovered many new resources that will be valuable to us in future programs. For example, we found speakers to add to our list about whom we knew little or nothing before Space Week. One professor from MIT gave such a good talk on planetary exploration that most of the audience stayed on for almost an hour to talk with him. (You can bet we will schedule him again.) Another resource we discovered was the Boston Public Library — it has a good lecture hall and is free. With this in mind we hope to plan several more programs there for the coming year. Also, we hope to explore other public libraries in the region.

Our most public activity was our information booth at Quincy Market, which we ran for most of Space Week. Our booth was devoted to the New Space Program and was surprisingly easy to put together. We had handouts, books, and L-5 material on display, and our members were around to talk with people.

We not only talked, but did a lot of listening; people seemed to welcome the opportunity to talk to us about space. We had one eight-year-old tell *us* about solar

Marcia Allen getting some sun at the information booth. (No, those aren't moonrocks!)

power satellites (SPS). A soft-technologist stopped by and spent an hour praising SPS to another soft-tech. (Although most people were positive about space utilization, we did get some negative comments: one elderly woman stopped, quietly looked over our table, then said "Bullshit!" and stomped away.) It was good to listen to people's comments because we discovered some things. Some people didn't read past the "Solar Power . . ." and told us all about their wood-burning stoves. We also found out that some people were not well informed about the mechanics of space. (It didn't help that Skylab fell the week before.) One man told us quite seriously

Some of the people who made it happen: (left to right) Nancy Mari was the chief sign-maker; Blaine Atkins, the New England L-5 president; Eric Drexler and Chris Peterson put in time at the booth.

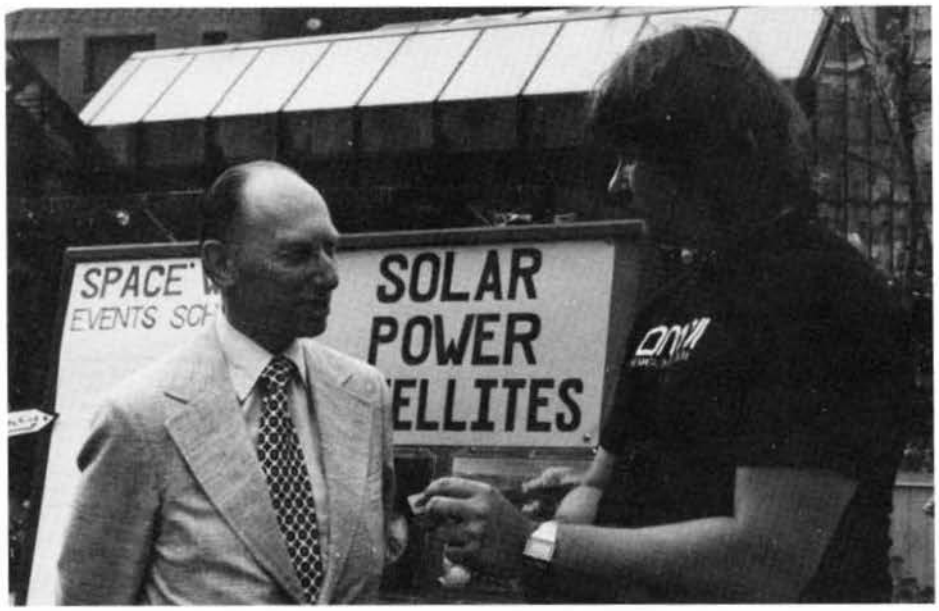
that we couldn't possibly collect so much solar energy because we would drain the Sun's energy, and it would not be able to rise.

One little two-sided sheet of paper provided us with our greatest success in public contact. Our Space Week Questionnaire (almost an afterthought) turned out to be a gold mine! It kept our booth constantly surrounded by people and helped to get people thinking about Space. When they finished the questionnaire, they often stayed to talk with us enthusiastically about space utilization and solar power satellites. The questionnaire also helped us to quantify several things: the number of people stopping at our booth (we had over 400 completed), and the number of people really interested in continuing space development (most people didn't think that national prestige was a good reason to continue space development, but did think that further exploration of the solar system was very important).

But that's not all our little gold mine did. The questionnaire provided us with over a hundred potential recruits—positive people in our area who gave us their names and addresses! What more could you ask for?

By July 22nd we were all feeling a bit smug; we were really pretty pleased with ourselves. After we got everything put away, we sat around and talked authoritatively about how we would do Space Week '80. (One of our members has already formed a Space Week '80 Committee.)

Even now we smile at how good it felt to do that **Big Event!**



Dr. Peter Glaser (left), the inventor of the solar power satellite, was one of the speakers at Faneuil Hall. Here he is with Wayne Jefferson.

Acknowledgements:

The New England L-5 would like to thank all those who helped with Space Week '79. First, thanks to all our members who were instrumental in making Space Week a reality, especially Blaine Atkins, Chris Peterson and Eric Drexler who gave their leadership and management to our program. A special thanks to Wayne Jefferson for generously donating the funds for Faneuil Hall, as well as for his efforts in helping with Space Week. And a personal thanks to Jim Mabry for his help and encouragement.

We thank all those who helped us behind the scenes: loaning us material, getting films, etc. A special thanks to Bill Rudow who did so much behind the scenes.

We thank all those who participated in our programs, and also those who offered to participate.

Further we thank the people at Faneuil Hall, Quincy Market, and the Boston Public Library for all their kindnesses. And, of course, we thank Governor King for declaring July 16-22 Massachusetts Space Week.

Finally, we thank the National L-5 Society for their ongoing support.

Spacefair '79 — The Impossible Dream Realized

by Rosemary Shields

Question: Can a new, eleven-member chapter blanket a big city with space week exhibits in their spare time—and have a marvelous time doing it?

Answer: Yes!

What Was Done

For Spacefair '79 the Boston Chapter focused on exhibits. The sites included the main U.S. Post Office, the Prudential Center (a 50-story downtown office and shopping complex), the John F. Kennedy Federal building, the Boston Public Library, the Tufts University Library, and the Burlington Mall— the largest enclosed mall in the Boston area (500,000 people pass through it each week). After filling the mall with exhibits, we ran a booth and the results were so good that we plan to have booths at *all* locations in the future.

We found the site directors extremely cooperative and interested, and have been invited back again for future exhibits. In fact, the Post Office in Boston asked us to extend the exhibit for a week because of the strong public response.

Results

- Invitations to provide exhibits and programs for a number of civic and private organizations.
- Over 200 seriously interested names for

Rosemary Shields at the booth in Burlington Mall.

our mailing list.

- Over $300 in contributions resulting from just 20 hours of booth sitting (five evenings and two Saturdays).
- Active cooperation with New England L-5, establishing an important precedent for regional cooperation.
- Phenomenally high morale and momentum in the chapter as we discovered how effective we could be and how much fun it was working as a team.

Impressive Points

The response of people who came to our booth was overwhelmingly positive, and they were hungry for information. Selling space is easy and exciting. Since we were prepared for hostility, the amount of public support stunned us. We conclude that L-5 can completely reverse the current downhill slide of space support. This may seem a wild extrapolation from 20 hours of booth duty, but you'd have to try it yourself to understand why we feel this way.

The whole enterprise—preparing exhibits, setting them up, running the booth—was exhilarating beyond belief. It is a great way to get a chapter off the ground. Before this project we had a strong committment to space, but little sense of being a team working toward common objectives. Now we are a seasoned, cohesive chapter with enough projects in mind to keep us working for years to come. Not only do we work effectively together, but we have a great time doing it.

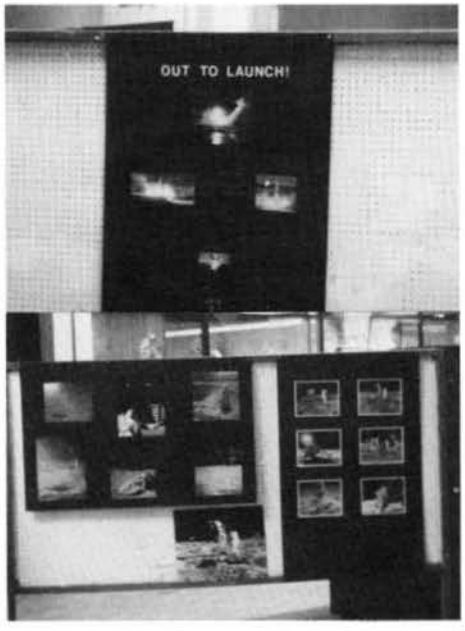
Lessons We Learned

- Organizing and planning as a group, with good communications among the members, is essential.

Above: Last minute preparations at 3:00 AM! Left: Rick Shields; right: Bill Rudow. Below: Some of the displays in Burlington Mall.

- Enthusiasm builds exponentially as a chapter becomes immersed in a common project.
- Booths work well from many perspectives, including feedback on public attitudes, fund raising, public relations, and group morale.
- Handouts are critical, and can be used even when no one can staff the booth.

We have prepared a packet on how to do (and how not to do) exhibits. This includes sample letters, layouts, handouts, cost estimating sheets and planning sheets (the time and cost planning sheets were developed *after* having been through space week!). If you would like a copy for your chapter, simply write L-5 Society, Boston Chapter, P.O. Box 162, Prudential Center, Boston, Massachusetts, 02199. Let us know your experiences with using it so we can improve its effectiveness.



Space Day Picnic, Texas Style

Reprinted from **The Colonist**, *the newsletter of the L-5 Society of Texas.*

L-5 Texas held its first annual Space Day Picnic in Clear Lake City on July 22. Among the many things which happened out among the trees was a Frisbee Fight which ended with everyone attacking Bobby, the Boston Barbarian, with all available ammunition. Also, some very irreverent photos were taken of the new L-5 Texas president who found himself unexpectedly sitting in a trash can. Everyone had such a good time that plans are already underway for the highlight event for 1980—the school teacher is going to hang the "Sugarland Kid" (junior) from a tree and perform a lobotomy with a baseball bat. Y'all come!

Space Futures Society Celebrates Space Day!

by Chuck Divine

The Space Futures Society (Philadelphia's L-5 affiliate) celebrated Space Day with a picnic at Pennsylvania's Neshaminy Park. Swimming, frisbee tossing and volleyball were the order of the day as some of our membership met to celebrate past successes in space and plan for future ones. The pièce de resistance of our celebration was an ice cream cake (see cover) decorated with a model of the lunar lander (acquired and assembled by member Donna Varr). Soon after the photograph of the cake was taken, the hungry mob devoured the ice cream cake, leaving it only a delicious memory of a happy time. Gorged and happy, the picnicers departed for their respective homes, vowing to continue to work for space.

The Space Futures Society at their Space Day picnic. (Photo by Charles Divine.)

What do these people have in common?

KRAFFT EHRICKE | CAROLYN HENSON | TOM HEPPENHEIMER | BARBARA HUBBARD | RICHARD JOHNSON | TIMOTHY LEARY | PETER VAJK

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—Curt Bormann, L.A. TIMES

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—Brenda Miranda ,(Gerard O'Neill) Princeton Univ.

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The Truth About the Skylab Crew "Revolt"

by B.J. Bluth, Ph.D.

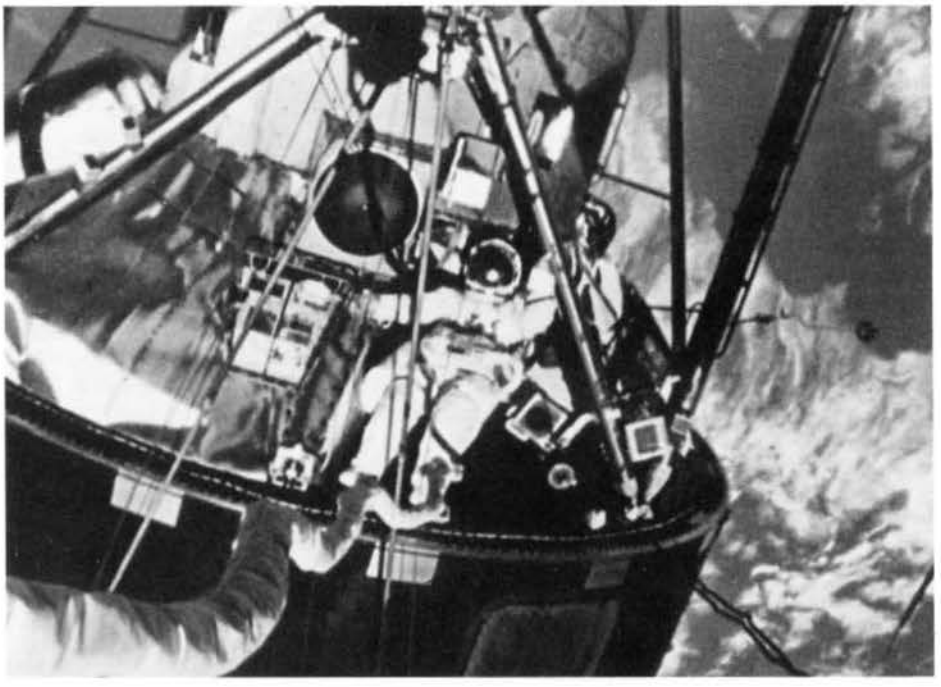
Rebellious Astronauts! How remarkable, and even romantic, to find a revolt at the heart of the NASA Space Program! And it seems Henry S.F. Cooper, Jr., in **A House in Space**, succumbed to the temptation. The record needs to be set straight.

Cooper starts the "Skylab rebellion" theme early, by saying that one of the most important results of the Skylab experiment was that "some of the astronauts would rebel." At the end of the sixth week in space, the third Skylab crew composed of Commander Gerald M. Carr, Science Pilot Edward G. Gibson, and pilot, William R. Pogue, took a day off. This action, according to Cooper, was preceded by days and days of bitching, complaining, grumbling, griping, and impatience about nearly everything in the Skylab. Ground Control, he says,

> wondered whether there was anything in the strange alchemy of space that had changed their characters. They were unaccountably irritable, even when they were getting dressed in the morning. They complained that there weren't enough changes of clothes . . . they bitched that the bundles had been packed too tightly. Then they grumbled that they didn't have a great enough variety of clothes.

The "complaints" go on as Cooper notes men "blowing up" over velcro that didn't stick, and pockets that were too small, evidencing a "blend of ridicule, exasperation, and plain hostility" that was notably unusual for astronauts. This "testiness" culminated at the end of the sixth week in what Cooper calls a "memorable bitch" where Carr made a "sort of declaration of independence to the ground" followed by the complete crew taking the whole day off—the revolt.

. . . Cooper notes men . . . evidencing a "blend of ridicule, exasperation, and plain hostility" that was notably unusual for astronauts.



Shortly before the end of the Skylab mission, Scientist-Astronaut Edward G. Gibson climbed out of the hatchway to begin the crew's final extra-vehicular activity. From above the obscuring atmosphere of the Earth, the astronauts got a unique opportunity to observe Comet Kohoutek.

One thing Cooper fails to mention is M487, the "Habitability Experiment." All the crews went up to the Skylab equipped with an elaborate checklist of some 180 items that they were to evaluate and make descriptive comments about, "especially for items considered only adequate or less than adequate." Not only were they to fill out the checklists, they were also asked to voice-record spontaneous comments when the situation arose as these were considered an "excellent source of data since they would probably be the result of some onboard discovery." The whole point of M487 was to have complete written, audio, and filmed records about the habitability of the design of the crew quarters and work areas in zero gravity conditions so future space stations could be designed more effectively and more comfortably. Many of the comments that Cooper dubs spontaneous "gripes," "grumbling," "complaints," and "bitching," etc. are actually responses to the items on the M487 Checklist, and the third crew members were not the only ones to be critical.

To give you some idea of the extensiveness of the experiment, *some* of the checklist's 180 items are as follows:

- Architecture:
  - Compartment Arrangements
  - Color Scheme
  - Floor Design
  - Light Baffles
  - Windows
- Communications
- Environment:
  - Temperature
  - Noise
  - Humidity
- Food Management:
  - Beverage Dispensers
  - Food Cans
  - Wardroom Table
  - Water Gun
- Garments
  - Comfort/Fit
  - Warmth
  - Don/Doff Ease
- Housekeeping
  - Cleanup Procedures
  - Trash Collection
  - Unanticipated Problems

Utensil Wipes
Locomotion
Maintenance
Manual Dexterity
Mobility/Restraints
Equipment Restraints
Shoe Cleats
Handholds
Sleep Restraints
Off-Duty Activity
Personal Hygiene
Tool Inventory

It was the spirit and intent of this experiment to identify and describe as many problems as possible, when they arose, on the assumption that the men would forget many of the details once they returned to Earth.

It is true that Carr, Gibson, and Pogue took a day off, but the term "revolt" is not the only interpretation possible, and with the M487 to defuse much of the supposed "rebellious" attitude of the crew, the picture looks quite different.

The situation *was* one of frustration for the crew. Contradictory commands had been given to the crew before launch and once they were up in Skylab. Carr had been told by William C. Schneider, Director of the Skylab Program, that his crew was to go at a slower pace than the previous two crews. However, Ground Control was busy adding new experiments to the schedule which resulted in putting the crew under a lot of pressure. According to Carr's statement to the ground:

> We'd all kind of hoped before the mission, and everybody got the message, that we did not plan to operate at the second crew's pace . . . We're beginning to get just little hints and indications that we're getting into a time bind—that it's got people really worried down there. People are asking about experiments, and the medics are asking about exercise . . . I imagine you guys are probably caught right smack in the middle of it.

Carr wanted to know where things stood, what needed to be done to catch up, and "What can we do that's reasonable?" He wanted to be in on the conversation. Instead of being labeled a "diatribe" and a "declaration of independence" this stand on Carr's part can be seen as a "hold" until things could be straightened out and the conflicting instructions resolved. Carr himself saw that as Commander, and in a position to directly observe the effects on himself and his crew, it was up to him to call the slow down. Soon after Commander Carr requested that Mission Control work out the contradictions, "the third crew's performance soon improved."

In light of M487 and contradictory work expectations, Cooper's revolt dissolves along with the mist of the "strange alchemy of space," leaving us again to marvel even more at the fact of people's capability for work and survival in space.

B.J. Bluth is an Associate Professor of Sociology at California State University, Northridge, CA 91330. She conducted a symposium on the industrialization and settlement of space June 25th through August 3rd.

A Question of Semantics?

Comments by Henry S.F. Cooper, Jr.

Dr. Bluth is correct in pointing out that many of the astronauts' pithier comments about life and conditions inside Skylab came in response to lists of questions they had to answer for the so-called "Habitability Experiment," M487. Many did not. She is wrong in saying I made no mention of the experiment in **A House in Space**; I describe it on pp. 39 and 40, Bantam edition. Discussing living conditions in space, even at the ground's request, is still a legitimate expression of the astronauts' feelings, and I fail to see how it detracts from the genuineness of the third crew's irritation. I certainly don't see how the M487 "defuses" Commander Gerald M. Carr's words with Mission Control, which preceded the astronauts' taking a day off—especially as he also questions the ground controllers' motives and suggests that some of the extra workload might be caused by "people coming out of the woodwork with new things to be done." No one at the time regarded Carr's words as a fireside chat.

I think Dr. Bluth misunderstands my use of the phrase "strange alchemy of space," which I introduce early in the book (p. 10) only to knock it down later myself. It was appropriate there because at the beginning it was a question in the minds of many people at the Space Center who were baffled and concerned by the irritation of the third crew. I then go on to demonstrate at considerable length how the crew's problems and annoyance in fact are due to overprogramming by the ground and contradictory commands—a situation Dr. Bluth presents as though she just discovered it. The fact that these problems originated on the ground is not a good argument for the astronauts being any less angry at Mission Control. There is always a tendency to play down the intensity of an event afterwards, but I do not think that Dr. Bluth has succeeded in smoothing over this one.

Response of B.J. Bluth

The point to be made about the Third Skylab Crew is that there is no evidence they "revolted." A "revolt" implies a rejection of the legitimate authority. It is a protest which refuses to accept the obligation and duty to obey, and substitutes some other authority—thus a declaration of independence.

To suggest that people trained in, and a part of the military, as Commander Carr and Pilot Pogue were, "revolted" is a serious innuendo, both to the people involved and for those planning future space missions, and such intimations can have many unanticipated consequences.

Thus, it makes a big difference if you imply that the astronauts' "griping" and irritability were all signals that foreboded a climactic revolt, or if you say that (a) a lot of the apparent "griping" was a planned response to the M487, (b) a lot of frustration was in response to impossible and contradictory commands, and (c) Commander Carr exercised his legitimate authority to solve the problem. The event was intense. But was it a revolt? I think not.

P.S. A House In Space is *well* worth reading.

The American Heritage Dictionary defines "revolt" not only as "an uprising against state authority" but also as "any act of protest or rejection." Attempts to define the troubles aboard Skylab as revolt or non-revolt might end up as just a question of semantics. — JA

NEWS BRIEFS

The Salyut-6 space station crew, commander Vladimir Lyakhov and flight engineer Valeriy Ryumin returned to Earth at 15:30 Moscow time Sunday, August 19 after a record-breaking 175 days in orbit.

A TASS special correspondent asked the two cosmonauts, "What were your most memorable moments upon landing?"

"My first impression," replied Lyakhov, "was the odors of the steppe when I opened the hatch."

When the cosmonauts arrived at Baykonur they were handed bouquets of gladiolis. The cosmonauts couldn't hold them long, admitting they felt "heavy as sheaves of wheat." However, Soviet doctors report Lyakhov and Ryumin were in the best condition of any returning cosmonauts. The two walked around and even took a short swim their first day back on Earth.

They didn't sleep well the first night, however, because even the softest bed felt like a rock after months of weightlessness!

July 3 the United Nations Outer Space Committe unanimously reported out an "agreement governing the activities of States on the Moon or other celestial bodies." The General Assembly will vote on it in mid-September. It is expected to pass by a heavy majority.

Although the entire U.S. delegation to the U.N. Space Committee supports the treaty, NASA Ames Chief Counsel J. Henry Glazer opposes the treaty because it regulates trajectories to the Moon as well as the Moon and all other celestial bodies. Glazer supports a lasseiz-faire approach to all shipping of goods and passengers in space. "It's an issue of human rights."

Former chief U.S. negotiator on deep seabed issues Leigh Ratiner warns the treaty will effectively ban private enterprise using extra-terrestrial materials. Neil Hosenball, NASA General Counsel, counters that by stretching the treaty's language it will be possible for private companies to operate in space. Retorts Glazer, "There's no such thing as a treaty that doesn't mean what it says!"

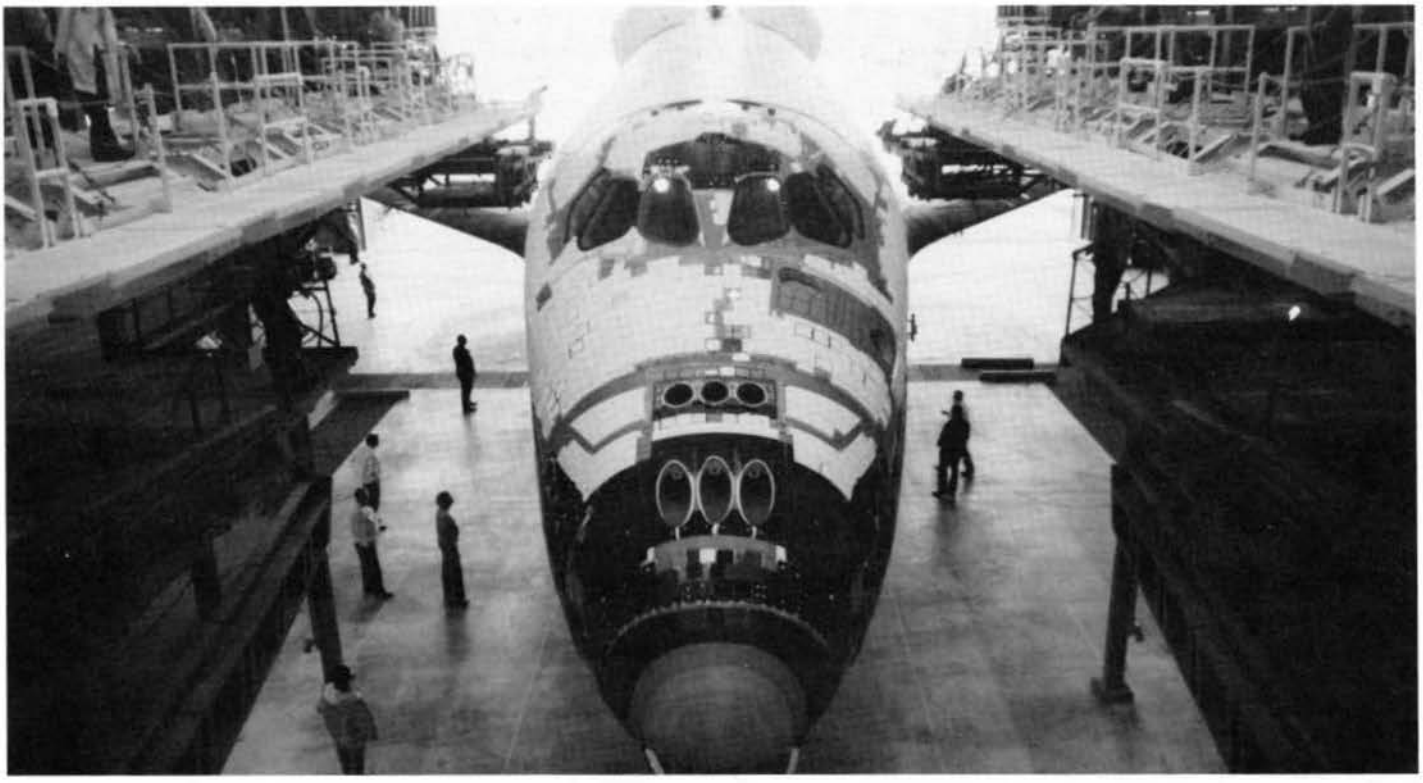
Sept. 10 Dr. Glazer will detail his objections to the new moon treaty at a meeting of the Bay Area L-5 Chapter. For more information call (415) 223-2463.

Congress chopped $1.5 million from the Department of Energy budget for solar power satellites. The final budget is still considerably higher than last year's, however, including $5.5 million for R&D and $0.5 million for equipment purchase.

Russian cosmonauts Lyakhov and Ryumin installed a 10 meter radio telescope on the aft area of their Salyut-6 space station. The antenna was delivered by a Progress 7 transport rocket. It has been used to survey parts of the Milky Way as well as the Sun and Earth.

When used to observe the Earth it returns data on humidity and surface water content. Observers also point out that it should be able to detect the wake of submarines even when deeply submerged, possibly allowing the Soviet military to make a first strike against U.S. subs.

Job opening: Princeton Prof. G. K. O'Neill is looking for someone with a B.S. or M.A. in physics or electrical engineering, recent graduate, with one or two years experience in discrete component electrical circuitry design, to work with Bill Snow on the mass driver project. Send your resume to Laura Hagopian, Dept. of Physics, Jadwin Hall, Box 708, Princeton, NJ 08544.



The space shuttle orbiter Columbia

Space Shuttle Update

NASA has named the remaining four Shuttle Orbiters after oceangoing vessels used in world exploration and discovery. Orbiter 102, scheduled to be launched into Earth orbit late this year or early next is named Columbia. The other orbiters are: 099—Challenger, 103—Discovery, 104—Atlantis. The first orbiter constructed (101) was named Enterprise in 1976 after the flagship in the popular television series "Star Trek."

Columbia arrived at Kennedy Space Center March 24th on top of the 747 shuttle carrier aircraft. Later this year Columbia will be mated with the fuel tanks and made ready for launch.

The Enterprise has completed a nine month long ground vibration testing program at Marshall Space Flight Center in Alabama. All the shuttle elements—the orbiter, external tank and solid rocket boosters were assembled and put through conditions matching those during various phases of actual flight. The tests showed that the Shuttle will withstand the vibration forces it will encounter during powered flight into Earth orbit.

The Enterprise was flown to Kennedy Space Center and assembled with the external tank and solid rocket boosters in the giant Vehicle Assembly Building and moved to the launch pad. This cleared the way for the launch of its sister ship, the Columbia, by making certain the shuttle elements are compatible with the spaceport's assembly and launch facilities and ground support equipment and by providing for training of space center personnel.

Two early-configuration Spacelab pallets have been delivered to the Kennedy Space Center. One of the pallets will be used on the Space Transportation System (STS)-2 mission and the other is tentatively planned for STS-9. Delivery of the Spacelab module is planned for April 1980.

NASA is currently working toward a launch opportunity between March and June of 1980. No exact launch date has been named. NASA is currently assessing manufacturing and testing progress in an attempt to refine a launch date.

"We are at a fork in the road. One sign post says: Surface—cutback, stagnate, leave whatever space activity there is to the military. The other says: Space—explore, develop, stimulate, industrialize."—Hugh Downs, president, National Space Institute.

Our thanks to Robert Dotson for contributing information and locating photographs.

New Shuttle Patch—*The official insignia for the first Space Shuttle orbital flight test was recently issued. Crewmen for the Columbia (orbiter 102) will be Astronauts John W. Young (commander) and Robert L. Crippen (pilot).*

Announcements:

Errata

We would like to apologize to Theo Pirard for neglecting to credit his contribution of the photograph of the Guyana Space Center in the June **L-5 News.** The photograph appeared in the article entitled "Ariane Ahead of Schedule" by Randy Clamons. The map serving as background for the photo, also not credited, was courtesy of ESA.

Habitat 2000 - Dimensions in Space

This is the title of a new adult education class to be presented at the Buffalo Museum of Science in cooperation with the Niagara Frontier L-5 Chapter.

The purpose of the class is a striving to understand human activities in space. Who were the people who struggled to turn the dreams into reality? What were the critical events and decisions that shaped the course of the struggle? What is happening today—from planetary exploration, Landsat and the Earth resources programs to Shuttle and Spacelab? In what direction will we go tomorrow—to solar power satellites, large space habitats, mining of the Moon and asteroids and manufacturing in space?

The class will use lectures, films, slide programs and discussions to explore this complex field. It will closely examine the structure of the U.S. and international space programs, look behind the headlines at the politics of space and at such topics as space law, the militarization of space and the role of free enterprise.

The text will be "The High Frontier" by Dr. Gerard K. O'Neill. Teaching the class will be Elissa Sisti Wynn, Michael Cooper and Jim Conyngham.

Elissa Sisti Wynn has been a space enthusiast since Sputnik. A member of the L-5 Society and National Space Institute, she is founder and present co-chairman of the Niagara Frontier L-5 Society, a museum affiliate club.

Michael Cooper has a bachelors degree in aerospace engineering and a masters in engineering science. He is an engineer at Bell Aerospace, a member of the American Institute of Aeronautics and Astronautics and co-chairman of the Niagara Frontier L-5 Society.

Jim Conyngham is a computer scientist at Calspan, a local aerospace firm. He is an officer of the Niagara Frontier L-5 Society, a member of the Institute of Electrical and Electronic Engineers and active in the Association for Computing Machinery.

The class will be held on Wednesday evenings, 7:30-9:30 PM from September 12 through November 7, 1979 (nine sessions). For more information on the class or for L-5 members wishing to start a similar class in their area, contact: The Niagara Frontier L-5, c/o Elissa Wynn, 40 Kings Trail, Williamsville, NY 14221.

Innovative Concepts Sought for Solar Cells

DOE has begun a research program to find new methods of converting the Sun's energy into electricity using photovoltaic, or "solar" cells.

The program, termed the Innovative Concepts Program, will be coordinated by the Department's Solar Energy Research Institute in Golden, Colo. To participate in the program, researchers are being asked to submit "letters of interest" to SERI by February 15, 1979.

Present plans call for similar solicitations twice yearly. With a major goal of developing low-cost photovoltaics, the research and development areas include new high-risk photovoltaic conversion concepts; cell structures and geometrics; materials; junction formation techniques; fabrication processes; and material deposition methods.

The primary targets of the program include universities, small businesses and private investors. many of whom often find it difficult to obtain funding for their high-risk ideas. Initial contracts are expected to be for one year. Those projects that demonstrate sufficient potential will be considered for renewal or incorporation into previously established activities in DOE's photovoltaic program.

Requests for further information and the solicitation document should be submitted in writing to: Solar Energy Research Institute, Attn: Roger Ganger, Contracts Branch, 1536 Cole Boulevard, Golden, CO., 80401

Rooftop "Earth Stations" Wanted

A group of amateur astronomers at and around Rensselaer Polytechnic Institute of Troy, NY, is currently designing a 12" dia. Amateur Space Telescope for release into orbit by the space shuttle. We are interested in corresponding with people who own, or plan to build, rooftop "Earth stations" that are capable of receiving pictures from weather satellites. Stations in the southern US and in foreign countries would be of particular interest.

We are also interested in corresponding with others who plan to use the Space Transportation System and who might be interested in forming an organization for non-professional builders of Gateway special experiments, satellites, Earth stations, etc.

Please address letters to: Jesse Eichenlaub, 100 9th Street, Troy, NY 12180.

Letters

There is another method of using space solar electric power that many of us may not have considered. Although as members of the L-5 Society we fervently believe in the concept of space solar power and the SPS, many people in this country feel that the concept is a little (if you will excuse the pun) far out. Many of these people would, however, be much more accepting of ground-based, conventional, solar-fired power plants. These plants have an obvious drawback in that the Sun does not shine at night; even so, there will probably be experimental plants built in the near future.

However, we can help this problem associated with ground-based solar energy; we can make the Sun shine at night, too. If two or more large mirrors are orbited in geosynchronous orbit, sunlight could be reflected to one or more existing ground-based solar power plants. This would provide for the illumination of the plants at night and thus continuous power generation (eliminating the need of expensive and inefficient power storage methods). This idea has a number of points in its favor: (1) mirrors can be put in orbit much more cheaply than, say, solar cells (assuming all materials upshipped from Earth—they simply weigh less), (2) the beam is sunlight at approximately one sun in

intensity (no significant environmental damage is likely to occur from sunlight at an intensity of one sun), (3) the beam could not be considered a weapon by any nation, (4) the power generation system is less subject to military attack (the power generating station is not at the mirror and could still function during the day without the mirror—also mirrors are less subject to damage than fragile microwave generators or laser tubes), (5) and last but not least, this system provides for a phased buildup to the SPS.

The value of a phased buildup in such a project as the SPS concept is obvious, if one looks at it from the standpoint of the taxpayer. (What would the average taxpayer say if you asked him for a few hundred billion to build powersats?) However, the cost of expanding *then existing* solar power plants by adding large space mirrors would be small in comparison to the cost of the SPS system, and it would be relatively easy to get the government and NASA to buy it. Then, when people begin to accept the concept of power from space as practical and economical, the idea of the SPS can be put forward as the practical and elegant energy source it is.

Steven D. Hamm
Clear Lake City, Texas

There are several problems of the space mirror for Earth solar power ("solares") concept that are not shared by SPS.

The disk of the Sun is wide and its light incoherent. This means that at geosynchronous altitude the minimum size beam would be enormous. For this reason the solares design calls for low orbit reflectors. But this means only dawn and dusk lighting of power plants—things will be dark as ever in the middle of the night. Low orbit systems also mean the minimum system size will require many mirrors.

Solares will cost less than an SPS system. But it will perform far more poorly. Nevertheless, the cost vs. performance tradeoffs may be sufficiently favorable for solares to become a first step toward space solar power.—CH

Steven Lubar's letter (April **L-5 News**), in which he criticizes the Society for becoming "a cheering section for a couple of big corporations . . . Boeing and Grumman," intrigues me. He is clearly more interested in means than in ends—a variant on the ethical-over-pragmatic position.

What Lubar wants is "to change the future course of technology". Since the two quotes are part of the same sentence, he assumes that "change" will shift "big corporations" out of space industries. While I appreciate the small-is-beautiful sentiment, I do not see a necessary connection between the aforementioned *change* and *shift*. Space exploration and industrialization, no matter what technology is used to carry them out, is a large-scale enterprise which requires large-scale manufacturing (and *high* technology).

While "big corporations" may not in fact be the best way to get into space, a "*big* something" will be the best way and *only* a "big something". It is scale which is important here, not form. Also remember that any decision to shift corporations out of space industries will be made by the government and is thus a political, not technological, decision. (Ignore Karl Marx and Adam Smith: if politicians make a decision, it's a political decision.)

Howard Beatman
New London, Conn.

I wish to address the subject brought up by Steven Lubar in his letter of April 1979. He states: "The goal is still important, but the means have changed." By what ever means does Steven imagine that our goal will be accomplished? Who else will put Colony One up there? Congress? The Russians? or maybe The Ayatollah? If you think that those who are left with practically no technological muscle can do it, then you have a very romantic and very foolish idea of reality. Steven seems to lack grasp of the fundamental necessities of our position. We are balanced on the point of a very sharp sword: off to one side is technological revisionism and to the other side is Three Mile Island. Although corporate control may not be the ideal means, we seem to need some sort of symbiosis. Besides, after the goal is established, events may roll unheeded.

Keith Kuhn
Lewistown, PA

A problem with colony architecture that has occurred to me is that in a sharply curved space, you could hear all of your neighbor's stereos. Robert Heinlein might not appreciate me playing Jimi Hendrix and Led Zeppelin at the level at which I like hearing them. Sound insulation is a problem that can be solved, but it should have some attention paid to it. In the 21st Century, large colony sizes will hopefully reduce this problem.

Michael C. Emmert
San Antonio, TX

Our Society, and especially the **L-5 News** has the potential for enlightening a large block of future decision-makers, voters and leaders of the world in which space exploration and exploitation will truly begin. Now is the time to take this unabashed enthusiasm and imbue it with the understanding absolutely vital to making realistic decisions. How much more quickly could our Society's goals be accomplished if its members could see for themselves the ludicrousness of trusting a few government officials to decide what gets funded and by how much, when these same officials think a light-year is a unit of time, and don't have the foggiest notion of what kept Skylab in orbit, much less how it got there and why it came down? Who better to turn the imposters out than concerned, informed voters?

I would hope that my fellow members are of a caliber that even a pipe-fitter would want to understand what L-5 is, where it is, how he got there, and why it is important.

John B. Charles
Lexington, KY

I am involved in a year long study investigating our culture's responses to the photographs of planet Earth taken by the Apollo astronauts on their way to the Moon. I wish to know the ways in which various groups within our culture interpreted these photos. I would like to know who used them and what messages they attached to the photographs.

Currently I am gathering materials in which the photographs have appeared. I am interested in individuals and groups who have made use of the photos, e.g. poets, professors, media editors, environmental, religious, and/or space age communities, educators, corporate advertisers, etc. Any communication format is desirable, e.g. posters, books, flyers, magazine articles, buttons, shirts, brochures, stationary, memorabilia, etc.

If your organization has made use of the photographs or if you know of others who may have made use of the photos, I would be most grateful if you could help me locate and obtain examples of this material. If you have direct access to these items, and could send copies, that would be wonderful. If you know of other individuals and/or organizations who may be able to help, I would appreciate your forwarding this letter to them. My funds are limited, but I can cover some minimal acquisition expenses.

Steve Axelbaum
Box 25
Amherst, Mass. 01002