BUSH ANNOUNCES MANNED SPACE EXPLORATION INITIATIVE

to the stars

ad Astra

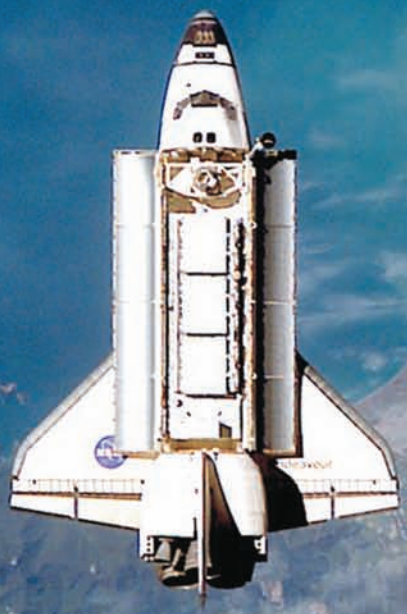
THE MAGAZINE OF THE NATIONAL SPACE SOCIETY

JANUARY/FEBRUARY/MARCH 2004 $4.95

The Nation's New Space Garage

Power Down: Beaming Solar Energy to Earth

Heinlein Award Send Your Ballot



WHAT'S NEXT?

SHUTTLE RETIREMENT LOOMS

23rd International Space Development Conference

ISDC 2004

"Settling the Space Frontier"

Presented by the National Space Society

May 27–31, 2004
Oklahoma City, Oklahoma

Location:

Clarion Meridian Hotel & Convention Center
737 S. Meridian, Oklahoma City, OK 73108
(405) 942-8511 **Room rate: $65 + tax, 1-4 people**

Co-Sponsors:

Oklahoma Space Industry Development Authority
Mars Society
Kirkpatrick Science & Air Space Museum at Omniplex
NSS of North Texas
Huntsville Alabama L5 Society
Austin Space Frontier Society

Speakers:

Keynote Speaker (Scheduled): Oklahoma Lt. Gov. Mary Fallin, Chair of the Aerospace States Association

Astronaut Donald A. Thomas, Shuttle astronaut and ISS Program Scientist
Melchor J. Antunano, M.D., MS, Director, FAA Civil Aerospace Medical Institute
Charles Chafer, CEO, Team Encounter ("Humanity's First Starship™"— solar sails)
Gen. Ken McGill, Board Chair, Oklahoma Space Industry Development Authority
Harrison Schmitt (Apollo 17 astronaut, lunar geologist)
Rick Tumlinson, Founder, Space Frontier Foundation
Prof. Robert Winglee, Department of Earth and Space Sciences, University of Washington
Robert Zubrin, President, Mars Society; and many more, both familiar and new.

Program Tracks:

Spaceport Issues Symposium • Space Education Symposium • "Space 101"
Advanced Propulsion & Technology • Space Health & Biology • Commercial Space/Financing Space
Space & National Defense • Frontier America & the Space Frontier • Solar System Resources
Space Advocacy & Chapter Projects • Space Law and Policy
Launch Infrastructure Debate • Pioneering Space

Planned Tours include:

Cosmosphere Space Museum, Hutchinson, KS (all day Thursday, May 27), with Max Ary
Oklahoma Spaceport, courtesy of Oklahoma Space Industry Development Authority
Oklahoma City National Memorial (Murrah Building bombing memorial)
Omniplex Museum Complex (includes planetarium, space & science museums)

See coverwrap of this magazine for additional information and Advance Registration Form.

Updates on line at **www.nss.org** or **www.nsschapters.org**.

SPACE adventures®

For NSS Members...

Space Station Launch Tour

Moscow • Star City • Baikonur

April 2004

Feeling the vibrations in the pit of your stomach as you watch the 300 ton Oxygen and Kerosene burning vehicle blast into orbit is one of the most amazing sights in the world.

The Soyuz-FG launch vehicle is a modernized descendant of the same rocket used by Yuri Gagarin on his historic flight on April 12, 1961.

This 5 day program begins in Moscow and includes VIP tours of the Gagarin Cosmonaut Training center in Star City Russia and the Baikonur Cosmodrome in Kazakhstan.

This package is designed to give the space enthusiast and aspiring space explorer an up close look at the culmination of participating in a Space Adventures mission.

Call now for dates and to reserve your space on the tour:

1-888-85-SPACE

Outside the U.S. +1 703 524-7172

Tour Highlights

Soyuz rocket launch viewing from the same launch pad used by Yuri Gagarin, and Space Adventures Private Explorers.
Tour of Baikonur Cosmodrome, including the Buran launch vehicle, Museum of Cosmonautics, and the Soyuz-Progress launch vehicle assembly building.
Private Business Class jet from Moscow to Baikonur
Tour of Gagarin Cosmonaut Training Center
Three Nights stay in 5-Star downtown Moscow Hotel.

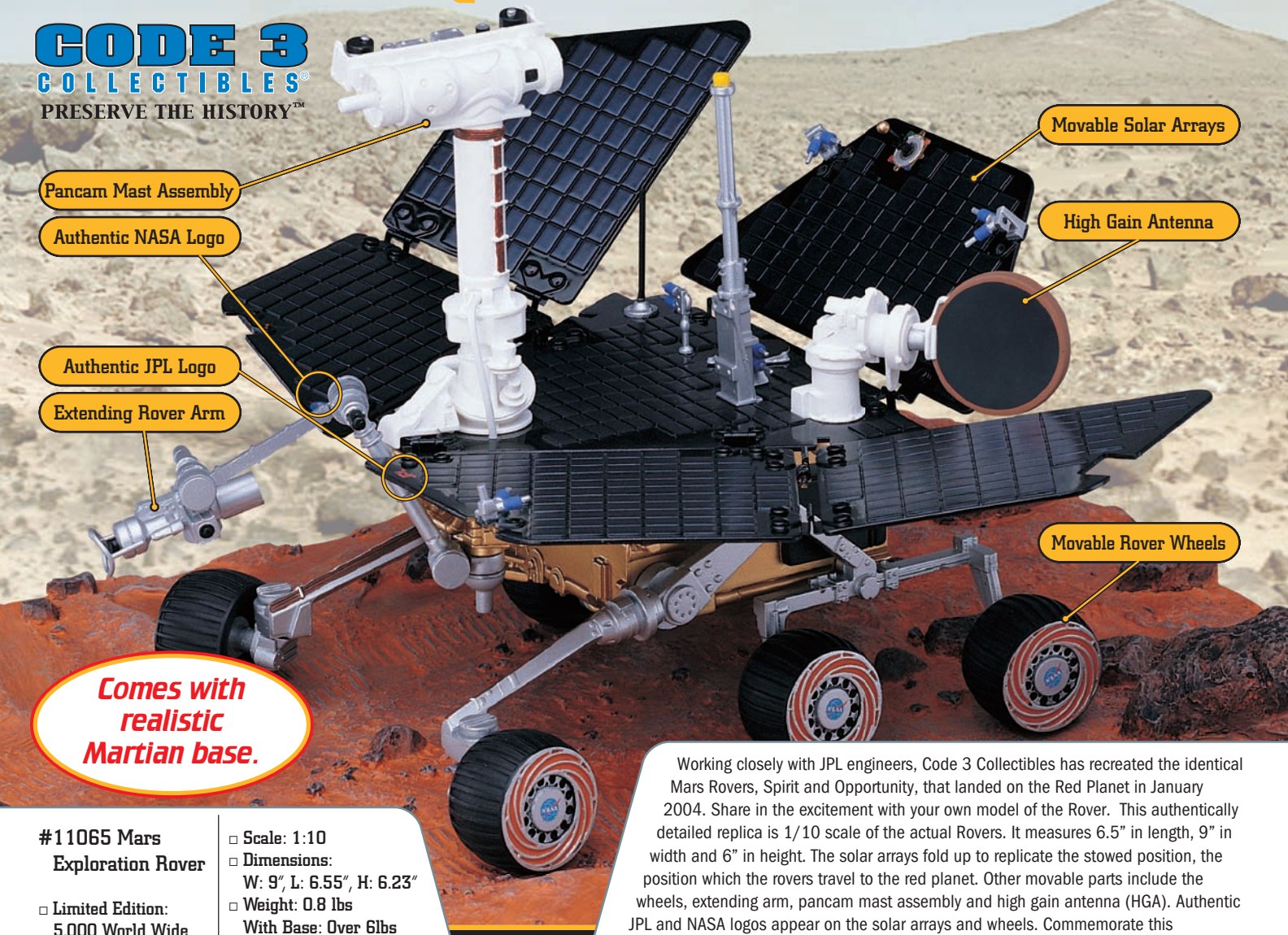
Inclusions

- VIP arrival/departure and transfers in Moscow
- 4 Nights hotel stay (3 nights in 5 Star downtown Moscow hotel, 1 night in Baikonur)
- Private charter flight from Moscow to Baikonur
- Transfers and Tours
- All security clearances
- Baikonur customs and immigration

NSS Members Discount! Call for details!

Own Your Own
Mars Exploration Rover

CODE 3 COLLECTIBLES®
PRESERVE THE HISTORY™



Comes with realistic Martian base.

#11065 Mars Exploration Rover

- □ Limited Edition: 5,000 World Wide
- □ Scale: 1:10
- □ Dimensions: W: 9″, L: 6.55″, H: 6.23″
- □ Weight: 0.8 lbs With Base: Over 6lbs

Working closely with JPL engineers, Code 3 Collectibles has recreated the identical Mars Rovers, Spirit and Opportunity, that landed on the Red Planet in January 2004. Share in the excitement with your own model of the Rover. This authentically detailed replica is 1/10 scale of the actual Rovers. It measures 6.5" in length, 9" in width and 6" in height. The solar arrays fold up to replicate the stowed position, the position which the rovers travel to the red planet. Other movable parts include the wheels, extending arm, pancam mast assembly and high gain antenna (HGA). Authentic JPL and NASA logos appear on the solar arrays and wheels. Commemorate this extraordinary mission with this extraordinary model of the Mars Exploration Rover!

"I am extremely impressed, the rover model is gorgeous! Please give my appreciation to your team, it is truly amazing how well they captured the real look."

- **Randy Lindemann, Mechanical Project Element Manager JPL**

100% SATISFACTION GUARANTEE*

Order Form

YES! Rush _____ Limited Edition **#11065 Mars Exploration Rover**(s) and charge my credit card 5 monthly installments of just $30 plus $14.95 S&H (added to first payment) for each model. CA residents: add sales tax to first payment ($12.38). For fastest service order online **www.code3.net/MER**

Please charge my: ❑ VISA ❑ MASTER CARD ❑ AMEX ❑ DINERS CLUB ❑ DISCOVER

Credit Card No.: _____ Exp. Date (mm/yy): _____

Cardholder's Signature: _____ Date (dd/mm/yy): _____

Mail your order form to Code 3 Collectibles, 6115 Variel Ave, Woodland Hills, CA 91367.
To pay by check, please send $150 plus 14.95 S&H (plus CA sales tax if applicable ($12.38)).
Sorry, we cannot ship PO Boxes.

(Please print clearly)

Name: _____

Street Address: _____

City / State / Zip: _____ Country: _____

E-mail: _____ Day / Eve Phone: _____

*30 day money back guarantee, S&H not included.

Source code: ASO1PAA

www.code3.net/MER

to the stars
ad Astra
THE MAGAZINE OF THE NATIONAL SPACE SOCIETY

VOLUME 16, NUMBER 1 JANUARY/FEBRUARY/MARCH 2004

MODULES

4 Launch Pad
5 Transmissions
6 Mission Control
Space Beat
Orbiter Update
13 Policy Insight
14 Guest Space
15 Countdown
38 Space Community
48 Lifting Off

PAYLOAD

REKINDLING THE DREAM
President George W. Bush outlines an initiative that puts us back on the moon by 2020. And from there, on to Mars...
BY FRANK SIETZEN, JR. 16

THE VISION THING
After floundering for decades, the U.S. space program has a new mission and a broader vision. But will it be enough to get us where we want to go?
BY JEFF FOUST 18

IN SEARCH OF PLANETS AND LIFE
When it comes to stars like our sun, planets may be the rule rather than the exception. A new flock of space telescopes will help scientists hone in on the Earth-like worlds.
BY ERIK BAARD 22

THE CASE FOR SOLAR POWER FROM SPACE
There's an awful lot of energy to be had out in space. Why we should be looking to solve Earth's energy crisis by harvesting power from the sun.
BY ARTHUR P. SMITH 26

AMERICA'S NEW SPACE CATHEDRAL
The expansion of the Smithsonian Air and Space Musuem in Dulles, Virginia, is a space buff's dream. A look inside the new museum.
BY KEITH COWING PHOTOS BY JEFF FOUST 34

ON THE COVER:

Space shuttle Endeavour over Cook Strait, New Zealand, during approach to the International Space Station on Nov. 25, 2002
Photo: NASA

AD ASTRA, **which means "to the stars" in Latin, is the motto of the National Space Society, an international membership group dedicated to furthering the exploration and development of space. Our bimonthly magazine *AD ASTRA* is only one of many NSS activities aimed at creating a spacefaring civilization. For more information on NSS call 1-202-543-1900 or visit www.nss.org/**

Background photos: NASA/JPL

New Directions

Greg Allison
Chairman of the NSS Executive Committee

With new prospects for a return to the moon and missions to Mars, it is important that NSS focus resources to promote humanity's reach into the cosmos. As chairman of the NSS Executive Committee, I'm pleased to announce new directions for NSS that will provide better service to members and supporters. These new directions consist of three spheres of activity: the way NSS operates, how NSS associates with other organizations, and what NSS does.

The primary change in NSS operations will be characterized by a contract with a Washington-based association management firm named Management Options, Inc. (MOI). This will enable NSS to operate more efficiently and effectively. An association management company typically has a number of organizations as clients, so it is able to distribute the needs of its clients across a staff with a wide-range of organizational skills, including key areas such as membership growth and fund-raising. This move should increase financial and membership growth while improving customer service.

Secondly, in order to more effectively partner with other space organizations and implement our goals, NSS has opted to be a founding member in the newly created National Space and Satellite Alliance (NSSA). Other inaugural members are The Space Foundation, the Satellite Industry Association, the Washington Space Business Roundtable and the Aerospace States Association. Each organization leads in its particular area of expertise among non-profit space organizations. NSS, for instance, is considered by the Alliance to be the leading membership-based space organization.

Working together as the National Space and Satellite Alliance, these organizations will help each other with activities and events to achieve mutual goals. NSS will remain wholly independent, always speaking for itself. The Alliance only will speak with the unanimous consent of all members. When we agree on goals and objectives, NSS will provide leadership in grassroots advocacy and public outreach. Coupled with collective NSSA expertise, we will dramatically increase our effectiveness.

In addition to joining the Alliance, several organizations—including NSS—have opted to move into adjoining offices to further improve communication and coordination. The National Space Society's new office, as well as our new headquarters team at MOI, will be located just a block north of the White House.

NSS is now poised to do new things. NSS is in the process of creating a new and improved Political Action Network that will feature an online resource center, e-mail alerts and direct, old-fashioned, follow-up phone calls for a personal touch.

The NSS projects leadership team of Greg Rucker and Gail Leatherwood is rekindling work on space-related programs, such as Project HALO—an NSS chapter project working to launch the first amateur rocket to space. NSS also will be investigating projects to facilitate a return to the moon, exploration of Mars and asteroid defense/utilization. These projects can range from public outreach/education to sponsoring research into living in and traveling to and through space. You'll see more project information in each issue of *Ad Astra*.

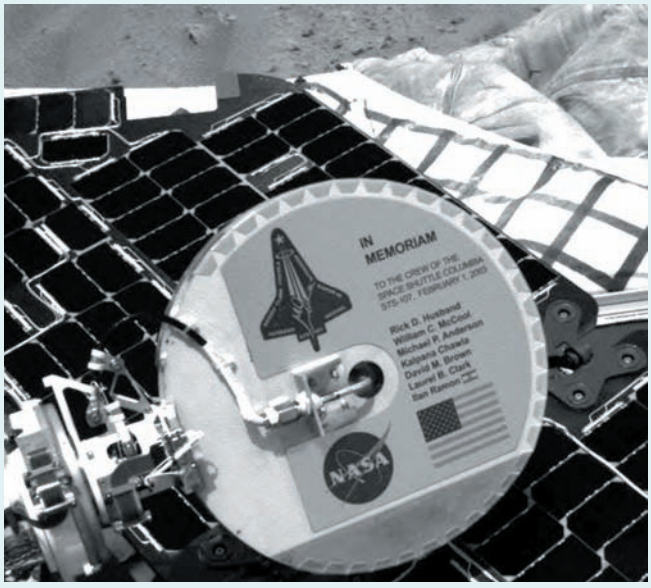
In short, we are looking at a new NSS, with new management and operating modes, and a renewed commitment to our objectives. Together we will build an NSS that will be heard, respected and innovative. We will pursue aggressively our dream of taking humanity to the stars. Join with us.

Ad Astra!

Greg Allison

A Memorial on Mars

The astronauts who perished in the Feb. 1, 2003 Columbia accident are commemorated in a plaque that will remain on Mars. The memorial was designed by Jet Propulsion Laboratory engineers working on the Mars Exploration Rover missions. The first rover, Spirit, which landed on Jan. 3, 2004, carried the plaque on the back of its primary communications antenna. NASA administrator Sean O'Keefe, also announced the rover's landing site will be named Columbia Memorial Station.



National Space Society

600 Pennsylvania Ave., S.E.
Suite 201
Washington, DC 20003
(202) 543-1900

http://www.nss.org/

Brian E. Chase
Executive Director

Vivian Silver
Membership Database Manager

Sherry Wilson
Direct Marketing /
Chapter Relations Manager

Publisher
National Space Society

Editor-in-Chief
Irene Mona Klotz

Senior Contributing Editor
John Kross

Copy Editor
Jonathan Aretakis

Photographer
Joe Marino

Art Direction and Graphic Design
Leonard D. Righter
Andrew S. Ladson

Production Services
Mercury Publishing Services, Inc.
http://www.mercurypubs.com

Ad Astra (ISSN 1041-102X) is published quarterly by the National Space Society. Editorial offices are located at 600 Pennsylvania Ave., SE, Suite 201, Washington, DC 20003-4316.

Periodicals postage paid at Washington, DC, and additional entry. Membership inquiries ($38/yr, $25/yr for students under 22 and senior citizens 65 and older, $12.50 of which is for a subscription to Ad Astra) should be sent to the National Space Society, 600 Pennsylvania Ave., SE, Suite 201, Washington, DC 20003-4316. Postmaster: Send address changes to Ad Astra, 600 Pennsylvania Ave., SE, Suite 201, Washington, DC 20003-4316.

MISSION CONTROL

spacebeat
BY JOHN KROSS

orbiter update

NASA/JPL/Cornell

Spirit relays a view of Gusev Crater.

RED ROVERS LAND ON MARS

The successful landing of NASA's twin rovers Spirit and Opportunity in January lifted NASA from its post-Columbia doldrums and marked the first safe return to the Red Planet's surface since the 1997 Pathfinder mission. The pair of golf cart-sized rovers survived perilous plunges through the Martian atmosphere, capping their seven-month voyages with six-minute finales featuring scorching heat shields, rapid-deploy parachutes, retrorocket thruster firings and encapsulation by airbags to soften the impact of touchdown.

Spirit bounced down Jan. 3 in Gusev Crater, a Connecticut-sized basin scientists believe once contained a brimming lake. Swaddled in its air bags, the rover bounced about 25 times after hitting the surface of Mars, said Rob Manning, manager of the entry, descent and landing portion of the mission.

After a nervous wait of about 20 minutes, mission controllers at NASA's Jet Propulsion Laboratory in Pasadena, Calif., received a radio signal from Spirit confirming it was functioning properly. The call set off a boisterous wave of cheers and clapping in the control room, a celebration that resumed three hours later when the rover transmitted its first black-and-white images to Earth.

"It was so gorgeous to see the horizon in the pictures. It's what we'd been imagining for so long," said Julie Townsend, a mission avionics engineer.

The first images showed a flat, wind-scoured plain peppered with small rocks, none more than a few centimeters high. Also visible were several wide, shallow bowls that may be impact craters. As the higher-resolution color pictures appeared over the next few days, mission scientists, who had been getting little rest since the landing, chose the name "Sleepy Hollow" for one of the circular depressions about 9 meters (30 feet) across and about 12 meters (40 feet) north of the lander.

"It's a window into the interior of Mars," said rover science team leader Steve Squyres, with Cornell University.

Closer to Spirit, scientists were intrigued by the thin layer of crumpled crust apparently disturbed by retraction of the lander's deflated airbags. "It's strangely cohesive," said Squyres, who speculated that evaporating water could have left salts behind that cemented the Martian soil together.

After spending 12 days scanning its surroundings and carrying out engineering checks, Spirit raised itself up, extended its front legs, and started trundling over the surface of Mars. The rover's first trek was not a long one: It moved just 10 feet from the outstretched petals of its landing platform for an initial round of soil and rock studies. Spirit's science gear includes a microscopic camera, two spectrometers to analyze the chemical composition of rocks and soil and a grinding tool to peer beneath the surface of rocks.

Over the next three months, both Spirit and Opportunity, which landed Jan. 24 across the globe from Gusev Crater, will look for evidence of past water activity in the rocks and soil and use cameras for geology studies.

A VIRTUAL MARS MISSION

Although, for now, human spaceflight is locked in low Earth orbit the extra months the Expedition Six crew spent aboard the space station after the Columbia accident demonstrates that people can make the long trip to Mars, says former station science officer Donald Pettit.

NASA

The sixth space station crew, (from left) Ken Bowersox, Donald Pettit and Nikolai Budarin, at a welcome home ceremony following their extended mission.

Pettit, his commander Ken Bowersox and cosmonaut Nikolai Budarin had been planning on a four-month stay aboard the station as members of the Expedition Six crew. However, their ride home was canceled after the Feb. 1, 2003, Columbia accident and subsequent grounding of the space shuttle fleet. The men ended up flying back to Earth aboard a Russian Soyuz spacecraft after an extra two months in orbit, inadvertently demonstrating humans' fitness for interplanetary travel, says Pettit.

"The whole experience had an uncanny resemblance to a trip to and landing on Mars," he said. "We were on orbit in a reduced-gravity environment for … about as long as a one-way trip to Mars … We got in our own vehicle (and) piloted it down to Earth … Then, without any help from the ground, we secured the spacecraft, we opened the hatch, we crawled out.

"All of this demonstrates human beings have enough physical strength and integrity to go on these long missions," Pettit said.

Not everyone echoes Pettit's optimism, countering that living aboard the space station cannot replicate one of the most challenging aspects of human missions to Mars—space radiation. The station is cocooned within Earth's magnetic field and somewhat protected from cosmic and other dangerous radiation.

Unfortunately, research into the radiation environment around the Red Planet suffered a setback with the demise of the Martian radiation environment experiment on NASA's 2001 Mars Odyssey orbiter. The device had been collecting data continuously from the start of Odyssey's mission in March 2002, but, ironically, fell victim to a barrage of intense solar radiation in October.

Red Oasis or Requiem for a Wet Planet

Meanwhile, back on Earth, debate over Mars' past continues with various camps claiming that Mars has always been a desiccated desert or, alternately, a warm, wet place capable of supporting rivers and lakes.

Mars Global Surveyor, which has been looking for signs of water-related carbonate minerals, found only traces of carbonates in dust, which probably came from the atmosphere rather than rocky outcrops deposited by oceans.

"What we don't see is massive regional concentrations of carbonates, like limestone," said Joshua Bandfield, a planetary geologist at Arizona State University.

Added researcher Philip Christensen, "This really points to a cold, frozen, icy Mars that always has been that way, as opposed to a warm, humid, ocean-bearing Mars sometime in the past."

On the other hand, newly observed details in a fan-shaped apron of debris on Mars paint a rosier picture and suggest the planet had long-lasting rivers instead of just brief, intense floods. Pictures from Global Surveyor show what appear to be eroded ancient deposits of transported sediment hardened into interweaving, curved ridges of layered rock.

Scientists interpret some of the curves as traces of ancient meanders made in a sedimentary fan as flowing water changed its course over time.

"Meanders are key, unequivocal evidence that some valleys on early Mars held persistent flows of water over considerable periods of time," said Michael Malin of Malin Space Science Systems.

Fire and Ice

Galileo Galilei, the discoverer of Jupiter's four largest moons, lived the last years of his life a broken man. Threatened by the Inquisition, he was hounded into silence. Now the spacecraft that bears his name has itself gone silent as well.

After 12 years of development, several launch postponements, a six-year journey and an extended eight-year mission, the intrepid Galileo probe steered itself into the giant planet's stormy clouds for incineration. The suicidal dive, which took place in September, was orchestrated to prevent any inadvertent contamination of Jupiter and its moons, some of which are under scrutiny as possible life-bearing worlds.

NASA

Studying the volcanically active moon Io was among the highlights of Galileo's eight-year tour of Jupiter.

Despite a few technical problems, the mission has been among NASA's most successful. Shortly before Galileo arrived at Jupiter in 1995, it released a small probe that plunged into the planet's atmosphere, relaying an unprecedented weather report on the gas giant. And during its very first orbit of Jupiter, Galileo passed Io and revealed how the tiny moon had changed since the Voyager flyby of 1979. In particular, closeup images of the Ra Petara volcano showed sulfur lava flows blanketing the surface.

Another highlight of Galileo's tour was the moon Europa. Data from the plucky probe suggest the ice-crusted world could be hiding a salty ocean up to 100 kilometers (62 miles) deep.

Cruising with Cassini

It has not yet reached its intended target, but the Saturn-bound *Cassini* spacecraft already is hard at work. In addition to some collaborative studies of Jupiter with the now-defunct Galileo spacecraft, Cassini helped prove Einstein's theory of relativity.

The experiment took place in the summer of 2002, when the spacecraft and Earth were on opposite sides of the sun and separated by a distance of more than 1 billion kilometers (621 million miles). Researchers observed the frequency shift of radio waves as they passed near the sun, and precisely measured the change in round-trip time of the radio signal.

NASA

The Cassini spacecraft is starting to close in on Saturn.

"The scientific significance of these results is the important confirmation of the theory of general relativity and the agreement with Einstein's formulations to an unprecedented experimental accuracy," said

Sami Asmar, manager of the Radio Science Group, which acquired the data for NASA's Jet Propulsion Laboratory in Pasadena, Calif.

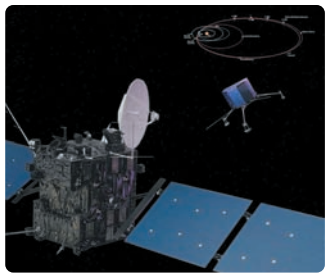
Upon arrival at Saturn this July, Cassini also is expected to be able to confirm new Earth-based radar data suggesting that Titan, Saturn's largest moon, is a very strange place indeed. Recent radar observations from the Arecibo Observatory in Puerto Rico detected mirror-like glints from the surface of Titan—properties that are consistent with liquid hydrocarbon surfaces.

According to Cornell University astronomer Donald Campbell, radar signals would glint from liquid surfaces on Titan, similar to sunlight glinting off the ocean. Although Titan's underlying surface is believed to be water ice, the complex chemistry in the upper atmosphere might have resulted in the icy surface being at least partly covered in liquid ethane, methane and solid-hydrocarbon deposits.

Cassini, which was launched in October 1997, also carries a European probe named Huygens, which will be released to plunge into the hazy Titan atmosphere and land on the moon's surface.

Europe Gears Up for Comet Chaser

The Old World is stepping up its preparations for the launch of a spacecraft designed to chase and land on a comet. The Rosetta mission was scrubbed at the last minute in January 2003 because of problems with the Ariane booster, but after a delay of more than a year the



European Space Agency

Artists impression of Rosetta comet probe and lander.

comet chaser was slated to lift off on Feb. 26, 2004.

Because of the delay, scientists have had to target a new comet—a chunk of ice and rock known as Churyumov-Gerasimenko. The new destination has posed some engineering challenges for the European Space Agency, not least of which is the fact that the new target is much larger than Wirtanen, its original quarry. When Rosetta reaches the comet, it will release a 100-kilogram (220-pound) lander that is to descend and harpoon itself to the comet's surface.

"We've had to look at all the mission elements and make sure this new mission can be satisfied by the spacecraft that was ready to be launched in January 2003," said project manager John Ellwood. "We're very confident we've looked at all the mission aspects. Ariane is in good shape and I think the spacecraft is ready to go."

China on "Long March" to Space

China recently parted its "Bamboo Curtain" and gave the rest of the world a peak into the communist giant's plans in space. Against a clear blue sky, China fired its first *taikonaut,* the Chinese word of an astronaut, becoming only the third nation to put a human in space.

The rocket carrying Yang Liwei, a 38-year-old fighter pilot, streaked into the sky on Oct. 15 from the Jiuquan launch site in the western Gobi Desert. Fourteen orbits later, Yang returned a hero when his capsule, dubbed Shenzhou V, landed in China's northern grasslands.

The launch of Shenzhou V, which means "divine vessel," capped a decade-long effort by China's secretive, military-linked space program that leaders hope will boost the nation's image abroad and their own standing at home. The Chinese government has long been enthusiastic about its space program, which it casts as a symbol of technological progress in a nation ascendant.

"The short-term goal is to send Chinese into space. The grand vision for the future is to explore space. Both are inspiring to the Chinese people," said Huang Chunping, chief commander of rocketry for the Shenzhou project.

Fast off the success of Shenzhou V, a top Chinese defense official confirmed reports in the Chinese media that the Middle Kingdom is planning a series of lunar missions. According to Zhang Qingwei, China is to launch its first satellite to the moon in the next three to five years.

Also, the state-run Beijing *Youth Daily* newspaper has reported that China plans to launch a lunar orbiter within the next three years. The orbiter would circle the moon for a year, gathering information about the lunar geology, soil, environment and natural resources. Signaling that Chinese ambitions in space go far beyond manned spaceflight, the second phase of China's moon program would send probes to the lunar surface and return samples to Earth.

Great Balls of Fire

The most powerful explosions in the universe, gamma-ray bursts, may generate the most energetic particles in the universe, known as ultra-high-energy cosmic rays (UHECRs), according to new analysis of observations from NASA's Compton Gamma-Ray Observatory.

Researchers report a newly identified pattern in the light from these enigmatic bursts that could be explained by protons moving within a hair's breadth of light speed. These protons, like shrapnel from an explosion, could be UHECRs, which seemingly defy physical explanation, for they are far too energetic to be generated by well-known mechanisms such as supernova explosions.

The new data does not focus directly on UHECR production, but rather a new pattern of light seen in a gamma-ray burst. Digging deep into the Compton Observatory archives—the mission ended in 2000—investigators found that a gamma-ray burst from 1994, named GRB941017, appears to be different than some 2,700 other bursts recorded by Compton. In this case, higher-energy gamma-ray photons dominated the burst, and were thousands of times more powerful than lower-energy photons after about 100 seconds. The enrichment of higher-energy photons is inconsistent with the popular "synchrotron shock model" describing most bursts.

"One explanation is that ultra-high-energy cosmic rays are responsible," said researcher Brenda Dingus. A delayed injection of ultra-high-energy electrons provides another way to explain the unexpectedly large high-energy gamma-ray flow observed in GRB 941017.

But this explanation would require a revision of the standard burst model, said co-investigator Charles Dermer. "In either case, this result reveals a new process occurring in gamma-ray bursts," he said.

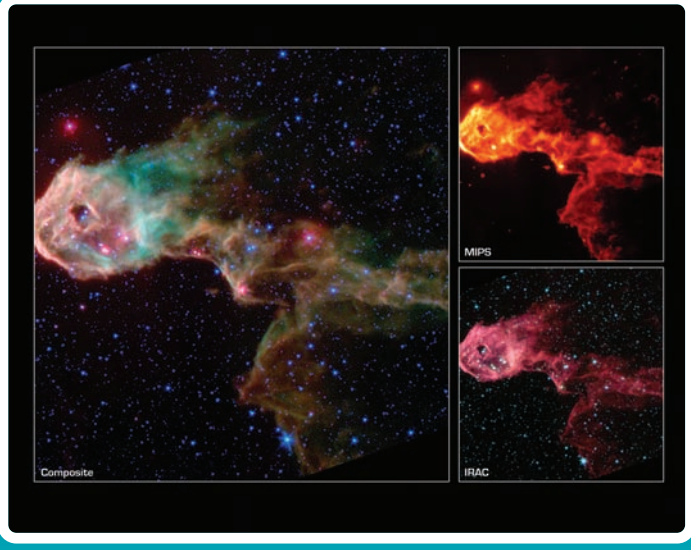
A leading contender for long-lived kinds of gamma-ray bursts like GRB941017 is the supernova/collapsar model. Collapsars are a special type of supernova where the core is so massive it collapses into a black hole, an object so dense that nothing, not even light, can escape its gravity within the black hole's event horizon. However, black holes are sloppy eaters, ejecting material that passes near, but does not cross, their event horizons.

"It's like bouncing a ping pong ball between a paddle and a table," said Dingus. "As you move the paddle closer to the table, the ball bounces faster and faster. In a gamma-ray burst, the paddle and the table are shells ejected in the jet. Turbulent magnetic fields force the particles to ricochet between the shells, accelerating them to almost the speed of light before they break free as UHECRs."

An Infrared Eye in the Sky

NASA

Among the first images taken by NASA's new infrared Spitzer Telescope is a view of the spiral arms of Messier 81, a neighboring galaxy located in the constellation Ursa Major. The telescope clearly shows galaxy details such as old stars, interstellar dust which has been heated by star formation and some embedded sites where massive stars are forming.



NASA

A stellar nursery shines in infrared light, revealing the birth of protostars. The telescope is named after the late Lyman Spitzer, who was among the first scientists to propose putting observatories in space.

ORBITER UPDATE

A LOOK AT NASA'S EFFORTS TO PREPARE THE SPACE SHUTTLES FOR RETURN TO FLIGHT

NASA

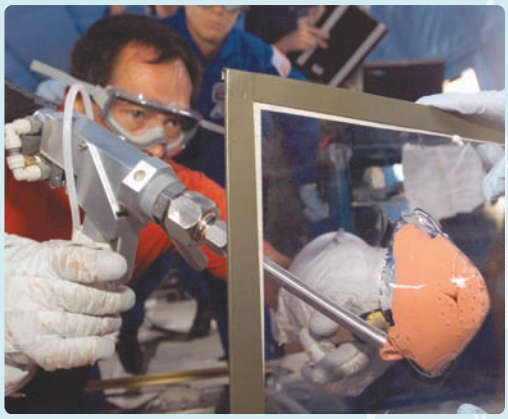
SOMBER REMINDER

Charles Stevenson of the Kennedy Space Center, foreground, briefs staff and members of the Stafford-Covey Return to Flight Task Group during visit to the Columbia Debris Hangar at KSC. Chartered by NASA Administrator Sean O'Keefe, the task group will perform an independent assessment of NASA's implementation of the recommendations by the Columbia Accident Investigation Board.

Lockheed Martin

ASTRONAUT OVERSIGHT

Carlos Noriega, the NASA astronaut representative assigned to support the Return to Flight Task Group, inspects a space shuttle wing leading edge reinforced carbon-carbon thermal protection system panel during a tour of the Lockheed Martin Missiles and Fire Control Systems facility in Grand Prairie, Texas. Members of the task group's Technical Panel visited the facility where space shuttle thermal protections system components are manufactured and refurbished.



NASA

TILE PATCH TEST

Astronaut Carlos Noriega, onboard a KC-135 zero-gravity aircraft, injects material into a special clear damage mold to observe flow characteristics of the material in a weightless environment. NASA is developing a process for repairing shuttle tile damage in orbit. The agency is also working on techniques to patch holes in the shuttles' wings.

NASA

NEW CREW

Astronaut Wendy Lawrence, one of two new crewmembers added to the STS-114 flight, inspects the tiles on the wing of Atlantis, which is being prepared to make the first post-Columbia mission late this year. Behind Lawrence is astronaut Charles Camarda, also a new addition to the STS-114 crew.

NASA

Nosecap inspections

Astronauts assigned to fly the first post-Columbia mission take a look at their ship's nose cap, which was removed for additional inspections. From left are mission specialist Wendy Lawrence and commander Eileen Collins. Pilot James Kelly is behind Collins.

NASA

Equipment check

As part of return-to-flight efforts, the shuttle's Mobile Launcher Platform (MLP) number 3 and crawler transporter are undergoing a series of vibration tests. A pair of shuttle rocket boosters is bolted to the platform for the test. The crawler moved at various speeds up to 1 mph so engineers could gather data about vibrations as the crawler left the Vehicle Assembly Building, traveled toward the launch pad and returned. The primary purpose of the test was to gather data to develop future maintenance requirements on the transport equipment and the flight hardware.

NASA

Short trip

The orbiter Atlantis rolls out of the Vehicle Assembly Building for transfer back to the Orbiter Processing Facility. Atlantis spent 10 days in the VAB so Kennedy Space Center technicians could do some work in the shuttle's hangar. Work included validation of the bay's cranes, work platforms, lifting mechanisms and jack stands.

National Space Society

NSS POSITION PAPER
The Next Steps for Human Space Exploration

In light of the recent loss of the Space Shuttle Columbia and her crew, many people have asked, "Why send humans into space?" The National Space Society (NSS) has identified many fundamental reasons why humans should travel beyond the confines of Earth orbit (to the Moon, Mars, asteroids, and beyond), including the long term survival of humanity and life on Earth, unlimited room for expansion of human civilization, virtually limitless resources providing benefits to Earth, economic opportunities for enterprising individuals, and a wealth of new knowledge and technologies for our society. NSS therefore recommends the following:

1. **REVITALIZED POLICY.** The U.S. should strengthen its leadership in human space exploration by building on the principles in the 1988 National Space Policy[1]. Accordingly, the U.S. government should once again direct federal departments and agencies to permanently open the space frontier to enable the U.S. and humanity to receive the enormous benefits from the exploration, development, and settlement of space.

2. **LOW COST SPACE ACCESS.** Low cost, robust, and reliable access to space is the single largest barrier to further advancement in space exploration and development. Therefore, NASA and the Departments of Defense and Transportation should be directed to place a priority on work to develop the technology and regulations for affordable, reliable, and frequent human access to and from space. Wherever possible, these technologies should share a common architecture and engage the private sector – ranging from entrepreneurs to existing aerospace companies – to ensure that a broad range of approaches are considered. Included in this recommendation is clarification of regulations and policies related to suborbital launch activities.

3. **PERMANENT LUNAR BASE.** NASA should be assigned the task of preparing for and, immediately after completion of the International Space Station (ISS), establishing a permanent human presence on the Moon. A lunar base would enable the long-term exploration of the Moon, utilization of lunar resources (including energy, oxygen, and metals) to reduce the cost of space operations, and development of infrastructure and test facilities to support the industrialization/commercialization of space and exploration of the solar system. A permanent lunar facility also provides a low gravity, isolated, stable, magnetic-field free, vacuum environment to perform cutting-edge physics, medical research, astronomy, sensitive biological/genetic investigations, and industrial research that could lead to major breakthroughs. A focused but incremental effort to return to the Moon would also give the ISS a renewed objective for testing new hardware, software, human operations, logistics, assembly, and medical safety protocols. This effort would also help drive design and operations choices for the Orbital Space Plane and next generation launch vehicle programs; the use of common architecture in these efforts will save time and money in the long-term.

4. **PLANETARY PROTECTION.** The Department of Defense should be assigned the task of developing protections for American space assets and the nation from terrestrial and extra-terrestrial threats, including orbital debris and Earth-crossing asteroids and comets.

For more information, contact Brian Chase at (202) 543-1900 or brian@nss.org
Updated October 1, 2003 | No. 2003-2

[1] The 1988 National Space Policy is archived at www.hq.nasa.gov/office/pao/History/policy88.html

GETTING UNSTUCK

By Clifford R. McMurray, *NSS Executive Vice President*

The human presence in space has been stuck in low-Earth orbit for more than 30 years, ever since the crew of Apollo 17 returned from the moon in December 1972. Since then, many missions have been flown with hundreds of astronauts and cosmonauts, but none climbed more than a few hundred miles from the surface of Earth. Lots of plans have been made for more ambitious exploration and development on the moon and beyond, but nothing has moved beyond the "viewgraphs and pretty artist conceptions" stage.

Today, with President Bush's announcement of a new policy for NASA's human space program, we have a real opportunity to change that.

Even before the loss of Columbia, the White House and members of Congress had begun to engage in some intense soul-searching and questioning of what America's long-term strategy for humans in space should look like. The Columbia tragedy added a sense of urgency. President Bush appointed a special task force to reconsider U.S. space policy. The NSS Policy Committee was invited to submit a brief statement for consideration by this task force. Our vision, which we spelled out in the NSS Position Paper, *Next Steps for Human Space Exploration* (reprinted on the opposite page and available at the home page of the NSS website) is almost exactly what the president has now set forth as our new national policy. First, we return to the moon – but this time to stay, with a permanent lunar base. Then, step-by-step, we continue outward to Mars, the asteroids, and the rest of the solar system.

In short, we won! But it is only the first round. The president can only propose national policy. If the Congress doesn't back up the president with appropriations to pay for it, the proposed policy dies. It falls to each of us to send a loud and clear message to Congress that this policy has our support.

Whether we will win in Congress as we have with the Bush administration is by no means a foregone conclusion. Practically everyone in Congress agrees that *if* we are to have a manned space program costing billions of dollars a year and risking the lives of astronauts, that program must have a goal worth the cost and risk. But there is not yet a consensus in Congress as to what that goal should be, or even if we should send humans into space at all. The old arguments that space exploration by robots will be cheaper and less risky to human life, and that the money spent on human space exploration would be better spent in tackling social problems here on Earth, still have a lot of supporters on Capitol Hill. These arguments may yet prevail, if we are silent now.

All of us in NSS believe in a future not just of human exploration of space, but of eventual settlement and exploitation of space by thriving communities of pioneers. We want the experience of space to be open to all people, not just an elite few. That's the ultimate goal. But we'll never get there without a visionary national space policy, and now – when politicians of both parties are (for the first time in many years) searching for a policy that makes sense – now is the time to speak out loudly and clearly in support of our dreams.

I ask each of you to write President Bush, your senators and members of Congress in support of the NSS vision for human space exploration, as articulated in President Bush's new national space policy. We are closer to victory than we've been at any time in the past 30 years. If we act together today, we can set space policy onto a path that will lead us to the future we want. Please join the fight!

CONTACT INFORMATION FOR THE PRESIDENT AND CONGRESS

You can reach President Bush by phone, e-mail or letter. The e-mail address is president@whitehouse.gov.

Vice President Cheney, who has been active in the task force appointed by the President to examine U.S. space policy, can be reached at vice.president@whitehouse.gov.

The phone number for the White House Comment Line is (202) 456-1111.

The President's mailing address is:
President George W. Bush
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

The general address for the Senate is:
Senator _____
U.S. Senate
Washington, D.C. 20510

The address for the House is:
The Honorable _____
U.S. House of Representatives
Washington, D.C. 20515

You can find more detailed address information for your representatives (exact building and office number, as well as phone number and e-mail address) at www.senate.gov and www.house.gov, respectively.

LUNAR SAMPLE RETURN MISSION DESERVES TOP FLIGHT

BY DONALD F. ROBERTSON

EXCITING AS FARTHER PLANETARY DESTINATIONS are, NASA's next and highest priority should be the proposed lunar south pole sample return. No other near-term, relatively low-cost mission could do so much to advance humanity's future in the solar system.

The definitive location of accessible water in permanently shadowed polar craters would have momentous consequences for humanity's future. Instantly, it would become much easier to maintain geologists, astronomers, explorers and other scientists on the moon. There they could practice living on an airless, low-gravity world. Extracting resources useful to other space projects could initiate the beginnings of intra-solar system trade.

Launch costs should be relatively low, as the target is relatively close by, and the flight could be executed in weeks, rather than months or years.

Though relatively simple logistically, such a mission would be a technological challenge. Any ice at the lunar poles is believed to be underground, and dispersed through large volumes of regolith.

Ideally, human geologists should be sent to conduct wide-ranging expeditions covering tens or hundreds of kilometers. They could dig multiple deep trenches and analyze thousands of samples in real time. A robot rover mission would be another option.

Such a rover would have to operate in the near-total darkness of the polar craters while conducting high-energy trenching operations and generating artificial light. In theory this might be achieved with transmitted solar power or batteries.

More realistically, such a mission may require some form of nuclear energy. It will also have to maintain satellite communications links to Earth, which will spend much of the time out of sight over the horizon.

By definition, the polar surface with its suspected volatiles will differ from the equatorial regions explored by the Apollo expeditions and Russian rovers—perhaps a lot different. The landscape inside the most interesting craters remains largely unknown due to the permanent darkness and the extremely low lines of sight to Earth-based telescopes. There will be many surprises and dangers—just the things that robots are ill equipped to deal with.

Yet, in spite of the risks, NASA must attempt this mission as soon as possible.

The space station project will be completed or abandoned within the decade.

It is time to plan humanity's next major goal. To do that, a definitive determination of the presence or absence of accessible resources like lunar water is critical.

In addition to natural resources, a lunar polar mission would be scientifically rewarding. The Aitken Basin is believed to be the oldest large crater impact site on the moon. When it was formed, material from deep within the moon's interior probably was flung out, leaving a well-preserved geologic record of the moon's early history—and perhaps Earth's as well. Scientists believe the moon was formed from debris flung out from baby Earth after a huge asteroid strike.

Given this mission's potential for high scientific and exploration payoff at relatively low cost, NASA should move it to the front of the queue. In an era of tight budgets, missions that achieve both scientific goals and advance human expansion into the inner solar system should have a higher priority than purely "scientific" or "human space" missions.

Donald F. Robertson is a freelance space industry journalist based in San Francisco.

The Winds of Change

By Irene Mona Klotz, *Editor in Chief, Ad Astra*

Following a year that opened with the deaths of seven astronauts and closed with the 100th anniversary of humanity's first powered flight, the space community is hearing the knock of opportunity at the door.

We know all about trials and tribulations and how the two move hand-in-hand in life. The art is learning how to spring from the lows to soar to the next high.

There will be plenty to complain about, plenty of compromises and some long overdue closures as individuals, legislators, governing boards, institutes, agencies and companies respond to the space exploration vision laid out by President Bush on January 14. This issue of *Ad Astra* includes an insider's perspective of the policy's creation, written by the former editor of this magazine, Frank Sietzen. His captivating tale and the implications for the space program are fleshed out with a sensitively written essay by Steven Wolfe about internalizing the commitment to space exploration and unlocking the key to powerful, communal and focused results. A second thought-piece about vision in the space program, by The Space Review e-zine editor Jeff Foust, illuminates the foibles of initiatives past.

The distinction between NASA's human and robotic expeditions is changing as well, with initiatives such as lunar sample return missions that were once squarely on the science side of the house taking on new luster in support of the planned return of men—and presumably women—to the moon. Contributor Donald Robertson explains why the return of materials from the lunar pole deserves a top spot on the priority list; Arthur Smith makes a case for harvesting solar power in space; and freelancer Erik Baard writes about NASA's plans for looking for life well beyond our solar system.

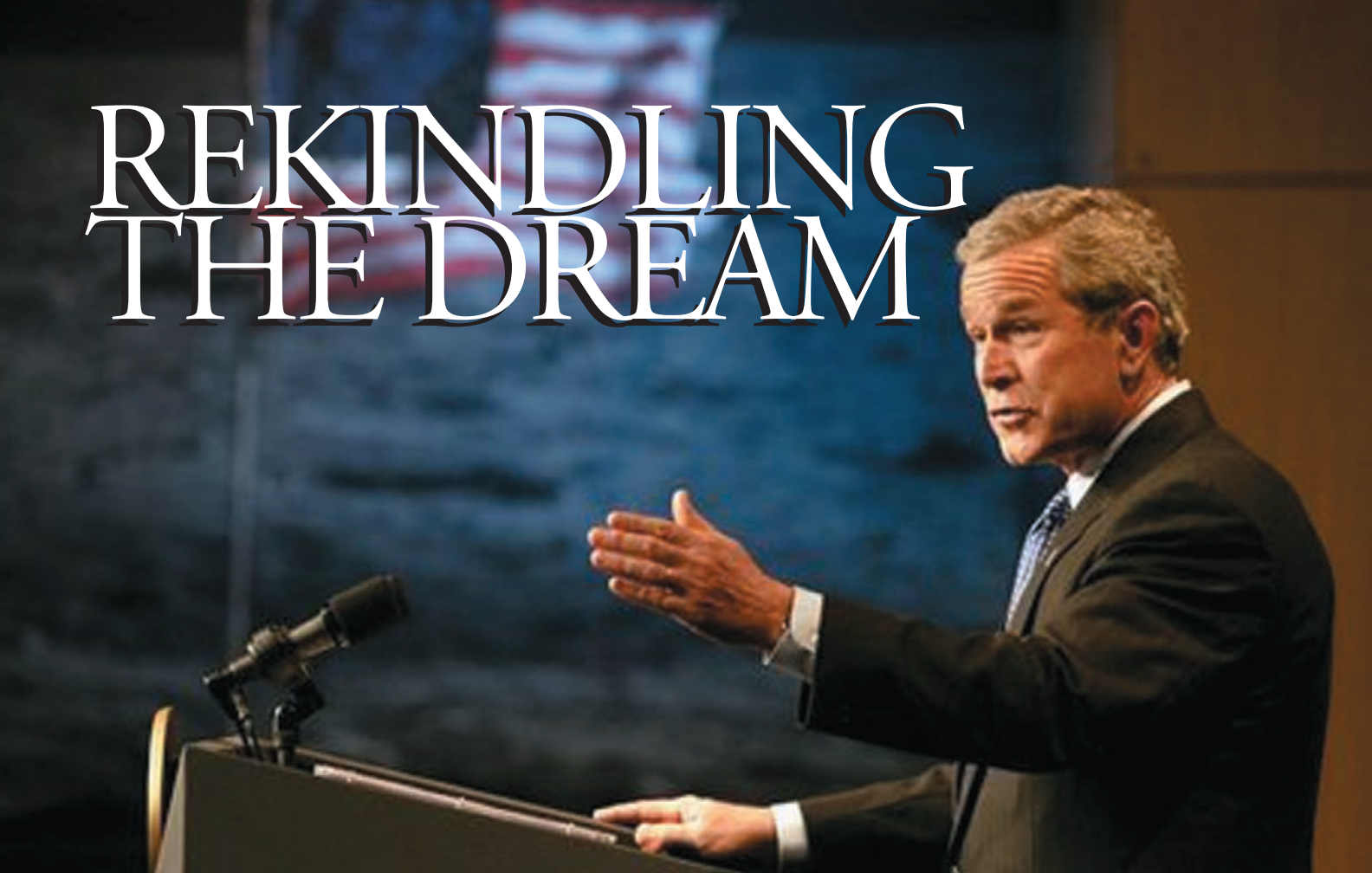
Closer to home, we have a beautiful color postcard from Mars dispatched by an appropriately named rover probe that has been keeping us all in high Spirit since its death-defying plunge to the planet's surface on January 3.

It is a year of change for NSS as well, with a new alliance in the works, as well as a new editor at the helm of *Ad Astra*. I will tell you three things about myself: I have been writing about the space program since 1987 for Florida-based, as well as national and international media outlets, including print, wire, radio, online and book publishers; tears welled in my eyes the first time I saw a shuttle launch; and I'm very good with names.

I welcome your comments and suggestions as we fly ever forward into the future.

Ad Astra!

REKINDLING THE DREAM



President George W. Bush outlines a bold initiative for manned space exploration.

By Frank Sietzen, Jr.

In the end, it was a president with no known previous interest in space, a NASA administrator with no space background, and fallout from a national space disaster that combined to bring about the most substantial change in U.S. space policy in nearly three decades.

On Jan. 14, President George W. Bush announced a new national space goal to return astronauts to the moon and develop multi-mission modular spacecraft capable of flights to asteroids and Mars.

If the proposal survives election year politics and gets under way this year, it will serve as a catalyst for change on an unprecedented scale. If it is stopped in the Congress, the future of the space program itself will be very much in doubt.

Bush's directive sets as the centerpiece of U.S. space activities the sending of humans out into the solar system, starting with the moon, but not ending there. A permanent human presence on the moon and Mars is to follow early, initial landings and circumnavigation flights. Under the plan, NASA will get an $800-million boost next year, and a five percent rise each year thereafter to pay for the effort.

To free up billions more, the shuttle fleet will be retired as soon as the space station is finished—and that might be in as few as 21 to 30 more missions. After that, the ships and their support infrastructure would be abandoned.

Bush's plan calls for the first post-Apollo lunar landing to take place as early as 2015, after which the United States would begin reducing its use of the International Space Station. And in the decade ahead, all U.S. space station work would shift to focus on sustaining humans on other worlds. All other research work would cease.

NASA will be tasked to reinvent itself in other ways. Nearly every element of the existing civil space program would change to support Bush's plan—or risk cutback or termination. In addition, a new, short-lived commission would be set up to vet NASA's implementation plan and assure it was capable of fulfilling Bush's goals.

The roots of change

The new space policy was in play well before the Feb. 1, 2003, space shuttle Columbia accident. In November 2001 Vice President Dick Cheney, frustrated at the Bush administration's inability to find anyone willing to succeed Dan Goldin as NASA administrator, tapped the deputy director of the Office of Management and Budget (OMB), Sean O'Keefe, to head up the civil space agency.

O'Keefe, 47, had served George H.W. Bush as Secretary of the Navy following the embarrassing Tailhook scandals. Bush sent O'Keefe to the Navy to clean up the mess created by that sexual fiasco.

O'Keefe had been a Republican staffer on the Senate Defense Appropriations Committee and a protégé of Alaska Sen. Ted Stevens. He had a reputation then as a clean-up man, totally loyal to the Bush family and close to then-Defense Secretary Cheney. At the end of the first Bush administration, O'Keefe went to Syracuse University to teach management science.

Now the Bushes were back, and O'Keefe was back in the thick of a dysfunctional agency. At a November 2001 meeting in the Oval Office, Bush himself gave O'Keefe his charge: "That place is messed up," Bush told a startled O'Keefe. "I want you to go over there and straighten it up.

"Whatever you need, you've got," the president added, but this did not mean massive new federal spending on space—at least not until the chronic space station cost overruns had been stopped.

With his bean-counter background, O'Keefe's primary thrust was to do just that.

The day after the inauguration, Bush was presented by NASA chief Goldin with a whopping $4-billion cost overrun on the station. O'Keefe's first task was to stop this hemorrhage. This he did, by a combination of budget reductions and temporary cancellations of station elements, such as a crew lifeboat and a habitation module. The cuts triggered an outcry from the international partners and scientists, who were instrumental in building and maintaining critical Congressional support for the controversial project. But O'Keefe forged on, and by January 2003 had stopped the flow of red ink, and, according to some closest to him, had caught the 'space bug.'

Bill Ingalls/NASA

The darkest day

The hard-fought momentum ground to a sudden halt a month later when Columbia fell from the sky, killing seven astronauts who were returning home from a 16-day science mission.

Bush and O'Keefe now faced an even greater space crisis. As O'Keefe met with and spoke to Bush throughout that long weekend, the president made clear that he supported restoration of the shuttle program. But what also was emerging was a sense from Bush that this disaster had exposed a major fault line of space activities: What was the nation doing in space? What were the focus and the goal?

Gradually, as the Columbia accident hearings emphasized, it became clear that there really wasn't an overarching goal that focused all the nation's space policy together. O'Keefe quietly began briefing Bush and Cheney on this shortcoming. What started as a series of informal discussions throughout the spring and summer of 2003 became much more focused as the president and vice-president weighed in with their views of the state of the civil space program. To the surprise of many—but not O'Keefe—Bush made it clear he wanted a new, visionary space goal. But he also wasn't prepared to throw money at the idea, at one point cautioning his team, "Don't break the bank."

By the end of the summer, the options had started to narrow. Replacing the fleet of shuttles was deemed too expensive. Worse yet, if the money was spent on a new big space transportation system, there would be precious little left to spend on something for it to carry.

Among the ideas considered: canceling the human space program and shifting NASA to a full-time robotic exploration effort; and developing alternative launch technologies, such as the space elevator. Both plans were dumped, and in the end one idea took root. Manned missions to the moon to establish limited landing bases to test advanced space technologies emerged as the least risky and most visionary effort the nation would likely support. By the end of November, the recommendation to the president was to resume moon flights—but with an eye toward other destinations

When the plan was placed before him on Friday, Dec. 19 in a meeting in the Roosevelt Room in the White House, Bush balked. "I was concerned that you would present me with a plan that wasn't visionary enough," Bush told the group. He wanted to make sure that other destinations, like asteroid rendezvous and Mars missions, were part of the plan.

"This is clearly more than just about the moon," replied Vice President Cheney. All agreed. After a short pause, Bush turned to the group: "OK, let's do it!"

The planning was over. Now, the greatest tests of public and political support are ahead. It has been 20 years since Ronald Reagan launched the last successful space policy effort—building the space station. It is up to the space community—and the public—to see if this new effort to send humans beyond Earth's orbit will succeed or end—like every initiative since the station—in failure.

Frank Sietzen is the former editor of *Ad Astra*. He and partner Keith Cowing, editor of NASAWatch.com, first broke the story of the Bush plan following unprecedented access to the administration as deliberations were under way. The authors are working on a book titled *New Moon Rising: The Making of George W. Bush's Space Vision and the Remaking of NASA*, to be published by CGI Publishing in June.


THE
VISION
THING

President George H.W. Bush proposed a grand space vision, the Space Exploration Initiative in 1989, but it went nowhere; will his son be more successful in developing a compelling space vision?

By Jeff Foust

One concept has gripped the space policy community in recent months. There is hardly a speech, Congressional hearing, or op-ed piece dealing in space that doesn't discuss, in one manner or another, the lack of vision in U.S. space policy and the importance of developing one. Yet, while there is widespread concurrence that NASA needs a vision, there is little agreement about how to develop one, let alone what that vision should be.

Looking back

One can make the argument that NASA has had a compelling vision only once in its 45-year history, and that vision was born of desperation. When John F. Kennedy challenged NASA—and the nation—to land a man on the moon by the end of the 1960s, he did so at a time when the country appeared to be well behind the Soviets in the space race. That competition, with its overtones of technological supremacy and military might, had turned into a proxy for the Cold War. By setting a goal as outlandish as landing people on the moon in less than nine years, Kennedy effectively leveled the playing field: the Soviet lead to date was minimized relative to this new, distant goal.

Moreover, going to the moon, as opposed to building a space station or other alternatives considered by Kennedy's advisors, could not only tap a recent enthusiasm in space exploration, but also a latent interest in the moon that could sustain the program during the trials and tribulations to come. After Apollo, though, there has not been a similar intersection of interests and incidents that has led to the development of a new vision for NASA and U.S. space exploration.

In the early 1970s NASA began work on the space shuttle program, and in the 1980s started what would eventually become the International Space Station. Over time, these programs have evolved from means to ends in and of themselves: cheap, frequent space access for the shuttle and a base for wide-ranging scientific research and other work for the station. Neither was part of a well-defined, widely accepted vision for space exploration.

Only in the wake of the Columbia accident has NASA acknowledged that the shuttle is, and will always be, an experimental not an operational vehicle and the program still faces a long and difficult road ahead to return the ships to flight. The station, meanwhile, is awaiting the shuttle's return to resume construction although its final configuration may very well fall short of the "world-class" research laboratory upon which the program was sold to the American people and to NASA's international partners. Combined, the shuttle and station act as a drag on NASA, programs mired in adversity but too difficult, and with too much invested in them, to easily discard.

The last time a president attempted to define a bold new vision for NASA was in 1989. President George H.W. Bush, speaking at ceremonies at the National Air and Space Museum marking the 20th anniversary of the Apollo 11 landing, promised a new spirit of exploration that would send humans back on the moon – "this time, back to stay"—and on to Mars, all within 30 years.

Most of what people remember about the Space Exploration Initiative (SEI) is the price tag: $450 billion, or well over $600 billion in current dollars. That price quickly sank any hopes of making SEI a reality, and Bush made little effort to support or revive his initiative in the face of Congressional opposition. Bush had much greater issues to grapple with at the time—the end of the Cold War, the first Gulf War, and a recession—none of which would be directly benefited by SEI.

Since then the biggest change in space policy was the incorporation of Russia into the space station program, an effort by the Clinton administration to engage the Russian aerospace industry in peaceful pursuits instead of arms proliferation, and an attempt to reap cost savings in the process.

Priot to President Bush's new space policy, the last major overall space policy document issued by the White House was the National Space Policy of 1996. This document lays out the roles and responsibilities of NASA, the Defense Department, and other federal departments and agencies in space. The document is rational but uninspiring: the "goals" of the U.S. space program, as defined in the policy, are deliberately vague, with few detailed metrics and deadlines by which to measure progress. One of the few things the

NASA

Former NASA Deputy Administrator Robert Seamans, Wernher von Braun and President John F. Kennedy at Cape Canaveral.

document makes clear is that the human role in space is limited in the current policy to Earth orbit: "The International Space Station will support future decisions on the feasibility and desirability of conducting further human exploration activities," it states.

Presidential plans

The Clinton-era space policy survived for three years into the presidency of George W. Bush primarily through bureaucratic inertia. In the greater scheme of things, including a recession and war against terrorism in Afghanistan and Iraq, space is a relatively minor issue. It wasn't until 2002 that the Bush administration convened an interagency panel to perform a "phased review" of national space policy. At the start of 2004, that effort has led to only one published policy document, on commercial remote sensing, released in April 2002. A second policy document on space transportation was nearly complete as of Feb. 1, 2003, but was put on hold in the wake of the Columbia accident. It still has not been completed, or at least not released.

"This country is capable of great things once we focus, but getting us focused is always a challenge."
Senator Sam Brownback

Members of Congress, meanwhile, not only have their own visions for NASA, but their own ideas of how to develop that vision. Sen. Sam Brownback, a Kansas Republican who chairs the science, technology and space subcommittee of the Senate Commerce Committee, has frequently spoken of the need for the United States to "dominate the Earth-Moon orbit."

"We have to step back and really establish a national vision for space, engage the American public with that, and make sure that the vision is sustainable with us as a nation," Brownback said during a meeting of the Space Transportation Association.

"I look back and ask, 'Why did George Bush Sr. fail with his plan of going to Mars?' As I look at that, I don't know that it sufficiently engaged the public," Brownback said. "This country is capable of great things once we focus, but getting us focused is always a challenge," he said.

Other Congressional leaders are taking different approaches to NASA's vision. In November, Sen. Ernest "Fritz" Hollings, a South Carolina Democrat, introduced S.1821, the National Space Commission Act of 2003, which would create a permanent commission initially tasked to review NASA's shuttle return-to-flight efforts. Beyond that, though, the 12-person commission would perform a more comprehensive review of the nation's space plans. That report, to be completed by September 2005, would include "recommendations for future national goals for the development and use of space" and "a blueprint of capabilities that could and should be achieved by the end of the present decade, by 2015, and by 2025 in order to better position the nation to achieve those goals."

While this commission would weigh in on any future goals or vision for the U.S. space program, Hollings himself doesn't believe that it will be within the purview of the commission to draft those goals itself.

"My bill is not intended to supplant, nor substitute for, the president's desire to set a new goal into place for the Human Space Flight Program. Merely setting a far-reaching goal into place for NASA and for the nation is not enough. It will not resolve the many complex issues raised by Admiral Harold Gehman and the Columbia Accident Investigation Board," he said.

The bill's future is unclear. It had been referred to the Senate Commerce Committee, where Hollings is the ranking minority member, for consideration. When introduced, the bill had six co-sponsors, all fellow Democrats, including presidential candidate John Kerry of Massachusetts. Hollings also had announced his intent to retire after the 2004 elections, so if his bill is not enacted into law by then, someone else will have to take over the effort.

Yet another path toward a new vision for NASA is to set goals in law. Congressman Nick Lampson, a Texas Democrat, reintroduced his Space Exploration Act, a bill he had previously introduced in 2002 only to see it die in committee. The bill, designated HR 3057, would establish a series of very specific, ambitious goals for NASA's human spaceflight program. Those goals range from the development of a vehicle within eight years of the bill's passage that could ferry people from Earth orbit to lunar orbit, to establishment of a "human tended habitation and research facility" on the surface of a Martian moon within 20 years.

"America's human spaceflight program is adrift, with no clear vision or commitment to any goals after the completion of the International Space Station," Lampson said in a statement issued at the

bill's reintroduction. "The real obstacle we face in overcoming the drift in the nation's human spaceflight program is not technological and it's not financial—it's the lack of commitment to get started.

"We don't need another national commission to come up with goals for human spaceflight beyond low-Earth orbit. What we need is a national commitment to carry out any one of the many worthy goals that have been articulated to date," he said.

"Merely setting a far-reaching goal into place for NASA and for the nation is not enough. It will not resolve the many complex issues raised by Admiral Harold Gehman and the Columbia Accident Investigation Board."
Senator Ernest "Fritz" Hollings

Reality check

What this review makes clear is that there is widespread interest in developing some kind of vision for NASA in the form of a goal or goals for human spaceflight beyond Earth orbit. Beyond that general interest, however, there is little consensus regarding not only what that vision should be—moon, Mars, asteroids, or elsewhere—but also how that vision should be developed among the executive and legislative branches and the general public. That dissonance is a recipe for yet another space policy failure.

A vision requires leadership from the highest levels of government—nothing short of the president as demonstrated by his January 14 speech—but it cannot be imposed on Congress and the public by executive fiat. The failed Space Exploration Initiative is proof of that. While Congress must play a role in shaping this vision, it seems unlikely that it can mandate a particular detailed vision through legislation like Lampson's Space Exploration Act. And although activist organizations including the National Space Society, the Mars Society and the Planetary Society all push for a bold new direction for space exploration, the general public is, if not less interested, less engaged in the debate. Moreover, support for NASA among the various sectors of the American public is not universal. These are all concerns that need to be addressed if any vision can be successfully translated from speeches to spacecraft.

"We choose to explore space because doing so improves our lives and lifts our national spirit."
President George W. Bush

This year is an election year, and the focus of the presidential and congressional campaigns will be on far bigger issues, notably Iraq and the economy. That makes it unlikely that the president and leading members of Congress will be willing to expend the time and political capital needed to push through a new vision for space exploration, particularly one that may require significant additional funds at a time when budget deficits are approaching half a trillion dollars.

Unlike the 1960s, there are no geopolitical or other external factors that could support a new space exploration vision. While some have invoked China's entry into human spaceflight as one motivating factor, the slow, methodical pace of their efforts—their publicly stated plans for the next 10 years are no grander than a small space station—have yet to trigger a significant reaction in Washington, and are unlikely to do so.

For now, "vision" primarily is a buzzword intended to set NASA off on a new direction and in the process resolve all the other problems facing the agency. It's a tempting solution, but also too simplistic.

"Merely announcing a bold new plan to travel to the Earth's moon or to Mars is not sufficient. We must challenge our assumptions, question our decisions and designs, revisit our approaches, and rethink our nation's ambitions and goals for space," said Hollings. "We must submit ourselves to the discipline to begin anew. The future of space and our nation's reputation that we carry into history rests in the balance."

The question remains whether Hollings and his colleagues, as well as the president and the American people, have the willingness to devote the time and energies needed to tackle those tough issues. If not, then any new vision for NASA will render space policy as blind as it has been for the last few decades.

Jeff Foust is editor of *The Space Review* online publication. (http://www.thespacereview.com)

In search of planets and life

BY ERIK BAARD

Probes zooming toward Mars and Saturn's planet-size moon, Titan, garner a lot of attention, so it's easy to forget that plenty of worlds are out there, circling stars other than our sun.

Reminders of that fact come from a new Australian study arguing that planets may be the norm for sun-like stars, and from a NASA astrobiology road map for finding signs of extraterrestrial life.

To find life, astronomers must first locate Earth-like planets. They try to spot their rocky centers, and then follow through with studies to determine what kinds of atmospheres—if any—are wrapped around them, said David J. Des Marais, a senior scientist at NASA's Ames Research Center in Northern California. He also is the lead author of the road map, the result of collaboration between 20 scientists that includes hunts for life both by robotic probes in our solar system and by telescopic surveys to find potential abodes for life around other stars.

"Our current method does best at finding big planets close to stars, but with every year it's like a curtain is being pulled back from that stage, and we'll see smaller planets further out," Des Marais said.

Citing the opinions and work done by NASA colleagues, he said, "We may find a dozen or two dozen Earth-sized planets in the next eight years or so."

But such discoveries will rely on new telescopes that must be planned now, in a very broad, interdisciplinary effort as laid out in the road map published in a recent issue of the journal *Astrobiology*.

"The new telescopes need to be optimized for that search based on examples from our own solar system," Des Marais said. The road map therefore aims for a continuity of research toward its seven main scientific goals:

- grasping the broad array of potentially life-sustaining environments in the universe
- finding evidence of such environments inside the solar system
- gaining knowledge about life's emergence
- determining how early life interacted and evolved with its changing environment
- understanding the mechanisms of evolution
- estimating how evolution may continue into the future
- recognizing signs of life on early Earth and in other worlds

The nitty-gritty work of these lofty endeavors will take place in mountaintop observatories, aboard robotic probes and in laboratory clean rooms. But it will also happen at the bottom of the ocean and in slime-filled caves, where bacteria and other life forms adapted to extreme conditions have carved out improbable niches.

"We can do a lot of this with the technology available today, but with a sense of purpose," Des Marais said. "A road map is just that, a guide to what we can meaningfully do today. In the late '70s and early '80s or so, the community fragmented. Everybody had a favorite object in the solar system, so it was hard to get people behind a broader mission. I think probably the important point is that the road map shows a continuity of efforts between what was thought to be exobiology and what was planetary science and geology."

But most of the glory will go to NASA's three planned space-based planet-hunting telescopes. First to launch will be the Kepler in 2007. The next two missions will be orbiting arrays of telescopes that are still being designed. The Terrestial Planet Finder is slated for roughly 2015. A much more ambitious successor to the TPF, called Life Finder, is expected to be completed sometime beyond 2020.

These telescopes will look for the telltale dimming of light when a planet passes in front of a star, and for chemical signatures revealed when light from that star passes through a planet's atmosphere. The current standard method, called a Doppler exoplanet search, relies on detecting the wobbling of a star caused by the gravity of planets revolving around it.

According to University of New South Wales astronomy professor Charles Lineweaver and doctoral student Daniel Grether, these telescopes will have plenty to look at. The pair argues in a paper accepted for publication by *Astrophysical Journal* that at least 25 percent of sun-like stars will prove to have planets, and that perhaps nearly 100 percent do. Planet-seeking surveys of the nearest 2,000 stars have so far yielded about a 5-percent positive result.

"Strictly speaking, the analysis we did, and the greater than 25 percent result we got, refers to only the sun-like stars since these have been the major focus of the Doppler exoplanet searches. About 10 percent of the stars in the galaxy are sun-like," Lineweaver said. "However, there is very little reason to believe that our result applies only to sun-like stars."

So, if the same proportion applies to all stars in the Milky Way, our solar system could be only one of 100 billion in the galaxy, he said. Take an even wider view—of the 100 billion galaxies in the universe—and our familiar collection of planets could be just one of 10 trillion, he said.

His optimistic statistical model stems from recognition of how superficial our view of even closely neighboring stars is.

"Most planets are too small or take too long to orbit their host stars to be detected," said Lineweaver. Imagine alien scientists using the same methods we do now to search their local 10 to 50 light-years of space. "If the sun were one of the stars being monitored, (they) still wouldn't have detected any planets around it," Lineweaver said.

Des Marais agrees with that assessment, and points out that even with the powerful new space-based telescopes in place, we can hope for only a fraction of worlds to be detected, because only 0.5 percent of planetary systems will orbit their stars on a plane that is in the line of sight of Earth. But that still leaves perhaps 100,000 extrasolar systems to find with the Kepler telescope alone, he said.

After the Kepler provides a reliable statistical base, the next generation of telescopes could deliver the thunderclap of revelation. "If there were another Earth out there, we'd see that," Des Marais said. "But the problem is that Earth is almost an ideal target. It's got 50 percent visible light penetration to the surface, a big 20 percent atmospheric oxygen signal.... Oh my gosh, it's almost too perfect."

Using the standard of that perfect Earth, most mainstream scientists will winnow the enormous planet list by looking for signs of water, oxygen and carbon. David Grinspoon, however, will be planetary dumpster-diving to give some of the discarded candidates for life a second or third look.

"My view is that hoping to find the holy grail of another Earth is narrow-minded. To a limited extent it's a reasonable starting point, but if you go too far with it, you're applying pre-Copernican thinking. We're back to thinking of ourselves as the center of the universe," said Grinspoon, a principal scientist in the Department of Space Studies at the Southwest Research Institute and author of *Lonely Planets: The Natural Philosophy of Alien Life.*

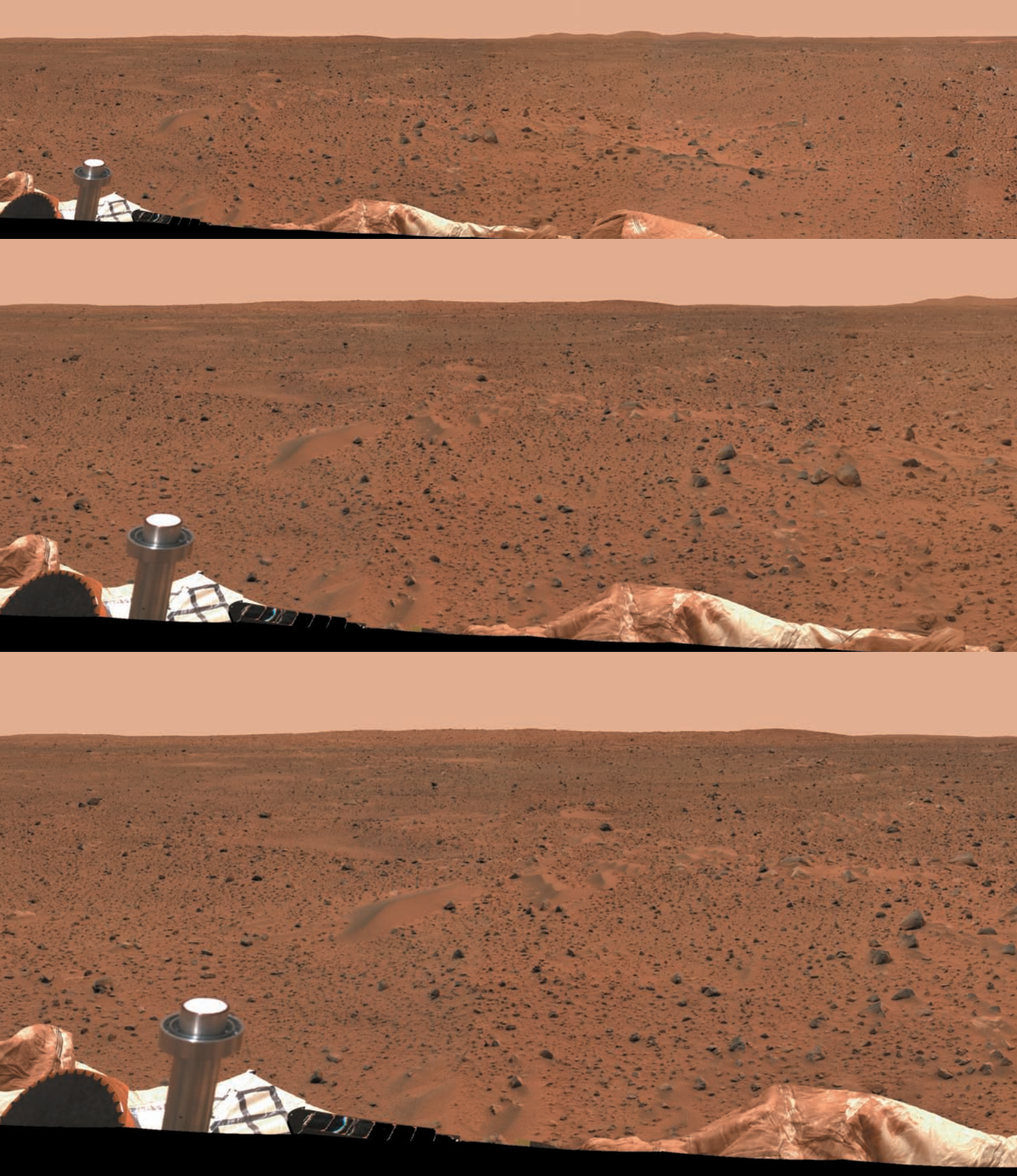
Grinspoon argues for seeking out broader principles, rather than familiar particulars. "I would look for disequilibrium, a mixture of chemicals that's difficult to produce," he said.

That rule applies to Earth because of its free oxygen, produced by plants, and its waste products, like methane and ammonia, from animals.

But it can take other forms too, he said, like sulfur dioxide and hydrogen sulfide coexisting in an atmosphere. In those cases, "something would have to be actively altering that atmosphere. The planet is not sitting there passively. That could be a dead giveaway, or rather, a live giveaway."

Erik Baard is a freelance writer based in New York City.

NASA



The human thirst for knowledge ultimately cannot be satisfied by
We need to see and examine and touch for ourselves. — President

A 360-degree color view from NASA's Spirit Mars Exploration Rover, which touched down for a three-month science mission on January 3, 2004. (NASA)

even the most vivid pictures or the most detailed measurements.
George W. Bush, January 14, 2004

The Case for Solar Power from Space

Space-based power is a potential multitrillion-dollar market. Can we make the launch systems investments to tap it?

By Arthur P. Smith

Energy policy is in the news again, with debates in Congress, statements from presidential candidates, consternation over U.S. dependence on the Middle East for oil, and a California recall election traceable in part to energy supply problems for that state.

Use of energy, whether fuel for transportation, electrical energy running the Internet, or the destructive energy released in weapons, is central to our economy and security. It is with good reason that the technical term for energy use per unit time, "power," suggests control in the human world as well. Three actions taken now—working to reserve radio spectrum for power transmission, focusing on reductions in costs for space launch, and investing in space solar power system research—hold the promise of opening up vast new sources of power within the next 10 to 15 years.

Space is big. There is an awful lot of energy out there, and the crumbs we fight about here on Earth are laughably tiny in comparison. Zettawatts from the sun pass just through the region between Earth and the moon — that's enough energy for each man, woman and child in the United States to power and sustain an entire U.S. economy all by themselves.

Gathering power in space and transmitting it to Earth should not be a mystery to us in this 21st century. Communications satellites already do it routinely. One significant obstacle to power applications, however, is regulatory oversight. There is no spectrum allocated to power transmission, as there is for communications. Since frequency of operation has a significant impact on transmitter design, which may alter the design of the overall solar power system, the earlier we have a frequency allocation decision, the better. The Federal Communications Commission and the International Telecommunications Union should be prodded to start work on this issue now.

The potential for power from space has been recognized for more than 30 years. Studies in the late 1970's by NASA and the Department of Energy pro-

NASA

duced a reference design for solar power satellites using then-current technology that proved technically feasible, but expensive. NASA returned to the subject with an exploratory study from 1999 to 2001. A review by the National Research Council found the program to have a credible plan that required significant funding increases. Rather than strengthening the program, however, all funding for the space solar power group ceased after September 2001, and essentially no R&D work on power from space is now being done in the United States.

Worldwide more than a trillion dollars a year goes to the energy industry, and utilities routinely construct multibillion-dollar power plants. The energy industry has a bigger wallet than the entire U.S. federal discretionary budget. Money is not directly the problem here; profitability is. The two essential factors in the cost equation are the cost per delivered watt of the solar power components, and the cost per delivered watt of getting those components to their final destination in space.

Current costs put the capital investment needed for a space solar power system well above the $2-per-watt of competitive terrestrial options such as fission plants and wind turbines. R&D work is needed to bring these costs to where the vast energy resources of space are within reach of a large utility project.

The cost of components is the first problem here. Current prices for solar electric power systems are about $2.50 per peak watt, a price that has been declining by about 7 percent per year for the last few decades. The day/night cycle, non-ideal sun angles, weathering, and cloud cover reduce power output enough to make the final cost per average watt $10 or more. Terrestrial solar power is still too expensive for wholesale utility use, but it is now competitive for homeowner installation in many areas.

In space you can get peak power almost all the time. The $2.50-per-watt homeowner systems are not space-rated, but the space market is still small; with a larger market, suitable photovoltaic elements could be produced at comparable cost. Transmitting power from space will have somewhat higher losses than transmitting from a terrestrial power plant. Nevertheless, component costs are potentially much closer to wholesale utility requirements for space solar power than they are for terrestrial solar, and with continued improvement in prices, in another 10 to 15 years component costs should not be an obstacle to large-scale installation.

The other cost of concern is delivery to orbit. Typical communications satellite solar panels have a mass per kilowatt of about 20 kilograms, so with current launch costs of $10,000 per kilogram, that comes to $200 per watt – 100 times too high to be competitive at the utility level. Bringing that number down requires both improvements in mass per kilowatt and cheaper access to space.

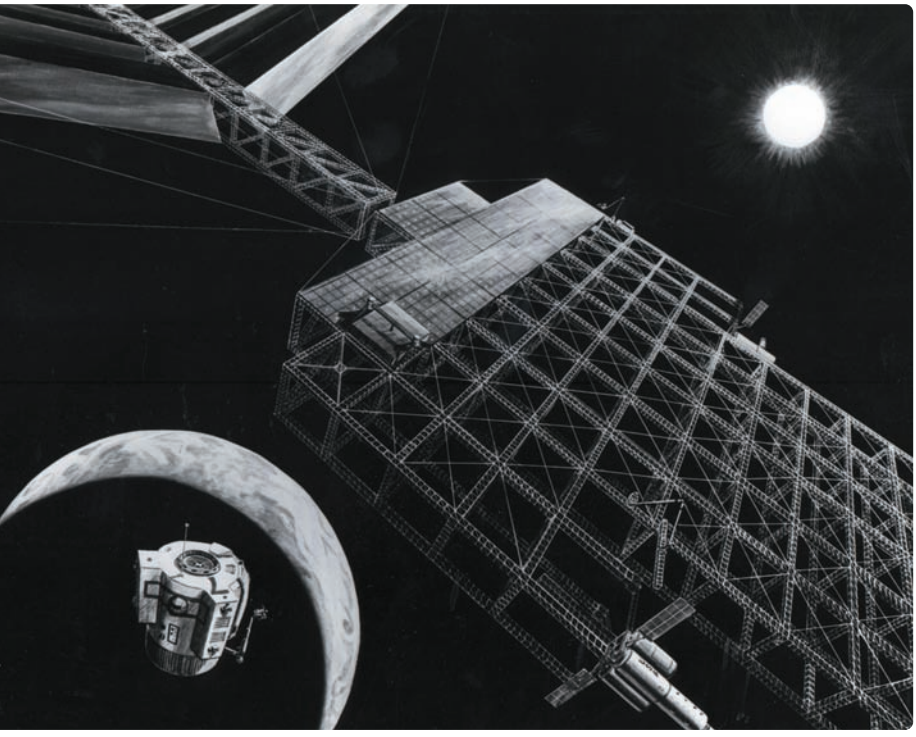
There is another way to reduce launch costs. ... Instead of launching the final components from Earth, manufacturing facilities are sent from Earth to the moon to build the solar power system components there. And to save even further on launch costs, the solar components stay on the moon and transmit power directly from there.

Mass per kilowatt is sensitive to solar power system design. The NASA/DOE reference design came to 10 kilograms-per-kilowatt, but more recent studies of lightweight design options have suggested mass could be as low as one kilogram per kilowatt. Significantly more R&D effort to validate these designs and settle on a few cost-effective approaches would be extremely helpful here. The lower the mass requirement, the less we need to bring down launch costs to break the $2-per-watt barrier.

Lower launch costs are a major goal of all space advocates. The X-Prize contenders, Space-X, even

the major aerospace EELV programs all have the intention of significantly reducing launch costs. Whether any rocket-based system will succeed remains to be seen. Perhaps we will have to wait for space elevators to see much reduction in the cost to orbit. But there are some indicators that we could see some improvement over the next decade with a sufficiently large and competitive launch market.

Competition in the commercial launch market already has some providers such as Sea Launch offering $4,000- to $5,000-per-kilogram prices to low-Earth orbit. Use of solar electric propulsion allows higher orbits at only slightly higher cost. Given the multitrillion-dollar potential market for space-based power, increased funding for launch systems development to accelerate these improvements also would be a worthy investment.



NASA

Artist's impression of a solar power satellite. Pictured is the assembly of a microwave transmission antenna.

There is another way to reduce launch costs. In David Criswell's Lunar Solar Power proposal, instead of launching the final components from Earth, manufacturing facilities are sent from Earth to the moon to build the solar power system components there. And to save even further on launch costs, the solar components stay on the moon and transmit power directly from there. The initial capital investment is higher than for an Earth-launched system primarily due to the much larger antennas needed to transmit power efficiently from the moon to Earth, but overall costs per delivered watt should be much lower, and the costs for such an approach are less dependent on reducing launch costs from Earth.

Component and launch will not be the only costs. For example we need to learn how to cost-effectively put together very large (kilometer-scale) objects in space. Improved robotics and computational capabilities should make this much less expensive now than was true for the 1970's era designs, but it is another area where we need some experience to be confident in cost estimation. Further R&D in robotics also may be needed.

Looking at the major cost areas again, for the wholesale utility market space solar power is currently about a factor of two too expensive with regard to cost of materials and components, and at least a factor of 10 on the launch cost side. Both cost barriers have realistic chances of being overcome in the next decade.

The prospects for space-based solar power are at least as bright as for fusion power. These two options were identified as the only long-term sustainable energy sources in a report published in *Science* magazine in 2002.

While space solar power has received essentially no government funding for two decades, fusion gets close to $1 billion per year. The ITER fusion project scheduled for completion in 2014 will cost $5 billion for a research reactor that produces only thermal power. In contrast, a space solar power study by John Mankins presented at the 38th annual International Astronautical Federation conference found some systems with an estimated cost of $6 billion to $8 billion, producing 250 megawatts of electricity available for commercial sale, readily expandable to several gigawatts, and offering a profitable return on investment. With some further research those numbers can likely be improved upon, but the funding has been terminated rather than increased.

We already have an immense fusion reactor working for us in our solar system, ultimately responsible for almost all our energy choices. All we really need to do is make better use of it by tapping into it more directly. Any rational energy policy for the United States must support the steps needed to make that happen: increased investment in reducing launch costs, reserving radio frequency spectrum for power transmission, and moving toward an investment of $1 billion per year for a robust and diverse research and development program for space solar power.

Arthur P. Smith works for the American Physical Society and is the president of the Long Island Space Society.

Making a Difference in Washington:

THE NSS LEGISLATIVE CONFERENCE

July 11-13, 2004

What is the NSS Legislative Conference?

Space policy is made in Washington D.C. by your elected representatives. At the National Space Society Legislative Conference, we will visit the offices of your U.S. Representatives and Senators, and speak with them directly on the importance of space development and access. As citizen lobbyists, we will represent the 20,000 members of NSS, presenting specific proposals for legislation and funding that will bring the creation of a spacefaring civilization closer to reality. The greater our participation, the more seriously our representatives will take our members' concerns and recommendations.

The NSS Legislative Conference is your opportunity to actively participate in your country's government, supporting budget decisions and legislative action that affect what you really care about. This is an enjoyable and educational way to become involved in the future of our country.

What will we be doing at the Conference?

Sunday, July 11, 2004

- Policy briefings
- Training session and protocol review for Hill visits (REQUIRED for all participants)
- Review of briefing packets

Monday, July 12, 2004

- Capitol Hill and Administration speakers with Q&A opportunities
- Congressional visits

Tuesday, July 13, 2004

- Congressional visits
- Reception

How do I sign up for the Conference?

Go to *www.nss.org*, download the registration form, and fax or mail it to NSS Headquarters, 600 Pennsylvania Ave. SE, Suite 201, Washington, D.C. 20003. Any questions regarding the conference should be directed to the conference chairman, Dr. Peter J. Schubert at *pschubert@spacemanufacture.com* or call 317-843-9822.

Special room rates are available for conference participants at the Radisson Hotel Old Town Alexandria (901 N. Fairfax Estate, Alexandria, VA 22314, 703-683-6000), which will also be the location of the Sunday briefings and training session. The hotel offers free shuttle buses to the Washington area Metrorail service that provides easy access to all of the Washington area. More information is available online at *www.radissonoldtown.com*.

National Space Society
http://www.nss.org • phone: 202.543.1900


SPACE
SETTLEMENT:
The Journey
Inward

Before the space frontier can be permanently settled by humans, we must be clear about why we go

By Steven Wolfe

As we mark the first anniversary of the shuttle Columbia tragedy, there is a renewed urgency to reflect on why we ever got into the space business in the first place and why permanent human settlement of space is worth the risk of life itself.

For many of us, it was the space settlement vision that stimulated our original passion for space. Not to be confused with a clunky, overpriced NASA program, the space settlements vision, in its purist sense, embodies all our hopes and dreams of what space means to the future of civilization. In order to move forward, we need to reassure ourselves that this vision is still very much a living possibility.

For far too many of us, the space settlement dream was long ago put on the back burner of our hearts. If you are fortunate enough to work in the space industry, you may feel satisfied that you have a job that at least remotely relates to your passion. To be sure, we celebrate the occasional successes in space technology, science and politics. But, however much we may think we are contributing to the space cause, the predominant feeling is one of frustration and regret that our dream for space settlement is not any closer today than it was on the day Aldrin and Armstrong walked on the moon.

With Columbia, we are coping with a major setback. This is surely a time of renewal. Not just in making necessary fixes to the space shuttle and planning its successor technology, but it is also a time to renew our own original passion for space. Not in a superficial way that will quickly fade when the demands of everyday life creep back in. Real renewal will require that you be willing to go much further in honoring your core passion than you may ever have before. It requires you to find a way back to the moment your passion for space was first realized. Once there, you will discover all the strength and wisdom you need to get through this difficult period, and more importantly, actually take part in laying the groundwork for human evolution into space.

This kind of self-reflection will require effort on your part. If you are interested enough, the following steps will take you on an internal journey back to your original passion.

Reflect on your original motivation

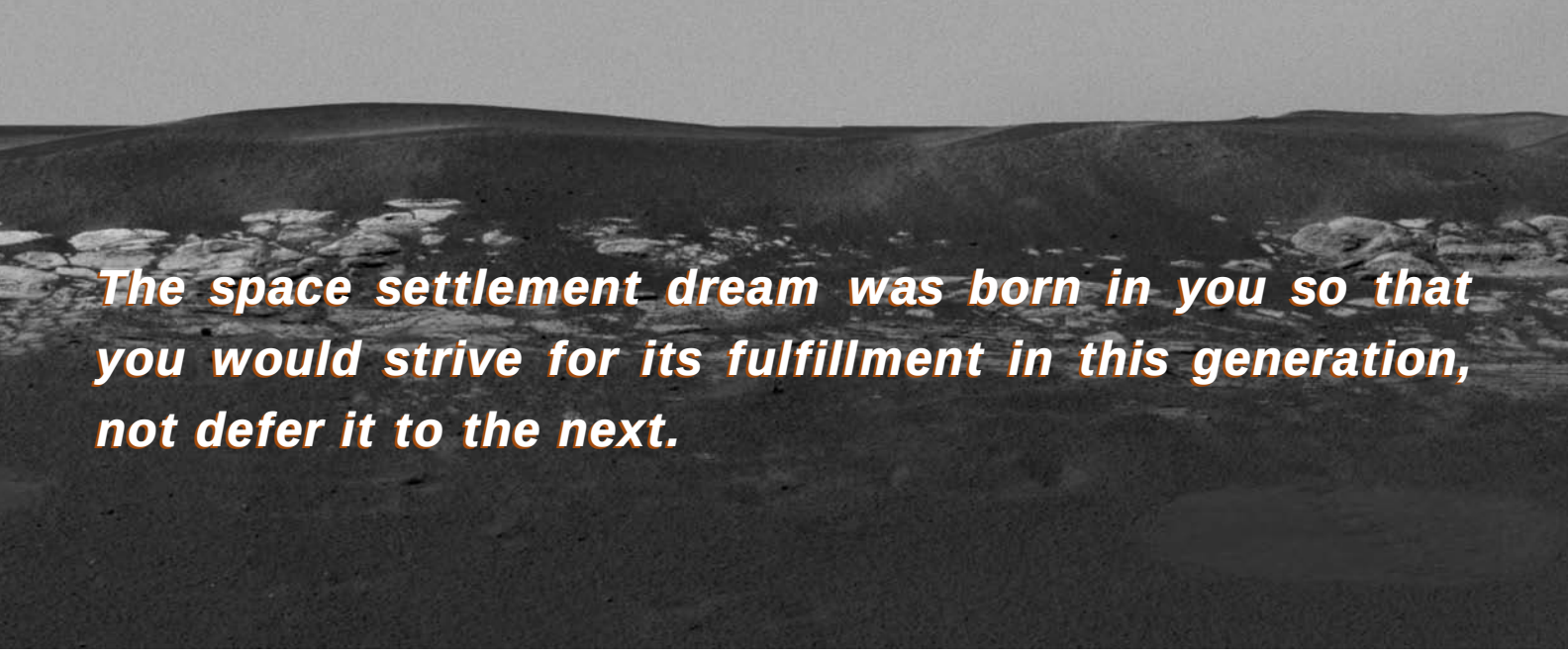
At some point in your life there was a moment when you were overcome by the full magnitude of the unlimited possibilities awaiting humanity in space. You may have directly experienced some of the magnifigence of the Universe within which humanity itself is completely insignificant. This moment may have been euphoric or simply a feeling of "Yeah, that's for me." This was the moment the passion for space was born in you.

Take some quiet time to reflect on that original moment of inspiration as if for the first time. No matter when or how it occurred, try to separate yourself a little from the experience and ask yourself questions about what you see. If your peak experience came at the time of the Apollo launch, for example, ask yourself what was it about that mission that stirred your emotions. In this way you will gradually achieve greater depth of understanding about your desire for space.

In examining this moment, it is not so much that we are seeking an explanation that can be articulated, as much as we are attempting to connect with our emotional state at that moment. To be sure, this exercise, if fully embraced, requires delicate consideration and a high degree of openness. If you are willing to give in to this inquiry fully, you are likely to reach a depth of your own self you never experienced before. This inquiry may also spark new peak experiences, which is only natural as you examine anew the nature of your passion.

Realize the profound "rightness" of your original inspiration

As a result of your reflection, you should arrive at a place where the "rightness" of the space vision is unquestionable. There is nothing hokey or fringy about the space settlement passion. It is the direct recognition of humanity's destiny, and should be a source of great motivation, not hesitation. It is not something to shy away from, or to take casually. Seeing the "rightness" in this effort will provide the clarity of mind that you need to carry you forward. In order for us to make real progress in settlement matters, we cannot doubt its imperative.



The space settlement dream was born in you so that you would strive for its fulfillment in this generation, not defer it to the next.

Become fixed in this perspective

Once you have accepted the rightness of the settlement mission, you must cultivate an unwavering stance in relationship to it. There must be a fundamental orientation about human expansion into space that is expressed through you within whatever professional and personal context you may be living. In other words, your worldview is altered such that the settlement imperative becomes a core value.

This kind of fixed perspective is arrived at by repeatedly reflecting upon the source of your motivation at its deepest level. Let this become a regular practice, which can be in the form of deep contemplation and/or meditation. If you get to that fixed perspective, than it doesn't matter what others think. You can't be moved by criticism, ridicule or self-doubt.

Take action consistent with this stance

Correct or right action will naturally arise from the fixed point of view you have established. Depending on who you are, and where you are, these actions could be big and far-reaching or subtle and discrete. There should be ease in your actions that come from your connectedness to your original passion. But do not confuse ease with laxness, however. Once you are clear on the direction to take, you must act upon it with all determination and confidence.

Your course of action may be obvious. Perhaps you will recall a long put off activity; something that you heard fleetingly will suddenly seem much more relevant; or you may feel the need to reestablish contact with people you know share your passion. Resist the temptation to take impulsive actions that may not help the cause of space, and could even hurt its progress. Before acting, ask yourself how much selfish motivation is contained in the act.

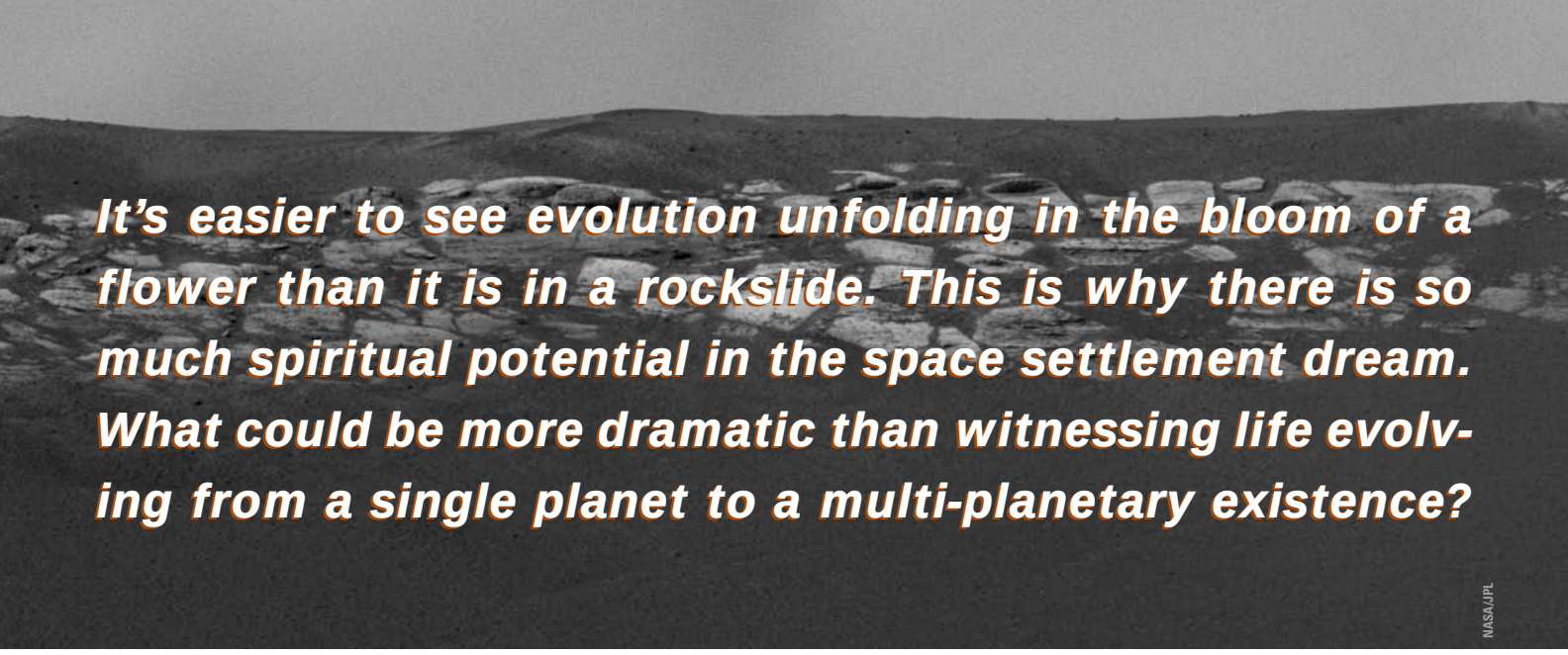
If you are unsure of what action to take, turn inward again, and trust that the right course will present itself. If no appropriate action seems obvious, there is no need to remain idle. Apply yourself to whatever feels closest to the mark. It is important, however, to remain open to any new insights that may arise that will provide clearer direction.

Spiritual space

If we dare to consider this journey to original passion in a spiritual context, the search as described here is synonymous with the transcendent journey to higher consciousness that men and woman have aspired to for millennia. Seeking to understand your urge to move into space is to directly experience the primordial force of evolution moving within you.

To help clarify this statement, let's look at what we mean by "evolution" in the way it is used here. Science is beginning to recognize that evolution is a phenomenon that permeates the entire universe. Darwin's theory of biological evolution is just one expression of evolution's perpetual process of matter organizing itself into increasingly higher forms of complexity. This process has been ongoing since the big bang, and occurs in every moment and every square centimeter of time and space. The spiritual dimension is added when we accept that a higher intelligence is guiding evolution's march.

The creative force of evolution abounds all around us. Every time we stand in awe of a natural or man-made wonder we are directly connecting with that force. If we can stay with that experience long enough, it can have a transcendent affect on us. Indeed, if you are sensitive enough, the movement of evolution is obvious everywhere. But most of us are so dense we need dramatic examples of evolution to experience even an inkling of the universal dimension. Man landing on the moon is such an example. The birth of a child is another.



It's easier to see evolution unfolding in the bloom of a flower than it is in a rockslide. This is why there is so much spiritual potential in the space settlement dream. What could be more dramatic than witnessing life evolving from a single planet to a multi-planetary existence?

NASA/JPL

While evolution is occurring in all places at all times, some of its manifestations, at least from our limited perspective, are more apparent than others. It's easier to see evolution unfolding in the bloom of a flower than it is in a rockslide, for example.

This is why there is so much spiritual potential in the space settlement dream. What could be more dramatic than witnessing life evolving from a single-planet to a multi-planetary existence? Those who feel the pull of the space cause have a unique opportunity for Awakening because evolution is so much more obvious here than it is in other aspects of life.

The edge of evolution

The glaring fact of our current situation, of course, is that our space dream is not yet manifest. We feel only the evolutionary tension impelling us to take action and make it a reality. The transcendent "whoosh" experience won't occur for most people until we have done our part in creating that new reality. We are at the stage of the flower bud, not the bloom; the pregnant woman, not the newborn.

In this stage we represent only the potential for the extension of life into the cosmos, with no guarantee that we will succeed. Humanity is the means by which evolution has determined to achieve its end. Yet, while we are commanded to take this action, we still have free will to act or not. But to not act in building civilizations beyond this planet is quite literally to go against the very demand of the universe. If we are resolved to participate in this effort, we must be willing to get very close to the evolutionary tension throbbing within us, and boldly act in accordance with it. If these ideas seem a bit heavy to consider, look into your own desire for space and you may begin to see the truth contained in them.

I am not suggesting here that everyone interested in space needs to embrace the spiritual dimension. Opportunists are as likely as the pure of heart to participate in the actual construction of space settlements. But it will be the deliberate actions of those who are most aligned with the evolutionary imperative who will provide the leadership and set the whole space settlement enterprise in motion.

The settlement of space is an unbelievably difficult project for our species. Its success will require sustained determination of legions of individuals around the globe. To get this project moving forward in a meaningful way will first require that those already enthusiastic get behind the effort with far greater integrity than they have yet exhibited. It just won't happen any other way.

Remember, the space settlement dream was born in you so that you would strive for its fulfillment in this generation, not defer it to the next. It was, and is, a call to you to take some action in this lifetime; and if you are not meant to see it through to completion, than you must at least lay a foundation on which those who will follow can build.

This process of renewing your passion for space will bring you, if you are fortunate, to a very lonely place. It is a place where you realize that success or failure of this entire enterprise rests solely in your hands. Will you ignore this responsibility, or will you give yourself over to it regardless of how you may feel about your own capabilities? Taking right action, despite how you may feel inside, is not only necessary to complete the evolution of humanity into space, but it is the very means to your own spiritual Awakening, and quite possibly that of the entire planet as well.

Steven Wolfe was the legislative aide for space policy to the late Congressman George E. Brown, Jr. (D-CA), where he drafted the Space Settlement Act of 1988. He served as executive director of the Congressional Space Caucus and on the board of the National Space Society. He writes about space policy for several publications and is working on a book.

The new museum is so large that the entire Air and Space Museum would fit inside its 10-story hall.

Photos by Jeff Foust

Udvar-Hazy Center

America's New Space Cath

By Keith Cowing

Many have referred to the National Air and Space Museum on the Mall in Washington D.C., as a shrine to achievements in air and space. If the original museum is a shrine, then its new annex, which opened in December adjacent to Dulles International Airport, is a cathedral.

Nothing is small about this place: the building, the exhibits, the scope of achievements displayed. The new museum, named the Steven F. Udvar-Hazy Center, is so large that the entire Air and Space Museum would fit inside its 10-story hall. With this vast increase in display space, virtually all of the Smithsonian's aviation and space collection can now be displayed. Previously, only about 10 percent of the collection was available for public viewing.

There are a few things still lacking. National Air and Space Museum Director Gen. Jack Dailey made repeated mention of the fact that the museum does not have a B-24 in its collection—yet.

Unlike the downtown museum, everything is all together—and juxtaposed in provocative ways. Small prop planes sit beneath a Concorde jet; Mercury and Gemini capsules are next to a space shuttle; wood and canvas next to titanium alloy. To be certain, this can be said of the museum downtown, but here great attention has been given to making things accessible—unlike the downtown museum where much of the interesting stuff is 50 feet over your head.

Here, according to Gen. Dailey, great care was taken in the design of the Udvar-Hazy Center, utilizing ramps, lighting, etc., such that you can get at eye-level with nearly every item on exhibit.

The museum is named after its prime benefactor, Steven Udvar-Hazy. The total cost for the facility will be $311 million—all of it raised from private funds. While a substantial amount already has been raised, $90 million more is still needed to completely pay for construction.

In addition to the private construction funds, Congress paid for the planning activities and Virginia provided the new road infrastructure. In addition, local school districts are contributing to various educational activities that will be a core feature of this museum's outreach mission.

At the center's opening, Dailey spoke fondly of the museum's construction contractor which has not only passed on 100 percent of all cost savings accrued during construction, but also has rushed some things to completion even though the contract does not call for it. The most visible example is the James McDonnell hangar, which houses the space shuttle Enterprise.

There was one item in particular that I wished to see—Enterprise. Over the past 25 or so years I have seen all other shuttles, either as they were being assembled (I stood inside portions of Atlantis,

edral

Discovery, and what would eventually become Endeavour when I worked at Rockwell International) or when they were launched or landed. Yet I had never managed to actually see Enterprise—even though she has sat in a hangar 11 miles from my home the entire time I have lived in Virginia.

Enterprise was used for a series of approach and landing tests, which were conducted at Edwards Air Force Base in California. These flights consisted of lofting the Enterprise on top of a modified 747 and then letting the Enterprise fly free to glide in for a landing as an unpowered glider. Enterprise flew only five missions on her own in 1976. While some consideration was given to modifying Enterprise to fly into space, cost and weight issues led to a decision not to make the modifications.

After serving as a public relations centerpiece at a variety of international venues in the early 1980s, including the Paris Air Show, Enterprise was delivered to the Smithsonian Institution in November 1985. After being housed outdoors for a time, a special hangar was assembled around Enterprise. While Enterprise was protected from the elements, the hangar was cramped and not equipped for any maintenance or restoration.

Enterprise was brought back out of retirement briefly two years later to test some emergency landing restraint system hardware in 1987,


A


B

C

developed in the aftermath of the Challenger accident. Enterprise also was tapped to serve last year after Columbia's demise, when portions of the leading edges from both wings were removed for tests and inspection.

When the Smithsonian takes possession of an aerospace artifact, it is restored to a condition suitable for display. Sometimes things need to be totally disassembled and then rebuilt. While many artifacts are restored to flight-capable condition, they will never be flown again, per Smithsonian policy. Several of the items on display—the SR-71A, Concorde, and XV-15 arrived at the museum under their own power — with only their fuel, hydraulics and other potential hazards removed.

Often, an artifact arrives at the museum having served other uses after it fulfilled its original intent. Sometimes restoration can bring a plane back to the condition it was in when it was delivered from the factory. In other cases, a decision is made to pick a moment in time as a guide for restoration.

In the case of Enterprise, it was modified somewhat after its initial test flights were complete. A paint job for the Paris Air show brought its original paint scheme a bit closer to what Columbia and the other operational shuttles looked like. Its cockpit and other parts also were removed.

I asked Dr. Valerie Neal, Enterprise's curator, what time frame in Enterprise's life she was aiming for. She said that they had decided that they would seek to maintain the vehicle in 'as delivered' condition—i.e., as it looks right now.

As part of this process, several of the leading edge units removed for use in the Columbia accident investigation will need to be reinstalled. In addition, although Enterprise was shielded from the weather, some corrosion needs to be repaired.

The process of getting Enterprise ready for formal display will take several months. Because of the cleaning process, the McDonnell Hangar where she sits will be sealed off from public view until March 2004, when she is scheduled to go on display.

Previous page: A The Gemini 7 capsule, with the shuttle Enterprise in the background.

B A boilerplate Apollo capsule is one of the hodgepodge of other space artifacts at the new museum.

C While the museum has no actual launch vehicles at the new center, it does have on display a number of models of launch vehicles, including versions of the Titan, Delta, and Ariane. In the background is the forward fuselage section of the Concorde.

D

E

D A ground level, nose-on view of the space shuttle Enterprise.

E Sections of the leading edges of both wings of Enterprise are currently missing. NASA took them earlier this year for use in the Columbia accident investigation.

Unlike Enterprise's Soviet kin—the Buran series of shuttles—she will not have holes cut in her or be converted into a restaurant. Rather, she will be exhibited as the trailblazer she represents.

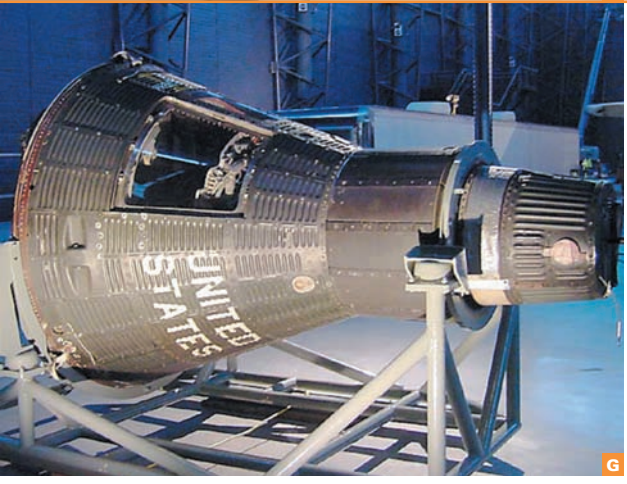
Enterprise is but one of the marvelous artifacts in this museum. When totally filled, more than 300 aircraft and spacecraft will be on display.

There are a lot of fun things for folks to do as well. In addition to the large educational facilities, there is an immense IMAX theater, a gift shop, and plenty of room to just sit and gaze at all of these wonderful machines. There also is a 3-degree motion-based simulator, which takes you to the International Space Station.

Despite a few nits, this expansion of the already magnificent National Air and Space Museum is simply astonishing. I am certain that in the years to come this place will become as popular—if not more so—than its sister facility in downtown Washington, D.C.

Keith Cowing is the editor of Spaceref.com.

F



G

Beyond DC

Other places to see relics from space-days past:

Florida's Kennedy Space Center features a rocket garden, two IMAX space films, walk-through exhibits about the early human space program and Mars missions, a full-size shuttle replica, a memorial to America's fallen astronauts, an actual 363-foot, 6.2-million pound Saturn 5 moon rocket and bus tours.
http://www.kennedyspacecenter.com/html/exhibits.html

Alabama's U.S. Space and Rocket Center has films, hands-on learning exhibits and rides, such as the Space Shot, where you can experience for yourself what it feels like to be aboard a rocket and a gravity-force accelerator. The center also has an Apollo Command Module, a Blackbird spy plane and a lunar lander, as well as a rocket park filled with relics from the early space program. Exhibits include a Saturn 5, Juno, Jupiter, Redstone, Jupiter-C, Atlas, and other boosters and engines.
http://www.spacecamp.com/museum/

Mississippi's Stennisphere has the largest rocket test complex in America and offers visitors the opportunity to see where the space shuttle main engines are tested. The center features real rocket engines and scale models of spacecraft, exhibits on NASA missions and a Navy exhibit that lets you forecast the weather.
http://www.ssc.nasa.gov/public/visitors/

Virginia's Air & Space Center features IMAX movies, an Apollo command module, a lunar lander simulator, a Martian meteorite, the hatch from a Gemini capsule, a Mercury capsule, sounding rockets and dozens of historic aircraft.
http://www.vasc.org/index.html

In Texas, Space Center Houston offers a realistic tour of the human space program, with flight simulators, shuttle landing trainers and a hands-on satellite retrieval simulator. Also on display: Mercury, Gemini and Apollo capsules; mock-ups used for astronaut training and tram tours of the Johnson Space Center.
http://www.spacecenter.org

The Kansas Cosmosphere and Space Center features the largest collection of Russian space artifacts outside of Moscow as well as an extensive display of historic relics from the U.S. space program, including the famed Apollo 13 capsule and the restored Liberty Bell 7 Mercury capsule.
http://www.cosmo.org

F The center has a number of smaller space artifacts, including an Apollo space suit (right) and other items.

G The Mercury-Atlas 10 capsule, nicknamed "Freedom 7 II" by Alan Shepard, who would have flown it. The capsule is in pristine condition, with its retrorocket pack still attached.

CULTURES MELD AT YOUTH SPACE SUMMIT IN TURKEY

BY LARRY EVANS,
ORANGE COUNTY SPACE SOCIETY

Space exploration has united the world better than any other institution. Early manned spaceflights of the 1960s provided everyone with a new perspective of our planet. The only borders seen from space were natural ones (the rivers, mountain and oceans) not arbitrary man-made ones based on politics.

Even at the height of the Cold War, the Soviet Union and United States started to swap scientific data on spaceflight, and eventually the counties even began to swap astronauts and cosmonauts. Today, 16 countries are partners in space through the International Space Station program.

Those of us within the National Space Society always believed that better relations come from igniting people's interest in space and science. Recently, we had an opportunity to put this to the ultimate test: Our Southern California chapter, the Orange County Space Society (OCSS), participated in the first Global Friendship Youth Space Summit at Space Camp Turkey.

OCSS members Pam Leestma and Sema Basol joined teacher Neme Alperstein to put together the curriculum used at the event, which took place July 13-19, 2003.

Sema is the head of the Global Friendship Through Space Education Organization, based in Pacific Palisades, Calif. (http:// www.gftse.org). One of the goals of GFTSE is to raise money to provide scholarships to deserving 12- to 16-year-old students to attend Space Camp at the Aegean Free Zone in Izmir, Turkey.

Photos by Larry Evans

Students sign T-shirts as a memento of their fun-filled week in Turkey.

Pam is a second-grade teacher at Bellflower Christian School in California and Neme is a sixth-grade teacher at Harry Eichler School in Queens, New York. Together, they formed a partnership with school teachers in Izmir and Istanbul. Students became friends by crossing cultural barriers using email to learn about each other's countries and share their excitement about space.

Out of this seed blossomed the idea to create a special week for a select group of students from different countries to educate them about space-related subjects and inspire them to think about global friendship. Students came from Turkey, Greece, North and South Cyprus, Israel and Azerbaijan for the first space summit. Counselors and teachers arrived from the United States, Turkey, and the Ukraine, giving the space summit representatives from a total of eight countries.

Pam and I flew out from Los Angeles, joining Neme in New York for the continuation of our flight to Istanbul and then south to Izmir. We spent several days getting acclimated to the new country, its food, hospitality, and the 10-hour time difference from Orange County, Calif.

Then the festivities began. Kaya Tuncer, founder of Space Camp Turkey, summed it up at the opening ceremonies when he told the 126 students: "This whole week is for you."

He then read a list of firsts that would happen in the coming days. "There are so many firsts that I had to write them all down so I wouldn't miss any of them!" he said. His list included first contact between space station crewmembers and Turkey and

Turkish dancers perform in front of a shuttle simulator.

a video conference between Space Camp and the Johnson Space Center in Houston, Texas.

Entertainment that evening was spectacular, highlighted with a performance by a troupe of traditional Turkish dancers. The backdrop was a very 21st-century space shuttle simulator. Also included was a special video to introduce the students to prominent space personalities such as Brian Chase of the NSS, Peter Diamandis of the X-Prize Foundation, John Spencer of the Space Tourism Society and Edmund Burke from the Endeavour Center.

Throughout the week, the students participated in their regular Space Camp curriculum as well as many special activities. The highlight of this was the first-ever contact accomplished via short wave radio between the International Space Station and Turkey.

Aziz Sasa, president of the Turkish Amateur Radio Club, and his team set up their equipment in a corner of Space Camp across from the computer lab and near a full-scale model of the unmanned lunar exploration craft Surveyor. One of the first things they had to do was to get a call sign for the contact.

Based on their location in Turkey and the fact that the communication would take place at Space Camp Turkey, they came up with YM3SCT. In the parlance of radio, this call sign would translate into "Yankee-Mike-Three-Sierra-Charlie-Tango."

Out of the 126 students present, 20 were selected by their teachers to represent all of the countries involved in the summit. Questions were composed and submitted to NASA to ask American ISS astronaut Ed Lu. The window of opportunity was very short, only 20 minutes, so the activity had to be rehearsed to a fine drill to guarantee that everyone would have a chance to ask his or her questions. Everything went perfectly, and all the students were able to speak with Ed before the station went out of range.

Students and counselors gather at Space Camp Turkey.

Later in the week, a second special hookup was accomplished, this time between the camp and the Johnson Space Center. This time, the students were able to converse via video link with astronaut Dr. Ellen Baker. They asked about her experiences in space, including the time when she was part of the first crew to dock with the Russian Mir Space Station.

Team-building is one of the primary tasks of Space Camp. Several exciting simulators support that aspect of training. The largest simulator is a full-scale nose section of the Space Shuttle Discovery. Aboard this high-fidelity mockup, the commander, pilot, and mission specialists interacted with another flight team in Mission Control to launch into orbit, perform an EVA (Extra-Vehicular Activity, or spacewalk), and then reentered to land at the Kennedy Space Center in Florida.

Students test their space suits in front of the shuttle simulator.

What a ride, and yet no one ever left the third floor of the Space Camp building in Izmir.

During classroom time, students built their own model rockets and then, several days later, took them to a nearby field for launching. This was an exciting day since they got to see something that they built with their own hands actually take to the air. A new generation of rocket scientists had been initiated.

On another day, students tried on space suits and learned why an astronaut must depend on these garments for their very lives above the atmosphere. Other activities included: donning rocket packs to float around on an air-bearing floor; twirling in three directions simultaneously on the Multi-Axis Trainer; walking up and around walls on the Space Station Mobility Trainer; building a computer-modeled space station in the computer lab; driving a tiny remote-controlled rover across the nearly airless plains of simulated Mars; growing real plants in the hydroponics lab; learning astronaut landing techniques; and discovering what construction in weightlessness might be like using the Zero-Gravity Wall and later with a day in a pool.

By Graduation Day, the students who were once just a group of kids from diverse parts of the world were now a cohesive team, excited about science and the possibilities opened up by their experiences at the Youth Space Summit and Space Camp Turkey.

"I don't remember any other experience in my life that provided so much responsibility, fun, excitement, and information," said Melike Abacioglu, a student at Robert College in Istanbul. "We all started to think being an astronaut would be enthralling. I loved it."

During the cultural presentations held at the midpoint of the space summit, Steven Stavoulakis, the student moderator of a set of mini-plays about life in Greece in ancient and modern times, had a fairly profound way of describing the political versus personal situation between his country and Turkey. It is certainly applicable to us all.

"Even though there are some problems between the politics of our two nations, Greeks and Turks [as people] at least always try to get along well," he said. "As long as people do not treat each other with prejudice, the essential thing—to maintain peace between these two nations—is not hidden in politics and international views. The important thing is to be able to look for and see the personality behind the person's face before you look at their nation. Don't ever forget that we are just human beings and the rest is just politics."

What better sentiments for all of us to remember as we look toward our future as a space-faring race, living and working together on planets within our own solar system and beyond.

PROGRAM FORGES COMMON GROUND BY SETTING SIGHTS ON THE STARS

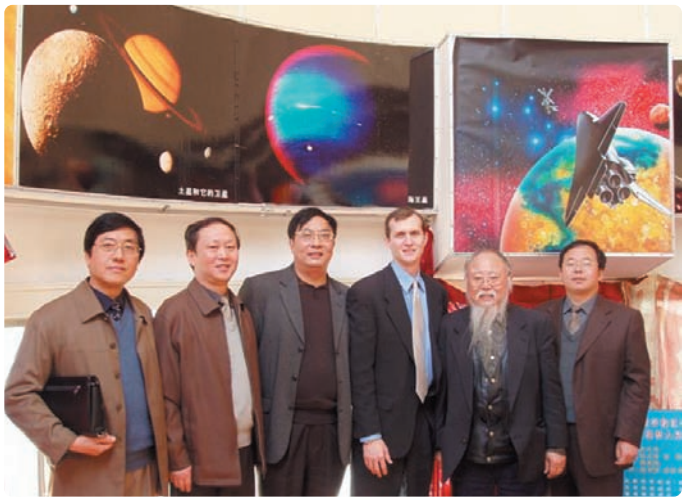
The National Space Society recently became a partner in the Permission to Dream (PTD) program, which sends telescopes around the world to school children and eventually will connect them via the internet to share observations and insights.

The program was initiated in China by Frank Braun, an NSS officer, and Chinese-American businessman Cheong Lee.

Mr. Lee, PTD sponsor, in front of a brand new space-related Chinese advertisement. The ad is promoting a brand of milk, and the blue circle on the right says, in English and Chinese, "Special milk for China's astronauts." How cool is that?

George Whitesides just returned from a trip to China to deliver 16 telescopes. Here is his report:

The telescopes made it to China and the local officials and teachers were incredibly appreciative. They are now organizing to make the best use of the donation.



Presentation at the observatory of the Hanjiang Experimental School. They have a first-class telescope inside the dome, as well as some pretty beautiful space illustrations (note the space shuttle in the background!) Pictured are Mr. Ma, head of Geography Section of the Hanjiang Education Bureau; Mr. Wang, vice head of Hanjiang Education Bureau; Mr. Fang, head of the Hanjiang Science Bureau; me; Mr. Wang, headmaster of the Hanjiang Experimental School.

We met with the local 'secretary' of the area—in China that means the head of the local government—and with the heads of all the local educational offices. The news coverage was great! We also talked about a future collaboration for a community planetarium.

Along the way we saw Chinese space ads, temples, ate things that I am not sure I will ever eat over here, and drank a lot of Chinese liquor. (Toasting is apparently a big part of ceremonial meals there.)

So thanks for making it all happen. Overall, it was a big success.

Possible future home of a community planetarium for Yangzhou. The site is currently under development by Mr. Lee, PTD's sponsor in China. In addition to the buildings already under construction, Mr. Lee wants to create a top-quality educational center that includes a planetarium. We briefed senior officials from the regional government on the planetarium programs in Brazil.

National Space Society awards

BY DR. DANA JOHNSON

Chairwoman, NSS Awards Committee

The National Space Society has a long tradition of recognizing its members and chapters as well as those individuals or groups who have made outstanding contributions to space programs and activities consistent with the Society's vision and goals.

The Society acknowledges these contributions through the Space Pioneer awards, given in such categories as legislator, business/corporate, business/entrepreneur, scientist/engineer, education, mass media, wide media, compelling art, and special merit.

Of particular mention is the Space Activist award, given to an NSS member who has exemplified the spirit and goals of the Society. Additionally, Chapter awards are given by the Vice President of Chapters. These awards are designated "Chapter Excellence," "Special Merit," and "Meritorious Service," and are made for such efforts as membership recruitment, publicity, education, chapter newsletters, explorer, public outreach, and other key chapter activities. These awards are given at the ISDC awards banquet annually.

Two major awards, the Wernher von Braun and Robert Heinlein awards, have been given in alternating years. Chosen through a rigorous evaluation process by the NSS Awards Committee, the von Braun award recognizes those individuals with a visionary outlook toward spaceflight, the ability to promote the vision extolled, and the capability to manage teams, large or small, and often interdisciplinary, that are characterized by a remarkable sense of loyalty and cohesion.

Past recipients of the von Braun award have included Donna Shirley, George Mueller, Max Hunter, and Dr. Ernst Stuhlinger. Given in memory of the noted author Robert A. Heinlein, the Heinlein award has recognized the achievements of Gerard O'Neill, Arthur C. Clarke, Wernher von Braun, Gene Roddenberry, Robert Goddard, Buzz Aldrin, Carl Sagan, Neil Armstrong, and Robert Zubrin.

While other NSS awards are decided by the Awards Committee based on recommendations from the Board of Governors, the Board of Directors, and the membership at large, the Heinlein award recipient alone is chosen by current NSS members in good standing in a voting process overseen by Awards Committee member John Strickland. This is described on the ballot included in this issue of *Ad Astra.*

It is very important that you, the members of NSS, express your views by voting for a candidate of your choice for this year's Heinlein award. Please take time to review the guidelines, and send in your vote as soon as possible (look for your ballot on the coverwrap!). We look forward to seeing you at the ISDC awards banquet in May!

Groups unveil songs of space CD

BY MARK UNGAR

After six years in the making, an NSS-sponsored CD of songs celebrating the history and future of space exploration was released in January. *To Touch The Stars* is a joint project of the NSS, Prometheus Music and the Mars Society. Right now, $2.50 of each CD purchased at http://www.prometheus-music.com/buy/thestars-nss.html will go directly to the NSS as a donation to support society programs.

At a time when a lack of public interest and excitement are cited in the NSS Roadmap as a key barrier to space settlement, the diverse songs on the compilation are intended to evoke a sense of vision and inspiration about man's struggle to leave the planet. Executive Director Brian Chase says, "I am confident that music and songs will go with us to the stars and that future explorers will hum and whistle the songs from this very album while mining the moon or planting a Martian garden."

The 17 tracks span a range of styles, including folk, rock, majestic ballads and ska.

Winning entrants of the NSS Apollo Awards for Space Songwriting (created by former Chairman of the Executive Committee Dr. Robert Zubrin) are featured. As Dr. Zubrin puts it: "If we are to win the hearts and souls of humanity to the vision of a space-faring future, the space exploration movement must also develop its songs."

Other tracks were penned by a variety of space-struck songwriters. Notable composers include Judy Collins, whose soaring "Beyond the Sky" (here sung by Margaret Davis) was written to honor astronaut Eileen Collins. Popular contemporary songwriter Christine Lavin makes an appearance with her Nova-episode-in-8-minutes number "If We Had No Moon."

Wholesale copies are available direct from the publisher (eli@prometheus-music.com) to resell for chapter fundraising and as an outreach tool to spread the NSS message.

HOW TO ORDER *TO TOUCH THE STARS*

NSS members receive a 15% discount off the usual $15.97 price.

By Internet:

www.prometheus-music.com/buy/thestars-nss.html

By Postal Mail:

Send a check for $15.97 per CD, plus $2 shipping and handling to:

Prometheus Music
(c/o Eli Goldberg)
333 Franklin St. #5
Mountain View, CA 94041

Please indicate that you are an NSS member—the Society will receive a $2.50 donation for each CD that you buy! Please include your NSS member number, located in the upper-left of your *Ad Astra* mailing label.

NSS CHAPTER PROJECTS

Welcome to the NSS Chapter Projects page! Here you can find out what projects are underway or being planned by National Space Society chapters. You also you can publicize your own projects, ask for help, and share your experiences in this space.

In every issue of *Ad Astra,* we will highlight chapter projects which are not only newsworthy, but also inspiring to other members.

If you have questions or need more information about any project, or want to contribute to any current or planned project you see here, please contact the person shown.

Ad Astra!

REGION 01

Orange County Space Society
Larry Evans
PO Box 53241
Irvine, CA 92619
Voice/Fax: 949/770-0702
OCSpacesociety@hotmail.com
- Public displays and programs
- Student Space Congress
- After School Academy
- Space Camp Southern California

Oasis
Steve Bartlett
7108 Peabody St.
Long Beach, CA 90868
Phone: 562/627-3991
www.oasis-nss.com
oasis@oasis-nss.com
- Public talks and lectures
- Star Parties at Mount Wilson Observatory
- Mars Rover Simulator
- Speakers for space-related convention panels
- Monthly newsletter "The Odyssey"
- List of space-related websites worldwide

REGION 02

Golden Gate Space Frontier Society
Brook E. Mantia
PO Box 11341
Berkeley, CA 94712-2341
Phone: 510/393-0518
Fax: 510/520-6070
tothestarz@aol.com
- Volunteers for the Challenger Learning Center at Chabot Space and Science Center, Oakland, CA.

Sacramento L-5 Society
Robert Compton
3945 Grey Livery Way
Antelope, CA 95843
916/344-3290
energycube1@cs.com
www.geocities.com/CapeCanaveral/Launchpad/1939
- Prototype H2O2/kerosene rocket (static test completed)
- Web site
- Public shopping center displays

NSS Seattle
David Stuart
14618 21st Ave. SW
Seattle, WA 98166
206/241-6165
clvancil@aol.com
www.hometown.aol.com/clvancil
- Space Day displays and volunteers
- NSS speakers and staffed display table at Norwestcon, regional Sci-Fi convention

REGION 03

Tucson L5 Space Society
Dick H. Fredericksen
7351 E. Speedway #11-G
Tucson, AZ 85710
520/722-2230
dhfred@mindspring.com
www.azstarnet.com/public/nonprofit/tucl5
- Judging space-related exhibits at regional school science fair
- Chapter newsletter

Oklahoma Space Alliance NSS
c/o Syd Henderson
102 W. Linn Apt. 1
Norman, OK 73069
405/321-4027
sydh@ou.net
members.aol.com/osanss/science
- Bimonthly newsletter "Outreach"
- Bimonthly e-mail newsletter "Update"
- Chapter website
- Host for ISDC 2004

Austin Space Frontier Society
John Strickland
12717 Bullick Hollow Road
Austin, TX 78726
512/258-8998
jstrick@io.com
- Revision of Boy Scouts of America Merit Badge Handbook on Space Exploration
- Space issue and briefing paper for senatorial campaign of John Cornyn of Texas
- Participation and papers at conventions and councils on space-related issues

NSS of North Texas
Louis Mazza
PO Box 1671
Arlington, TX 76004-1671
972/681-3600
www.utdallas.edu/plemmos/nss
www.nssnt.org
- Chapter website
- Information table and display at The Science Place, Dallas, TX
- Co-authored Boy Scouts Merit Badge Handbook revision
- Donated World Space Week posters to schools, libraries, and The Science Place

San Antonio Space Society
Carol Redfield
609 Ridgeview Drive
San Antonio, TX 78253
210/679-7625
Fax: 210/522-3729
credfield@stmarytx.edu
- Support for Radiance Academy West, a charter school the chapter helped to start
- Support for activities at St. Mary's University
- Support for Young Astronauts organization at Galm Elementary School
- Distribution of CDs from NSS Education Committee Adopt-A-School packet
- Produce CD of abstracts from ISDC 2003

REGION 04

United States Air Force Academy Chapter
Kyle Vacca
PO Box 2649
USAF Academy, CO 80841
719/333-4759
co4kyle.vacca@usaf.edu
- Sponsored astronaut visits and presentations to cadets
- Conduct observatory nights
- Coordinate and conduct trips to Cheyenne Mt, Lockheed Martin and others

Wichita Chapter of NSS
Dr. Randall Chambers
2704 Winstead Circle
Wichita, KS 67226-1179
316/684-2614
Fax: 316/684-6748
RChamb8342@aol.com
- Magazine and newspaper articles
- Educational and training programs at the Kansas Cosmosphere and Space Center
- Support for and participation in establishing ASTRA KANSAS DAY proclamation and celebration for the governor of Kansas
- Evaluation and judging of presentations at Wichita State College of Engineering and National Institute for Aviation Research's Engineering Openhouse and Banquet
- Numbered NASA HSF News Digest Reports
- Participated in NARAM-44, the National Association of Rocketry's 44th Annual Meeting and Competition.

Heart of America Chapter NSS
George Howard
PO Box 22537
Kansas City, MO 64113-0537
816/523-7593
KCNSSH18@aol.com
- "William Bent Station" project to give idea of what it would be like to live in a Moon or Mars base.

Utah Space Association
J. David Baxter

378 I Street
Salt Lake City, UT 84103
801/359-0251
utahspace@aol.com
http://members.aol.com/utahspace
- Quarterly newsletter "Aurora"
- Chapter website

Region 05

Huntsville Alabama L5 Society
Gregory H. Allison
PMB 168
1019A Old Monrovia Road
Huntsville, AL 35806
256/859-5538
Fax: 256/461-3045
hal5@hiwaay.net
http://hiwaay.net/~hal5
- Public lectures on space-related subjects
- Continuation of Project HALO, including test firings of large and small hybrid rocket motors

Middle Tennessee Space Society
Chuck Schlemm
508 Beechgrove Way
Burns, TN 37029
615/441-1024
cschlemm@comcast.net
- One-hour weekly television program "Space TV"
- Display at Dickson Renaissance Center
- Participated in Girl Scout Jamboree Astronomy Night
- Educational presentations to groups of Vanderbilt University Childcare children
- Display tables at Cumberland Science Museum
- Monthly presentations during public viewing nights at the Vanderbilt Dyer Observatory

Region 06

Chicago Society for Space Studies
Lawrence Boyle
PO Box 1454
North Riverside, IL 60546
708/788-1336
708/455-6229
LarryBerwy@aol.com
www.astrodigital.org/csss
- "Cartoon History of the Space Program"
- Planetarium presentations

Cuyahoga Valley Space Society
George F. Cooper III
3433 North Avenue
Parma, OH 44134
216/749-0017
geocooper@aol.com
- Monthly chapter newsletter

Lunar Reclamation Society, Inc.
Peter Kokh
PO Box 2102
Milwaukee, WI 53201-2102
414/342-0705
KokhMMM@aol.com
www.lunar-reclamation.org
- Monthly publication "Moon Miners' Manifesto"
- Booth and exhibit at Aviation Career Day, Mitchell Field
- "Rockets for Schools" annual rocket launch event

Sheboygan Space Society
Wilbert G. Foerster
728 Center St.
Kiel, WI 53042-1034
920/894-2376
wilf@tcei.com
www.tcei.com/sss
- "Rockets for Schools" display
- Chapter website

Region 07

Baltimore Metro Chapter of NSS
Dale S. Arnold, Jr.
102 F Seevue Ct.
Bel Air, MD 21014
410/879-3602
science@balticon.org
- Display and manned table at Andrews AFB air show
- Science programming at Maryland Regional Science Fiction Convention
- Judging and prize awarding at Maryland Regional Science Fair
- Display and space backdrop at outdoor community festival

NSS North Coast Chapter
Edward C. Longnecker
88 Pine Leaf Drive
Erie, PA 16510
814/899-8069
nasaspaced@cs.com
- Astronomy Night
- Blastoff Rocket Club

Philadelphia Area Space Alliance
Earl Bennett
PO Box 1715
Philadelphia, PA 19105
215/633-0878
EarlBennett@erols.com
pasa02.tripod.com
- Presentations at Super Science Weekend, New Jersey State Museum
- Special Awards judging at George Washington Carver Science Fair
- Special exhibit at New Jersey State Museum in conjunction with NASA Traveling Exhibit
- Presentations at Philcon Science Fiction Convention

DC-L5 (Metro Washington DC)
Donnie Lowther
PO Box 16630
Arlington, VA 22215-1630
703/567-1630
dcL5@aroundspace.com
- Cable access program "Around Space"

Region 08

Suffolk Challengers for Space
Prof. Reagan Lorraine Lavorata
182 Millard Avenue
West Babylon, NY 11704
631/321-0964
francoisehardy51@viola.fr
edithpiaf51@hotmail.com
www.geocities.com/CapeCanaveral/Hall/5950/challengers.html
- Aid to Internet space start-up company
- Educational lectures on French space program

Long Island Space Society
Arthur Smith
8 Cherry Lane
Selden, NY 11784
631/732-1367
apsmith@lispace.org
www.lispace.org
- Chapter web site
- Promotion of Space Exploration Act of 2002
- Challenger Center
- Promote local space development authority

International Chapters

Queensland Space Frontier Chapter
Noel Jackson
PO Box 419
Nundah Queensland 4012
Australia
61-7-3266-6324
nwjloog@bigpond.com
- Literary Project—donation of chapter library materials to schools and library

Deutsche Raumfartgesellschaft e.V German Space Society
Michael Stennecken
Greta-buenichmann-Str. 3
48155 Muenster
Germany
+49 251 131857
info@drg-nss.com
www.drg-gss.org
- Item in personal package of Russian cosmonaut to ISS and back

Don't see your project here? Want to make a correction, add your project? Ask for help? To do any of these things, send your information and/or questions to:

G. B. Leatherwood
NSS Director of Projects—Chapters
776 Spring Valley Parkway
Spring Creek, NV 89815-6224
Phone/Fax: 775/753-9165
Email: wordwright@elko-nv.com

Major NSS Donors

National Space Society appreciates the financial support of all of its members, and would like to recognize the top donors in the last year (donation levels reflect cumulative contributions from May 2003–January 2004).

Buzz Aldrin Council

Majel Barrett-Roddenberry
Paul Canolesio
Lars S. Easterson
Robert Edwards
Greg Foote
Dana Johnson
David Peter Kapelanski
J.Michael Lekson
Charles T. Lenzmeier
Dean E. London
John H. McQuilkin
Mary Morss
Stanley J. Novak
Allan M. Schiffman & Phyllis Ooi
Eric Tilenius

Visionary

Jack Bader
Lori Cooke-Marra
Stephen Donaldson
Seymore Graff
The Gryphon Fund
Mark Hopkins
Hugh Hotson Jr.
Don Kimball
Jeffrey Kodosky
Ronnie Lajoie
Frederick Ordway III
Jay Wittner

Pioneer

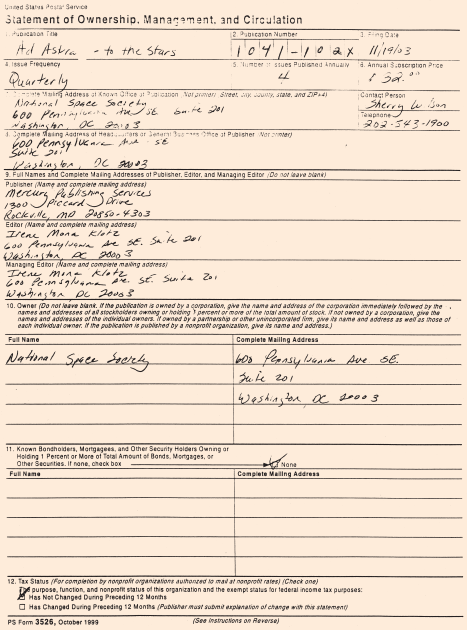
P. Alpaugh
Edward Apke
Janet Asimov
Richard Beers
Amy Bouska
Bruce Boxleitner
S. Bruce
Thomas Defilipps
Robert Dettmer
Michael Downey
Mike Dudley
Terry Gray
Kane Gross
Mark Herrup
Edwin Jones, Phd.
Georgette Koopman
George Lagorio
J. Lekson
James Maenpaa
Stephen Marshall
Alden McKelvey
Rear McQuilkin
Steve Price
David Shulan
Fred Simms
James Skaggs
John Swanson
Mike Symond
Michael Tomkins
Cynthia Yarborough

Explorer

Jennifer Adams
Dwayne Addison
Roger Bara
L. Baxter
Michael Bellardi
Robert Bigelow
Peter Bissegger
David Blanchard
Blandy Boocock
Chris Brand
George Brickner
Geoffrey Buckley
Jose Bueno
Randall Chambers
Paul Clark
Lammot Copeland
Mr. Crowley
Hoyt Davison
Robert De Bock
Donald Disraeli
Rick Donovan
Daymon Duncan
Jack Egan
Christopher Ellsworth
James Fackert
Marc Foulkrod
Mary Friese
Joseph Gillin
Jonathan Gjessing
Steven Goddard
Robert Gounley
Joseph Guerin
Eric Gunnerson
Anthony Haga
David Hampton
George Hanff
Ed Harris
Thomas Harris
Herbert Hartman, Jr.
William Hettchen
Armand Hilaire
Derek Ho
Robert Hoffman
Justin Houk
Robert Hunter
Michael Huston
W. Iller
Earnest Jackson II
Stephen Jensen
Keith Keeter
William Kelley
Kenneth Kerr
Michael King
Thomas Kistler
William Knowles
Jeffrey Labaw
Khajak Lajinian
Barry Lamont
David Lerner
Michael Livanos
Charles Livingston
Edwin Louie
Dennis Lydick
David Lyon
John Magee
Jerilee Mattingly
Donald McClellan
Glenn Mclntyre
Eric Moller
Mike Neary
William Nowlin
C. Osborn
Kurt Paasch
D. Penn
Erik Peterson
Robert Peterson
Jared Polis
Charles Poteet IV
Richard Potthoff
John Pritchard
Roger Raham
George Ray
Mike Rees
Ruth Remmel
Marc Rhodes
Pete Ricketts
George Roberts
Guillermo Rodriguez
David Rucker
Randy Rumley
Donald Russo
Richard Salonek
Peter Schenck
Gary Scotto
Brandon Sherlock
Kathy Shinn
Shirley Sontheimer
Robert Stepp
Adam Temple
John Tenopir
Richard Thayer
Pat Tomasko
Terry Troup
Richard Trub
Richard Uren
Richard Vail
John Vance
Richard Von Glahn
Jocelyn Wallace
Richard Waters
Doug West

44 january ▪ february ▪ march 2004
Ad Astra to the stars

STATEMENT OF OWNERSHIP



United States Postal Service
Statement of Ownership, Management, and Circulation

1. Publication Title	2. Publication Number	3. Filing Date
Ad Astra - to the Stars	1041-102X	11/19/03
4. Issue Frequency	5. Number of Issues Published Annually	6. Annual Subscription Price
Quarterly	4	$ 24.00

7. Complete Mailing Address of Known Office of Publication (Not printer) (Street, city, county, state, and ZIP+4) — Contact Person: Merry G. Lin; Telephone: 202-543-1900
National Space Society, 600 Pennsylvania Ave SE Suite 201, Washington DC 20003

8. Complete Mailing Address of Headquarters or General Business Office of Publisher (Not printer)
600 Pennsylvania Ave SE Suite 201, Washington DC 20003

9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor (Do not leave blank)
Publisher (Name and complete mailing address)
Mercury Publishing Services, 1300 Piccard Drive, Rockville MD 20850-4303
Editor (Name and complete mailing address)
Ilene Mona Klotz, 600 Pennsylvania Ave SE Suite 201, Washington DC 20003
Managing Editor (Name and complete mailing address)
Ilene Mona Klotz, 600 Pennsylvania Ave SE Suite 201, Washington DC 20003

10. Owner (Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by the names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give the names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as those of each individual owner. If the publication is published by a nonprofit organization, give its name and address.)

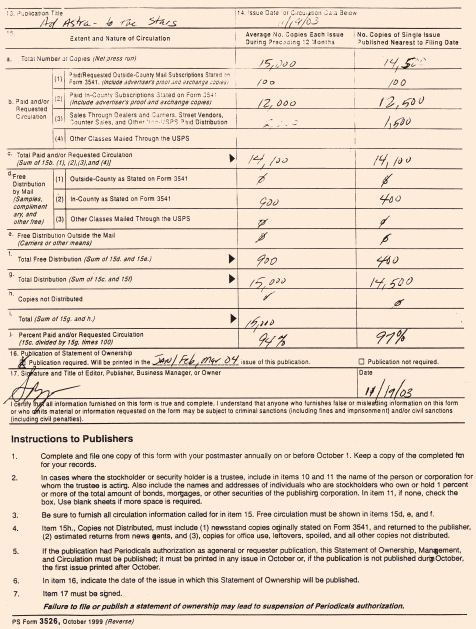
Full Name	Complete Mailing Address
National Space Society	600 Pennsylvania Ave SE. Suite 201, Washington DC 20003

11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. If none, check box → ☒ None

Full Name	Complete Mailing Address

12. Tax Status (For completion by nonprofit organizations authorized to mail at nonprofit rates) (Check one)
☒ The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes:
☐ Has Not Changed During Preceding 12 Months
☐ Has Changed During Preceding 12 Months (Publisher must submit explanation of change with this statement)

PS Form **3526**, October 1999 (See Instructions on Reverse)



13. Publication Title: Ad Astra - to the Stars — 14. Issue Date for Circulation Data Below: 11/4/03

15. Extent and Nature of Circulation		Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies (Net press run)		15,200	14,500
b. Paid and/or Requested Circulation	(1) Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541. (Include advertiser's proof and exchange copies)	100	100
	(2) Paid In-County Subscriptions Stated on Form 3541 (Include advertiser's proof and exchange copies)	12,000	12,500
	(3) Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid USPS Distribution	[illegible]	1,680
	(4) Other Classes Mailed Through the USPS		
c. Total Paid and/or Requested Circulation (Sum of 15b. (1), (2),(3),and (4))		14,100	14,100
d. Free Distribution by Mail (Samples, complimentary, and other free)	(1) Outside-County as Stated on Form 3541	0	0
	(2) In-County as Stated on Form 3541	900	400
	(3) Other Classes Mailed Through the USPS	0	0
e. Free Distribution Outside the Mail (Carriers or other means)		0	0
f. Total Free Distribution (Sum of 15d. and 15e.)		900	400
g. Total Distribution (Sum of 15c. and 15f)		15,000	14,500
h. Copies not Distributed		1	0
i. Total (Sum of 15g. and h.)		15,100	
j. Percent Paid and/or Requested Circulation (15c. divided by 15g. times 100)		94%	97%

16. Publication of Statement of Ownership
☒ Publication required. Will be printed in the Jan/Feb, Mar 04 issue of this publication. ☐ Publication not required.

17. Signature and Title of Editor, Publisher, Business Manager, or Owner — Date: 11/19/03

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

Instructions to Publishers

1. Complete and file one copy of this form with your postmaster annually on or before October 1. Keep a copy of the completed form for your records.
2. In cases where the stockholder or security holder is a trustee, include in items 10 and 11 the name of the person or corporation for whom the trustee is acting. Also include the names and addresses of individuals who are stockholders who own or hold 1 percent or more of the total amount of bonds, mortgages, or other securities of the publishing corporation. In item 11, if none, check the box. Use blank sheets if more space is required.
3. Be sure to furnish all circulation information called for in item 15. Free circulation must be shown in items 15d, e, and f.
4. Item 15h., Copies not Distributed, must include (1) newsstand copies originally stated on Form 3541, and returned to the publisher, (2) estimated returns from news agents, and (3), copies for office use, leftovers, spoiled, and all other copies not distributed.
5. If the publication had Periodicals authorization as agenerai or requester publication, this Statement of Ownership, Management, and Circulation must be published; it must be printed in any issue in October or, if the publication is not published during October, the first issue printed after October.
6. In item 16, indicate the date of the issue in which this Statement of Ownership will be published.
7. Item 17 must be signed.

Failure to file or publish a statement of ownership may lead to suspension of Periodicals authorization.

PS Form **3526**, October 1999 *(Reverse)*

National Space Society Chapters

The NSS Chapter List is available at **http://www.nss.org/chapter.** Please direct all changes to NSS Headquarters at nsshq@nss.org.

CHAPTERS COORDINATORS

V.P. of Chapter Affairs
Jim Plaxco
700 Cape Lane
Schaumburg, IL 60193
847/923-7122
jplaxco@astrodigital.org

U.S. Chapters Coordinator
Bennett Rutledge
4264 E. Maplewood Way
Centennial, CO 80121
720/529-8024
720/529-8024 FAX
rutledges@nsschapters.org

International Chapters Coordinator
Michael James
PO Box A2078
Sydney South, NSW 1235
Australia
61-2-9808-1429
michaeljames@netspace.net.au

UNITED STATES

REGION 01

Region One Chapters Organizer
James Spellman, Jr.
4617 Oak Lane, Mtn. Mesa
Lake Isabella, CA 93240-9713
760/379-2503
wspaceport@aol.com

CA - NSS Western Spaceport Chapter
James Spellman, Jr.
4617 Oak Lane, Mtn. Mesa
Lake Isabella, CA 93240-9713
760/379-2503
760/379-2503 FAX
wspaceport@aol.com
http://hometown.aol.com/wspaceport/Welcome.html

CA - OASIS
Steve Bartlett
PO Box 1231
Redondo Beach, CA 90278
310/364-2290
http://www.oasis-nss.org
oasis@oasis-nss.org

CA - Orange County Space Society
Larry Evans
P.O. Box 53241
Irvine, CA 92619-3241
949/770-0702
949/770-0702 FAX
OCSpacesociety@hotmail.com

REGION 02

Region Two Chapters Organizer
Bryce Walden
P.O. Box 86
Oregon City, OR 97045
503/655-6189
Bwalden@aol.com

CA - Golden Gate Space Frontier Society
Brook E. Mantia
P.O. Box 11341
Berkeley, CA 94712-2341
510/393-0518
925/520-6070 FAX
tothestarz@aol.com

CA - Sacramento L5 Society
Robert Compton
3945 Grey Livery Way
Antelope, CA 95843
916/344-3290
energycube1@cs.com
www.adguy.com/sac.L5/index.html

OR - Oregon L5 Society
Bryce Walden
P.O. Box 86
Oregon City, OR 97045
503/655-6189
503/655-6189 FAX
moonbase@attbi.com
www.OregonL5.com

WA - NSS Seattle
David Stuart
14618 21st Ave. SW
Seattle, WA 98166
206/241-6165
dstuart@prodigy.net
www.hometown.aol.com/clvancil

REGION 03

Region Three Chapters Organizer
Claire Stephens McMurray
1206 Classen Blvd.
Norman, OK 73071
405/329-4326
clairst@Quixnet.net

AZ - Tucson L5 Space Society
Dick H. Fredericksen
7351 E. Speedway #11-G
Tucson, AZ 85710
520/722-2230
dhfred@mindspring.com
www.azstarnet.com/public/nonprofit/tucl5

OK - Oklahoma Space Alliance NSS
Thomas Koszoru
514 Fenwick Ct.
Norman, OK 73072
405/366-1797
t_koszoru@cox.net
http://members.aol.com/osanss/science/

TX - Austin Space Frontier Society
John Strickland
12717 Bullick Hollow Road
Austin, TX 78726
512/258-8998
jkstrick@io.com

TX - Clear Lake Area Chapter of NSS
Murray G. Clark
P.O. Box 890588
Houston, TX 77289-0588
281/367-2227
MClark637@aol.com
www.nsshouston.org/

TX - NSS of North Texas
Louis Mazza
PO Box 1671
Arlington, TX 76004-1671
972/681-3600
loumazza@swbell.net/www.issint.org

TX - San Antonio Space Society
Carol Redfield
609 Ridge View Dr.
San Antonio, TX 78253
210/679-7625
210/522-3729 FAX
credfield@stmarytx.edu

NM - New Mexico Space Society
Fred Aiken
P.O Box 94133
Albuquerque, NM 87199-4133
505/856-2145
faaiken@aol.com

REGION 04

Region Four Chapters Organizer
George Howard
P.O. Box 22537
Kansas City, MO 64113-0537
816/523-7593
KCNSSH18@aol.com

CO - Front Range L5 Society
Bill Nelson
2295 Gross Circle East #2
Boulder, CO 80302
303/247-9797
billfrL5@hotmail.com

CO - Mile High L5 Society
Mark Schloesslin
6937 E. Briarwood Circle
Englewood, CO 80112
303/779-5692
mschloess@msn.com

CO - United States Air Force Academy Chapter
Kyle Vacca
PO Box 2649
USAF Academy, CO 80841
719/200-6506
co4kyle.vacca@usaf.edu

KS - Wichita Chapter of NSS
Dr. Randall Chambers
2704 Winstead Circle
Wichita, KS 67226-1179
316/684-2614
316/684-6748 FAX
RChamb8342@aol.com

MO - Heart of America Chapter NSS
George Howard
P.O. Box 22537
Kansas City, MO 64113-0537
816/523-7593
KCNSSH18@aol.com

UT - Utah Space Association
J. David Baxter
378 I Street
Salt Lake City, UT 84103
801/359-0251
utahspace@aol.com
http://members.aol.com/utahspace/

REGION 05

Region Five Chapters Organizer
Harry Reed
163 Harrison Rd.
Benton, KY 42025
270/527-2386
hreed@vci.net

AL - Huntsville Alabama L5 Society
Gregory H. Allison
PMB 168
1019A Old Monrovia Road
Huntsville, AL 35806
256/859-5538
256/461-3045 FAX
hal5@hiwaay.net
http://hiwaay.net/~hal5

GA - NSS Atlanta
Bill Gardiner
1197 Spur 138
Jonesboro, GA 30231
770-473-7617
770-477-0515 FAX
analytee1981@aol.com

KY - Kentucky Chapter of NSS
Harry Reed
163 Harrison Rd.
Benton, KY 42025
270/527-2386
hreed@vci.net

TN - Middle Tennessee Space Society
Chuck Schlemm
508 Beechgrove Way
Burns, TN 37029
615/441-1024
cschlemm@comcast.net

TN - NSS Memphis/Mid-South
Robert Hudson
3861 Trufant
Memphis, TN 38128
901/388-1480
midso_space@juno.com
www.memspace.org

REGION 06

Region Six Chapters Organizer
Larry Ahearn
610 West 47th Place
Chicago, IL 60609
773/373-0349
LDAhearn@aol.com

IL - Chicago Society for Space Studies
Lawrence Boyle
PO Box 1454
North Riverside, IL 60546
708/788-1336
1/455-6299
LarryBerwy@aol.com
www.astrodigital.org/csss/

IL - Chicago Space Frontier L5 Society
Bill Higgins
MS 355, Fermilab Box 500
Batavia, IL 60510
630/393-6817
higgins@fnal.gov
www.astrodigital.org/csfs

IL - Illini Space Development Society
Joannah Metz
314 Talbot Laboratory 104 S. Wright St.
Urbana, IL 61801
217/244-4263
isds@hotmail.com
www.uiuc.edu/ro/isds

IL - Illinois North Shore NSS
Jeffrey Liss
1364 Edgewood Lane
Winnetka, IL 60093
847/446-8343
312/201-0737 FAX
jgljgl@aol.com

OH - Cuyahoga Valley Space Society
George F. Cooper, III
3433 North Avenue
Parma, OH 44134
216/749-0017
geocooper3@aol.com

WI - Lunar Reclamation Society, Inc.
Peter Kokh
P.O. Box 2102
Milwaukee, WI 53201-2102
414/342-0705
KokhMMM@aol.com
www.lunar-reclamation.org

WI - Sheboygan Space Society
Wilbert G. Foerster
728 Center St.
Kiel, WI 53042-1034
920/894-2376
willf@tcei.com
www.tcei.com/sss

REGION 07

Region Seven Chapters Organizer
Bennett Rutledge
4264 E. Maplewood Way
Centennial, CO 80121
720/529-8024
720/529-8024 FAX
rutledges@nsschapters.org

MD - Baltimore Metro Chapter of NSS
Dale S. Arnold, Jr.
102 F. Seevue Ct.
Bel Air, MD 21014
410/879-3602
science@balticon.org

PA - NSS North Coast Chapter
Edward C. Longnecker
160 W. 8th St. Apt. 3E
Erie, PA 16501
814/459-2572
nasaspaced@cs.com

PA - Philadelphia Area Space Alliance
Earl Bennett
PO Box 1715
Philadelphia, PA 19105
215/633-0878
Earl.Bennett@erols.com
pasa2.tripod.com

VA - DC-L5 (Metro Washington DC)
Donnie Lowther
PO Box 3955
Merrifield, VA 22116
703/354-2665
dc-L5@aroundspace.com
www.aroundspace.com

REGION 08

Region Eight Chapters Organizer
Bennett Rutledge
4264 E. Maplewood Way
Centennial, CO 80121
720/529-8024
720/529-8024 FAX
rutledges@nsschapters.org

MA - NSS Boston Chapter
Roxanne Warniers
5 Driftwood Rd.
Acton, MA 01720
978/266-2625
space1st@world.std.com
http://nss.ac/ma

NY - Long Island Space Society
Arthur Smith
8 Sherry Lane
Selden, NY 11784
631/732-1367
apsmith@lispace.org
www.lispace.org/

NY - New Frontier Society of Greater Rochester, NY
Carl Ellsbree
117 Kirklees Rd.
Pittsford, NY 14534
585/381-4218
celsb@frontiernet.net
http://space.rochester.ny.us

NY - Suffolk Challengers for Space
Prof. Reagan Lorraine Lavorata
182 Millard Avenue
West Babylon, NY 11704
631/321-0964
francoisehardy51@voila.fr
edithpiaf51@hotmail.com
http://www.geocities.com/CapeCanaveral/Hall/5950/challengers.html

NY - NSS/NYC
Candace Pankanin
300 Gorge Road #66
Cliffside Park, NJ 07010
201-945-0769
cpankanin@aol.com
www.nssnyc.org

SPECIAL INTEREST CHAPTERS

CA - Space Nursing Society
Linda Plush, RN
3053 Rancho Vista Blvd H377
Palmdale, CA 93551
661/949-6780
lplushsn@ix.netcom.com
www.spacenursingsociety.com

AL - The Odyssey Foundation
Harry K. Coffman
P.O. Box 18987
Huntsville, AL 35804
404-786-5958
hkc1@tof.one.org
www.theodeysseyfoundation.org/

INTERNATIONAL CHAPTERS

AUSTRALIA

NSS of Australia
Philip Young
GPO Box 7048
Sydney NSW 2001
Australia
61-2-9614-1900
nssa@nssa.com.au
http://nssa.com.au

Central Coast Space Frontier Society
Tony James
98 Malison Street
Wyoming, NSW 2250
Australia
61-2-4329-4748
jamest@cci.net.au

Newcastle Space Frontier Society
Jack Dwyer
PO Box 1150
Newcastle, NSW 2300
Australia
61-24963-5037
nsfs@nssa.com.au
www.nssa.com.au//

Queensland Space Frontier Society
Noel Jackson
P.O. Box 419
Nundah Queensland 4012
Australia
61-7-3266-6324
jackson@uqconnect.net

Sydney Space Frontier Society
Wayne Short
GPO Box 7048
Sydney, NSW 2001
Australia
61-2-9150-4553
wayne_short@optusnet.com.au

University of New South Wales Space Frontier Society
Jennifer Wood
c/o Student Guild
1st Floor, East Wing
Quadrangle Building
University of New South Wales
New South Wales 2052
Australia
61-2-9746-5518
loisjw@hotmail.com

CANADA

Calgary Space Frontier Society
Paul Swift
218 - 200 Lincoln Way
Calgary, Alberta T3E 6K6
Canada
403/287-3107
pswift@home.com

Niagara Peninsula Space Frontier Society
Raymond Merrick
PO Box 172
Thorold, Ontario L2V 3Y9
Canada
905/680-9784
bessea@vaxxine.com

GERMANY

Deutsche Raumfahrtgesellschaft e.V. German Space Society
Michael Stennecken
Greta-Buenichmann-Str. 3
48155 Muenster
Germany
+49 251 3944 863
+49 251 3944 864
info@drg-nss.org
www.drg-gss.org

IRELAND

NSS Ireland
Alan Kelly
P.O. Box 6896
Dublin 2
Ireland
+353-1-87-2220425

MEXICO

Sociedad Espacial Mexicana, A.C.
Jesus Raygoza B.
Apartado Postal 5-75
Guadalajara, JALISCO 45042
Mexico
3/647-5710
semspaceorg@mixmail.com

NOTE:

This list is constantly changing. Visit **www.nss.org** for the most current chapters listing.

Paving A New Road To Space

By Brian E. Chase, NSS Executive Director

The day we've been waiting for has finally arrived. A U.S. president again has decided that the future of humanity belongs in the stars. President George Bush has set us on a path to return to the moon—this time to stay, and eventually go on to Mars and even asteroids. But will we reach that point, and how will we do so?

We certainly won't get there by building a circular firing squad. Too often we see passion for the exploration, development, and settlement of space turn into raw hostility toward those who share similar objectives but differ in methodology. Who do we really think we're convincing with behavior like that?

We stand on the threshold of the expansion of our civilization into the solar system, and we should not confine our thinking to narrow agendas that isolate us from the general public or from each other. There are many visionaries within the space advocacy movement, and it is healthy to have debate regarding our "next steps." But I see a disturbing trend to attack the ideas of other rather than work together for the common good.

The official NSS position is that we support a return to the moon first, for a variety of practical reasons. But would we have withheld support if the White House opted to go to Mars first? Absolutely not! We believe the moon is just the first step in a bold and aggressive exploration and eventual settlement of the solar system, and there are many paths to get us to that point.

The space advocacy community is too small to become fractured in a political environment consumed with critical domestic and international issues. We could take some cues from the health care, transportation, defense and other special interest and industry sectors in how we promote ourselves to policy-makers and the general public. Why don't we have organizations running issue ads and funding industry-wide Political Action Committees to get our messages across? As a sector, even combining the size and influence of major aerospace companies, we lag far behind our political competitors in virtually every area of impacting public policy and opinion.

Brian E. Chase

Yet the policy arena is just one aspect of the challenges facing us. The rubber meets the road in the business community, where everyone from the biggest federal contractor to the smallest startup company is trying to turn a profit in space. And that—not sole reliance on federal funding—is the real key to our long-term success.

But to make that a reality, entrepreneurs and advocacy organizations need to recognize the important role NASA has to play in our space exploration efforts and that, despite some needed reforms, the federal government is going to be an important partner for the foreseeable future. In turn, NASA, other federal agencies and the established aerospace industry need to recognize that free market solutions may provide critical technologies and skills to tackle some of our greatest challenges.

Finding common ground is never easy, but it's more important than ever if we are going to move forward as a nation and truly build a space-faring civilization. President Bush has given us the vision, but we have a lot of work ahead of us to make it a reality.

Ad Astra!

National Space Society Visionary Donors

Buzz Aldrin Council

Majel Barrett-Roddenberry
Paul Canolesio
Lars S. Easterson
Robert Edwards
Gregg Foote
David Peter Kapelanski
J. Michael Lekson
Charles T. Lenzmeier
Dean E. London
Mary Morss
John H. McQuilkin
Stanley J. Novak
Allan M. Schiffman & Phylis Ooi
Eric Tilenius

Individuals

Edward Apke ▪ Jack Bader ▪ Richard F. Beers ▪ Michael Cronin ▪ Stephen R. Donaldson
Michael Downey ▪ Hugh Downs ▪ Vernon Edgar ▪ Steven Goddard ▪ David R. Hamlin
David Hampton ▪ Mark Herrup ▪ Adrian S. Hooper ▪ Hugh Hotson, Jr. ▪ Robert Hunter
Dave Jacques ▪ William Jaeger ▪ Randy D. Kelley ▪ Don Kimball ▪ Jeffrey Kodosky
Georgette Koopman ▪ Ronnie LaJoie ▪ Evan Malone ▪ Eugene Montgomery ▪ James O'Neil
Frederick I. Ordway III ▪ Christopher Pancratz ▪ Ed Post ▪ Guilermo P. Rodriquez ▪ Greg Rucker
Neil Ruzic ▪ Randall Skinner ▪ Charles E. Stauble ▪ Mike Symond ▪ John A. Swanson
Eric W. Tilenius ▪ Adrian Tymes ▪ Jeffrey C. Walker ▪ Glen P. Wilson ▪ Jay Wittner

Corporations

Fisher Space Pen ▪ Lockheed Martin ▪ Raytheon ▪ SGI ▪ Space Adventures

20

TWENTIETH ANNIVERSARY OF THE **NATIONAL SPACE SYMPOSIUM**

MARCH 29 - APRIL 1 · 2004 · THE BROADMOOR · COLORADO SPRINGS

"Champions of the High Frontier" created by **Robert T. McCall** • 2003 Douglas S. Morrow Public Outreach Award Winner • www.McCallstudios.com

The year 2004 marks the Twentieth Anniversary of the **National Space Symposium,** an annual event considered the premier U.S. policy and program forum. This four-day "must do" opportunity for information and interaction on all sectors of space — commercial, civil and national security — is attended by industry leaders, military and government officials, space educators and media.

Record numbers are expected to attend.

Secure your attendance today with online registration.

www.spacesymposium.org • 800.691.4000

SPACE FOUNDATION

SPACE IS OUR FUTURE

National Space Society

http://www.nss.org • phone: 202.543.1900