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Summer Study Postscript: A 1986 Perspective

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Now that the National Commission on Space has set out bold goals and strategies for the American space program in the next 50 years, how can we turn such visions into realities? Since the *Challenger* tragedy and other space failures have brought about a crisis of confidence in NASA, what innovations are necessary to rebuild public consensus and support? What initiatives can the private sector take to promote the peaceful use of space by its exploration and industrialization? The faculty fellows from the 1984 summer study propose three possibilities for action by NASA and supporters of the space program.

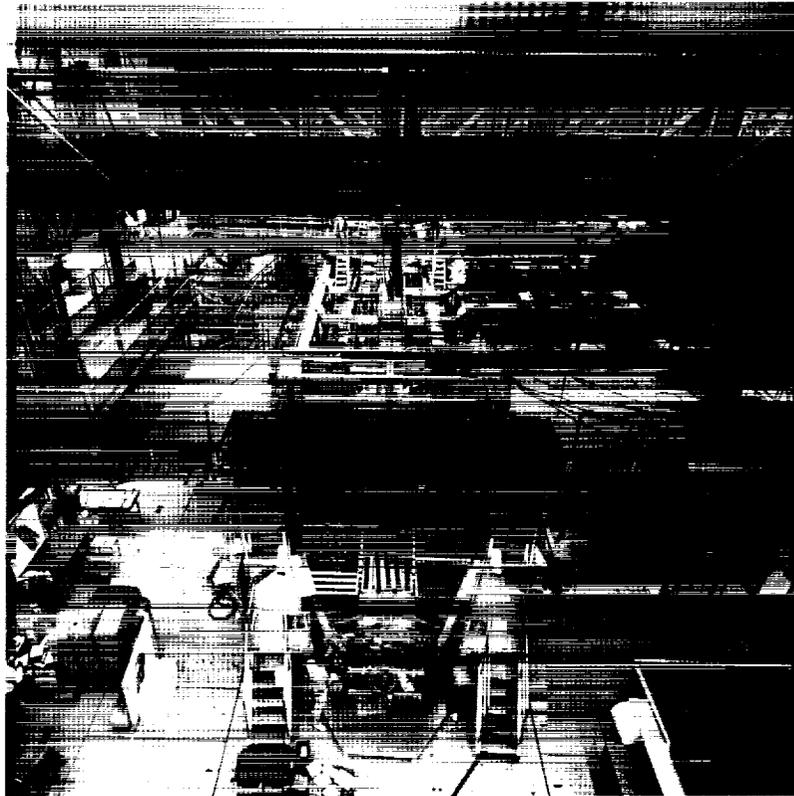
A National Lottery for Space Enterprises

Public lotteries to support exploration and civilizing ventures on new frontiers are part of the Nation's tradition. They were used by the English to support the Jamestown colonization and to open the western frontier. They have

become popular again in this century as a means of raising money for state governments. Such a lottery could alleviate the national tax burden imposed by the plans of the National Commission on Space, which they estimate to cost \$700 billion.

As a step to providing the vigorous leadership on the space frontier called for by these commissioners, either the Congress or a private consortium or a combination of public and private leaders might launch this national lottery. The first target would be to obtain funding for a fourth orbiter, to be devoted exclusively to scientific, commercial, and international use. Named "Challenger II," it would be a public memorial and expression of appreciation to the seven crewmembers who lost their lives in the first shuttle of that name. Once the Shuttle fleet was back to full capacity, the next objective might be funding for more advanced aerospace planes. Just as the Conestoga wagons and the railroad opened up new resources in the West, so will these initial vehicles on the space "highway."

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A Fourth Orbiter

The Endeavour, expected to bring NASA's Shuttle fleet to four again, is seen under construction at Rockwell's manufacturing facility in California.

Continued fundraising of this type would be designated to help underwrite the space infrastructure that will enable us to tap space resources (e.g., the construction of the space station and lunar or martian bases of operation).

How? As the National Commission on Space gathered its input, hundreds of individuals in 15 public forums contributed their ideas. Such people, along with the space advocacy groups, could provide the momentum for this National Lottery for Space Enterprises. At the

present time, there are 50 groups advocating the development of space. They have a collective membership of 300 000 and an aggregate annual budget of \$30.5 million. All these, together with other space business leaders and entrepreneurs, could provide the thrust to translate the lottery proposal into dollars for space enterprise. Readers of such magazines as *Aviation Week & Space Technology* and *Commercial Space* could be enlisted in such a campaign. Gradually, beginning with Canada, the lottery could be

extended internationally. We suggest Lee Iacocca and his leadership of the campaign to restore the Statue of Liberty as an example of the type of citizen and strategy needed in this next national endeavor. "We the people of the United States of America" can implement the goals set forth by the National Commission on Space.

A White House Conference on Space Enterprise

Another step to encourage civilian leadership in the American space program would be a White House

conference. Space planners and advocates should urge their congressional representatives to introduce a bill supporting such a convocation and calling upon the Administration to issue invitations and set an agenda. The primary purpose of the conference would be to examine ways to implement the recommendations of the National Commission on Space, thereby opening up the space frontier and improving the quality of life here on Earth. The secondary purpose would be to develop a national consensus on the peaceful and commercial exploration and utilization of space resources.



A White House Conference

The faculty fellows in this NASA summer study group urge that a White House conference be called to find ways and means to implement the recommendations of the National Commission on Space, thereby opening up the space frontier and improving the quality of life here on Earth.

Photo: Joyce C. Naltchayan

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A call by the President to carry out the space commission's goals* would boost American morale, turn our energies outward, and ensure the country's space leadership into the 21st century. To recharge the national enthusiasm for space, distinguished Americans and other guests would be invited to this conference to propose immediate and pragmatic means for reaching the commission's targets. The planners might invite corporations in the space business to join the Government in sponsoring the event. The participants would include not only space professionals but also people of competence and distinction in positions to influence the citizenry in their support of space activities. We suggest Walter Cronkite as the type of person capable of communicating the message from such a White House conference and enlisting public support. The aim would be to obtain massive media attention not only to the conference but also to its results.

The proposed White House conference might be structured on a theme set forth by the National Commission: "Stimulating space

enterprises for the direct benefit of the people on Earth." The sessions might be organized around the four parts of the commission's report—civilian space goals for 21st century America, low-cost access to the solar system, opening the space frontier in the next 20 years, American leadership on the space frontier in the next 50 years.

Reorganization of the National Aeronautics and Space Administration

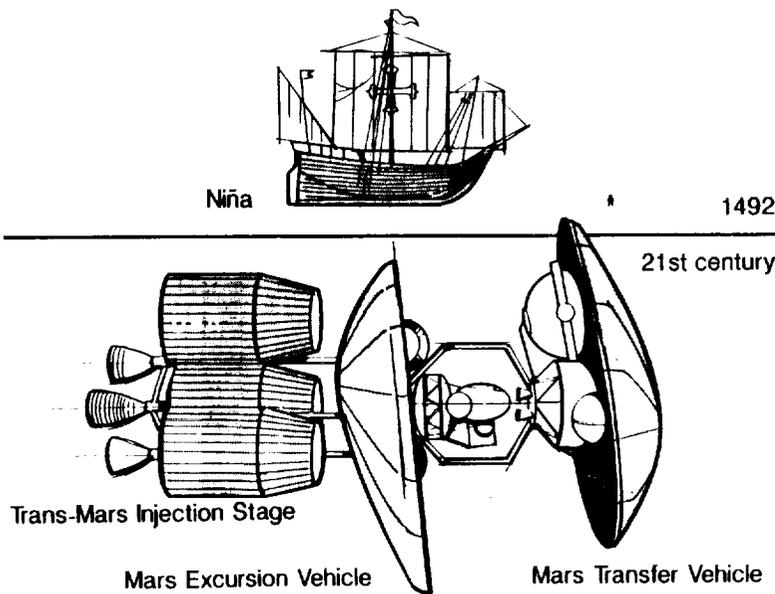
If the goals and recommendations set forth by the National Commission on Space are to be achieved, then NASA needs to be renewed and reorganized. The internal renewal of its organizational culture and management is already under way as a result of the findings of the Presidential Commission on the Space Shuttle Challenger Accident. But reorganization in the charter and structure of the agency might enable it to become more free of the Federal bureaucracy, annual budget battles, and political pressures that undermine its ability to make strides in space.

*Such a call was issued by President George Bush in his July 20, 1989, speech on the steps of the Smithsonian Air and Space Museum. Specifically, he proposed commitment to three of the Commission's twelve technological milestones in space: Space Station *Freedom*, a permanent lunar outpost, and human exploration of Mars.

In 1984, the faculty fellows of the NASA summer study recommended that legislation be passed to strengthen NASA by making it more autonomous. (Models exist in the U.S. Postal Service, the Tennessee Valley Authority, and the New York Port Authority.) By creating a National Aeronautics and Space Authority as a semiautonomous corporation, our Nation's leaders would allow the NASA budget to be set for long-term project development. The funding for research and development could be separated from that for operations. Such legislative changes might enable NASA to enter into joint ventures with the private sector in the

United States and abroad, as well as with other national space entities, so as to supplement its income beyond Government appropriations. Then, creative financing of space ventures might be discovered through the issuance of bonds or the sale of stock in limited R&D partnerships or in space trading companies. (Shades of the Dutch East India Company!) Because of the scope and complexity of space development, NASA needs to be empowered to give leadership in promoting the cooperative efforts of Government, universities, and industry in the furtherance of human enterprise in space.

Ships of Exploration



Ships of Exploration

"From the voyages of Columbus to the Oregon Trail to the journey to the Moon itself, history proves that we have never lost by pressing the limits of our frontiers," said President George Bush on the 20th anniversary of the Apollo 11 landing on the Moon. The President urged that we press the limits of our frontiers on to another planet and make a journey to Mars.

Our Niña (and Pinta and Santa Maria) might look like this: A trans-Mars injection stage, essentially large propellant tanks with rocket motors attached (Columbus' ships didn't have to carry their propellant), to propel the ship from Earth to Mars. A Mars excursion vehicle, with its aerobrake to slow the descent into Mars orbit (we, too, will make use of the "wind") and its martian lander. And a Mars transfer vehicle, also equipped with an aerobrake and much smaller rocket motors, to enter Mars orbit and bring the crew home.

Addendum: Participants

The managers of the 1984 summer study were

David S. McKay, Summer Study Co-Director and Workshop Manager
Lyndon B. Johnson Space Center

Stewart Nozette, Summer Study Co-Director
California Space Institute

James Arnold, Director
of the California Space Institute

Stanley R. Sadin, Summer Study Sponsor
for the Office of Aeronautics and Space Technology
NASA Headquarters

Those who participated in the 10-week summer study as
faculty fellows were the following:

James D. Burke	Jet Propulsion Laboratory
James L. Carter	University of Texas, Dallas
David R. Criswell	California Space Institute
Carolyn Dry	Virginia Polytechnic Institute
Rocco Fazzolare	University of Arizona
Tom W. Fogwell	Texas A & M University
Michael J. Gaffey	Rensselaer Polytechnic Institute
Nathan C. Goldman	University of Texas, Austin
Philip R. Harris	California Space Institute
Karl R. Johansson	North Texas State University
Elbert A. King	University of Houston, University Park
Jesa Kreiner	California State University, Fullerton
John S. Lewis	University of Arizona
Robert H. Lewis	Washington University, St. Louis
William Lewis	Clemson University
James Grier Miller	University of California, Los Angeles
Sankar Sastri	New York City Technical College
Michele Small	California Space Institute

Participants in the 1-week workshops included the following:

Constance F. Acton	Bechtel Power Corp.
William N. Agosto	Lunar Industries, Inc.
A. Edward Bence	Exxon Mineral Company
Edward Bock	General Dynamics
David F. Bowersox	Los Alamos National Laboratory
Henry W. Brandhorst, Jr.	NASA Lewis Research Center
David Buden	NASA Headquarters
Edmund J. Conway	NASA Langley Research Center
Gene Corley	Portland Cement Association
Hubert Davis	Eagle Engineering
Michael B. Duke	NASA Johnson Space Center
Charles H. Eldred	NASA Langley Research Center
Greg Fawkes	Pegasus Software
Ben R. Finney	University of Hawaii
Philip W. Garrison	Jet Propulsion Laboratory
Richard E. Gertsch	Colorado School of Mines
Mark Giampapa	University of Arizona
Charles E. Glass	University of Arizona
Charles L. Gould	Rockwell International
Joel S. Greenberg	Princeton Synergetics, Inc.
Larry A. Haskin	Washington University, St. Louis
Abe Hertzberg	University of Washington
Walter J. Hickel	Yukon Pacific
Christian W. Knudsen	Carbotek, Inc.
Eugene Konecci	University of Texas, Austin
George Kozmetsky	University of Texas, Austin
John Landis	Stone & Webster Engineering Corp.
T. D. Lin	Construction Technology Laboratories
John M. Logsdon	George Washington University
Ronald Maehl	RCA Astro-Electronics
Thomas T. Meek	Los Alamos National Laboratory
Wendell W. Mendell	NASA Johnson Space Center
George Mueller	Consultant
Kathleen J. Murphy	Consultant
Barney B. Roberts	NASA Johnson Space Center
Sanders D. Rosenberg	Aerojet TechSystems Company
Robert Salkeld	Consultant
Donald R. Saxton	NASA Marshall Space Flight Center
James M. Shoji	Rockwell International
Michael C. Simon	General Dynamics
William R. Snow	Electromagnetic Launch Research, Inc.
Robert L. Staehle	Jet Propulsion Laboratory
Frank W. Stephenson, Jr.	NASA Headquarters
Wolfgang Steurer	Jet Propulsion Laboratory
Richard Tanguin	University of Texas, San Antonio
Mead Treadwell	Yukon Pacific
Terry Triffet	University of Arizona
J. Peter Vajk	Consultant
Jesco von Puttkamer	NASA Headquarters
Scott Webster	Orbital Systems Company
Gordon R. Woodcock	Boeing Aerospace Company

The following people participated in the summer study as guest speakers and consultants:

Edwin E. "Buzz" Aldrin	Research & Engineering Consultants
Rudi Beichel	Aerojet TechSystems Company
David G. Brin	California Space Institute
Joseph A. Carroll	California Space Institute
Manuel I. Cruz	Jet Propulsion Laboratory
Andrew H. Cutler	California Space Institute
Christopher England	Engineering Research Group
Edward A. Gabris	NASA Headquarters
Peter Hammerling	LaJolla Institute
Eleanor F. Helin	Jet Propulsion Laboratory
Nicholas Johnson	Teledyne Brown Engineering
Joseph P. Kerwin	NASA Johnson Space Center
Joseph P. Loftus	NASA Johnson Space Center
Budd Love	Consultant
John J. Martin	NASA Headquarters
John Meson	Defense Advanced Research Projects Agency
Tom Meyer	Boulder Center for Science and Policy
John C. Niehoff	Science Applications International
Tadahiko Okumura	Shimizu Construction Company
Thomas O. Paine	Consultant
William L. Quaide	NASA Headquarters
Namika Raby	University of California, San Diego
Donald G. Rea	Jet Propulsion Laboratory
Gene Roddenberry	Writer
Harrison H. "Jack" Schmitt	Consultant
Richard Schubert	NASA Headquarters
Elie Shneur	Biosystems Associates, Ltd.
Martin Spence	Shimizu Construction Company
James B. Stephens	Jet Propulsion Laboratory
Pat Sumi	San Diego Unified School District
Robert Waldron	Rockwell International
Simon P. Worden	Department of Defense
William Wright	Defense Advanced Research Projects Agency