Space Congress Programs

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1984 Twenty-First Space Congress Program

Canaveral Council of Technical Societies

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Cocoa Beach, Florida April 24, 25, 26, 1984
CHAIRMAN’S 
MESSAGE

The objective of the Twenty-First Space Congress is to present a series of up-to-the-minute presentations on Space Technology. This year’s theme, “New Opportunities in Space,” underscores a growth industry with dynamic challenges, vitality, and competition.

The Space Shuttle is fulfilling its promise as an economical and reliable vehicle to deliver payloads to orbit. The development phase has been an unparalleled success. This year, however, the focus is shifting to the operational phase where the name of the game is to increase the launch rate dramatically while holding cost to reasonable levels. This must be done without compromising reliability. The cost of future Shuttle operations will determine the ultimate demand for payload space—hence the potential benefits to mankind. Achieving higher levels of efficiency in Shuttle processing and flight operations becomes of paramount importance and is the subject of a featured panel. You can look forward to a stimulating discussion of new methodology, techniques, goals and objectives and expected results.

Space represents a new frontier in military science and technology and, as such, may play an expanding role in defensive and offensive strategy and systems. A Department of Defense panel comprised of senior officers and experts in military space will review current activities and future projects.

Finally, as the nation embarks on the next major initiative in space — The Space Station — it is appropriate to examine the planning for this bold venture. The Space Congress will present a select panel discussion of Space Station missions, schedules, scientific usefulness and key technologies.

Paper sessions which complement the panel discussions are listed in the pages to follow. They cover a broad range of topics from “Machines to Augment Man” to “Commercialization of Space.”

I urge you to make it a point to visit the Exhibit Center at the Crossway Inn where state-of-the-art technology of major corporations is on display. As in the past, a secondary school science fair, featuring exhibits by a host of bright young students, will be held in conjunction with the Congress.

Russell M. Barnes 
General Chairman 
Twenty-First Space Congress
GENERAL INFORMATION

HEADQUARTERS/REGISTRATION

Headquarters for the Twenty-first Space Congress is the Holiday Inn, Cocoa Beach. Registration will take place in the Dolphin Room from noon to 5:00 p.m. Monday, April 23, 1984. Registration will continue from 7:00 a.m. to 5:00 p.m. on Tuesday and Wednesday, and from 8:00 a.m. to 1:00 p.m. on Thursday.

PACKAGE REGISTRATION ........................................ $75.00
(Includes four items listed below)
Tuesday Banquet ........................................... 20.00
Thursday Luncheon ........................................ 8.00
Bound Copy of Proceedings ............................... 30.00
Sessions ....................................................... 25.00

Package registration will save you money; however, each item may be purchased individually at the listed price. Individual papers in the proceedings will be available at a cost of $0.10 per page.

PRESS ROOM

Press headquarters is in the Pelican Room of the Holiday Inn and is staffed and directed by Pat Hicks from 12 noon to 5:00 p.m. on Monday and from 8:00 a.m. to 5:00 p.m. on Tuesday, Wednesday and Thursday. The telephone number in the press headquarters is (305) 783-2631.

MESSAGE/LOCATOR ASSISTANCE

The sponsoring organization, the Canaveral Council of Technical Societies (CCTS), assists attendees by maintaining a message board. Registrants who wish to leave lodging and local phone information can do so by turning in locator forms, available at the Registration Desk, to the CCTS/Message/Locator Desk located in the Dolphin Room, Holiday Inn, or by phone to 783-2642 or 783-5375.

PROCEEDINGS

The proceedings of the Twenty-first Space Congress are available at the registration desk in the Holiday Inn during the Space Congress. After the close of the Space Congress, additional proceedings can be purchased for $35 each plus postage from Secretary, CCTS, Post Office Box 245, Cape Canaveral, Florida 32920.

EXHIBITS

Exhibits will include displays of the Space Shuttle, Shuttle payloads and communications satellites. The exhibit hall will be open from 11:00 a.m. to 7:30 p.m. on Tuesday, from 11:00 a.m. to 7:45 p.m. on Wednesday, and from 9:00 a.m. to 1:00 p.m. on Thursday. Representatives of the exhibits will be in attendance to assist and inform visitors. The exhibit hall is located at the Crossway Inn, 3901 N. Atlantic Ave. (A1A), Cocoa Beach.

The exhibit center is open to the general public at no charge. A free Shuttle Bus is available on a 30-minute schedule from the registration area, Holiday Inn, to the Beach Theater and the exhibit area in the Crossway Inn.

EXHIBITORS

Boeing Aerospace Co.
Bravard Community College
Canaveral Council of Technical Societies
EG&G Florida Inc.
Florida Institute of Technology
Grumman Aerospace Co.
Harris Corporation
International Business Machines Corporation
Lockheed Missiles and Space Co.
McDonnell Douglas Corporation
Morton Thiokol Inc.
Northrop Services, Inc.
Pan Am World Services, Inc.
Planning Research Corporation
Rockwell International Corporation
The Space Coast Tourism Committee
TRW Inc.
United Technologies Corporation
Wyle Laboratories

ATTRACTION CENTERS

Late April in Florida is a delightful time of the year for the entire family. The weather is pleasant, the hardy find the Atlantic warm enough for swimming, and the tourist attractions are not yet crowded. Cocoa Beach offers a long stretch of swimming beach, surfing areas, and both deep-sea and shore fishing. One day Sea Escape adventures can be enjoyed from Port Canaveral. Bus tours of the Kennedy Space Center and Cape Canaveral Air Force Station are available from the KSC Visitors Center where a free exhibit-filled space museum can be enjoyed by both children and adults. Within one to two hours drive are - a world of vacation fun in the Magic Kingdom of Walt Disney World and Epcot - Sea World, one of America's finest marine attractions - the mystery and excitement of Africa in Busch Gardens - the famed Glass Bottom boats at Silver Springs - the beautiful gardens and daily water ski revue with lovely aquamarina at Cypress Gardens - or see the show and be a performer at Circus World.

THE MAP BELOW GIVES THE LOCATION OF VARIOUS ATTRACTIONS.
YOUTH SCIENCE FAIR

Science fair displays and demonstrations from local secondary school students will be open to the public from 7:00 a.m. to 7:30 p.m. on Tuesday, and 7:00 a.m. to 7:45 p.m. on Wednesday. The Thursday schedule is from 8:00 a.m. to 1:00 p.m. All Youth Science Fair activities will take place in the Dolphin Room of the Cocoa Beach Holiday Inn. Judging will be conducted from 8:00 a.m. to 12:30 p.m. on Wednesday, April 25. The awards will be presented to the winners at the 8:00 p.m. "Meet the Astronauts" panel session to be held at the Beach Theater on Wednesday.

PIONEERS' DAY

The Pioneers' Banquet '84 will be held on Friday, April 27, at the Officers Open Mess, Patrick Air Force Base.

Speaker: Mr. Lee R. Scherer, Director
Commercial Space
General Dynamics Convair Division

Social Hour 6:30 p.m.
Dinner 7:30 p.m.

Registration is April 24, 25 and 26 at the Holiday Inn, Cocoa Beach, and 2:00 to 6:30 p.m. at the Officers Open Mess on April 27.

CANAVERAL COUNCIL OF TECHNICAL SOCIETIES

Air Force Association
American Society for Quality Control
American Institute of Aeronautics and Astronautics
American Welding Society
American Institute of Architects
American Society for Training and Development
American Institute of Industrial Engineers
Armed Forces Communications Electronics Association
American Meteorological Society
Coalition of Aerospace Professional Engineers
American Society of Civil Engineers
Florida Engineering Society
American Society of Heating, Refrigeration and Air Conditioning Engineers
Institute of Electrical and Electronic Engineers
American Society for Industrial Security
Missile, Space and Range Pioneers, Inc.
American Society of Mechanical Engineers
National Contract Management Association
American Society of Photo Optical Instrumentation Engineers
Society of the Advancement of Material and Process Engineering
American Society of Safety Engineers
Society of Logistics Engineers
Society for Technical Communication

Many of the societies will have educational/promotional brochures/information on display at the CCTS Desk. Attendees are invited to stop by and review this material.

TWENTY-FIRST SPACE CONGRESS COMMITTEE

GENERAL CHAIRMAN
Russ Barnes
Pan Am World Services, Inc.

VICE CHAIRMAN
Don Capone
NASA

ASSISTANT TO CHAIRMAN
Don McLamb
Pan Am World Services, Inc.

FINANCE
Dwight Easterly
TRW

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TECHNICAL PAPERS
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LOCAL ACCOMMODATIONS
Gail Galloway
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LOCAL SUPPORT
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PUBLICATIONS/GRAPHICS
Jackie Cooper
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PUBLICITY
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Ray Cheedle
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DBA Systems, Inc.

CCTS
Dorsey Dean
General Dynamics Convair

ADVISOR
Janet Bonder
PRC Systems Services
TUESDAY, APRIL TWENTY-FIRST

KEYNOTE ADDRESS (8:30 a.m. to 9:00 a.m.)
Beach Theater

Introduction: Mr. Russ Barnes
Speaker: Congressman Bill Nelson

Bill Nelson serves as a member of the Budget Committee and the Science and Technology Committee in the House of Representatives. He was elected to the 96th Congress in November 1978 and subsequently re-elected in 1980 and 1982.

Bill attended public schools in Brevard County, Florida and graduated from Melbourne High School in 1960. He attended the University of Florida and graduated with a Bachelor of Arts from Yale. He received a Juris Doctor Degree from the University of Virginia and was admitted to the Florida Bar in 1968.

Bill was a Captain in the United States Army Reserve where he served from 1965 to 1971 and was on active military duty from 1968 to 1970.

He was elected to three terms in the Florida House of Representatives beginning in 1972.

Bill is a member of the Kiwanis Club, the Jaycees, and is a Master Mason. He and his family attend the Tabernacle Church in Melbourne and the National Presbyterian Church in Washington.

Bill has been honored by the Florida Jaycees as one of the Five Outstanding Young Men of Florida in 1975 and nominated as the most valuable member of the Florida House of Representatives in 1976. Two Florida colleges have conferred upon him honorary degrees - a Doctor of Laws from Rollins College and a Doctor of Science from Florida Institute of Technology.

He is married to the former Grace Cavert of Jacksonville. They have two children, Billy and Nan Ellen.
B. MACHINES TO AUGMENT MAN
Holiday Inn, Manatee Rooms A&B

Session Chairperson: Dr. David Flinchbaugh, Senior Staff Specialist, McDonnell Douglas Astronautics Co., Titusville, FL
Session Organizer: Mr. Tom C. Davis, Jr., NASA, Kennedy Space Center, FL.

1. Advanced Teleoperation in Nuclear Applications
   Dr. William R. Hamel, Oak Ridge National Labs, Oak Ridge, TN

2. Advanced Control Techniques for Teleoperation in Space
   Dr. Antal Bejczy, Automated Systems Section, Jet Propulsion Labs, Pasadena, CA

3. Robotics and Research Development for Applications
   Mr. Russell L. Werneth, Naval Weapons Center, White Oak/Silver Springs, MD

4. Electronic Countermeasures
   Mr. George A. Spellman, Sr. Associate Principal Engineer, Government Satellite Communications Division, Harris Corporation, Melbourne, FL

5. ACTS Flight System: Cost Effective Advanced Communication Technology
   Mr. W. M. Holmes, Jr., TRW Electronics & Defense, Electronics Systems Group, Redondo Beach, CA
   and
   Mr. George A. Beck, RCA Government Systems Div., ASTRO-Electronics, Princeton, NJ

6. Satellite Communications Network Control in the Presence of Electronic Countermeasures
   Mr. Marc I. Spellman, Sr. Associate Principal Engineer, Government Satellite Communications Division, Harris Corporation, Melbourne, FL

C. SPACE COMMUNICATIONS
Holiday Inn, Manatee Rooms C&D

Session Chairperson: Mr. Leon F. Blachowicz, Vice President-Engineering, Government Satellite Communications Division, Harris Corp., Melbourne, FL
Session Organizer: Mr. Raymond J. Cerrato, NASA, Kennedy Space Center, FL.

1. Space Communications Overview – 1945 to 1995
   Mr. Leon F. Blachowicz, Vice President-Engineering, Government Satellite Communications Division, Harris Corporation, Melbourne, FL

2. ACTS Flight System: Cost Effective Advanced Communication Technology
   Mr. W. M. Holmes, Jr., TRW Electronics & Defense, Electronics Systems Group, Redondo Beach, CA
   and
   Mr. George A. Beck, RCA Government Systems Div., ASTRO-Electronics, Princeton, NJ

3. Space Station Communications
   Dr. Joel G. Smith, Manager, TDA Technology Development, Jet Propulsion Labs, Pasadena, CA

4. Tracking Accelerating Spacecraft Signals with the Wide Dynamic Demodulator
   Mr. Frank R. Leslie, Associate Principal Engineer, Government Data Communications Div., Harris Corporation, Melbourne, FL

5. Rescue in Space – TDRS Flight
   Mr. Emery I. Reeves, Vice President/Manager, Spacecraft Engineering Div., TRW Electronics & Defense, Redondo Beach, CA

SPACE CONGRESS BANQUET
Officer’s Club, Patrick Air Force Base

Cocktails: 7:00 p.m. to 8:00 p.m.
Banquet: 8:00 p.m.

Introduction: Mr. Russ Barnes
Speaker: Mr. Philip E. Culbertson, Associate Deputy Administrator, NASA, Washington, DC

Philip E. Culbertson is the Associate Deputy Administrator, National Aeronautics and Space Administration. He was appointed to this position in November 1981. He serves as senior staff advisor to the Administrator and the Deputy Administrator and directs NASA’s efforts to formulate policy, strategy and planning of a facility providing the permanent presence of the United States in space.

From 1979 to November 1981, he served as Assistant for Space Transportation System. He provided the Administrator and Deputy Administrator continuous assessment of STS Development, Acquisition and Operations status; forecasted potential problems affecting resources, performance or schedule; prepared analyses and other papers relating to the STS for use by the Administrator and Deputy Administrator in communication with the Executive Office, Congress and other offices within the government and industry; and otherwise advised the Administrator and Deputy Administrator on STS matters requiring policy decisions.

Prior to this assignment, he was Deputy Associate Administrator for Space Transportation Systems (Technical). Earlier assignments within NASA include the positions of Assistant Administrator for Planning and Program Integration, Director of Advanced Manned Missions, and Manager of the Institutional Assessment conducted in 1977. He also served as the NASA representative in the 1979 A-Set treaty negotiations and in 1976 and 1977 was detailed to the Executive Office for a five-month period as Executive Director of the President’s Committee on Science and Technology.

Mr. Culbertson came to NASA in September 1965 from General Dynamics/Convair, where he spent eleven years in key technical management and engineering positions associated with aerospace activities.

Mr. Culbertson was born at Colfax, Washington. He attended State College of Washington, Pullman, Washington; Millsaps College, Jackson, Michigan; and received a B.S. degree in aeronautical engineering from Georgia Tech. He served as a commissioned officer in the U.S. Navy following which he spent four years at the University of Michigan as a research associate and received a Master of Science degree in aeronautical engineering.

He and his wife, Shirley, reside in McLean, Virginia. They have a daughter, Camden, and a son, Philip, Jr.
PAPER SESSIONS II (1:00 p.m. to 4:00 p.m.)

A. FLIGHT AND GROUND OPERATIONS

Beach Theater

Session Chairperson: Mr. Thomas E. Utman, Director of Shuttle Management & Operations, NASA, Kennedy Space Center, FL
Session Organizer: Mr. William F. Huseneca, NASA, Kennedy Space Center, FL

1. Delta Ignition in Launch - Closed Loop Feedback
   Mr. Philip W. Payne, Director, Launch Sites, McDonnell Douglas Astronautics Co., Kennedy Space Center, FL

2. Airline Enhancements for Shuttle Ground Turnaround
   Mr. T. S. Gourley, Director, Process Planning & Control, Pan Am World Services, Inc., Kennedy Space Center, FL
   and
   Mr. Robert F. Tiney, Manager, Operations Analysis, Pan Am World Services, Inc., Kennedy Space Center, FL

3. The Evolution, as Anticipated by LDGC, of Ground Operations from Current Turnaround Flow to the Baseline 28 Days Flow
   Mr. John Sanen, Deputy Program Manager, Lockheed Space Operations Company, Kennedy Space Center, FL

   Mr. John D. Holt, Chief, Payload and Operations Support Branch, NASA, Johnson Space Center, Houston, TX
   and
   Mr. David A. Beckman, Payload & Operations Support Branch NASA, Johnson Space Center, Houston, TX

5. Shuttle Operations & Planning Complex: Its Role in the Consolidated Space Operations Complex
   Major Harold S. Hardwick, Chief, Flight Control Division, Flight Support & Training Directorate, Manned Space Flight Support Group, Johnson Space Center, Houston, TX

6. Advanced Space Transportation System Operations Study
   Mr. Clement D. DiLoreto, Manager, Advanced Programs, Martin Marietta Aerospace, Kennedy Space Center, FL

7. Payload On-Orbit Refueling Using the SPS
   Mr. Don A. Moldgaard, Senior Staff Engineer, TRW Space & Technology Group, Redondo Beach, CA

B. SPACE STATION TECHNOLOGY

Holiday Inn, Manatee Rooms AA & BB

Session Chairperson: Mr. James L. Hirtt, Manager, Scientific Satellite Systems, TRW, Redondo Beach, CA
Session Organizer: Mrs. Fran Harding, Manager, Customer and Public Relations, TRW Space & Technology Group, Redondo Beach, CA

1. A Miniatized Cassegrainian Concentrator Solar Array for High Power Space Applications
   Mr. Robert E. Patterson, TRW Space & Technology Group, Redondo Beach, CA
   and
   Mr. Richard M. Kurland, TRW Space & Technology Group, Redondo Beach, CA

2. Space Station Active Thermal Control Technical Considerations
   Mr. William E. Ellis, Chief, Systems Engineering Branch, Johnson Space Center, Houston, TX

   Dr. L. Bernard Garrett, NASA, Langley Research Center, Hampton, VA

4. Power Generation and Energy Storage Consideration for Space Station
   Mr. Gerald J. Beza, Manager, Space Station Office, NASA, Lewis Research Center, Cleveland, OH
   and
   Mr. R. B. Burns, Manager, Power & Propulsion Office, NASA, Lewis Research Center, Cleveland, OH

5. Focusing Life Support Technology for Space Station
   Mr. Merlen Schreml, Product Marketing Manager, Hamilton Standard, Windsor Locks, CT

6. The Space Station Data System and the UOP
   Mr. Larry H. Kasuka, Branch Chief - System Requirements, McDonnell Douglas Astronautics Co., Huntington Beach, CA

C. INNOVATIVE TECHNOLOGY APPLICATIONS

Holiday Inn, Manatee Rooms C&D

Session Chairperson: Dr. Michael W. Vannier, Assistant Professor of Radiology, The Edward Mallinckrodt Institute of Radiology, St. Louis, MO
Session Organizer: Mr. Robert L. Butterfield, NASA, Kennedy Space Center, FL
1. NASA Image Processing Technology Applied to Medicine: Ten Unsolved Problems in Medical Imaging
   Dr. Michael W. Vannier, Assistant Professor of Radiology, The Edward Mallinckrodt Institute of Radiology, St. Louis, MO
   and Ronald G. Evens, M.D., Professor and Director, The Edward Mallinckrodt Institute of Radiology, St. Louis, MO

2. Magnetic Refrigeration: The Promise and the Problems
   Dr. John A. Barclay, Project Leader, Los Alamos National Laboratory, Los Alamos, NM

3. Graphical Programming of Robots
   Dr. Donald Gayou, Specialist, CAD/CAM, McDonnell Douglas Automation Co., St. Louis, MO

4. Meteorological Interactive Data Display System (MIDDS)
   Lt. Col. John W. Oliver, Staff Meteorologist, Patrick Air Force Base, FL
   and Maj. John E. Erickson, Staff Meteorologist Office, Patrick Air Force Base, FL

EXHIBIT CENTER COCKTAIL RECEPTION (4:30 to 6:00 p.m.)
Crossway Inn Convention Center
The reception is open to general public (cash bar)

PANEL SESSION III (8:00 p.m. to 9:30 p.m.)
Beach Theater
MEET THE ASTRONAUTS

Session Chairperson: Mr. Richard G. Smith, Center Director, NASA, Kennedy Space Center, FL

A panel open to the general public with several astronauts and payload specialists discussing present and future activities for men and women in space.

THURSDAY, APRIL 26, 1984
PANEL SESSION IV (8:30 a.m. to 11:30 a.m.)
Beach Theater
SPACE STATION & OTHER NEW PROGRAMS

Session Chairperson: Mr. Philip E. Culbertson, Associate Deputy Administrator, NASA Headquarters, Washington, DC
Session Organizer: Mr. Edward D. Bretzius, Mgr. Test Engineering, Lockheed Space Operations Co., Kennedy Space Center, FL

MEMBERS:
Mr. Philip E. Culbertson, Associate Deputy Administrator, NASA Headquarters, Washington, D.C.
Mr. Richard F. Carlisle, Manager, Space Station Systems Office, Space Systems Div., OAST, NASA Headquarters, Washington, DC
Mr. David Wensley, Chief Program Engineer, Space Station McDonnell Douglas Astronautics Corp., Huntington Beach, CA
Mr. Richard L. Kline, Director, Shuttle Application/Space Station Program, Grumman Aerospace Corp., Bethpage, NY
Mr. Ivan Bekey, Director, Advanced Programs Office, Office of Space Flight, NASA Headquarters, Washington, DC

LUNCHEON (11:45 a.m.)
Holiday Inn, Manatee Room

Introduction: Mr. Russ Barnes
Speaker: Mr. Gerald D. Griffin, Director, Lyndon B. Johnson Space Center, NASA, Houston, TX

Mr. Griffin assumed the post of Director of the NASA Lyndon B. Johnson Space Center in Houston, Texas on August 8, 1982.

Mr. Griffin was born in Athens, Texas. He received a bachelor's degree in aeronautical engineering from Texas A&M University in 1956 and served 4 years as an officer in the U.S. Air Force. Following military service Mr. Griffin was employed as an aerospace engineer with Douglas Aircraft Co., the Lockheed Missile and Space Company, and General Dynamics. He joined NASA in 1964 and served continuously until 1981 when he left NASA to become Vice President for Systems Engineering and Management, Scott Sciences and Technology, Inc., Lancaster, California. He rejoined NASA in 1982.

Mr. Griffin has served NASA in a variety of important and challenging positions. From 1977 to 1981, he was the Deputy Director of the Kennedy Space Center, Florida. From July 1980 to June 1981 he concurrently served as Associate Administrator for External Relations at NASA Headquarters in Washington. Mr. Griffin was Deputy Director of the Dryden Flight Research Center, Edwards, California, from 1976 to 1977. At NASA Headquarters he was Deputy Associate Administrator for Manned Spaceflight (Operations) from 1975 to 1976, and from 1973 to 1975 served as Assistant Administrator for Legislative Affairs.

Prior to his first Headquarters assignment, he was a Flight Director in Mission Control on all 11 Apollo missions. He was lead Flight Director on Apollos 12, 15 and 17. He was also involved in all of the Gemini flights as a flight controller. He joined the NASA Johnson Space Center (then the Manned Spacecraft Center) in 1964. During his career he has received many honors and awards.

Mr. Griffin is married to the former Sandra "Sandy" Jo Huber. He and his wife have a son and a daughter.
PAPER SESSION III (2:00 p.m. to 5:00 p.m.)

A. FUTURE SPACE: TRANSPORTATION AND MISSIONS
   Beach Theater

   Session Chairperson: Mr. Paul F. Holloway, Director for Space, NASA, Langley Research Center, Hampton, VA
   Session Organizer: Mr. Thomas A. Feaster, NASA, Kennedy Space Center, FL

   1. Shuttle Derived & Heavy Lift Launch Vehicles
      Mr. William R. Marshall, Director, Program Development, Marshall Space Flight Center, AL

   2. Future Space Transportation: The Next Step Beyond STS
      Mr. Robert Tewell, Manager, Vehicle Systems, Martin Marietta Aerospace, Michoud Division, New Orleans, LA
      and
      Mr. Samuel P. Bronson, Sr. Engineer, Mission Analysis, Martin Marietta Aerospace, Michoud Division, New Orleans, LA

   3. Orbital Maneuvering Vehicle (OMV) Missions Applications and Systems Requirements
      Mr. David C. Cramblit, Deputy Manager, OMV Task Team, NASA, Marshall Space Flight Center, AL
      and
      Mr. William G. Huber, Manager, OMV Task Team, NASA, Marshall Space Flight Center, AL

   4. Transportation Systems in the Space Station Era
      Mr. P. H. Bialla, General Dynamics/Convair Div., San Diego, CA

   5. An Evolutionary GEO Transportation System
      Mr. Gideon Markus, Senior System Development Engineer, McDonnell Douglas Astronautics Co., Huntington Beach, CA

      Mr. Edward A. Gabris, Transportation Systems, NASA Headquarters, Washington, DC
      and
      Mr. Delma C. Freeman, Jr., Analysis Engineer Team Leader, Space Systems Division, Langley Research Center, Hampton, VA

   7. Orbital Transfer Vehicle
      Mr. Robert E. Austin, Advanced Systems Office, NASA, Marshall Space Flight Center, AL

B. STS FLIGHT EXPERIMENTS
   Holiday Inn, Manatee Rooms, A&B

   Session Chairperson: Mr. Michael J. Sander, Director, Spacelab Flight Division, NASA Headquarters, Washington, DC
   Session Organizer: Mr. James A. Aliberti, NASA, Kennedy Space Center, FL

   1. NUSAT — The First Getaway Special Free-Flying Satellite
      Mr. R. Gilbert Moore, Special Programs Manager, Morton Thiokol, Brigham City, UT

   2. STS 41-D Solar Array Flight Experiment
      Mr. Gary F. Turner, Manager, Solar Array Programs, Lockheed Missiles & Space Co., Inc., Sunnyvale, CA
      and
      Mr. Henry C. Hill, Manager, Solar Array Flight Experiment, NASA, Marshall Space Flight Center, AL

   3. STS Flight Experiments Database
      Mr. Lott W. Brantley, Jr., Preliminary Design, Electrical Systems Branch Chief, NASA, Marshall Space Flight Center, AL

   4. Capture of Uncontrolled Satellites — A Flight Demonstration
      Mr. Herbert M. Lenox, Aerospace Engineer, NASA, Marshall Space Flight Center, AL

C. COMMERCIALIZATION OF SPACE
   Holiday Inn, Manatee Rooms C&D

   Session Chairperson: Mr. David J. Stoddard, President, American Society of Aerospace Pilots, Schaumburg, IL
   Session Organizer: Mr. Sam Beddingfield, NASA, Kennedy Space Center, FL

   1. Commercial Use of Space
      Mr. Llewellyn J. Evans, Jr., Director, Commercialization Task Force, NASA Headquarters, Washington, DC

   2. Opportunity for Commercial Participation in Materials Processing
      Mr. Kenneth R. Taylor, Preliminary Design, Marshall Space Flight Center, AL

   3. Electrophoresis in Space
      Mr. James T. Rose, McDonnell Douglas Corp., St. Louis, MO

   4. American Society of Aerospace Pilots Space Commercial Initiatives
      Mr. David Koch, National Chairman, American Society of Aerospace Pilots, Schaumburg, IL

   5. Space Development: The Strategic Implications
      Capt. James H. Sloan, Satellite Support Systems Engineering, Los Angeles Air Force Station, Sunnyvale, CA
PROGRAM SUMMARY

MONDAY, April 23
12:00 noon to 5:00 p.m.  REGISTRATION DESK OPEN
Holiday Inn Dolphin Room

TUESDAY, April 24
7:00 a.m.  REGISTRATION DESK OPENS
Holiday Inn Dolphin Room
7:00 a.m. to 7:30 p.m.  YOUTH SCIENCE FAIR
Holiday Inn Dolphin Room
8:30 a.m.  KEYNOTE ADDRESS
Beach Theater
9:00 a.m. to 11:30 a.m.  PANEL SESSION I – DEPARTMENT OF DEFENSE PROJECTS
Beach Theater
11:00 a.m. to 7:30 p.m.  EXHIBITS
Crossway Inn Convention Center
1:00 p.m. to 4:00 p.m.  PAPER SESSION I:
A. INTERNATIONAL AEROSPACE PROGRAMS
Beach Theater
B. MACHINES TO AUGMENT MAN
Holiday Inn Manatee Rooms A&B
C. SPACE COMMUNICATIONS
Holiday Inn Manatee Rooms C&D
5:00 p.m.  REGISTRATION DESK CLOSES
7:00 p.m.  BANQUET SOCIAL HOUR
Patrick Air Force Base Officers
Open Mess
8:00 p.m.  BANQUET
Patrick Air Force Base Officers
Open Mess

WEDNESDAY, April 25
7:00 a.m.  REGISTRATION DESK OPENS
Holiday Inn Dolphin Room
7:00 a.m. to 7:45 p.m.  YOUTH SCIENCE FAIR
Holiday Inn Dolphin Room
8:30 a.m. to 11:30 a.m.  PANEL SESSION II – EFFICIENCY AND ECONOMY IN SPACE OPERATIONS
11:00 a.m. to 7:45 p.m.  EXHIBITS
Crossway Inn Convention Center

THURSDAY, April 26
8:00 a.m.  REGISTRATION DESK OPENS
Holiday Inn Dolphin Room
8:30 a.m. to 11:30 a.m.  PANEL SESSION IV – SPACE STATION AND OTHER NEW PROGRAMS
Beach Theater
8:00 a.m. to 1:00 p.m.  YOUTH SCIENCE FAIR
Holiday Inn Dolphin Room
9:00 a.m. to 1:00 p.m.  EXHIBITS
Crossway Inn Convention Center
11:45 a.m. to 1:00 p.m.  SPACE CONGRESS LUNCHEON
Holiday Inn Manatee Rooms
1:00 p.m.  REGISTRATION DESK CLOSES
2:00 p.m. to 5:00 p.m.  PAPER SESSION III:
A. FUTURE SPACE: TRANSPORTATION AND MISSION
Beach Theater
B. STS FLIGHT EXPERIMENTS
Holiday Inn Manatee Rooms A&B
C. COMMERCIALIZATION OF SPACE
Holiday Inn Manatee Rooms C&D

FRIDAY, April 27
6:30 p.m.  MISSILE, SPACE, AND RANGE PIONEERS’ ANNUAL REUNION BANQUET
Patrick Air Force Base Officers
Open Mess
ACKNOWLEDGEMENTS

The Twenty-First Space Congress gratefully acknowledges the special support of the following organizations:

Air Force Eastern Space and Missile Center
Barnet Bank
Beach Theater and Draft House
Belk Lindsey
Boeing Services International, Inc.
Brevard Community College
Brevard County School Board
Communicable
Computer Sciences Corporation
Crossway Inn
Eastern Airlines
EG&G Florida Inc.
First American Bank and Trust
First Bankers
Florida Institute of Technology
Florida Solar Energy Center
Florida TV Cable, Inc.
General Dynamics Corporation
Grumman Technical Services, Inc.
Harris Corporation
Holiday Inn of Cocoa Beach
Hughes Aircraft Company
IBM
Lockheed Space Operations Company
Martin Marietta Aerospace
McDonnell Douglas Corporation
Morton Thiokol Inc.
Mousetrap
National Aeronautics and Space Administration
Newspapers: SUN, BREVARD SENTINEL, SENTINEL STAR, and TODAY
Pan Am World Services, Inc.
Patrick Officers Open Mess
PRC Systems Services
RCA Service Company
Radio Stations: WEZY, WJZX, WMEL, WMMB/WYRL, WCKS, WCWR, WATX/WAMT, WWBC, WRKT
Rockwell International Corporation
Southeast Bank
SPAR Aerospace Ltd.
Television Stations: WEST-TV, WCPX-TV, WFTV, WMOD, WMFE-TV, WOFL
TRW, Inc.
The American Bank
TWA Services, Inc.
United Space Boosters, Inc. (USBI)
United Technologies Hamilton Standard
United Technologies Chemical Systems
U.S. Navy, Naval Ordnance Test Unit