U.S. Department of Justice

Federal Bureau of Investigation
Washington, D.C. 20535

June 17, 2021

MR. JOHN GREENEWALD JR.
SUITE 1203
27305 WEST LIVE OAK ROAD
CASTAIC, CA 91384-4520

FOIPA Request No.: 1385943-000
Subject: CAMERON, EDWIN NEAL

Dear Mr. Greenewald:

The enclosed documents were reviewed under the Freedom of Information/Privacy Acts (FOIPA), Title 5, United States Code, Section 552/552a. Below you will find check boxes under the appropriate statute headings which indicate the types of exemptions asserted to protect information which is exempt from disclosure. The appropriate exemptions are noted on the enclosed pages next to redacted information. In addition, a deleted page information sheet was inserted to indicate where pages were withheld entirely and identify which exemptions were applied. The checked exemption boxes used to withhold information are further explained in the enclosed Explanation of Exemptions.

Section 552		**Section 552a**
☑ (b)(1)	☐ (b)(7)(A)	☐ (d)(5)
☐ (b)(2)	☐ (b)(7)(B)	☐ (j)(2)
☑ (b)(3)	☑ (b)(7)(C)	☐ (k)(1)
50 U.S.C, § Section 3024(i)(1)	☐ (b)(7)(D)	☐ (k)(2)
	☑ (b)(7)(E)	☐ (k)(3)
	☐ (b)(7)(F)	☐ (k)(4)
☐ (b)(4)	☐ (b)(8)	☐ (k)(5)
☐ (b)(5)	☐ (b)(9)	☐ (k)(6)
☑ (b)(6)		☐ (k)(7)

154 pages were reviewed and 48 pages are being released.

Please see the paragraphs below for relevant information specific to your request as well as the enclosed FBI FOIPA Addendum for standard responses applicable to all requests.

☑ Document(s) were located which originated with, or contained information concerning, other Government Agency [OGA].

- ☐ This information has been referred to the OGA(s) for review and direct response to you.
- ☑ We are consulting with another agency. The FBI will correspond with you regarding this information when the consultation is completed.

Please refer to the enclosed FBI FOIPA Addendum for additional standard responses applicable to your request. **"Part 1"** of the Addendum includes standard responses that apply to all requests. **"Part 2"** includes additional standard responses that apply to all requests for records about yourself or any third party individuals. **"Part 3"** includes general information about FBI records that you may find useful. Also enclosed is our Explanation of Exemptions.

For questions regarding our determinations, visit the www.fbi.gov/foia website under “Contact Us.” The FOIPA Request Number listed above has been assigned to your request. Please use this number in all correspondence concerning your request.

If you are not satisfied with the Federal Bureau of Investigation’s determination in response to this request, you may administratively appeal by writing to the Director, Office of Information Policy (OIP), United States Department of Justice, 441 G Street, NW, 6th Floor, Washington, D.C. 20530, or you may submit an appeal through OIP's FOIA STAR portal by creating an account following the instructions on OIP’s website: https://www.justice.gov/oip/submit-and-track-request-or-appeal. Your appeal must be postmarked or electronically transmitted within ninety (90) days of the date of my response to your request. If you submit your appeal by mail, both the letter and the envelope should be clearly marked "Freedom of Information Act Appeal." Please cite the FOIPA Request Number assigned to your request so it may be easily identified.

You may seek dispute resolution services by contacting the Office of Government Information Services (OGIS). The contact information for OGIS is as follows: Office of Government Information Services, National Archives and Records Administration, 8601 Adelphi Road-OGIS, College Park, Maryland 20740-6001, e-mail at ogis@nara.gov; telephone at 202-741-5770; toll free at 1-877-684-6448; or facsimile at 202-741-5769. Alternatively, you may contact the FBI’s FOIA Public Liaison by emailing foipaquestions@fbi.gov. If you submit your dispute resolution correspondence by email, the subject heading should clearly state “Dispute Resolution Services.” Please also cite the FOIPA Request Number assigned to your request so it may be easily identified.

☑ See additional information which follows.

The enclosed documents represent the first interim release of information responsive to your Freedom of Information/Privacy Acts (FOIPA) request.

Duplicate copies of the same document were not processed.

This release is being provided to you free of charge.

As previously indicated, documents were located which originated with, or contained information concerning another agency. We are consulting with the other agency and are awaiting their response. Our office has processed all other information currently in our possession. The FBI will correspond with you regarding those documents when the consultation is completed.

Sincerely,

Michael G. Seidel
Section Chief
Record/Information
Dissemination Section
Information Management Division

Enclosures

FBI FOIPA Addendum

As referenced in our letter responding to your Freedom of Information/Privacy Acts (FOIPA) request, the FBI FOIPA Addendum provides information applicable to your request. Part 1 of the Addendum includes standard responses that apply to all requests. Part 2 includes standard responses that apply to requests for records about individuals to the extent your request seeks the listed information. Part 3 includes general information about FBI records, searches, and programs.

Part 1: The standard responses below apply to all requests:

(i) **5 U.S.C. § 552(c).** Congress excluded three categories of law enforcement and national security records from the requirements of the FOIPA [5 U.S.C. § 552(c)]. FBI responses are limited to those records subject to the requirements of the FOIPA. Additional information about the FBI and the FOIPA can be found on the www.fbi.gov/foia website.

(ii) **Intelligence Records**. To the extent your request seeks records of intelligence sources, methods, or activities, the FBI can neither confirm nor deny the existence of records pursuant to FOIA exemptions (b)(1), (b)(3), and as applicable to requests for records about individuals, PA exemption (j)(2) [5 U.S.C. §§ 552/552a (b)(1), (b)(3), and (j)(2)]. The mere acknowledgment of the existence or nonexistence of such records is itself a classified fact protected by FOIA exemption (b)(1) and/or would reveal intelligence sources, methods, or activities protected by exemption (b)(3) [50 USC § 3024(i)(1)]. This is a standard response and should not be read to indicate that any such records do or do not exist.

Part 2: The standard responses below apply to all requests for records on individuals:

(i) **Requests for Records about any Individual—Watch Lists.** The FBI can neither confirm nor deny the existence of any individual's name on a watch list pursuant to FOIA exemption (b)(7)(E) and PA exemption (j)(2) [5 U.S.C. §§ 552/552a (b)(7)(E), (j)(2)]. This is a standard response and should not be read to indicate that watch list records do or do not exist.

(ii) **Requests for Records about any Individual—Witness Security Program Records.** The FBI can neither confirm nor deny the existence of records which could identify any participant in the Witness Security Program pursuant to FOIA exemption (b)(3) and PA exemption (j)(2) [5 U.S.C. §§ 552/552a (b)(3), 18 U.S.C. 3521, and (j)(2)]. This is a standard response and should not be read to indicate that such records do or do not exist.

(iii) **Requests for Records for Incarcerated Individuals.** The FBI can neither confirm nor deny the existence of records which could reasonably be expected to endanger the life or physical safety of any incarcerated individual pursuant to FOIA exemptions (b)(7)(E), (b)(7)(F), and PA exemption (j)(2) [5 U.S.C. §§ 552/552a (b)(7)(E), (b)(7)(F), and (j)(2)]. This is a standard response and should not be read to indicate that such records do or do not exist.

Part 3: General Information:

(i) **Record Searches.** The Record/Information Dissemination Section (RIDS) searches for reasonably described records by searching systems or locations where responsive records would reasonably be found. A standard search normally consists of a search for main files in the Central Records System (CRS), an extensive system of records consisting of applicant, investigative, intelligence, personnel, administrative, and general files compiled by the FBI per its law enforcement, intelligence, and administrative functions. The CRS spans the entire FBI organization, comprising records of FBI Headquarters, FBI Field Offices, and FBI Legal Attaché Offices (Legats) worldwide; Electronic Surveillance (ELSUR) records are included in the CRS. Unless specifically requested, a standard search does not include references, administrative records of previous FOIPA requests, or civil litigation files. For additional information about our record searches, visit www.fbi.gov/services/information-management/foipa/requesting-fbi-records.

(ii) **FBI Records.** Founded in 1908, the FBI carries out a dual law enforcement and national security mission. As part of this dual mission, the FBI creates and maintains records on various subjects; however, the FBI does not maintain records on every person, subject, or entity.

(iii) **Requests for Criminal History Records or Rap Sheets.** The Criminal Justice Information Services (CJIS) Division provides Identity History Summary Checks – often referred to as a criminal history record or rap sheet. These criminal history records are not the same as material in an investigative "FBI file." An Identity History Summary Check is a listing of information taken from fingerprint cards and documents submitted to the FBI in connection with arrests, federal employment, naturalization, or military service. For a fee, individuals can request a copy of their Identity History Summary Check. Forms and directions can be accessed at www.fbi.gov/about-us/cjis/identity-history-summary-checks. Additionally, requests can be submitted electronically at www.edo.cjis.gov. For additional information, please contact CJIS directly at (304) 625-5590.

(iv) **National Name Check Program (NNCP).** The mission of NNCP is to analyze and report information in response to name check requests received from federal agencies, for the purpose of protecting the United States from foreign and domestic threats to national security. Please be advised that this is a service provided to other federal agencies. Private Citizens cannot request a name check.

EXPLANATION OF EXEMPTIONS

SUBSECTIONS OF TITLE 5, UNITED STATES CODE, SECTION 552

(b)(1) (A) specifically authorized under criteria established by an Executive order to be kept secret in the interest of national defense or foreign policy and (B) are in fact properly classified to such Executive order;

(b)(2) related solely to the internal personnel rules and practices of an agency;

(b)(3) specifically exempted from disclosure by statute (other than section 552b of this title), provided that such statute (A) requires that the matters be withheld from the public in such a manner as to leave no discretion on issue, or (B) establishes particular criteria for withholding or refers to particular types of matters to be withheld;

(b)(4) trade secrets and commercial or financial information obtained from a person and privileged or confidential;

(b)(5) inter-agency or intra-agency memorandums or letters which would not be available by law to a party other than an agency in litigation with the agency;

(b)(6) personnel and medical files and similar files the disclosure of which would constitute a clearly unwarranted invasion of personal privacy;

(b)(7) records or information compiled for law enforcement purposes, but only to the extent that the production of such law enforcement records or information (A) could reasonably be expected to interfere with enforcement proceedings, (B) would deprive a person of a right to a fair trial or an impartial adjudication, (C) could reasonably be expected to constitute an unwarranted invasion of personal privacy, (D) could reasonably be expected to disclose the identity of confidential source, including a State, local, or foreign agency or authority or any private institution which furnished information on a confidential basis, and, in the case of record or information compiled by a criminal law enforcement authority in the course of a criminal investigation, or by an agency conducting a lawful national security intelligence investigation, information furnished by a confidential source, (E) would disclose techniques and procedures for law enforcement investigations or prosecutions, or would disclose guidelines for law enforcement investigations or prosecutions if such disclosure could reasonably be expected to risk circumvention of the law, or (F) could reasonably be expected to endanger the life or physical safety of any individual;

(b)(8) contained in or related to examination, operating, or condition reports prepared by, on behalf of, or for the use of an agency responsible for the regulation or supervision of financial institutions; or

(b)(9) geological and geophysical information and data, including maps, concerning wells.

SUBSECTIONS OF TITLE 5, UNITED STATES CODE, SECTION 552a

(d)(5) information compiled in reasonable anticipation of a civil action proceeding;

(j)(2) material reporting investigative efforts pertaining to the enforcement of criminal law including efforts to prevent, control, or reduce crime or apprehend criminals;

(k)(1) information which is currently and properly classified pursuant to an Executive order in the interest of the national defense or foreign policy, for example, information involving intelligence sources or methods;

(k)(2) investigatory material compiled for law enforcement purposes, other than criminal, which did not result in loss of a right, benefit or privilege under Federal programs, or which would identify a source who furnished information pursuant to a promise that his/her identity would be held in confidence;

(k)(3) material maintained in connection with providing protective services to the President of the United States or any other individual pursuant to the authority of Title 18, United States Code, Section 3056;

(k)(4) required by statute to be maintained and used solely as statistical records;

(k)(5) investigatory material compiled solely for the purpose of determining suitability, eligibility, or qualifications for Federal civilian employment or for access to classified information, the disclosure of which would reveal the identity of the person who furnished information pursuant to a promise that his/her identity would be held in confidence;

(k)(6) testing or examination material used to determine individual qualifications for appointment or promotion in Federal Government service the release of which would compromise the testing or examination process;

(k)(7) material used to determine potential for promotion in the armed services, the disclosure of which would reveal the identity of the person who furnished the material pursuant to a promise that his/her identity would be held in confidence.

FBI/DOJ

FEDERAL BUREAU OF INVESTIGATION
FOI/PA
DELETED PAGE INFORMATION SHEET
FOI/PA# 1385943-0

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Page 4 ~ b3; b7E;
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Page 6 ~ b3; b7E;
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FD-340a (Rev. 11-12-89)

ALL INFORMATION CONTAINED
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DATE 08-07-2020 BY [redacted] ADG

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(Title [redacted]

(File No [redacted]

Item	Date Filed	To be returned Yes	To be returned No		Disposition
1	10/16/92		✓	Drug notes on [redacted]	
2	10/16/92		✓	" " " [redacted]	
3	8/1993		✓	" " " [redacted]	

[redacted]

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SERIALIZED K FILED S
OCT 16 1992
FBI — BALTIMORE

Memorandum

~~SECRET~~

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To : SAC, BALTIMORE [redacted] (P) Date 10/29/92

From : SA [redacted]

Subject: EDWIN NEAL CAMERON
[redacted]
OO: BA

This communication is classified ~~"SECRET" in its entirety~~.

Per writer's request, SA [redacted] Huntsville RA, furnished the Fall 1990/Winter 1991 edition of "Aviation Space Education" which contains an article entitled "Soviets Reveal Moon Rocket." This article discusses the N1 Booster about which subject professes to have considerable knowledge.

b6
b7C

A copy of the journal is attached to the file copy of this memo.

On 10/28/92, Maryland DMV records revealed that EDWIN NEAL CAMERON, W/M, DOB 4/11/47, 5'10" tall, 240 lbs., residence 2272 Four Seasons Dr., Gambrils, Maryland, 21054, has license #C-565-188-626-232.

On 10/28/92, MSP records, Pikesville, Maryland, were checked with negative results regarding subject.

~~CLASSIFIED BY: G-3~~
~~DECLASSIFIED ON: OADR~~

~~SECRET~~

2 - Baltimore (Attachment 1 to file copy)
AC:dlk
(2)

[redacted]

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12/10/92

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NOV 16 1992
FBI — BALTIMORE

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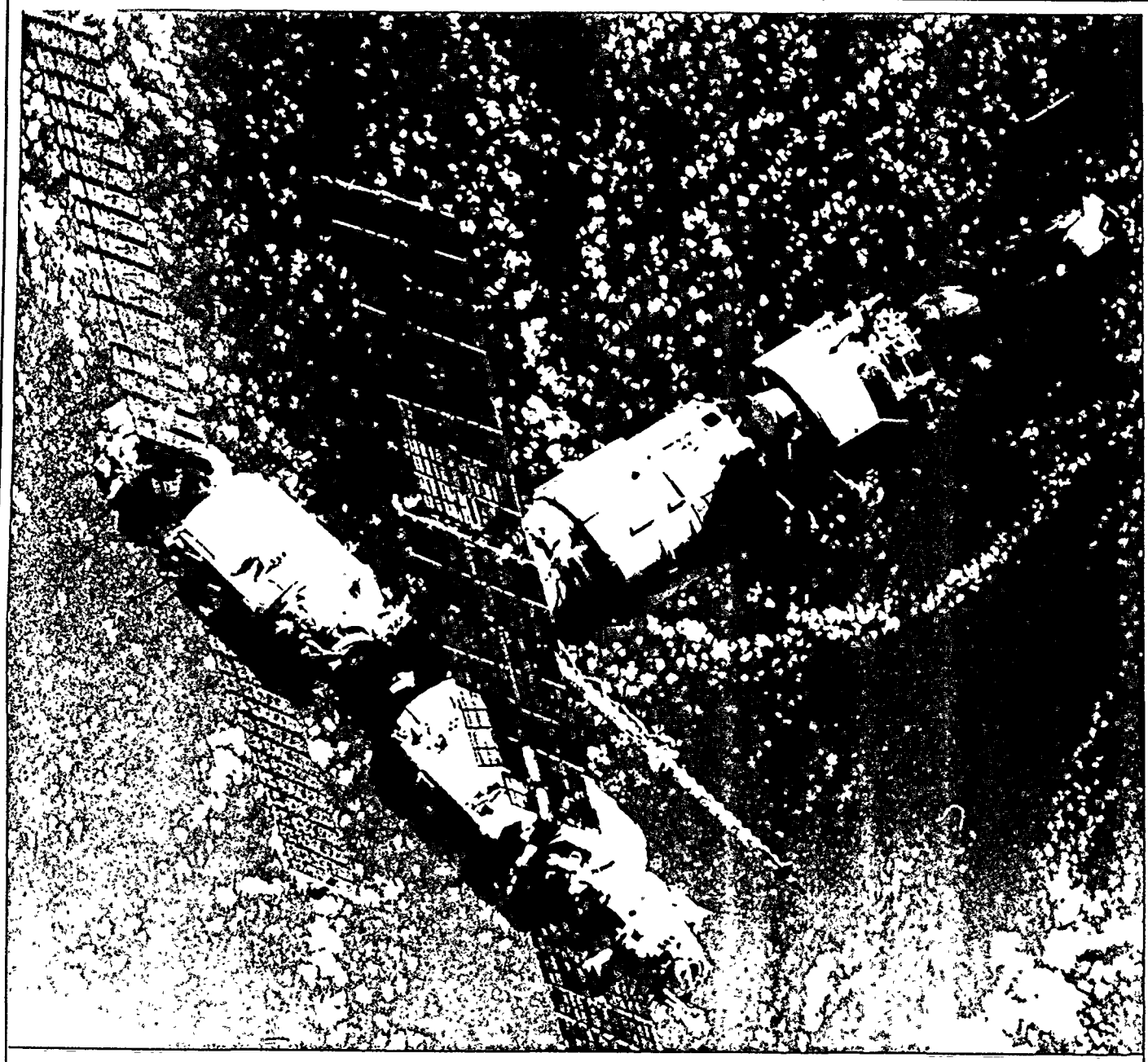
FALL 1990/WINTER 1991 • $5.00

AVIATION SPACE EDUCATION

JOURNAL OF THE AVIATION SPACE EDUCATION ASSOCIATION



American Teacher to Fly on Soviet Space Station

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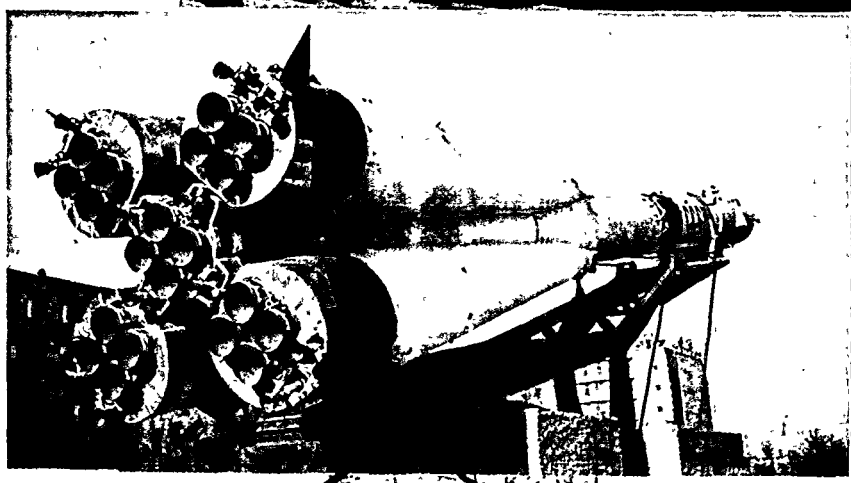
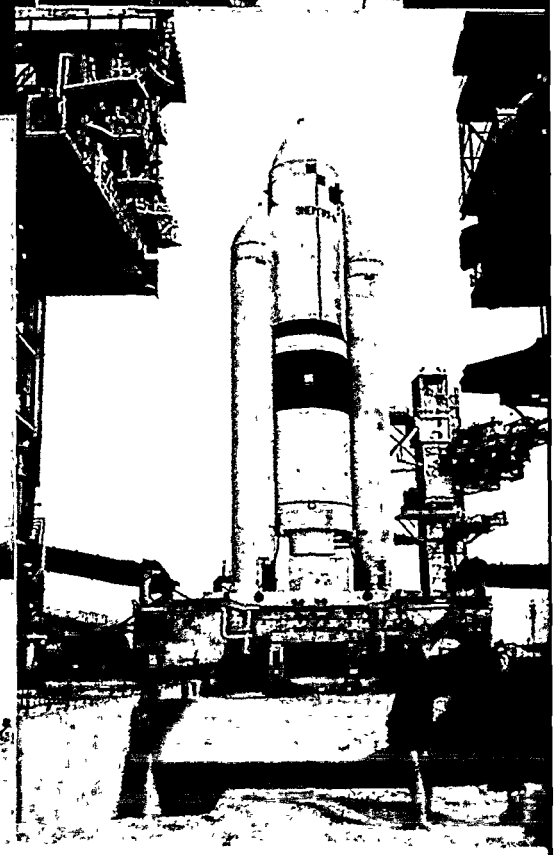
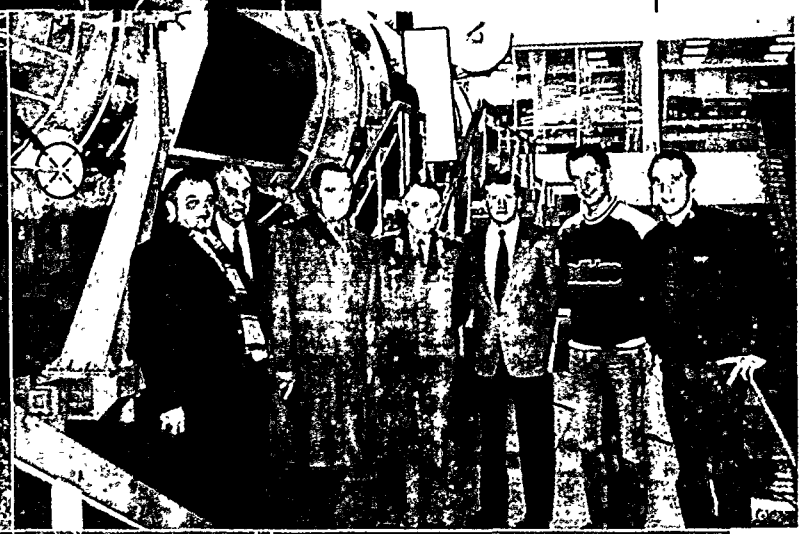
Aerospace Ambassadors in the U.S.S.R.

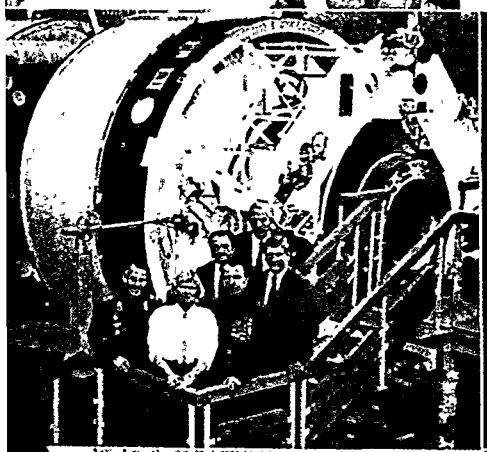


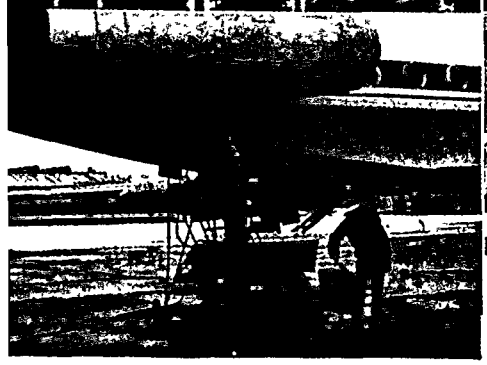


"Greatest educational experience of a life time — our Soviet hosts were the greatest" (See inside Back Cover for more photos)

Summer '90 Attendees: Robert Hotz, Frances Joan Basick, Louis and Mary Ann Bruno, Patricia Church, Molly Dando, Norma Jean Evans, Arthur Fisher, Ross Fleisig, Susan House, Wesley Kelly, Wayne Matson, Richard Mellett, Robert Mellette, Sharon Newman, Norman Paulson, Elizabeth and James Sanders, Alan Smith, Muriel Stevens, Robert Swanson, Jerry Thomson, Delores and Hendrik Velhuisen, Betty Walker, and Niki Wenger.







Winter '90 Attendees: Cathleen Byram, John Biro, Michelle Dunning, Linda Ewing, Melody King, Cynthia Lynch, Richard Kolker, Wayne Matson, Abby McKinnon, Vonneke Miller, Katherine Musgrove, Bonnie Newsome, Edward O'Grady, Mike Plaster, Richard Tormey, and Al Tessmeer.

AVIATION SPACE EDUCATION

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Photo/Illustration Credits:
"Soviet Space Odyssey," pages 16-24, article courtesy *Popular Science* (January 1991), color photos courtesy *Cosmonautics in the USSR* (see page 35);
"Soviet Year in Space," pages 24-31, article courtesy *Soviet Year in Space 1990,* published by Teledyne Brown Engineering;
"Soviets Reveal Moon Rocket," article courtesy *Aviation Week & Space Technology,* illustrations courtesy Teledyne Brown Engineering.

AVIATION SPACE EDUCATION ASSOCIATION

By Josef Weiss, Chairman, Aviation Space Education Association (AEA)

U.S. – U.S.S.R. Cooperation. In 1990, we celebrated the 40th anniversary of AEA with many new programs and accomplishments, including the expansion of our Aerospace Ambassadors Travel/Study Programs and our aerospace courses for graduate credit. (See pages 7, 9, 11, 12 and 13) Possibly the most important of all our efforts in 1990 was the establishment of our new cooperative efforts in aerospace education with the Soviet Union.

Following on the success of our 1990 Delegations, (See "Soviet Space Odyssey" page 16 and inside front and back covers) Soviet space officials agreed to provide Aerospace Ambassadors with exclusive rights to organize and bring special delegations to the top Soviet space facilities, including the Baikonur Cosmodrome — the Soviet "Cape Canaveral." Proceeds from this and other U.S.- U.S.S.R cooperative efforts will help support aerospace education.

The two individuals that were instrumental in bringing about these new programs of cooperation were AEA president Dr. Wayne R. Matson and Mr. Vladimir A. Pivnyuk, Executive, for Space Affairs, USSR Council of Ministers (photo below).

Dr. Matson said he was surprised to learn that 90% of American's are not aware the Soviet's have a Space Station; And, that the majority of Americans believe the U.S. has a Space Station. Talk about an uniformed public — and a challege for aerospace education. During a luncheon with General Shatalov, Director of Cosmonaut Training, (photo page 23) in Star City, the Director mentioned that one of most difficult problems they had with their Space Station was coming up with a name for it — Mir. Dr. Matson commented, "That's funny, we've had a name for ours for a long time.

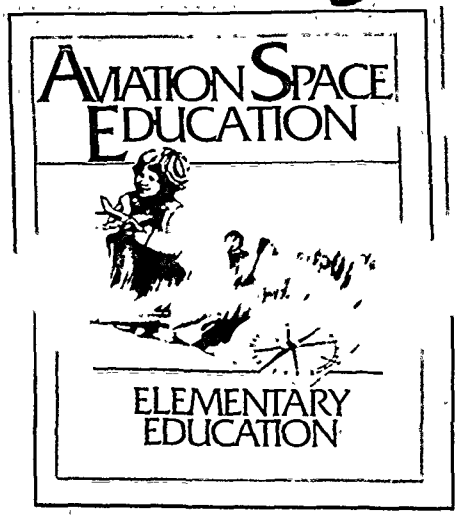
We hope these new programs of cooperation will lead to a better understanding of the aerospace opportunities available to both of our countries.

Following a successful tour of USSR space facilities last June, Matson invited Pivnyuk to the U.S. for a three week tour of U.S. space facilities including a visit to the Space Shuttle simulator at the U.S. Space and Rocket Center in Huntsville, AL.

AVIATION SPACE EDUCATION

JOURNAL OF THE AVIATION SPACE EDUCATION ASSOCIATION
FALL 1990/WINTER 1991 • VOLUME 17, NUMBER 3 & 4

IN THIS ISSUE



New Book on Elementary Education

This just-published book of readings, *Aerospace Education and Elementary Education*, contains a collection of the outstanding articles that have appeared in *The Journal of Aviation & Space Education* during the past 16 years. The book, which sells for $9.95 and contains hundreds of teaching ideas, is FREE to AEA members when they join or renew their membership (see Pages 3 and 4 for details). Some of the articles included in "AE & EE" are listed below. *This book is* must *reading for anyone interested in aerospace education and elementary education.*

• What Can Aerospace Education Do for Me? • Aerospace Concepts at the Elementary Level • Curriculum Development for Behavior, Skills and Values • Affective Consequences of Aerospace Education • Suggestions for Preschool, Kindergarten and First Grade • Seventeen Classroom Activities That Are "Right On" • Teaching Science Process Skills •

Anthropology; Economics; Sociology • Aerospace for Youngsters with Learning Difficulties • An Intermediate-Level Social Studies Unit • General Aviation & Career: Goal & Strategies • Teacher's Guide to "Aviation" Coloring/Activity Book • Learning Design for Primary Study (6-Week Aviation Unit) • Kinds of Aircraft; Parts of Aircraft; Uses of Aircraft; Aviation History; Airport Facilities; Airport Personnel • An Airport Trip: For Children in Early Grades • Games and Activities — A Series of Skill-Builders: Dictionary Skills; Encyclopedia Skills; Math Skills • Christmas Catalogs • Aerospace Education Treasures • This Helicopter Visits Schoolyards • Simulating the Running of an Airline • Sixth-Graders Learning on "Spaceship Earth" • Teaching about "Spaceship Earth": Developing Global Units • On Teaching the First Grade • Bringing Space Down to Earth: A Total Community Program • Youngsters Test "Astronaut" Skills • Landsat Maps in the Elementary School • Elementary Students Simulate Moon Walk • Afternoon Star Gazing: Low-Cost, Portable Planetarium • Students Create an Aerospace Mural for LaGuardia Airport • NASA Elementary Aerospace Activities • Aeroplanes and Flying Machines • Ballooning in the Classroom • Balloon Launch(es) • Unidentified Flying Omelets (Egg Loft): Creative Thinking • Kite Day: Gave 540 Students Many Learning Experiences • Rocketry: Fun, Educational and Contagious • Not Just Airplanes but a Total Program • Derby with Wings: Fun, Safe, Exciting Cub Scout Activity • Children's Questions about Aviation: Results of Inquiry • Careers in Airplane Transportation • Career Questions Practices and Dreams: Philosophical Structures/Practices • Research, Curriculum, Materials, Teacher Training • Classroom Classics: "Gems of Wisdom" from Children • Space Shuttles in the Classroom: Lesson Plans/Strategies • A Simple, Effective Learning Unit for Elementary Level

Education News

AEROSPACE UNIVERSITY

Courses in aviation and space education (credits) are semester graduate hours

Certified Aerospace Educator

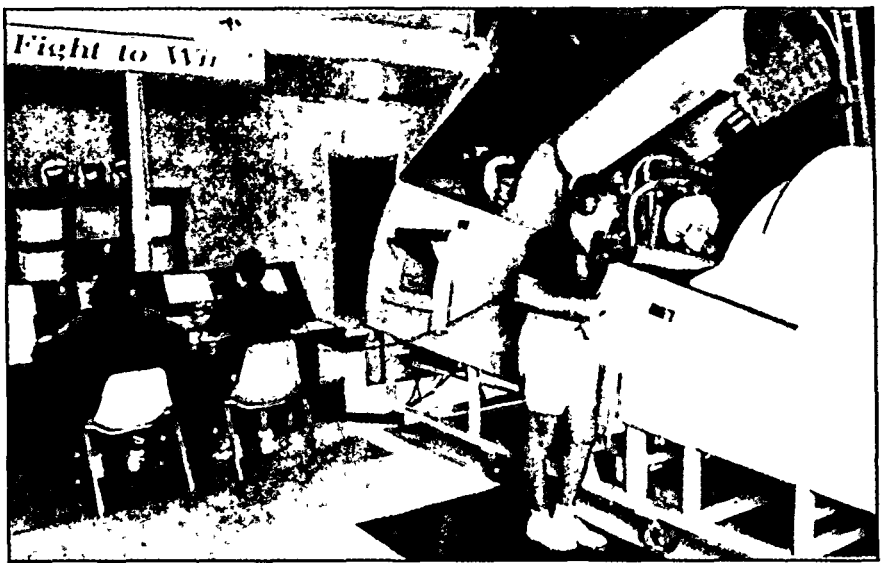
Basic courses (credits) for "Certification" (15 Credits)

- Introduction to Aerospace Education (3 Credits)
- Aviation Orientation (3 Credits)
- Space Orientation (3 Credits)
- Methods and Materials for Aerospace Education (3 credits)
- + Aviation/Space Elective (3 Credits)

Master's Degree in Aerospace Education

Basic courses (credits) for Master's Degree (30 Credits) include courses required for "Certified Aerospace Educator" and other courses approved from the Master Courses:

- Aerospace Education (3)
- Introduction to Aerospace Education (3)
- Aerospace Issues (1-6)
- Issues in Aerospace Education (2) (National Aviation & Space Education Convention)
- National Aerospace (1-6)
- U.S. Space Programs and Policies
- International Aerospace (1-6)
- U.S.S.R Space Programs and Policies (3 and 6) (See List page 11)
- International Aerospace: Paris Air Show (3 & 6)
- Aviation Specialist
- Aviation Orientation (3)
- Space Specialist
- Space Orientation (3)
- Aerospace Science (3)
- Aerospace Society (3)
- Methods and Materials for Aerospace Education (3)
- Thesis/Project/Independent Study (1-6)



Aviation orientation is offered at Hunstville, Alabama and and at the Kennedy Space Center, Florida.

AEROSPACE EDUCATION
Introduction to Aerospace Education (3 Credits)
This is a foundation course for all aerospace education. It is designed to help educators make informed judgments regarding the concept and scope of aerospace education and to develop a philosophy of aerospace education. An analysis and synthesis of an aerospace taxonomy, an aerospace education taxonomy, and an overview of information and materials in the field of aerospace education will be utilized.

AERONAUTIC/AVIATION SPECIALIST
Aviation Orientation (3 Credits)
This is a unique course not offered anywhere else in the United States. Since many astronauts have some military training, this program exposes students to the stepping stones of an astronaut's career.

This course is offered at the U.S. Space & Rocket Center (SRC) Aviation Challenge facility in Huntsville, Alabama and Kennedy Space Center, Florida.

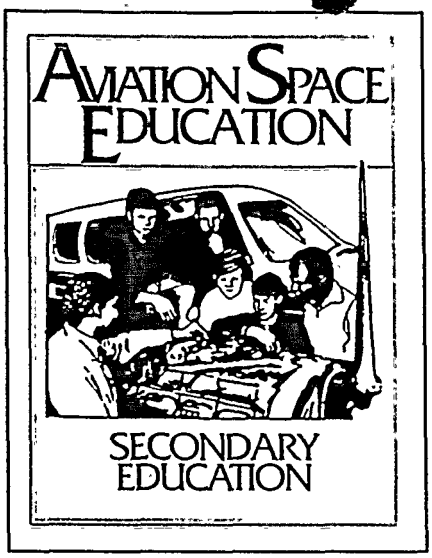
This course is divided into three phases: Pre-SRC Experience (Study Guide); The SRC Experience (includes Adult Aviation Challenge); and the Post-SRC Experience (Study Program). The SRC Experience consists of three parts: academic training, simulator flights, and water survival training.

ASTRONAUTIC/SPACE SPECIALIST
Space Orientation (3 Credits)
This course is offered at the the U.S. Space & Rocket Center (SRC) Space Academy facility in Huntsville, Alabama and Kennedy Space Center, Florida.
It consists of three phases: PRE-SRC Experience (Study Guide); The SRC Experience (includes Adult Space Academy); and the Post-SRC Experience.

While present at the Space Academy facility, students are introduced to a wide variety of space science topics, provided a view of state-of-the-art technology in the field of space science, and trained to participate in a simulated Space Shuttle mission.

METHODS AND MATERIALS IN AEROSPACE EDUCATION
This course provides students an overview of the methods and materials for teaching aerospace courses.

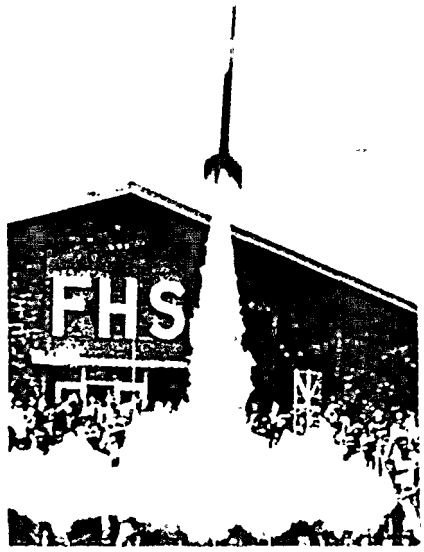
(continued on page 9)



New Book on Secondary Education

This just-published book of readings, *Aerospace Education and Secondary Education*, contains a collection of the outstanding articles that have appeared in *The Journal of Aviation & Space Education* during the past 16 years. The book, which sells for $9.95 and contains hundreds of teaching ideas, is FREE to AEA members when they join or renew their membership (see Pages 3 and 4 for details). Some of the articles included in "AE & SE" are listed below. *This book is* must *reading for anyone interested in aerospace education and secondary education.*

• Everything You Always Wanted to Know about Starting an Aerospace Course in High School but Were Afraid to Ask • How Aerospace Studies Benefit All Teaching Disciplines • Individualized Approach: Learning at Their Own Speed • A High School Workshop: Experiment in Summer Workshops • WASP (WWII Women's Air Force Pilot) Teaches HS Aviation • The Educational Skies of Montana • A Realistic Approach to Vocational/Technical Education • Aerospace in New York City High Schools • English Through Aviation • Aerospace at St. Francis: "Flight Deck" Learning Program • Wanted: New Worlds; an Astronomy Course That Expands Both the Imaginative and Factual Horizons of Students • A Mini-Course for Social Studies • Flying Geography: Students Fly over Areas Being Studied • Education Through Aviation Helps Underachievers • A Program Designed to Hold Migrants Students Longer • Building an Aircraft Is Not Your Ordinary School Project • Airplane Construction Can Serve as Catalyst for Careers • Simulating Is Stimulating • Students Build "Kitty Hawk" Replica for Kennedy Airport • Teen Summer Camp: Soaring, Soloing and Ballooning • Students Get Head Start on Pilot's License/College Credit • Aviation Camp: Teaching Youngsters to Fly (SkyLife Camp) • Space Camp and the Alabama Space & Rocket Center • NASA Student Experiments • "Orbit '81" Influences College/Career Choices • Space Shuttle Project in New Jersey High Schools • The Kearny Space and Science Club Builds a "Space Ship" • Construction of Model Space Station (Skylab) in Inner-City Environment Changes Apathy to Enthusiasm • Live Satellite Communications — an Exciting Teaching Aid • This School Plugs into Outer Space • The Ultimate Field Trip: What Happens When a High School Student Gets a Chance to Take Lab Class in Space • Civil Air Patrol Program • Air Force JROTC Cadets Served as "Commanders for a Day" • Aviation's Next Generation: The Explorers • Stewardess Explorers Take to the Skies • Career Education Attracts Tomorrow's Professionals • Aviation Careers: Eliminating Stereotyping • Portraying Careers Awareness in Aviation • Richmond Flight Project: Results of a Longitudinal Study • Characteristics/Motives of Students in Aviation Classes



Education News

AEROSPACE SCIENCE
(SET)
This course examines science, engineering, and technology in the field of aerospace.

AEROSPACE AND SOCIETY
(SEP)
This course examines the social, economic, and political aspects of aerospace.

NATIONAL AEROSPACE
U.S. Space Programs and Policies
(6 Credits)
This course is designed to provide a foundation from which students can make informed judgements/decisions concerning the current status of the U.S. space program, its past and future. A two-week tour and lecture format at the nation's top space facilities will allow students to gain valuable insights into both government and civilian aspects of U.S. space activities.

Some of the facilities and sites to be visited include:

- Kennedy Space Center
- Astronaut Hall of Fame
- Goddard SFC
- Challenger Center
- Space Telescope Inst.
- NORAD Air Force Academy
- Jet Propulsion Lab
- Johnson SFC
- Exploratorium
- Ames Research Center
- Space Camp
- Marshall SFC
- U.S. Space & Rocket Center
- Washington, D.C.

INTERNATIONAL AEROSPACE
USSR Space Programs and Policies
(3 & 6 Credits see options)
These courses provide participants a first hand look at the Soviet space program. From the information gained through tours of Soviet space facilities and lectures by Soviet space experts, the participants will be able to make informed judgements about the status of the Soviet space program, its past, present and future, and about cooperative space ventures. (See "Soviet Space Odyssey" page 16)

Space orientation at Huntsville, Alabama and the Kennedy Space Center, Florida.

International Aerospace: Paris Air Show (June 10-24 & 17-24) 6 or 3 Semester Hours Graduate Credit.
This course is designed to provide an overview of the international arena of the aerospace industry. Participants will attend the Paris Air Show, be briefed by the leading members of the aerospace industry and government officials on current trends in the field, and view the daily airshow.

AEROSPACE LEADERSHIP
This course provides students the opportunity to serve as a delegation leader of a National or International Tour.

AEROSPACE ISSUES
These courses are usually taught in conjunction with major national and international conferences/conventions.
Issues in Aerospace Education
(2 Credits)
Students will become aware of current aerospace programs, publications, organizations, curricula, and teaching methods. This course is taught during the National Aviation & Space Education Convention.

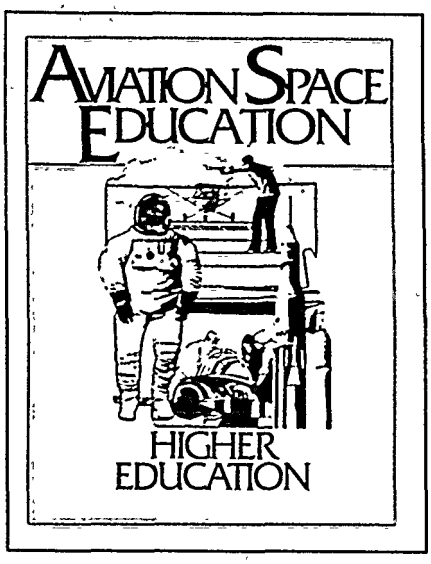
AEROSPACE AMBASSADOR TRAVEL/STUDY PROGRAMS

Aerospace Ambassadors offers the most travel/study programs in the field of aerospace.

These highly acclaimed programs provide participants a view of aerospace very few people experience. Aerospace Ambassadors meet the top officials in the aerospace field, go beyond closed doors, and see facilities and hardware regular tourists never dream of seeing.

Each year Aerospace Ambassadors strives to provide a diversified travel/study program. International and national events, conferences and championships are all considered in designing these programs. (See program areas on this page.)

One of the many unique aspects of the Travel Study Program is the diversity of the groups. Aerospace Ambassadors are teachers, journalists, aerospace executives, scientists and engineers. Each group member gains new insights and perspectives through association and interaction with the group and with their *(continued on page 11)*



New Book on Higher Education

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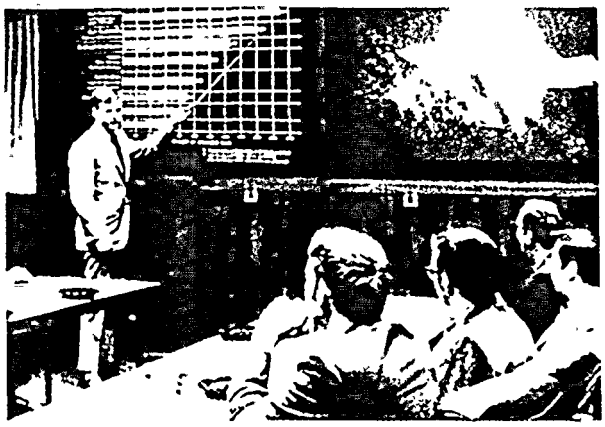
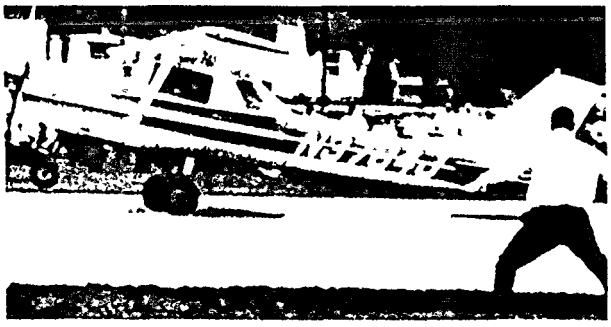
• Post-Secondary Programs in Aerospace: Receiving Widespread Acceptance and Increased Recognition • The University-Trained Aviator • Exploring the Need for a Second Career for Pilots • If you Can't Beg, Borrow or Buy, You'd Better Build: A Solution When Scrounging Materials Just Doesn't Work • Introduction to Flight: Experiment in Adult Education • A Case for Aerospace Education: Justification for a Separate Department for Aerospace Engineering Education • Airway Science: Aviation Education for the Future • Aviation — Academic Orphan Looking for a Home • Educating Future Aviation Executives • Universities and Research: Trailing Vortices • Airport Management: A Science and an Art • Accommodation of Nontraditional Aerospace Degree Aspirants • So Now You re an Instructor Pilot • Preventive Maintenance 101: The Campus Is a Hangar • An Integrated Flight System • The National Collegiate Parachuting League • Soliciting Skydiving Funds from Your School • Classroom in the Sky: Homeroom, Honolulu; Recess, Nairobi • Purdue and Women Pilots: Tradition from Amelia Earhart • Cadets on Campus: New Look of AFROTC Includes Women Students, Emphasis on Management Training & Selectivity • Community College of Air Force • Airlines' View of Value of University Minor in Aviation • A Follow-Up Study of Aviation Graduates • Preparing Social Studies Teachers for the Space Age • The Politics of Outer Space — a Syllabus • Space Politics: A Political Science Curriculum • Teaching about the Colonization of Space • Model Rocketry: University-Level Educational Tool • Landsat Maps in Student Teaching • UFOs as an Educational Resource • Aerospace Science: Teaching Science to Humanists • Preparing Teachers for Instruction • Aerospace Education Workshop Techniques and Activities • A New Approach to Aerospace Education Workshops • A Guide to Aerospace Workshop Planning • Evaluating Aerospace Workshops • Research on Workshops: Relationship to Practices and Attitudes; Assessment of Effects upon the Teaching of AE Concepts; Utilizing NASA Materials and Personnel; Adult Education in a Total Community Awareness Program • Curricular Experiences for a Summer Workshop • Aerospace Education — 1990: An Exercise in Futuring





Education News

AEROSPACE AMBASSADORS TRAVEL/STUDY PROGRAMS

There are three basic Travel/Study Programs/Formats:
1. Travel/Tour a Nation's Aerospace Facilities (Travel to and study at multiple locations)
2. Travel/Attend Airshow/Exhibit/ Conference/Championship. (Travel to and study at a single location)
3. Travel/Tour and Attend an Aerospace Event (Combine a Tour with attendance at an Event)

INTERNATIONAL PROGRAMS

1. Tours of Nation(s)
- Soviet Aerospace
- South American
- Pacific Rim/Asian
- European Aerospace
- China Aerospace
- Canadian Aerospace
- Australian Aerospace

2. International Event
- Air Shows
- Airshow Canada
- Hanover Air Show
- Farnborough
- Paris Air Show
- Singapore Exhibitions
- e.g. Space Commerce, Montreux, Switzerland.

3. International Tour/Event
Combination of 1 and 2, e.g. European Aerospace and Paris Air Show

NATIONAL PROGRAMS

1. Tours of United States
- Aerospace Facilities
- Aerospace Organizations by

U.S Adults/Youth
Student/Teachers
Foreign Citizens
Foreign Teachers/Students

2. National Event
- Sport Aviation (EAA)
- General Aviation (AOPA)
- Business Aviation (NBAA)
- Military Aviation (AFA)
- Aero/Astronautics (USSF)
- Aerospace Writers (AWA) (see Sport Disciplines under Championships)

3. National Tour/Event
- Combination of 1 and 2, e.g. NASA facilities and Space Shuttle Launch

International/National Aviation/ Space Education Conventions (Sponsored by The Aviation and Space Education Association).

Additional Events • Conferences • Championships

INTERNATIONAL EVENTS/ CONFERENCES
- FAI Annual Conference (70+ Nations Report on Sport Aviation and Aeronautics)
- IAF Annual Conference (Reports on Helicopter, Space Programs and Astronautics)

INTERNATIONAL/NATIONAL CHAMPIONSHIPS
- Aerobatics
- Aeromodeling
- Ballooning
- Gliding (Soaring)
- Hang Gliding
- Helicopter
- Micro/Ultralight Aircraft and Parachuting

foreign counterparts.

The 1990 Travel/Study Programs were so successful, they have been expanded for 1991. The Soviet Union programs were so highly acclaimed, they have been expanded to meet the new demand.

1991 AEROSPACE AMBASSADOR PROGRAMS IN THE SOVIET UNION

"You have seen more of our space program than any previous delegation." This statement was made by Vladimir Pivnyuk, staff director for Space Affairs to the Council of Ministers (who controls the budget for all Soviet manned spaceflights), to last summer's first Aerospace Ambassadors Delegation to the Soviet Union. (See Soviet Space Odyssey)

The second delegation in December saw even more, including the launch of the Japanese journalist to space station Mir. The December Delegation was the first to view the new, never before shown, launch vehicle, Energia-M. (See photos of the Delegations, inside front cover.)

Due to the success of these programs, Aerospace Ambassadors signed an exclusive contract with Soviet Officials to organize and bring Delegations to Baikonur the Soviet "Cape Canaveral". (See 1991 Schedule below.)

April 8-15: 30th Anniversary Space Celebrations honoring the historic First Manned Space Flight of Yuri Gagarin, April 12, 1961. The first ever Festival at Baikonur.

May 10-19: Launch of the British (female) Cosmonaut to Mir (May 12, 1991)

June 14/15-28/29: Adult/Youth Program Together to Mars.

July 13-28: Aerospace Education Delegation (attend unmanned launch, July 16, 1991)

August: TBA

September 27-October 6: Launch of Austrian Cosmonaut to Mir (September 29, 1991)

October: TBA

Education News

November 22 - December 1: Launch of Soviet Cosmonauts (November 25, 1991)
December: TBA

Join one of the "Official" U.S. Aerospace Delegations to the Soviet Union. There will be one every month in 1991; 1992. Please write for the latest dates/programs.

Launch Programs: A typical program includes 2-nights at the Baikonur Cosmodrome (the Soviet Cape Canaveral) and 5-nights in the Moscow area visiting the top Soviet space facilities. At Baikonur, the Delegates visit the major launch sites, including Soyuz, Proton, Energia, and the Buran (space shuttle) Facilities.

In the Moscow area (in addition to an outstanding tourist/sightseeing program, Delegates visit the Cosmonaut training Facilities (and Museums) at Star City; The Soviet Space Control Center in Kalingrad; The NPO Space Flight Test Facilities (and Museum). A visit to this Museum, not open to the public, is worth the entire trip. This is the definitive collection of Soviet Space Craft — The "Crown Jewels" of the Soviet space program (See pages inside back cover)).

Launch Programs are usually One-Week Programs.

Two-Week Programs, offered in the Summer, include aerospace programs in Kiev, Leningrad, Moscow and Baikonur.

Soviet Aerospace Travel/Study Programs can be designed to fit the specific objectives of different groups. Let us know how we can serve the needs of your organization.

TWO SPECIAL PROGRAMS FOR 1991:

30th Anniversary Space Celebrations

Yuri Gagarin's Space Flight, April 12, 1961) Honoring The First to Fly in Space April 12th will also be the 10th Anniversary of the first launch of the American Space Shuttle."

All who have flown in space and a 30 member American Delegation (under the auspices of Aerospace Ambassadors) have been invited to attend the first ever Festival at Baikonur. The Baikonur Cosmodrome is the world's most active launch complex, with multiple launches every month.

In addition to visiting the top space facilities in Moscow, the Delegation will be special guests at the Baikonur Cosmodrome. Soviet President Gorbchev is expected to attend the "Special Ceremonies."

The "Festival at Baikonur" will include:

- Telebridge between Cosmodromes of USSR, USA and France;
- Aerobatics Show; Musical Show; and Meetings of International Space Schools and Space Societies; Special Events with Astronauts and Cosmonuats; plus, of course, briefings and tours at all the major launch sites and facilities at Baikonur.

Cosmonautic School Conference on Space Education

An Aerospace Ambassador Travel/Study group has been invited to participate in a very special session of the Cosmonautic School's Conference on Space Education, "Together to Mars."

The "Together to Mars" conference will be held on board a Soviet ship from June 15 - June 28 sailing from the center of Siberia to beyond the North Polar Circle.

The aim of the conference is to solve together the problems of scientific and technical education.

Soviet teachers and students with teachers and students from the United States will have the opportunity to exchange ideas with interesting and experienced people and make advantageous contacts.

During the trip you will see modern and ancient Siberia, the place of Stalin's exile and trail of Stalin's Gulag, swim beyond the Artic Circle, fish, sing and dance, and enjoy yourself with others.

An additional tour of Moscow, Baikonur, Lenningrad and Kiev can be attached to this conference.

INTERNATIONAL AVIATION AND SPACE EDUCATION CONVENTION

The International Aviation and Space Education Convention will be held July 16-20 1992 at the Von Braun Civic Center in Huntsville, Alabama. It is set to coincide with the National Space Week and will be the educational highlight of the 1992 International Space Year.

Educators, students, and dignitaries from more than fifty nations are expected to come to Huntsville for a series of fantastic hands-on, educational experiences.

This international convention will be a unique opportunity to bring together aerospace experts and professional educators from around the world to explore mutually beneficial approaches to aerospace explorations and aerospace education.

Cosmonauts and soviet space experts, along with special aerospace exhibits from the Soviet Union will provide convention attendees with the most comprehensive look yet at the Soviet space program.

In addition to special Soviet events/receptions, many other nations will take this opportunity to showcase their achievements in aviation/space and aviation/space education.

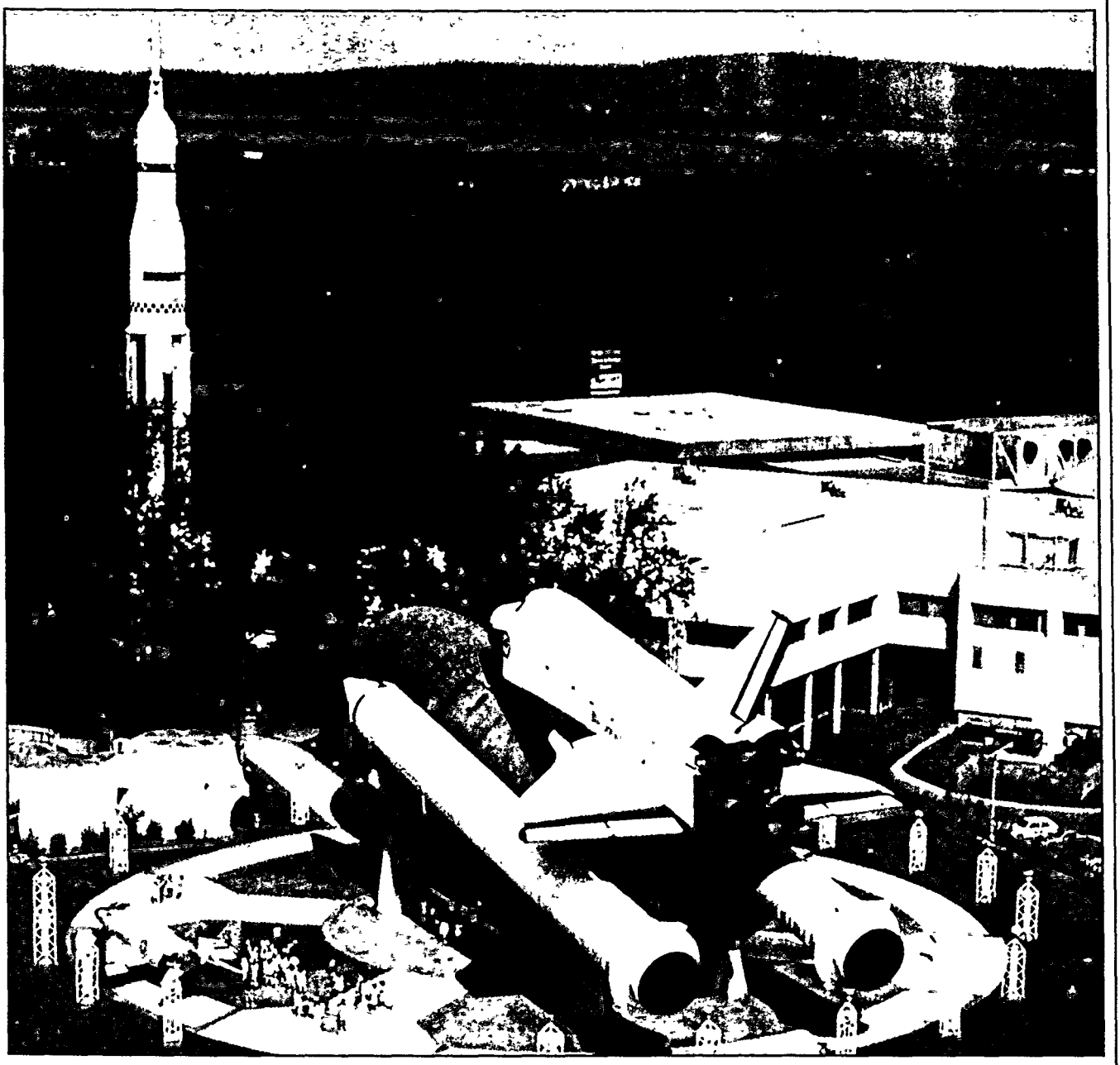
The Convention is actually three Conventions in one: (1) An Aerospace Convention; (2) An Aerospace Education Convention; and (3) A Convention for Educational Technology.

The convention will feature mini aviation & space camps for students and adults in addition to lectures, seminars, and exhibits.

The exhibit areas at the Von Braun Civic Center will showcase the latest in international aerospace programs and education, as well as the technology that has been made available to improve education.

Attendees are invited to come early or stay after the convention and participate in some of the fantastic aviation & space

Huntsville, Alabama, site of the International Aviation and Space Education Convention, in July 1992



experiences at the world famous U.S. Space & Rocket Center in Huntsville. In addition, many aerospace courses will be offered for credit, including Aviation Orientation and Space Orientation; Introduction to Aerospace Education and Issues in Aerospace Education.

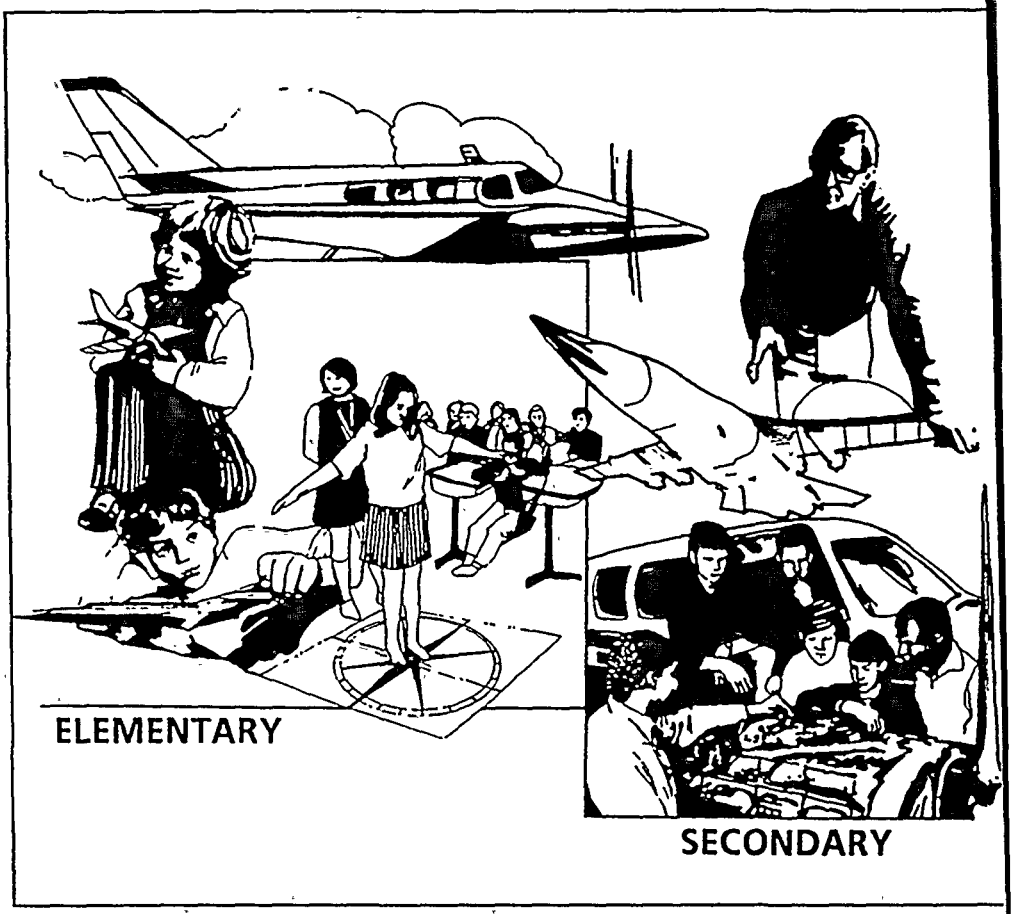
Several new courses will be offered in conjunction with the Convention. Teachers will be able to plan a program of educational experiences and become Certified Aerospace Educators. (See page 7.)

This international convention will be the world showcase for aerospace education and educational technology.

Plan to be in Huntsville in July, 1992 for the ultimate experience in aerospace/education.

AEA Brings Aviation and Space into America's Classrooms

Your membership in The Aerospace Education Association helps sponsor programs that are as practical as they are far-reaching. The goal — to strengthen aviation and space education where it exists and to establish it where needed. You join a growing roster of distinguished educators, industry leaders, scientists and others — all sharing a strong concern for the future of aviation and space.



Purposes

- To promote and support collaboration of individuals and institutions for the advancement of aerospace education.
- To provide significant knowledge pertinent to aerospace education and means for its exchange.
- To publish professional periodicals, resource guides, status reports and curriculum materials for aviation and space education.
- To provide members with a voice in national and international aerospace education affairs.
- To recognize individuals and organizations that have contributed to the advancement of the field.

The Only Organization

AEA is the only non-profit professional education organization founded for the promotion, support and advancement of aviation and space education at all levels of learning.

D.C. Representation

With offices in the nation's capital, AEA keeps abreast of space and aviation developments. AEA keeps the aerospace community up to date on activities in the aviation and space education community.

U.S. Representative International Forum

AEA represents the United States on the prestigious International Council for Aerospace Education. Through the council, the AEA maintains a relationship with similar organizations in more than fifty countries.

National Forum

AEA sponsors the National Council for Aerospace Education, which regularly brings together representatives from all the major aerospace education organizations in the United States. Through the national council, these groups plan ways to pool their efforts.

Education Councils

AEA's council activities include its special divisions: National Council of Elementary Teachers of Aerospace Education; National Council of Secondary Teachers of Aerospace Education; National Council of University Aerospace Educators; National Council of Workshop Directors; National Council of Aviation Education; and National Council on Space Education.

State Directors

AEA maintains directorates in each state for coordinating and encouraging development of aviation and space education at the state and local levels.

Annual Convention

The largest annual gathering of aerospace educators in the world. Not only does the convention bring together our nation's aerospace education leaders, but each year it attracts more international

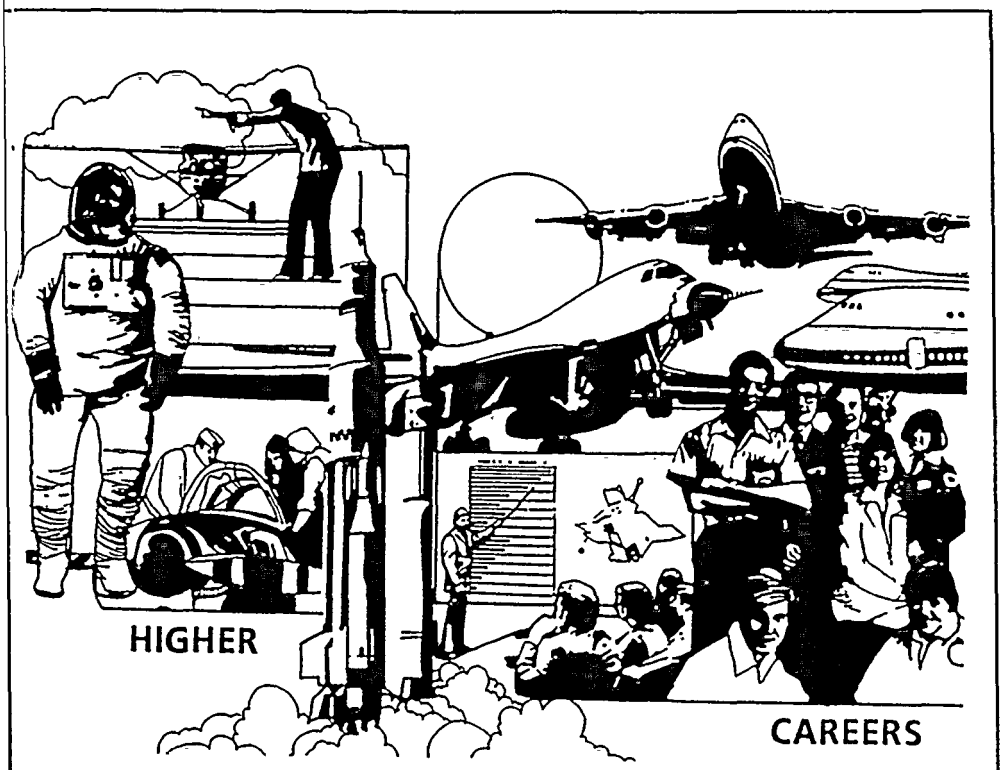
observers. The convention is the single best opportunity each year to find out what's happening in aviation and space education.

Workshop & Conferences
Annually, AEA sponsors programs and provides materials for more than 200 teacher-education conferences, in-service programs and workshops throughout the United States. More than 10,000 teachers have been reached in this manner every year. They in turn instruct more than one million students.

Member Involvement
Through participation in the councils, attendance at conventions and conferences and dialogue in *The Journal of Aviation and Space Education*, AEA gives its members a real voice in the growth and development of the aerospace field.

Awards Program
AEA supports/promotes/administers the nation's highest awards in aerospace education, including the FAI Gold Medal (the world's highest award), the NAA Brewer Trophy (the nation's highest award), and awards recognizing lifetime achievement in aerospace education, distinguished aerospace educators and outstanding teachers each year.

Teaching Materials
AEA editors list sources available for further reading, teaching and study. These include listings of free and inexpensive materials; aerospace bibliographies; government publications; pictures, pamphlets, packets and products available from a variety of sources; audio-visual aids available for purchase, rental or free loan; books, including a listing of eery new aviation or space title published in the United States, as well as selected foreign publications.



Special Consultation
AEA answers thousands of letters and calls from students and teachers throughout the nation. AEA provides advive and materials for efforts in developing educational programs and publications in the aviation and aerospace fields.

Curriculum Development
AEA collects, catalogs and creates special publications on aerospace curriculum and concept development, including lesson plans for teaching about aviation and space at elementary, secondary and higher levels.

Ideas & Activities
AEA collects and publishes information on hundreds of ideas and activities successfully used by individuals and institutions throughout the world.

Researching, Recording & Reporting
AEA researches the aerospace field, records the history and development of aerospace education and reports on new publications and programs.

Helping Others
AEA reports on — and supports — publications and programs of all aerospace education organizations. When you support AEA, you support all the efforts in the field.

Education Network
AEA has an extensive network of educators at all levels who are working to bring aviation and space into the classrooms.

Beyond the Classroom
AEA members go beyond the classroom. Through speeches, programs and articles, they build understanding and appreciation in their community for the potential of aviation and space to improve society and serve mankind.

The National Center
Aerospace education offices located at The National Center for Aerospace Education in Washington, D.C. include:

- Aerospace Education Association
- Aerospace Education Library
- National Research Center
- National Resource Center
- National Council for Aerospace Education
- International Council for Aerospace Education
- National councils of elementary, secondary and university teachers of aerospace
- National Hall of Honor
- National Convention for Aerospace Education
- International Convention for Aerospace Education
- Continuing education programs for aerospace education
- Aerospace youth programs
- Aerospace Ambassador travel/study programs and international tours

Soviet Space Odyssey

From Star City to Baikonur: an inside look at the Russian space program as it keeps pace with glasnost and a changing economy.

By Arthur Fisher

There is something odd about the Soviet space launch facility in Baikonur. It's not really in Baikonur, a hamlet in the Central Asian republic of Kazakhstan, but about 300 miles away, outside the town of Leninsk.

Why the misnomer? In the days before glasnost, the government masked the real locations of sensitive installations by assigning them misleading place names, putting them in wrong locations on maps, or leaving them off maps altogether. In naked contrast to the openness of the U.S. civilian space program, the Soviets kept places like Baikonur, and the launches that blasted off there, hidden from the gaze of most Western observers.

Members of the Aerospace Ambassadors delegation gather in front of the entrance to the Yuri Gagarin Cosmonaut Training Center with Lt. General Vladimir Shatalov and Major General Yuri Glazhov, the Center's commander and deputy commander, respectively. At the extreme left in the front row are, from left, Robert B. Hotz, former editor of Aviation Week & Space Technology magazine and Dr. Wayne Matson, president of the Aviation Space Education Association, who were the delegation leaders.

That's just one of the significant differences between the Soviet space program and America's. But the times they are a changin'. Last June I had a chance to observe other differences, and also some striking similarities. I joined an unprecedented tour of Soviet space facilities, one of the first to allow any but high-ranking American VIPs to visit previously closed places, such as Baikonur.

Sponsored by the Aviation and Space Education Association's Aerospace Ambassador Travel/Study Program, and facilitated by the Citizen Ambassador Program in Spokane, Washington, it included a highly varied assortment of participants: There was an air traffic control specialist; several aerospace engineers actively engaged in the U.S. space program; teachers, including three who were participants in NASA's Teacher in Space Program; a past member of the presidential commission to investigate the space shuttle Challenger accident; and four journalists.

"You have seen more of our space program than any previous delegation," — Vladimir Pivnyuk

"You have seen more of our space program than any previous delegation," we were told by Vladimir Pivnyuk at Baikonur. Pivnyuk, our host throughout much of the trip, is a powerful 30-year veteran of the Soviet space establishment, although his title is unpretentious "staff director for space affairs to the Council of Ministers of the USSR." He actually assembles and presents the budget for all Soviet civilian space activity.

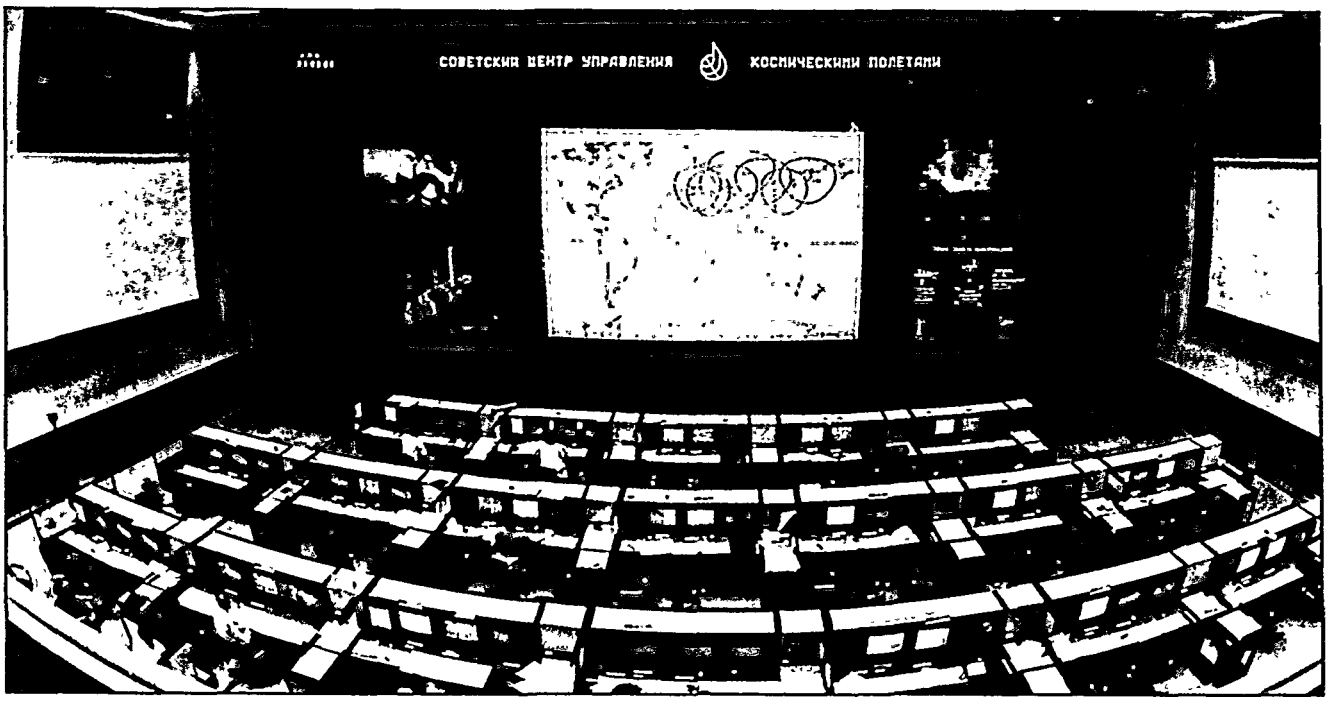
The trip was not only a sign of the remarkable increase in openness wrought during the years of Soviet leader Mikhail Gorbachev's rule. It also signaled a drive by the Soviets to commercialize their space program and reduce its costs, in part by entering into cooperative ventures with the United States and other countries.

Among the space centers visited: The Yuri Gagarin Training Center at Star City, near Moscow; the Energia Design Bureau and Space Control Center in Kaliningrad; and the Institutes for Medico-Biological Problems in Moscow. But Baikonur was certainly the jewel in the crown for our group. To get there, we flew in a military jet from a well guarded VIP section of Moscow's Vnukovo airport, covering 1,500 or so miles eastward in about three hours. The view from the plane as we crossed the Aral Sea was ominous, a bleak landscape of mingled grays and tans that intensive irrigation for cotton farming has turned into an ecological disaster; diversion has drained the Aral Sea of some half its water.

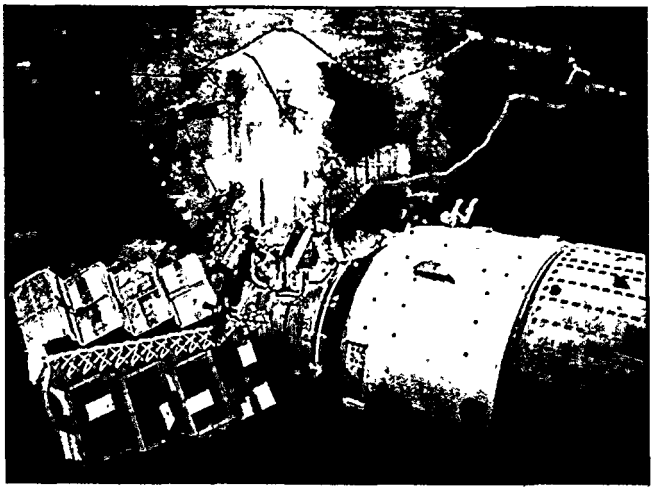
Soon we saw the Syr Darya River, winding in sinuous oxbows and meanders through alkali flats to empty into the Aral Sea. It is the Jaxartes River of ancient times, the eastern boundary of the Persian Empire, where Alexander the Great, using catapults, pelted the Scythians with stones about 2,320 years ago.

The semi-arid dun-colored steppes that constitute the sprawling 4,000 square miles of the Baikonur complex along the bank of the river have probably changed little since then. Camels amble in the distance, occasionally munching on a gray-green thornbush, (Aleski Leonov, the first man to walk in space, describes it to us "a very big beach, but no water.")

The summer temperature during the day is 100 degrees F. But Alexander's catapults have been replaced by their modern



The main hall of the Soviet Space Flight Mission Control Center.



LEFT: Cosmonauts training in the watertank at Star City. RIGHT: Jean Louis Cretien and other participants in the second Soviet-French space mission on board the orbital complex Mir.

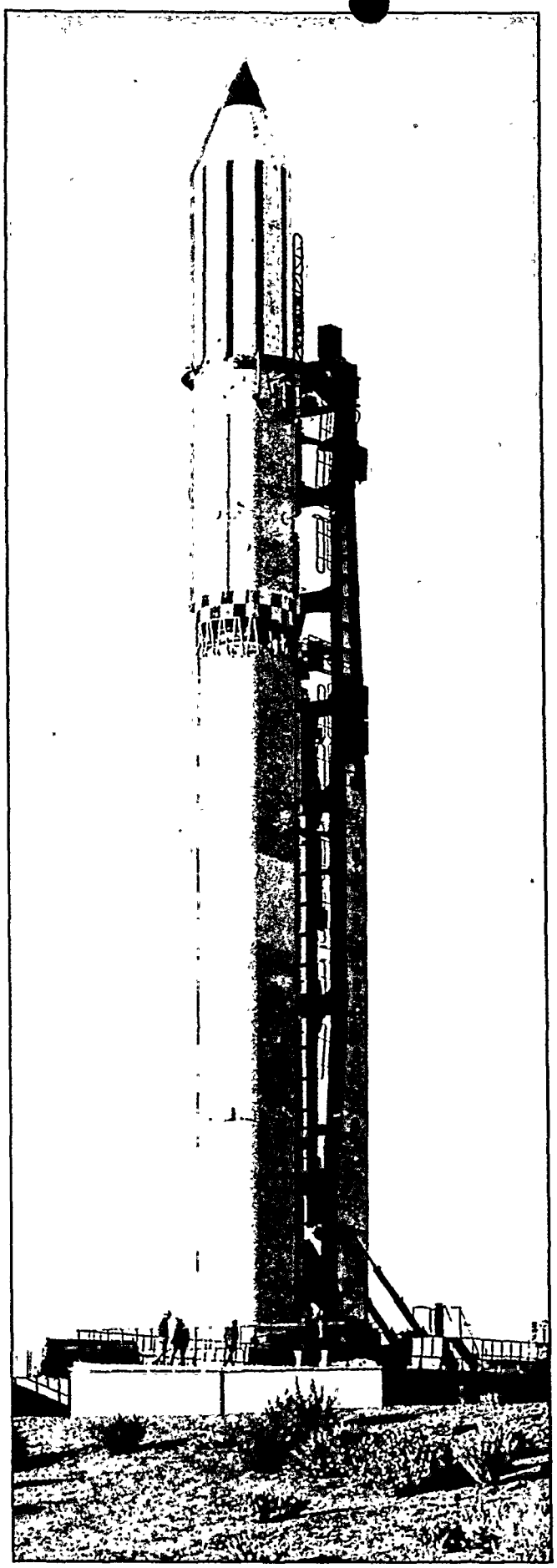
equivalents — rockets.

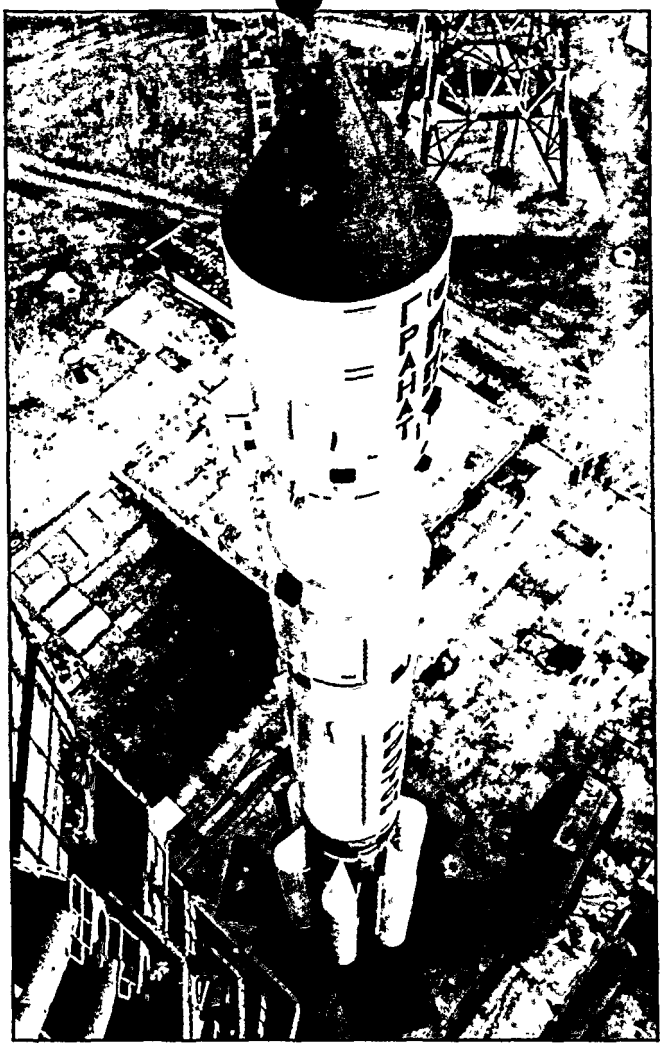
The vast expanse of Baikonur is punctuated by towering launch gantries, metal monsters whose clamplike arms gape wide, waiting to embrace rocket boosters for both manned and unmanned missions. (We were admitted to only that part of Baikonur devoted to the civilian space program. In another part of the huge complex the Soviets launch their intercontinental ballistic missiles.)

One type of gantry is used to launch the Soviet's workhorse rocket, the Proton, which they boast has had a 92 percent success record since 1970. A slender 195 feet long with a maximum diameter of about 30 feet, it can boost payloads of 44,000 pounds into low earth orbit, or 4,800 pounds into geostationary orbit, 22,300 miles above earth. The Proton has launched Soviet orbiting space stations and, in 1988, the two Project Phobos Mars probes. Anatoly Nedayvoda, deputy director of the Proton program, told us that his country is ready to launch American satellites on Protons, and even components for our space station.

Three of the gantries at Baikonur are larger and quite different from the ones used for Protons. They are designed to accomodate the Soviet's super booster, Energia. We saw one of these huge rockets (198 feet long and 4.4 million pounds) lying on its side like a beached whale inside a cavernous assembly building at Baikonur.

The Energia is by far the world's most powerful vehicle, five times more "energetic" than any other Soviet rocket, with a thrust of 8.8 million pounds. It can launch super-sized communications satellites weighing 18 tons into geostationary orbit, or 200,000 pounds of payload into low earth orbit. And that pay-





ABOVE: Proton, a powerful launch vehicle, transports orbital stations Salyut, Mir and other space vehicles.
LEFT: Cosmodrome Baikonur: On the launch stand is the new universal spaceroket, the Zenit, with ecologically pure engines.

load can be either a massive cannister or the Soviet space shuttle orbiter, the Buran.

Buran translates as "snowstorm," "blizzard," or "whirlwind." In any case, the intention is clear. Energia has been launched just twice so far. The first time was in May 1987, carrying only a test satellite payload.

On its second launch in November 1988, Energia carried Buran, without a crew. The unmanned shuttle flight ended successfully after three hours and 25 minutes and two orbits of Earth when Buran landed on a special runway at Baikonur. The flight and the landing were under totally automatic on-board computer control, making it a technological triumph in the view of space experts. Incidentally, only five of the 38,000 fragile ceramic tiles used for thermal shielding had fallen off during the orbiter's flight. Current plans call for a second unmanned flight in 1992.

The Soviet press release issued to trumpet Buran's launch said, somewhat disingenuously, that the shuttle "looks remarkably like the American one." Indeed. the Soviets have been frank to concede that Buran's design was more or less copied

American Teacher to Fly on Soviet Space Station

Aerospace Ambassadors' president, Dr. Wayne R. Matson, signed an agreement with Soviet space officals (Moscow, March 13, 1991) to fly an American teacher (free) to the Soviet space station Mir.

Ten finalists from a national competition will be announced during the International Aviation and Space Education Convention in Huntsville, Alabama, July 1992 *(see page 12).*

Dr. Matson will meet with Soviet President Gorbachev in April during 30th Anniversary Space Celebrations.

The Soviet "Mir" Space Station (left) is photographed in orbit by a departing crew. At top right is the Soyuz TM-10 spacecraft. The Soyuz is docked to the Kvant 1 module, which in turn is attached to the aft port of the core Mir station. The Kvant 2 airlock module (bottom) and the Kristall module (upper left) are attached to Mir's docking hub.

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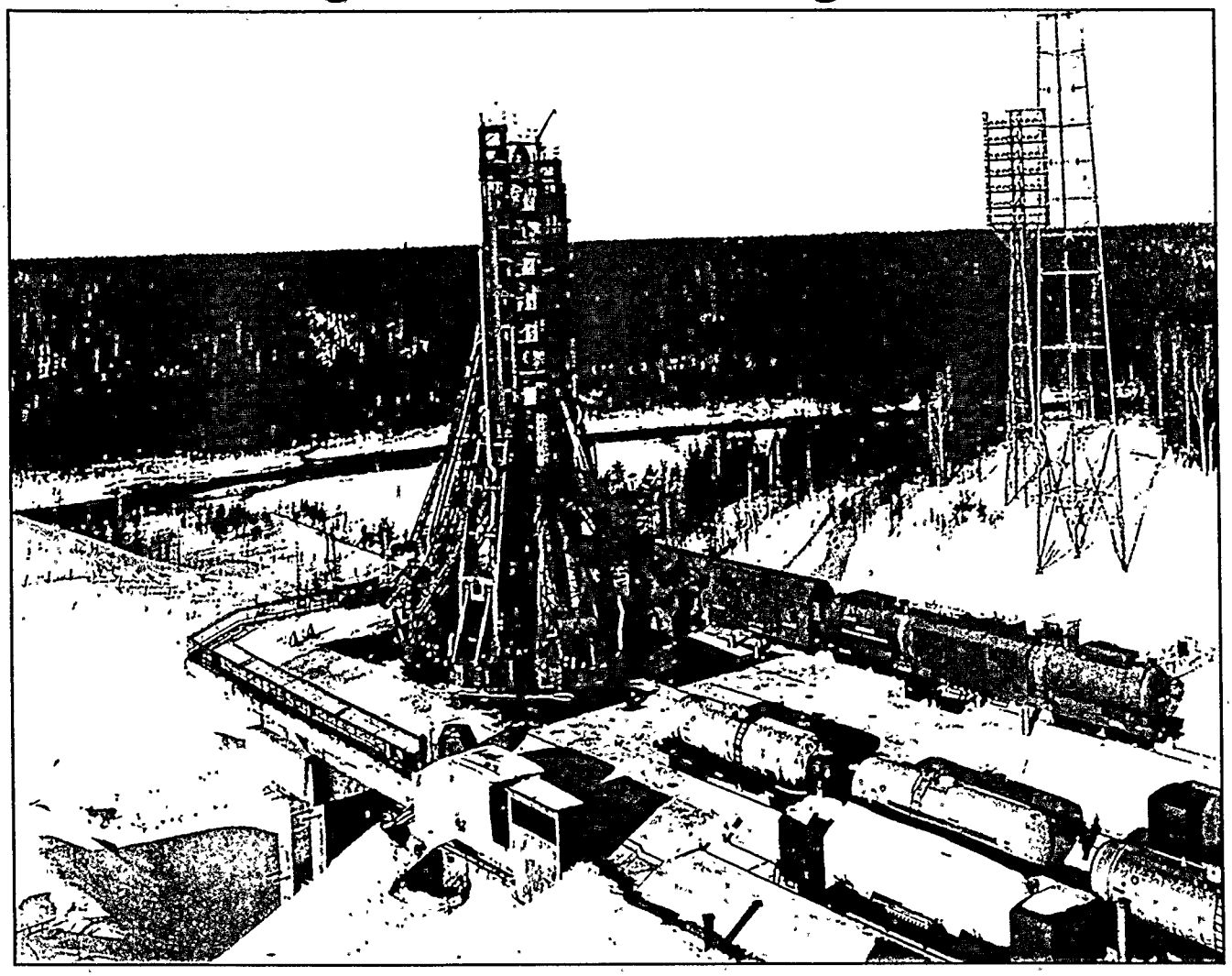


One of the launch pads of the Plesetsk Cosmodrome, located in the European north of the Soviet Union.

from the Rockwell International design for NASA's space shuttle, with some important differences. The space shuttle has two huge recoverable strapon solid-fuel boosters and an external expendable fuel tank. Buran has none of these. Instead, it must be launched by the liquid fuel system of Energia, which is its sole booster. Buran's crew quarters, however, are similar to NASA's, designed to accomodate six to eight travelers.

There is one other strong similarity between the two shuttle programs: Like NASA's space shuttle, Buran has been subjected to sever criticism. Because of its dependence on the Energia booster, the Buran program is enormously expensive. Through mid-1990 it had already cost 14 billion rubles. (the official exchange rate is 0.6 ruble to the dollar.) In an environment of increasingly draconian Soviet budget squeezes, Buran is a luscious target.

In fact, the crumbling Soviet economy is forcing the government to make severe cutbacks in the country's space program. Vladimir Pivnyuk says that the space budget has already been cut 20 percent, and faces further cuts in 1991. He points out that money for the space program must now be justified to a democractically elected Supreme Soviet.

No longer will national prestige be the major criterion for space projects, Pivnyuk says; the emphasis will be on maximizing profits and practical payoffs, such as those from communications, weather, navigation, and Earth-monitoring satellites, and from the space manufacturing of special materials like the ultrapure gallium arsenide crystals used for microchips. Manned missions will probably have the lowest priority, with only two or three manned flights a year.

> One facet of the Soviet space program that may survive relatively unscathed is the space station Mir. (the word means both "peace" and "world." A favorite Russian toast is mir o mir, or "peace on Earth.")

In an address last May, Gorbachev said that the technological advances embedded in Buran could eventually be worth billions of rubles, but only if they are transferred throughout Soviet economic enterprises. Only then, he said, will the huge sums expended on space be justified. Buran, its promise as yet unfulfilled, is now particulary vulnerable.

One facet of the Soviet space program that may survive rela-

tively unscathed is the space station Mir. (the word means both "peace" and "world." A favorite Russian toast is mir o mir, or "peace on Earth.") For one thing, it brings in scarce hard currency: Germany, Japan, and France each fill Soviet coffers with the equivalent of a million dollars a day to have their astronauts fly on Mir. For another, Mir has an especially prized record of successes, despite some near-disasters. Cosmonauts Vladimir Titov and Musa Manarov set the world record for living in space by remaining aboard Mir for 365 days 22 hours, and 39 minutes, returning to Earth on December 21,1989.

We met cosmonaut Alexsander Serebrov at Star City, a mini-

> "Why build a Mir 2 and your space station Freedom separately? They would be quite similar. Why not cooperate to build a bigger one?"
> —Aleski Leonov

city of 4,000. He had returned from Mir, he told us, "exactly 135 days before your visit." When asked what it was like to work in space, he said "just like working on Earth, except we save time by not having to commute."

The reality is not quite that amusing. Leonov, who was on the Russian end of the famous Apollo-Soyuz handshake, told us that the space station was too small to be comfortable. "It's good for technology, but not for the crew," he said. "The diameter is only four meters. Your Skylab space station (launched in 1973 and abandoned in 1974) was much better-nine meters." And Lt. Gen. Vladimir Shatalov, commander of cosmonaut training at Star City, says that cosmonauts' living conditions on Mir are more severe than submariners' in their quarters.

The Soviets have been designing a successor space station, Mir 2, which would be larger, accomodating a crew of 12. Intial plans called for its segments to be ferried to orbit by the giant booster Energia and the shuttle Buran in 1994.

The Soviets are interested in the prospects for multinational space stations, because the costs of building them independently are devastating. The sentiment was echoed by Leonov. "Why build a Mir 2 and your space station Freedom separately?" he told us. "They would be quite similar. Why not cooperate to build a bigger one?"

The theme of cooperation continued during a visit to the Energia Design Bureau and Space Control Center at Kaliningrad, an industrial city about 15 miles north of Moscow where the Soyuz and Progress spacecraft — and Mir, in part — are manufactured. Here is where the idea for Buran took off.

The Design Bureau's chief, Yuri Semenov, told us: "Manned flights are the most promising area for cooperation. We would like to share our experiences with the American side. The very fact that we are welcoming you here today is a sign that we have reached a real turning point in international politics."

The Kaliningrad Control Center actually houses two mission control rooms. The older is used for all post-launch operations of major manned flights, including the comings and goings to Mir. The newer one, installed in a newly built wing of the center, is devoted to Buran and Energia. Passageways leading to it are surfaced in marble and hung with elaborate crystal chandeliers, in the style of New York's Radio City Music Hall. This veneer of luxury occasioned some embarrassment in our hosts.

Pilot-cosmonaut Lt.General Vladimir Shatalov, Director of the Yuri Gagarin Cosmonaut Training Center at Star City with Dr. Wayne R. Matson, President of Matson Press, publisher of Cosmonautics USSR, inside the training mockup of the space station Mir.

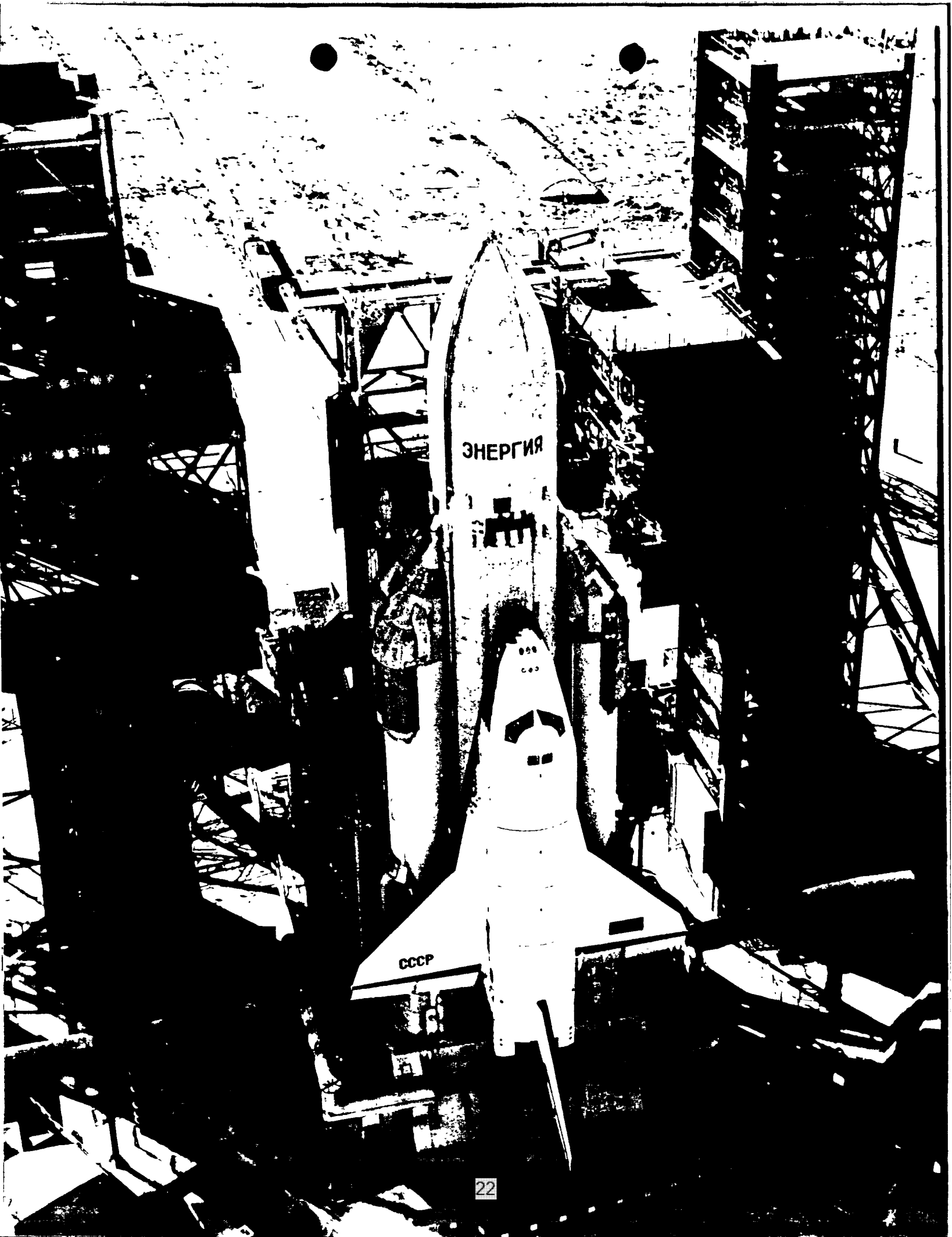
"Perhaps we went a little overboard," one muttered.

We filed onto a balcony outfitted with rows of red plush seats, overlooking banks of desks with computers, to face a giant screen displaying a map of the region around the Baikonur cosmodrome. The actual launch site appeared as a glowing red dot.

An immense mural in the lobby of the Kaliningrad center portrays the holy trinity of the Soviet space program: Yuri Gagarin, the first man in space; Sergei Korolev, the mastermind designer of the early Soviet program, supervisor of the first launch of a Soviet rocket in 1933, and Semenov's immediate predecessor; and Konstantin Tsiolkovsky dubbed "the father of cosmonautics," who first demonstrated the theoretical possibility of space travel and whose writings inspired Korolev.

Prophecy of Space

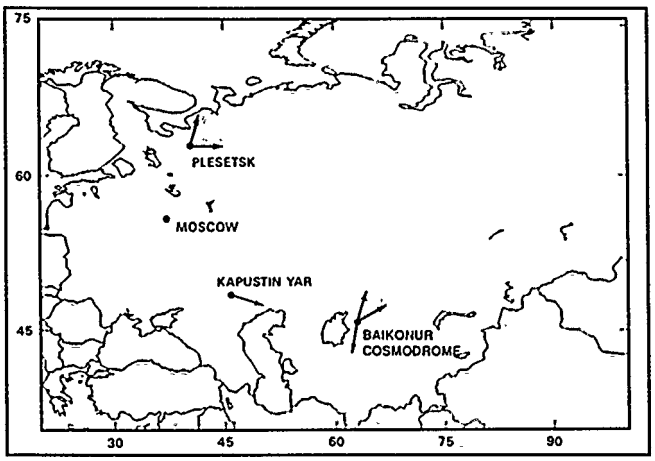
Among those writings is a prophetic passage set down shortly after the turn of the century, and familiar to every Russian schoolchild. It can serve as the credo of the future effort that the Soviets hope will be one of fruitful cooperation. "Humanity will not remain on earth forever, but in pursuit of new frontiers will first penetrate timidly beyond the atmosphere, and then will conquer for itself the rest of the planets around the sun."


ЭНЕРГИЯ
СССР

The Soviet Year in Space

By Nicholas L. Johnson

Despite widespread domestic unrest which threatened the very foundation of the Union, the Soviet space program in 1990 easily maintained its role as the world's most active space endeavor with few outward signs of distress. A new space mission thundered away from a Soviet cosmodrome every five days on the average — a rate three times greater than any other nation or organization. In all, Soviet rockets reached Earth orbit a total of 75 times, compared with 27 missions for the United States and 14 flights by the rest of the world.



ABOVE: Launch corridors around Soviet cosmodromes are highly restricted due to range safety concerns and the normal impact of first and second stage boosters. Due to its high latitude Plesetsk cannot launch spacecraft directly into inclinations below 62°. FACING PAGE: Launch vehicle Energia is capable of transporting into orbit space vehicles of diverse applications, large mass and large sizes. In November 1988, it transported into orbit the Buran spacecraft.

Although not the best measure of merit for discerning the strength or vitality of the Soviet space program as a whole, the number of orbital missions achieved by the U.S.S.R. each year is reflective of evolutionary processes taking place within the dozens of individual satellite projects. The decline in Soviet space launches since 1985 has often been interpreted as an indication of budgetary pressures. However, a more careful examination suggests that to date the economic difficulties apparent in the Soviet Union have yet to impact the operational capacities of space systems and in fact these are increasing in specific areas.

In May, 1986, Teledyne Brown Engineering was tasked by the U.S. government to review the historical activity of foreign space programs and to project that activity into the future. After analyzing the separate components of the entire Soviet space program, predictions of Soviet launch rates into the 1990's were derived. Although new space systems continue to be deployed, the increasing maturity and technological sophistication of Soviet satellites are primarily responsible for the reduced launch rate without a decrease in overall capability.

The 1990 budget for Soviet space programs — both military and civilian — fell from the 1989 level of 6.9 billion rubles to a reported 6.3 billion rubles, a decline of 8.7%. By comparison the official defense budget was reduced 8.2%. These cuts, however, were not made uniformly, causing some programs to be curtailed by 10-30% or even cancelled. The budget for manned space programs (not including the Buran space shuttle) fell more than 25% from 300 million rubles in 1989 to only 220 million rubles in 1990.

Also influencing the true level of effort available to Soviet space program managers is the value of the ruble, which is under intense pressures from inflation and the decision to make the ruble fully convertible in the international market by about the year 2000. While the Soviet Government has only recently begun calculating the official annual inflation rate, Soviet scientists and engineers have been acutely aware of its effects for many years. One example offered recently was the increase in price of a type of space equipment from 120,000 rubles in 1970 to 340,000 rubles in 1975 to 810,000 rubles in 1984 to 6,000,000 rubles in 1988.

Several official exchange rates exist simultaneously for domestic, international business, and tourist applications, and most fluctuated considerably in 1990. The long-held official commercial exchange rate of 0.6 rubles to the U.S. dollar is scheduled to jump to 1.8 rubles per dollar in January, 1991. Private citizens, on the other hand, are permitted 6 rubles per dollar. Meanwhile, the more common, everyday exchange rate of 15-16 rubles per dollar was expected to climb to 30-40 rubles per dollar when new currency auctions are instituted.

Assessments of the profitability of Soviet space activities vary widely by program as well as by methodology. Reportedly, more than 1,100 Soviet organizations now use products or information acquired from space photography alone, and 60 countries are paying hard currency for similar services. By one account in 1990 by the Minister of General Machine Building, who is responsible for the manufacture of almost all spacecraft and launch vehicles, cosmonautics as a whole is not yet self-supporting, although profits on all expenditures are anticipated by 1992. A long-range plan for the period 1990-2005 was developed in 1989, but its adoption was in question during 1990.

The majority of Soviet space missions continue to be directed toward low earth orbits below 2,000 km. Fewer spacecraft are placed in geostationary or semi-synchronous (circular and highly elliptical) orbits, but they are normally longer-lived. By

occasionally launching more than one satellite on a single rocket, a total of 96 spacecraft were launched in 1990.

The most dramatic change from recent years is the significant decrease in military and civilian photographic reconnaissance missions which accounted for 42% of all missions in 1989 but only 28% in 1990. Flights to Mir space station, including both manned and unmanned spacecraft, rose to eight, earning this highly publicized segment of the Soviet space program third place overall. The launch rate of any particular mission type is not indicative of its relative portion of the entire operational satellite constellation. More than half of all Soviet satellites support communications needs, while the vital photographic reconnaissance satellite normally account for the smallest percentage of the major mission types. The total number of active Soviet satellites has grown from less than 100 in 1980 to more than 160 in 1990.

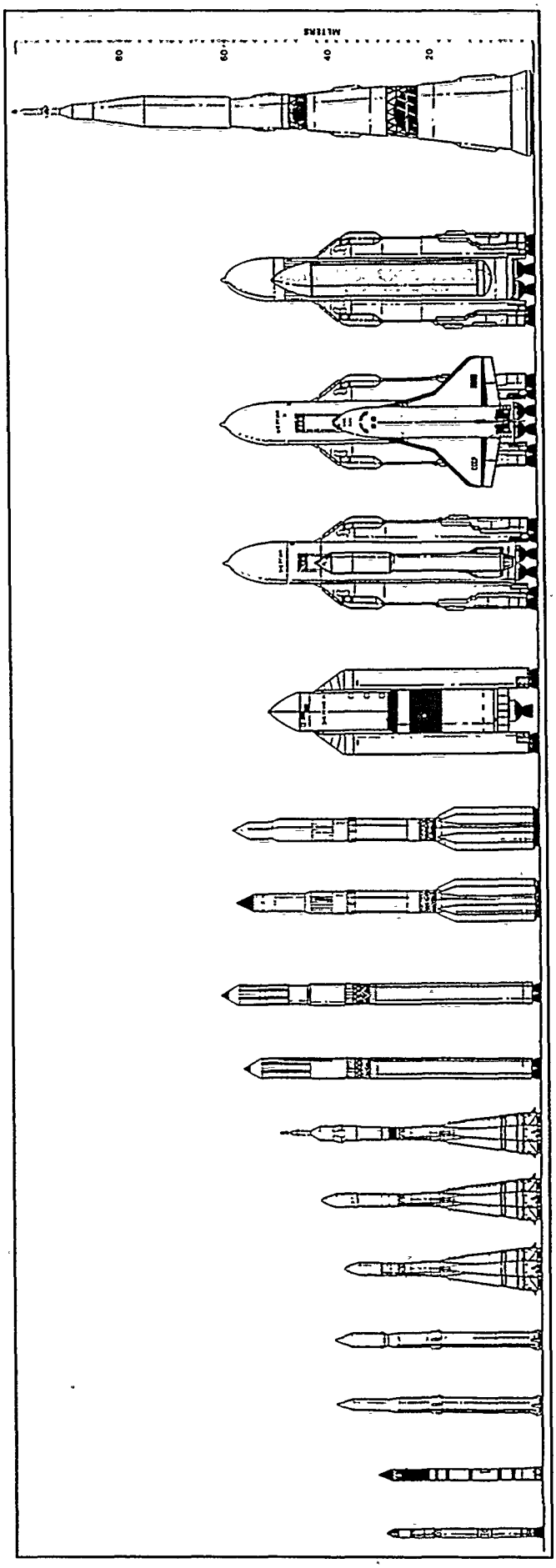
Although no spectaculars were staged, solid achievements in a variety of space programs were achieved during the year. A 20-metric-ton module was added to the Mir space station complex, greatly increasing its capability to produce valuable crystals and biologically active compounds. The module also was equipped with a new universal docking device which will permit future missions with the Buran space shuttle as well as foreign spacecraft. Also important to future space station plans were the successful testing of a manned maneuvering unit needed to expand activities outside the orbital complex and the demonstration of a new payload return capability from Mir.

The long-awaited Gamma astrophysical observatory was placed in Earth orbit, while the Granat deep space platform passed its initial check-out tests and completed its primary program. Commercial materials science packages belonging to foreign sponsors were launched on three Soviet satellites and recovered successfully. The prospects of Soviet commercial launch services increased substantially with the signing of an agreement with the Cape York Space Agency and the subsequent permission form the U.S. Government for an American firm to manage the international space port in Australia. Another milestone was reached with the launch of a civil communications satellite owned and operated by the Russian Republic rather than the Soviet Union's Ministry of Communications.

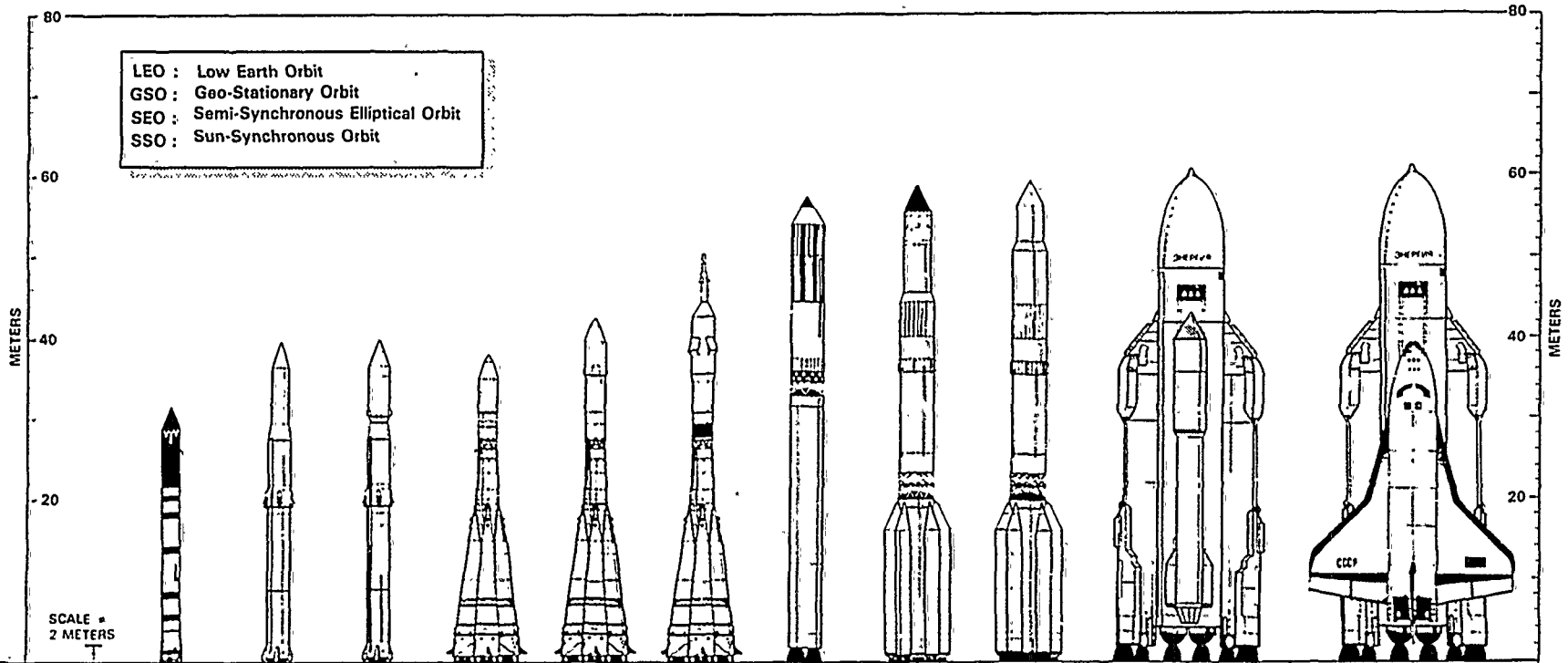
Along with these achievements and the monumental chore of operating and replenishing such a large constellation of spacecraft came a number of setbacks. At least two payloads were lost when their launch vehicles failed, stranding one in a useless orbit and destroying the other in a terrific launch pad explosion. Late in the year a military photographic reconnaissance satellite was deliberately exploded in orbit after it failed to respond to a command to return to earth.

After a launch postponement of two months, the unique Kristall module failed to dock with the Mir space station on its first attempt when a thruster malfunctioned. Thermal blankets were ripped away from the Soyuz TM-9 spacecraft during launch, upsetting schedules for much of the year and indirectly leading to a damage of Mir's special EVA hatch. A power circuit failure also curtailed the Gamma astrophysics program.

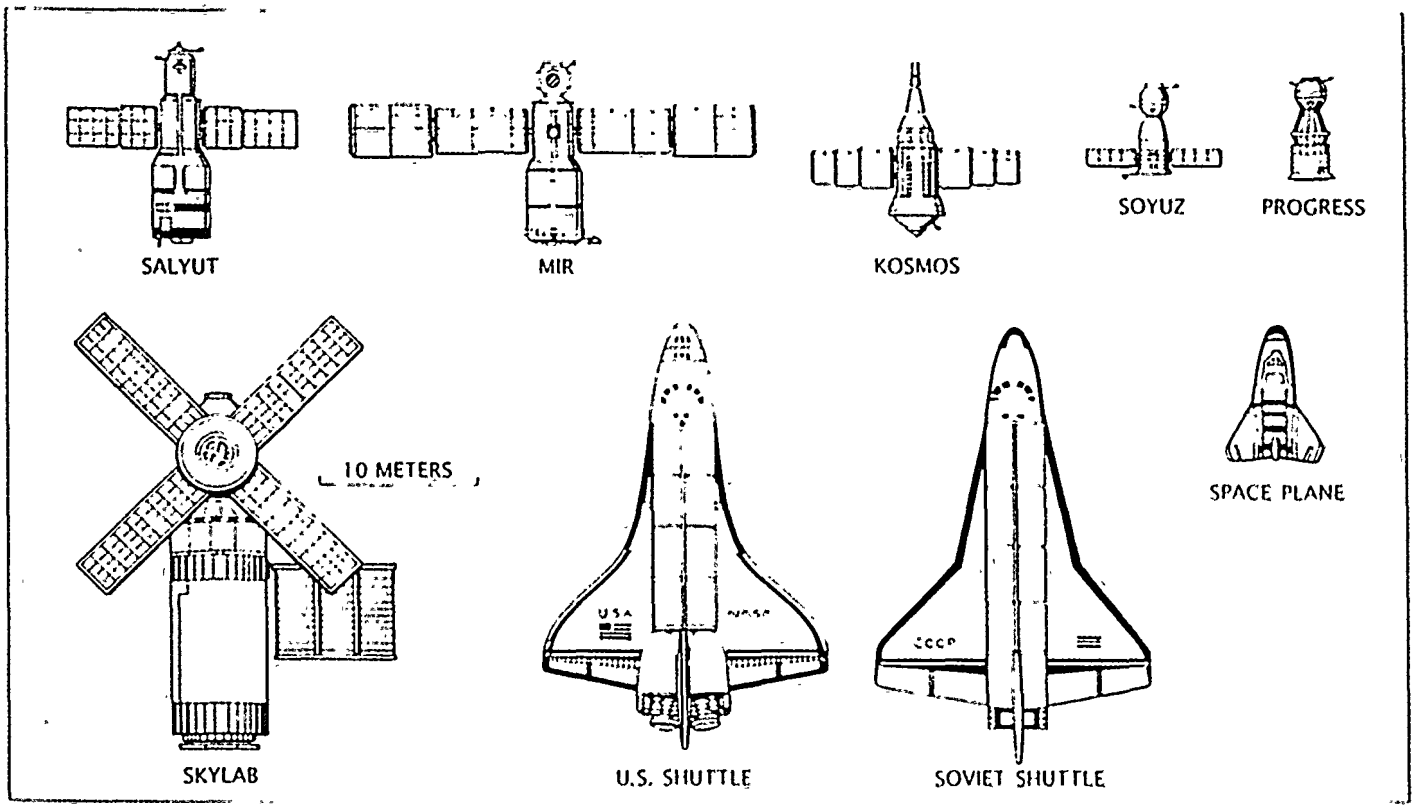
Three satellites admittedly scheduled for launch in 1990 never got off the ground. The large Almaz spacecraft with its impressive synthetic aperture radar missed its mid-summer launch date, eventually slipping to early 1991. An Ekran-M and a remote sensing satellite also did not meet an announced lift-offs, but these may have been delayed because they were not yet needed. Finally, the Energiya launch vehicle and the Buran space shuttle remained idle for the second year in a row, still



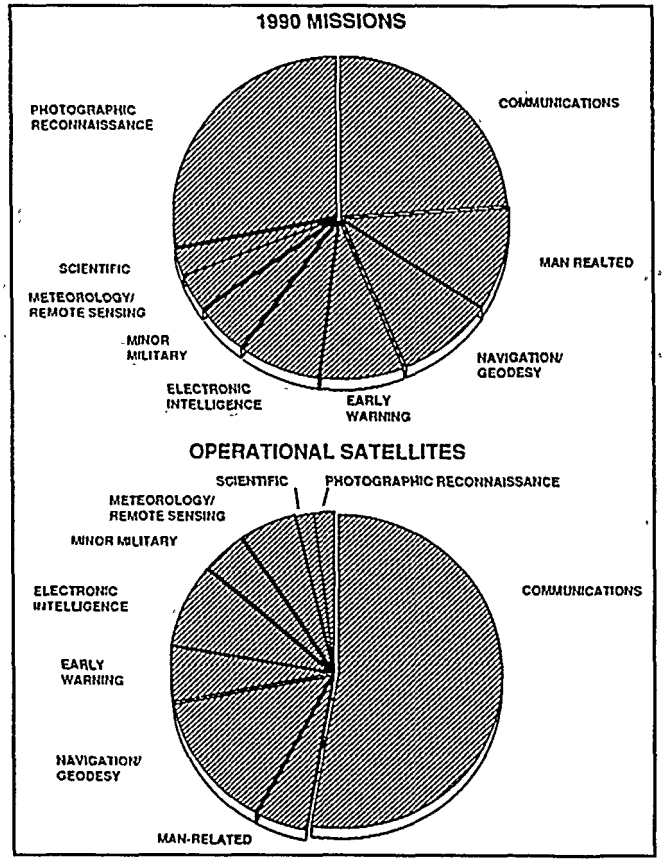
SOVIET OPERATIONAL SPACE LAUNCH VEHICLES



USSR NAME	KOSMOS	—	TSYKLON	VOSTOK	MOLNIYA	SOYUZ	ZENIT	PROTON	PROTON	ENERGIYA	ENERGIYA/BURAN
DoD DESIGNATOR	SL-8	SL-11	SL-14	SL-3	SL-6	SL-4	SL-16	SL-12	SL-13	SL-17	SL-17
SHELDOM SYSTEM	C-1	F-1-m	F-2	A-1	A-2-e	A-2	J-1	D-1-e	D-1	K-1	K-1
YEAR OF DEBUT	1964	1966	1977	1959	1961	1963	1985	1967	1968	1987	1988
LAUNCH SITES	PL,KY	TT	PL	TT	TT,PL	TT	TT	TT	TT	TT	TT
1990 ORBITAL MISSIONS	10	4	8	0	12	30	1	9	1	0	0
TOTAL ORBITAL MISSIONS	371	114	86	148	259	943	13	146	21	0	1
OPERATIONAL PAYLOAD CAPACITY (KG)	1,500(LEO)		4,000(LEO)	4,730(LEO) 1,840(SSO)	1,800(SEO)	7,240(LEO)	13,740(LEO) 11,380(SSO)	5,700(Moon) 5,300(Venus) 4,600(Mars) 2,500(GSO)	20,600(LEO)	105,000(LEO) 32,000(Moon) 28,000(Mars/Venus) 19,000(GSO)	30,000(LEO)



ABOVE: Spacecraft that have played or will play historic roles in the Soviet space program are shown alongside the US space Station Skylab and the US Space Shuttle. RIGHT: Due to the short mission times of most photographic reconnaissance and man-related spacecraft, their launch rates are not reflected in the Soviet resident satellite population.



looking for justifiable missions.

Domestic — rather than Western — assessments of the health and long-term prognosis of the Soviet space program were in ample supply during 1990 in this era of glasnost. As in years past, the views ranged from the oppressive to the optimistic. Soviet space program managers were particularly criticized with allegations of Lysenkoism or worse:

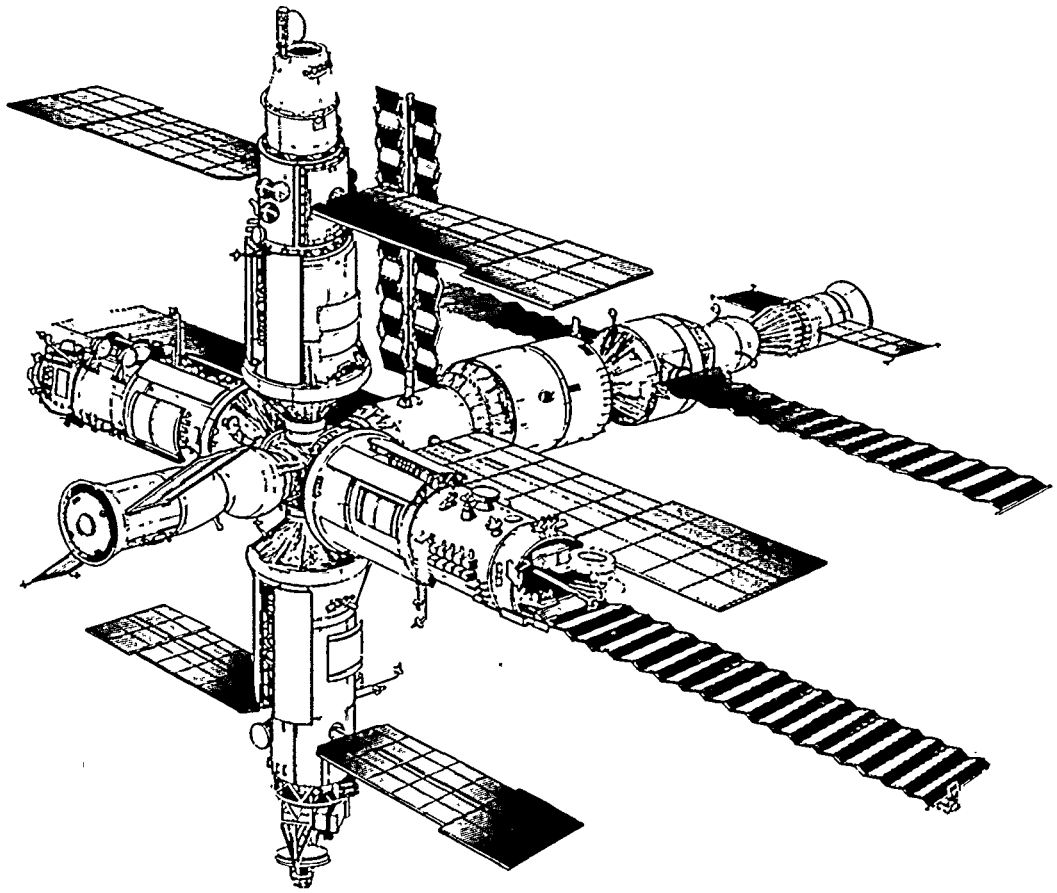
"The monstrous hybrid of departmentalism and monopolism in the management of Soviet space research also leads to the economic, political, and moral losses that have transformed it from the subject of deserving pride by the Soviet people into a soup kitchen."

On a more positive note, more than 20 governmental, educational, and industrial organizations combined resources to establish the Cosmos International center for Advanced Studies. The objective of the non-profit corporation is to "provide a mechanism through which Soviet universities, research institutes and industrial enterprises will cooperate to further a new system of private aerospace education, policy, socio-economic studies, basic research, and commercial development (including spinoff and conversion) of science and technology."

In connection with a visit to Moscow by NASA Administrator Richard Truly, a Soviet journalist offered his personal view of the Soviet Union's future in space:

"We have to our credit technical and medical-biological backup for long manned flights, powerful and reliable carrier rockets, and a developed infrastructure of scientific and production projects — a guarantee of further progress in cosmonautics."

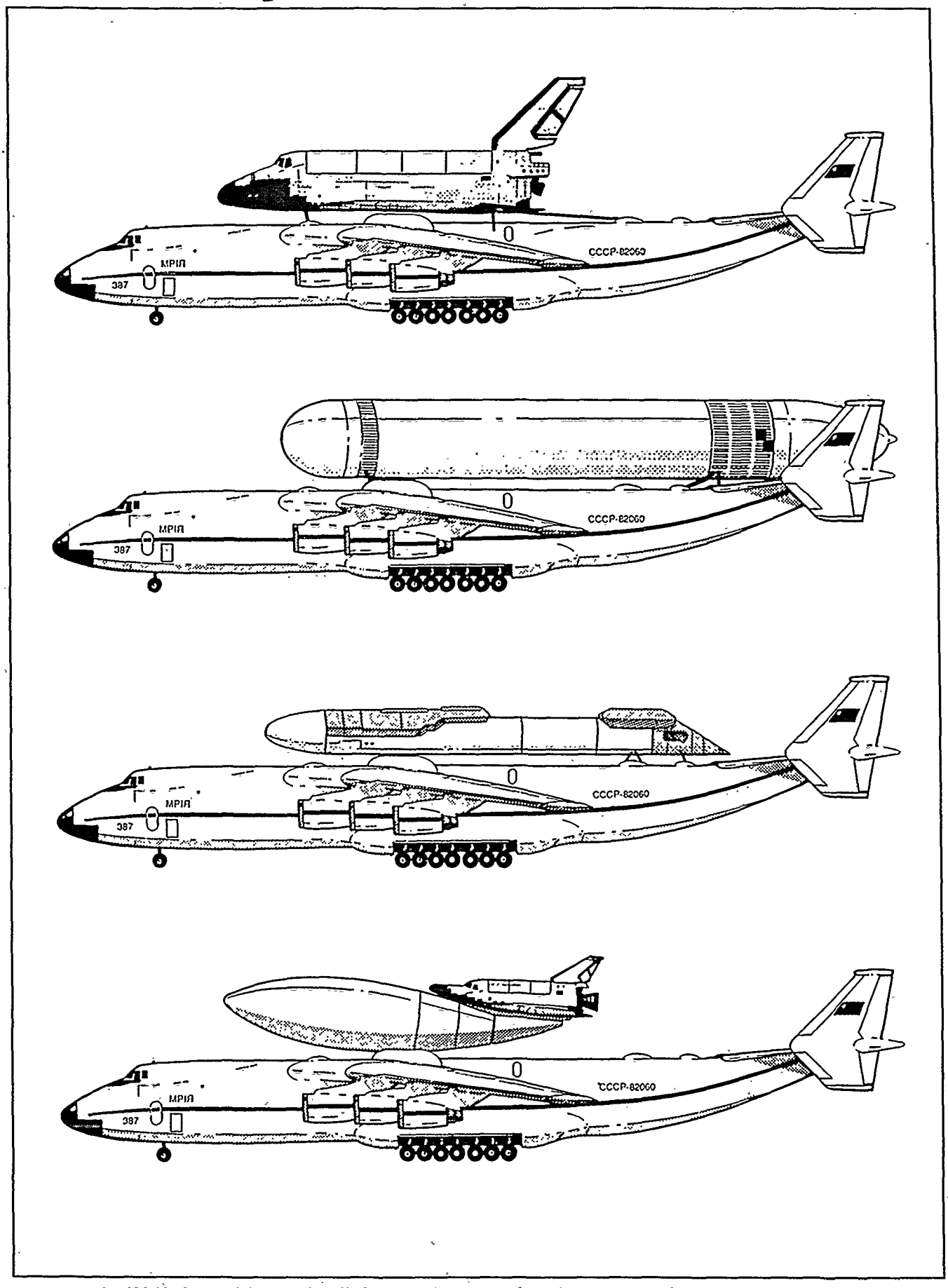
THE MIR SPACE STATION COMPLEX



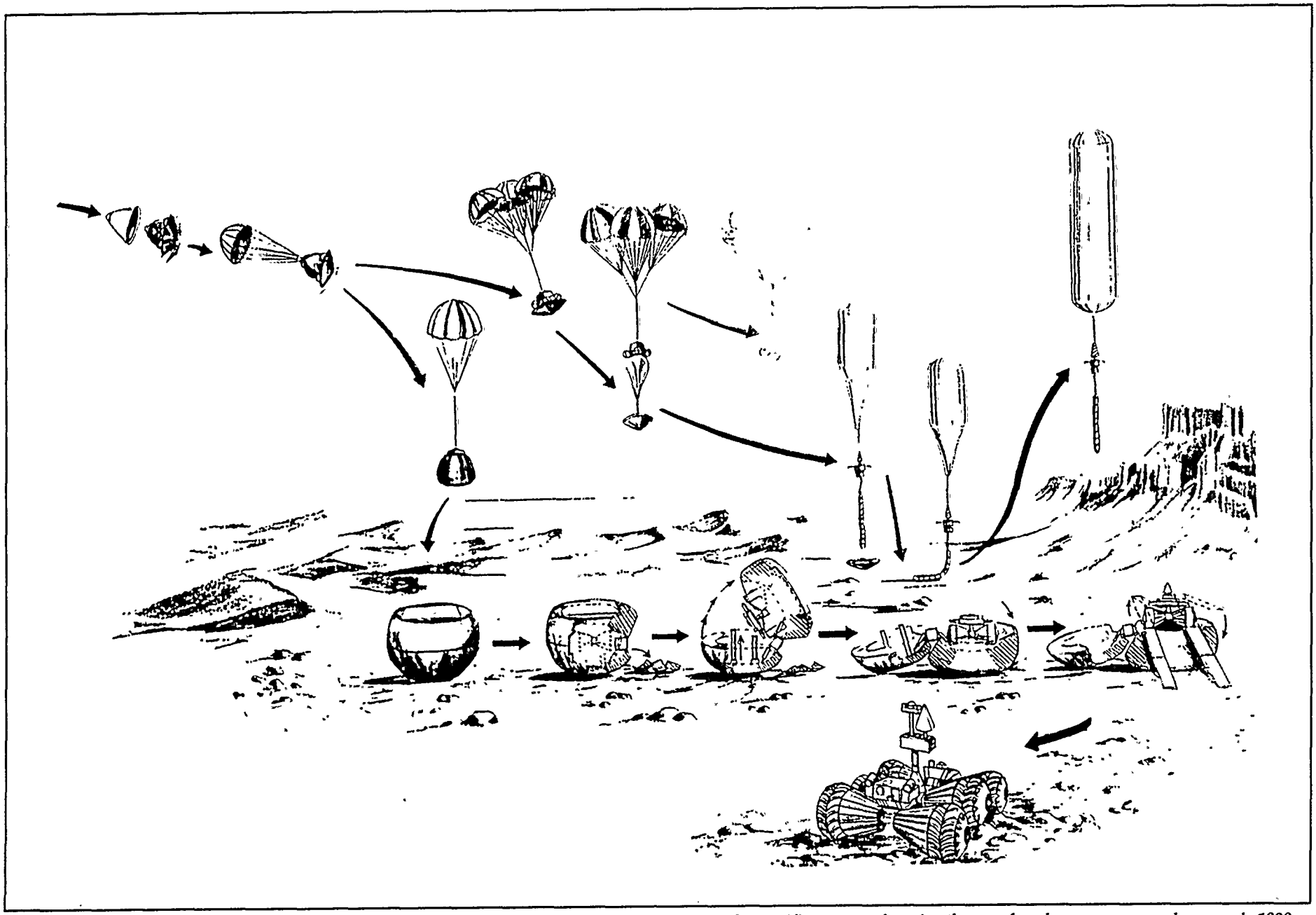
COMPONENT	SOYUZ TM	KVANT 2 (77 KSD)	KRISTALL (77 KST)	PRIRODA (77 KSI)	SPEKTR (77 KSO)	MIR (17 KS)	KVANT 1 (37 KZ)	PROGRESS M	TOTAL COMPLEX
YEAR OF DEBUT	1986	1989	1990	1991-1992	1991-1992	1986	1987	1989	1992
LENGTH, m	7.0	12.4	11.9	~ 12	~ 12	13.1	5.8	7.0	33
MAXIMUM BODY DIAMETER, m	2.7	4.4	4.4	4.4	4.4	4.2	4.2	2.7	4.4
INITIAL MASS, metric tons	7.1	19.6	19.6	19.7	19.6	20.4	11	7.2	127
USEFUL VOLUME, m^3	10	62	61	66	62	90	40	7.6	400
NUMBER OF SOLAR ARRAYS	2	2	- - *	1	2	3	2	2	14
TOTAL AREA OF SOLAR ARRAY, m^2	10	56	- - *	35	56	98	70	10	335
MAXIMUM POWER GENERATION, kW	1.3	6.7	- - *	4.2	6.7	10.1	8.4	1.3	23**

* See Kvant 1 entry; panels launched on Kristall are scheduled to be transferred to Kvant 1 in 1991

** Less than total maximum due to solar panel orientations, shadowing, and degradations



An AN-225 heavy-lift aircraft will play a vital support role in the Energiya and Buran programs and may serve as the first stage booster for a future spacecraft.



A small Mars rover was tentatively returned to the Mars 94 mission in 1990, increasing the potential scientific return and paving the way for a larger, more complex rover in 1998.

Soviets Reveal Moon Rocket

After more than 20 years of secrecy, the Soviet Union has revealed details of its massive N1 booster, which was designed to send cosmonauts to the Moon ahead of U.S. astronauts.

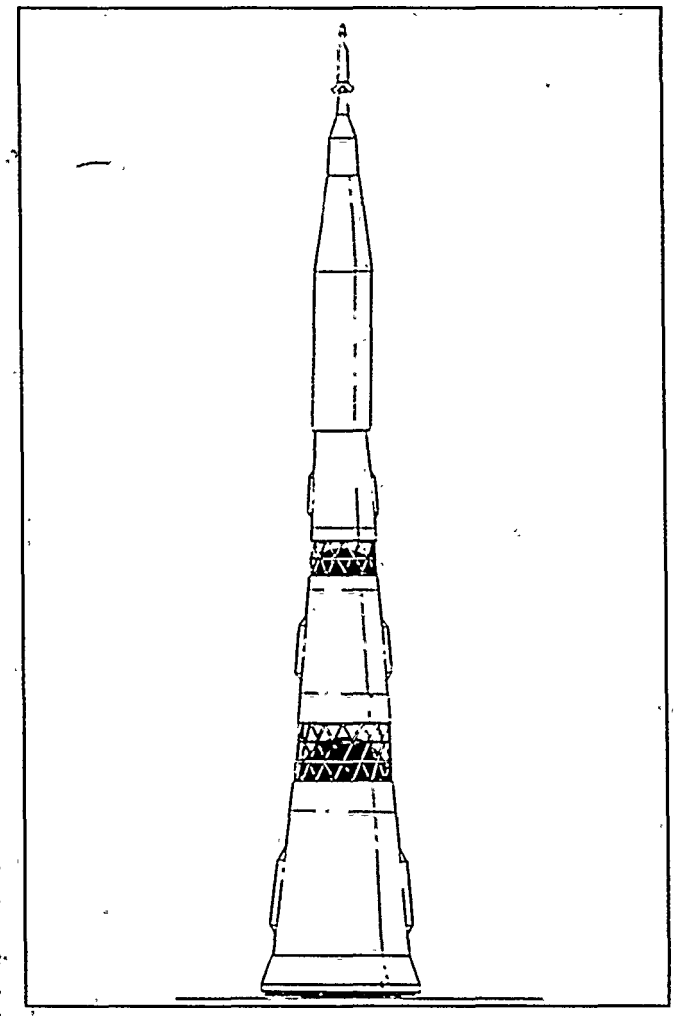
By Craig Covault

The new data show the first four stages of the N1 — the Soviet equivalent of the U.S. Saturn 5 — had a more conical shape than the Saturn 5 and used four stages with a total of 43 engines to do what the U.S. vehicle achieved with three stages and 11 engines.

The new information on the N1 booster and a drawing of the design appeared in a recent issue of the Soviet aerospace technical journal, "Znanye Cosmonavtika Astronomiya."

During the early 1970s, four N1 launch attempts failed before the Soviet lunar landing program was scrapped. One N1 flew as high as about 70,000 ft. before failing. In contrast, the U.S. Saturn 5 flew several successful Earth orbit missions and sent nine Apollo crews to the Moon, including six astronaut teams who landed on the lunar surface.

The overall reason for the N1's failure was the USSR's inability to achieve reliability and thrust stability across the vehicles 30 first stage engines, Vladimir A Pivnyuk, a space official on the Soviet Council of Ministers told the author.



The Soviet N1 Moon rocket had a more conical shape than the U.S. Saturn 5 booster.

The Soviet journal's drawing and information agree with the new research on the program being done by Soviet analyst Phillip Clark in Britain with the USSR's cooperation.

Noted Soviet space analyst Nicholas L. Johnson, advisory scientist for Teledyne Brown Engineering, Colorado Springs, also endorses the new Soviet information, based on his study of the vehicle.

The Soviet N1, like the U.S. Saturn 5, was about 370 ft. tall, but height was about the only feature the two boosters had in common. The individual stages of the N1 and Saturn 5 cannot be compared directly because their propulsion systems used different propellants and had much different burn times to do their respective jobs in the ascent profile.

The first stage of the N1 used 30 liquid oxygen/kerosene engines each providing about 338,800 lb. of thrust at vacuum. The engines were arrayed with 24 of the powerplants around the circumference of the boattail, while six additional engines were clustered in the center, Clark said.

This compares with the Saturn 5 Boeing S-IC first stage, which used only five Rocketdyne F-1 engines, each providing about 1.5-million-lb thrust using the same propellants as the N1.

The Saturn 5 had a total lift-off thrust of 7.5 million lb, while analysis shows the N1 had about 10 million lb of lift-off thrust, depending upon the conversion between sea level and vacuum thrust.

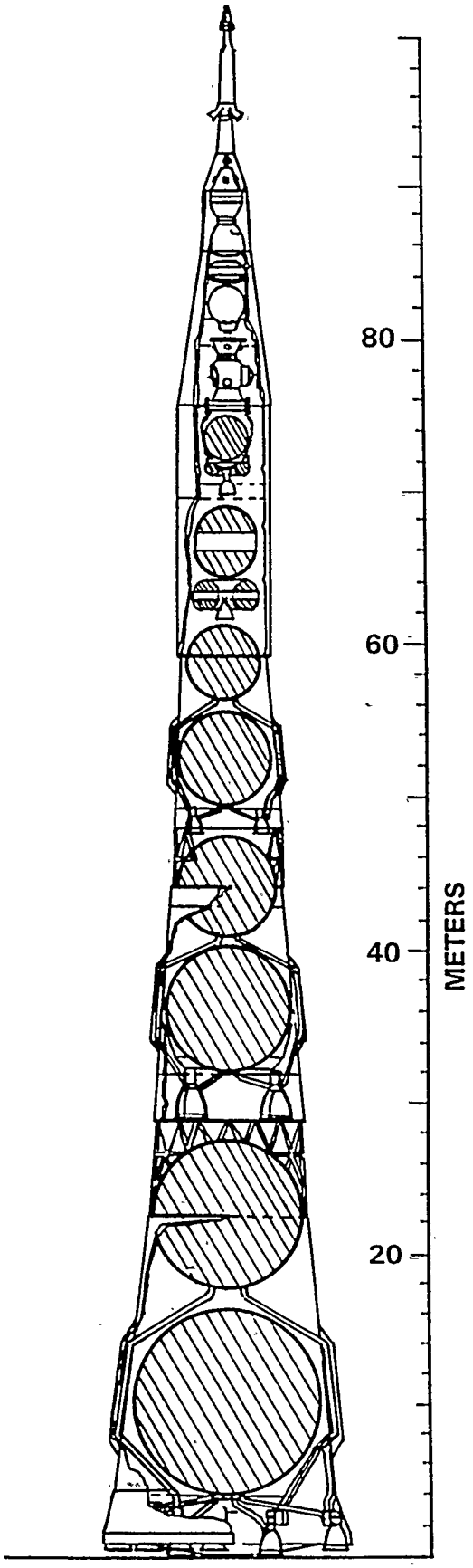
The second stage of the N1 has eight engines mounted around the circumference of the stage, with each engine providing about 393,800 lb. of thrust at vacuum. This gave the second stage a thrust of about 3 million lb.

Analysis by Clark indicates that both the first and second stages of the vehicle used the same powerplant, but that the engines on the second stage had nozzle and other differences that increased each powerplant's thrust compared with the version used on the first stage.

Like the first stage, the second stage of the N1 used oxygen/kerosene propellant. This contrasts significantly with the Saturn 5, which used a North American Rockwell S-2 second stage powered by five Rocketdyne J-2 engines using liquid oxygen and liquid hydrogen propellants.

The second stage of the Saturn 5 had a total thrust of just over 1 million lb., compared with the Soviet second stage that had more than 3 million lb. of thrust.

The N1 third stage used four engines, each providing about 90,200-lb-thrust, yielding a total thrust of 360,800 lb.



The Soviet lunar module's descent to the Moon would have differed from the U.S. Apollo landings.

The Saturn 5's McDonnell Douglas S4B third stage used a single oxygen/hydrogen J-2 providing 229,515 lb. of thrust.

On the Saturn 5, the third stage fired first to place the Apollo lunar module/command-service module stack into an Earth parking orbit. It was then fired again to place the LM/CSM on a trans-lunar trajectory.

The first three stages of the N1 also were to place the Soviet lunar module/soyuz transport vehicle into Earth parking orbit. But the N1 was to use a 90,200-lb.-thrust fourth stage to propel the Soviet lunar vehicles toward the Moon instead of restarting its third stage to carry out that function as was done by the three-stage Saturn 5.

The new material provided by both the Soviet technical description of the booster and information developed independently by Clark differs somewhat from data returned in the late 1989 by a Massachusetts Institute of Technology group that accidentally saw a Soviet lunar module in storage at the Soviet Aviation Institute

The group's information was that the large Soviet N1 was to be launched unmanned carrying the Soviet lunar module, but that a manned Soyuz was to be launched atop a second booster, then dock with the N1 fourth stage/lunar module in Earth orbit to transfer a crew to N1 stack.

The new Soviet data and research by Clark, however, indicate that the N1 was to carry both the Soyuz, manned by two cosmonauts, and the lunar module aloft simultaneously — much as the Saturn 5 carried three astronauts in the CSM along with the NASA lunar module. The Soviet propulsion system for lunar orbit insertion, descent to the Moon and return to Earth also differed significantly from the U.S. design.

In the U.S. Apollo design, an Aerojet Service Propulsion System engine on the CSM was used to brake the docked LM/CSM into lunar orbit. Two astronauts in the LM than used a single burn of the LM descent stage for descent to the Moon.

According to the new Soviet data, a large separate propulsion system attached to the Soviet LM/Soyuz would be fired to brake the Russian vehicles into lunar orbit. Instead of this engine remaining in lunar orbit, however, it was to be refired to start the initial descent of the Soviet lunar module carrying one Soviet cosmonaut.

Unlike the U.S. system — where the astronauts transferred from the CSM to the LM internally — a single Soviet cosmonaut was to have used extravehicular activity (EVA) to move from Soyuz into the LM

After the N1 fifth-stage engine fired to slow the Soviet LM for its descent, this engine was to be separated, according to the new Soviet data. The Soviet lunar module descent stage was then to fire to complete the landing. This meant the Soviets would have to rely on perfect performance of two rocket engine systems to lower the LM to the Moon — instead of a single firing of the LM descent stage engine as was the case for the Apollo LM.

Once the lunar exploration was completed by the single cosmonaut, the Soviet lunar module's ascent stage was to have fired the cosmonaut back toward lunar orbit, just as in the U.S. system.

The cosmonaut left in lunar orbit on board the Soyuz and the crewman who landed on the Moon were then to have rendezvoused in lunar orbit. The lunar crewman was then to have used EVA to get back into Soyuz. A large "trans-Earth stage" attached to the back of the Soyuz was then to have been fired to place the Soyuz and its two cosmonauts on a trajectory back to Earth

Red Star in Orbit

Russian spacecraft come to the United States in an exclusive exhibition in Huntsville, Alabama.

The opportunity to see Rusian spacecraft never seen outside the Soviet Union is available at the U.S. Space and Rocket Center in Huntsville, Alabama. The Space Center is the first and only U.S. stop for "Red Star In Orbit," a special exhibition of Soviet spacecraft and art. The exhibit is scheduled for an international tour.

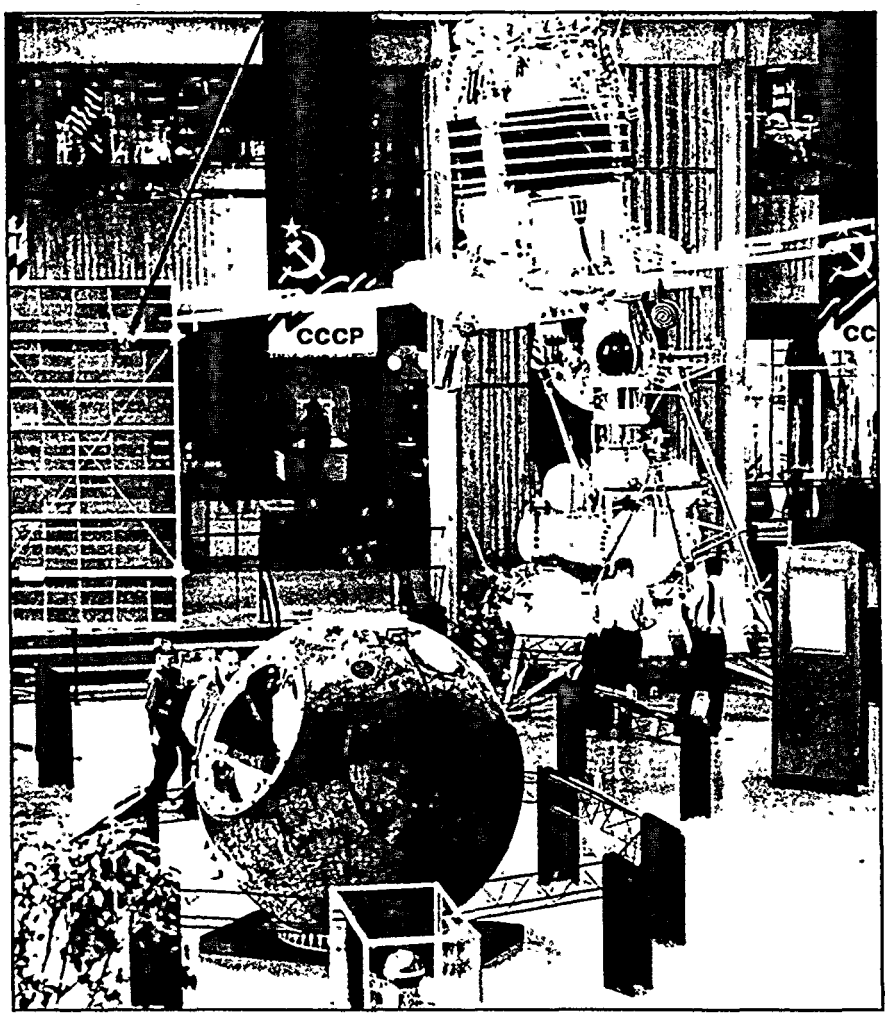
Space Center Director Edward O. Buckbee selected many of the exhibits for "Red Star in Orbit" during a trip to Russia nearly two years ago. "This is the most significant exhibit that we have hosted during our 20 years in operation," he said. "We believe the public and trainees in all Space Camp programs will share our fascination at seeing actual Russian spacecraft up close. The fact that these items have never been seen outside the Soviet Union adds tremendously to their appeal and educational value."

The Soviet exhibit is anchored by a Vostok capsule which actually flew in the early years of the Soviet manned space program. Vostok is best known for the flights of Yuri Gagarin, the first man in spce in 1961, and Valentina Tereshkova, who in 1963 became the first woman in space.

Full-size mock-ups include the Luna-24 Space Probe, used in unmanned moon expeditions to send back photos and soil samples; Sputnik 1, the satellite that in 1957 opened up the Space Age; and the descending module of a Soyuz spacecraft, which was a two and three-man capsule design mainly for hook-ups to other vehicles such as Mir space station.

The Mir, represented in a one-third scale, is considered the first modular space station and remains manned to this day. It was launched in 1986. The Soyuz is best known in America for the famous 1975 space rendezvous between Soviet cosmonauts aboard Soyuz 19 and three American astronauts inside an Apollo spacecraft.

Also on display is a full-scale backup of the Lunokhod Lunar Rover, the only mobile, unmanned laboratory to explore the Moon by remote control.



Red Star in Orbit Soviet space exhibition in Huntsville, Alabama.

The Soviet exploration of Venus is represented by full-size, completely outfitted backups of the Vega and Venera 15 spcaecraft.

Hanging from high above the Space Center ceiling is a full-scale Molniya 1 Satellite. The Soviets have launched approxiamately 127 satellites in the Molnyia series.

Visitors have the opportunity for the first time to see Soviet cosmonauts spacesuits. The two suits on display represent the type worn by Vostok cosmonauts such as Yuri Gagarin, and one of the suits worn by cosmonauts in the early Soyuz flights.

Also included is the first appearance outside the Soviet Union for dozens of paintings, etchings, and lithographs inspired by the space program. The paintings were created by two former Soviet cosmonauts and internationally known Soviet artists.

The exhibit will remain at the Space Center through early fall of 1991.

COSMONAUTICS USSR

A colorful history of the Soviet space program

The Publishing House "Mashinostroenie" (Soviet Union) and the firm "Matson Press" (United States) are preparing a magnificent publication, **Cosmonautics USSR**, dedicated to the Soviet cosmonautics and the USSR space and rocket industry.

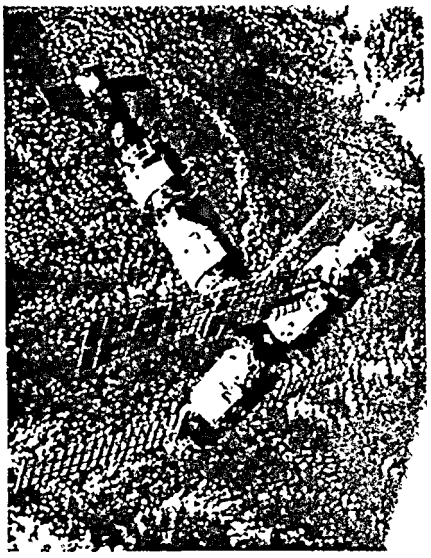
Almost half of the material has never been pub- lished. The presence of this material in the first edition was simply inconceivable. Much of it, until recently, could only be found in the documents inscribed "Secret." This new edition is the most complete, exceedlingly open, and strictly objective account describing the great successes and the bitter disappointments of the Soviet space program.

This book will include: hundreds of descriptions and stories; more than 600 photographs, many of which are unique; more than twenty colorful diagrams containing a detailed account of Soviet cosmonautics; the launch vehicles, including the latest; the spacecraft and orbital stations; and automatic space vehicles.

For the first time, you will be able to read about the major design bureaus, institutes and manufacturing facilities where Soviet space and rocket technology is forged.

All the latest stages in the development of Soviet cosmonautics are illustrated in a popularized and understandable format, from the early work of the eminent Russian scientist Konstantine Tsiolkovskiy to the latest achievemnets of our day. In a brief historical period Soviet cosmonautics has made great progress.

View the first Earth envoy, "Sputnik," and the hundreds of "Kosmos's," "Moliniya's," "Meteor's," Ekran's," "Raduga's," "Gorizont's," and other automatic space vehicles,



carrying out the everyday watch in space. Explore history from the 108 minutes of heroic achievement of the first cosmonaut of our planet, Yuri Gagarin, to the many months of planned work of alternating crews of cosmonauts on the orbital complex "Mir."

Cosmonautics USSR contains a detailed description of the system of cosmonaut training accepted in the USSR, a system which allowed many dozens of Soviet citizens and those of fourteen other nations to work successfully in space. This book highlights, in photographs and text, the training and subsequent missions, including Vladimir Titov and Musa Manarov's one year stay in space.

The reader will discover more than a few interesting facts about the work of the Mission Control Center, located near Moscow and the Search and Rescue Complex. For the first time, a publication will feature the Soviet cosmodromes: Baikonur, Kapustin Yar, and Plesetsk. Detailed descriptions of vehicles and spacecraft are also presented. They include: the Soviet spacecrafts , Vostok, Soyuz, Soyuz T, Soyuz TM; the freight vehicles, Progress and Progress M; and the orbital stations, including all modifications of Salyut and the complex Mir, presently operating with its modules, Kvant, Kvant 2, and Kristall.

One of the sections is dedicated to the international cooperation in space. This section will describe the joint projects in space exploration, the recent mission of the Japanese journalist to the space station Mir, and the future joint missions of Soviet cosmonauts with partici pation of cosmonauts from Austria, England, Germany, and France.

The book will feature four completely new sections. One of these is dedicated to the USSR space and rocket industry, the leading organizations taking part in the development and production of space technology. Another section will contain a description of all Soviet launch vehicles. A special section will be dedicated to the unique spacerocket transportation system Energia and Buran, the orbital spacecraft with repeated use capability.

The concluding section of the book will discuss the future development of cosmonautics, including the multi-modular orbital station of the second generation Mir 2, being designed now, and the future of manned mission to Mars. A map of the major sites associated with cosmonautics on the territory of the Soviet Union will be published for the first time.

Everyone should acquire this unique edition, **Cosmonautics USSR**, distributed throughout the world.

For more information write to: Matson Press, P.O. Box 17242, Washington, D.C. 20041

Aviation Space Education

Dear Colleague,

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I'm writing to invite you to join us in celebrating the 40th Anniversary of The Aviation Space Education Association (AEA). Working together, we have accomplished a great deal over the years. With your continued support, we are looking forward to an exciting and rewarding new decade.

If you are not familiar with the Purposes, Programs, Publications and "accomplishments" of AEA, I would like to direct your attention to pages 4, 6-13 and 37.

Your membership in AEA helps sponsor programs that are as practical as they are far-reaching. The goal – to strengthen aviation and space education where it exists and to establish it where needed. You join a growing roster of distinguished educators, industry leaders, scientists and others – all sharing a strong concern for the future of aviation and space.

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We hope you enjoy this issue of *The Journal*. We would very much appreciate you sharing it with your colleagues and also encouraging your library to subscribe.

We encourage you to get involved in the programs of AEA through participation in the Councils, attendence at our Conventions/Conferences and dialogue in *The Journal*. AEA gives its members a real voice in the growth and development of aviation and space education.

On behalf of The Board of Directors, I want to thank you for your support.

Wayne R. Matson
President

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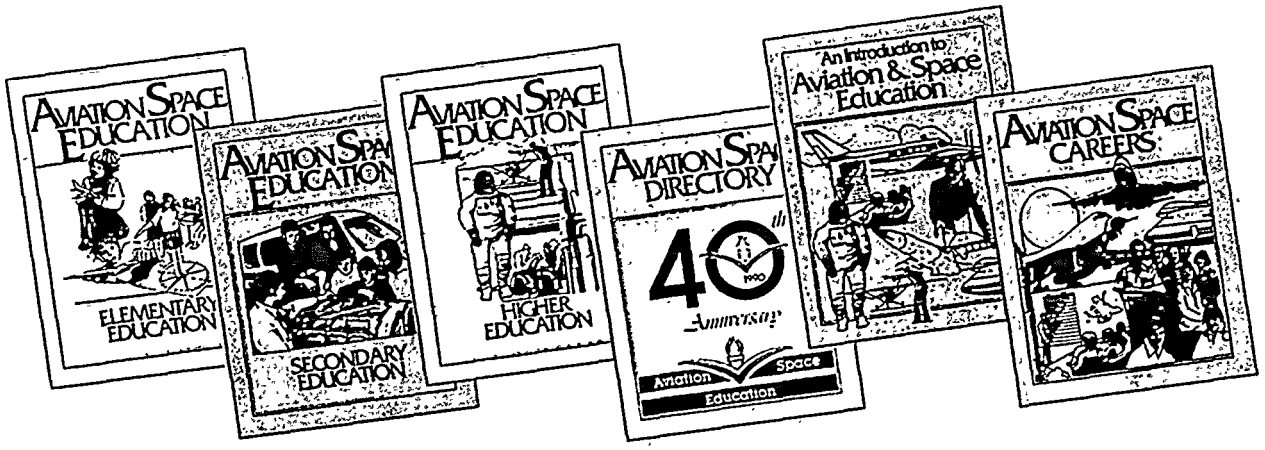
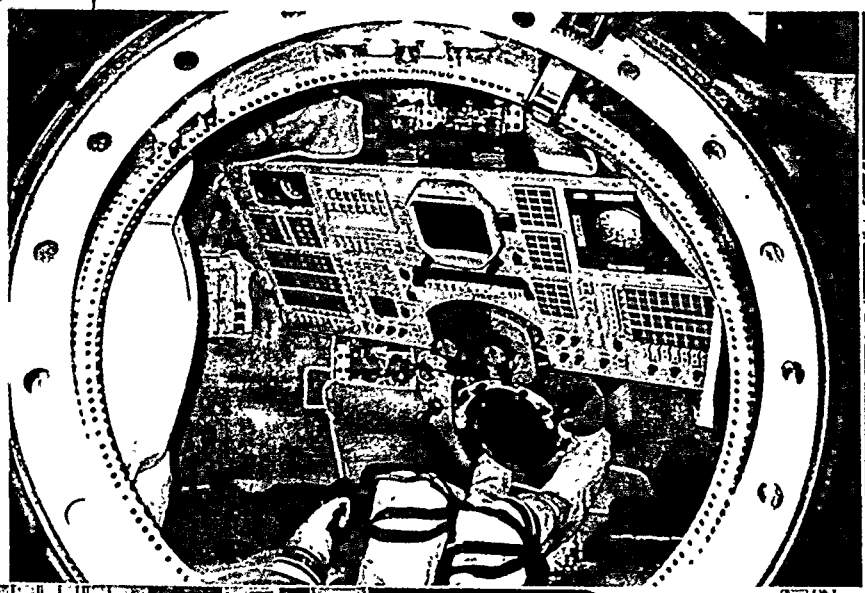
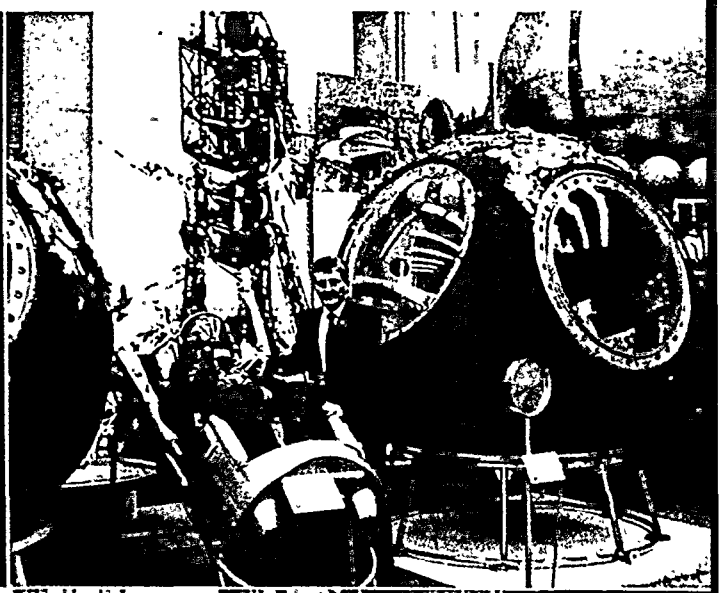
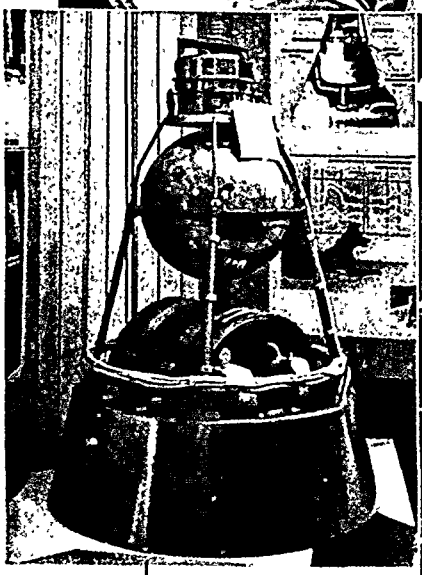


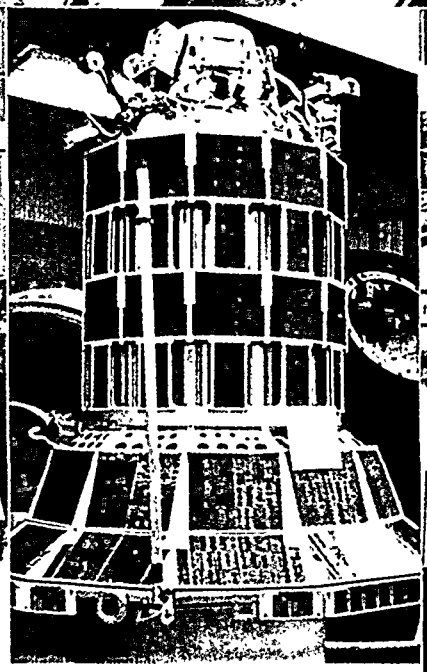
The *Journal, Directory* and *Book(s) of Aerospace Education* (see pages 6, 8 and 10) are FREE with Membership (See details page 36) (Individual copies of *The Journal* [if available] are $5 each. Single copies of *The Directory* are available for $25. All other AEA publications are $9.95 each.)

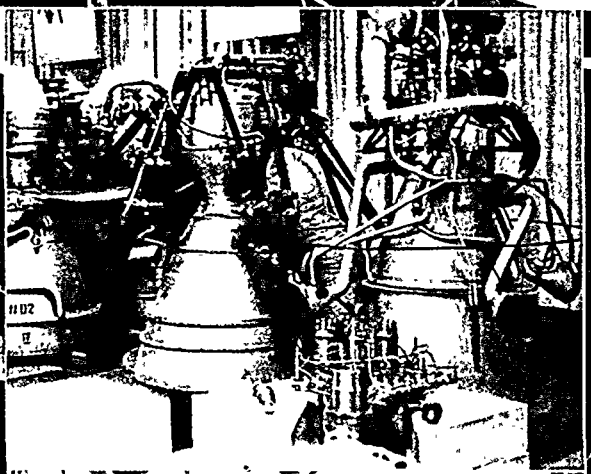
Soviet Spacecraft in the Private Museum of NPO Energia



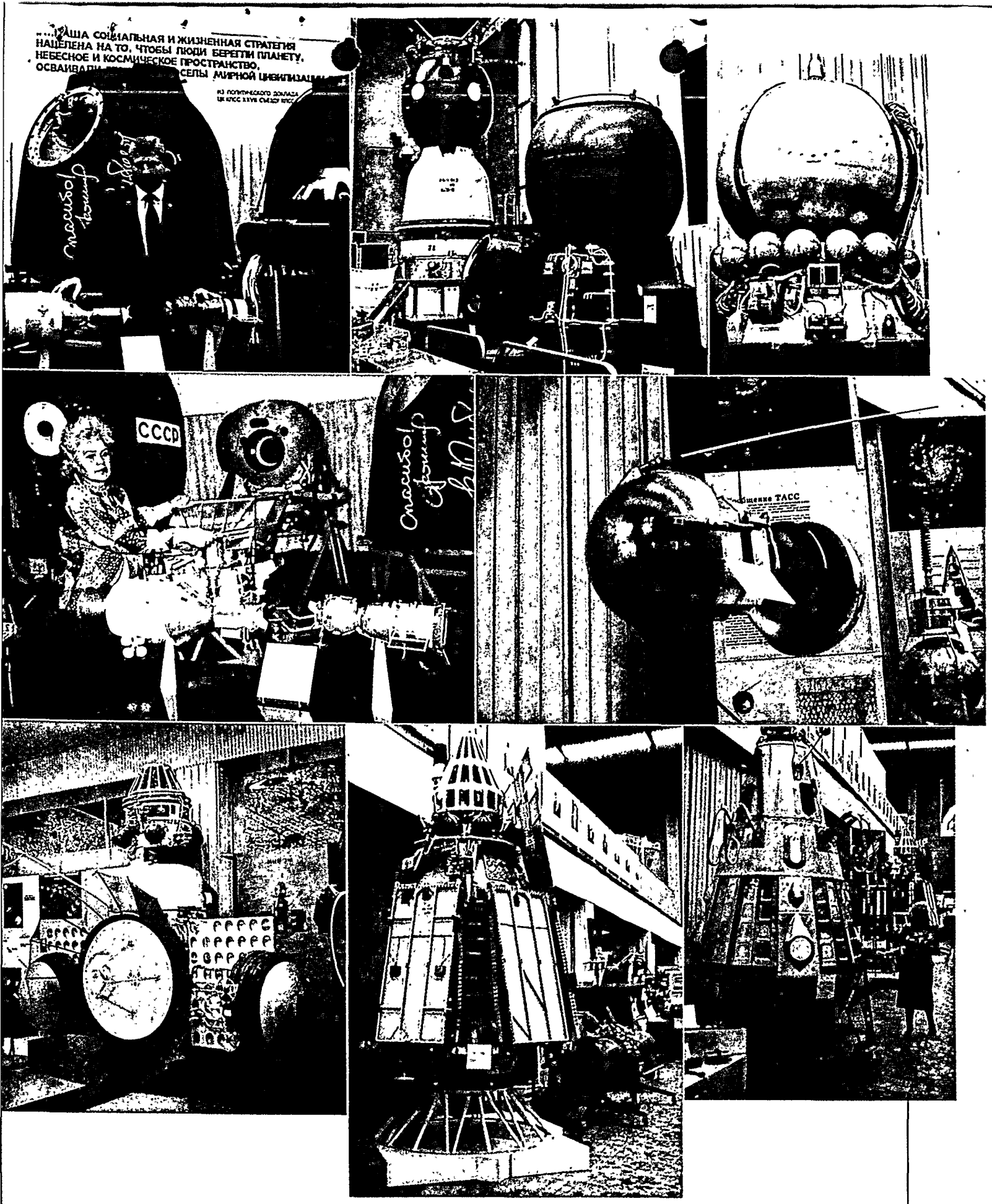








Soviet Spacecraft in the (Private) Museum of NPO Energia — The "Crown Jewels" of the Soviet space program. A visit to this museum is an experience of a lifetime. How many of these spacecraft can you identify?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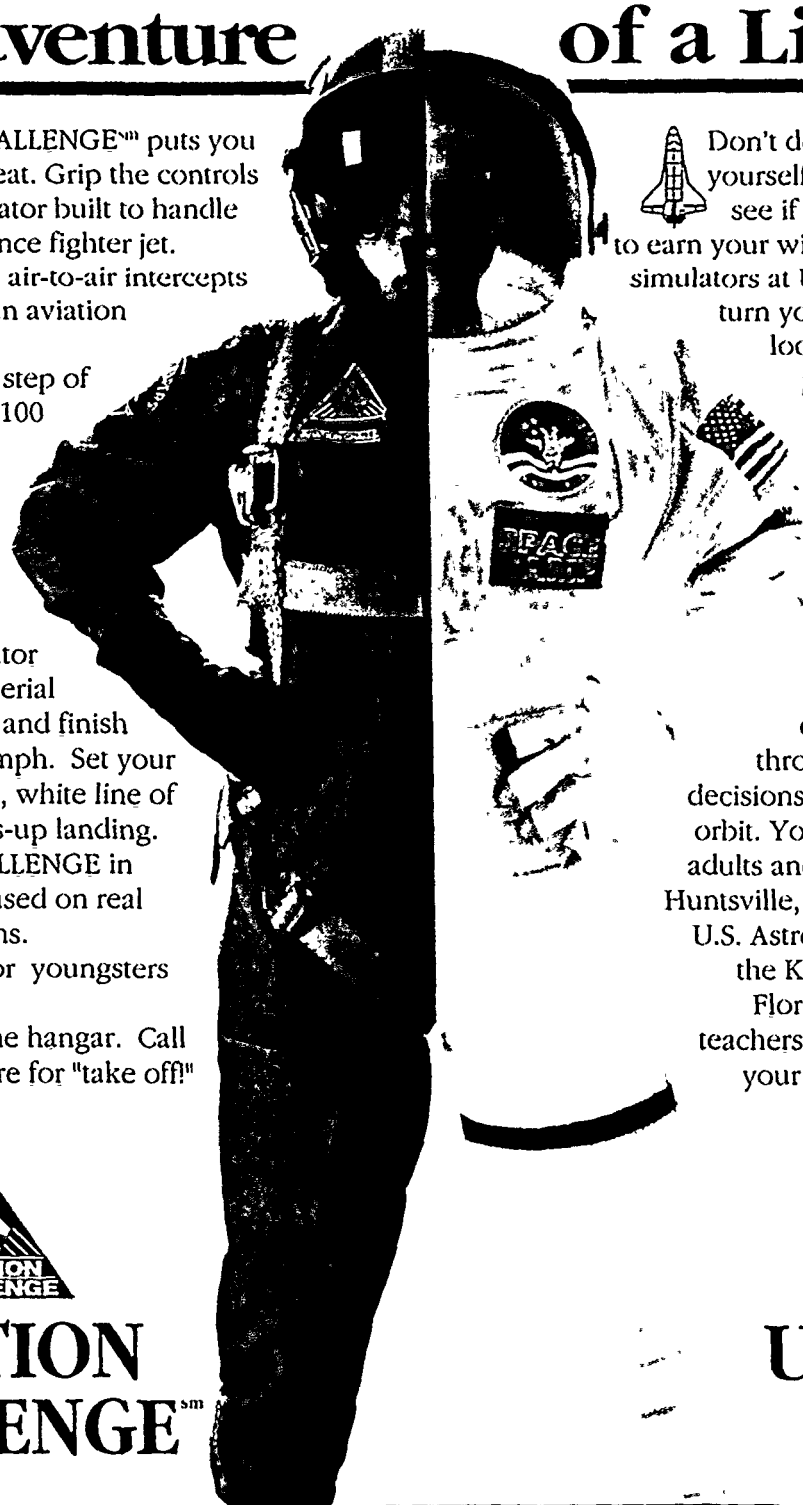

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____ Albuquerque
____ Anchorage
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____ Houston
____ Indianapolis
____ Jackson
____ Jacksonville
____ Kansas City
____ Knoxville
____ Las Vegas
____ Little Rock
____ Los Angeles
____ Louisville
____ Memphis
____ Miami
____ Milwaukee
____ Mineapolis
____ Mobile
____ Newark
____ New Haven
____ New Orleans
____ New York City
____ Norfolk
____ ASAC, Brooklyn-Queens (MRA)
____ Oklahoma City
____ Omaha
____ Philadelphia
____ Phoenix
____ Pittsburgh
____ Portland
____ Richmond
____ Sacramento
____ St. Louis
____ Salt Lake City
____ San Antonio
____ San Diego
____ San Francisco
____ San Juan
____ Seattle
____ Springfield
____ Tampa
____ Washington Metropolitan Field
____ Quantico

TO LEGAT,

____ Bangkok
____ Bern
____ Bogota
____ Bonn
____ Bridgetown
____ Brussels
____ Canberra
____ Hong Kong
____ London
____ Manila
____ Mexico City
____ Montevideo
____ Ottawa
____ Panama City
____ Paris
____ Rome
____ Tokyo

January 19, 1993
Date

RE: EDWIN NEAL CAMERON"
[redacted]
OO: BA

b3
b7E

X For information X For appropriate action

____ The enclosed is for your information. If used in a future report, conceal all sources and paraphrase contents.

This entire communication is classified "~~SECRET~~".

Remarks:

Reference FBI, Baltimore teletype to FBIHQ dated September 9, 1992, captioned as above.

FBIHQ indices reflect no identifiable information for [redacted]

[redacted]

ENTER
UPDAT
NO ACTI 1/29/93

~~Classified by: G-3~~
~~Declassify on: OADR~~
~~SECRET~~

JAN 22 1993
FBI — BALTIMORE

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Enc:
Bufile: [redacted]
Urfile:

FBI/DOJ

SSA [redacted]
x 4566

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~~SECRET~~

5-183 (Rev. 5-23-85)

(Copies to Offices Checked)

TO: SAC,

____ Albany
____ Albuquerque
____ Anchorage
____ Atlanta
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____ Birmingham
____ Boston
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____ Charlotte
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____ Cincinnati
____ Cleveland
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____ New Orleans
____ New York City
____ Norfolk
____ Oklahoma City
____ Omaha
____ Philadelphia
____ Phoenix
____ Pittsburgh
____ Portland
____ Richmond
____ Sacramento
____ St. Louis
____ Salt Lake City
____ San Antonio
____ San Diego
____ San Francisco
____ San Juan
____ Seattle
____ Springfield
____ Tampa
____ WMFO
____ Quantico
____ ASAC, Brooklyn-Queens (MRA)

TO: LEGAT,

____ Bangkok
____ Bern
____ Bogota
____ Bonn
____ Bridgetown
____ Brussels
____ Canberra
____ Hong Kong
____ London
____ Manila
____ Mexico City
____ Montevideo
____ Ottawa
____ Panama City
____ Paris
____ Rome
____ Tokyo

INDICES SEARCHED
☒ UCFN dl 4/20
☐ FOIMS
☐ MANUAL
☐ CIU
☐ ELSUR

April 16, 1993
Date

RE: EDWIN NEAL CAMERON
[redacted]

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XXX For information ____ Retention optional ____ For Appropriate action ____ Surep,by _____

____ The enclosed is for your information. If used in a future report, ____ conceal all sources
____ paraphrase contents.

____ Enclosed are corrected pages from report of SA _____
dated _____

Remarks:

Contents hereof are all ~~Secret~~.

[redacted]

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Reur airtel & LHM dated 4/8/93, captioned as above.

[redacted]

~~SECRET~~
Declassified by: G-3
Declassify on: OADR

[redacted]

Encl.
Bufile
Urfile

[redacted]

SEARCHED
ENTERED
UPDATED 4/29/93
NOTIFICATION

FBI/DOJ

FD-36 (Rev. 8-29-85)

DECLASSIFICATION AUTHORITY DERIVED FROM:
FBI AUTOMATIC DECLASSIFICATION GUIDE
DATE 08-07-2020 BY [redacted]

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FBI

TRANSMIT VIA:
- [X] Teletype
- [ ] Facsimile
- [ ] AIRTEL

PRECEDENCE:
- [ ] Immediate
- [ ] Priority
- [X] Routine

CLASSIFICATION:
- [ ] TOP SECRET
- [X] ~~SECRET~~
- [ ] CONFIDENTIAL
- [ ] UNCLAS E F T O
- [ ] UNCLAS

Date 9/3/93

9/9/93 SS (C) #4 10yrs 9/9/93

FM FBI BALTIMORE [redacted]

TO DIRECTOR FBI/ROUTINE/

BT

~~S E C R E T~~

CITE: [redacted]

PASS: [redacted] SSA [redacted]

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SUBJECT: EDWIN NEAL CAMERON; [redacted] OO: BALTIMORE.

THIS COMMUNICATION IS CLASSIFIED "~~SECRET~~" ~~IN ITS ENTIRETY.~~

[redacted]

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RE BALTIMORE AIRTEL AND LHM, DATED APRIL 8, 1993; BALTIMORE TELETYPE, DATED JUNE 1, 1993; AND BALTIMORE TELCALL TO SSA [redacted] FBIHQ, AUGUST 11, 1993.

[redacted]

[redacted]

SS
SS
SO #2

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Doc/RPB

HARDCOPY
ENTERED
UPDATED
NO ACTION
JK 9/9/93

Approved: _____ Original filename: SL30004.246

Time Received: _____ Telprep filename: _____

MRI/JULIAN DATE: 1645/246 ISN: 011

FOX DATE & TIME OF ACCEPTANCE: 9/3/93 4:40/mron

REFERENCED BALTIMORE AIRTEL AND LHM SET FORTH THE RESULTS OF THE INVESTIGATION REGARDING CAPTIONED SUBJECT AND REQUESTED FBIHQ TO OBTAIN A PROSECUTIVE OPINION FROM THE INTERNAL SECURITY DIVISION OF THE DEPARTMENT OF JUSTICE.

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DURING REFERENCED TELCALL OF AUGUST 11, 1993, SSA [redacted] FBIHQ, ADVISED BALTIMORE THAT THE INTERNAL SECURITY DIVISION HAD DECLINED PROSECUTION OF CAPTIONED SUBJECT.

IN VIEW OF THE ABOVE, BALTIMORE IS PLACING THIS CASE IN A CLOSED STATUS.

C ~~BY G3; DECL: OADR.~~

BT

0033 MRI 01375

RR FBIBA

DE RUCNFB #0084 2652137

ZNY SSSSS

R 221929Z SEP 93

FM DIRECTOR FBI [redacted]

TO FBI BALTIMORE [redacted] /ROUTINE/

BT

~~S E C R E T~~

CITE: [redacted]

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SUBJECT: EDWIN NEAL CAMERON; [redacted] OO: BALTIMORE.

THIS COMMUNICATION IS CLASSIFIED "S~~ECRET~~" ~~IN ITS ENTIRETY~~.

FOR INFORMATION OF BALTIMORE, ON SEPTEMBER 17, 1993, THE INTERNAL SECURITY SECTION, UNITED STATES DEPARTMENT OF JUSTICE, AGAIN ADVISED THAT PROSECUTION IS HEREBY DECLINED FOR LACK OF MERIT. THIS IS IN RESPONSE TO BALTIMORE DIVISIONS LHM DATED APRIL 16, 1993.

THE AFORESTATED DECLINATION HAS PREVIOUSLY BEEN PROVIDED TO THE BALTIMORE DIVISION VERBALLY BY FBIHQ.

IN VIEW OF THE FOREGOING OPINION, AND IF BALTIMORE HAS NO

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HOLD For [redacted]
Amm
9/22/93

[redacted]

ADDITIONAL INFORMATION, THIS INVESTIGATION SHOULD REMAIN CLOSED.

PLEASE ADDRESS ALL CORRESPONDENCE CONCERNING THIS MATTER TO

SSA [redacted] FBIHQ, [redacted] ROOM 4226, b6 b7C b7E

STU III (202) 324-4566.

~~C G-3, DECL OADR.~~

BT

#0084

NNNN