

MARSBUGS:

The Electronic Exobiology Newsletter

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We apologize for the delay in publication, but Dave recently moved to Idaho to pursue his Ph.D. Hopefully, MARSBUGS will now continue as before.

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THE EUROPEAN POLAR PLATFORM FOR THE ENVISAT-1 MISSION: ESA AWARDS CONTRACT FOR THE DEVELOPMENT PHASE ESA release 15-95

The European Space Agency, ESA, is pushing ahead with the development and construction of its Polar Platform, which will carry the eleven Envisat-1 Earth observation instruments. The objective of this ambitious and challenging program is to develop and build a new satellite platform to accommodate Earth observation instruments and supply them with the necessary energy, attitude control and data links to Earth. The Polar Platform has been designed to fit on Europe's new Ariane 5 launcher and to make use of ESA's Data Relay Satellite system for the transmission of data to Earth. Also, it capitalizes on previous ESA developments, notably ERS satellite technology.

The Polar Platform is being developed specially for Earth observation missions, in which satellites are put into circular,

sun-synchronous orbits at 800 km altitude, passing above the poles so that all regions of the Earth can be viewed at regular intervals.

The prime contractor for development of the Polar Platform is Matra Marconi Space (more precisely, the company's establishment at Bristol, formerly British Aerospace Space Systems), and the value of the contract is 502 million ECU (1988 prices), corresponding to about 675 million ECU at today's prices [about \$858 million (U.S.)].

The contract for Phase C/D development was signed on 24 July 1995 in Paris by Jean-Marie Luton, ESA Director General, and Armand Carlier, Chief Executive Officer of Matra Marconi Space. It includes development of the Polar Platform as well as integration of the Envisat-1 payload and final satellite inspections. Major subcontracts, each representing about 30% of the contract value, are awarded to Matra Toulouse and Daimler-Benz Aerospace.

"The modular design of the Polar Platform is a choice which will be exemplary for other projects," said Lanfranco Emiliani, ESA's Director of Observation of the Earth and its Environment. "At the same time, we are building on technologies we have successfully tested on earlier missions."

The Polar Platform will be the backbone of Envisat-1, which weighs about eight tonnes and is the largest satellite ever built in Europe. It is scheduled for launch in mid-1999. Thanks to its improved and more sophisticated instruments, Envisat-1 will continue the very successful all-weather radar imaging of the Earth currently being provided by the two ERS satellites.

The Polar Platform consists of two modules: the Service Module (SM) and the Payload Module (PM), which carries the instruments for sensing the Earth and the atmosphere. Because of the platform's modular structure, these two elements can be developed and built in parallel. Modularity is also omnipotent inside the two modules, thereby accommodating individually tailored dimensions and capabilities. The only limiting factors are the overall dimensions, which must be compatible with the Ariane 5 launcher.

The Service Module re-uses many items of equipment already developed for the French Earth observation satellite, SPOT 4. However, the structure that carries the various subsystems has had to be enlarged, as well as the base plate, on which eight batteries can now be mounted. The four propulsion unit tanks hold 300 kg of hydrazine for attitude and orbit control, sufficient to keep the module in service for at least five years. The Service Module also accommodates an S-band terminal for command and control via ESA's future Data Relay Satellite system.

The modular concept of the Polar Platform is demonstrated best by its solar generator: this is an entirely new development, made up of rigid panels fitted with solar cell elements. These panels are folded during launch and deployed once in orbit. The technology is derived from that successfully tested on ESA's retrievable platform Eureka. How many solar panels are actually used depends on a mission's power requirements--in the case of Envisat, 14 panels provide 6.6 kW of power.

The payload module is made up, in a similarly flexible way, of two to five segments, each measuring 1.6 meters in length. Envisat-1 will have four such segments bearing a 2000 kg payload. When assembled, the Payload and Service Modules stand an impressive 11 meters high inside the Ariane 5 fairing.

The core of the Payload Module, the Payload Equipment Bay, has been designed to provide maximum capabilities for the payload. It is, for example, possible to vary the number of data recorders, the data storage capacity and the number of communications channels to Earth. Payload data can be transmitted (using two 100 Mbits/s channels simultaneously) in the X-band to ground receiving stations within direct view of the satellite, or via ESA's Data Relay Satellite system, directly to Europe.

The Polar Platform will circle the Earth on its orbit once every 100 minutes or so. Its orbital parameters are usually chosen so that one full orbital cycle is repeated every 35 days, i.e. the satellite passes over exactly the same region once every 35 days. Some instruments have a large swath, providing global coverage within three to five days. The orbit is sun-synchronous--that is, the satellite always crosses the equator at the same local time at an inclination of 98 degrees--so that Earth's surface is illuminated by the Sun at a constant angle.

"ESA's new platform technology for the Envisat and Metop missions will be a step forward in the continuous development of Earth observation and climate research in Europe," said ESA Director Lanfranco Emiliani, commenting on the significance of the Polar Platform development.

POLAR PLATFORM MISSIONS

Envisat-1--A new era of European Earth observation

ESA's Earth observation program constitutes an important contribution to international efforts to gain a better understanding of the complex ecological system of planet Earth. For Europe, it is particularly important to ensure the acquisition of data irrespective of cloud cover and even at night. The requisite radar technologies have been developed since the early 1980s, and tested through the current ERS-1 and ERS-2 missions. Envisat-1, the first satellite to make use of the Polar Platform, will continue these missions. It will carry more instruments with enhanced performances, developed for the observation of land surfaces, the oceans, polar ice caps and the atmosphere. The active radar instruments will be complemented by an increasing number of new optical sensors for atmospheric chemistry and marine biology.

Under the prime contractorship of Daimler-Benz Aerospace (DASA), with system contracts awarded to Aerospatiale, Alenia and Matra Marconi, more than 80 companies in Europe and Canada are participating in the development of this satellite. The payload includes seven instruments developed directly by ESA, plus another four provided by various national institutions in ESA Member States.

Metop-1: Europe's contribution to weather forecasting and climate monitoring

Global meteorological observations have for many years been provided by an international network of geostationary satellites complemented by two American polar-orbiting satellites. Europe's contribution up to now has included the geostationary Meteosat weather satellites, developed by ESA on behalf of Eumetsat. So far, only satellites belonging to the US weather organization NOAA are providing data from polar orbit. It is planned that Europe and the US will share this task from 2001, with Eumetsat taking responsibility for the "morning orbit", and the local time at which the satellite passes over the Earth's equator, and NOAA covering the "afternoon orbit".

Polar Platform technology will be the basis for the Metop-1 platform development. Fitted with a number of instruments, Metop-1, belonging to Eumetsat, will be launched on an Ariane. In parallel, Eumetsat will make preparations for further two satellites to provide data continuity over some fifteen years.

STUDY SHOWS FEASIBILITY OF PLANT-BASED LIFE SUPPORT SYSTEMS

NASA release 95-145

The science fiction concept of plants providing a complete life support system for the crews of lunar and deep-space missions came a step closer to reality with the successful completion of a NASA life sciences experiment that studied potato production in a self-contained environment.

"We have demonstrated that a bioregenerative life support system really can support humans in an enclosed environment over a long period of time," said Kennedy Space Center (KSC) plant physiologist Dr. Gary Stutte. "Our long-range goal is to

prove that a plant-based life support system is as reliable as the mechanical systems found in today's spacecraft."

KSC scientists conducted a successful 418-day experiment in the Biomass Production Chamber of the Controlled Environment Life Support System. The experiment investigated how well a bioregenerative life support system can perform on a continuous basis over an extended period of time. This experiment was the longest test of a major component of a bioregenerative life support system ever completed.

During the experiment, the potato plants produced enough oxygen to support one crew member on a continuous basis, while also removing excess carbon dioxide from the atmosphere, Stutte said. In addition, the potato crops produced enough food to supply 55 percent of the caloric needs of an astronaut, along with enough purified water for a total of four crew members. A larger chamber could be used to provide all the consumables for the crew for as long as a mission might last, Stutte said.

"The major advantage of the bioregenerative life support system is that it does not need to be resupplied with food, water and air, nor does it require expendable water or air filtration systems as present-day mechanical spacecraft life support systems do," said Dr. Bill Knott, chief scientist of Biological Programs for the NASA/KSC Biomedical Operations Office. Instead, the current system recycles plant waste and nutrients. This recycled material sustains the plant crops, which in turn produce the oxygen, water and food that the crew would need for an indefinite period of time.

Once the analyses of the KSC experiments are complete, they will be provided to NASA's Johnson Space Center (JSC) Houston, Knott said. JSC research personnel will then use this data to conduct research on the effectiveness of bioregenerative life support systems with human subjects.

"We have been supplying this kind of information since we first began growing crops at KSC in 1987," Knott said. "Some of our data was used in preparing a recent JSC experiment where a British chemist was supplied with all of his oxygen and carbon dioxide removal requirements in a sealed chamber for 15 days by a crop of 30,000 wheat plants."

Because of the success KSC has had with potatoes, this crop will make up 75 percent of the food for the next bioregenerative life support system experiment, Stutte said. Wheat will make up the remaining 25 percent of the crop during the two-year study that will begin in January 1996. "We feel that a mixed crop is needed to optimize system production," Stutte said. "Potatoes provide the highest yield, but wheat is more tolerant to longer light cycles that might be used in the chamber."

The planned longer studies also will provide more data on the ability of the bioregenerative life support systems to operate over an expected three-year mission to Mars. "We feel that we can keep this system going indefinitely," Knott summed up. "There is no reason to believe we can't."

**LOCKHEED MARTIN MISSILES & SPACE ANNOUNCES
NEW SPACE STATION CONTRACT**
Lockheed release.

SUNNYVALE, California, August 28, 1995--Lockheed Martin Missiles & Space will provide freezer equipment to NASA for life science research onboard the International Space Station

under a \$25.8 million contract from Boeing Defense & Space Group, Huntsville, Alabama. The contract, awarded July 31, will draw upon the extensive cryogenic technology expertise of the company's Palo Alto Research Laboratories. It will be managed by Sid Bourgeois, Lockheed Martin's Space Station Product Group Three (PG-3) program manager in Sunnyvale.

Under the new contract, Missiles & Space will design, build, and test three cryostorage freezers, two quick-snap freezers with a miniaturized snapping mechanism, and a freeze drier, and is responsible for overall integration of the freezer components, including the external packaging and ancillary equipment such as specialty specimen vials. The freezer equipment had been included in the life sciences section of the U.S. Laboratory Module of Space Station Freedom, but during subsequent redesigns schedules slipped and the equipment was put on hold. Now, with the first element of the International Space Station scheduled to be launched in November 1997 and the research planned to begin in the 1998-1999 timeframe, the freezers have been reintroduced to the production schedule.

"The freezers and freeze drier are crucial to any life sciences research aboard the station," said Bourgeois. "Because only limited examination will be possible on orbit, the samples must be preserved and brought back to Earth."

Biological decay is prevented by cooling the samples to cryogenic temperatures immediately after sample preparation and maintaining them at these temperatures until the samples are returned to Earth for evaluation and test. Specimens to be preserved will include life science samples such as plant and animal tissues and protein crystals grown onboard the space station. The cryostorage freezers will freeze the specimens at -180 degrees C and hold them at or below -180C until delivery to a research facility on the ground. The quick-snap freezers will allow station crew members to freeze specimens to -196 degrees C in a matter of milliseconds.

"If you need to look at a specimen down to the cell level, it is important to freeze it quickly so that it doesn't expand and burst the cell walls," said Bourgeois. "This ultra-rapid freezing will be a critical capability aboard the station."

The freeze drier will be important for eliminating ice produced by the moisture that the frozen samples pick up from the air. It will sublimate frozen samples in a high vacuum environment, at pressures below 10-3 torr.

The first freezer units will be delivered to Boeing in February 1998. Final delivery, of the freeze drier, is scheduled for December 2001.

Lockheed Martin Missiles & Space provides several components critical to the International Space Station, with contracts totaling approximately \$1 billion and more than 600 people on the program.

The company will provide rotary joints for the station's solar arrays and thermal radiators under contract to McDonnell Douglas Aerospace as part of Space Station Product Group One, eight solar array wings and one qualification solar array wing under contract to Rocketdyne as part of Space Station Product Group Two, and a variety of equipment for the station laboratory module under contract to The Boeing Company as part of Space Station Product Group Three, including the freezers and two Trace Contaminant Control System protoflight units, which will provide revitalization of the atmosphere on the station.

Under contract to NASA's Johnson Space Center, Missiles & Space also will provide tools and equipment that astronauts will use to assemble the station on orbit and to move around outside the structure once it is operational. In December, 1994, Missiles & Space completed shipments of solar panel modules to Russia for its space station Mir, marking delivery of the first U.S. space station flight hardware for NASA's cooperative space endeavors with that country. The Mir cooperative solar array project is managed by NASA's Lewis Research Center, Cleveland, Ohio, for the Space Station Program Office, Houston.

Missiles & Space is a subsidiary of the Lockheed Martin Corporation, a highly diversified advanced technology company with core businesses in aeronautics, electronics, energy and environment, information and technology services, materials, and space and missiles. The Corporation has its headquarters in Bethesda, Maryland.

Boeing Defense & Space Group is NASA's prime contractor for the space station, assisting NASA in management of the Houston-based program and directing a nationwide contractor team.

Under the leadership of NASA, the international Space Station program aims to place unique scientific laboratories in space to enable high value research bettering the quality of life on Earth. NASA is joined in this effort by the space agencies of Europe, Canada, Japan, and Russia, making Space Station the largest peaceful, cooperative international scientific project ever.

SETI LECTURE AT BOSTON NSS CHAPTER By Larry Klaes, President, Boston NSS.

The Boston Chapter of the National Space Society (NSS) will hold its next lecture on Thursday, September 7, at 7:30 pm at MIT. The lecture will be on "The Frontiers of SETI (Search for Extraterrestrial Intelligence)", presented by Professor Nathan Cohen of Boston University. Professor Cohen teaches on the very subject at BU and developed the concept of Polychromatic SETI.

Boston NSS lectures are held on the first Thursday of every month at 545 Main Street (Tech Square), 8th floor Computer Playroom, MIT, Cambridge, MA. Admission is free to all, refreshments will be served, and the room is air-conditioned. For more information, call 617-258-2828.

THE SCIENCE AND POLITICS OF UFO RESEARCH

A Symposium, October 28 and 29, 1995, at the Radisson Hotel St. Paul, Minnesota.

Presented by The Science Museum of Minnesota in cooperation with UFO Magazine.

The American government holds more than a trillion classified documents and there is a growing trend towards conducting science in secret.

Increasingly, scientists sign away their freedoms to work on government-funded research. By choosing what kind of research to fund, the government can (and sometimes does) control the direction of scientific progress, often keeping the knowledge gained to itself. As a result, we now have good reason to doubt what we are told about the world by both

government authorities and many of those in the scientific community.

The 1995 Science and Politics of UFO Research Symposium will use the UFO phenomenon as a vehicle with which to explore the closed and cloistered world of government research, the process of scientific discovery, and the strange and often uncomfortable relationship between science and politics.

Regardless of what you think or believe about UFOs, the phenomenon provides a unique living classroom in which we can explore how science works in the real world.

All sessions will take place in the Minnesota Ballroom of the Radisson Hotel, 11 East Kellogg Boulevard, St. Paul, Minnesota.

Early registration discount before August 31! See information below.

Scheduled To Speak

- ✓ Terry Hansen, science journalist, symposium moderator.
- ✓ Glenn Campbell is a former computer software developer turned anti-secrecy activist who has successfully called the attention of the national news media to strange goings on at Area 51, a highly secret desert research facility that some have claimed is involved in government UFO research.
- ✓ Don C. Donderi, associate professor, is a research psychologist who has an interest in the UFO abduction phenomenon. He participated in a conference on the subject held at the Massachusetts Institute of Technology in June 1992. He has studied the UFO phenomenon since 1966.
- ✓ Ann Druffel is a long-time UFO researcher and author of several books and many articles on the subject. She is just completing a biography of the late University of Arizona atmospheric physicist James McDonald, who courageously defended the cause of UFO research in the 1960s.
- ✓ Richard Haines, Ph.D., is a physiological psychologist retired from NASA Ames Research Center, where he did extensive research on various aspects of the U.S. space program. He has a special interest in pilot reports of UFOs, analysis of UFO films and photos, and CE-IV (abduction) reports. He is the author of several books about UFOs.
- ✓ David M. Jacobs, professor, teaches a college-level course in UFO research at Temple University. He received one of the first doctorates awarded for research on a UFO-related subject, and is author of *The UFO Controversy in America* and *Secret Life*, a study of UFO abduction reports.
- ✓ George Knapp is an investigative journalist and video producer best known for breaking the story of Bob Lazar, a self-professed government scientist who claims to have back-engineered UFO technology at Area 51. Knapp has more recently traveled to the former Soviet Union where he interviewed Russian scientists about UFO research there.
- ✓ Bruce Maccabee, Ph.D., is an optical physicist for the Naval Surface Weapons Research Lab. He has a special

interest in UFO photos and films and has published several scientific papers on the subject.

- ✓ Jeffrey W. Sainio is a broadcast technician and videotape analyst for the Mutual UFO Network. He has analyzed many videotapes alleged to be of UFOs, some of which he has concluded are genuine.
- ✓ Michael Swords, professor, is a former editor of the Journal of UFO Studies for the J. Allen Hynek Center for UFO Studies. He has a special interest in the government's behind-the-scenes relationship with the controversial University of Colorado UFO research project headed by Dr. Edward Condon.

Symposium Schedule

Saturday, October 28

- | | |
|------------|---|
| 8:30 a.m. | Conference check-in St. Paul Radisson Hotel Minnesota Ballroom foyer |
| 9:00 a.m. | Welcome and Introduction to the UFO Controversy (Terry Hansen, science journalist, symposium moderator) |
| 9:20 a.m. | UFO Evidence From Motion-Picture Films and Photographs (Richard Haines, Ph.D., physiological psychologist, NASA Ames Research Center, retired) |
| 10:20 a.m. | Questions from audience and discussion |
| 10:50 a.m. | Break |
| 11:05 a.m. | Analysis of UFO Evidence From Videotape Records (Jeffrey W. Sainio, broadcast technician, MUFON videotape analyst) |
| 12:05 p.m. | Questions from the audience and discussion |
| 12:35 p.m. | Break for lunch |
| 2:00 p.m. | Analysis of UFO Evidence From Videotapes and Films (Bruce Maccabee, Ph.D., optical physicist, Naval Surface Weapons Lab) |
| 3:00 p.m. | Questions from audience and discussion |
| 3:30 p.m. | Break |
| 3:45 p.m. | UFO Research in the Former Soviet Union (George Knapp, investigative journalist, video producer) |
| 4:45 p.m. | Questions from audience and discussion |
| 5:15 p.m. | Break for dinner |
| 7:15 p.m. | The University of Colorado "Condon" UFO Study and the U.S. Government (Michael Swords, Ph.D., Western Michigan University, former editor JUFOS, Center for UFO Studies) |
| 8:15 p.m. | Questions from audience and discussion |
| 8:45 p.m. | Panel discussion: Media Coverage of the UFO Controversy; Publishing UFO Research Results; The Politics of Science and Technology in the Post Cold-War Era; Conflicts |

of Interest Between Science and Weapons Development

Participants: Terry Hansen (moderator)
 Jeffrey Sainio
 Bruce Maccabee
 George Knapp
 Michael Swords
 Glenn Campbell

Sunday, October 29

- | | |
|------------|---|
| 8:30 a.m. | Conference check-in St. Paul Radisson Hotel Minnesota Ballroom foyer |
| 9 a.m. | Welcome back (Terry Hansen) |
| 9:15 a.m. | Tales of the Test Site: Area 51 and the Human Circus (Glenn Campbell, anti-secrecy activist, Area 51 Research Center) |
| 10:15 a.m. | Questions from audience and discussion |
| 10:45 a.m. | Break |
| 11 a.m. | A Scientist versus the System: Dr. James E. McDonald's Fight for UFO Knowledge (Ann Druffel, long-time UFO investigator and author of many books and articles on the subject) |
| 12:00 Noon | Questions from audience and discussion |
| 12:30 p.m. | Break for lunch |
| 2 p.m. | The History of UFO Abduction Research and Current Issues (David M. Jacobs, Ph.D., Department of History, Temple University) |
| 3:00 p.m. | Questions from audience and discussion |
| 3:30 p.m. | Break |
| 3:45 p.m. | The Scientific Context of Abduction Research (Don C. Donderi, Ph.D., associate professor, Department of Psychology, McGill University) |
| 4:45 p.m. | Questions from audience and discussion |
| 5:15 p.m. | Break for dinner. |
| 7:15 p.m. | Panel discussion: UFO Abduction Experience Hypotheses; Limitations of the Scientific Method; Current Research Handicaps |

Participants: Terry Hansen (moderator)
 Ann Druffel
 David Jacobs
 Don Donderi
 Richard Haines

8:45 p.m. Closing comments and adjourn.

* E-mail address for content questions:
 twhansen@cuix.pscu.com

Note: The above schedule may need to be revised as conference date approaches.

Registration Information

Two-day, single-day, or half-day rates are available. See rates below.

Preregistration is recommended. Early-bird discounts are available for those who register before August 31, 1995.

Please allow two to three weeks for registration processing. You will receive a written confirmation in the mail.

Fees

	Before August 31	After September 1
Full two days:	\$90	\$120
One day:	\$50	\$70
Half day:	\$30	\$50

Student rate: 15% discount (high school and university students with i.d.)

Group Discount: 15% discount for groups of 10 or more (must register together as a group).

Note: If you are registering for the one-day or half-day option, there is no need to specify which day or half day you wish to attend.

Cancellations/Refunds: All cancellations must be in writing. Cancellations received before September 29, 1995, will receive a refund less a \$25 processing charge. Cancellations received after September 30 will be subject to a \$50 cancellation fee. No refunds will be made after October 13.

For additional information:
Call The Science Museum of Minnesota at (612) 221-4742.

Registration

Complete this form and return to:

Science Museum of Minnesota
Continuing Education
30 East 10th Street
St. Paul, MN 55101
Fax: (612) 221-4528

Name (s) _____

Address _____

City _____ State _____ Zip _____

Phone Number (day) (_____) _____ - _____

(eve) (_____) _____ - _____

Or E-mail person@geom.umn.edu

Accommodations

The Radisson Hotel is offering special rates for conference attendees. Some other nearby hotels are listed below as well. Plan to make reservations well in advance of conference dates.

Radisson Hotel 11 East Kellogg Blvd., St. Paul, MN 55101
Special Conference Rate.

\$80 per night single or double.

Airport Express service: \$8 one way, \$11.50 round-trip, shuttles every half hour.

When you call for reservations, make sure to mention that you are registered for the Science Museum of Minnesota's UFO conference. Call 1-800-333-3333 or 612-292-1900 (call early to ensure space availability).

Crown Sterling Suites 175 East 10th Street, St. Paul, MN 55101

Two-room suites.

Regular suites: \$139/night for single or double. Executive

suites: \$167/night for single or double. Free parking.

Free airport shuttle.

Call 1-800-433-4600.

Kelly Inn Best Western 161 St. Anthony Blvd., St. Paul, MN 55101

\$84/night for double room.

\$74/night for single room.

Free parking.

Call 612-227-8711.

Registrations on or before August 31

Two-days: (No. Attending) x \$90 per person = \$_____

One-day: (No. Attending) x \$50 per person = \$_____

Half-day: (No. Attending) x \$30 per person = \$_____

Check here if you are a student (15% discount) Enclose a copy of ID card or fee statement. (____)

If registering for a group of 10 or more take 15% discount.

TOTAL DUE:\$_____

Registrations on or after September 1

Two-days: (No. Attending) x \$120 per person = \$_____

One-day: (No. Attending) x \$70 per person = \$_____

Half-day: (No. Attending) x \$50 per person = \$_____

Check here if you are a student (15% discount) Enclose a copy of ID card or fee statement. (____)

If registering for a group of 10 or more take 15% discount.

TOTAL DUE:\$_____

***** DO NOT E-MAIL YOUR CREDIT CARD NUMBER *****

Payment

() Check or Money-order enclosed (Make payable to "Science Museum of Minnesota")

Credit card:

() Visa

() MasterCard

() Discover

Credit Card #_____Exp date_____

Signature_____

Questions?:

Call the Science Museum of Minnesota (612) 221-4742

Or E-mail penson@geom.umn.edu

PRELIMINARY CONFERENCE DETAILS

By Julian Hiscox.

COSPAR

The international Committee on Space Research, COSPAR 1996 commission F assembly will be held in Birmingham (England!) between the 14th and 20th July, 1996. So far, MARSBUGS has learned that there will be a symposium on planetary engineering-- Implanting Life on Mars--organized by Prof. Robert H. Haynes (President of the Royal Society of Canada).

IAF Congress

The 46th IAF Congress of the international Astronautical Federation will be held in Oslo, Norway, between the 2nd and 6th October, 1996. The conference is entitled, "Benefits of Space for Humanity."

The Case for Mars

International Conference for the Exploration and Colonization of Mars will be held at the University of Colorado, Boulder, Colorado, USA, July 17th-20th, 1996. Further details may be found on:

<http://spot.colorado.edu/~marscase/home.html>

Further details on the above conferences will be published when available.

JOURNAL REVIEW: *JBIS*

by Julian Hiscox

JBIS is short for the *Journal of the British Interplanetary Society*, which is devoted to the science and technology of space. It is published by the British Interplanetary Society (bis@cix.compulink.co.uk) a British pro-space society based in London. Back issues are available from them at a modest cost (about \$10 including postage).

The past several issues may be of interest to MARSBUGS readers as they detail Mars Exploration in three special issues edited by Dr. Robert Zubrin. In this issue of MARSBUGS we will briefly review the first issue of this series. Author addresses are provided so that reprints may be more easily obtained.

JBIS Vol.48, No. 7. Mars Exploration (Part 1).

Practical methods for near-term human exploration of Mars. Authors: Robert M. Zubrin, Martin Marietta Astronautics, PO Box 179, Denver, CO 80201, USA. David B. Weaver, Johnson Space Center, Houston, Texas 77058, USA.

The paper describes a mechanism by which human exploration of Mars may be realized using near-term technology. The key focus of the article is in situ propellant production utilizing Martian resources, specifically the production of CH_4/O_2 and H_2O on the Martian surface. The authors also discuss a variety of missions, habitats, consumable and crew composition. Also, presented is how this technology may be applied for a return to the Moon. The

article is well written and although it contains some technical detail, it is easily understood.

Exploration of the future habitability of Mars. Author: Martyn J. Fogg, Probability Research Group, c/o 44 Hogarth Court, Fountain Drive, London, SE19 1UY, U.K.

This paper is essentially a review article concerning the materials on Mars required for planetary engineering, specifically terraforming (the creation of a human habitable biosphere). The paper is well written and Fogg briefly reviews what is required to terraform Mars and then describes the ancient climate of Mars, making the point that Mars was once more clement for life. Fogg then describes what is known about the current volatile inventory, concentrating specifically of the location and quantity of CO_2 and H_2O .

Concepts for in situ resource utilization on Mars--a personal historical perspective. Author: J.R. French, JRF Engineering Services, 2111 Selby Avenue, Los Angeles, CA 90025, USA.

This is a short article essentially summed up by the title. It is written by a previous Manager of Advanced Studies at the Jet Propulsion Laboratory and presents a non-technical history of in situ propellant production (ISPP). The author makes the excellent point that during exploration of the Earth, materials such as food and fuel were obtained along the way, rather than taken for both forward and return journeys. The article argues that ISPP is a logical step in space exploration.

Mars multi-sample return mission. Authors: Evgeny Y.A. Shafirovich and Udo I. Goldshleger, Institute of Structural Macrokinetics, Russian Academy of Sciences, Chernogolovka, Moscow 142432, Russia.

The paper describes a Mars sample return mission, with a single ascent/ decent vehicle. The mission calls for either a direct return to Earth or a rendezvous in low Martian orbit; three hops on Mars are planned. In situ resources are utilized with Martian CO_2 acting as an oxidizer. The paper goes into detail on the performance characteristics of a CO_2 /metal rocket engine and the authors estimate that an improved Proton or Ariane-5 launcher is sufficient for the mission.

Terraforming Mars with four war-surplus bombs. Author: Robert A. Mole, 1441 Mariposa Avenue, Boulder, Co. 80302, USA.

Mole presents a scenario, similar to Sagan's, in which nuclear devices would be used to generate dust, which would cover and darken the Martian South Polar Cap. This, he suggests, would cause the CO_2 to sublime (via solar heating) and trigger the runaway greenhouse affect described by McKay, Toon, Kasting and McKay and Zubrin. Mole bases his estimates on the eruption of Mount St. Helens and the amount of dust released from that explosion, although precise calculations are absent.

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