



Southeastern Space Supporter

Newsletter of HAL5 - the Huntsville Alabama L5 Society chapter of the National Space Society

Volume 4, Number 1 — January-February 1995

FIRST WORD

HAL5 Starts Year with HALO

(by Gregory H. Allison, HAL5 President)

Happy New Year! HAL5 is gearing up for its most ambitious year ever!

Last July, the membership of HAL5 decided that we have sat at the “cross-roads” of space exploration and development far too long. After more than a decade of trying to influence government and mega-corporations to take an interest in the future (and sustain it), we finally learned the time honored lesson: “If you want to get something done — do it yourself!” Thus, we decided to do something concrete about it. HAL5 has committed itself to launch into space its own payload, in a rocket of its own design, from a high altitude balloon. We have defined this as Project HALO, for “High Altitude Lift-Off”.

(continued on page 3)

HAL5 Program Night

Wednesday, January 25, 1995
7 to 9 PM

Huntsville Public Library Auditorium

“Announcing Project HALO High Altitude Lift-Off”

HALO Project Manager Gregory Allison will officially announce the start of Project HALO, describing its goals and current status. He will also answer questions from the audience. Free press kits and other handouts will be available, as will HALO sign-up sheets. All HAL5 members are encouraged to attend, and to bring interested friends and co-workers. Open to the public. Free admission.

Time to Renew Membership

(by Ronnie Lajoie, HAL5 Treasurer)

HAL5 membership dues are collected on a prorated basis so that they all expire at the end of the year. All memberships have now expired. This is the last issue of the HAL5 newsletter you will receive unless you renew.

HAL5 dues are a modest \$20 for regular members, and a very low \$8 for members who are students, unemployed, or retired. See the enclosed HAL5 Membership Renewal Form for details. Dues money is used only to pay for member-requested services such as this newsletter and HAL5 program nights. Special projects, such as Project HALO, are funded from separate donations.

This is an exciting year for HAL5, which could see us become the first amateur group to launch its own rocket into outer space! Please renew and join us in this history-making endeavor!

If you are not yet a member of our parent organization, the National Space Society, I strongly encourage you to join. You can do so using the same HAL5 Membership Renewal Form enclosed. The NSS is extremely active right now and is having much success convincing our government to reshape the goals of our nation’s space program towards our ends — namely the eventual colonization of outer space by everyday people like you and me. Now more than every, the NSS needs your moral, vocal, written, and financial support. Each NSS membership comes with a subscription to the bi-monthly magazine *Ad Astra*, 60 colorful pages of articles on the past, present, and hopeful future of public and private ventures in outer space. Please join! ☆

PROJECT HALO NEWS

A Summary of Project HALO

(by Larry Scarborough, Education Lead)

Project HALO, for “High Altitude Lift-Off”, was conceived to explore the scientific and economic potential of using high altitude balloons as launch platforms for rockets.

The balloon-launched rocket concept, known as “rockoon,” was first put to use by Dr. James Van Allen in the 1950’s. Rockoons allowed Dr. Van Allen to conduct pioneering studies of the upper atmosphere. Because of increased efficiency for small rockets above the drag of Earth’s atmosphere, Dr. Van Allen was able to boost the altitude attained by the Deacon rocket from 60 thousand feet to over 300 thousand feet. As larger military rockets capable of reaching orbit from the ground became available, rockoons were for the most part abandoned. Van Allen’s Radiation Belt was discovered by a ground-launched probe.

HALO is designed to use today’s better balloon and small rocket technology to push the rockoon concept to its full potential as an economical means of reaching extremely high altitudes.

Project HALO Phases

Project HALO will consist of several distinct steps, each of which in itself will provide opportunities for HAL5 to build the managerial and technical skills and resources to proceed to the next step. Each step will provide unique opportunities for student involvement, original research on the edge-of-space environment, and perhaps suggest commercial uses of rockoons.

Huntsville Alabama L5 Society

President — Gregory Allison
 Day: 533-3700, Eve: 859-5538
 Vice-President — Craig Presson
 Day: 880-7692, Eve: 880-7692
 Treasurer — Ronnie Lajoie
 Day: 961-4832, Eve: 721-1083
 Secretary — Ethan Scarl
 Day: 461-2747, Eve: 534-3993
 Membership — Philomena Grodzka
 Day: 837-4287, Eve: 536-8638
 Publicity — William Axenroth
 Day: 539-3111, Eve: 539-3386
 Special Projects — Larry Scarborough
 Day: 881-1944, Eve: 881-4363

Southeastern Space Supporter

Volume 4, Number 1
 January / February 1995

The Southeastern Space Supporter is a bi-monthly publication of the Huntsville Alabama L5 Society (HAL5), a not-for-profit 501(c)3 organization devoted to the goal of seeing everyday people living and working in thriving communities beyond the Earth.

Any opinions expressed in this newsletter are those of the authors or of the Editor, and, unless expressly so stated, are not necessarily those of HAL5 or the NSS.

HAL5 encourages its members to speak out on space-related issues. We welcome submissions of both fact and opinion articles of interest to HAL5 members.

Submit letters/articles to: Ronnie Lajoie
 162 Kirby Lane, Madison, AL 35758
 Day phone/message: 205-961-4832
 Night/Weekend phone: 205-721-1083
 Electronic mail (E-Mail) address:
 lajoier@node_25763.hv.boeing.com

Deadline for submittal is the last day of the following months: February, April, June, August, October, and December.

Preferred format for text is ASCII on a diskette or sent by E-Mail. Preferred format for text with graphics is Word or MacDraw on a diskette. Also acceptable is letters and articles sent by mail or faxed; however, the more retyping required, the less likely the acceptance. HAL5 is not responsible for receipt of mailed submissions; none will be returned unless sent with a self-addressed stamped envelope. Hand-delivered diskettes will be returned. No compensation will be paid for submissions.

Phase 0: Balloon tests of rocket sub-systems to altitudes of 20 miles.

Phase I: Rockoon Proof-of-Concept: Rockets launched from balloons.

Phase II: Operational rockoons providing cheap access to space.

HALO — Phase 0

This step takes advantage of well-developed and cheap balloon technology for carrying payloads above 99 percent of Earth's atmosphere. It consists of attaching a payload to a helium-filled balloon and allowing it to rise to an altitude of 20 miles or more. A balloon-borne platform will be the basis of all HALO missions.

Because of the low cost, this phase can be repeated many times during the overall program to prove the space-worthiness of components of subsequent phases. It is in Phase 0 that student participation is likely to be broadest. Principles of radio and satellite communication can be demonstrated. Student experiments for studying ozone and other atmospheric phenomena are anticipated.

Since this phase allows access to temperature extremes and near-vacuum conditions similar to those encountered in orbit and beyond, experiments in space life-support systems could be carried out here. Astronomy from such a platform could take advantage of conditions similar to those enjoyed by the space telescope.

HALO — Phase I

This phase will use balloons as launch platforms. Its objective will be the development of the family of vehicles which will carry Project HALO to completion. Small, experimental rockets previously tested on the ground will be evaluated for performance, safety and practicality at high altitude. Systems integration and launch procedures will be perfected.

Student experiments during this phase will likely deal with rocket technology,

effects of acceleration, vehicle tracking and possible recovery. For safety reasons, most Phase I missions will be flown from coastal regions.

HALO — Phase II

As proficiency with high altitude rocket launches is achieved, a major milestone for HALO Phase II will be to meet or exceed the altitude record for ground-launched, privately-developed rockets. Our goal would be to reach such a height with a larger payload and smaller budget than is practical for a rocket that must plow through Earth's atmosphere.

Unique opportunities for experiments exist in this phase as well. On-board cameras could take photographs or transmit live video from this vantage point which would cover hundreds of square miles of the planet's surface. Microgravity payloads would experience a "weightless" environment for at least a minute or two — enough time to do some short experiments. Again, the emphasis is on cheap access to space for student and private experimenters on tight budgets.

Goals for Project HALO

It is our hope that Project HALO will demonstrate that extreme altitudes are reachable by amateurs; that by pushing rockoon technology to its limits, we will inspire ourselves and those who participate with us as student experimenters or commercial developers to push technology and ourselves to reach ever higher.

While we at HAL5 support and applaud the achievements of NASA and other national space programs, we believe that the scale of human space activity we envision will come about only when the public has frequent, affordable access to space. With Project HALO, we hope to help lay the groundwork of organization, technology, and imagination that will make cheap access to space a reality for us all. For more information, call HALO Project Manager Greg Allison at 859-5538. ☆

Project HALO

Propulsion Team Report

(by Tim Pickens, Propulsion Team Lead)

I would like to inform everyone on the current status of the HALO rocket motor test facility, as well as other propulsion-related items.

A suitable site for the test facility was found in remote Gurley, and the use of the land was donated to Project HALO. It was then time to design and begin the physical work that a project of this magnitude entails. Just before Christmas, our team dug out a foundation and laid down an internal steel and rebar framework for the test stand, over which was poured 9000 pounds of concrete. This slab is designed to accommodate vertical test loads of up to 10,000 pounds thrust. For the initial phases of Project HALO, we have erected a small above-ground test structure designed to withstand testing of up to 1000 pounds thrust.

Between the test stand and the control/viewing building (aka "barn"), we dug a trench (thankfully with a trencher, complements of Aggregate Construction Equipment and Supply), then laid down electrical wiring and separate two-inch conduit piping for underground water and sensor and control wiring. There can be up to 12 sensors to monitor the motor during testing. All of this information will be recorded on a computer in the control room. The software to support incoming data will be similar to "Lab View". In addition to electronic monitoring, there will be a viewing port in the control building. All valves, ignition, and fire safety will be controlled from this place.

We currently have completed two test firings of small hybrid rocket motors. Hybrid rockets use a solid propellant with a liquid or gaseous oxidizer, and are much safer than ones using either all-solid or all-liquid propellants. For a solid propellant, we used asphalt (which is literally "dirt" cheap!); and for an oxidizer, we used gaseous oxygen. We have plans to test asphalt with a nitrous

(NO) oxidizer, as well as HTBP propellant, which is more energetic but much more expensive.

As of today, the test facility is 90% complete. We have fabricated a hybrid test motor with a total impulse of 2000 lb-sec (200 pounds thrust for 10 seconds). We are currently working on the test stand instrumentation and the oxidizer flow control system. If everything goes well, we plan to test these larger motors sometime in mid-February. All interested members are invited to witness these test firings.

I would like to thank the members of my team for their great efforts in just two months: Steve Mustakis, Larry Larson, Larry Scarborough, Herman Pickens, Chris Pickens, Brent Sandlin, and Gene Hornbuckle.

If any of you are interested in joining the HALO Propulsion Team (you don't have to be a "rocket scientist" to help — just ask Dr. Scarborough), call me (Tim) at 971-1566 or HALO Project Manager Greg Allison at 859-5538. ☆

Project HALO Meeting Times

Members of Project HALO meet regularly to discuss the engineering aspects of the project. Current and prospective members are welcome to attend. The meetings are held on Tuesdays during lunch hours, 11:30 am to 1:00 pm, at the Ponds Restaurant at the Madison Square Holiday Inn. ☆

HAL5 Meeting Times

The HAL5 Executive Committee meets weekly to plan for the future of HAL5, and to discuss the non-technical aspects of Project HALO. Current and prospective members are welcome to attend, and to bring ideas for HAL5 activities. The meetings are held each Thursday during lunch hours, 11:30 am to 1:00 pm, at the Ponds Restaurant at the Madison Square Holiday Inn. ☆

HAL5 Starts Year with HALO

(continued from page 1)

To date, Project HALO members have created a rocket motor test facility and have started test firings of small hybrid rocket motors. See the article on this page by Propulsion Lead Tim Pickens for more about the technical aspects of Project HALO.

HAL5 is currently negotiating with the Huntsville Education Association and Junior Achievement on developing an "in the classroom" pilot educational project based on HALO. See the article on page 1 by Education Lead Larry Scarborough for more about the educational aspects of Project HALO.

Other members of our impressive support team include Bill Brown, our chief balloonist, who is widely known as one of the top amateur high altitude balloonist in the world. We also have Ben Frink who has been through the process of obtaining launch waivers for launching rockets from high altitude balloon off the coast of North Carolina.

The big questions still loom: What, When, Where, and most of all WHY?. To find out, attend the HAL5 Program Night this Wednesday (January 25) at 7:00 PM at the Huntsville/Madison County Public Library.

Want to get involved? Join HAL5, or renew your membership, using the enclosed form. There is plenty of work for everyone.

I do want to give special thanks to Mr. Herman Pickens for the use of his property near Gurley, Alabama for our rocket motor test facility. I also want to thank the members of HAL5 who came to our meetings and answered the surveys in support of this project.

I strongly feel that this new year offers to be the best HAL5 has ever known. I ask each of you to join with us in making a place in aerospace history, through securing a foothold for mankind in the quest for dirt-cheap access to space. Ad Astra! ☆

SSTO / RLV NEWS

The Inside Scoop on RLV

(by Ronnie Lajoie, RLV Program member)

I am putting on my Boeing engineer's hat to give you the inside scoop on the new Reusable Launch Vehicle (RLV) Program. I am a member of the Boeing/McDonnell Douglas team. As this is a competition, I can only give you information which has been released to the public; however, I can provide it fast and accurate.

The RLV Program is five year joint government-industry initiative to research, design, develop, and fly single-stage-to-orbit (SSTO) vehicles to and from Earth orbit (and specifically to the Space Station) routinely and cost-effectively. Unlike other NASA spacecraft programs — but very much like NASA aircraft programs — NASA expects industry to pay for most of the R&D expenses, and all of the operating expenses. Such a radical change has shocked many NASA and aerospace industry employees, but is welcome news to us members of the National Space Society. In fact, the NSS helped launch this program when they hosted last year's Launch Roundtable.

NASA Releases the RLV CAN

On January 12, NASA released the Cooperative Agreement Notice (CAN) for the RLV Advanced Technology Demonstrator (ATD), code named the X-33. Proposals are due back to NASA by February 24. See the following article for more details.

A draft of the CAN was released last October 19 and comments were due on November 2. The revised CAN was supposed to be released two weeks later, but was delayed over two months!

Two Competing Goals for RLV

Speculation for the delay centers around disagreements within NASA on the purpose of the RLV Program. On one side are the technologists, who see the

program as a research study to prove, or disprove, the engineering feasibility of SSTO technology. From the inside, I can tell you that creating a practical SSTO vehicle using current technology is going to be difficult at best.

On the other side are the operations analysts, who see the program as an effort to finally live up to the promise of the Space Shuttle — to have airline type operations: certify once, fly often, have a fast turnaround, and make a profit. A SSTO vehicle is not necessarily required to achieve this, as long as all parts are totally reusable and require little maintenance between flights.

The biggest problem with the Space Shuttle is not its multiple stages; it is the vast amount of servicing required to prepare it for the next flight. For example, the shuttle's engines are taken apart after each flight. Once back together, the shuttle must be recertified for flight. Imagine the airport delays if this happened with commercial jets!

RLV CAN Walks the Fence

The revised RLV CAN walks the fence between both sides of the debate. Technical requirements are clearly specified for an SSTO vehicle (to the extent where "RLV" and "SSTO" are used interchangeably); but operations requirements are still as strong as they were in the draft: fast turnaround (7 days vs. 3 months), and high reliability (one failure in 1000 vs. one in 100).

Fortunately, the CAN leaves much open to the imagination and ingenuity of the industrial teams. Since industry will foot most of the bill, it only seems fair to let them decide on how best to recoup their investment.

The space side of NASA has finally come around to the idea the airplane side has had all along — that NASA best serves the economy when it helps industry to reduce the risks that prevent them from investing in potentially profit-making ventures. ☆

NASA Kicks Off X-33 Bidding

(excerpt, Aerospace Daily, Jan. 13, 1995)

NASA has given bidders until Feb. 24 to outline how they would develop the X-33 reusable launch vehicle (RLV) demonstrator that may form the basis of a low-cost replacement for the Space Shuttle early in the next century. The X-33 CAN invites businesses, educational institutions, non-profit organizations and government labs and agencies to enter cost-sharing arrangements to develop the X-33.

The X-33 program will be divided into two phases. The first will refine vehicle concepts and business plans and carry out ground demonstrations of technology necessary for a full-scale vehicle.

The second phase would follow a decision late in 1996 to go to development of the X-33 vehicle, with test flights set to begin late in 1999. Because the White House policy specifies SSTO capability in assigning the next-generation launcher development to NASA, the X-33 will focus on the SSTO approach. But the CAN does not rule out a two-stage-to-orbit approach for the operational vehicle to follow the X-33. ☆

NASA Estimate High Shuttle Costs if RLV Program Fails

(excerpt, Aerospace Daily, Jan. 12, 1995)

NASA estimates it will cost from \$5.5 billion to more than \$10 billion to keep the U.S. Space Shuttle fleet flying if plans to shift space launch capability to a commercially operated reusable launch vehicle (RLV) early in the next century come to nothing.

The estimate, which includes \$3 billion for a new orbiter and about \$7 billion if a decision is made to replace the Shuttle's solid rocket boosters (SRBs) with liquid fueled reusable flyback boosters, is contained in the space agency's access-to-space implementation plan approved last Friday. ☆

HAL5 CALENDAR OF EVENTS**January 1995**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
22	23	24 HALO Technical Team Meeting 11:30a at Ponds	25 HAL5 Program "Project HALO" 7p at Hsv Library	26 HAL5 Executive Comm. Meeting 11:30a at Ponds	27	28
29	30	31 HALO Technical Meeting 11:30a at Ponds	TIME TO RENEW YOUR HAL5 MEMBERSHIP SEE ENCLOSED FORM FOR DETAILS			

February 1995

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2 HAL5 Executive Comm. Meeting 11:30a at Ponds	3	4
5	6	7 HALO Technical Team Meeting 11:30a at Ponds	8	9 HAL5 Executive Comm. Meeting 11:30a at Ponds	10	11
12	13	14 HALO Technical Team Meeting 11:30a at Ponds	15	16 HAL5 Executive Comm. Meeting 11:30a at Ponds	17	18
19	20	21 HALO Technical Team Meeting 11:30a at Ponds	22 HAL5 Program TBD 7p at Hsv Library	23 HAL5 Executive Comm. Meeting 11:30a at Ponds	24	25
26	27	28 HALO Technical Team Meeting 11:30a at Ponds				

March 1995

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2 HAL5 Executive Meeting 11:30a at Ponds	3	4
5	6	7 HALO Technical Team Meeting 11:30a at Ponds	8	9 HAL5 Executive Meeting 11:30a at Ponds	10	11
12	13	14 HALO Technical Team Meeting 11:30a at Ponds	15	16 HAL5 Executive Meeting 11:30a at Ponds	17	18
19	20	21 HALO Technical Team Meeting 11:30a at Ponds	22 HAL5 Program TBD 7p at Hsv Library	23 HAL5 Executive Comm. Meeting 11:30a at Ponds	24	25

HAL5 Survey Results

(By Ronnie Lajoie, Survey Coordinator)

Last November, HAL5 mailed to each member a survey form. As this issue goes to press, 14 out of 42 have been returned (one-third). While this is a good return percentage for mass-mail-type surveys, it is not a good one for a club as small as ours. Hopefully, the survey results are representative of the views of the membership as a whole, or at least of the vocal part of it.

HAL5 Membership

The best news of the survey is that all respondents are happy or very happy with their membership to HAL5. This is great news for us in the Executive Committee, who's only contact with many of you is through this newsletter. We have an open invitation for members to join us at our weekly meetings on Thursday, especially if you have an idea for a HAL5 project. Your editor also welcomes letters and articles to be published in this newsletter.

HAL5 Newsletter

All of the respondents regularly read and like this newsletter. Thank You!. In fact, many (6) said they would like it to go monthly, while (8) demanded that it not go quarterly. As editor, I can promise you at least a bi-monthly newsletter. I would need a lot of help to produce a monthly one. As treasurer, I can tell you that we would have to raise our membership dues by \$8 if we go monthly, as each issue costs about \$1.32 to copy, collate, and mail.

Most (7) said they received their newsletter on time, but three did not. Your editor is working to correct this problem. My goal is to have your copy in your mail box at least a week before critical upcoming events.

Most (11) like the content of this newsletter. Most (9) wanted more articles on local space activities, followed by (8) for personal articles by HAL5 members, and by (6) for articles on national space news. Surprisingly,

many (9) did not want more articles on NSS activities. I guess *Ad Astra* satisfies your needs. Because of this, I will include such articles only when they might affect HAL5 (or if they're about really cool subjects! Article follows).

Most (9) said they would be willing to write articles. THANK YOU! My mail box is always available, both physical and electronic. See the sidebar on page 2 for details.

HAL5 Program Nights

Most (8) of the respondents said that they regularly attend and enjoy the monthly Program Nights, as well as the socials at Shoney's afterwards. The 4th Wednesday seems to be good for most (9); three disagreed but offered no alternative. The 7-9pm timeslot was preferred by all respondents, as was the location: the Huntsville Public Library.

The Library has recently initiated a \$50-per-meeting room charge (previously free). Our Executive Committee is currently negotiating with the Library to permit us to continue using the facility for free (since we only use it to sponsor public lectures) in return for event co-sponsorship. The respondents were divided (5 to 4) over whether or not they would be willing to pay a \$1-2 admission charge to cover such fees. Thus, if negotiations fail, it seems likely that we will have to look elsewhere to hold our Program Nights.

HAL5 Activities

Most (6) of the respondents felt mediocre about HAL5 hosting another conference, however five felt we should host another and volunteered to help. The same was true about HAL5 focusing our efforts on political activism (7 versus 5). For now, it seems likely that HAL5 will remain a politically reactive organization rather than a proactive one.

Members who want to be politically proactive, and are willing to take a leadership role, should discuss the matter with the Executive Committee.

We very much would like to resurrect the HAL5 Phone Tree. There are supplies left over from the ISDC which can be used for such activities, as well as funds which can be used to reimburse reasonable expenses.

Most (8) felt that HAL5 should strengthen its commitment to public education, of which our Program Nights are only part. Half of those (4) volunteered to lead or help. HAL5's new Project HALO will have a strong educational aspect. Members who are not technically-inclined may want to serve the goals of the project through this avenue. Contact Larry Scarborough for more information.

Not surprisingly (from the outcome of our July meeting), all of the respondents chose to focus HAL5 on hands-on technical projects. 11 volunteered to lead or participate in such activities, and 9 specifically for Project HALO. This project is going to make the 1993 ISDC look small! Its goals are historic in scope; all the more reason for us to try. We have nothing to lose and everything to gain! I encourage all interested members to attend the Project HALO press conference at the January 25th Program Night. ☆

NSS Funds Life on Mars Study

(excerpt from article in Inside NSS)

Life on Mars? Maybe. The possibility that the scientific instrument on the Viking spacecraft which failed to detect life on Mars was flawed has prompted NSS to support and fund a re-study of that instrument, and the Board of Governors (BOG) is taking the lead in promoting the effort.

NSS's Executive Committee recently endorsed a proposal by noted scientist and NSS BOG member Robert Jastrow to refurbish and test the duplicate of the suspect instrument, the Gas Chromatograph Mass Spectrometer, being stored at NASA JPL. Jastrow believes the instrument can be made available but needs \$30,000 to fund the re-study. ☆

First NASA Launch Voucher Goes to UAH

(The Aerospace Daily, January 6, 1995)

NASA has picked a materials research center it helps fund at the University of Alabama in Huntsville to receive the first of six planned space launch "vouchers" in a congressionally mandated test of whether letting scientists procure their own launch services can save money.

Space agency officials said the Consortium for Materials Development in Space (CMDS) at UAH, one of NASA's Centers for the Commercial Development of Space, will use the voucher to secure launch services it negotiates on its own with a commercial vendor. Once the sub-orbital launch has occurred, NASA will pay the vendor.

Overall, NASA plans to issue six launch vouchers for a test of the voucher system mandated by 1992 legislation sponsored by Rep. Ralph Hall (D-Tex.), former chairman of the House Science space subcommittee, and Rep. Robert Walker (R-Pa.), the new chairman of the House Science Committee.

'Strawman' payloads

The CMDS announced a draft solicitation for launch services in Wednesday's Commerce Business Daily, designed to give launch suppliers an opportunity to ask questions and raise concerns about the voucher procedure. Emond said the full draft document, available through the CMDS, will include a number of "strawman" payloads to give potential bidders an idea of the types of experiments they could expect to fly when the first voucher launch occurs late this year or early next.

"The CMDS envisions a set of short-duration recoverable experiments, most of which require six to 12 minutes of microgravity," the UAH center said in its CBD announcement. "The contractor or contractors will provide

services for integration, launch and recovery of the suborbital microgravity experiments."

For the first voucher demonstration, proposals will be accepted for small dedicated launchers to fly some of the chosen experiments, larger dedicated launchers that can carry all of them, or integrating one or more experiments into a suborbital flight dedicated to another mission, the CBD notice said.

Vendors will not be limited to U.S. companies, even though the voucher demonstration is intended to stimulate the U.S. launcher industry, according to the CMDS announcement. However, CMDS ruled out the use of surplus government motors or other equipment unless the vendor already owns them.

The UAH voucher flight is the only one currently planned under the aegis of the Office of Space Access and Technology, which has inherited the task of the old headquarters Office of Commercial Space. The remaining five planned flights will be handled through the Office of Space Science, which has already tentatively selected two research projects to receive vouchers.

Louis Demas, chief of flight programs in the Space Physics Div. of the Office of Space Science, said the two will be announced after their experiments fly this spring on conventionally procured suborbital flights at White Sands Missile Range, N.M. With the completion of those flights, NASA will prepare an interim report on the voucher demonstration, and then use it for three more Space Science flights after that, Demas said.

The National Association of Professional Administrators will help NASA set up the details of the voucher test and evaluate its results, Demas said. The vouchers will be valued on the basis of what NASA believes is fair market value for meeting the requirements of specific payloads, based on its own experience with sounding rockets. "We will try to get the cheapest launch possible," he said. ☆

SPACE SCIENCE

Hubble Finds Aftermath of Violent Cosmic Events

(by Donald Savage, January 9, 1994)

Two new images taken by NASA's Hubble Space Telescope provide details of the results from two violent cosmic events. Both images were taken with the Wide Field & Planetary Camera-2.

"Ring World" Colliding Galaxies

This image shows a rare and spectacular head-on collision between two galaxies located 500 million light-years away in the constellation Sculptor. The galaxy, called the Cartwheel Galaxy, is surrounded by a ring-like feature which is a direct result of a smaller intruder galaxy -- possibly one of two objects to the right of the ring -- which careened through the core of the Cartwheel galaxy. The collision sent a ripple of energy into space, plowing gas and dust in front of it. The ring is now a stellar birthplace for at least several billion new stars and is so large the entire Milky Way Galaxy would fit inside. Hubble resolves bright blue knots that are gigantic clusters of newborn stars and immense loops and bubbles blown into space by exploding stars (supernovae) going off like a string of firecrackers.

"Cat's Eye Nebula"

A fascinating and colorful preview of the possible eventual fate of Earth's sun is evident in the Hubble image of a planetary nebula, named NGC 6543 but nicknamed the "Cat's Eye Nebula," which is in the last stages of its life after an explosion about 1,000 years ago blew away the outer gas layers of the star. This image reveals surprisingly intricate structures including concentric gas shells, jets of high-speed gas and unusual shock-induced knots of gas. The nebula, located 3,000 light-years away in the northern constellation Draco, is a visual "fossil record" of the dynamics and late evolution of a dying star. ☆

Ulysses Flies Over Sun's Pole

(Press Release, September 16, 1994)

The pass over the Sun's south pole currently being carried out by ESA's probe Ulysses has so far been a total success and has already yielded a first clutch of surprise results concerning this unexplored region.

The first thing that surprised the scientists was the low cosmic radiation activity above the south pole and the remarkable apparent absence of a south magnetic pole. Richard Marsden, ESA scientist: "We expected the Sun to have a relatively simple magnetic field, such as the Earth's or that of a magnetised iron bar. We thought we were going to find a local increase in the field's intensity. But the probe did not detect any such thing and all the evidence so far suggests that the Sun has no south magnetic pole. Could it be that the Sun has no south magnetic pole? Or is one suddenly going to appear before Ulysses completes its pass?"

It is however clear that the structure of the solar magnetic field in the southern polar region is not as predicted by the models. Ulysses has detected a new type of very slowly varying electromagnetic waves, with oscillation periods of 10 to 20 hours. Theory is that this is due to some phenomenon that conveys the solar magnetic field into space through the solar wind.

Further insights will probably be gained when Ulysses passes over the Sun's north pole in 1995 and, if the mission is extended, when it makes two further polar passes in 2000-2001, during a period of intense magnetic activity. ☆

OTHER SPACE NEWS

Lines Drawn for International Space Station Program

(The Aerospace Daily, January 9, 1995)

NASA Administrator Daniel Goldin says there can be no more funding or design changes to the International Space Station. "If there's one more request to redesign, I will recommend cancellation of the Space Station," he tells the House Science Committee. Goldin says 26,500 pounds of Station hardware was built in 1994.

The Station's old nemesis, Rep. Tim Roemer (D-Ind.), was trounced when he introduced an amendment last year to kill Station. But Roemer says he's going to continue to push for termination of the project. "I will continue to put that before this Congress as an honest option," he says.

The new congressman representing NASA's Johnson Space Center says he's concerned about Russian participation in the Station project. "I hope we look to Americans first before we do the Russians," Rep. Steve Stockman (R-Tex.) tells Goldin. He also wants to know if Goldin believes Russia will be a democracy in five years. Replies Goldin: "If I knew I'd be a very wealthy man." ☆

Top 20 NASA Contractors for Fiscal Year 1994

(The Aerospace Daily, January 5, 1995)

NASA's top 20 contractors, ranked by

the dollar amount of the business they received, are listed below. Work on the International Space Station moved Station prime contractor Boeing into first place from fourth in FY 1993. Overall these firms accounted for 88% of direct awards to business in the fiscal year. Procurement totaled \$12,913.1 million in FY 1994, a 1.9% drop from FY 1993.

1. Boeing Space Station	1,142 M	11.5 %
2. Rockwell	1,088 M	10.9 %
3. Lockheed Space Ops	571 M	5.7 %
4. McDonnell Douglas	565 M	5.7 %
5. Martin Marietta	497 M	5.0 %
6. Thiokol Corporation	430 M	4.3 %
7. Rockwell Space Ops	338 M	3.4 %
8. Computer Sciences	254 M	2.6 %
9. AlliedSignal	247 M	2.5 %
10. TRW Inc	234 M	2.4 %
11. Lockheed Missiles	222 M	2.2 %
12. Lockheed Engineering	216 M	2.2 %
13. EG & G Florida	200 M	2.0 %
14. USBI Booster	155 M	1.6 %
15. United Technologies	118 M	1.2 %
16. Loral Aerospace	118 M	1.2 %
17. Grumman Aerospace	111 M	1.1 %
18. Space Systems Loral	90 M	0.9 %
19. Boeing Computer	83 M	0.8 %
20. Santa Barbara Research	82 M	0.8 %

FTC Approves Merger of Lockheed and Martin

(excerpt, Aerospace Daily, Jan 12, 1995)

The Federal Trade Commission blessed the merger plans of Lockheed and Martin Marietta yesterday, so long as the merged company lets infrared sensor partners Hughes and Northrop Grumman out of exclusivity clauses in their teaming agreements. ☆

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