Southeastern Space Supporter

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

Volume 6, Number 5 — September–October 1997

FIRST WORD

Fall Cleaning Issue

(by Ronnie Lajoie, *SSS* Editor)

As you know, Spring of 1997 was quite a busy time for us in HAL5. We launched our first rockoon after three attempts, we attended TABES events and journeyed to Florida for the 1997 ISDC. Summer was almost as busy for us, as we began Project HALO Phase 2, wrote articles for four magazines on the successful HALO SL-1 mission, hosted our monthly space talks, and competed in the NSS "Campaign for the Future".

With the end of the baseball season now upon us (the reason for some of the article titles), fall is here. Thus we will have a "Fall cleaning" issue and provide the status of HAL5's many activities. ☆

Project HALO Main Event

Sunday, November 2, 1997
Noon to 5 p.m. (with barbecue lunch)

The primary purpose of this event was to test the 800-pound thrust hybrid rocket motor for the upcoming HALO Sky Launch 2 (SL-2) rockoon mission, now rescheduled for Spring 1998.

The event was held at the HALO Rocket Motor Test Facility, at the home at Herman Pickens.

Apology for this Late Issue

Editor's Note: Due to delays in getting this issue finalized (from urgent HAL5 and personal matters), this issue is being published well after the planned date. I apologize if this has caused you to miss key HAL5 events, like the one above.

HALO SL-1 Hits a Home Run . . . in Sep/Oct issue of *Ad Astra*

(by Ronnie Lajoie, *SSS* Editor)

The September/October 1997 issue of the National Space Society magazine *Ad Astra* features a three-page article on HAL5's Project HALO entitled "High Altitude Lift-Off: Amateur Space Missions YOU Can Participate In". The article was written by Greg Allison and Ronnie Lajoie and summarizes the project up until the May 11 HALO SL-1 mission. The article is part of a special 70-page education issue, which also features 3D pictures of Mars from the Pathfinder lander (glasses are included).

HAL5 Purchases 101 Extra Copies

Due to a database problem, the NSS Headquarters staff was unable to send this issue to their newest members who were recruited during the Campaign. (Their subscriptions will start with the November/ December issue.) The HAL5 Executive Committee voted to buy 101 extra copies (required to get the lowest unit price of $1 each).

As a member, you are entitled to get **ONE FREE** copy, upon request, provided that you can pick it up at a HAL5 meeting, Program Night, or HALO worknight. If you want it mailed, please send a check for $2 to cover the postage. You may also purchase additional copies for $1 each if picked up ($3 if mailed). Non-members may purchase copies at $3 each if picked up ($5 if mailed). Send your requests to me at "hal5@advicom.net" or leave a phone message at 721-1083 or 461-3064. Please mail checks to the HAL5 address on Page 8. ☆

HAL5 Takes Third . . . Place in NSS Campaign for the Future

(by Ronnie Lajoie, HAL5 Campaign Chair)

Thanks to the many of you who joined (or rejoined) the National Space Society via HAL5 between April and September 1st, our chapter finished 3rd Place in the NSS 1997 "Campaign for the Future" membership drive!

HAL5 Wins a "Moonlink" Education

HAL5's prize for achieving 3rd Place is a free registration (valued at $360) for the *Moonlink* education program to go to the high school (or perhaps middle school) of our choice. The *Moonlink* program (see enclosed flyer) consists of lesson plans, computer software, and Internet access to the project scientists

(see Campaign on page 2)

HALO SL-2 hybrid motor fuel and nozzle ready for testing. See page 3 for details.

Huntsville Alabama L5 Society

President — Greg Allison
Day: 895-2415, Eve: 859-5538
Vice-President — Larry Scarborough
Day: 881-1944, Eve: 881-4363
Treasurer — Ronnie Lajoie
Day: 461-3064, Eve: 721-1083
Secretary — Peter Ewing
Day: 876-5151, Eve: 876-5151
Membership — Philomena Grodzka
Day: 837-4287, Eve: 536-8638
Communications — Bill Brown
Day: 876-5151, Eve: 536-9334
Special Projects — Alfred Wright
Day: 876-8037, Eve: 420-6273
Programming — Wade Dorland
Day: 534-2566, Eve: 534-2566

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September / October 1997

The *Southeastern Space Supporter* is a bimonthly 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 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.

Visit the HAL5 Web Page on Internet via:

`http://advicom.net/~hal5/`

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

Submit letters or articles to: Ronnie Lajoie
162 Kirby Lane, Madison, AL 35757
Day phone/message: 205-461-3064
Night/Weekend phone: 205-721-1083
Electronic mail address: hal5@advicom.net

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 on a diskette. Also acceptable are 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 SASE. Hand-delivered diskettes will be hand-returned. No compensation is paid for submissions.

(Campaign, continued from page 1)

and engineers for the NASA Lunar Prospector mission, now scheduled to be launched on January 5, 1998.

Up to 24 students (grades 6 to 12) can participate (based on 2 students per computer). The computer requirements are high however: up to 13 Pentium-class PC's with ISDN or T1 connections to the Internet. See page 3 of the enclosed flyer for details.

Help HAL5 to Choose a School

HAL5 Executive Committee members have already begun discussions with some middle and high schools in the Huntsville area. A leading candidate is the Huntsville Center for Technology, which can draw from all of Huntsville's high schools for students. If you have a school in mind, please contact them and verify that they have both the interest and the computer capability. Feel free to make copies of the *Moonlink* flyer insert as required. Then send an E-mail message to "hal5@advicom.net" or leave a telephone message at 205-721-1083 or 205-461-3064.

HAL5 Votes to Help Other Schools

The HAL5 Executive Committee has decided that if more than one school shows sufficient interest, then HAL5 would find a way to raise the money so that they could also participate — rather than force the schools to compete. If two schools are very interested, HAL5 would raise the money for the second school among its own members — **we will need your support for this!**

If three or more schools are very interested, then HAL5 would go to HATS, AIAA, and other organizations to raise the required registration fees. HAL5 would like for all interested schools to be able to participate!

Chicago Chapters Finish 1st and 2nd

The NSS chapter which finished in 1st Place was the Illini Space Development Society with 42 new members, all recruited by President Ross Beyer. As a reward, the Illini chapter will receive a free visit from astronaut and Chairman of the Board Buzz Aldrin. Mr. Beyer, as top individual recruiter, will receive an all-expense trip to our lovely town to see first hand the International Space Station hardware. HAL5 would like to extend an invitation to Mr. Beyer to visit with us during his trip.

The NSS chapter which finished in 2nd Place was the Chicago Space Frontier L5 Society with 38 new members. Like HAL5, the Chicago L5 Society will also receive a free copy of *Moonlink*. Their top recruiter was long-time space activist Larry Ahearn (with 17), the current Region 6 Chapters Organizer.

HAL5 Raises 32 for NSS, 43 for Us

NSS recruitment for HAL5 totaled 32 (membership pledge #33 from Melanie Hazelrig arrived too late to be counted). Of those 32, 22 also joined HAL5, swelling our chapter membership to an all new record high of 80 (now 81, see page 8). Of the remaining 10, 9 came from existing HAL5 members and one joined just the NSS.

At the start of the contest for HAL5 in late April, HAL5 had 37 members, of which 14 were NSS members (38%). In addition to the 22 who joined both NSS and HAL5, 21 more members joined just our chapter, including 11 who were already NSS members (and thus could not be counted for the contest). At the end of the contest on September 1, HAL5 had 80 members, 56 of which are NSS members — a whopping 70%!

This percentage is a much more appropriate number for one of the flagship chapters of the National Space Society. All HAL5 members should be proud of your accomplishment this year!

HAL5 Recruiters Win "Space Pens"

NSS has awarded Fisher "Space Pens" to anyone who recruited 5 or more members during the campaign. For HAL5, this includes Ronnie Lajoie (16), Bill Brown (7), and Gene & Gladys Young (5). Congratulations to all! ✯

HALO NEWS

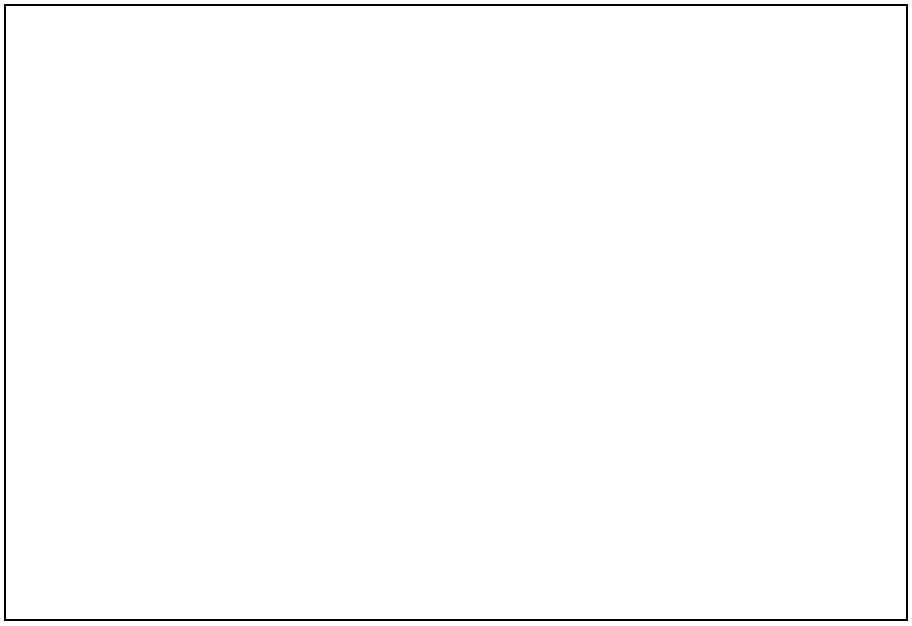
HALO SL-2 Slides into … 1998

(by Ron Lajoie, HALO team member)

The launch date for the upcoming HALO SL-2 rockoon mission has slid into 1998, probably Spring. Reasons for this are mainly due to a larger than planned effort to design, manufacture, and test the new larger hybrid rocket. It is almost twice as tall as the SL-1 rocket and 3 times as heavy (see table at left).

Latest HALO SL-2 Rocket Weights

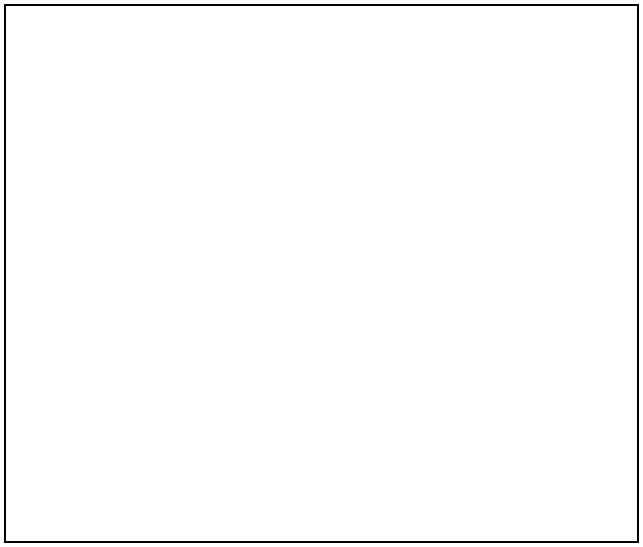
HALO SL-2 Rocket Item	Weight
Nose Cone Fairing and GPS	1.5
Experiments and HAL5 Cards	1.2
Payload Canister & Electronics	13.0
Parachutes Can & 3 Parachutes	4.6
Oxidizer Tank / Motor Casing	29.5
Tank Top and Bottom Plates	3.5
Tank Heaters (2) and Insulation	2.0
Fuel Injector & Igniter Plate	1.2
Motor Composite Inner Case	6.0
Motor Case Bottom Ring	1.0
Mounted Stabilizer Fins (4)	3.0
Graphite & Composite Nozzle	2.6
Nozzle Extension Cone	2.7
BURNOUT WEIGHT TOTALS	**70.1**
Asphalt Fuel Grain	8.7
FUELED WEIGHT TOTALS	**78.8**
Liquid Nitrous Oxide	52.1
LAUNCH WEIGHT TOTALS	**130.9**



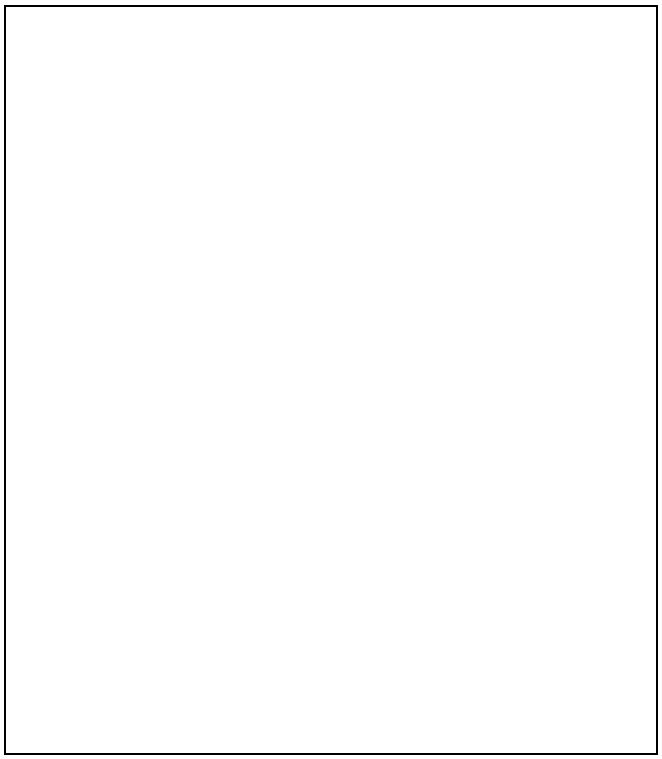
Tim Pickens and Steve Mustaikis perform a hydrostatic pressure test of the aluminum cylinder to be used for the oxidizer tank and outer motor casing.

On Saturday, August 23, the HALO team held its 14th motor test firing day. Two motors were successfully fired, but the burns were not exactly as had been hoped. On the first, an aluminum cap on the new injector melted and allowed too much oxidizer to flow. On the second motor firing, a new injector was tried but had not been sized properly for this motor. The next motor test firing is scheduled for November 2.

The HALO team is looking for student payloads to fly on SL-2. Interested students and teachers and should contact Greg Allison at 205-859-5538. ☆



SL-2 injector following August 23 motor test firing. Aluminum cap melted and will be replaced with steel.



Greg Allison sands rust off a surplus steel frame, which will attach SL-2 motor to the HALO test stand.

The SL2 Electronic Scoreboard

(by Clay Sawyer, HALO Electronics Lead)

Planning and work on the electronics for the HALO SL-2 rockoon mission are well under way. The electronics are divided into three categories: avionics for the rocket, avionics for the balloon gondola, and ground stations.

Rocket Avionics

Presently, the rocket avionics is still in breadboard stage. There are still several minor issues to be worked out before the actual board is made. These should be worked out within a week. Once the board is made, the accelerometer needs to be calibrated on a G table. We do not have a G table and may build one if we cannot otherwise obtain use of one.

The rocket avionics SL-2 functions very similar to that of SL-1 with several exceptions:

1. The telemetry is being transmitted to the ground station over two independent transmitters.
2. An accelerometer is onboard and it's output is being integrated twice. The first integration produces the rocket speed (magnitude of velocity) and the second produces the distance traveled (approximately the altitude gained) and each are being transmitted over an analog channel of the MIM chip. Since we have five analog channels, we are sacrificing battery voltage and an extra payload temperature.
3. Both primary and redundant main parachute squibs are being triggered by the Basic Stamp II.
4. The redundant main parachute squib status is being sent on a digital MIM chip channel.
5. The squib firing circuit will be current limited by a 3 Watt resistor to prevent excessive battery drain and voltage drop in the event of a shorted squib.
6. GPS will be displayed on the ATV using video overlay to back the MIM chip up.
7. To conserve space, weight, and costs, as well as provide a long term reliable solution to squibs firing, a MOSFET squib circuit was developed and will be used instead of rare surplus MILSPEC solid state relays.

The SL-2 telemetry is separated into five analog channels (AC) and seven digital bit (DB) signals as follows:

AC 0: Accelerometer Speed
AC 1: Accelerometer Altitude
AC 2: Internal Payload Temperature
AC 3: Outside Air Temperature*
AC 4: Outside Air Pressure

DB 0: Launch Detect
DB 1: Drogue Deployed Detect
DB 2: Primary Drogue Squib Status
DB 3: Redundant Drogue Squib Status
DB 4: Primary Main Squib Status
DB 5: Redundant Main Squib Status
DB 6: Status Count Bit 0
DB 7: Status Count Bit 1

*There may be some changes, as there has been some discussion on monitoring and transmitting the N_2O oxidizer tank temperature and yield the outside air temperature to the gondola electronics.

The rocket avionics also has a separate Serial Channel for downloading data from the onboard GPS receiver. The GPS data will be sent via both telemetry and the ATV system. The ATV frequency will be 1255 MHz. The telemetry frequency has yet to be determined. The antennas are a new (classic "X") design and have been extensively tested by Gene Young.

Balloon Gondola Avionics

The balloon gondola avionics package is mostly built and tested. The uplink module card will be used in the next hybrid rocket motor static test firing to trigger the motor igniter. Although, the balloon gondola itself will be but a small fraction compared to the SL-1 rockoon, the SL-2 gondola electronics system is functionally very similar to that of SL-1 with minor variations.

1. There will only be two independent engine ignition commands. Either one will ignite all three ignition squibs. This is to simplify the launch procedure which was unnecessarily difficult and slow on SL-1.
2. Mechanical relays are used instead of solid state. Since the balloon gondola will not encounter high accelerations, on hand mechanical relays were deemed sufficient and are being used.
3. The squib firing circuit will be current-limited by a 12 Ohm, 3 Watt resistor to prevent excessive battery drain and voltage drop in the event of a shorted squib. The resistor charges up a 390 uF, 35 Vdc capacitor which, when the relay is enabled, dumps its charge into the squib.
4. Two different radios are being used for receiving the uplink commands to insure that a particular design flaw does not inhibit command reception.

There are five squibs, three for rocket ignition, and two to cut the gondola from the balloon:

1. Ignition Squib 1
2. Ignition Squib 2
3. Ignition Squib 3
4. Cutdown Squib 1
5. Cutdown Squib 2

The three uplink commands for the HALO SL-2 mission are as follows:

1. Fire primary ignition squibs 1 to 3
2. Fire redundant ignition squibs 1 to 3
3. Fire cutdown squibs 1 & 2 (or Abort)

The Primary uplink frequency will be 145.5 MHz, and a redundant uplink frequency will be 145.6 MHz.

Ground Stations

Little work has been done on the ground stations so far. That should be started in about two weeks. The configuration is expected to be very similar to SL-1 with the respective exception corresponding to those noted in the telemetry and uplink commands. ☆

HAL5 CALENDAR OF MEETINGS AND EVENTS

October 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
5	6 **HALO SL-2 Work Party** 6 pm at Tim's	7 **Project HALO Tech. Meeting** Noon at Ponds	8 **HALO SL-2 Work Party** 6 pm at Tim's	9 **HAL5 Executive Comm. Meeting** Noon at Ponds	10 Triton discovered, 1846	11
12	13 **HALO SL-2 Work Party** 6 pm at Tim's	14 **Project HALO Tech. Meeting** Noon at Ponds	15 **HALO SL-2 Work Party** 6 pm at Tim's	16 **HAL5 Executive Comm. Meeting** Noon at Ponds	17	18
19	20 **HALO SL-2 Work Party** 6 pm at Tim's	21 **Project HALO Tech. Meeting** Noon at Ponds	22 **HAL5 Program Night** 7pm at Library	23 **HAL5 Executive Comm. Meeting** Noon at Ponds	24	25
26 Daylight Savings Time Ends	27 **HALO SL-2 Work Party** 6 pm at Tim's	28 **Project HALO Tech. Meeting** Noon at Ponds	29 **HALO SL-2 Work Party** 6 pm at Tim's	30 **HAL5 Executive Comm. Meeting** Noon at Ponds	31 Halloween	November 1

November 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
2 **Project HALO Motor Firing** 12p at H.Pickens	3 Taurid meteors	4 **Project HALO Tech. Meeting** Noon at Ponds	5	6 **HAL5 Executive Comm. Meeting** Noon at Ponds	7 Space Frontier Foundation Conference	8 Space Frontier Foundation Conference
9 Space Frontier Foundation Conference	10	11 **Project HALO Tech. Meeting** Noon at Ponds	12 **HALO SL-2 Work Party** 6 pm at Tim's	13 **HAL5 Executive Comm. Meeting** Noon at Ponds	14	15
16 Leonid meteors	17 Leonid meteors	18 **Project HALO SL-2 Review** 7 pm at HATS	19 **HALO SL-2 Work Party** 6 pm at Tim's	20 **HAL5 Executive Comm. Meeting** Noon at Ponds	21	22
23	24	25 **Project HALO Tech. Meeting** Noon at Ponds	26 No HAL5 Program Night	27 Thanksgiving Day	28	29

December 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
November 30	1	2 **Project HALO Tech. Meeting** Noon at Ponds	3 **HALO SL-2 Work Party** 6 pm at Tim's	4 **HAL5 Executive Comm. Meeting** Noon at Ponds	5	6
7	8	9 **Project HALO Tech. Meeting** Noon at Ponds	10 **HALO SL-2 Work Party** 6 pm at Tim's	11 **HAL5 Executive Comm. Meeting** Noon at Ponds	12 Geminid meteors	13 Geminid meteors
14 Geminid meteors	15	16 **Project HALO Tech. Meeting** Noon at Ponds	17 **HALO SL-2 Work Party** 6 pm at Tim's	18 **HAL5 Executive Comm. Meeting** Noon at Ponds	19	20

Look at Those Fans, uh, Fins!

(by Ronnie Lajoie and Larry Scarborough)

Yes, fins are back, at least for now. The original SL-2 rocket design was finless, a straight long tube which would have been spun-stabilized during launch. The spin-up mechanism was a clever design by Tim Pickens utilizing a small bottle of nitrous-oxide to vent through four small ports on the sides of a cylinder. Gene Young even made a prototype.

Both the rocket and the spin-up device would have been placed in a larger tube and suspended from the balloon by a single hook. (The wooden gondola idea used for SL-1 was deemed too much of a waste of valuable weight.) The rocket would have then been fired from the tube like a bullet from a rifle. Neat idea, and probably would have worked very well — unfortunately it would have weighed a ton! Okay, not a "ton" as in "2000 pounds", but as in a lot more than any balloon we could afford to buy could have ever carried (mainly because most of the parts would have been made from aluminum tubing).

What About Van Allen?

When James Van Allen and the Navy launched their solid rockets from high altitude balloons, they too used no gondola and just a hook. They also used no rifle-barrel-type tube either. They just suspended the rocket directly from a hook.

How did the rocket stay stable during launch then? Well they had three things going for them. One, they had very big fins (just like we did for SL-1); two, they had very high launch accelerations (thrust-to-weight ratios of 20 to 70); and three, they had some form of attitude control for the rocket (by turning the fins and/or by vectoring the thrust).

Can't We Do What Van Allen Did?

We had hoped to demonstrate thrust vectoring on SL-2, but we have yet to acquire all the people with the right knowledge and experience, nor have we had the time (due to scheduled, though sliding, launch dates) to learn it ourselves and experiment. Proper thrust vectoring involves four critical technologies. Hardware to deflect the thrust, actuator mechanisms to control the hardware, electronics and software to instruct the actuator mechanisms, and sensors to feed back information to the electronics. Each technology involves either a lot of money or a lot of work, and usually both.

Our predicted thrust of 800 pounds at launch should provide our vehicle (131 pounds at launch) with an acceleration of about 6 g's, which is less than past rockoon rockets. We therefore need some form of stabilization mechanism. The original SL-2 design would have put the rocket's center of mass further aft of its aerodynamic center of pressure. Thus, the slightest thrust misalignment could have caused the rocket to veer off course. Spin stabilization could have contained most of this, but that solution weighed too much.

Fins to the Rescue — Again

Ronnie Lajoie, Steve Mustaikis, and Alfred Wright did some computations and determined that four fins of approximately the SL-1 shape would be enough to bring the center of pressure back far enough behind the center of mass to make the rocket statically stable. Thus, as long as the rocket was pointed near vertical at launch, it would have a very good chance of remaining so during the entire burn.

Given the SL-1 fin dimensions, Larry Scarborough quickly made two fin prototypes from wood. The HALO team liked them so much (especially the speed at which they were created) that Larry constructed all four flight articles. Gene Hornbuckle, creator of the fins for the 1996 GL-1 and 1997 SL-1 mission rockets, now has them and has been preparing them for attachment to the rocket body.

Larry constructed each fin from four ¼-inch birch plywood panels, feathered to near-zero thickness at the leading and trailing edges (for a double-wedge-shape airfoil cross-section). He routed out the insides of each panel to reduce their weight. The minimum thickness is about $^{1}/_{16}$-inch.

The two top panels were placed over the two bottom panels and a thin strip of maple was used to ensure a fin thickness of ½-inch. The pieces were then bonded together with epoxy. Each fin will be mounted to the rocket body by a metal bracket made by Tim Pickens. ✰

Email Addresses of HAL5 Officers & HALO Team Members

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SPACE NEWS

Black Hole Distorts Space-time

(NASA Press Release, Nov. 6, 1997)

Astronomers using NASA's Rossi X-ray Timing Explorer (RXTE) spacecraft reported today that they have observed a black hole that is literally dragging space and time around itself as it rotates. This bizarre effect, called "frame dragging," is the first evidence to support a prediction made in 1918 using Einstein's theory of relativity.

The phenomenon is distorting the orbit of hot, X-ray emitting gas near the black hole, causing the X-rays to peak at periods that match the frame-dragging predictions of general relativity. The research team, led by Dr. Wei Cui of M.I.T., is announcing its results in a press conference today during the American Astronomical Society's High Energy Astrophysics Division meeting in Estes Park, CO. Collaborators in the research include Dr. Wan Chen of NASA Goddard, and Dr. Shuang N. Zhang of NASA Marshall.

"If our interpretation is correct, it could demonstrate the presence of frame dragging near spinning black holes," said Cui. "This observation is unique because Einstein's theory has never been tested in this way before."

Black holes are very massive objects with gravitational fields so intense that near them, nothing, not even light, can escape their pull. This effect shrouds the hole in darkness, and its presence can only be inferred from its effects on nearby matter. Many of the known or suspected black holes are orbiting a close "companion" star. The black hole's gravity pulls matter from the companion star, which forms a disk around the black hole as it is drawn inward by the black hole's gravity, much like soap suds swirling around a bathtub drain. Gas in this disk gets compressed and heated and emits radiation of various kinds, especially X-rays.

The research team used these X-ray emissions to determine if frame dragging was present. The team found that the X-ray emissions were varying in intensity. By analyzing this variation, they found a pattern, or repetition, that was best explained by a perturbation in the matter's orbit. This perturbation, called a precession, occurs when the orbit itself shifts around the black hole. This is evidence for frame dragging because as the matter orbits the black hole, the space-time that is being dragged around the black hole drags the matter along with it. This shifts the matter's orbit with each revolution.

Einstein's Theory of General Relativity has been highly successful at explaining how matter and light behaves in strong gravitational fields, and has been successfully tested using a wide variety of astrophysical observations. The frame-dragging effect was first predicted using general relativity by Austrian physicists Joseph Lense and Hans Thirring in 1918. Known as the Lense-Thirring effect, it has not been definitively observed thus far, so scientists will scrutinize the new reports very carefully.

The possible detection of frame dragging around another type of very dense, quickly spinning objects, called neutron stars, was accomplished very recently by Italian astronomers, whose work led Dr. Cui's team to seek the effect near black holes. These observations also were made using the RXTE, which is available for use by astronomers throughout the world.

"This is exciting work that needs further confirmation, as for any seemingly major advance in science," said Dr. Alan Bunner, Director of the Structure and Evolution of the Universe Program at NASA Headquarters.

The RXTE spacecraft is a 6,700 pound observatory placed into orbit by NASA in December 1995. Its mission is to make astronomical observations from high-energy light in the X-ray range, which is emitted by powerful events in the universe. These events are often associated with massive, compact objects such as black holes and neutron stars. ☆

Commercial Firm Planning to Launch Vehicle to Asteroid

(Huntsville Times, September 10, 1997)

It's time for entrepreneurs to go boldly where private money has never gone before, according to businessman James W. Benson. Benson, who made a fortune with two computer software companies, said Tuesday he now wants to use "common-sense business tactics to explore deep space" and cash in on profits that can be made by mining asteroids.

"Space is a place, not a government project," Benson said at a news conference announcing the project. "We will not seek or accept one penny of government funds."

Benson said his new company, which he calls SpaceDev, planned to launch a robot craft to an asteroid, one of the thousands of space rocks orbiting the sun between Mars and the outer planets. He said the craft, to be called Near Earth Asteroid Prospector, would land instruments to take photographs and scientific readings. It also would search for gold, platinum, cobalt and other valuable minerals.

Benson said the cost would be under $50 million, about $200 million less than an asteroid mission designed and launched by NASA. And, unlike NASA, said Benson, he planned to make a profit.

To make all this happen, Benson admits, he needs a little more money. "We are with $6 (million) to $7 million of having the funds we need, not counting the costs of the launch vehicle," said Benson. ☆

Campaign Helps HAL5 to Break Membership Record

(by Ronnie Lajoie, HAL5 Treasurer)

The NSS "Campaign for the Future" membership drive was not only a success in terms of our ability to recruit members to the national organization, we also recruited 33 more NSS members to our chapter (11 since the last issue), for a new (again!) all time high record membership. As of October 30, we now stand at 81, plus 10 newsletter subscriptions. The following is a list of 12 additions to the current paid membership of HAL5, which includes 42 renewals (a new record) and 39 new members, for a total of 81. Welcome to all our new and renewed members!

Jeff	Brown	(N,C)
Joe	Brown	(N,C)
Cary/Fran	Bruton	(N,C)
Robert	Ehresman, Jr.	(R)
James	Forbes	(N,C)
Jackson	Hogan	(N,C)
Susan	Pond	(N,C)
Paul	Pritchett	(N,C)
Larry	Schaefer	(N,C)
Lisa	Taylor	(N,C)
Steve	Unger	(N,C)
Austin	Young	(N,C)

(N) - New Member
(R) - Renewed Member
(C) - New NSS Member via Campaign

HAL5 welcomes back its previous member Bob Ehresman, who was instrumental in setting up the HAL5 Web site thanks to his very generous donation of one-year free Internet access via his former Internet company.

HAL5 also welcomes its new local members, including James Forbes, Jackson Hogan, Paul Pritchett, Larry Schaefer, and Austin Young. James, Jackson, and Austin are grandchildren of Gene and Gladys Young and are our youngest members. (Hopefully we can get them to volunteer to be test subjects for the HALO Achievement educational program.) Paul and Larry are friends and co-workers of Bill Brown. Perhaps we can get them to come out to see our HALO workshop someday.

HAL5 also welcomes its new out of state members, including Jeff Brown (OH), Joe Brown (OH), Cary & Fran Bruton (NC), Susan Pond (CA), Lisa Taylor (CA), and Steve Unger (NC). 26 members of HAL5 (32 percent) reside outside of Alabama. Jeff, Joe, Susan, and Lisa are brothers, sister, and friend, respectively, to Bill Brown (our number two Campaign recruiter).

Cary & Fran Bruton are the kind and very hospitable landowners of the grass site in Hampstead, North Carolina, from which the Project HALO team launched the SL-1 rockoon. (The Brutons have even invited us back!)

Steve Unger is Editor of the Topsail Voice, the local newspaper which also serves the town of Hampstead. Mr. Unger very generously allowed us to store our U-Haul truck at his home in between our 2nd and 3rd launch attempts. He also provided us with a wonderful history of Topsail and its Navy-sponsored Project Bumblebee. Welcome all to HAL5 and NSS! ☆

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SOHO Data Reveals Clues to Sun's Extremely Hot Corona

(excerpt NASA Press Release, Nov. 5, 1997)

A likely solution to one of the major mysteries of the Sun has emerged from recent observations with the ESA/NASA Solar and Heliospheric Observatory (SOHO) mission.

The new findings seem to account for a substantial part of the energy needed to cause the very high temperature of the corona, the outermost layer of the Sun's atmosphere. Since its temperature was first measured 55 years ago, scientists have lacked a satisfactory explanation for why that temperature is three million degrees while the visible surface of the Sun is only 11,000°F or about 6,000°C.

It is physically impossible to transfer thermal energy from the cooler surface to the much hotter corona, so the energy transfer had to be in the form of waves or magnetic energy, but no measurement to date had found adequate energy to account for the coronal temperature.

"We now have direct evidence for the upward transfer of magnetic energy from the Sun's surface toward the corona above. There is more than enough energy coming up from the loops of the 'magnetic carpet' to heat the corona to its known temperature," said Dr. Alan Title of the Stanford-Lockheed Institute for Space Research, who led the research. "Each one of these loops carries as much energy as a large hydroelectric plant, such as the Hoover dam, generates in about a million years!" ☆

Special Announcements

(I deeply apologize for this delay)

E-mail hal5@advicom.net or call 721-1083 to get your free *Ad Astra* magazine featuring Project HALO

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