

Southeastern Space Supporter

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

Volume 5, Number 2 — March–April 1996

FIRST WORD

HALO Achievement Overview

(by Gregory Allison, HAL5 President)

Editor's Note: Greg gave the following presentation at the recent STEDTRAIN conference, sponsored by HATS.

We live in an age of distractions to the educational process. More often than not it seems that young students are more interested in the trappings of pop culture, such as fashion, music, television, and the sway of their peers than in learning. Far too many are dropping out, falling under the influences of drugs, and joining gangs. Many view the term "Generation X" as referring to a lost generation.

With the prevalent themes of Gloom and Doom so often portrayed for our future, it is no wonder that so many students tune out and fall to the academic wayside. Why would one want to work hard for a future that offers no rewards for the effort? To maintain our economic competitiveness we must turn this around. Else, one has

HAL5 Program Night

Wednesday, March 27, 1996

7 to 9 p.m. (with social afterwards)

Huntsville Public Library Auditorium

"Lasers Up the Butt — How to Achieve Infinite Isp"

Guest speaker will be HAL5 member Dr. Ray Moses.

All HAL5 and NSS members are encouraged to attend, and to bring interested friends and co-workers. Open to the public. Free admission.

to wonder who will maintain the power plants and keep the planes flying when we grow old?

HALO Achievement to the Rescue

Concerns for the future of our school children drove the HAL5 to develop the High Altitude Lift-Off (HALO) Program. This Program consists of (1) Project HALO which launches student experiments on ground-based rockets, tethered balloons, weather balloons which fly 20 miles high, to the edge of space, and rockoons (rockets launched from high altitude weather balloons) which fly on ballistic trajectories into space, and (2) Project HALO Achievement designed to take space education directly into the classroom.

Project HALO Achievement (developed under the oversight of the Junior Achievement of North Alabama) is designed to encourage students' academics through building an excitement for space. This program will

demonstrate to the students the importance of the fields of science, mathematics, and language arts for the exploration and development of space.

What Students Will Learn

The students will learn many basics of science, about energy, Planet Earth and how it fits into the space environment, how to combine ecology and biology to develop deep space life support systems they will develop a new appreciation for life on Earth and the environment, learn the effects of the space environment, rocketry, aerodynamics, about spaceflight, navigation, communications, psychological and sociological aspects of spaceflight, and about Planet Mars. Most of all, the students will learn that there is hope for the future, that they can make a difference.

All of this is presented at their grade level. To keep the students' interest, the program combines several different formats. There are class presentations,



HAL5's Project HALO display premieres at STEDTRAIN conference

Huntsville Alabama L5 Society

President — Gregory Allison
Day: 971-1041, Eve: 859-5538
Vice-President — Ethan Scarl
Day: 461-2747, Eve: 534-3993
Treasurer — Ronnie Lajoie
Day: 461-3064, Eve: 721-1083
Secretary — Larry Scarborough
Day: 881-1944, Eve: 881-4363
Membership — Philomena Grodzka
Day: 837-4287, Eve: 536-8638
Communications — Ron Creel
Day: 881-8016, Eve: 881-8016
Special Projects — Alfred Wright
Day: 876-8037, Eve: 420-6273

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March / April 1996

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 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://www.cici.com/~hal5/index.html>
Courtesy of Community Internet Connect.
Contact Bob Ehresman for info: 722-0199

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 35758
Day phone/message: 205-461-3064
Night/Weekend phone: 205-721-1083
FAX number: 205-461-2551
Electronic mail address: hal5@cici.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 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.

and field day activities. The key format of activity to build the students' interest and develop teamwork and leadership skills will be team projects. In this hands-on team-oriented approach, students will gain a broad knowledge of science and space while planning space missions.

At the fifth grade level a series of nine sessions will lead the student teams into planning missions and simple spacecraft system concepts (based on what they learn about the space environment) to send a comic character, Rascal the Rockoon Raccoon, to Mars. Rascal will help us humor the students and keep their interest.

Middle school students will develop their projects to fly on ground-based rockets and high-altitude weather balloons. To coach them in project development we are establishing the Junior Cadet Foundry, which will be modeled on the Foundry project incubator workshop we initiated at the 1993 International Space Development Conference (ISDC). With the Junior Cadet Foundry we will coach the students all the way through the project development phase.

High school students would develop their projects to fly on high-altitude weather balloons, and rockoons. They would participate through the Senior Cadet Foundry. Just imagine high school students flying payloads into space!

Students and Rockets

Student involvement in this program runs deep. College students from the Students for the Exploration and Development of Space (SEDS) play a key

role in the design, testing, and fabrication of the HALO rockoon system. It is planned to have various system components constructed by vocational-technical programs. In short, the HALO Program offers opportunities for hundred of thousands of students to touch space. The availability of these opportunities are up to us. It is only a matter of how much we are willing to assist them.

May you not lie one day in a nursing home, freezing, hoping an airplane will not crash through your roof! Help us inspire a new future. Then you can witness our descendants building cities in space, and know you helped make it happen! The key to our collective futures lies in our children. Ad Astra per Ardua! ☆

HALO rocket motor a big hit at STEDTRAIN

PROJECT HALO NEWS

Rocket Motor Test Success

(by Tim Pickens, Propulsion Team Lead)

The tenth Project HALO rocket motor test day was held on Saturday, February 24, at our test facility in Gurley. We had hoped this would be a very successful and final test day for Project HALO, Phase I. This was to be a test day to confirm the total impulse of our propulsion system, and to test the durability of our components. Many of our objectives were achieved, but some were not.

Many of us arrived at our usual 9-10 am time. We had hoped that this day would really go smooth — and it did until we started working! I had grand visions of testing by lunch, enjoying the cook-out festivities, and relaxing on the farm while taking an evening stroll. This was going to be the best day of testing to date! Why, I had even gone and gotten a 70-lb bottle of N₂O so we would definitely not run out as we had in times past. We all met at my garage two nights before to test out our data acquisition system, stage all the necessary test support equipment, prepare two motors for testing, and to finalize the details of our upcoming test day.

Full Burn of New Motor Planned

This would be the first time that we would be testing the total propulsion system, with no means to stop the burn. This was a very exciting endeavor considering that we had never burned a motor of this size for over 6 seconds. We would be able to record the thrust, chamber pressure, nitrous flow pressure, temperature, and burn time as we had done in the past. We would also test our igniter, valve, nozzle extension, double tank configuration, and the ability of the system to handle the loads of up to 350 pounds of thrust. The loads would be distributed through the entire structure because of the way we secured the motor to the test stand.

New Equipment Causes Delays

We spent hours getting the data acquisition to work properly. The cables and the connectors do not seem to like the moisture that the country conveniently offers. Thanks to the fine group of problem solvers that we have, we were back in business before long. The stand, plumbing, and associated hardware were assembled, while others worked getting the calibration finalized. We were finally back on track.

We mounted the rocket into the stand and connected all the fill hoses, chamber pressure hose, igniter, etc. We were finally ready to start the N₂O loading. This was expected to go well because the Nitrous Pump that I had fabricated was supposed to help us. The idea was to fill the tanks on the rocket without having to vent.

Previously, during filling, we would have problems getting the desired amount of N₂O into the vehicle tank without venting. The pressure from the supply tank would near the pressure on the target tank thus reducing flow to near zero. We would vent in order to reduce the target fill tank pressure, thus creating a pressure differential, which promoted N₂O flow. The valves we were using in the past increased the vehicle weight, which is not desirable. The new pump would also increase the safety in our loading procedure.

Nothing Could Stop Us Now, Except...

We were finally to begin testing; nothing could stop us now. We began loading the N₂O into our vehicle, Al and I stayed down at the pad behind the wall in order to try the new pump system out. Steve was talking to us via intercom to keep us posted on the rate of loading, which he was monitoring on the computer. After 5 minutes of loading, only 2 pounds of N₂O was in our vehicle. We decided that something was not right; we should have easily been able to load at least ten pounds of N₂O with no venting. We tried the pump to see if the bypass was restricting flow. It seemed to work at first; we saw another pound go in, but

then it quit filling. We new that we had a new bottle, so being out of N₂O was not an option. Or so we thought.

We tried everything from turning the bottle upside down just in case there was no pickup tube, to our old method of venting. We finally went straight to the horse's mouth only to learn that it was dry and not wet. In other words, we only had gaseous N₂O left in the bottle — which meant that we had been sold an empty bottle for the second time! We were delirious at this point and totally frustrated. It was Saturday, and no gas supply companies were open. I wonder why they call it *laughing gas*!?!

Old Bottle to the Rescue

Anyways, we had enough in our other N₂O tank to do a partial test. We loaded about 5 pounds, which was mostly gas. We decided that we were going to burn something, no matter what! We all took our places (hiding behind trees or whatever was at a safe distance away), and the countdown began. 3-2-1-FIRE! Smoke billowed from the nozzle for what seemed to be an eternity, and then the motor roared as it came to life. The motor flamed for 15 seconds! Only two of those 15 seconds was usable thrust because the N₂O was in a liquid state, which our system requires. The rest of the burn was gaseous tail off.

We were very pleased with the results of the test although we did not obtain a total impulse. The chamber pressure was where we expected it to be. The thrust was low during the liquid and gaseous phase because of our 44-to-1 expansion ratio on our new nozzle extension, which was not optimized for a sea level atmosphere. We used it anyway because it would be a great reliability test to see how it survived under heat and shock. I am happy to report that it did great, and our new ablative coatings did an excellent job also at providing protection for our nozzle extension, premixing chamber, and post-mixing chamber. All of these

(see HALO Test on page 8)

1996 HAL5 Race for Space

(by Ronnie Lajoie, SSS Editor)

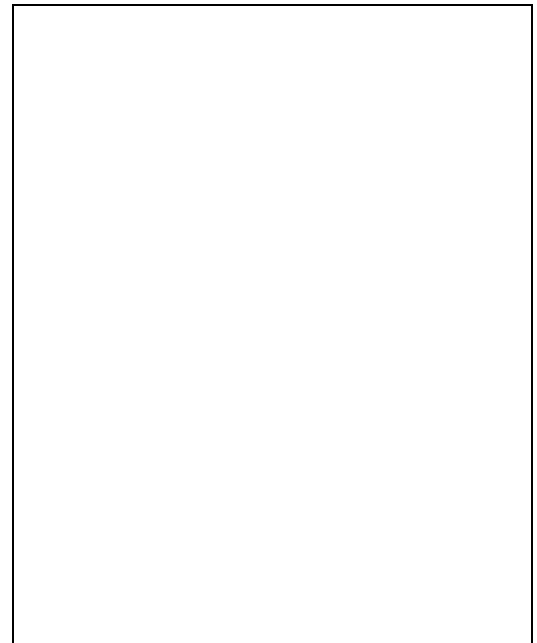
At 8 AM on Saturday, March 16, HAL5 *launched* Space Week for real with an Estes rocket launch, to signal the start of the 1996 HAL5 Race for Space. Jesse Scarborough, son of HAL5 Secretary Larry Scarborough, holds the honor of being the first person (that we know of) to start a 5K race with a Estes rocket launch. Way to go, Jesse!

Earlier, Al Wright and myself had registered the contestants and passed out their Project HALO T-shirts, while Ray Moses, Greg Allison, and Ron Creel paced out our last-minute new course. An early morning rainstorm had soaked the cross country track we were planning to use. Instead, runners would complete three laps around the perimeter of the old runway. Larry and Jackie Scarborough set up the trophy table, which Alice Moses also used for refreshments for the runners and staff. We owe Larry great praise for making the race trophy bases, and finding and installing the astronauts for the age-group trophy tops. Kudos also to Greg and Ron for researching the Estee rockets for the overall trophy tops.

20 minutes after the start of the race, the runners began crossing the finish line. Top overall male runner was 25-yr-old A.C. Ellis with a time of 19:18. Second place went to 50-yr-old Dick Franklin with a time of 19:55; and third, 40-yr-old Paul McConaughey with a time of 20:44. In addition to their overall trophies, the three also placed first in their respective age-groups. Greg Allison finished 21 overall with a time of 30:15 and placed fifth in his very competitive age group.

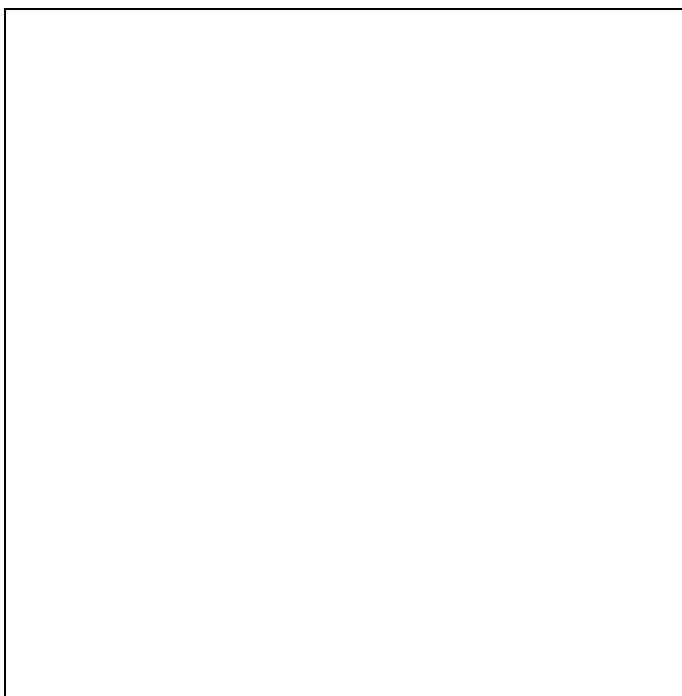
Top overall female runner was 22-yr-old Kelly Pace with a time of 22:08. Second place went to 38-yr-old Cheri Laurent with a time of 24:17; and right behind her, 31-yr-old Michele Taber with a time of 24:18. The three ladies also placed first in their respective age-groups.

Thanks goes to Ray Moses for directing the 1996 HAL5 Race for Space. Thanks also goes to our corporate sponsors Boeing for donating several thousand copies of our flyer, and McDonnell Douglas for donating \$250. Despite a massive publicity

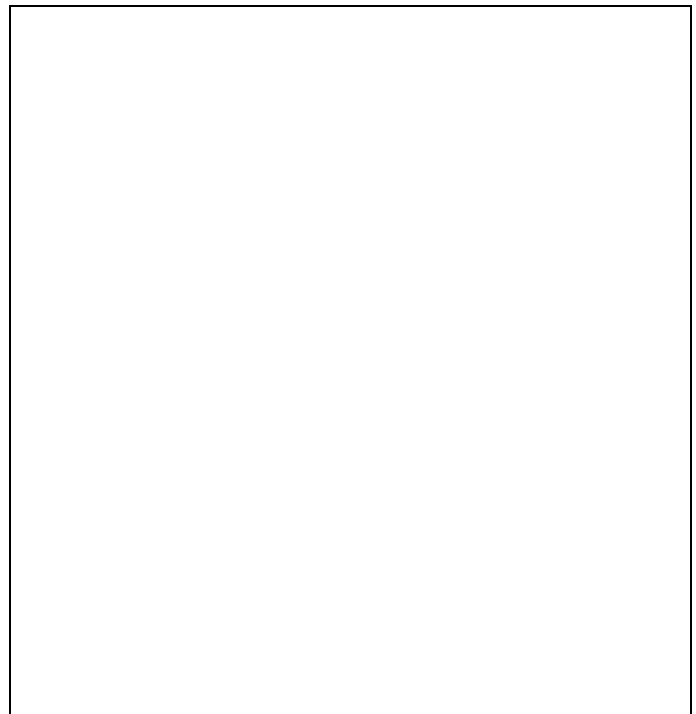


Top male runner A.C. Ellis and Wendell Sandlin help to launch the balloon

campaign, we only had 36 runners, rather than the hoped for 150. The low turn-out is a mystery to all, but certainly the rain did not help. We still have over 120 HALO T-shirts, which we plan to sell at \$10 to members, and \$12 to non-members. Get yours while supplies last! ☆



HAL5 Race for Space Director Ray Moses presents top female runner Kelly Pace with her two awards



Many wear HALO T-shirts after the race, including HAL5 President Greg Allison and Jesse Scarborough

HAL5 CALENDAR OF EVENTS (Post Me!)**March 1996**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
10	11 HALO Rocket Work Party 7 pm at Tim's	12	13	14 HAL5 Executive Comm. Meeting Noon at Ponds	15 HALO Rocket Work Party 7 pm at Tim's	16 HAL5 1996 Race for Space 8a at Old Airport
17	18 HALO Rocket Work Party 7 pm at Tim's	19	20 HALO Rocket Work Party 6 pm at Tim's	21 HAL5 Executive Comm. Meeting Noon at Ponds	22	23 HALO Rocket Work Party 9:30a at Tim's
24 Computer Fair 10 am to 4 pm \$4 at VBCC	25 HALO Rocket Work Party 7 pm at Tim's	26	27 HAL5 Program Night 7 pm at Library	28 HALO Rocket Work Party 7 pm at Tim's	29	30

April 1996

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
31	1 HALO Rocket Work Party 7 pm at Tim's	2	3 HALO Rocket Work Party 6 pm at Tim's	4 HAL5 Executive Comm. Meeting Noon at Ponds	5	6 HALO Rocket Work Party 9:30a at Tim's
7	8 HALO Rocket Work Party 7 pm at Tim's	9	10	11 HAL5 Executive Comm. Meeting Noon at Ponds	12 HALO Rocket Work Party 7 pm at Tim's	13 HALO Rocket Ground Launch Manchester, TN
14	15	16	17	18 HAL5 Executive Comm. Meeting Noon at Ponds	19	20 AIAA 3rd Moon Buggy Race 10 am at S&RC
21	22	23	24 HAL5 Program Night 7 pm at Library	25 HAL5 Executive Comm. Meeting Noon at Ponds	26 Panoply 1996 9 am to 5 pm VBCC & Park	27 Panoply 1996 9 am to 5 pm at VBCC & Park
28 Panoply 1996 9 am to 5 pm Big Spring Park	29	30	Project HALO Main Event — Hybrid Rocket Ground Launch Ground launch of the flight-ready hybrid rocket, dress rehearsal for space 9 am – 6 pm, Saturday, April 13 at the Barrens Test Range in Manchester, Tennessee — Maps at Program Night (or call Ron: 721-1083)			

May 1996

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Huntsville Association of Technical Societies' 1996 Technical and Business Exhibition / Symposium with an exhibit booth promoting Project HALO May 14-15 at the Von Braun Civic Center (VBCC)			1	2 HAL5 Executive Comm. Meeting Noon at Ponds	3	4
5	6	7	8	9 HAL5 Executive Comm. Meeting Noon at Ponds	10 Inputs to HAL5 newsletter due	11
12	13	14 TABES 1996 9 am to 5 pm at the VBCC	15 TABES 1996 9 am to 4 pm at the VBCC	16 HAL5 Executive Comm. Meeting Noon at Ponds	17	18

PLACE AD HERE

(SPACE?) FICTION**Easter Island — 10,000 B.C.**

(by Ronnie M. Lajoie)

Nnor sat on the beach, along the water's edge, staring out across the vast sea to the distant isle. "Sand and rocks" he mumbled. That's all his people had ever found there — "sand and rocks." That's why no one wanted to go back.

No one except Nnor, of course, and a few of his friends. He himself had not been there. He himself had not seen the "sand and rocks," except for the few samples brought back, now part of the guarded personal collection of the Chief. He himself had not set foot upon this distant land.

His whole body ached to go there. The isle beckoned to him, especially at night, when its yellow sands glowed off the day's heat. And every winter, when the cold, clear, daytime sky allowed one to see much farther, he could just make out even more distant isles. They appeared as small, low, dark blue-gray bands hovering just above the dark blue waters and just beneath the light blue sky. Sometimes, they even appeared greenish in color. Most people dismissed them as low clouds or "more places of sand and rocks."

But not Nnor and his friends. He desperately wanted to go to these places. If the greenish color was true, then these places might have trees — and maybe even people. He wanted to go. His friends wanted to go. But they could think of no way how to do it.

Toes in the Water

It was almost 40 rain seasons ago when Nnor's people first discovered how to survive the water which surrounded their land. Up until then, people had feared the water. Legends had spoken of those who tried — and died. Like tall grass, the water parted when you walked into it. Unlike tall grass, however, the water closed back around you

so tightly that you could not breathe. Most people stayed well away from the water. Still, a few brave men would venture out as much as waist deep and collect the shells and spear the small fish found there, which supplemented the people's diet of fruits, roots, and small animals.

But almost 40 rain seasons ago, a smart and brave man, Iruy, survived the water for the first time. Legend says Iruy saw a large dead tree branch floating on the water. He walked out to meet it and grabbed onto it. To the amazement of the people, Iruy floated too! The branch allowed him to go past even neck level deep. Iruy ducked his head under the water for a short time and the branch allowed him to raise it again. Iruy brought back a very large shell and told the people that the fish were even bigger out there. Iruy was made Hero of the People. Fires were burned in his honor. Everyone celebrated for days.

Bigger Trees, Bigger Fish

Over the course of 10 rain seasons, much progress was made using medium and large dead trees. The people learned that a 3-person-high dead tree could support the full weight of a man on the water. Such "tree-men" found that they could steer the trees back to the beach by using their hands to push against the water. Some tree-men died in accidents when trees rolled over and threw them in the water. Others learned that by flaying their arms, they could keep their heads above water for a long enough time to regrab the tree.

The people also discovered that a 7-person-high dead tree could support two men. Now, one man could help rescue another if the tree rolled over. Also, one man could hold the other's legs while he went head-first into the deep water to collect the bigger shells and fish.

The people thrived on this new bounty from the deep water. They reasoned that if shells and fish got bigger the further away one got from the land, then the far away, very deep water must

hold enormous shells and fish! The people were determined to find out. What was needed was a very large tree which could hold three men.

Journey to the Far Water

Very large dead trees were scarce on the land. The few which had fallen on their own were too rotted to be usable. The people decided to knock down one that was still standing. Lacking long enough vines, the strongest men the people could provide took turns jumping from nearby live trees to the dead one while other men bashed the base of the tree with stone axes. Women and children from all over the land stood nearby and yelled encouraging words. Finally, the tree came down, and the people cheered. All the men, and some women, were needed to carry the tree to the water.

As the people had hoped, the very large dead tree did indeed support the weight of three men. With the people watching and cheering from the shore, three brave men, Sug, Regor, and Dde, climbed aboard and began pushing against the water with their hands. Slowly, the tree began moving away from the shore and towards the unknown far water. The tree-men soon saw very large fish and shouted their discoveries back to the shore. The people cheered.

After spear-fishing for awhile, Sug looked over to the yellow isle in the distance and saw that it was growing larger. He convinced his companions to steer their tree towards it. As the tree-men moved further away from the shore, the people saw that the tree and the men were getting smaller and lower in the water.

The people started to panic. Their shouts of concern reached the three men, but they could not hear clearly. They looked back in shock to see their homeland smaller and lower in the water. Fearing that their loved ones were suffering some awful tragedy, they raced to turn about their tree, but rolled it over instead, throwing all three men

into the water. Sug, Regor, and Dde all perished that day, and the large tree was lost. The people mourned for many days, and the fear of the water started to return.

Journey to the Yellow Isle

Two rain seasons later, the people had recovered from their loss, thanks in large part to Renrew, a smart man who convinced the people that the shrinking tree-men vision was just a trick of the eye. Another very large dead tree was knocked down, and three more men ventured out into the far water. This time, they returned without mishap, with a haul of large fish they were able to capture with their stone spears and hands — and also with a few stories of some larger fish “that got away”. The tree-men all spoke of the yellow isle which grew larger as they went further from the shore.

Renrew convinced the people to attempt a journey to the mysterious yellow isle, which the people viewed with both suspicion and romance. Just after sunrise, with the people watching from the shore, the three bravest men on the land, Lien, Zub, and Ekim climbed onto the floating tree and steered it towards the isle. This time no one panicked as both tree and men shrank to the size of ants, although most were concerned, especially when rough water bobbed the tree up and down.

The sun was high in the sky when the tree-men arrived at the yellow isle. Although they were tired, they were too full of excitement to stop for rest. Lien and Zub climbed off the tree, but Ekim stayed to make sure the group did not lose their only means of returning home. Up close, Lien and Zub found the yellow isle to be a beautiful but desolate wasteland. No trees, no sight or sounds of birds or animals, just lots of sand and rocks. They wandered around for a short while and collected a few samples, but with the sun now lowering in the sky, they decided to board the tree and return home before sun-fall.

On the shore, the people cheered as both tree and men grew from their ant-like size back to normal. The tree-men had successfully journeyed to the yellow isle and had returned safely. Celebration of this feat lasted for many days. Songs and stories were made about the three brave men who dared to go where no one had gone before.

Return to Yellow Isle

Hoping that the yellow isle had more to offer than “sand and rocks”, the people mounted several more trips to that faraway land. The two remaining very tall dead trees were knocked down in preparation, but only one was used. That tree was involved in the only mishap, when rough water rolled it and broke it in half partway to the yellow isle. The tree-men managed to climb back aboard one half, but were so exhausted from their ordeal that they abandoned the trip and barely managed to returned home. After a total of six visits to the yellow isle, the people became convinced that it was indeed just “sand and rocks.”

The tree-men did discover some small shells and fish in the water near the yellow isle, but found that they were smaller than the ones back home. They could think of no reason to make any more perilous journeys across the rough water. The used trees were beached and the remaining one was left to rot in the forest. Smaller dead trees were instead relied upon for fishing near the shore. The larger shells and fish bounty from the nearby waters was sufficient for all the people.

The End of Adventure?

Except for Nnor, of course, and his friends. He was very young when Lien and Zub first set foot on the yellow isle. Now, almost 30 rain seasons later, the Heroes were old men and Renrew was dead; but Nnor was a full adult with adventure still in his heart. Nnor walked over to the rotted shell of the once mighty tree that had let his people journey to another land. No way would this tree ever float again, nor its half-

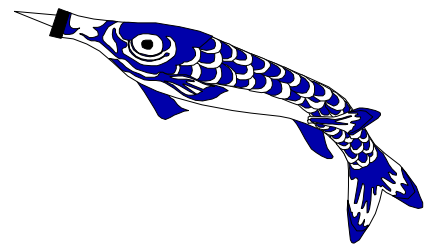
twin further down the beach, nor the one in the forest. And no very tall dead trees were left standing. Just live ones — and no one had ever been able to knock down a large live tree.

He looked out past the shore to the few tree-men fishing near the shore. No way would their trees survive the long journey across the rough far water without rolling over. He kicked at the tree shell in disgust, then regretted it when a section collapsed. His spirits dropped even lower then.

Nnor returned to his place on the beach, along the water’s edge, and again stared out across the vast sea to the distant isle. “Sand and rocks” he mumbled. He scanned the horizon for the more distant greenish isles he knew were there, but could not see them.

If only those greenish isles had trees and people too, he wondered. Maybe, if those people were smarter, then they might know something about trees, or rocks, or vines — or even the water — that Nnor’s people did not, as unlikely as that seemed. Maybe, if they made the journey to this land, they would teach his people those new ways and Nnor’s people could again journey across the rough water. Or, maybe Nnor’s people would just have to figure it out for themselves, if possible.

And if they wanted to. For now, the people seemed content on nearby fishing. “The people of Earth have all that we need right here” they told him. “Always had, always will.” Nnor got up and walked back home to find his friends. He could always rely on them to cheer him up. ☆



SPACE NEWS BLUES

Dan Goldin vs. Space Industry

("Viewpoint" in Av. Week, Feb. 26, 1996)

Daniel S. Goldin is the most controversial administrator in NASA history, both professionally and personally. One accusation never leveled against him, though, is that of pulling his rhetorical punches. At a recent Space Transportation Association breakfast in Washington, he told U.S. aerospace executives of his disappointments in American rocketry.

The Breakfast Speech

"We have watched this great nation fall to a second rate power in access to space. It's not that we didn't spend money; you could tally up the bill from the end of Apollo to today and see we spent an equal or greater amount of money on human space flight during that time frame than we did on Apollo, but [what] have we gotten?

"Something has to change in NASA. I've seen it happen in the robotic space flight area. . . . I challenged the Jet Propulsion Lab. I said, 'Take today's technology, take what we have learned from our good friend Hank Cooper did at SDI, and all the work we have done in New Millennium, and tell me what it would cost to replicate the Galileo spacecraft using today's technology.' Galileo cost \$2.4 billion. Using the very expensive launch vehicles we have, it [would] cost \$500 million — of that, more than \$100 million in the launch. So, effectively, the mission came down by a factor of five, but the space segment came down much more. . . .

Rocket Profits Not Spent on R&D

"Everyone at NASA, everyone at the Defense Department, and everyone in the American space industry ought to hang their heads in shame. American rockets are inferior to others. Inferior. I take the great Delta, and I take the great Titan. They have a payload mass fraction of 2%; the Ariane and the H-2,

I think, are 3.5%. The responsibility starts right here, and I'm as guilty as anyone. I've been in the industry 32 years. But let me tell you rocket companies, how many profit dollars have you put into pushing the state of the art out of the billions you've gotten from NASA? I think the answer is close to zero. . . .

"We have too much government in the rocket business. So, we said, let's get rid of the government, so we'll go commercial. Well, this commercial launch, in terms of development, is a dismal failure. We went for 25 years without a new rocket engine in America. In 1995, [NASA] spent \$5 million on advanced technology for propulsion.

X-33 more than just "LEO to GEO"

"Things must change. So we set up the X-33 program. I personally worked with the Congress and White House to reprogram a billion dollars — not new money, but we canceled things — to set up the X-33 program. My expectation was that people would say, 'Gosh darn, we could do it!' And now I'm hearing we need another half-billion dollars. Industry's in charge, and the only application that industry is willing to look at is geostationary orbit, LEO to GEO, and to take these old clunking LEO to GEO stages [IUS, Centaur]; that will determine the design of the single-stage-to-orbit. Give me a break!

"I had a meeting with the communications industry. I'm talking AT&T and MCI. I said, individually, to them, 'What is the biggest thing that we at NASA could do to help you?' They said, 'There is only one thing. The cost of spacecraft has come down an order of magnitude in dollars per bandwidth during the last decade. The cost of launch [to GEO] is \$10,000 a pound. We want \$1,000 a pound.'

"I made a commitment that this was going to happen. I told them, 'I don't care whose feelings get hurt; I don't care which companies go under. . . .' So, I'm telling the [NASA] contractors that are here that are working on X-33,

get with the program and have a little courage.

NASA Will Do it if Industry Won't

"Now, if you don't want the government to tell you what to do, show us some vision and leadership, show us some courage, figure out what you need from us, and we'll work with you. But if you don't want to invest with us, tell us, and then we'll convert to a government-type program, and we'll get it to \$1,000 a pound. It's up to you. I'm sick and tired of the whining and crying. . . .

"We're prepared at NASA, if the budget comes down some more, to cancel some other programs, but we are going to rebuild the launch capability of this nation and we're not stopping at just the X-33. We believe there are some small companies that have a tremendous amount to give this country. We're going to bring them into the rocket business; we want to make a little competition, because we'd like the big companies to start acting like little companies.

Opening the Space Frontier

"This is a new NASA. If you stick to your old ways and undercapitalize on commercialization approaches and then expect Uncle Sugar to underwrite you on risk so you can then sell substandard vehicles commercially, you're coming to the wrong place. But, if you want to get a \$1,000 a pound vehicle so you can go get rich and open the space frontier, you'll be working with the right place. It's been 26 years since a human being has stepped on another planetary body. I didn't come to NASA to watch the shuttle go up and down; I came to NASA to help us open the space frontier, and together we're going to do it." ☆



(HALO Test, continued from page 3)
 areas were of great interest to the propulsion team. These will be key issues to address when we move on to HALO Phase II.

We were going to burn two motors, but instead only burned one because of **NO NITROUS!** One motor was to have the extension; one would not. We would then compare the data, and adjust to account for the over expansion on one motor, which was more of a hardware test than a total impulse test.

Nonetheless, we are pleased with the test and are looking forward to a Manchester ground launch on April 13. Much work is needed to be completed in all areas. I encourage all to get involved and be apart of our history making project. We are in our final stretch now, and it would be a good time to get in the race so we can all cross the finish line together. My garage work schedule is included in the HAL5 Calendar. I also have a list of items that can be done at your home which can be obtained from me at 971-1566 or Ronnie at 461-3064. ☆

HAL5 Membership Report

(by Ronnie Lajoie, Treasurer)

The following is a list of the current paid membership of HAL5, which includes 22 renewals and 10 new members, for a total of 32. Last year's membership peaked at 42, matching the previous year's record for the society. Since all memberships expired at the end of last year, more renewals are expected to come in. Welcome to all our new and renewed members!

- William Adams (R)
- Henry Ahler (N)
- Gregory Allison (President)
- William Axenroth (R)
- John Barnum (R)
- Jan Bijvoet (R)
- Julian Campbell (N)
- Douglas Childs (P)
- Thomas Craig (R)
- Ronald Creel (R)
- David Dean (R)
- Robert Ehresman (R)
- Peter Ewing (R)
- Ernest Gilmer (R)
- Philomena Grodzka (MC)
- Jones Hamilton (P)
- Melanie Hazelrig (P)
- Gene Hornbuckle (R)
- Alexander Khalyarkin (N)
- Peder Kilness (R)
- Nancy Lajoie (N)
- Ronnie Lajoie (Treasurer)
- Dennis LaMothe (N)
- Randall McCollum (P)
- Ray Moses (P)
- Chris Pickens (R)
- Herman Pickens (R)
- James Prentice (N)
- Clayton Sawyer (N)
- Larry Scarborough (Secretary)
- Chuck Schlemm (N)
- Fritz/Tina Stapf (N)
- Alfred Wright (MC)
- Richard Braastad (S)

- (MC) - Membership Chair
- (CC) - Communications Chair
- (N) - New Member
- (R) - Renewed Member
- (P) - Past Member
- (S) - Newsletter Subscriber

HAL5 welcomes back its previous members and also past members Douglas Childs, Jones Hamilton, Melanie Hazelrig, Randall McCollum (see sidebar), and Ray Moses. ☆

HAL5 also welcomes its new members, including Henry Ahler, Julian Campbell (VP of Aerojet), Alexander Khal-yarkin (a visitor from Russia), Nancy Lajoie (my sister), Dennis LaMothe (Tripoli VP), James Prentice (President of Hybridine), Clayton Sawyer (our new electronics wizard), Chuck Schlemm (NSS chapter president), and Fritz & Tina Stapf (tank insulation donors). ☆

**A Special Offer from
Alpine Cleaning Systems**
 (by Randy McCollum, ACS President)

Dear fellow members of HAL5,

My name is Randy McCollum and I own Alpine Cleaning Systems here in Huntsville. As a way to help raise funds for the great projects undertaken by our club, I propose donating 10 percent of any cleaning services performed for HAL5 members.

Alpine Cleaning Systems specializes in premium carpet cleaning, featuring our exclusive low-moisture, Dual-Processing cleaning system. We also clean upholstery (fabric or leather), rugs, and repair bleach damaged carpet. We discount commercial vacuum cleaners even to our residential customers and I'll make a special price for HAL5 members on an air purifier in time for pollen season.

For more information, call me at 852-5177. If that number is long distance for you, please dial instead 1-800-799-7871. Thanks!

Special Announcements

“Lasers Up the Butt” by Ray Moses

7 to 9 p.m. Wednesday, March 27

at the Huntsville Public Library

Huntsville Alabama L5 Society
 1019-A Old Monrovia Rd, Suite 168
 Huntsville, AL 35806

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