

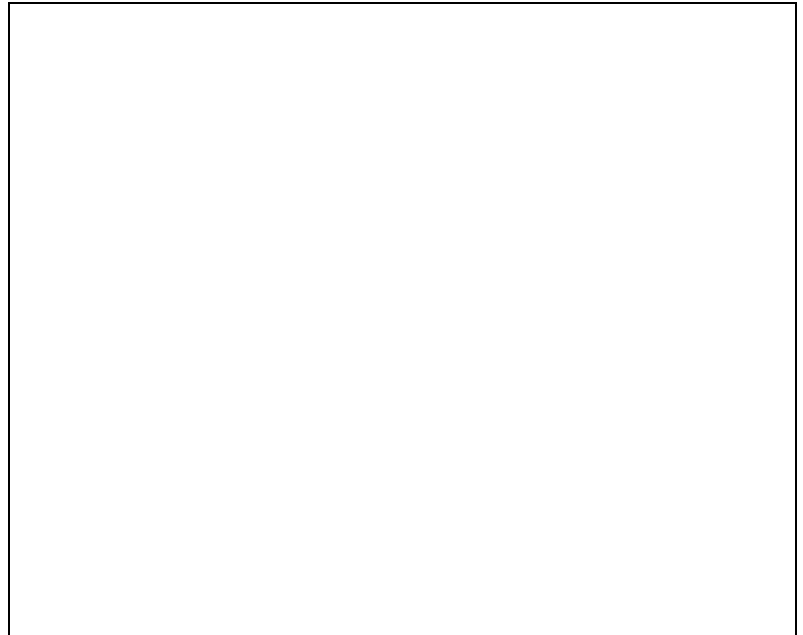
Southeastern Space Supporter

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

Volume 6, Number 3 — May–June 1997

SPECIAL COLLECTOR'S EDITION

LIFT-OFF!



The Project HALO team sends the Space Launch 1 rockoon onto its amateur and hybrid rocketry history-making mission

FIRST WORD

Special Project HALO Issue

(by Ronnie Lajoie, SSS Editor)

This special edition of the *Southeastern Space Supporter* celebrates the first successful amateur rockoon mission — and the first high altitude launch of a hybrid rocket — on May 11, 1997, by none other than the hard working members of the Project HALO team!

With HALO Space Launch 1, HAL5 has entered the history books and now holds claim to the world records for highest altitude achieved by an hybrid rocket and also by an amateur rocket.

This amazing feat of volunteer effort came after almost three years of solid dedication by over 30 members of the Huntsville Alabama L5 Society and other Project HALO volunteers.

And it's not over yet! Believe it or not, this first rockoon mission was “just” a proof-of-concept flight — Phase 1 in the grand scheme of Project HALO, for “High Altitude Lift-off.” The program is now entering Phase 2: Operational Rockoons, when HAL5 will build larger hybrid rockets capable of carrying student and amateur experiments.

But that's all for the future. For now, sit back, relax, and enjoy the very personal Space Launch 1 experiences of the core members of Project HALO, as told by the members themselves. As for me, I will sum up my own experiences on Mother's Day, May 11, as follows:

I went to a little town called Hampstead
On the shore of the Ocean Atlantic
To relive the history of the forefathers
Of modern rocketry and space travel.

Happy Mother's Day, Mom! ☆

HAL5 Elections/Program Night

Wednesday, June 25, 1997

Huntsville Public Library Auditorium

6:30 to 7 p.m. HAL5 Elections
(nominee list will be sent by postcard)

7 to 8:30 p.m. (with social afterwards)

“Solar Thermal Propulsion Utilizing Polymid Fresnel Lenses”

Guest speaker will be Mr. Rodney Bradford, President of United Applied Technologies.

This is a joint program with the Alabama Solar Association (ASA) and the World Future Society (WFS). Come and meet friends old and new!

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

Huntsville Alabama L5 Society

- President — Gregory Allison
Day: 895-2415, Eve: 859-5538
- Vice-President — Larry Scarborough
Day: 881-1944, Eve: 881-4363
- Treasurer — Alfred Wright
Day: 876-8037, Eve: 420-6273
- Secretary — David Hewitt
Day: 430-2767, Eve: 430-2767
- Membership — Philomena Grodzka
Day: 837-4287, Eve: 536-8638
- Communications — Peter Ewing
Day: 876-5151, Eve: 536-9334
- Special Projects — Ronnie Lajoie
Day: 461-3064, Eve: 721-1083
- Programming — David Dean
Day: 922-4897, Eve: 379-3661

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Volume 6, Number 3
May / June 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 35758
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.

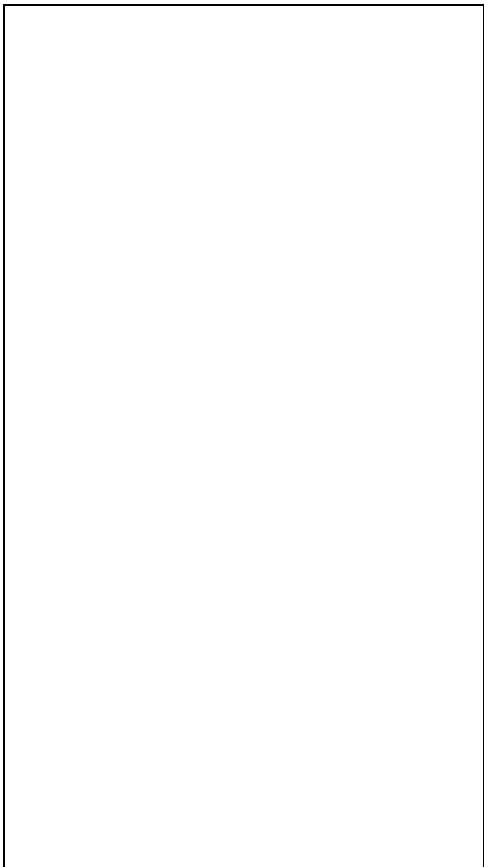
Preferred format for text is ASCII on a diskette or sent by E-Mail. Preferred format for text with graphics is Word on a diskette. Also acceptable are letters and articles sent by mail or faxed; however, the more retyping required, the less likely the acceptance. HAL5 is not responsible for receipt of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

Larry Scarborough HAL5's Professional of the Year

HAL5 is pleased to select Dr. Larry Scarborough as the 1997 HAL5/ HATS Professional of the Year. Larry joined HAL5 in 1992, and previously served as Projects Coordinator and Secretary. He also served as Medical Track chair for the highly-successful 1993 International Space Development Conference hosted by HAL5. Now as Vice-President, Larry has spearheaded HAL5's renewed campaign to help the U.S. Space and Rocket Center promote the future of humanity in space. His articles and editorial cartoons have appeared in many issues of HAL5's newsletter, the *Southeastern Space Supporter*.

Larry serves as the technical lead for the balloon gondola for Project HALO, and has designed and built several successfully-tested rocket launch platforms. He also produced artwork for the HALO exhibit. Larry is also a key member of HALO's Education Committee, which has developed the HALO Achievement program. He has supported all of HAL5's Education Days at local schools and was instrumental in arranging for HAL5 to donate a tethered balloon to help local elementary schools with their TOPE/HOPE program.

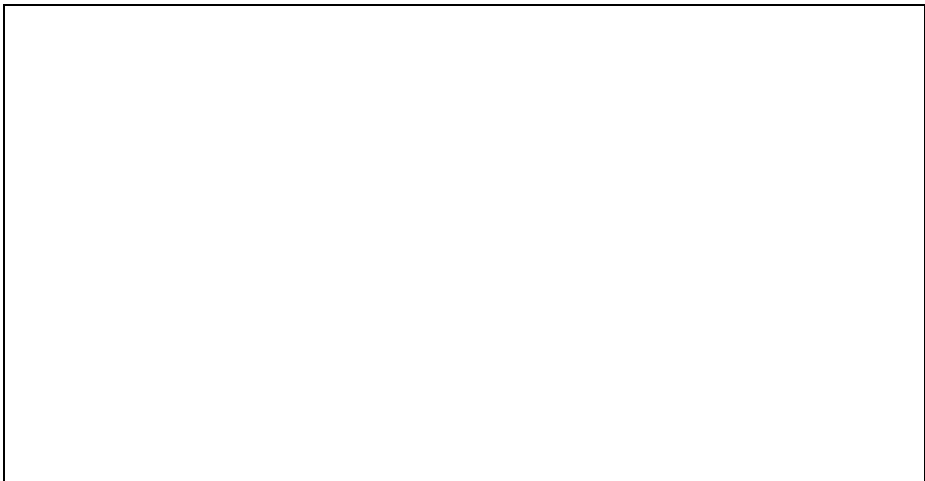
Larry's family has also been actively involved in HAL5 and Project HALO, including wife Jacqueline, son Jesse, and



**1997 HAL5 Professional of the Year
Dr. Larry Scarborough**

daughter Stacy. We are proud to have Larry as a member and extend our congratulations to him and his family.

Philomena Grodzka and Bryan Jones received POY Awards from the World Future Society and Technology Transfer Society, respectively. Congrats all! ☆



Pictured L-R: Greg Allison, Peter Ewing, Alfred Wright, Bill Brown, Jackie Scarborough, Larry Scarborough, and Bill Axenroth. Photo by Ron Lajoie

HALO EXPERIENCES

Third Time's a Charm

(by Timothy Pickens, Rocket Systems Lead)

I want to start this article by congratulating the whole team on their outstanding effort on our first rockoon flight. I am very proud of everybody that was involved. This was not an easy challenge that we embarked upon. I am amazed that we made it appear so easy to those on the outside looking in. We all know that there was nothing easy at all concerning what we did in less than three years.

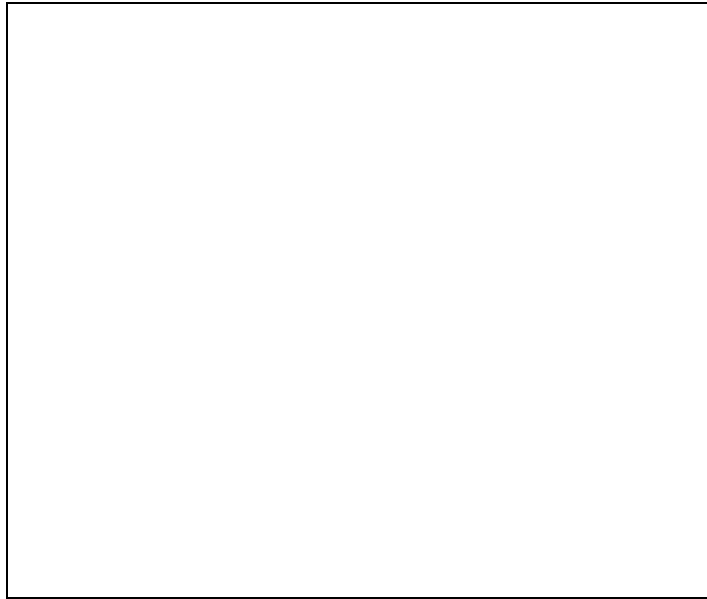
I have been involved in other rocket group activities before, but none with the drive and vision to succeed more than this one. I have been extremely impressed with everyone's willingness work with each other under sometimes stressful conditions. This thanks goes out to the electronics guys, the ham guys, the programmatic people, the paper pushers, and to the broom sweepers. It all takes a dedicated team!

When I came on board this project, all I wanted to do was to work with rocket propulsion design and subsequently, a space-shot attempt, having absolutely nothing to do with big balloons. Fate would not allow things to turn out that way. This group was determined that "balloons and rockets are a marriage made in heaven", and this would be an ideal way to achieve very high altitudes at dirt cheap prices. The club had previously raised enough money to take on such a project, so I dove in — and have been barely hanging on ever since!

I have been involved in this project for over 2½ years and have often stopped and asked myself "What in the heck am I doing in this mess?". Then it dawns on me that I love a challenge. Designing and building big rockets with little to no money has made me a real MacGyver of

rocketry. I can't go to the hardware store or even to the grocery store with my wife without trying to transform something on the shelf into usable rocket hardware.

I do this for three reasons: (1) I'm trying to get around building something from scratch by using some preexisting configuration or shape on the store shelf, (2) because I'm too lazy to build parts from scratch, and (3) because I know that many of the parts that we need would take lots of time to make and the materials can be costly.



A Rocketman at home with his tools: Timothy Pickens

The real objective here is to design and build a rocket with everyday stuff for a price tag close to nothing. Folks, it ain't been easy. It blows my mind that there is so much to consider in the development of a project of this magnitude. Thank goodness that we have a super team that can achieve anything to which we put our minds. Because there is such a wide range of disciplines in this group, we have been able to tackle all aspects of this project with our core group. Working together and cross-training has forced us all to be better engineers, friends, and well rounded persons. Sometime I learn a little more about some of the members than I'd like to!

My next articles are my experiences with all three SL-1 mission attempts.

The First Time: Cerro Gordo

(by Timothy Pickens)

The first time that we attempted our "proof-of-concept" rockoon launch, we went to Cerro Gordo, North Carolina. The planning that went into that trip was quite an ordeal. Just like many of our previous events, this one would turn out to be no less trying on us. Just like always, while getting ready for a big event, something bit us while getting ready the night before. The video camera on the rocket was not working right. Bill Brown had us remove the payload electronics, at least enough for him to perform exploratory surgery. This was quite an experience!

After a short while, Bill said, "It's fixed." That was it. This is what I wanted to hear. We quickly buttoned it up and began to pack up the last minute items. It was late in the night by now, maybe 1 AM.

Gene Hornbuckle and I left late the following afternoon, after spending most of the day packing the U-haul trailer (with the help of Ron Lajoie), which Gene and Gladys Young took; and part of the afternoon calibrating the rocket TV camera. The next time the team would meet up would be in our launch field 650 miles away.

Guerrillas in the Mist

We arrived at the launch site about lunch time and started setting up the rocket/balloon preparation areas. The night was closing in on us and we were soon to be working by generator and flood lights. It was probably 75 degrees when we arrived, but the temperature was dropping as the night came on. Moisture was really getting bad as the temperature began to plummet and everything began to get soaked with water. This was not what we were expecting. All of our electronics were getting soaked along with our rocket.

We had to rush around very quickly to build a make shift tent out of some poles that we had brought in addition to a large tarp. This, along with my propane heater, turned out to be a real godsend. We now had somewhere warm to work and we needed it. Much of the gondola/balloon rigging was still to be done and I was not prepared to give instructions on how to do it. I was also very short-handed on help. It was obvious that there would be no sleep for anybody who remotely knew how unprepared we were for what was to come next.

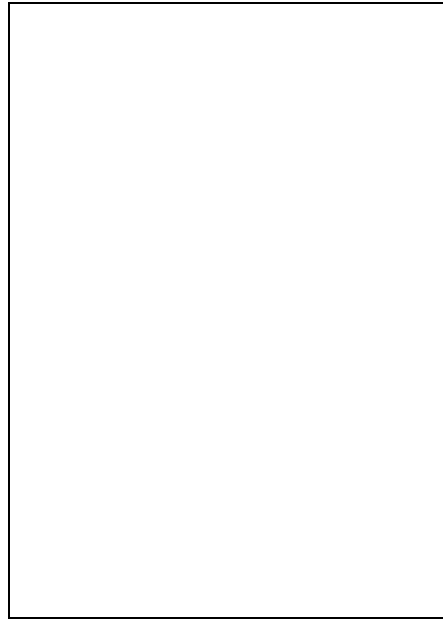
Children of the Morn

At 2 AM the following morning I had to get some sleep. I new that we were not ready, but like always somehow it would all come together — it had to! The Hale-Bopp comet was in full viewing as was a full, beautiful moon; and the skies were clear. I could only look up into the heavens in awe of what was about to happen, and I was fortunate enough to have been born in this envelope of time and place to be a part of it.

We were about to embark upon a new era in amateur rocketry, and the moment was too perfect for us to fail. Besides, we had put our hearts into what we were doing and had covered every possible scenario that could happen. We had it all covered, or at least that is what we thought. If there would be any problems, it would be trying to fill the balloon or launching it. The wind can really be unforgiving to these types of balloons. I would now try to catch about one hour of sleep in the cab of a pickup truck.

It was freezing cold and there was going to be no sleeping for me. I couldn't get all the stuff left to do out of my head. Did anyone else realize all that was left to do? I jumped out of the truck and went back to work. We were also waiting on Bill Brown's gondola video package. As soon as he got there, we began mounting one of the last pieces to this 1000 piece puzzle. We completed all that was needed, then several of us made our way from the tent to the field with the gondola/rocket combination.

It was now time for the Nitrous Oxide Fill Team to come in and fill the rocket. The Balloon Team was working on last minute rigging, while the electronic guys were doing checkouts. The helium/balloon team came in to begin their filling of the balloon. This would turn out to be a more involved process than I first imagined. The helium is put into the balloon through a long fill tube that is attached to the top of the very thin balloon. The helium tanks were emptied one at a time until the balloon was able to lift more than the payload.



Taking the rocket out for a stroll.

A Big Balloon

During the filling process of the helium, the wind would sometimes rotate the balloon. That would in turn twist the fill tube and stop the flow of helium. The helium pressure could far exceed the burst pressure of the tube and could rupture or blow the tube apart — which would mean the tube could end up in the air above the balloon far away from anyone's reach. Fortunately, every time the fill tube twisted, our fill team was quick enough to respond to the situation by stopping the helium flow at the tank valve. This scenario scared me to death. I hate balloons you know. I have had some really scary experiences in the past at some of our smaller launches. I just wanted to go somewhere and hide until it was all over with. This would include

the balloon lift-off. Someone could then sound the trumpet, and I would come out from hiding wearing a big grin. This was all just a fantasy of course.

Snap, Crackle, Pop

After the balloon was finally inflated and all systems were ready to go, it was time for Greg to call the FAA, and give the final "Go for Launch" call. Clay was going to arm the systems after all tasks had been completed and everybody had cleared the area. After a few minutes into his final checkout and arming, I heard a loud "pop". I looked up only see everyone scurrying around. One minute later I heard another "pop". I knew then that the balloon cut-down pyro/ cutters were prematurely going off. At this point the rope going to the balloon had been chopped in two. We were not prepared for this occurrence. I had an eerie feeling that this might be the calm before the storm.

I was waiting on the rocket to come roaring to life at any minute. I couldn't stomach everything that was transpiring. Some of my anxiety stemmed from my ignorance about how the electronics were configured. Clay then ran out to the rocket and cut all motor ignition wires. Boy was I relieved. There was no time to check out the problems, nor were we prepared to fix the problem this go around. It was time to go home now, and everybody was extremely down in the dumps. I felt like I was a pall-bearer as we loaded the rocket/gondola into the back of the truck. My prayers had not come true for this round and boy, was I down!

Preparing for the Second Attempt

After we all returned to Huntsville, we met to decide what to do next. After the team determined what had caused our electronic anomalies, they corrected any potential EMI/ electrostatic problems. They shielded all the electronics and installed bellows switches in order to safe the rocket ignition systems until the rocket had reached an altitude of 50,000 feet. I really liked this idea and wasn't hard to do. On to the second attempt! ☆

The Second Time: Hampstead

(by Timothy Pickens)

A few weeks after our first attempt, it was time to go through the same preparation as we had before to pack for another attempt. I thought that before we load the rocket into the truck, I'd better ask Al Wright to pressure check the rocket for leaks. I was really concerned that the solid black powder plug that retains the nitrous flow could have taken on some humidity from the last trip and become very weak.

Al discovered that this was indeed the case, and a serious leak was present. It would take about four hours to replace the plug with a new one. It was about 7 PM when this was discovered — and we wanted to leave the next morning. The whole rocket from the payload down would have to be removed! It was a dreaded task, but the team dove right in and did an outstanding job. There is always a last minute gotcha in everything that we do. I thought that we would really be ready this time.

Night of the Twisters

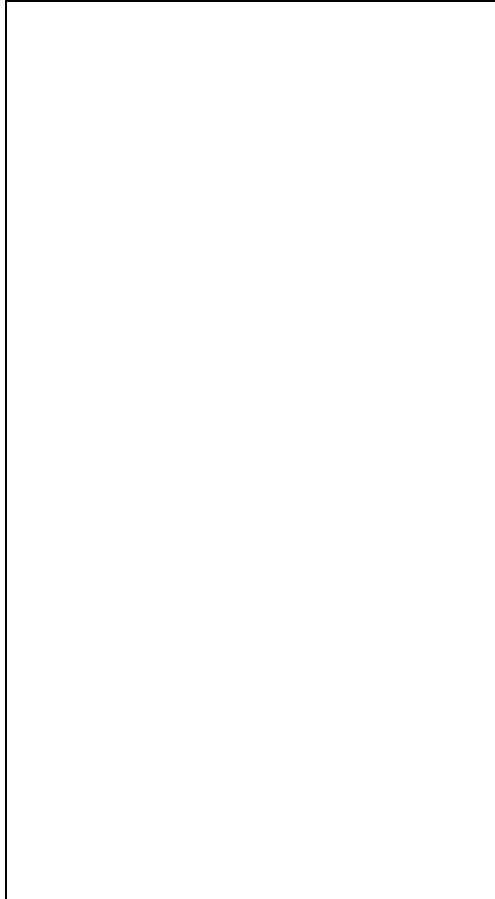
Because of the prevailing winds changing, our next launch would be in a small town called Hampstead, along the coast of North Carolina. Clay Sawyer and I went up a day early in order to get a jump on everything. We would be less rushed this time around; we would get there and check out the new field and decide how everything would be arranged. We decided to stay in a "roach motel" to save money. We were all broke from our last go around, so it didn't matter what the motel looked like.

Or so we thought! The only room with a phone was reserved for some rocket nut named "Ronnie" who needed a phone for his Internet in order to tell the world that the "Rockoon Buffoons" had made it to Space. Clay and I paid \$4 extra to get the room with the better bathroom.

I checked in and headed straight for the room. Clay beat me into the room because I had to go back to the office

because I had a call. It felt like I had my own phone because the manager let me walk around outside while I talked to our fearless leader back in Huntsville about the incoming weather. You see, Clay and I hadn't called home to see what the weather was doing, so we were out of touch! This is a common occurrence for me in my daily life.

Greg was on the phone telling me to get



Clay Sawyer and Tim Pickens with the HALO Space Launch 1 rocket.

me and the rocket home ASAP! The worst weather in 10 years was coming through and tornadoes were popping up everywhere. There was no way that we were going to beat the storm of all storms before it hit Huntsville. I couldn't believe this was happening. It was so nice and pleasant outside. I thought that maybe this would all blow over and a launch could be done on Sunday or Monday; but the local fishermen told me that if we could launch a balloon in 15 to 20 mph winds, then it might be a good time to launch.

For those of you out there that aren't familiar with launching balloons; you can't even begin thinking about filling one of big balloons if the wind is slightly blowing. Boy, was I hating balloons once again! I thought that we would have already launched the rocket if it had been a ground launch. I swallowed real hard and remembered that if we did launch from the ground, we would do good to hit 35,000 feet; a long way from the desired 50 nautical miles. Clay and I decided that the next morning would be a good time to go out and scope out the new field and then head home. We would first have to spend the night in the hotel-motel.

Tim and Clay's Bogus Journey

After returning to my room that night, I noticed that Clay had laid claim to the only bed that was not going uphill by placing his sleeping bag on it. I quickly checked under the sheets for whatever and it looked OK. I went to cut on the air conditioner — and there were no knobs. I went to cut on the TV — and there were no knobs. I went to the front door — and there was a knob. (That was a close one!) I went to brush my teeth, but the water taste exceeded the minty fresh taste of my toothpaste. It smelled terrible; I was not going to take a shower because the smell of it was worst than the taste. I decided that I would not reveal the secrets of this motel to the others as punishment for our long journey traveled for nothing.

The following morning we went out to view the field. We stood there and said, "Well, here it is — a field." I once again thought how much I hate the balloon aspects of our project, but it was a necessary evil to what we were trying to do. Some good did come of the trip. We did meet several local townfolk, including owner Cary Bruton, HAM operator Bob Brandenhof, and Topsail Voice editor Steve Unger, who offered to store our U-Haul for us. We also met a team of reporters from ABC News. After meeting up with Gene and Gladys Young, Clay and I returned home and just barely missed the storms. ☆

The Third Time: Back to Hampstead

(by Timothy Pickens)

After returning to Huntsville, we had our weekly meeting, at which we debriefed the club on the new launch site prospect. The field was about a mile long by 300 feet wide. Other than the tough grass, it would be ideal for our next launch.

I was not looking forward to going back to Hampstead to do this again. It would only be one week later that I would return to Hampstead to do it again. The enthusiasm was dying quickly. I could not have survived another trip. The prevailing wind direction change was about to lock the door on us for the summer and there would be no way we could launch for fear of the balloon could head west instead of out to the Atlantic Ocean.

The next time we left from Huntsville, I waited until some of the others had also gone. This time I and a couple of others were not going up alone. We would all commit together and we would all decide our launch fate together, from Hampstead.

We arrived on Friday to setup, but the thunderstorms would not allow us to have a Saturday morning launch. We would have had to setup the camp in the middle of the thunderstorm. As the bad

weather encroached, we couldn't help but think about the possibilities that maybe we wouldn't get to launch again.

We all got up the following morning to find out that it was quite calm. Steve and I had gotten a good night's sleep in a large fishing boat that the nice land owner (Cary Bruton and wife) had offered as an alternative solution to the sleeping problems that I had experienced in the past. They were outstanding hosts, and accommodated us in more ways than we deserved. Steve and I had attempted a good night's sleep in a large fishing boat. I say attempted because sleep was impossible due to Ron Creel's chainsaw snoring — which was in need of a good tune-up!

The whole community was very receptive to what we were trying to accomplish. To the local news people, North Carolina was about to make history again, just as was done at Kitty Hawk many years earlier. It might not carry quiet the weight of man's first flight, but still had some appeal.

Site Preparation

Saturday would show to be a much needed day for lots of ground preparation. Many members of our group ended up mowing the grass in the large field in order to help reduce the potential lethal punches that the tall grass could deliver

to our fragile balloon. At one of our previous launches, we had to deal with wind gusts and a lot of serious balloon handling, which ultimately led to the balloon whipping around in the wind and catching one of our members' eyeglasses and ripping a huge hole in our balloon. We wanted to minimize any threat of this happening in the grass. Real rocket science is not possible without a lawn mower — ask our chief propulsion guy Steve Mustaikis.

Gladys and Gene Young, Alfred Wright, Steve Mustaikis, and myself spent many hours trying to build a tent from a tarp in the middle of what seemed like the most windy day of my life. We couldn't seem to get this tarp/tent to stay in place. I was really getting frustrated after a couple of hours.

Ronnie and the Sparkies (electronic guys) had erected a nice new tent in a matter of minutes. We were on the other side of this huge field still trying to keep ours together. We had already spent \$50 on poles, rope, and spikes and I had to make another run to the hardware store to spend another \$50 dollars on wood. This tent exceeded \$100 dollars and could never be reconstructed again! We finally completed it after four hours of engineering and hard work. This time Ronnie would come out looking a little better than us by his \$100 dollar tent purchase for the Sparkies.

As the Rocket Fins Turn

We spent a lot of time wondering if the winds would ever die down. It was getting close to dark now and time was slipping through our hands. We still had to do electronics checkouts and a video calibration. We barely completed these tasks by dark.

It was finally time to place the rocket into the gondola and all was looking on schedule — until it didn't want to slide in! The fins were rotated 15 degrees off from where they were supposed to be! I was freaking out! It suddenly dawned on me that we had gotten everything out of whack back in Huntsville when we had to replace our igniter system.



Steve Mustaikis works on the rocket in the home-made Orange Tent.

For those who might have missed that experience, it takes about four hours to go in and make any corrections to these areas. We had a big brain busting session for about 30 minutes on what to do. We really didn't have time to go in and correct it properly, so we decided to rotate the entire fin assembly in relation to the rocket. This would restore the location of the umbilical wiring from the rocket to the gondola.

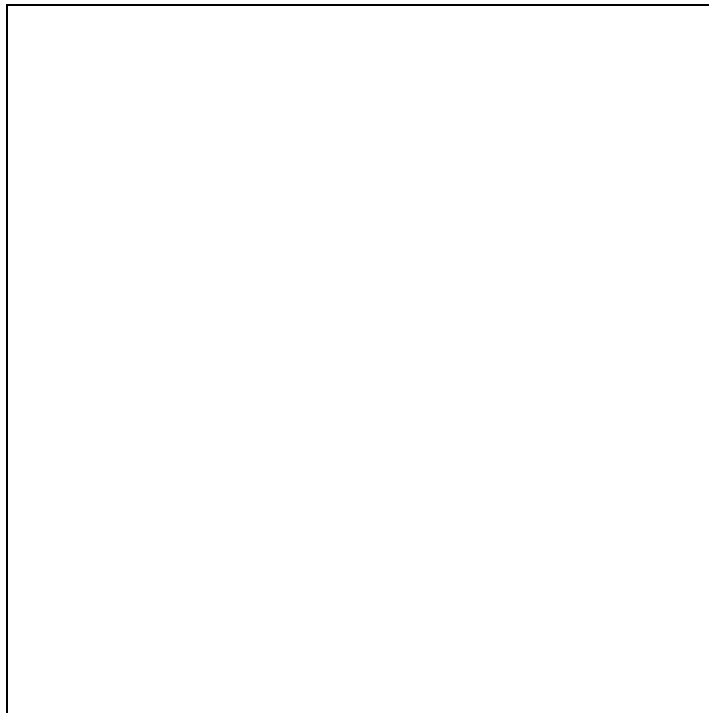
Did You Say "Leak"?!

After doing this, a leak check was performed and it was discovered that the system now had developed a leaky O-ring where the motor met the tank. This could jeopardize the whole mission if we lost all our nitrous oxide on the way up. It was looking like the whole assembly would have to come apart. The mission might have to be scrubbed until Monday morning. This would have been the last straw for everyone. We were all broke and tired.

Steve and Al were still tinkering with the situation and decided to rotate the assembly just a little in an attempt to reseal the O-ring. I heard a "pop" and my heart rushed. I knew that the problem had gone away and no permanent damaged had been noted. Would the assembly go into the gondola though? After attempting to place the rocket in, it was obvious that we would be going for launch. Leaks in flight had always concerned me because I new that we could leak all of the oxidizer out during our balloon ascent and nobody would know until the rocket motor igniter was fired. This is the main reason that I wanted to fly audio on board so if we did develop a lead and it could be heard, we could make a decision on whether or not to launch the balloon.

We buttoned the rocket up and enveloped the entire gondola into a clear

plastic sheet. This would be used to protect the rocket from the harsh cold environment during the balloon ascent. We were relying on the plastic in addition to two band heaters on the tanks in order to keep everything warm. This would complete everything until morning and the rocket would remain sleeping in the makeshift tent that we had built.



Steve Mustaikis, Gene Young, and Clay Sawyer perform final test and checkout of the HALO rocket and gondola.

Frosty the Rocketman

Steve woke me up by banging on my truck. It sounded like thunder — not again! I rolled out of the truck after about one hour of sleep. Boy, was it cold! I was shivering so bad that my teeth were rattling. It was time to make it happen. Boy, did this seem familiar. Al and Steve loaded the rocket with nitrous while Gene and Clay prepped the electronics. I got called down to help the balloon guys who were getting ready to fill the big balloon.

Boy, I didn't want to get involved in that end of the operation. It made me extremely nervous and I really hated it. I'm a rocket guy, but I had come up with a method to fill balloons faster and they

weren't sure how to hook it all up. I ended up being the swap boy for helium tanks as Ben Frink and Bill Brown did the honors. There were many other volunteers that helped out as well.

"How did I get stuck down here?" I kept asking myself. I had been doing nothing but rocket stuff for 2½ years. This wasn't suppose to happen this way. I was the "Rocket Team Lead" — and I had a badge to prove it!

Go for Launch

After we finally got the balloon filled, it was all systems "Go". I was running up and down looking at all the rigging to do last minute checks. Everything looked good! "Let's do it!" I thought before something really stupid comes up and bites us. I decided to stand in a safe place and watch the balloon release system work as we designed it. It had never been field tested. Steve, Gene, and All were all patiently holding the rocket/gondola up awaiting the balloon that would fly over and lift it all up out of their hands. Greg finally yelled "Go for Launch." Boy was I glad to hear this.

Greg was to take a hammer that I handed him and quickly pull the release pin that would launch our balloon. This didn't seem to work the way that I had intended. Greg couldn't seem to get the pin out and he was really murdering the whole launched balloon launch system. I thought he was going to kill the balloon as it jerked back and forth. I quickly grabbed it and said "Here is how I intended it to be used." With one quick pull, the Kjome launcher system released perfectly and the balloon shot up into the sky.

Isn't it ironic that the one guy who hates balloons more than anybody ends up releasing it to start the mission? I had

that Ronnie bought. They really looked like they were something sitting there, but I wasn't sure what. With all the computer stuff going and the pretty lights in the tent, all I could think about was stuff like "Roger and Wilco" and I'm not sure why.

The Long Wait — NOT!

I decided to leave for a minute because these boys really seemed like they had it together and I was ready to go to town to answer a call to nature. The moment seemed right. I never took these long winded balloon ascents very seriously. Our fearless leader (Greg), always said, "Once you get them off the ground, you won't have any problems with the balloon." I knew that its would be a good two hours before the rocket was ready to fly. The balloon was no longer visible from the ground with the naked eye, so I left.

After staying gone for a good 30 minutes, I decided to return to the others. I pulled across the field at my usual country pace and noticed that everybody was jumping up and down. They were yelling at me saying, "We fired the rocket! We fired the rocket!" I thought "You people are out of your mind and this is about the lowest, dumbest group joke I'd had ever seen — and you all will end up jinxing the whole launch if you don't shut up." It then dawned on me that maybe I was the nut. It was true; they had fired the rocket because the balloon burst and I had missed the whole thing!

This was my punishment for releasing the balloon. I had put my heart and soul into the rocket and had missed it! I changed my mind again. I never hated balloons so much in my whole life. It was all over and time to go home. I would later watch it on video feel some of the excitement, but it was a

little different. We would only end up going a little over 30 nautical miles; but that was OK, because the rocket did fire and nobody was killed.

On to HALO Space Launch 2!

Well, it's time to end the final chapter to this long book ('cause Ronnie is about to kill me!). I wrote all this to help those who could not attend this event, to give them a sense of what happened.

In closing, it looks like three is a charm. I think the whole experience is something that everybody in the membership should be a part of and get into this next go around. With HALO Space Launch 2, it's still our rocket, our design, our effort — and most of all, our success. This is still an all amateur mission. It doesn't matter where the money is coming from; it's the work and input from the club that makes it happen. Money just sits in the bank without us.

We are not charging anything for our service or effort nor do we plan to make any financial gains through our efforts. I feel all these things define the mission to be 100% amateur and we still have a good chance to get the first amateur rocket to reach 50 nautical miles! We need to go out and show the world that we can do more than just set the amateur altitude record as we just did — but also that we can achieve many records and hold them for years to come! Ad Astra per HALO! ☆



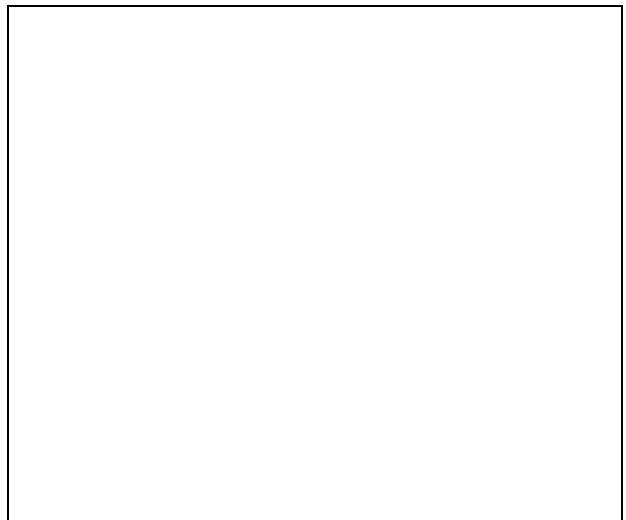
The balloon lifts the rocket gondola!

finally been tamed, balloons were now my friend (until later).

Lift-Off!

The rocket/gondola guys released the package as the balloon passed over, and boy was it a beautiful site. I couldn't believe that I was finally getting rid of this thing, and the best part was, that it was heading straight for the Atlantic. As I ran around and congratulated everybody, I couldn't hardly contain my emotions. To alot of us, this rocket was pretty neat and all, but we had better ways of doing things next time, and we just wanted to see it gone and close this chapter!

I went over to the electronic tent to look at the data and video and it really looked good. Ed Myszka and Clay were monitoring all the systems in the "nice tent"



The Electronics Team tent (alias "the nice tent").

Bucking the Wind

(by Larry Scarborough, Gondola Lead)

Dadburn it, Ronnie, I'm a doctor, not an engineer! I cannot give you a technical report on HALO Space Launch 1. It was a very visceral experience for me, especially after having driven all night Friday in order to get to Hampstead, North Carolina in time for Saturday's scheduled launch.

I arrived early Saturday morning in time to watch the dawn, little wind, no clouds. A perfect morning to launch the balloon — but there was no balloon to launch. There was not even a Balloon Team! Where was everyone?! I found a small sign which said "Launch delayed until Sunday. Saturday setup begins at 10 AM."

Later that morning, the crew began to arrive. Al Wright brought a lawn mower [borrowed from Steve Unger] that my son, Jesse, and I helped push in an effort to subdue the stubble that threatened to puncture the delicate balloon. Mowing grass is a great way to stay awake when you've been driving all night!

Gone With the Wind — Almost!

The dust and smoke the lawnmower spewed out were a graphic measure of how much the wind had picked up. The "CAUTION" tape that Ronnie was having us stretch around the launch site was catching enough wind to snap off the wooden rods to which it was affixed.

My broad-brimmed hat blew off so often that I was inspired to find yet another use for duct tape. Not only did it keep my hat on, but it also made shaving my chin unnecessary for the next few days when the tape and hat were removed in favor of a less aerodynamic cap, donated by a bystander.

By late afternoon on Saturday, the grass was cut and the site was mostly roped off. Tents to protect our equipment were anchored against the wind. I checked

the braces and rigging of the gondola one more time. The rocket was in the capable hands of Tim, Al, and Steve. Clay and Ed were doing their thing with the electronics. Jesse and I left and took a stroll on the beach and turned in early, hoping the wind would die down.

Inflating the Balloon

The wake-up call came before 4 AM on Sunday. There was frost on the stubble. Peter Ewing had already gathered most of the pieces of the Kjome balloon launcher device; but there was still a rush to find rope and attach weights as Bill Brown stretched out the balloon.



Peter Ewing, Ron Creel, & Larry Scarborough control the Kjome launcher during inflation.

Several team members turned on their car headlights so that we could better illuminate the balloon area. Ronnie set up a propane lamp on a stand nearby.

We fumbled briefly with cold fingers in the frosty morning to get the launcher locking mechanism in place. By the time Bill began filling the balloon with helium, the gas was neatly contained in the top 4th of the balloon by our device.

Thanks to Tim's new manifold, the balloon was champing at the bit of our launcher much more quickly than on the previous attempt. Then I got nervous, as I overheard parts of concerned conversation by the tank handlers. "Did he really say that some of our helium tanks were empty??"

Thoughts of Cerro Gordo

Remembering the pattern of our previous balloon launches, I watched the beautiful sunrise with dread rather than appreciation. Twice before had I held onto a large balloon hovering calmly at dawn. [Editor's note: the first time was with the 19,000 cu.ft. balloon launched in September, 1996.] Twice before had technical problems delayed launch. The wind routinely picks up soon after sunrise, and the pleats of that big inverted teardrop open into a sail. A tame work-horse becomes a bucking bronco. And I was no longer wearing my big hat!

Back to Reality in Hampstead

Greg now had to balance his running dialog with the FAA with securing more tanks of helium. Somehow he managed at dawn to get the local Food Lion supermarket to give up their two party balloon helium tanks. One turned out to be just enough to give our balloon the required lift.

The release went more smoothly than I could have imagined. The pieces of the Kjome launcher flew apart exactly as prescribed (Thanks, Norm!). The huge envelope drifted deliberately upward. The gondola carrying the rocket was plucked gently from the hands of its handlers. I was greatly relieved that the gondola looked so sturdy and straight — knowing full well the frailty of the wooden strips I had planed so thin to save on weight.

The rest, as they say, is history. The balloon rose quickly, soon finding the wind that we had somehow avoided on the ground. It was far out over the Atlantic when a premature rupture of the balloon tested the reflexes of Bill Brown and Ed Myszka. But they were up to the challenge. The rocket launched! And it was all caught on video tape. I'm ready to do it again! ☆

A Truly Enjoyable Experience

(by Peter Ewing, Balloon Team)

I left Huntsville Thursday evening around 7:00 with Ronnie Lajoie, and the two of us met up with Greg Allison at the Shoney's in Scottsboro. I suppose our goal was to get as much of the road behind us as we could; by 3:00 a.m. we had only reached Atlanta. But the stops for dinner, dessert, coffee, and "Georgia ice cream" had made this leg of the trip enjoyable.

After a "refreshing" three hours of sleep, our goal was to reach the coast by early afternoon to meet other Project HALO members we knew were ahead of us. Sure enough, Gene and Gladys Young were waiting at the launch site with their typical gung-ho attitude. Within minutes Tim Pickens and Steve Mustaikis also met us, bringing news that lodging could be had on Cary Bruton's forty foot yacht at no charge.

Steve Unger, Editor of the Topsail Voice, and Dusty Powers, a reporter for ABC News, also showed up Friday, confirming that the press was interested in everything we were about to attempt. Mr. Unger allowed us use of his lawnmower, to smooth the area from which the balloon would be launched, and Mr.

Powers donated some wooden stakes that would help lay the outline for a public viewing area.

Saturday saw everyone going full throttle in preparation for Sunday's launch. Everyone took a turn at the lawnmower including Larry Scarborough's son Jesse. George Andrews, an air traffic controller at the Wilmington tower, lent us two rakes to further smooth the area under the balloon, and even did most of the raking himself. At nightfall a disturbing stutter in one of our generators prompted him to lend us a generator as well!

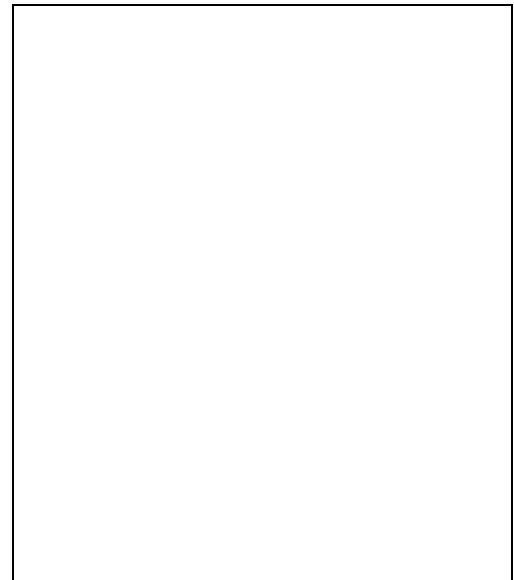
With virtually no sleep Saturday night, I completed taping off the public viewing area Sunday morning and joined the other members of my balloon team until it was time for liftoff. Use of Mr. Andrews' Food Lion charge card got us the extra helium we needed, but Greg still wasn't able to pull the pin on the Kjome launcher, so Tim stepped in. The balloon was set free and, at least in my opinion, everything went beautifully after that.

Although we didn't reach space, I would like to thank all Project HALO team members and the generous people of Hampstead, for a truly enjoyable experience. Ad Astra! ☆

An "Uplifting" Experience

(by Gene Young, Electronics Team)

The Hampstead SL-1 Rockoon launch was an uplifting (no pun intended) experience. Cooperation between all persons and technical disciplines involved was the word of the day. Everyone, club members and volunteers, pitched in to get the job done, even down to the menial task of cutting the grass with a small push-mower. The weather on the day before the launch (Saturday) was cool and windy. Caps and lawn chairs blew away frequently. Dr. Scarborough used duct tape and rope to keep his straw hat in place. The wind made pitching of tents a difficult

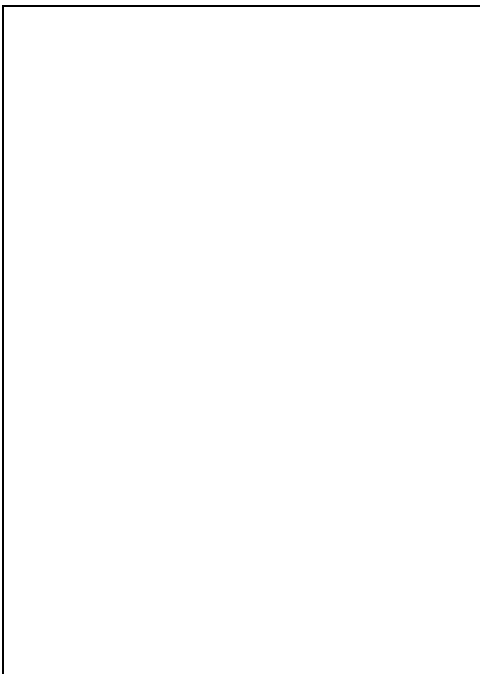


Gene Young and Clay Sawyer

process. It took real ingenuity and muscle to form a 10x20 ft orange tarpaulin and a variety of structural members (sticks, ropes and duct tape) into a suitable tent to house the rocket and associated activities.

The morning of the launch started for most club members about 3:00 AM. The weather was cold but the winds were calm. I worked with Clay Sawyer in electrical preparation and checkout of the rocket. There were minor deviations from perfection but electrical activities were completed on time. I did not have much opportunity to observe balloon preparations but I do remember seeing the silver-like balloon standing motionless and tall against a beautiful blue morning sky.

There was no doubt in my mind that we would launch that morning — and we did. I was one of three people holding the gondola when the balloon was released. We started running, carrying the gondola, in the direction of balloon drift. We were prepared to give the gondola a heave at the appropriate time but it was just taken by the rising balloon right out of our hands. Smiles and joy were abundant because it was obvious SL-1 was on its way. To watch SL-1 rising and proceeding east into the early morning sky gave me an emotional high like few I have ever experienced. Thanks, Project HALO! ☆



Peter Ewing manning the launcher

HAL5 CALENDAR OF MEETINGS AND EVENTS

June 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3 Project HALO Tech. Meeting Noon at Ponds	4 HALO Rocket Work Party 6 pm at Tim's	5 HAL5 Executive Comm. Meeting Noon at Ponds	9	7
8	9	10 Project HALO Tech. Meeting Noon at Ponds	11 HAL5 Program "Project HALO" 7 pm at Library	12 HAL5 Executive Comm. Meeting Noon at Ponds	13	14
15 Father's Day	16 HALO Rocket Work Party 6 pm at Tim's	17 Project HALO Tech. Meeting Noon at Ponds	18 HALO Rocket Work Party 6 pm at Tim's	19 HAL5 Executive Comm. Meeting Noon at Ponds	20	21 Summer Solstice
22	23 HALO Rocket Work Party 6 pm at Tim's	24 Project HALO Tech. Meeting Noon at Ponds	25 HAL5 Elections and Program 6:30 p at Library	26 HAL5 Executive Comm. Meeting Noon at Ponds	27	28
29	30 HALO Rocket Work Party 6 pm at Tim's	HAL5 Program Night, 7:00 to 9:00 pm "Project HALO: Space Launch 1" by members of the HALO team Huntsville Public Library Auditorium		HAL5 Elections and Program Night HAL5 Elections at 6:30 pm, followed by "Solar Thermal Propulsion via Fresnel Lenses" Huntsville Public Library Auditorium		

July 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Project HALO Tech. Meeting Noon at Ponds	2 HALO Rocket Work Party 6 pm at Tim's	3 HAL5 Executive Comm. Meeting Noon at Ponds	4 Independence Day Mars Pathfinder	5
6	7 HALO Rocket Work Party 6 pm at Tim's	8 Project HALO Tech. Meeting Noon at Ponds	9 HALO Rocket Work Party 6 pm at Tim's	10 HAL5 Executive Comm. Meeting Noon at Ponds	11	12 Project HALO Motor Firing 12p at H.Pickens
13	14 HALO Rocket Work Party 6 pm at Tim's	15 Project HALO Tech. Meeting Noon at Ponds	16 HALO Rocket Work Party 6 pm at Tim's	17 HAL5 Executive Comm. Meeting Noon at Ponds	18 HALO Team Appreciation Night	19
20 Apollo 11 lands on Moon, 1969 Viking 1, 1976	21 HALO Rocket Work Party 6 pm at Tim's	22 Project HALO Tech. Meeting Noon at Ponds	23 HAL5 Program "Anti-gravity" 7 pm at Library	24 HAL5 Executive Comm. Meeting Noon at Ponds	25	26
27 Delta Aquarid meteors	28 HALO Rocket Work Party 6 pm at Tim's	29 Project HALO Tech. Meeting Noon at Ponds	30 HALO Rocket Work Party 6 pm at Tim's	31 HAL5 Executive Comm. Meeting Noon at Ponds	HALO Team Appreciation Night featuring dinner, guest speaker, entertainment, and awards 7pm, July 18, at Holiday Inn	

August 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2

HALO Space Launch 1 Flight to the Edge of Space

(Greatness on the Ragged Edge)

(by Gregory Allison, Program Manager)

How the Launch Day Began

It was pitch dark at 3:00 AM on the Mother's Day morning of 11 May. The generators whined and sputtered in the background. It was cold — actually a record cold for that day. The weather report from Wilmington, North Carolina said it was 45 degrees. Yet when I picked up my flashlight that had been out overnight I found it coated with a thin layer of ice. Wouldn't you know it, I had no coat, just a tee-shirt and a regular shirt. Needless to say, I shivered as the goosebumps climbed up my back and down my arms. They served well to awaken me after only a couple hours of sleep. The storms of the previous day had blown through. There was no wind. It was calm, dead calm.

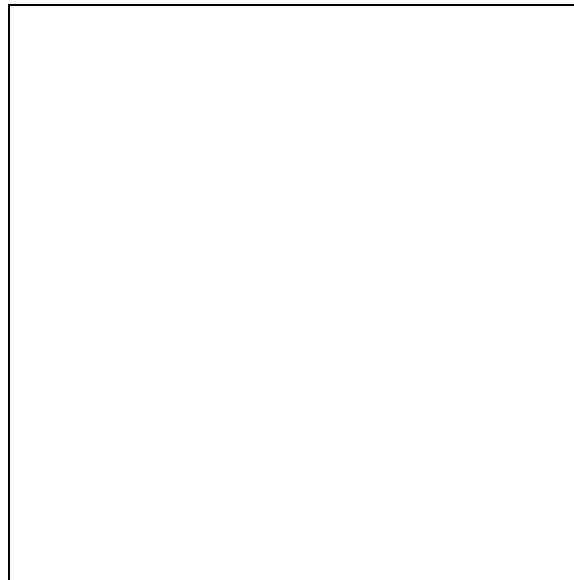
The cold still wake the storms left behind made for the perfect day to launch a rockoon. Voices were crackling over the earphone of my belt mounted two-way radio. I could hear the Electronics Team and the Rocket Team, each on separate channels discussing launch preparations. This is how the day began that a small dedicated group of space enthusiasts from Huntsville Alabama would reach up and kiss the edge of space.

We rolled out tarps, tarpaper, and plastic to protect the balloon from the stobs and stubble of the freshly mowed grass airstrip. The 141,000 cubic foot polyethylene weather balloon is only 0.35 mils thick, as compared to a 3 mil thick human hair. We had to take extraordinary care to protect it. Next the ground cloth and the balloon were lain out. The balloon layout stretched about 100 feet. At the head was the trailer with the helium tanks. On the other end, 100 feet from the bottom hook of the balloon, the gondola bearing the 7 foot 4 inch hybrid rocket was set up. In the middle of the balloon layout was

balloon launcher — our own homemade Kjome launcher.

We lined up the whole assembly using the North Star and pointed it almost due east toward the Atlantic. The Atlantic coast was only a couple of miles away. The Electronics Team's mission control center tent was about 150 feet north of the balloon filling station and the rocket preparations tent was about 50 feet from the rocket filling station. We had set up this camp the day before, just a few miles north of Hampstead, NC.

The HALO Operations Teams



The man with the phone and a license to call

There were six badged Project HALO operations teams on the field that morning. The Rocket Team consisted of Tim Pickens, Steve Mustaikis, and Al Wright. The Balloon Team consisted of Bill Brown, Ben Frink, Larry Scarborough, and Peter Ewing; plus local volunteers George Andrews and Monta Elkins. The Electronics Team consisted of Ed Myszka, Clay Sawyer, and Gene Young. The Runner Team consisted of Ron Creel. The Security Team consisted of Ronnie Lajoie and Gladys Young. The Document Team consisted of trust-proven reporters including Penn Stallard, Charlie Killebrew, Dusty Powers, and Jesse Scarborough. (Unfortunately, *Inside Space* reporter Amy Houts was unable to arrange travel

to Hampstead). We also had two non-HALO badge groups for other "Press" and for "Guests".

For security reasons, Ron Lajoie had designated me as sole member of the Command Team. I maintained communications between the other teams, the press, and the Federal Aviation Administration (FAA). Had there have been any winds, I would have also commanded a team of plastic handlers who would have held up two large sheets of plastic to prevent the balloon from grazing the ground. Fortunately we were spared from winds.

Filling the Balloon and Rocket

Helium tanks were rolled out to fill the balloon, as were the nitrous oxide tanks to fill the rocket. The Kjome-style balloon launcher was positioned at the appropriate distance down the balloon as calculated by Bill Brown. Filling for both balloon and rocket began at about the same time. The balloon would require about ten tanks for filling (we had brought 11) and would therefore take longer. Tim Pickens had designed and built a fill manifold that would let us connect three tanks at a time to speed up the process. We had just enough helium — and only one balloon. There could be no errors. The rocket filling was completed first. As we continued filling the balloon, the Electronics Team was conducting final systems checkout.

By the Skin of Our Teeth

I established communications with the FAA using my cell phone. I was required to maintain contact with the Wilmington, Raleigh, and Washington D.C. centers. The Rocket Team was ready, the Electronics Team was ready, the Balloon was ... we had a problem! Two of the helium tanks, as delivered by the supplier, were empty! Here we were at 06:10, 20 minutes until launch time, on a Sunday morning without enough helium. There would be no welding shops open. What could we do?!

First I asked the FAA for an extension to our launch window. They would only grant us 35 minutes. We had to launch the balloon no later than 7:05 AM. They could not extend our waiver beyond that point. I knew that the ABC News cameraman Dusty Powers had a local phone book on him. With my megaphone I called him over. No one knew any welding shops operators so the thought occurred to me, "What about party balloon places?" The local Food Lion grocery store was open. After all, we only needed two bottles. So I called Food Lion. I spoke to the manager there. She said, "No!". I talked her into calling the main store manager who was off duty.

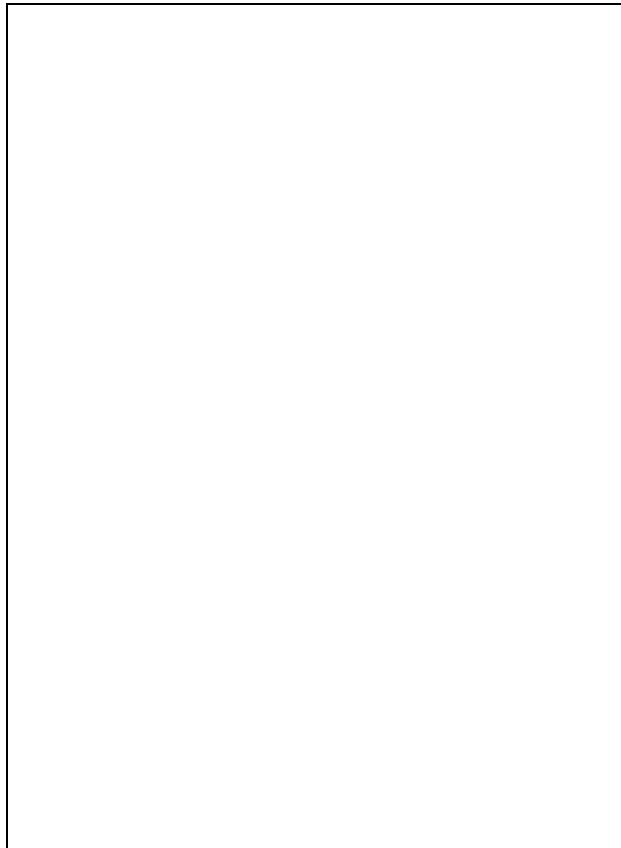
Meanwhile I called Wal-Mart (which was 20 miles away). While I was on hold waiting for the manager at Wal-Mart to check her bottles Food Lion called back to again say "No!". Of course I lost my line to Wal-Mart by taking that call. I asked the Food Lion shift manager if I could talk to her store manager. At first she declined but I managed to talk her into it. So I called the Food Lion store manager directly.

Of course, I had explained to each one of them that we were the group they had been seeing in their local news for the past few days, that we are a nonprofit educational group trying to develop trying to develop a low cost means of flying student payloads into space, that we were putting their community into the history books, that we would pay them their market rate, and much more.

The answer was once again "No". The problem was the contract Food Lion had with their helium vendor to keep the bottles on site at Food Lion. I explained that we had bottles which we could exchange for security till we were done; that as a highly visible nonprofit group, we lived in the public eye, and that in fact the news media, including ABC News, Channel 3 from Wilmington, and

Inside Space were there taping us. Therefore we had to live up to our honor. Once again she said "No", but indicated she would look into it.

Wasting no time I sent George Andrews and Peter Ewing to the Food Lion store with Dusty Power's cell phone. The clock was ticking. It was 06:30. (It normally takes 10 minutes a bottle to fill. We had filled all of the helium we had on hand. It wasn't enough. I called Wal-Mart again. Once again my call waiting beeped and it was the Food Lion.



Freed of the launcher, the balloon mushrooms up

This time they said "Yes!". The guys were already there. They loaded and started back.

At 06:40, I am starting to get worried. I call the guys on the cell phone to tell them to step on it!. They inform me that they are almost at the site. They arrive, unload the tanks, and commence final balloon filling. I reestablish contact with the FAA, and work out launch signals with the rocket crew.

At 06:59 All crews were stand ready. I announced over my megaphone to the HALO Teams, press, and visitors that "Launch is imminent." At the end of the balloon chain, Steve Mustaikis, Al Wright and Gene Young hoisted the 100 pound gondola bearing the rocket up over their heads. Larry Scarborough then asked me to release the locking pin from the balloon launcher. I gave it a sharp yank, but it was not enough. Then I remembered that you almost had to strike it with the hammer to free the release pin. Tim Pickens, not wanting to waste time explaining what I had realized, stepped in to save the day. "Rocketman" Tim Pickens launched the balloon.

The balloon climbed into the sky looking like a silent tornado and lifted the gondola from the hands of the gondola handlers. Up and away it drifted. The crowd shouted and cheered. It was a fantastic balloon launch! We were all ecstatic! Just to get to this point was a tremendous feat. The balloon launch occurred at just three seconds prior to 7:00 AM. Just five minutes before the end of our deadline. It was such a thrill to see that balloon soar out over the Atlantic. Larry Scarborough's son Jesse was video taping from inside Larry's van. Later we would hear his voice on the video saying "Bye balloon, bye!".

Tracking the Balloon

The media cameras are coming after me but I am heading for the control center tent. Everything looks good. The FAA is asking me for positional coordinates and I am reading them off Ed Myszka's computer screen as downlinked live from the Global Positioning Satellite (GPS) receiver onboard the rocket. The gondola video shows the balloon overhead, while the rocket video looks out over the horizon through the plastic wrapped around the gondola, the "rockoon cocoon" as Bill Brown called it.

Everything went well till the balloon reached 30,000 feet. Then for some reason we lost the GPS down link. Later we would find out that another group had the same problem with the same transmitter which we were using for the GPS packet data downlink. In their case the transmitter had a failure in the final transistor amplifier stage. The fact that our GPS downlink antenna was on top of the rocket just over the metal avionics canister probably didn't help either. All other systems continued to work fine.

We continued to receive video downlinks from both the gondola and rocket cameras. Regularly, the FAA called me back asking for positional updates. Bill Brown was forecasting balloon position based on latest rates and winds aloft analysis. The balloon continued to climb. It was caught in a 110 knot jet-stream, which was rapidly carrying it way out over the Atlantic toward the Gulf Stream.

A recovery boat had been dispatched from Morehead City. Local North Carolina volunteers Debbie Odom and Bob Brandenhof were onboard John McCallum's boat, the Grasshopper, in hopes of recovering the rocket. Unfortunately the Wilmington ham radio repeater didn't have the range to maintain contact as they went out far into the sea. We lost contact with the recovery

boat. Even marine sideband radio would not reach directly. Therefore we were not able to post recovery coordinates to the boat.

At about on hour before the scheduled rocket launch time, Rocketman Tim Pickens left the launch site to take care of some urgent business. Steve Mustaikis and I watched the balloon video. He pointed out how the gondola was spinning relative to the balloon. I said "It's a sinusoid, watch, in a few minutes it will reverse and spin the other way." We watched and surely it did. All systems were A.O.K. HALO SL-1 was on it's way. I stepped out of the tent again to give some more interviews with the press.

Tranquillity to Hell Breaking Loose!

Everything was laid back now. Bill Brown calmly announced that we are now above 50,000 feet, therefore the rocket was now armed for launch. Radiosonde bellows switches were preset to prevent firing below 50,000 feet as a safety precaution. In the background the generators wined. The sunlight was now extremely bright. Questions poured from the news media.

Suddenly, Steve Mustaikis split the tranquillity, "Launch the rocket!" he yelled. "What?!" I said and I bolted

from my chair. I could hear Ronnie (who did not know the jet stream had already taken the balloon well past the safe distance from land) shouting, "No you can't do that!" "The balloon popped!" responded Steve. Concerned about the vertical angle of the prospective launch, I rushed into the mission control tent. Ed Myszka was busily punching launch codes into his uplink transmitter.

I looked at the gondola video. The ruptured balloon was acting as a streamer keeping the rocket launcher pointing straight up. "Launch the rocket, Ed!" I confirmed. The screen blanked on his uplink. The next image was a flash of light. The plastic on the gondola was blown off and the rocket plume was a dot on the screen. The rocket was out of sight in seconds. The gondola continued to fall. To release the gondola parachute, command uplinks were issued to fire the balloon cutdown squibs. Each fired as commanded. We stepped out of the tent to announce the successful launch of the HALO SL-1 rocket. Everyone yelled, screamed, and cheered!

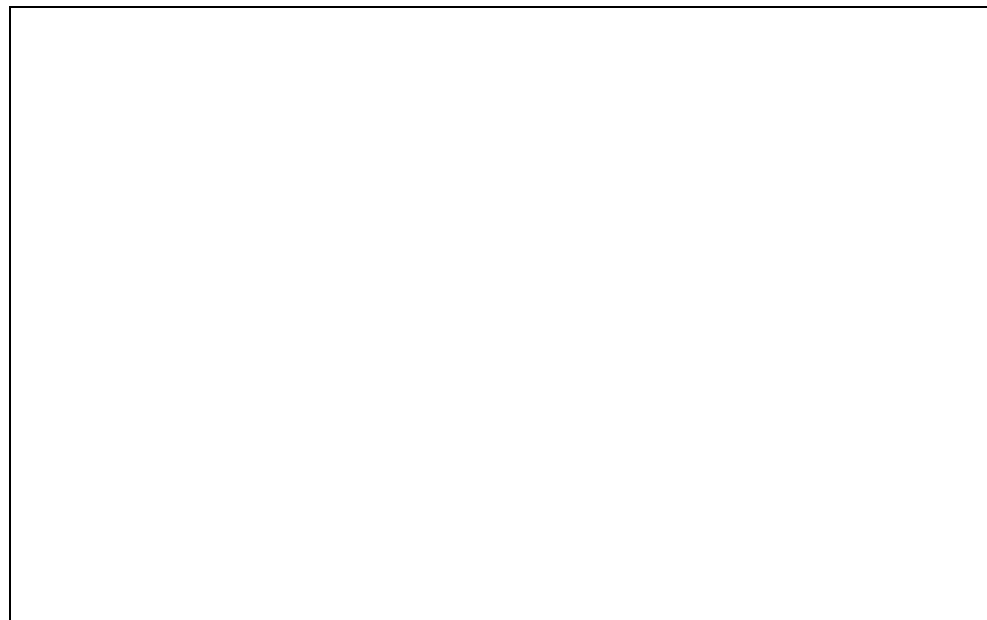
Tim Pickens walked back into the compound. When we told him we had launched the rocket he thought we were just teasing him. The funny irony is that the rocket man who always likes to taunt us with the phrase "I hate stinky balloons" launched the balloon and missed the launch of his own rocket. (Believe me, Tim was NOT laughing.)

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One does not always get what they dream,
 Leave it to fate to make us all humble,
 Tim's assigned to the Balloon Team,
 Hope he does not grumble.

— Greg Allison, 7 June 1997

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The press surrounds Mission Control tent as the rocket fires from the balloon.

We launched our rockoon on 11 May
The balloon took off up up and away,
At 60,000 feet the balloon did pop,
The whole thing started to drop,
Immediately we launched the rocket,
Hooray!

Greg Allison, 21 May 1997

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**HAL5's Project HALO
Adds to the History of Rocketry**

Bill Brown estimated that the balloon was over 60,000 feet up when the balloon ruptured. The bellows switches would not have permitted the rocket to fire if it was below 50,000 feet. Based on the range of possible launch altitudes Ron Lajoie and others estimated that the SL-1 rocket reached an altitude between 30 to 36 nautical miles. We literally kissed the edge of space. We have at least four world records.

1. The first ever high altitude ignition of an amateur rockoon.
2. The first high altitude ignition of a hybrid rocket motor.
3. The world altitude record for hybrid rockets. No government, no company on Earth has ever come close to our record.
4. The highest flight on any amateur rocket ever.

The champagne bottles came out. Ronnie, standing embarrassed in front of the press, could not pull the cork off his bottle. I came to his assistance. He thank me and splashed us all with champagne. We all got a bath! We all cheered and whooped!. We all got what we were looking for, confirmation that we could indeed launch our rocket at a high altitude. HALO SL-1 was a proof-of concept mission — and the concept was proven!

It should be noted that it is no small task to launch a rocket from a balloon. The first thing that one must understand is that solid rocket fuel will not ignite and burn in a vacuum. You can make it all ammonium perchlorate. The amount of oxidizer makes no difference. In a vacuum your motor will not burn. The secret is that the fuel must be under pressure. The military knows this lesson well. All high altitude motors have to be specially designed to ignite at altitude.

Also I ask you to consider what it takes to keep a liquid oxidizer at 70 degrees-F after ascending for nearly an hour through the upper troposphere and lower stratosphere where the temperatures fall



Ron Lajoie, Greg Allison (with Space Pioneer Award), Buzz Aldrin, and Bill Brown at the 1997 ISDC in Orlando, Florida

to 60 below zero. HAL5 is the first non-superpower entity to accomplish this feat!

Balloon Failure Mode Analysis

Later, we played back the balloon gondola video and watched the balloon as the gores and panels prematurely stretched out in a full circle. It appeared that the channel duct which was intended to vent the excess helium got choked off during the twisting of the balloon envelope. The balloon reached an over-pressure condition and an entire seam line opened at once. It looked like "Pack-Man" opening his mouth.

If the balloon had reached its operational altitude of 105,000 feet, the HALO Space Launch 1 rocket could have reached over 64 nautical miles. When we launch Space Launch 2, we shall beat even that!

Kudos a Million

I want to heartily thank all those who made the HALO SL-1 mission possible: Matt Beland, Bill Brown, Ron Creel, Peter Ewing, Ben Frink, David Hewitt, James Hopkins, Gene Hornbuckle, Ronnie Lajoie, Steve Mustaikis, Ed Myszka, Tim Pickens, Herman Pickens, Clay Sawyer, Larry Scarborough, Mark Wells, Alfred Wright, Gene Young, and Gladys Young; with support from George Andrews, Bill Axenroth, Monta Elkins, John Fox, Philomena Grodzka, Christie Harper, Rick Kauffman, Gene Marcus, Larry Larsen, Melanie Pickens, Chris Pickens, Dusty Powers, Drew Prentice, Steve Unger, and many others.

These individuals worked extremely hard many for over two years to make this flight possible. This dedication speaks highly of their vision and character. When things looked tough and the skies were gloomy, these people pushed on

through. I also want to thank Cary Bruton for use of his grass airstrip, Benny Godwin for use of his farm for the first attempt, Penn Stallard for assisting me in many aspects of logistics coordination, and Debbie Odom, Bob Brandenhof, and John McCallum for going miles out to sea in the recovery boat. I also want to express special thanks to Mr. Terry Williams of the FAA, for without his support and understanding, we would never have received permission to launch.

And I especially want to thank you, the membership of HAL5, for all of your support. Ad Astra per HALO! ☆

Up, Up, Down?! and Away!

(by Bill Brown, Balloon Team Lead)

The HALO team met at the launch site in Hampstead, NC in the wee hours of Sunday morning, May 11th. It was very cold (frost collected on the equipment) with absolutely no wind. Perfect conditions for a balloon flight! As the Rocket Team tested out the payload and command electronics and fueled the rocket with nitrous oxide, the Balloon Team (including myself, Ben Frink, Larry Scarborough, and Peter Ewing) unfurled the delicate plastic envelope on the protective ground tarp, attached our home-made Kjome launcher (from a design supplied by Norm Kjome of the University of Wyoming — thanks Norm!), and then started the inflation process.

As the sun poked up above the horizon, and with just 30 minutes to go before our FAA launch window closed, we ran across 2 nearly empty tanks of helium.

Concerned that we would not have enough helium in the balloon to lift the rocket payload, we searched Hampstead and nearby Topsail Beach for helium (not an easy task early on Saturday morning). It turned out the local Food Lion store had two tanks they used for party balloons and sold them to us. This saved the day and allowed us to achieve final flight lift.

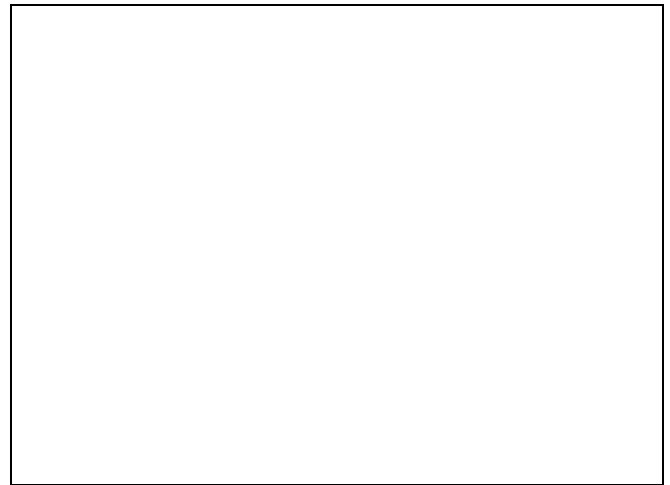
Balloon Lift-Off!

The rocket crew lifted the payload and stretched the lines tight, the fill tube on the balloon was tied off and the call to the FAA went out for imminent lift off. With just five minutes to go before the deadline, we released the balloon at 6:59:57 AM and the rockoon headed up smoothly into the still morning sky on its way to the stratosphere.

Spectacular color video (434 MHz) of the balloon and the side of the rocket launch tube could be seen in the command tent. The rocket video was viewable on another monitor, but little could be seen due to the protective plastic wrap around the gondola.

GPS Signal Fades Away

The GPS telemetry downlinked via packet radio in APRS format started to get weak after the rockoon exceeded 23,000 feet. The signal faded completely into the noise by 30,000 feet and we unable to record any more usable position and altitude reports from that point onward. We think that the internal antenna for the packet transmitter put most of the radio signal up and down, but very little signal made it towards the horizon as the payload headed out nearly 120 miles out over the Atlantic. It is also possible that the packet transmitter weakened and died.



Bill Brown addresses an audience at the 1997 ISDC

“Fire that Rocket NOW!”

At 8:21 am, we calculated the estimated altitude of the rockoon based on the ascent rate to be around 60,000 feet. I said, “Since we are now above 50,000 feet, the barometric rocket safety switches are now armed and the rocket can be fired at anytime.” Of course, we were hoping to reach about 105,000 feet before firing off the rocket. Just 30 seconds later, I happened to be looking at the video of the balloon envelope and thought that the balloon looked pretty full. Just then, one of the seams tore wide open, dumped out all of the helium and the balloon just folded up into a long streamer of plastic! As the rocket and gondola dropped rapidly, I shouted out to Ed Myszka (alias KE4ROC), “Fire that rocket NOW!”. We had just over a minute to issue the fire command before the safety switch disarmed the rocket at 50,000 feet.

Ed keyed down the 2 meter transmitter and anxiously entered the firing code via touchtones. Nothing happened. He tried another time ... nothing ... and then a third (we had only seconds left before the safeties cut in). All of a sudden there was a bright flash and a cloud of smoke and the rocket leaped out of the gondola and straight up towards space.

Bits of plastic tape and the plastic covering shredded off and fluttered past the camera view as the gondola continued its rapid descent. Fortunately, the camera had survived the rocket exhaust

Balloon-meister Bill Brown

blast and continued to work flawlessly until the gondola splashed into the Atlantic Ocean. Although the command was sent up three times, it appears that the second uplink command was the one that began the rocket ignition process.

We were treated to flashes of video from the rocket for about 30 seconds showing tantalizing views of the curve of the Earth. Since the rocket was spinning around, the ATV signal fluttered in and out and made it difficult to lock onto a good picture. After that, the video signal ceased and the rocket parachuted down into the Atlantic. Both the gondola and the rocket splashed down about 120 miles east of the launch site and 50 miles from the nearest land.

A Needle in a Very Large Haystack

Robert Brandenhof (W3RDS) was tracking everything on the chase boat, captained by John McCollum. They were unable to recover either the rocket or the gondola from the ocean since we could not provide them with precise GPS data. Without this, it's like finding a needle in a very large haystack!!!

Since we launched at a much lower altitude than planned, we estimate the final altitude attained by the rocket to be between 30 and 36 nautical miles high. Although we did not achieve true space (defined as 50 nautical miles in altitude), we did make several firsts and set several world records. Firsts include the first amateur launch of a rockoon (rocket launched from a balloon), and the first high-altitude launch of a hybrid rocket (hybrid referring to the nitrous oxide/asphalt fuel combination). Claims for world records include the highest altitude achieved by an amateur rocket, and the highest altitude achieved by a hybrid rocket.

Hats Off to the HALO Team!

It's amazing what can be accomplished when a dedicated group immerse themselves to achieve a lofty goal. Coordinating the construction and testing efforts, transporting the rocket, balloon and support equipment as well as 10

carloads of the group 700 miles from Huntsville is a lot like trying to herd cats! It can be done but takes an extraordinary amount of patience, dedication and time. My hats off to a job well done by the HALO group whose members performed calmly and flawlessly in the face of adversity. The planets definitely were aligned and Mother Nature smiled on us for this flight! Ad Astra per HALO! ☆

Deja-vous Blues — NOT!

(by Ben Frink, Balloon Team)

I do want to say that I enjoyed the flight tremendously and appreciate HAL5 vindicating me in front of my home audience. The most memorable moment for me was the wild emotional swing from panic to sweet success that took place at the time of the balloon panel blow out and the frantic attempt to ignite the rocket motor.

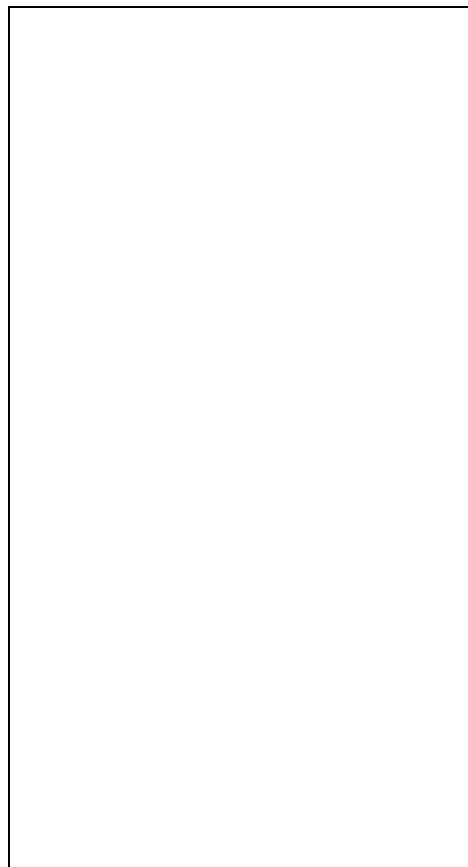
I think that Bill, Ed and I were the only folks in the tent when the panel blew out. I froze in disbelief with all my past rockoon attempts flashing before me. I was brought back into the present listening as Bill shouted for Ed to fire the rocket. My heart sank when the first uplink didn't fire. It sank deeper with the second unsuccessful launch command. Just when I felt I couldn't take no more disappointment, selfishly thinking about how my detractors would relish reading about another failed attempt, the rocket roared to life.

My mind's ear could hear the roar of the motor from over a hundred miles away at the edge of a rarefied atmosphere. I sincerely thank all the HAL5 members for allowing me to participate and I hope that you will consider southeastern North Carolina for another try for space! Ad Astra! ☆

Adventures at Sea

(by John McCallum, boat captain)

Congratulations on the successful launch. I was the captain of the recovery boat Grasshopper out of Morehead City,



Mr. Amateur Rockoon — Ben Frink

NC. I was contacted by Debbie Odom on Friday and told that a boat was needed to recover the rocket. She said that the anticipated landing site was about 20 nautical miles south of Morehead City. She gave me coordinates 34:18:26 and 76:03:19 for the site. When I plotted the position, it was 43 nautical miles east of Morehead on a bearing of 138 deg. We left the dock at 0545 and stopped several times on the way out for Bob Brandenhof (radio operator) to check in with the launch site for position updates.

About 20 miles out, Bob lost contact with the repeater station and so we lost contact with the shore crew. I began to wonder if we were going to the wrong place. I was assured that the coordinates were good so we continued on.

So Where's the Rocket?!

We arrived on site at about 0915 and began to circle and look for the parachute. I was too far offshore to reach any shore station with my VHF so I

contacted a local charter boat, "Harriet L" captained by Terrell Gould, who used his SSB to call his father Leroy Gould on his boat "Mattie G" back at the Morehead City. Captain Leroy Gould made several calls to Bill Brown's cellphone only to find it not in service. He called Bob Brandenhof's wife Doris who got the calculated landing site but was unable to get back in touch with Captain Leroy because of a telephone number mix-up.

I had Captain Leroy call the Comfort Inn in Wilmington and ask for anyone in the Rocket Group. He called back with the coordinates 34:16:55.1 and 77:47:37.9. According to my GPS that position was 60 nautical miles from Morehead City at a bearing of 250 deg. That position was well out of my range so we headed back in, arriving back at the dock at about 1500.

Gone But Not Forgotten

I was disappointed about not being able to recover the rocket and was wondering if the anticipated landing site was correct or if the difference was due to the unscheduled balloon burst which may have sent the rocket off on a different course than planned because of the gondola falling unsupported by the balloon. [Editor's note: the difference was due to a much stronger jet stream than planned.] I was glad to help in the effort and will be available for any future efforts. ☆

A Picture Perfect Launch

(by Ron Creel, Runner Team Lead)

The launch of the HALO SL-1 balloon and gondola was a resounding success. None of the many potentially bad things I had worried might happen ever materialized. A great and very rewarding time was had by all. Three long journeys to North Carolina finally paid off. I continue to be very proud of the HALO team effort. I also snapped a few pictures which I'd like to share.



Ron Creel and the "Quonset hut"

1. Well prepared launch preparations included the faithful orange Quonset hut. Note the waiting sealed up gondola. (Photo on page 6)
2. On Sunday morning the sun rises on last minute adjustments by Steve Mustaikis, Gene Young, and Clay Sawyer. Note the SL-1 rocket inside the gondola and the much appreciated propane heater. (Photo page 7)
3. The gondola is buttoned up and ready for launch out over the Atlantic Ocean. Nearly 3 years of testing and preparations are about to be rewarded. (Photo at left)
4. At the other end of the balloon, the Kjome does its holddown job. (Photo on page 10) ☆

From the Sidelines

(by Steve Unger, Editor, Topsail Voice)

While King Ferdinand and Queen Isabella may have financed Christopher Columbus' first journey, it has generally been the free-lancers who have really made the difference. The Henry Hudsons and the Jim Bridgers are the ones who ought to be remembered, Thomas Edison and Henry Ford, Susan B. Anthony and Martin Luther King Jr.

Say what you want about British Empire, the 14th Amendment, Five Year Plans and the Great Leap Forward. It is the free-lancers who really make things happen -- Thomas Watson, Bill Gates and even Thomas Crapper.

If we are ever going to make it to the stars, and be willing to assume the risks involved, in the end it won't be NASA that does it for us. It will be folks like those on the HAL5 project who finally make it happen, who will be able to attract corporate cash cows into private space enterprise.

Mission control was in a tent on a big field, and we were glad to help experience the adventure. The computing power of three PC's probably surpassed anything NASA had in the 1950 and satellites were helped use to track the flight, not concrete towers as in 1947. It was the next best thing to being on Topsail Island for Operation Bumblebee a scant 50 years ago.

So this launch didn't make it to "outer space" — no matter, Columbus didn't make it to India, either. The process is more important than any single event. And it is well underway. ☆

Other Photograph Credits

- Ronnie Lajoie: pages 1, 2, 4, 5, 8, 10, 14, 16, and 20.
- Bill Brown: pages 3, 4, 5, 9, 12, 13, 17, 18, and 19.
- Pat Dasch (*Ad Astra* Editor): page 15.
- Ben Frink: page 16.



SL-1 – All dressed up and somewhere to go!

LAST WORD

Ready to Do It Again!

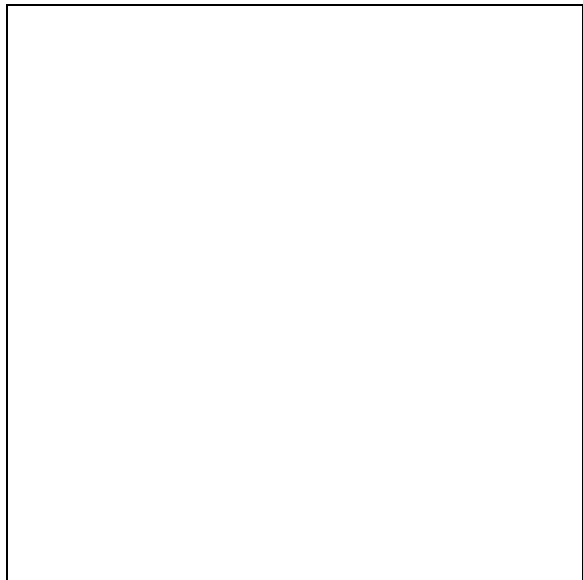
(by Steve Mustaikis, Propulsion Lead)

What a difference a year makes! For those of you who don't know me, I have been working in California for the last year. I was so happy to see the balloon lift into the sky after working all night on May 10. With the rocket on board sending back video and telemetry it was an impressive sight. At that point we had done more than almost every amateur group trying to do a space shot. We had a team of people who worked together to build and launch a vehicle capable of making it into space. This effort is amazing in itself.

Even more amazing is the team is still together and working on the next vehicle. None of the amateur rocketry organizations can claim this feat. When I left a year ago the propulsion system

was nearly complete, and the only major thing that was lacking was the electronics package to launch the vehicle and send back video. Apparently while I was away a few electronic gurus joined the team [Clay Sawyer, Ed Myszka, and Gene Young]. Their work looked excellent, especially for the time frame they had to put the system together.

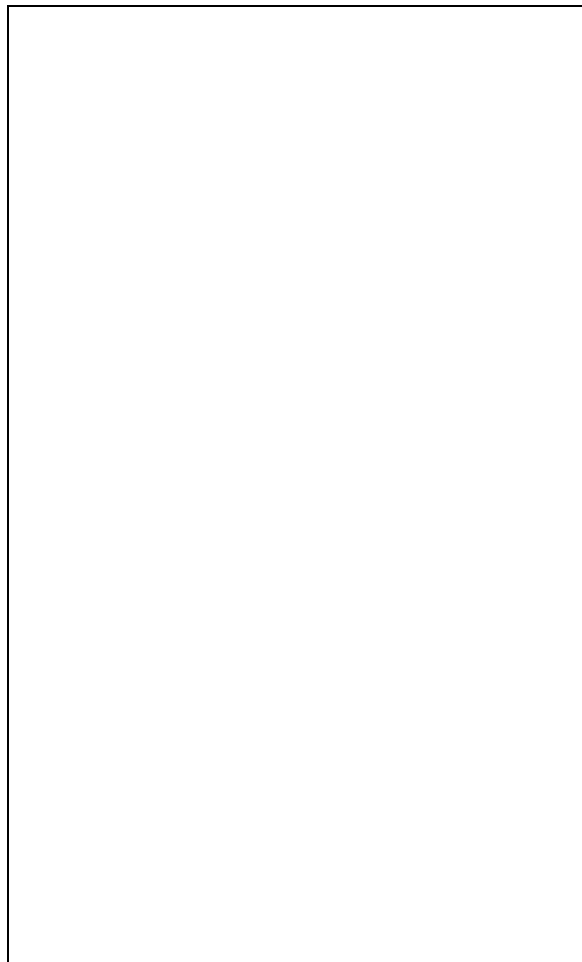
Now were getting ready to do it again. This time we have only four months to develop the new motor, vehicle and electronics package. We don't have time to change technology, just learn from our mistakes and successes, and go to work. For those of you who helped on the last vehicle, I thank you! And for those who are going to help on the next one, let's get busy! ☆



Steve Mustaikis — Ready to do it again!

Charlotte	Nelson	NSS
Bennett	Rutledge	NSS
Joel	Scotkin	SchwabOne
Cheryl	York	NSS

Thank you all for making these donations! If you have yet to donate to Project HALO, please do so as you can. HAL5 is also in need of donations so that we can print extra copies of this "Special Addition" newsletter. Please make your check payable to "HAL5 Project HALO" and mail to the return address next to your mailing label. ☆



Al Wright and Steve Mustaikis align the rocket.

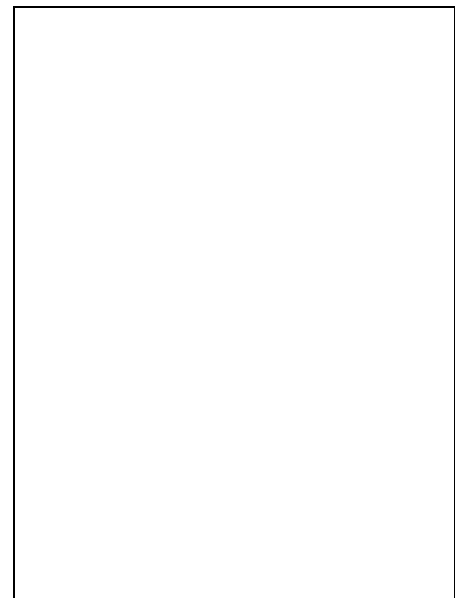
**Project HALO
Donation Update**

The 1997 ISDC was very good to HAL5 and its Project HALO. HAL5 received two awards, plus Greg Allison received a Space Pioneer Award (a very great honor).

Sales of HALO T-shirts raised \$216 for Project HALO. Also, many NSS members made direct donations to Project HALO, totaling \$451, a grand total of \$667!

The following is a list of people who have made recent donations to Project HALO (beyond anything they might have included with their membership, per previous article):

Mark R.	Kaehny	NSS
Tom	Koszoru	NSS
Allen	Meece	NSS



Electronics Team Lead Ed Myszka

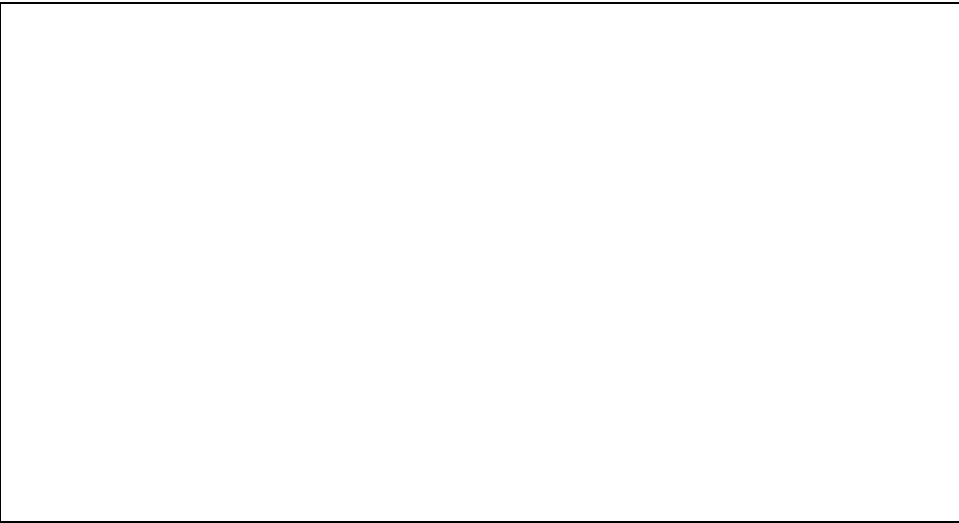
HAL5 Membership Update

The following is a list of additions to the current paid membership of HAL5, which includes 33 renewals and 12 new members, for a total of 45. Since all memberships expired at the end of last year, more renewals are expected to come in. Also shown is two new subscribers to our newsletter. Welcome to all our new and renewed members and subscribers!

Matt	Beland	(R)
David	Dean	(R)
Robert	DeBiase	(N, D)
Wade	Dorland	(N)
Peter	Ewing	(R)
Philomena	Grodzka	(R)
Carol Rene	Johnson	(N, D)
Greg	Keith	(N)
Linda	Kenny-Sloan	(N, D)
Dusty	McGee	(N, D)
Anthony	Murks	(N, D)
Ethan	Scarl	(R)
Charles	Walker	(N, D)
Bill	Weigle	(N)
Gordon	Woodcock	(P)
Joel	Scotkin	(S, D)
Cheryl	York	(S, D)

- (N) - New Member
- (R) - Renewed Member
- (P) - Past Member
- (S) - Newsletter Subscriber
- (D) - Included a Donation

HAL5 welcomes back its previous members and also past member Gordon Woodcock, who met with HAL5 members during our April meeting. Gordon is Chairman of HAL5's Board of Advisors. He is also now Executive Vice-President of the National Space Society. Welcome back, Gordon!



HALO Rocket and Balloon teams ready the rocket for its historic launch.

HAL5 also welcomes its new members, most of whom are NSS members who joined during the 1997 ISDC in Orlando. NSS members include Robert DeBiase from New York, Greg Keith from Florida, Linda Sloan from California, and Bill Weigle from Arizona. Wade Dorland and Anthony Murks are two local Huntsvillians who are already helping us with Project HALO. Welcome aboard!

NSS and Chapter Presidents Join

Two other new members are not only NSS members, but Presidents of their NSS chapters. Carol Johnson is the President of the NSS of North Texas, recipient of last year's Chapters' Assembly Outstanding Chapter award. Dusty McGee is President of the NSS of the Palm Beaches, a new and upcoming NSS chapter. Along with Chuck Schlemm, President of the Middle Tennessee, HAL5 now has three chapter presidents as members of our chapter. We are honored to have you all!

Lastly, but certainly not least, Charlie Walker is none other than President of the National Space Society itself. Mr. Walker was the first commercial astronaut to fly in space, and flew several times aboard the space shuttle. We are tremendously honored to have you as a member!

Many Donate to HAL5 and HALO

HAL5 gratefully thanks the many members who included a donation with their membership. Anthony Murks joined as a Contributor member. David Dean, Robert DeBiase, Carol Johnson, Dusty McGee, Linda Sloan, and Charlie Walker gave generously to Project HALO.

Finally, for the very generous donations provided by Joel Scotkin and Cheryl York, HAL5 is pleased to provide them with free subscriptions to our newsletter. Thank you all very much! ☆

Special Announcement

HAL5 Elections & Program Night

“Solar Thermal Propulsion”

Wednesday, June 25, 6:30p at the
Huntsville Public Library

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

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