Edge of Space Sciences Promoting Science and Education through Amateur Radio and High Altitude Balloons

Stratosphere

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Winter Edition

NATIONAL BALLOON SYMPOSIUM SUMMARY

by Jack Crabtree, AA0P

The Edge of Space Sciences (EOSS) National Balloon Symposium was held August 20-22, 1993 at the Denver International Airport Holiday Inn. The purpose of the symposium was to bring together amateur balloon groups, students, educational institutions and representatives of the balloon industry to share information and experiences relating to science and education through the use of high altitude balloons.

The activities got underway Friday evening with a welcome and hospitality gathering. Several payloads and other hardware components were on display. Video tapes of various projects were shown as well. Bill Brown, WB8ELK, provided the evening program with a video of both manned and unmanned balloon flights. Bill's humor provided for a very enjoyable program.

On Saturday morning, the formal symposium began. The moderator for the symposium was Marty Griffen, WA0GEH, of EOSS. The morning sessions were:

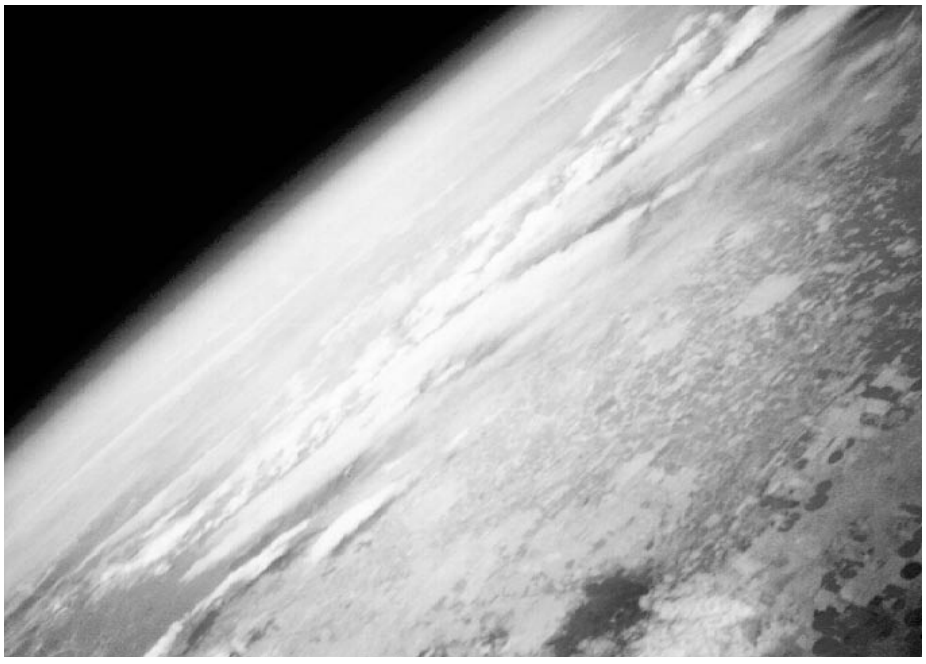
- Jack Crabtree, AA0P, Welcome, Symposium Purpose, What is EOSS?
- Tim Armagost, WB0TUB, Amateur Radio and Balloons
- Larry Epley, Winzen International, Balloon Physics and Designs
- Rob Kelly, N0SMR, The SSOK Balloon Microcontroller
- Bill Brown, WB8ELK, Balloon Software, Cheap and Dirty Payloads
- Andy Kellett, N0SIS, GPS/LORAN C Performance vs Altitude
- Gil Moore, N7YTK, Utah State U., Balloon Program of USU

Following an excellent lunch in the hotel's atrium, the afternoon sessions got underway. These included:

- Tom Isenberg, N0KSR, EOSS and Education with Balloons
- Ralph Wallio, W0RPK, High Altitude Balloon Education Team (Iowa)
- Rich Volp, N0PQX, Ground Station Hints and Kinks
- Paul Ternlund, WB3JZV, Tracking Balloons with a Mac Powerbook
- Tim Lachenmeier, Raven Industries, Raven Products and Capabilities
- Mike Manes, W5VSI, Payload Construction with Foamcore, VOR Experiments
- Larry Epley, Winzen International, Stratospheric Dynamics

The afternoon sessions concluded with a hour-long open forum where such subjects as liability insurance, project funding, national federation of balloon groups, and follow-up annual symposiums were discussed.

Following a break and social hour, the Symposium Banquet was held. After a delicious dinner, Larry Epley of Winzen International provided the banquet program, "The Pursuit of Science with Balloons." This was an outstanding slide program detailing the history and explorers of scientific ballooning. EOSS President, Jack Crabtree, then presented award plaques for



EOSS-13 The Earth from 95,000 feet

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Newsletter of
Edge of Space Sciences, Inc.
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Nets

The weekly on the air net is held on the Colorado Repeater Association's 147.225/825 MHz Repeater each Tuesday evening at 8:00 PM.

Meetings

The monthly meeting of E.O.S.S is held at Hewlett Packard Corporation at 24 Inverness place east. This is just east of I-25 and just north of County Line Road on the south side of Metro Denver. Talk-in is on the 146.640/040 MHz repeater.

Membership

Edge of Space Sciences Membership is open to all interested parties.
Student Membership is $2.00 per year.
Regular Membership is $10.00 per year.
To join, send a check to:

Edge of Space Sciences, Inc.
376 W. Caley Circle
Littleton, Colorado 80120

Submissions

Send articles for publication to the editor of *Stratosphere*:

Ann Trudeau, Editor
15487 E. Bates Ave.
Aurora, Colorado 80013
(303) 690-1669
Internet:rickvg@cscns.com
File Bank BBS: (303) 534-4646

"Outstanding support of the EOSS National Balloon Symposium." The recipients were: Bill Brown for "fathering" ballooning using amateur radio; Winzen International for technical achievements in ballooning and the support of amateur balloon groups; and Ann Trudeau, KA0ZFI, for her efforts in chairing the symposium committee. Attendees were reminded that the symposium was not over as two balloon launches were scheduled for Sunday morning.

Well before dawn the EOSS ground station was housed in the Loveland Repeater Association's emergency trailer. Around it launch teams were busily preparing for the early liftoffs. Because of the closeness of the hotel to the Stapleton Airport, the FAA had approved the launches but only if they occurred before 7:00 A.M. After the normal amount of last minute excitement and confusion, and just before the launch window was to close, the two balloons and their payloads were airborne. The first carried the WB8ELK cross-band repeater. This one would present a challenge because the 2 meter output power was a mere 5 milliwatts. The second balloon carried the EOSS "Shuttle" and tracking beacon. This time however, the separate 2 meter beacon also carried an automatic 35 mm still camera with exposures programed every 10 minutes.

The balloons drifted northeast and burst at about 102,000 feet. Due to a problem with the LORAN C antenna during descent, the foxhunters converged on the payloads using DFing techniques while maintaining ground communitations with the Colorado Repeater Association's many fine machines. With the help of visual sightings and the airborne N0MHU DF platform, both payloads were soon recovered some 60 miles from the launch site. A short recap of the flight back at the hotel concluded the symposium activities.

The symposium had brought 55 people together, from 10 states plus Canada, making the symposium an "international" event. Three universities were represented, two balloon manufacturers and a major aerospace company were in attendance. All agreed that the symposium had been a success and all returned home with newfound knowledge and friends.

Next year, the National Balloon Symposium will be hosted by the group in Des Moines, Iowa. Watch for details later this year or in early 1994.

EOSS 14 Coverage

EOSS-14 from the Ground

by Rick von Glahn - N0KKZ

On October 16, 1993 EOSS once again launched our ever faithful Shuttle into the stratosphere. This launch and the ground station operations were at the East Library in Colorado Springs. This site was selected because it was Amateur Radio Day at the library and along with EOSS there were many other amateurs showing off our hobby in its best light.

At 7 am, ground station and launch team members assembled at the library and setup began. The location inside the library was conducive to our ground station requirements (i.e. easy access for all our coax to the outside antenna location). The ground station included a packet radio station to receive payload telemetry, a handi talkie to send commands to the payload, a dual band mobile radio used to maintain contact with the fox hunting field teams and the launch preparations team. An ATV receive setup displayed the video downlink. Linking the groundstation to the payload was our "portable" beam antenna system—a 10-element 2-meter beam for the packet and a 15-element 70 centimeter beam for reception of the ATV video. Mounted on a tripod was a mast equipped with rotors for azimuth and elevation. Of course there was the usual peripherial equipment, power supplies, coax, power strips, and lots of junk boxes filled with all kinds of useless stuff that suddenly will invaluable when that unbreakable connector fails.

Liftoff took place at 10:30 am. Circling above the launch site, Jim Libhart - N0PSQ, was busy videotaping the launch from an airplane piloted by Jon Bergstrom.

Packet telemetry was coming in solid when just a minute or so into the launch we lost LORAN-C lock. This caused a bit of consternation as this is a primary method for determining the location of the payload by latitude and longitude. We reset hoping to overcome the problems. In a few minutes the LORAN-C came alive once again. Although we had those anxious moments at the beginning of the flight, we had few if any problems with the system for the rest of the day.

On the day of the flight the entire nation was participating in the Simulated Emergency Test (SET). This test was recognized by the group as having priority over our activity and so we endeavored to find field communications that would enable us to maintain contact with the fox hunters and they with each other while none of these communications would interfere with any ongoing SET activities. Everything worked out great for the SET folks. We stayed out of their way, but we also had some problems using the repeaters we'd selected. The balloon was on a high speed trajectory to the east and it quickly dragged the field teams beyond reliable coverage of the selected repeaters. The field teams then opted to transfer communications to a repeater located in Genoa, Colorado, a town just east of Limon. For the first half of the flight, the ground station had practically no idea what was happening out in the field. An occasional report was forwarded to us and we would supply tracking information to the vield via the same

relay station but for the most part we were in the dark. Then the SET ended locally and we were given permission to use the 146.970 MHz Pikes Peak repeater. This repeater is located, naturally, atop Pikes Peak at 14,210 feet elevation. So, needless to say, communications with all our teams were fully restored and we once again entered the loop.

While the flight progressed, many folks showed up at the library to see what amateur radio had to offer. They perused the various tables then settle into the middle of the room to stare raptly at our video monitor of the flight. Displayed on the screen were live pictures taken of the earth from over 100,000 feet. A large group of children settled in on the carpet immediatly below the screen and their parents and other adults took up the vigil behind them. Several members of the ground team would describe the current status of the flight. Most notable in these updates was our president, Jack Crabtree, who worked the crowd like a real pro. He would circulate through the throngs listening for and answering any questions he heard. His presense was very welcome as the ground station team did have some payload operations responsiblities.

As mentioned in another article in this edition, we did not have a controlled cut down device active on this flight. We had to wait for the balloon to burst of its own accord. This was a test flight of a new balloon constructed of different materials than we usually have dealt with. We weren't sure how high the balloon would go. The field teams were becoming concerned with the recovery operations. The higher the balloon ascended, the further it would fly to the east thus making the recovery process a longer and more difficult operation. Every few minutes after the balloon flew through 100,000 feet altitude we'd get a desparate call from the field. "Did it blow yet?" After the balloon exceeded 120,000 feet they would ask, "Is it ever going to explode???" The launch and ground teams were as much in the dark about the expected maximum altitude as everyone else. All we could do is relay the balloon's continuing ascent profile to the field teams. Finally at what we estimate was around 145,000 feet altitude the balloon exploded with a dramatic bit of video afforded to the observers at the Ground station. Instead of the usual tearing of the balloon into many strips of material, it seemed to disintegrate into thousands of small bits of material that quickly zoomed off the screen under the fearsome force of that explosion. The ground station quickly relayed the good news to the field teams and a sigh of relief could be sensed if not heard from the confirmation of our reports to them. Ed Boyer, N0MHU, our airborn recovery operator was in the general area and started heading to the estimated location of the landing, while all other members of the field teams still on the chase did the same.

The ground station continued to relay position reports into the field and our audience rapt attention never wavered from the spectacular live video as the payload made its rapid descent into the lower regions of the atmoshpere.

At an altitude of 27,000 feet the balloon set below our eastern horizon and the ground staton lost contact with the payload. Now it was entirely in the competent hands of our field recovery teams.

We dismantled the ground station leaving only our field communications tranceiver operational. After a relativly short time Ed Boyer reported he had acquired the beacon of the payload on the ground. Directions were passed to the members of the ground chase teams and they made their final dash to the site of the downed payload. Naturally it was on private property and so a delay ensued while appropriate permission was received to go out and recover the payload.

Ground Station Flight Statistics

First Packet (just prior to Launch)

Temp In	71 deg F
Temp Out	71 deg F
Temp Aux	71 deg F
Battery	13.8 volts
Altitude	5000 feet
Distance	0 miles
Bearing	39 deg
Speed	.1 mph
Course	155 deg
Latitude	38.915 North
Longitude	104.7635 West
Calculated Speed*	0.00 mph

Max Altitude Packet

Temp In	32
Temp Out	-2
Temp Aux	57
Battery	14
Altitude	145,000 feet (estimated)
Distance	91.57
Bearing	93
Speed	39.5
Course	78
Latitude	38.85717
Longitude	103.0633
Calculated Speed*	43.88

Last Packet Received

Temp In	8
Temp Out	-26
Temp Aux	36
Battery	14
Altitude	27,000
Distance	113.57
Bearing	95
Speed	82.4
Course	114

E.O.S.S. Elections

Elections are coming up next Tuesday, Feb. 8th, at the new meeting place at Hewlett-Packard in Inverness Park. (Directions listed elsewhere.) We have been through the process required by our by-laws and we must vote at this meeting. The candidates for office currently are:

Merle McCaslin K0YUK - President
Mike Doherty KB0JYO - Vice-President
Ted Cline N0RQV - Secretary
Greg DeWit N0JMH - Treasurer

Nominations will be accepted from the floor.

New Meeting Site

Many thanks to DEC for the use of their excellent facilities. We have had to find a new home and Greg Burnett has arranged for the use of the Hewlett-Packard Building at 24 Inverness Place East, Inverness Business Park; Englewood, CO.Feb. 8th, 7:30 p.m.

Directions:
South on I-25 to County LIne Road. Turn left and go east two blocks on County Line Road to the first stoplight. Turn left and go north 300 feet to another stop light. Turn right and go east at that light (you are now on Inverness Drive). Follow Inverness Drive a couple of blocks as it curves to the northeast. Stop at the 4-way stop sign, proceed northeast another block to Inverness Place East. The HP Building is at the Northwest corner of this intersection. Park in the HP parking lot, and enter the side door at the southwest corner of the building (no other doors will be available to you). Talk-in 146.64 or 146.94.

Latitude 38.79667
Longitude 102.6588
Calculated Speed* 85.49

Maximum Readings

Temp In 73
Temp Out 76
Temp Aux 76
Battery 14.2
Altitude 120,000 (max by instrumentation)
Distance 113.57
Bearing 358
Speed 99.9
Course 357
Latitude 38.94683
Longitude 104.8127
Calculated Speed* 234.09

Minimum Readings

Temp In 7
Temp Out -54
Temp Aux -24
Battery 13.8
Altitude 0 (error)
Distance 0.03
Bearing 4
Speed 0.1
Course 0
Latitude 38.74233
Longitude 102.6588
Calculated Speed* 0.0

Average Readings

Temp In 32.97
Temp Out -2.85
Temp Aux 32.13
Battery 14.02
Altitude 63,303
Distance 55.10
Bearing 123.11
Speed 50.57
Course 101.79
Latitude 38.82
Longitude 103.76
Calculated Speed* 62.30

*The Loran C receiver does not calculate speeds greater than 99.9 mph, so the latitude and longitude of each packet is used along with the elapsed time to calculate an estimated speed. Because of timing problems at high speeds this isn't all that accurate. But it does give us a feeling for the speed of the balloon when it exceeds 100 mph. Observing a graph of the speeds using this determination method, I'd estimate that our true maximum speed was between 125 and 150 mph, NOT the 234 mph listed above. That was undoubtedly the result of a timing error.calculate speeds greater than 99.9 mph, so the latitude and longitude of each packet is used along with the elapsed time to calculate an estimated speed. Because of timing problems at high speeds this isn't all that accurate. But it does give us a feeling for the speed of the balloon when it exceeds 100 mph.

Fun Night Out Sat. Feb. 19th

No launch, and no carting of equipment except for photos and the war stories that go with the photos. We meet at Mission Trujillo at Broadway and Ridge Road, 181 Ridge Rd, Littleton. Schnaps at 6:30 and dinner at 7:15 p.m. Talkin will be on the 146.640 MHz repeater. RSVP to Paul Ternlund WB3JZV on the net at 8 p.m. Tuesdays, except 2nd Tuesday meeting night, or, WB3JZV@W0GVT.#NECO.CO.USA, or Filebank. Let's treat ourselves out for a fun evening!

NEW TYPE BALLOON USED FOR EOSS 14

by Merle McCaslin, K0YUK

EOSS has used 1200 gram size rubber balloons manufactured by Kaysam for the majority of our flights. Humble I/II used a larger plastic vented balloon manufactured by Raven. On EOSS 12 a different type of rubber balloon was donated by Atmospheric Instrumentation Research Inc. It was a 2000 gram rubber balloon manufactured in Japan. A first look at this balloon was impressive. The neck of the balloon that is used for filling was much heavier and as the balloon was filled it maintained a spherical shape. This was used on EOSS-12A which had a short flight of 14,000 ft. with the payload attached so we did not get any rate of ascent or altitude data from this balloon.

EOSS was looking for a source for this type of balloon. At the National Balloon Symposium in August Bill Brown flew a small version of the same type which he purchased from Kaymont Consolidated Industries, Inc., New York TEL. (516) 424- 6459.

I believe this balloon is manufactured by Totex in Japan but all of the markings in the package say Kaymont. Here are some excerpts from the manufactures spec. sheet.

Kaymont balloons are manufactured using the "rotation" system. This produces a "jointless" balloon. Body and neck are formed as one piece which gives extra strength. The rotation process also means the balloon is spherical at inflation. The balloon is made from natural rubber compounded with chloroprene. This composition provides excellent resistance to ozone, good expansion under cold conditions and is much more suitable for upper atmospheric observation. Each balloon is inflated and inspected prior to being sealed in a polyethylene bag.

EOSS purchased two of the Kaymont 1200 gram size balloons and one was used on EOSS-14 and it worked well though it did deform some on inflation. We are filling the balloon more than twice the rated capacity. Our normal ascent time to burst is approximately 90 minutes. This one was 105 minutes and it obtained a higher altitude by 15 to 20 thousand feet. We do not have good altitude data at the upper altitudes. With the longer ascent rate and high winds the fox hunters had a long trip. The balloon travelled well over a hundred miles east south east of Colorado Springs and landed south of Cheyenne Wells Co.

The Kaymont balloon performed well on its first use. We will continue to evaluate how it performs on future flights. It is less expensive than the type we have been using.

Listed on the next page are some of the vendor specifications. Some of the data seems to be in conflict with the actual performance. I believe one reason for this is that these balloons are designed for light weight radiosondes. An example is that the Kaymont 2000 and 3000 gram balloons also show a payload of 650 grams but an increase in altitude up to 37.1 (km).

Observations on UHF Direction Finding

by Bob Ragain

During the hunt for EOSS 14, the WB4ETT and N0QGH—harmonic Colleen Ragain—team used the 426.25 MHz video transmitter on 70-cm for direction finding. This is a non-scientific comparison with 2-meter DFing systems.

Hardware used on the 70-cm band was an ICOM 7100 all-mode receiver and a 460 MHz commercial band 6 element Yagi antenna. The antenna wasn't retuned for the ham band. A 10 dB per step attenuator was used in this system to reduce received signal level.

Two 2-meter DFing systems were used for comparison:

1) A Clegg receiver with internal attenuation steps of 30, 60 and 90 dB loss (achieved by turning off DC power to various stages in the

VENDOR SPECIFICATIONS

	Kaymont	KaysamEOSS-14	
Weight (grams)	1200	1200	
Neck Diam	3.0(cm)	25(mm)	
Neck Length	12.0(cm)	125(mm)	
Payload (grams)	650	1250	
Free Lift (grams)	1370	2000	
Nozzle Lift (grams)	2020	(3250)	5332
Gross Lift (grams)	3220	(4450)	6684
Diameter at Release	175(cm)		
Rate of Ascent (m/min)	350	300	
Diameter at Burst (cm)	788		
Bursting Altitude (km)	31.9	33.5	

front end of the receiver).

The antenna was a 4 element Yagi mounted on a mast through the roof of the van. This antenna could not be adjusted for elevation readings during the test.

2) A Kenwood TH215 HT with "DFing converter" to offset the receive frequency from transmit frequency and provide up to 90 dB of variable attenuation. The antenna was another 4 element 2-meter Yagi mounted on a tripod with azimuth and elevation adjustments.

Vertical polarization was used on all antennas.

Signals were acquired at the same time on all three systems. The signals on 2 meters exhibited a characteristic "ground effect" in the first 15 or 20 degrees (estimated) above the horizon. This effect resulted in "mushy" directivity until the balloon was about 20 degrees above the horizon. The performance of the 70-cm DF system was much better within this "ground effect" zone. The bearings became sharper more quickly during the balloon's ascent. The 2-meter signals were useful but not as precise.

The area from where we were DFing was important. This was a rural location with no reflecting surfaces to bounce the 70-cm signal. Some prior DFing events had shown 70 cm to be much more susceptable to reflections from man-made objects.

As the balloon ascended the ease of aiming the 70-cm beam became apparent. Even though this rugged commercial beam is built like a tank it is still much lighter and easier to handle than the 2-meter antenna, even with its two additional elements.

When the balloon was over 30 degrees above the horizon, the fixed elevation 2-meter antenna started giving incorrect readings. This has been demonstrated time after time. Antennas must be elevated toward the balloon to get usable readings. Use of this antenna was discontinued until the balloon was again below 30 degrees from the horizon on descent.

Elevated 2-meter beam vs elevated 70-cm beam:

The 70-cm beam yields more precise (cleaner) bearings than the 2-meter beam. This is probably due to the beamwidth of the 6 element 70-cm beam being much narrower than that of the 4 element 2-meter beam.

The 70-cm beam is easier to handle. Translating beam direction to compass bearings is still the most difficult chore for a hand-held antenna. The tripod mounted 2-meter beam still excelled in ease of translating to compass bearing because you just lock its position, stand back, and take a compass reading.

The team went into the chase mode as the balloon passed overhead. As we drove east we had no way to DF the balloon. It was only a few degrees off of vertical and slightly east of us. We discovered that the 70-cm beam could be held out the window (on the passenger's side!) and pointed UP toward the balloon. Bearings were not plottable due to the very high angle but we knew where the balloon was at all times as we drove.

This is a tremendous advantage that we'll use next time.

As the balloon got ahead of us its angle started to drop. The 70-cm beam was used to compare accuracy of the roof mounted 2-meter beam. When the angle to the balloon was again low enough for the 2-meter beam to regain its accuracy, the 70-cm beam was retired for the day. The remainder of the chase was done on 2 meters as my "70-cm directional arm and elbow" recovered.

Next time?

1) Mount the 70-cm beam on the tripod for fixed DFing!

2) Use the 70-cm beam for "moving" DFing.

3) Continue to DF with 70 cm as we approach the balloon beacon.

Looking back on EOSS 14 I wish I had continued to use 70 cm as we approached the balloon. I don't yet know how it will perform on very weak signals such as when we temporarily lost the 2-meter signals. Maybe the 70-cm signal would have done better???? Let's launch another balloon and find out!

EOSS #14: Another Long Chase

by Marty Griffin WA0GEH

It was "another day in paradise" (Colorado) that stunning October morning as the Edge of Space Sciences (EOSS) tracking and recovery team set out to track and recover EOSS #14. The team had recovered all thirteen previous flights (Boulder Fire Department excluded) yet this flight seemed somewhat ominous.

Jack, AA0P, and the launch crew were launching a new type of balloon and there were some uncertainties regarding the length of the flight. Additionally, there were only five teams (later ten) scheduled for this recovery effort, about half the usual compliment of hunters. Our fearless leader, Greg, K0ELM, succumbed to a stomach virus and missed his first hunt. The plot thickens.....

The launch site was at the East Library in N.E. Colorado Springs. Weather data collected from Mike, KB0JYO, in Denver predicted the flight path was to be at 92 degrees and 87 miles. At 7:30 the tracking and recovery team was rolling toward the recovery area in anticipation for a 10:30 launch.

We thank hot-foot, unsuspecting rookie Mike Lynch who was piloting the field coordinator vehicle and would eventually tally 420 driving miles and help us dissolve 42 gallons of gas! On board were Marty, WA0GEH and Paul,

My sincere apologies for such a late publishing date. I do want to thank all the authors for their timely support. This is really December's information so that is why it is dated for 93. Things are looking better for the first issue for 94 to be on schedule. Thanks for your support.
Ann KA0ZFI Editor-Stratosphere.

WB3JZV who were flinging maps, marking pens and radios.

Because of scheduled Simulated Emergency Tests (SET), the wonderful 146.97 Pikes Peak repeater was not available until late morning. About 1/2 hour before liftoff the field coordinator vehicle astutely exceeded the range of all repeaters and promptly lost communications with all hunters. The plot continues to thicken....

Recovery teams were now on two frequencies and could not communicate with each other. We located a repeater in Genoa on 147.06 and thanks to Buck, W0DGJ, we were able to pull the hunters back together. This situation calls for increased use of HF in future recovery efforts if we plan to go to Kansas and see Toto!

The launch went well and it became clear that the balloon was moving in excess of 60 m.p.h. Successive readings from Larry, K2NA, near Deer Trail on I-70 varied extensively proving this speed. It also came clear after about 40 minutes of flight that the Pumpkin Center predicted touch down was only about half way. Teams were promptly dispatched eastward down highway 94 and 40. The balloon seemed to continue to new heights and lingered longer than anticipated.

About this time the SET was completed and the wide range 146.97 repeater was made available for our use. Whew!

We had the services (thank you) of two aircraft for this mission. Jim, N0PSQ, followed the balloon upward and Ed, N0MHU conducted the search. Dawn Ragain, N0QCW, took to the air with Ed and became his spotter. (Ah, young eyes). Directed into the area by the coordinators, she was quick to spot the parachute in a field about one mile from the road. Having reached such lofty success, our young student may never jostle in the "blue truck" again!

Due to the rapid movement of the team, the payload was located and spotted within 10 minutes of touchdown. More than an hour was spent contacting the land owner. Meanwhile, Ed kept the overhead vigil, burning some serious aviation fuel during that hour. The team walked in and recovered EOSS #14. The plot thinned....

In summary, the flight lasted about 2 hours 24 minutes, traveled 123 miles (our second longest flight). According to Mike Manes, W5VSI, it may have traveled to 147,000 feet (27 miles) which would be a new altitude record.

As recovery team members we need to review our use of frequencies, be prepared to use HF, consider alternate repeaters in our preplanning, and be prepared to deploy further. Bring your ideas to our next recovery team meeting.

Thanks again to our recovery teams members:

Bob, WB4ETT
Larry, K2NA
Colleen, N0QGH
Lonnie, N0PCZ
Dawn, N0QCW
Bill, N0EUL
Dan, N0PUF & KT0F
Tom, N0KSR
Chuck (New Guy), KF0CT
Ed, N0MHU
Mike, KB0JYO
Jim, N0PSQ
Paul, WB3JZV
Marty, WA0GEH
Greg, K0ELM (in spirit)

And to our launch team, thanks for putting up another fun mission.....

NEW RELEASE-DEVICE TEST ABORTED

by Jack Crabtree, AA0P

During the last few days prior to the EOSS-14 flight, the Balloon and Payload teams worked out details of a secondary experiment involving the balloon release device. Unfortunately, the test was aborted just prior to launch.

The release mechanism was much like that already sucessfully flown on previous EOSS flights. An enable signal would be sent to the device mounted at the top of the parachute. When activated, voltage from a lithium battery pack would be applied across a two inch length of Nichrome wire. The wire would heat to red-hot and melt through the nylon cord connecting the parachute to the balloon, thus separating the residual balloon material and cord from the *|parachute. This would (eliminate?)preclude the tangle problem that has been experienced on some previous flights.

This time however, instead of sending a second command to activate the device, that activation would occur by the closing of a weight sensitive switch also mounted between the parachute and the balloon. When the balloon burst as a normal event of the flight, the weight on the switch would diminish, closing the switch and activating the melt-through nichrome wire action. To keep launch dynamics and surface winds turbulance from activating the switch, the enable command was to be sent when the balloon was at a safe altitude, i.e., greater than 60,000 feet. The enable signal to the release device required that a small pair of wires connect the shuttle and the device. This is where the problem occured.

During the launch sequence where the balloon-payload train was raised into the air, stress was put on the wire and it broke. Because this experiment was not critical to the flight and excessive time would be required for repair—putting us out of our FAA window—the decision was made to abort the experiment.

A similar problem also occured with the LORAN C coax during the same launch but because LORAN was considered more critical to the flight and repairs would be much faster, this problem was corrected. The Balloon and Payload teams have renewed their efforts to develop an adequate corrective action to the launch induced wire stress problem. The experiment will be flown again at the next opportunity.

Eduction Never Stops

By Tom Isenberg N0KSR

I should rethink the title and say that my education never stops. We are still learning how to approach schools and get the most out of the students. I tried, for a while, to give the teachers the information needed to make the graphs etc., with the hope that they would have the students prepared on launch day. Trough FAX problems and other communication errors this didn't work well. I've learned that EOSS attention to each project has to be at a higher level, where we meet with the students and get them prepared. I know, extra meetings and time spent in student preparation adds to the already demanding work that EOSS does. That's why education always needs help. We can always use an extra hand.

On November 3rd we met at Cherry Creek High School to put together the starting organization for the NEWS 4 Education Expo project. EOSS attendees for this event included our president, Jack Crabtree AA0P, Paul Ternlund WB3JZV, representing the tech committee, Rick von Glahn N0KKZ for the ground station teams and myself. EOSS along with Cherry Creek High and Thunder Ridge Middle School will organize a booth at the expo. Prior to the Expo we will launch a balloon on Feb. 26 or March 5 at Eagle Crest High School, 5100 S Picadilly, Aurora. The students will be showing their graphs and explaining the results of their experiments to the people visiting our booth. WOW! What a fun reason to learn.

The students will be working with EOSS at two levels. One level will include the experiments, the graphs, and the plotting and the lesson plans the teachers will put together so the students can learn about the lower atmosphere. This will be done in a classroom. The second level will include students working with EOSS in the organization of the project. This will be done by a few students for extra credit.

EOSS has 5 committees that need help.

1).Public Relations:
Work with sponsor
Make video for NEWS 4 air time
Keep NEWS 4 informed about our project
Develop a three day plan for booth presentation
Investigate cost

2). Logistics (Rick Von Glahn N0KKZ)

Decide launch site
Work out antenna locations at expo site
Select booth location
Possibly work out remote feeds with NEWS 4

3). Technical
Work with Cherry Creek High on their experiment

4). Foxhunting
Set up student participation for launch day

5). Plotting and Graphs (Tom Isenberg N0KSR)
Work with the Middle School
Students will team with the EOSS member who leads each committee.

There is much work ahead of us to make this project the best ever. Immediate help is required in the PR and Logistics areas. Please contact me with your input.

Tom Isenberg N0KSR
(303) 620-2452 Office
(303) 680-6511 Home

(Internet)
tom.isenberg@filebank.com
Filebank BBS EOSS SIG (534-4646)

N0KKZ-1 (packet) 146.640 (2 meter)

There were no launches through Oct. I was hoping the Air Force Academy launch would come through, but it didn't.

Let's all pitch in on the NEWS 4 Expo project and show the world how good EOSS is at ballooning with students. Education never stops.

WHAT I KNOW, I CAN TEACH.

Ground Station Recruits

by Rick von Glahn, N0KKZ

Edge of Space Sciences is now recruiting additional personnel for the ground station. Some, but NOT all positions require an amateur radio licence. Look over the following list over and see if there's a job that you would enjoy participating in.

Responsibilites and Job Openings for these positions include:

Storage Locations

Storing various components of the ground station at your home QTH (radios, computers, antennas, rotors and all the various parts that comprise a ground station).

Transportation

Moving the ground station components to the launch site and back to their storage locations.

Documentation

A videographer and photographer (two people) to capture events at the launch site for use in EOSS publications and video tapes. (You supply the camcorder or camera). See your work become part of the growing Edge of Space Sciences archives.

Checklist Manager

We have a checklist we use prior to each launch to ensure that all tasks have been accomplished prior to launch. Your responsibility, keep the launch director informed the status of the checklist's completion status by canvassing each team concerning their readiness. Once the payload lifts off the responsibilities for this position end. (Amateur Radio Licence helpful but not required)

Range Safety Officer

Maintains saftey at the launch site, has veto power on launch - acts as a backup to the Checklist Manager and looks out for the items the launch preperation team and the ground crew miss - can help expand the checklist. After launch this position responsibility ends. (Amateur Radio Licence required)

Setup of the Ground station

We usually use ALL of the ground station personnel for this task because there are so few of us. However, if we get the volunteers we need, we would like to exempt the Checklist/Log manager, Field Communications, FAA liason, Documentation team as well as Launch Site Intercom from this task to ensure seamless communications with the various remote groups.

Launch Site Intercom

Two stations to handle simplex communications between the Ground Station and the Launch and Payload teams at the launch site. After launch this position's responsibility ends. (Amateur Radio Licence required)

Field Communications

Needs to establish and maintain communications with the field teams from preflight through recovery of the pay load. This also involves receiving the predicted touch down point for the plotting teams. During the flight LORAN-C tracking information is passed to the field teams, while collecting RDF plots and generally maintain contact with the field supplying them with any information they require until the recovery. Major traffic handling skills will be needed or LEARNED. (Amateur Radio Licence required)

Local Information Net

Maintain a net on a local repeater to disseminate information on the flight's progress and answer questions from interested parties thus freeing the field communications frequencies of traffic congestion. This position could be filled by a roamer with an HT and either access to local repeater or perhaps a link via a remote base dualbander. The operator must keep abreast of the current flight status and be aware of EOSS PR materials for the launch. (Amateur Radio Licence required)

HF Information Net

Operate an HF net supplying flight information to stations outside of the local area. This station must be well clear of ground station to avoid EMI. It could be a home based station with a link to ground station site via the local info net. The operator must keep abreast of the current flight status and be aware of EOSS PR materials for the launch. (Amateur Radio Licence required)

Mission Control Team

Man the ground station. Control the payload's various systems and experiments. Do ATV camera sweeps, issue the PR packet message periodically, watch telemetry for anomalies, reset LORAN-C, issue release commands, warm the ATV servo. (Amateur Radio Licence required)

FAA Liason

Maintain contact with the local FAA representativess advising them of the progress of the flight.

Mission Log Manager

After launch your task will ONLY be to keep logs of all communications with the payload, field teams and FAA. The communications themselves will be carried out by the appropriate team member. (Amateur Radio Licence helpful but not required)

Course Plotting

The position and progress of the payload are of GREAT interest to the spectators of each launch. Once the payload is out of sight, spectators flock to the ground station and watch the ATV video downlink. The most common question asked, "Where is it!" A full time plotting team, not encumbered by any other responsibilities, can keep an accurate track of the progress of the flight thereby fullfilling this requirement.

Student Plotting

A secondary plotting team that involves local student groups in course and telemetry plotting.

Tear down

Pack up the equipment for return to its storage location.

As an enticement, if you volunteer for BOTH the storage and transportation of EOSS equipment you can use the stuff between flights: antennas, packet station, computer, 50W power amplifier, ATV downconverter — of course you must keep it in good operating condition.

Currently ALL of the above positions are filled by three or four people at each flight. This makes for spotty communications, and a harried group of hardy souls. Having dedicated people for each task will reduce the individual work load and ensure a higher level of "professional" performance at each station.

Things get overlooked and mistakes happen when things don't go smoothly and we go into overload. The success of each flight hinges critically on hundreds of details. EOSS needs YOU!

Participation in these activities is NOT limited to EOSS membership and you don't necessarily have to have an amateur radio operator's licence. While we would like all folks involved in our activities to join the group as a paying member, it's not a requirement. We are open to all individuals.

Amateur Radio Emergency Services (ARES) groups, please note from the position descriptions, the complexity of our operations. They provide an EXCELLENT opportunity for exercising communications and net skills commonly used during actual emergency operations.

Most new folks won't have much experience with our operations. Don't worry about this. New team members will receive any training they require.

If you wish to participate in any of these activities contact me: N0KKZ at

303-751-4215 or N0KKZ-1 PBBS on 145.070 in the Denver area.

Or, contact me on the EOSS on the air net on Tuesday night at 8:00 pm on the 147.225 CRA repeater connections which cover much of the Colorado front range.

THE CASE FOR GPS

by Jack Crabtree

The last several EOSS flights we have been experimenting with the use of LORAN C. Not only did it provide additional insurance for the recovery of our payloads, but it significantly increased our ability to do real science with our projects. Wind speed, direction, position vs time were real additions to our telemetry capability, so much so that we will continue to depend on this information for upcoming projects. However, this capability has not been as reliable as we like.

I believe we can do better. The LORAN C receiver has proven to be quite sensitive but susceptible to electrical noise. During prelaunch checkout, it is necessary to turn off our checkout terminal and most often our ground power supply. Unexplained losses of lock are often experienced, usually in those last hectic moments before launch. We also experience losses of lock during the flight. Depending on how LORAN C locks up, the position data can be over two miles in error. To keep noise out of our preamp we had to separate the preamp from the Shuttle by ten feet. We have broken the preamp coax at least twice during launch and the antenna wire itself has broken twice during flights.

As part of our evolving Shuttle development, I think it is time to seriously consider GPS as a replacement to LORAN C. We have some testing yet to do but it appears GPS is much less susceptible to noise. The antenna is significantly smaller and simpler. The data itself should be much more accurate now that a full GPS constellation is in orbit. Accuracy is specified at 15 to 50 meters depending on the government induced selective availablity (error). And, we will get altitude! Our current barometric pressure sensor altimeter has done an excellent job. But due to the very minute pressure above 100,000 feet, our measurement error increases very rapidly. Measurements at or above 120,000 feet are almost impossible. GPS will correct this, the altitude measurement accuracy is the same as the position accuracy stated above. GPS is the right choice.

GPS board receivers are now less than $400.00. I have been surveying the industry and I believe it is time for us to make this move. Will our LORAN C receiver be wasted? I think not. We can repackage it into the original housing and provide it to the Tracking and Recovery team's chase vehicle for use during recovery operations. During the next month or so I will complete my industry survey, and conduct interference testing using GPS receivers available on loan. At the December EOSS meeting, I intend to formalize my proposal for the purchase and integration of a GPS receiver into our system. I invite your opinions and comments.

ed note: The membership voted for the addition of GPS capability. We now have a 5 channel magellan gps receiver and are planning integration with Controller Two (second generation computer control system).

Microwave DFing

Mike Manes, W5VSI

The EOSS Lost & Found Department has posted a flawless record of tracking and recovering the payloads from all 14 flights. For the most part, these champion bloodhounds have used 2-meter frequencies to track the balloon in flight and to pinpoint its landing. During EOSS 14, some of the team tried DFing the 426 MHz Amateuer Television, ATV, signal with favorable results. Why change a good thing? Perhaps the following information will shed a bit of light on this issue.

Many of you have seen Paul Ternlund's computer-generated tracking reports which show how rarely a reported bearing falls directly through the balloon's position. Bearing errors can be caused by a number of things.

Foremost is the fact that 2-meter beam antennas small enough to carry into the field have fairly broad gain patterns; that is changing the antenna compass heading or azimuth angle just a few degrees off of dead on the balloon beacon usually won't yield a detectable change in signal strength. An experienced DFer with a well-calibrated beam probably is reluctant to claim any better than 5 degrees bearing accuracy. Although this seems pretty accurate, a 5 degree error at a range of 30 miles will miss the balloon by 2.5 miles.

Another phenomenon called multipath can cause the signal to peak in a direction significantly different from a true line-of-sight to the beacon. Multipath occurs when the beacon signal reaches the tracking station over more than one path. One of these is usually the direct line-of-sight path, while the other(s) are bounced off large objects such as mountains, power lines and airplanes. Although the indirect signal path is usually weaker than the direct path, its effect is to cause the signal to peak somewhere between the beacon and the reflecting object. This is especially true if the angle between two paths at the tracking site is small enough that both signals are "heard" by the tracking antenna. A tracking station out on the eastern plains of Colorado may report a bearing between the balloon to his northwest and the front range mountains due west.

Another source of error occurs when

the signal arrives from a high elevation angle at the tracking site with a beam aimed at the horizon. The directional characteristics of beams become pretty muddy under these circumstances, and its likely that the antenna will hear a reflected signal from a terrestrial reflector more strongly than the direct signal. Some, but not all, tracking stations can adjust both the azimuth and elevation of their antennas. Rigging a 4-element 2-meter quad with a mobile az-el mount is no mean feat, and can create certain difficulties in the presence of low, overhanging branches.

All of the foregoing problems can be reduced, if not eliminated, by using a highly directional antenna, that is one that exhibits a noticeable drop in signal strength with small changes in pointing-angle away from line-of-sight. Obviously this allows the antenna to be aimed along the direct path quite accurately. Not so obvious is the ability to reject even small-angle multipath signals; in fact, a sharp beam can even distinguish beween the two or more paths, allowing selection of the true path as that with the strongest signal.

So why not simply build more directive 2-meter tracking antennas? Well, at a given frequency, directivity and gain usually go hand in hand, which is OK. But gain and physical size also increase together. High gain quads and yagis are characterized by their large director count and long boom length. The bottom line is that a 2-meter beam with significantly better directivity than those now in use in the field would be too large to carry into the field, much less mobile. Witness the 17-element monster used at the EOSS ground station!

There's another maxim which works in our favor, however. That is that the physical size of an antenna of given directivity varies directly with wavelength. In other words, you can install three times as many directors on a given length boom at 432 MHz than you can at 144 MHz, and significantly improve directivity. And the elements are only 1/3 the length, to boot.

So the folks who were tracking the 70-cm ATV signal were hoping to enjoy the benfits of a reasonably-sized highly-directional antenna. From what I've heard, they weren't disappointed. Aren't you glad you read this far?

Now, if tripling the frequency is good, won't going higher be even better? Well, the answer's yes, sort of. True, moving higher will give us smaller and more highly directional antennas with the attendant improvements in bearing determination. But as frequency rises, receiver sensitivity drops, and so does transmitter efficiency. It's also possible to have TOO MUCH directivity. If you can't even hear the beacon unless you're pointed directly at it, you may never find a signal to track. And of course, the balloon must be transmitting on the frequency your sooper-de-dooper radio telescope listens to. But the picture isn't really all that grim.

Let's suppose we went up REALLY high in frequency, to 10 GHz; that's 10,000 MHz, folks. This is 70 times 144 MHz, and the wavelength is about 3 cm, or a bit over one inch. And it's one edge of a 500 MHz wide ham band! You could fit ALL of the lower-frequency ham bands side by side in there and still have room left over, but that's not the point. Instead, let's look at the hardware used there.

Although one could build a monster 10 GHz yagi on a six-foot boom, you'd need watchmaker's skills to assemble it, and the boom diameter would be so small, like 1/16th of an inch, that you'd never get it off the bench intact. For such reasons, antennas for 10 GHz look different from those used on UHF and down. Horns and dishes sized for 3 cm, which are impractically huge on 2 meters, easily fit in a car seat. A 17 db gain horn, for example, has a major dimension of less than 4 inches, and fits nicely in the palm of your hand. To get this gain on 2 meters, you'd need a pair of 15-element yagis with 22-foot booms stacked 6 feet apart! Try mobile az-el tracking with that! Then think about using a light-duty photographic tripod or simply pointing with your hand to do the same job at 10 GHz.

Another point to be considered is that you really don't need all that much gain to track a 1-watt 2-meter beacon in flight; you just need directivity. Some of the trackers even crank-in attenuation to get a usable S-meter response. If the beacon power were cut 20 db, to 10 mW, it would still be trackable even with a small 7 db, three-(?)element beam. (Not on the ground, however, so don't fret that this is some perverse weight saving scheme!)

What I'm suggesting is that a 10 mW 10 Ghz beacon should be every bit as trackable in flight using a 17 db horn and a 10 db noise figure (i.e. stone deaf per modern VHF standards) receiver. These performance parameters are right in line with commonly available amateur 10 GHz gear. And you get superior pointing accuracy and field/mobile portabilty in the bargain.

Some folks may think that microwave technology is a black art weilded only by the Exhaulted High Propheads of Ham Radio. Despite that some may wish that image preserved, don't believe it for a second. Radio waves are radio waves. The hardware that we use to manipulate them is chosen more for convenience than anything else, as the previous example illustrates.

You might also be surprised to learn that common amateur 10 GHz gear is both simpler and cheaper than we are accustomed to using on HF and VHF. No kidding. True, one can go overboard and build up a 20 watt SSB rig with a 1 db noise figure front end mounted on a 30 foot dish. You'll need such a rig for moonbounce, but it's overkill for the fun stuff we're talking about.

Low cost 10 GHz gear typically performs to standards far below that required on the more crowded bands. Transmitters are simply modulated oscillators which drift with temperature and supply voltage over many MHz. With 500 MHz to roam in, who cares? The transmitters are usually no more than a cavity resonator (hollow box) with a Gunn

EOSS TO GO METRIC?

by Jack Crabtree, AA0P

Is it time for EOSS to go metric? I believe we should consider this and if there is consensus, convert over with the development of Shuttle II. I have mixed thoughts on this subject myself but it seems that metric is indeed the standard for both science and education and isn't that what we do? What do you think?

diode running through it; feed 6 or 8 volts DC to the diode, and you're on the air with 10 to 100 mW. Tweak the DC supply voltage over a 1 volt range with a pot to supply electronic tuning. Add a little audio to the Gunn supply voltage, like putting a carbon mike in series with the DC supply, and voila! FM!

Receivers typically have no front end gain. Received RF is fed directly to a single diode mixer which is pumped with some spare change output from the transmitter. Feed the ungrounded mixer diode terminal to a broadcast FM receiver, and now you can hear. The FM receiver serves as an IF strip, providing all of the receiver's gain and selectivity. Your 10 GHz receive frequency will be that of the transmitter (local oscillator) +/- the frequency your "IF strip" is tuned to.

The configuation described so far is known as a Gunnplexer. And it plays. I've worked over 150 miles using a 10 mW Gunnplexer; of course the 30 db dish antenna and line-of-sight path sure helped! One peculiarity of 10 GHz propagation is that it travels like light. A good sized tree in the path will eat your signal for lunch. So a 10 GHz beacon is clearly useless for locating a payload on the ground; by the time you hear it, you most likely can see it!

Since ordinary coax makes a great attenuator at 10 GHz, transmission lines usually take the form of hollow rectangular tubing, called waveguide. This "mysterious" stuff is really not much more than a fancy form of twin lead. New commercial waveguide prices will bring tears to your eyes, but it's plentiful on the surplus market. You rarely need more than a few feet, since the RF head is small enough to mount right onto the antenna. One-inch copper water pipe from the hardware store makes a perfectly good circular waveguide. A 17 db horn can be built from scraps of PC board stock. A kid's (alu)snow disk makes a fair-to-middling parabolic reflector, and the dish feed can be a quarter soldered on to the end of a piece of waveguide with a couple of slots filed on it.

For those who want to get on the air quickly, first class and with no hassle or homebrewing, ARR sells a full-up 10 GHz gunnplexer-based transceiver for $500; just hook up 12 Vdc, a mike and headphones. If you don't mind a bit of sweat, you can find surplus 10.525 GHz Gunnplexer heads for as little as $15. A little tweak on the cavity tuning screw brings it right into the ham band. These units were mass-produced for the intrusion alarm market before folks got weary of false alarms triggered by cars going down the street and drapes blowing in the wind. Build a simple 8V adjustable dc regulator fed from 12 V battery, add a horn, a wideband FM IF strip and some simple audio circuitry, and that's it. It won't perform like the ARR and it's harder to operate, but you're many bucks ahead.

ARR advertises in the ham rags. Gary Krancher WB1AUA sells 10 mW surplus gunn heads for $15 and horn antenna kits for less than a dollar per db. His address is:

1502 Old North Colony Road Meriden,
CT 06450
(203) 634-3006

I have his free catalog but haven't ordered anything from him yet, so I can't attest to his quality or service. But his are the best prices I've found anywhere.

A notable downside of Gunnplexer gear is frequency stablity. You don't just dial up a frequency and expect to hear the other guy. As the cavity temperature rises, the oscillator frequency drops at a rate of about 300 KHz per degree C. This is the primary reason that wideband receivers are used with these rigs; keeping a signal in a 15 KHz bandpass is a tough chore. The ARR rigs have very effective AFC to keep you locked on once you've found the signal, but you've still got to find it at the outset, and find it again if the signal drops. Before going out to play 10 Ghz with a friend, it's a good plan to "net up" at close range so each of you knows the approximate tuning voltage where you can find the other guy. If you have a highly directional antenna, it must be aimed approximately right so you can hear the signal while you're tuning for it.

Frequency drift may be a real problem in tracking a balloon. The *\bballoon beacon will experience some wide temperature swings, so your tuning voltage will probably have to change quite a bit over the course of the flight. Reading the packet temperature telemetry may help in this regard. Next, you can probably get your antenna aimed close enough to hear the beacon with the aid of a 2-meter or 70-cm beam. Once you've tuned in the 10 GHz signal, you can peak it and read the bearing off to the degree with confidence.

Your choice of antenna can affect the accuracy of your bearing determination. A 17-db-horn has a 3 db (1 S-unit) beamwidth of +/- 11 degrees. You may have to do some swinging to find the center of the peak, but you also won't have much trouble hearing the beacon while tuning for it. An 18" dish yields about 31 db gain and a +/- 3 degree beam at 50% illumination efficiency. The extra gain will more than quadruple your range and improve your bearing accuracy, but finding the beacon will be tougher. If you choose a dish, however, there's another trick you can put in your bag: you get max gain only when the phase center of the feed is right on the dish focal point. Moving the feed in or out will "defocus" the antenna, yielding lower gain and a wider beam. If you're not hurting for signal strength, then you can tune for the beacon while defocussed, then slide the feed to the focal point to take a final bearing.

While 10GHz DFing will never replace "DC-band" hunting, especially for the final recovery phase, properly equipped microwave tracking stations are very likely to produce tightly converging plots during the flight which can be at least as accurate as on-board navigation receivers. Although some of the lower-frequency microwave ham bands may yield greater range with equivalent results, an effective 10 GHz tracking receiver won't deplete your ham gear budget nearly as quicky.

OUR FIRST FLIGHT, EOSS (WVN) - 1

by Jack Crabtree, AA0P

Can you believe it? In just under three years we have managed to conduct 14 flights. While I hope this is just the beginning for EOSS, I think it is also important to know our roots. This is a summary of how EOSS came about and our first flight.

Dave Clingerman, W6OAL and myself were driving back to Littleton from Boulder where we had helped to kick off the Deep Space Network dish project on Table Mountain. We got talking that it would be a great project but would probably take several years to rebuild the dishes and put them into service. We wanted a project that would not take so long and one that could involve student participation. All of a sudden Bill Brown, WB8ELK, and his balloons came to mind. Both of us thought balloons would be great and why not put a project together?

We approached the local ATV group, Western Vision Network (WVN), to which we belonged and found lots of support. Thus EOSS-1 was born. We scrounged a balloon and helium from Atmospheric Instrumentation Research (AIR). Ken Zawarski, WB9QDC from AIR loaned us a barometer circuit that would interface with the sound subcarrier of the TV. We borrowed a TV camera and ID board from Bill Brown. Bob, WB4ETT loaned us the 147.555 MHz 2-meter beacon. A scant five weeks after Dave's and my ride home, we planned our first balloon flight to be launched from Clement Park.

We had assembled quite a team in so short a time, many of which I am proud to say still participate in EOSS flights. Dave, W6OAL had almost singlehandedly, constructed the payload package. Lessons learned from Dave's first payload still are a part of each EOSS flight today. Merle McCaslin, K0YUK, was yes, Mr. Balloon and Gas. Rick von Glahn, N0KKZ, was our first tracking and recovery lead and enlisted the help of a growing local fox hunting team. I put the ground station together. Eileen Armagost, WD0DGN, was the 40M and 2M net control central and with some help did quite a job trying to manage this first net.

Four days before our scheduled flight, I ended up in the hospital with a kidney stone. I was gonna miss the balloon flight! Somehow, the day before the flight, I recovered enough to come home as long as I took it easy. Easy for them to say!

Early Saturday morning, November 18, 1990, a crew like no other converged near Southwest Plaza in Robert Clement Park. Antennas were put up, radios and power supplies hooked up, TV monitors were placed where hopefully live pictures from the edge of space would soon be viewed. Quite a crowd had started to assemble.

The balloon was removed from its packing, stretched out on a table and soon the hiss of the gas was heard as the balloon started to fill. It was a clear and sunny day.

At 9:30 A.M., we walked the balloon and payload out into the soccer field. I can still remember the excitement as Merle released the balloon. All of our predictions said the balloon would go east but when we released it, west it went. In a few minutes, the balloon did start east and unlike today, the fox hunters went after it from the launch site.

The video was great! After a few minutes, we could see almost the entire city. We used the call of Tim, WB0TUB, and the color ID board video was magnificent. At approximately 93,000 feet the balloon burst, and as the payload tilted over on its side, we saw the curvature of the earth. Recovering the balloon would be our next challenge.

Thanks to Vince Lawrence, N0UA and his airplane, the weak 10 meter beacon was eventually heard and soon the ground fox hunting team recovered the payload. It had traveled 132 miles east of the launch site. Bob Ragain, WB4ETT, Greg Burnett, K0ELM and Ed Boyer, N0MHU, were among the first at the scene and to this day play important roles in each flight.

We learned a lot, what to do and what not to do. The learning continues with each flight. If it didn't, I don't think it would be quite as much fun. The hatbox like payload, with its American flag rudder was taken apart and eventually rebuilt for the next flight but it had a grand flight that day.

In January 1991, EOSS became a separate organization from Western Vision Network. Many WVN (now Colorado radio Amateur Television League) members still participate and I'm glad to say the fox hunters are still with us. We haven't kept all of our members, we lose and gain a few with each new project. From the looks of the crowd at EOSS-14 and the last couple of hamfest tables, it seems EOSS is still exciting. We've come a long way, but I hope, we've got a longer way to go.

Send us an Article

by Rick von Glahn N0KKZ

The EOSS Stratosphere is always looking for good articles. You wouldn't believe how difficult it is to collect enough material to publish a quarterly newsletter. So EOSS would like to extend an invitation.

I'd like to call on our far flung membership to assist us in collecting interesting articles. Our membership extends from both coasts of North America and up into Canada. Doubtless there are dozens of interesting topics that are discussed by folks who deal with the various geographic anamolies they have in their areas. If you know of anyone in your area who wants to submit to the Stratosphere, please encourage them to do so. They need not be members to be published. All the Stratosphere editorial guide requires is that the material be germane to the art of high altitude ballooning.

Authors don't have to come up with a voluminous article to be accepted for publication. You'll notice that we often have short, interesting and pertaint blurbs in our newsletter. In this issue there is one article under 400 characters in length. It's interesting and pertainent to the group so, it is being published. If you have something of importance, brief though it may be, SUBMIT!!

The Stratosphere editors prefer that you submit your article in some IBM-PC compatible computer readible format. ASCII text files are the best for us as we send all articles into PageMaker for layout. However, we can accept AMI-Pro, Word Perfect, WordStar, Microsoft Word (Windows or DOS) and possibly several other wordprocessor formats. I'd like to point out here that each of the above programs makes an ascii export available. And to save you time and energy upfront, remember, any fancy fonts, or other text layout designs you incorporate in your article will be stripped to allow for import into our newsletter format.

We will also accept computerized image files in accompaniement to your article. If you have graphs, or other artwork in your article, include that artwork as a separate file in your submission. We prefer image files be bit mapped images. If you are using a CAD program see if it has a PCX, BMP, TIFF or other similar output capability. It's usually quite time consuming to convert a plotter file to a graphic file and you can save us some time by having your CAD program do this on your end.

And finally, if you have more than one

file to submit use an archive program like PKZIP to squeeze them down in size and combine all the separate elements into one convenient file.

Submission of articles in plain ASCII text via modem to the Filebank BBS in Denver Colorado is the most desirable path. We get your article instantly, in electronic form, and can most easily deal with any editing and layout problems. There are two ways to get your article to the Filebank.

You can call direct at 303-534-4646. On your first call you will be issued guest user status. If you are a member of EOSS you can drop the SYSOP an note and he will upgrade your membership on the BBS to a super-guest. You'll be admitted to more areas of the system, most notably the EOSS SIG's download area, and you'll get more user time for any future calls once your upgrade is processed. Brian, the sysop, checks your sign on name with the current EOSS roster, uploaded once a month, and once he verifies your info he will make the upgrade. REGARDLESS of your status, all users of the Filebank are given local E-Mail privledges. Use that E-mail to send your article to Ann Trudeau. An E-Mail message is limited to 9,999 characters. If your article exceeds this limit, you can attach it to your message as a file. First you begin to send an e-mail. Tell Ann you're enclosing an article. Then when you go to the save process for that message you'll be presented with a typical menu of options like save, abort, edit etc. One of the options will be to enclose a file with the message. Select this option and the system will prompt you for a file name, an upload protocol and then ask you to begin your upload. Just follow the prompts and your article is on it's way.

The second way to contact the Filebank BBS is to use internet. Send your article to Ann.Trudeau@filebank.com. The filebank still has that 9,999 character message limit, but if your article is longer than that, the filebank will split it up into multiple messages so we should get it all.

Another way to get materials in for submission would be to use my Compuserve address. My CIS account number is 74620,637. You can send me text files as email messages or send your article as a binary email to that address. CIS also accepts internet mail, so if you're an internet user and wish to use this path of submission send your article to 74620.637@compuserve.com. Please NOTE that the normal comma in a CIS user id is replaced by a period in the internet address.

The Stratosphere currently has access to an HP Scanjet IIc color scanner. So, if you have any artwork you wish to appear with your article, graphs, schematics, photos etc., send them vis USPS to Ann Trudeau. Her address is on the masthead of the newsletter. Materials will be kept unless a stamped return envelop is supplied to get them back to you.

On behalf of the editorial staff I'd like to thank you in advance for all the forth coming articles I know you'll all be forwarding to the group for publication.

Edge of Space Sciences, Inc.
376 W. Caley Circle
Littleton, Colorado 80120

SEE INSIDE!!!!

NEW MEETING SITE
ELECTIONS
FEB. FUN NIGHT OUT
EXPO 4 LAUNCH