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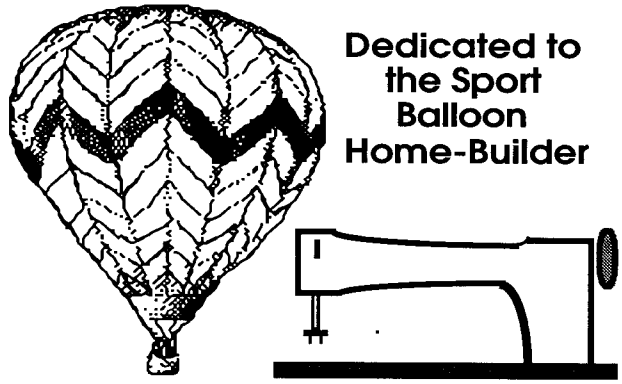

Dedicated to the Sport Balloon Home-Builder

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THE BALLOON BUILDERS' JOURNAL

July-August 1997

In This Issue

Page 2: A Good Time in Vermont

The *BBJ* editor flew to Vermont to participate in the Fourth EBAA Experimental Balloon Meet. This issue of *BBJ* emphasizes photos of some interesting ideas found at this meet:

- Read about a radio controlled blimp, and **Brian Boland's** efforts to create a new envelope out of old.
- **Jack and Carol Klein** came all the way from Alaska, bringing with them some interesting balloon construction.
- See details of **Phil MacNutt's** little hang balloon.
- **Mike Emich** has some new ideas to augment the Boland basket.
- **John Burk** has been building balloons for a number of years, and employs some different techniques in his construction.

Page 10: Letters to the Editor and Other Bits

Craig Kennedy is building a basket from Polyethylene commonly used in radiant floor heating. **Dave Koenig** comments on the status of his hang balloon. We discuss the concept of 'drop' as it applies to the cable system in the mouth of an envelope. **Woodcraft** is a company that can supply Finnish birch plywood for basket floors. **Ken Kennedy** follows up on his upright system which was recently reported in *BBJ*.

Cable Length Calculations

If you are using the method described in Issue #5 of *BBJ* to calculate your envelope to basket cable lengths, read page 11. What we have learned suggests that cables should be made longer than calculated using the Smalley Factors.

Reader Surveys

At Vermont, we had some discussion about the nature of amateur balloon building today.

Almost 200 persons subscribe to *BBJ* with about 10% of those readers residing outside of the United States.

There is interest in knowing more about readers. We are considering development of reader surveys to examine reader interest, and history.

If you have suggestions for a reader survey, mail or e-mail your ideas to the editor.

A Good Time at Vermont

By Bob LeDoux, Editor

2895 Brandi Lane, Jefferson, OR 97352

The long flight from Oregon to the Vermont Experimental Balloon Meet was well worth the effort and expense. Share with me some of my experiences from this interesting weekend.

Introduction

Brian Boland hosted the Fourth Annual Experimental Balloon And Airship (EBAA) meet, May 16-18, at the Post Mills Airport, in Post Mills Vermont. I counted at least 18 different balloons participating, and one radio-controlled helium blimp.

Among other interesting activities was a quick-build envelope project which took place during the weekend. The result was an envelope of unique shape which was affectionately known as *Cone-Head*.

Mother nature was not on her best behavior. Cold Arctic air mixed with a moist tropical airmass to create a very unstable weather picture all the way from the plains states into New England. Nevertheless, weather cleared to allow two days of flying, Friday and Sunday.

Friday saw 6 balloons take to the air, with a number of other creations tethering. Sunday was the best day when I counted 18 balloons in flight. Saturday morning and all afternoon flights were winded or rained out.

Brian made his very nice facilities available to all comers. Participants could park their campers on the airport free of charge. The rental cabins along the side of the airport had been quickly taken up.

A number of pilots chose hanger facilities in which to 'rough it.'. Phil MacNutt, from Austin, Texas was one of these. Phil flew to Vermont with his camping gear and a light weight balloon system. A very understanding airline put up with a total of some 275 pounds for his equipment.

As has become a tradition, Saturday and Sunday morning saw an all-you-can-eat ham and pancake breakfast served with real Vermont maple syrup. In spite of the chilly weather, on Saturday, this was a popular event, with the feed continuing until about the noon hour. The warmer weather on Sunday led to an even bigger turnout.

Brian has a big commitment to the Post Mills Airport. Take a look at his new museum building (photo on top of page 3). This two story structure, built in classic New England style, is 40 feet wide and 200 feet long. There is no difficulty stretching out 6 full size envelopes within the confines of the fully open second story. The wide expanse of window also makes for a well-lit interior.

The first story, with its carriage house style doors, was made available to visitors for storing balloon systems away from mother nature's fickle delights.

Enough of this–on to technical matters.

Figure 1: Brian Boland's new museum building at Post Mills Airport

Figure 2: This two-day building project, affectionately called *Conehead* was reconstructed from an old envelope. The envelope was cut apart. The panels were turned around to put, what had originally been the fabric at the bottom of the envelope, up at the top.

Radio Control Blimp

A builder from Manhattan, Paris von Hershon is in his fifth generation attempt to create a controllable radio controlled blimp. It can be seen flying among the inflated balloons on page 2. His intent is to continue development in an effort to construct a person-carrying aircraft along the lines of those of early 20th century aeronaut, Brazilian coffee baron, Santos Dumont.

This little blimp was impressive. With two high power battery powered motors it was able to maintain position in winds that were challenging for balloons. The propellers were mounted with some down thrust which helped to provide control. The large rudder area provided positive directional control.

The Resurrected Envelope

Brian always seems to have a special project underway during these annual flyouts. This year, his intent was to create a new envelope from a no longer airworthy aircraft.

His concept is premised on the fact that the fabric in the top of an envelope tends to 'go bad' while the bottom remains in good and sometimes 'like new' condition. Therefore, the old envelope is cut apart and the gores are turned around and recut, placing, what had been the bottom fabric at the top of the new construction.

The first effort, seen in figure 2, clearly shows the shape of the old envelope mouth in the top of the new construction. This concept appears to have merit. It should be possible to create a traditional shape, albeit, somewhat smaller envelope utilizing this concept. Look for more about this concept in future issues of *BBJ*.

Jack and Carol Klein from Alaska

Jack and Carol were one of two couples which had made the long trek from Alaska. Both Alaskan balloons had incorporated nylon uprights into the Boland basket. Because of the photo opportunity provided by Jack and Carol, I am providing some details of their basket design.

The top picture on page 4 shows the burner load ring. The ring was constructed from stainless steel tubing in a professional manner. Within the larger frame, a structure of smaller diameter tube was constructed to provide triangular mounts for the Balloon Works T3-017 burner. The finished structure provided good support to the burner. While I did not have a chance to check the load ring for weight, it appeared substantial in its strength.

The tubes which mount the nylon rods on the top end are heavy wall stainless steel. (Also note the photo below.) Jack employed a thick piece of stainless plate to make the carabiner attachment. It is about $^{3}/_{16}$" thick. This plate also serves to provide extra stiffening to the upright support tube. I was particularly sensitive to the thickness of the metal stock he used for his carabiner mounts.

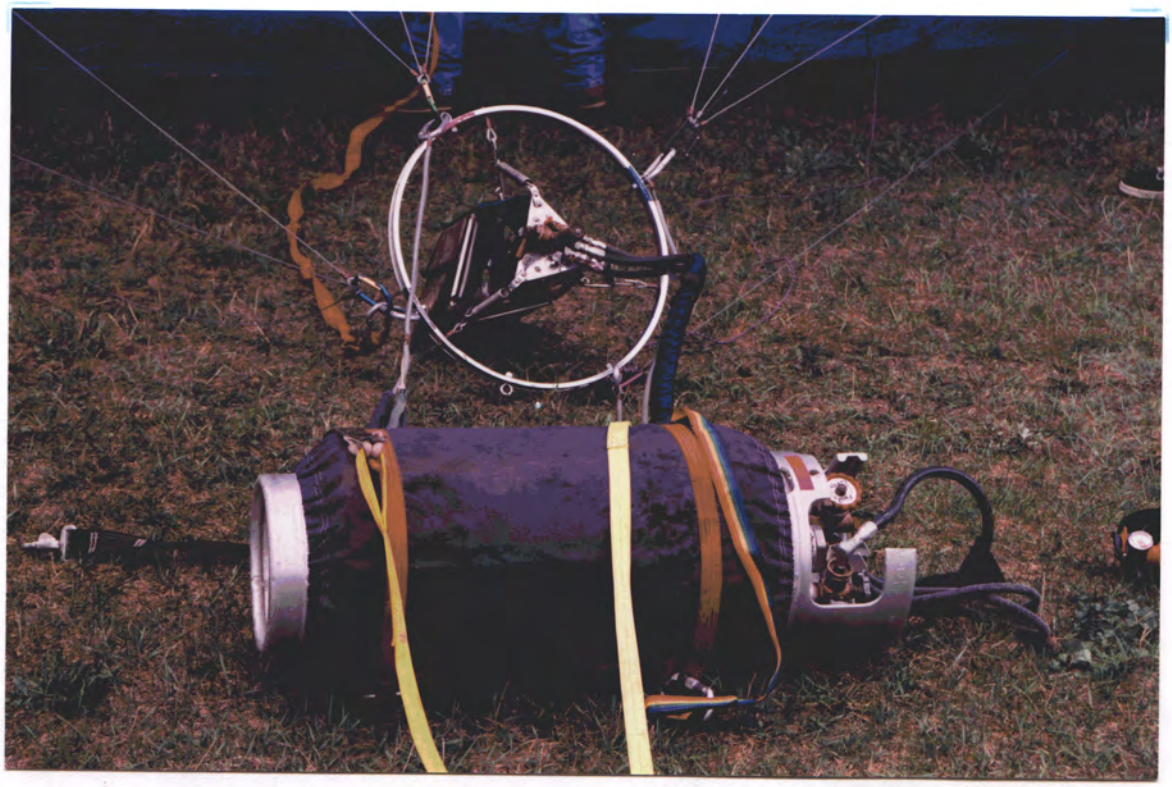
Some builders fail to appreciate the level of bending loads which can occur at the envelope to burner junction. If you look at any of the commercially produced baskets, the structural integrity of the mount points comes through loud and clear. The Klein basket appears well engineered and avoids some of the problems which occur when welded attachment points are thin tabs: Make Your Attachment Points Strong! (See my article in Issue #17, of *BBJ*, pages 2-7 for more on this topic.)

The lower left picture on page 4 shows more details of the basket setup. Note that the fully loaded and assembled basket is being moved using a pair of lightweight foldup handcarts.

These carts bore the brand name "RuXXac™ Fold-Flat Cart." The lower right hand photo on page 4 shows the basic cart structure, when folded. Apparently, these are available at larger department stores. They are marketed by The Faultless Starch, Bon Ami Company, 1025 W. 8th. St, Kansas City, MO 64101-1200.

Jack generally takes one of these carts into the field for simplified retrieval. Combined with the ease of disassembly found in the Boland basket the cart makes for easy packout.

The photo above shows the envelope on this system. I was very impressed with the artwork contained in their envelope. This is a very nice piece of work.



Texas Style Ballooning

On page 6 we see Phil MacNutt, from Austin Texas, flying his little solo ride balloon. In true Texan style he grabs the bull by the horns by riding a 10 gallon Worthington tank as his carriage. The load ring is a bicycle rim, in true Boland style, and his burner is a Balloon Works T3-017 unit. The envelope was his first building project. It is a Boland 41,000 cubic foot envelope kit. I had the opportunity to fly in close company with Phil on Friday. He really enjoys this little outfit, but is very careful to plan his flight within the limits of fuel and local terrain.

Mike Emich's Innovations

Mike Emich, from Akron, Ohio, has built several of the Boland baskets. Shown here are some construction details that might interest other builders.

Mike has employed a piece of rubber tubing to create a protector around the base of his 10 gallon Worthington tanks (Photo bottom right on page 6).

Mike has also developed a bit different technique for hanging tanks from the Boland basket. Most builders use quick-ejector parachute snaps which are both expensive and fairly heavy. Mike uses a rapid-link which attaches to a length of tubular webbing. The webbing is a double thickness, sewn together to leave a loop on each end. The photo, above shows how the assembly goes together. This assembly makes a lighter and less expensive hanger than the parachute harness technique. One disadvantage of this technique is that the tank must be lifted slightly to free the strap from the rapid-link.

Mike's basket also has the benefit of handles. These are simple ropes which run through lengths of 1 inch PVC pipe. To attach the handles to the basket, he made simple bent-up right-angle fittings. These bolt to the basket bottom using the bolts which assemble the floor to the basket skid plates. This detail can be seen in the photo to the left.

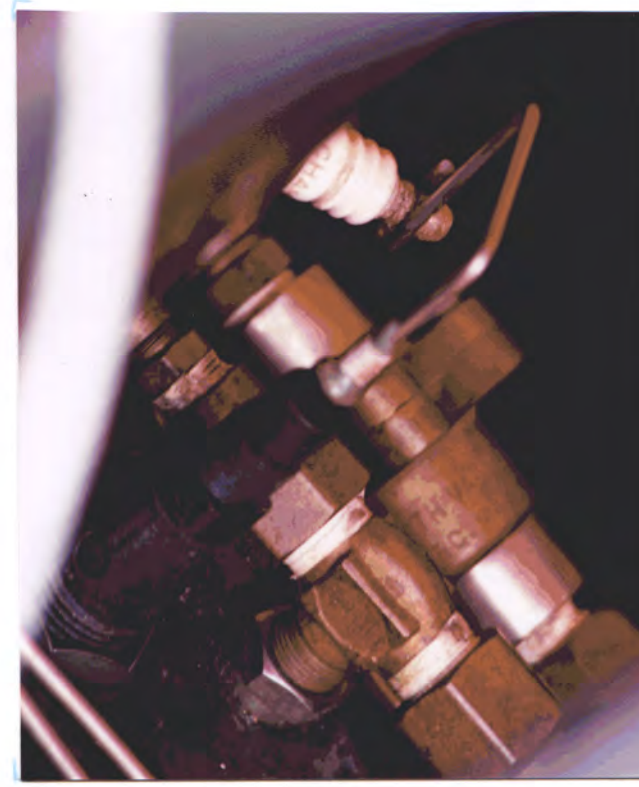
Mike commented that when his basket is lying on its side, the weight of objects in his inner flap would cause the flap to come loose. The Velcro™ attachment wouldn't hold under the tension. To solve this problem, Mike added snaps which are visible in the left hand photo.

John Burk, Innovator

The two left hand photos on this page are taken of the Burk Basket. John Burk, who designed and built this triangular basket, is a long-time builder with his own ideas about construction

The basket is constructed from a set of aluminum tubes. Each of the horizontal members is terminated in a right angle bend, and each side has three of these horizontal pieces. The aluminum tubes are fixed in place using an innovative aluminum clamp, which I have tried to describe using the drawing on the next page.

The basket covering is Cordura™ and the burner unit was made by Piccard.



The picture at the bottom of the previous page requires some explanation. This is a photo of the inner workings of the burner. John has incorporated a pilot light starter using a spark plug. Traditionally, spark plug ignitors employed a spark coil with a battery for the 'zap.'

John went one step better. By mounting a piezo unit, like that used by Aerostar, he manages to create spark with push of a mechanical button.

I was quite impressed by John's workmanship, but his innovation doesn't stop there. I wasn't able to get pictures, but John also has an interesting top design. In effect, the top of the envelope is cut vertically into quarters. The two opposite quarters are attached together at the crown. Then a center line is used to pull the crown down, opening up the slot between the envelope panels. I was not able to see this design in operation.

John had also constructed a simple steel tube 'wheel-barrow' type cart which snapped onto the base of the basket. This allowed him to move the whole assembly around with handles while rolling on a single front wheel.

John Burk reminds me that the number of builders who are trying something new is very small. Each time I've gone to Vermont I have run into one or two more of these free thinkers.

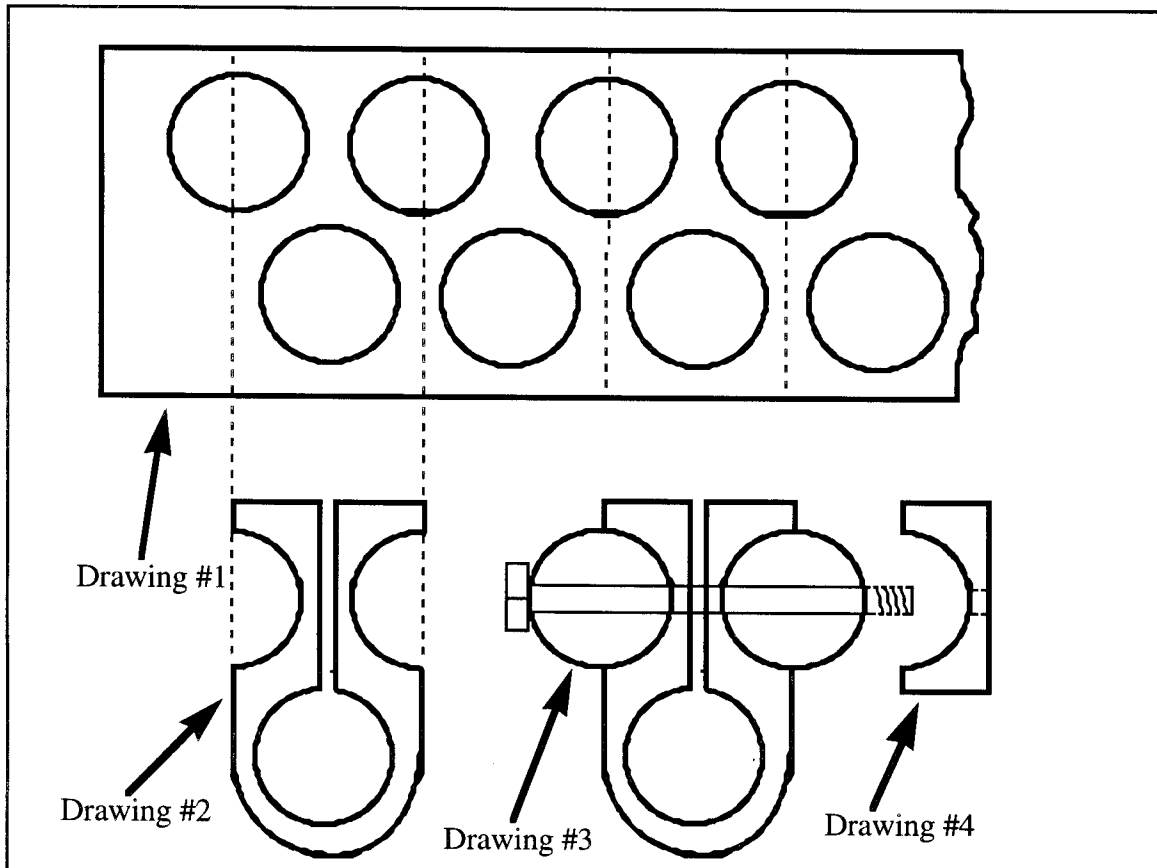


Figure 3: These drawings show the Burk method of making basket tubing fittings. **Drawing #1** is looking down on a piece of aluminum block about 2 inches deep and about the same width. Holes have been drilled through the block, the same diameter as the aluminum tubing. Then the block has been sawed apart on the dotted lines. With a bit of work each piece looks like **drawing #2.** A saw cut is made down the center of the block into the bottom hole, and the bottom edge is rounded with a file. **Drawing #3** shows the block in use. A bolt runs through the two tubes and through the center of the block. By tightening up a nut on the bolt, the block clamps the bottom tube and the two top tubes in place. Because of the tendency for the bolt to misshapen the top tubes, either internal spacers should be slipped inside the top two tubes and over the bolt, or an outside clamp piece (**drawing #4)** should be used. Also see upper left photo on page 8.

Letters to the Editor and Other Bits of Information

A Plastic Woven Basket

April 13, 1997
Bob

Are there any builders out there with experience using plastic tubing for basket construction? A friend has asked me to build a basket simply for display purposes out of his product. But I figure, after that much work, it ought to fly. The material I am planning on using is $^3/_8$ inch Wirsbo-Pex, a cross-linked polyethylene used in radiant floor heating. A test weave wall makes a beautiful weave. Its weight is actually less than traditional rattan. I'll share notes on the outcome.

Craig Kennedy
7315 Mesquite Wood NW
Albuquerque, NM 87120

This is an interesting idea. I've compared some solid plastic products and typically have found them to be of higher density and much higher cost than rattan. Most of them also were 'less stiff' resulting in a more flexible basket, than those constructed of rattan. I'm very interested in getting your report of a finished product. -Editor

Dave Koenig Comments on Hang Balloon

April, 15, 1997
Bob

I've flown my balloon [see picture page 9, Issue 23 of *BBJ*] twice now. Both times backwards. I will install a turning vent soon.

I used silicone sealant to attach my 'N' numbers. It works great. The MIDO issued my airworthiness certificate last month. The only question we had to prove was that I was allowed to use 3 inch tall numbers on the balloon. Good thing I had my FARS's handy.

Dave Koenig
3134 Hughes Road
Dickinson, TX 77539

Source of Basket Plywood

Builders looking for waterproof Finnish birch plywood might try *Woodcraft* at P.O. Box 1686, Parkersburg, WV 26102-1686. Their telephone number is 800-225-1153. This company specializes in fine woodworking tools and has a great catalog. In size 24" by 30" it costs as follows:

3/8 inch thick is 5 ply construction at $16.99.

1/2 inch thick is 9 plys at $18.99

3/4 inch thick is 14 plys at $28.99.

Ken Kennedy Follow-up

I our last issue, pages 7 and 8, Ken Kennedy reported on his recent balloon projects. Ken reports that the cables on his Rally basket go full circle using attachment bolts. He uses the original aluminum tubes for the flexible uprights. Ken has incorporated a pulley system into his top system like that found on Cameron balloons. He reports that the 20 foot diameter top on the 90,000 cubic foot balloon has a venting pull of about 8 pounds and a full opening load of about 20 pounds.

Envelope Cable 'Drop'

Bob,

Can you explain a comment that I have seen a couple of times in *BBJ*. Some readers were saying that they have increased the drop to put more tension on the mouth?

Mike Charles
34202 Del Obispo #54
Dana Point, CA 92629

Mike,

If you fully draw the envelope created by the Smalley factors, it generates a closed volume, coming to a point at the bottom (see next page). We slice off a section (a cone) from the bottom to create a mouth opening. Then the cone is replaced with cables which attach the envelope to the basket. The distance between the plane of the envelope mouth and the attachment points on the basket is a distance I called "drop" in my article on 'computing cable lengths,' *BBJ* Issue #5. According to my subscriber records, you have issue #5. If you were dumb enough to throw it away or lose it :) let me know – I'll send you a replacement copy.

Continuing on, the cables replace the fabric which closes off the envelope bottom. If the cables are too short, so as to actually come to

a projected point above the original fabric point, then, the mouth will scallop between the cable attachment points because the geometry won't hold the mouth open.

On the other hand, if the cables are longer, then they place tension on the horizontal load tape in the mouth, forcing it to remain open. Some builders prefer to make their cables a bit long to help keep the mouth open during low temperature/high velocity maneuvers like terminal descents.

If the cables are way too long, they can represent a risk factor. If the pilot burns through the mouth tape, the tension can result in a tear going some distance up the side of the envelope.

Look at recent Aerostar envelopes. You will see a horizontal load tape about 6 feet up from the mouth. I see two benefits to this practice. First, it permits invisible repairs to burns in the envelope mouth. The fabric is just replaced between the two horizontal and two vertical tapes. Secondly, if there is significant tension in the mouth tape as it is burned through, the upper tape acts as a rip stopper to prevent tears continuing up the side of an envelope.

A humorous aside: Back in my early ballooning days, about 1980, I started crewing for a local pilot. We performed a shopping mall tether in a rather confined space. After the balloon was inflated and before the tie off lines were attached (we were dumb and dumber back then) a thermal came through and dragged the envelope over some cars. The Balloon was put away, enough of asphalt flying for that day.

Next weekend, I helped this pilot as crew; he was carrying two elderly passengers. Just before takeoff, I make a final walk around the aircraft, looked up to see a tear from the mouth almost up to the horizontal load tape on the equator-about 25 feet long. (The envelope was torn in the parking lot as it dragged across a hood ornament of a 50's vintage car.)

He asked me "Do you think its safe to fly?" My response was "I don't know, we have no printed standards by which to judge" He flew and reported somewhat higher than normal fuel consumption. Otherwise everything was normal.

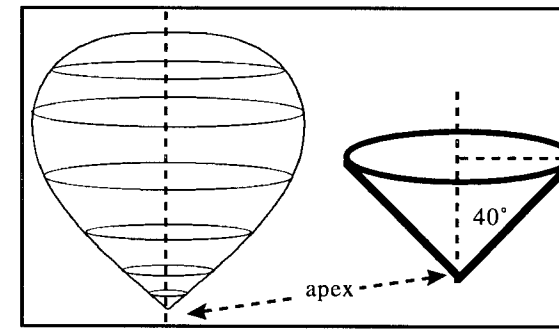
May all our luck be as good--

-Editor

A Special Note On Cables

There was considerable discussion among builders at Vermont about envelope shape and its effect on cable length.

Phil MacNutt, for example, had been using an inclinometer to measure the angle made by the mouth of the envelope on a number of balloon envelopes and he concluded that this angle was typically about 40°. The following graphic displays this concept.



In Issue #5 of *BBJ* I presented a method of generating mouth to basket cable lengths. My calculations were based on a theoretical calculation using the Smalley Gore Pattern factors as presented in *BBJ* #1. Based on those factors, my drop angle was estimated at 50°, not the 40° shown in the figure above.

If you are using the material in *BBJ*, Issue #5 to calculate your cable lengths, make the following adjustments your cable calculations to generate better cable lengths. All references are to the figures on page 5 of that issue:

In **Step 1**, use 40°, as shown above, instead of 50°.

In **Step 3**, instead of using the cotan 50°, use the cotan 40° = 1.1918. This value replaces the printed value of 0.8391.

In **Step 6**, use the value of 1.1918 instead of .8391 for the calculation of x1 and x2.

As a result of these changes, your calculated envelope cable lengths will become longer.

In issue (*BBJ* #23) I commented on the various reasons why a balloon envelope may take on a different shape than its original design shape. Add a new one to the list:

The Smalley factors were originally used to design gas envelopes. Hot air envelopes, which terminate in an open mouth, at ambient pressure and temperature, appear to take on a different shape when inflated.