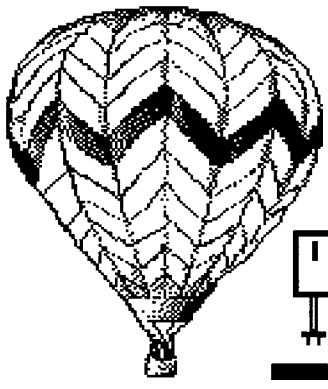
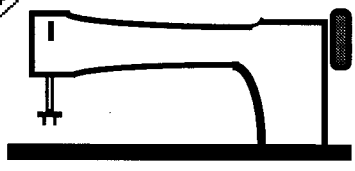
Volume 1, Number 5 $2.00



Dedicated to the Sport Balloon Home-Builder



THE BALLOON BUILDERS' JOURNAL

March-April 1994

In This Issue

Notices To Readers

Plan on attending a meeting of homebuilders on May 6-8, 1994 at Post Mills Airport in Vermont.

Brian Boland, who is organizing this event reports that at least 36 amateur built aircraft will be in attendance. This will be the first gathering of its kind and size.

The format will be informal. This will be an opportunity for builders to come together, share ideas, and plan for the future. A basic question we face is that of providing support to builders on a local level. For more information contact Brian at P.O. Box 51, Post Mills, VT 05058 or phone 802-333-9254

Financial Summary: Total revenues received are $1,085, with expenditures to date of $856.25, leaving a balance of $228.75. Our current circulation is 88 subscribers.

Cabling the Envelope to Basket

By Bob LeDoux,

2895 Brandi Lane, Jefferson, OR. 97352 or CompuServe 73474,76

Creating a simple, full size model makes cable length development a simple(?) task.

Introduction

One design element facing any envelope builder is the layout of cables connecting the envelope to the basket. This article is a response to a number of questions I've received on this topic. It's based on my own experiences as well as ideas from a number of readers. In particular, I would like to thank Paul Brockman for his contributions. You can read about his approach to cables in Issue 3 of *The Balloon Builders Journal.*

We continue to emphasize using proven methods, and techniques to eliminate or at least reduce the chance for "unseen" or "undesired" outcomes. When a builder copies ideas from a proven aircraft he benefits from the engineering work already completed. He also enjoys the benefits of many hours of "test flying" performed by loyal balloon buyers. So, when we copy a cable system from a factory produced balloon there may be only one task left to complete: the calculation of the individual cable lengths.

Most envelopes employ vertical load tapes or ropes to transfer flight loads to the bottom of the envelope. These tapes or ropes are often attached to cables with metal fittings or eyes. In the following discussion, the mouth end of a cable will be referred to as the "mouth", "mouth end" or "mouth attachment point."

The other end of each cable attaches to the basket. Perhaps the most common technique is to use carabiners or load fittings which then mount to attachment points on basket uprights. Whichever method is used, we will refer to this end of each cable as the "basket attachment point" or "basket end."

Brief Summary

To make this process clear, a series of graphic *steps* are presented on pages 5 and 6. These images take the reader through the actual model process.

Let's review the process. The builder begins by calculating three dimensions. The first dimension is the radius of the envelope mouth. The second dimension is the radius of the basket, cable attachment points. The third dimension is the vertical distance between the envelope mouth and the basket attachment points.

Once the builder has determined these three dimensions, a model is created "in space" and actual measurements are taken. First, a full size circle of the envelope mouth is drawn on the floor. A chalk image on a concrete garage floor will do nicely. The circumference of the circle is marked to represent each of the cable attachment points. Then the basket uprights, or a facsimile of the same, is mounted, upside down, and centered over the circle. Finally, the distances between the mouth and basket attachment points are measured with a tape measure.

Theory

Our method is based on the fact that the bottom end of an envelope is a geometric cone. Figure "b" in *step 1* (page 5) displays a cone. This figure also shows that a cone can be described by using a right triangle. Calculations of a right triangle can be made using simple trigonometry, as shown in *step 3*. Note that the envelope design and the cone both come to a point on the bottom. This point is called an '*apex*' and is a reference point from which other measurements are made.

If you aren't convinced that the mouth of a balloon is a cone, create the following graph: Take the first two columns from *The Gore Pattern Spreadsheet* as published in Issue 1 of this journal. For the graph 'x' range use the 's' values from column 'a' on The Spreadsheet. For the 'y' range use the radius from column 'b'. On the completed graph, the range s=0.00 to about s= 0.25 will create a straight line. An example of this graph is shown as *figure 1* (page 3).

Looking at *step 1*, on page 5, we see another characteristic which simplifies our calculations. If a vertical line is dropped down the center of the envelope the fabric in the mouth area creates an angle of 50° with respect to that line. It is this constant angle which is the basis of our cable length calculations. Many commercial balloons

share this 50° initial angle. This angle is consistent with balloon shapes using a shape factor called "Σ=0" (Sigma equals zero). Broader and more "squat" balloons would have a higher angle than 50° and would have a "sigma value greater than zero." On the other hand, the longer, thinner envelopes like Balloon Works and older Colt balloons could be said to have a sigma value of less than zero.

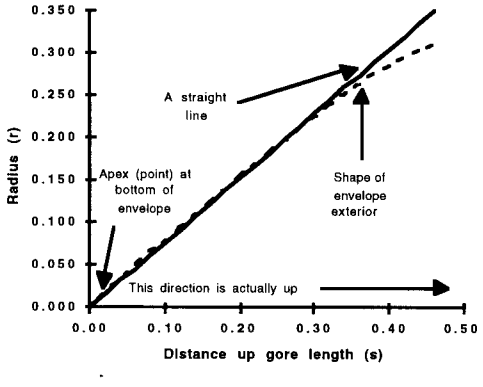


Figure 1: An envelope mouth creates a straight line, a true cone.

A Sample Problem

The basic calculations for the model are presented in *steps 1 through 6* on page 5. Calculations for a sample problem are also presented on page 5. The sample problem assumes an envelope of 16 gore construction with each gore terminating to a cable. The envelope mouth has a six foot radius. The basket calculations are based on measurements from an *Aerostar Aurora.*

Let's review the three essential dimensions:

Mouth Diameter: Issue 2 of *The Balloon Builders Journal* discussed envelope mouth diameter. This dimension is shown as 'y2' in *step 2* and *step 6*. Envelope mouths generally range between about 10 feet and 13 feet in diameter with a 12 foot diameter (6 foot radius) as a standard size. For the example shown in *step 6,* a standard size 6 foot radius is chosen.

Basket Attachment Points Diameter: The basket upright attachment points are also treated like a circle, just like the mouth. In *step 4* and *step 5* the *Aerostar Aurora* basket dimensions are used as an example. In *step 4* the reader is looking down on the top of the *Aurora* uprights. The attachment points form a square of 21 inches to each side. In *step 5* a circle has been constructed which passes through each of these attachment points. On a four point mount system, this circle can be measured by running a tape measure diagonally between the mount points. For the Aurora basket the radius is 14.85 inches or about 1.24 feet.

Determination of "drop:" Drop is Paul Brockman's term for the vertical distance between the envelope mouth and the basket attachment points. It is the final dimension needed to create the cable length model. The calculation of drop is shown in *Steps 2 and 6.* In *step 6,* 'x2' is the distance the mouth opening sits above the apex of the envelope. The mouth has a radius of 6 feet. It is placed a distance up from the apex where the cone also has a radius of 6 feet. Distance 'x1' is the same distance above the apex for the basket attachment points. The drop is the difference between 'x2' and 'x1'. The drop is determined using the simple trigonometry in *steps 3* and *6*. For the sample problem, the mouth is 5.04 feet above the apex. The basket attachment ring sits 1.04 feet above the apex. Thus the mouth is 3.00 feet above the attachment ring.

Creating the Model

With the three dimensions calculated, the model can be built. The model is described in *steps 7 through 10* on page 6.

The first step is to create a full size circle of the mouth on a floor. We recommend drawing the mouth, with chalk, on concrete, perhaps on a garage floor. Mark the center (radius) point of the circle. Then mark the circumference of the circle to represent the cable attachment points. The example in *step 7* shows a mouth with a six foot radius and 16 gores or cable attachment points.

Now the basket attachment ring is mounted upside down over the circle (*step 8*). The attachment points are placed above the floor by a distance equal to the "drop." The attachment points are also centered directly over the mouth circle.

In some instances the actual basket assembly can be used. For example, Cameron burner assemblies include the attachment points. The entire burner assembly, as heavy as it is, could be mounted above the floor. But in many cases, this approach is not reasonable. It makes no sense, for example, to suspend an entire basket, upside down to take measurements. For these situations, create a plywood or cardboard model which can be mounted

above the floor. This idea is presented in *Step 5*, figure 'b'. Simply cut out the board so the tips of the corners generate the required spacing.

After the basket attachment assembly is suspended, it is rotated to achieve symmetry (*step 9*). Our example has 16 gore points and 4 basket attachment points. Now, 16 divides into 4 evenly, giving 4 and no remainder. Thus 4 envelope cables attach to each basket corner. When properly aligned, the cables on one of the basket attachment corners will have the same set of measurements as on the other three basket corners. Thus, for this case, only one corner actually has to be measured. Once alignment is complete, use a tape measure to measure the distance from a basket mount point to its respective mouth attach points. These measurements are the lengths of the completed cable assemblies.

The measurement gets a bit more complex when this type of symmetry doesn't exist. For example, suppose we are attaching a 16 gore envelope to a Balloon Works Basket. This basket attaches to the envelope using three suspension ropes. Because 16 doesn't divide evenly into 3, 2 of the suspension ropes will each be attached to 5 cables and the third rope will be attached to 6 cables. Each cable length, for all 16 gores will need to be measured individually.

For the Balloon Works basket, the issue is further complicated because the suspension rope terminates to the cable "out in space." This is how I would approach this problem: Assemble the uprights on the basket but leave off the burner. Then run a piece of pipe about 8 feet long from the hole in the center of the basket floor and up through the center of the upright assembly. Pull out a suspension rope to create the angle of 50 degrees (the envelope mouth angle) with respect to the pipe. Use a tape measure to measure from the rope eye to the center of the pipe. Make certain the tape measure is horizontal when making the measurement. That measurement is the radius of your basket attachment circle and all the other steps covered above should be the same.

I haven't actually tried to measure a Balloon Works basket so this technique is theoretical. If you have faced and solved this problem, we would be happy to share your experiences with readers.

For readers seeking more information on actual cable assemblies, refer to Appendix J in *Aerostar's Continued Airworthiness Instructions*. Also note that Aerostar has "plus or minus one quarter of an inch" as their construction tolerance on individual cables. That can be taken as a reasonable standard or tolerance for the homebuilder.

Trigonometric Models

The basic techniques we've discussed involve building the model in space. There is an alternative for the builder with a grasp of trigonometry. Instead of building the model, the cables lengths can be computed. The mouth and the basket attachment points represent two parallel planes separated by a distance equal to the 'drop.' On each plane is constructed the respective circle with points on the circumference marked to represent the respective attachment points. Then the two planes are rotated until the desired symmetry is achieved. In a three dimensional (x,y,z or circular) coordinate system the coordinates of each point on the two circles is determined. Then the distance between the respective points can be computed using a three dimensional Pythagorean theorem. If this makes sense to you, this approach might be an interesting challenge, otherwise use the space model, above.

The Test Inflation Model

Bill Arras reported a different model system for his homebuilt balloon, *Jimi*. The envelope was tied to the basket using short lengths of rope. The crown line was securely tied off to the ground. Then the envelope was inflated and the individual ropes were adjusted until the cable system "looked right." Looking at his balloon, it appears the Bill's system worked well for him.

I would offer one caution. It appears that the real, inflated shape of an envelope depends upon its load. I think that a practiced eye can look at two balloons in the distance and note which one is carrying greater load. As the load increases, the envelope takes on a more stout, or broad appearance. The envelope height appears shorter and the equator appears larger. Of course this is only true for envelopes built from a common shape profile. I wouldn't try to compare a Balloon Works with Aerostar envelopes using this technique.

If you plan on using Bill's technique its probably a good idea to bring the envelope to flying temperature before checking the rope lengths.

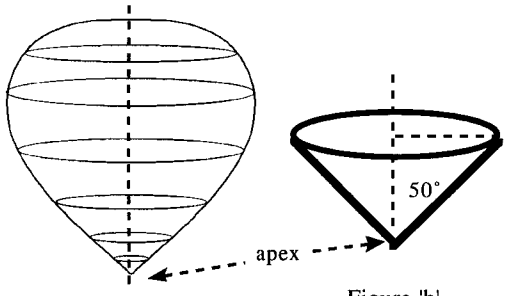
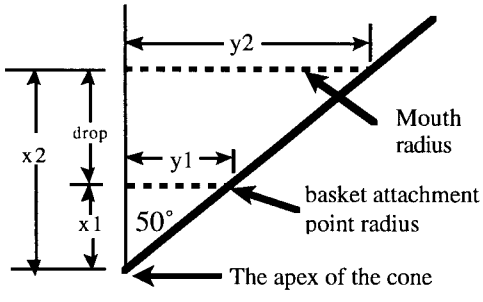
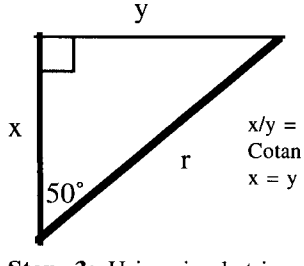


Figure 'a' Figure 'b'

Step 1: Balloon models, like *The Gore Pattern Spreadsheet* treat the envelope bottom end as coming to a closed point, an *apex*. Looking only at the bottom end (figure b) we see a cone. The fabric surface on this cone creates an angle of 50° with respect to a vertical line drawn through the envelope. In the following steps this cone is described as a 50° right angle triangle.

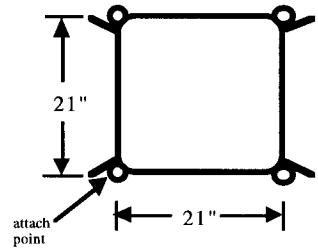


Step 2: In reality the bottom of the envelope is cut off to make a mouth. This mouth has a radius (y2). We can also consider the basket attachment points as a radius (y1) below the mouth. To determine cable lengths, y2, and y1 must be determined. Once these are decided we can compute the distance the mouth is above the basket attachment points, a distance called "drop."



x/y = cotan 50°
Cotan 50° = 0.8391
x = y * 0.8391

Step 3: Using simple trigonometry we can determine the distance up the mouth, x, if we know the radius at that point in the mouth, y. The distance x equals distance y times 0.8391.



Step 4: Here's a sample problem based on an *Aerostar Aurora* basket. We are looking down on the basket upright system. A cable attach point is seen at each corner. Let's compute a cable system based on this basket.

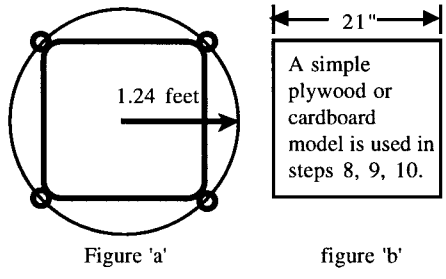
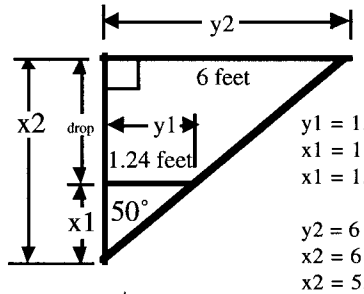


Figure 'a' figure 'b'

Step 5: In figure 'a', a circle has been drawn to pass through the four attachment points. The circle has a radius of 1.24 feet. In figure 'b' a simple cutout is used to model the upright attachment points.

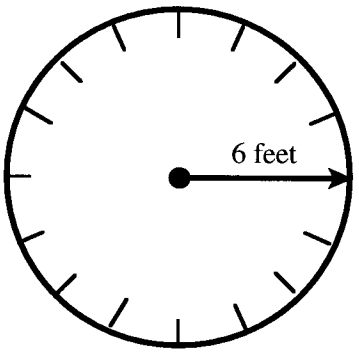


y1 = 1.24 feet
x1 = 1.24 feet x .8391
x1 = 1.04 feet

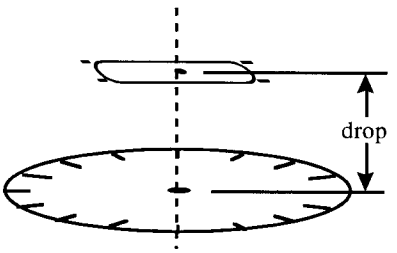
y2 = 6 feet
x2 = 6 feet x .8391
x2 = 5.04 feet

Drop = x2 - x1 = 5.04 feet - 1.04 feet = 3.00 feet. Thus the basket attachment points are 3.00 feet below the envelope mouth.

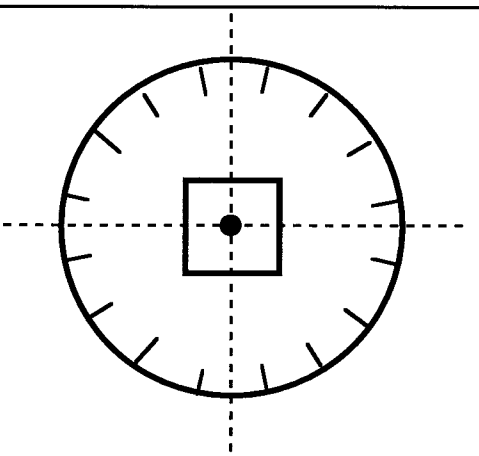
Step 6: Here are the calculations for our sample problem (refer back to steps 2 & 3). We assume a standard 12 foot diameter mouth (6 foot radius) with cables attached to basket mount points shown in steps 4 & 5 above. **To summarize: The mouth radius = 6.00 feet; the basket attach radius = 1.24 feet; and the drop = 3.00 feet.** Now we can model cable lengths.



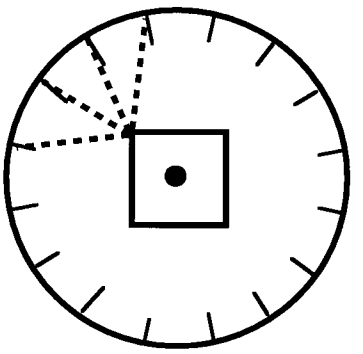
Step 7: Here the actual model is built. Begin by drawing a full size chalk circle of the mouth on a concrete floor. A garage floor is a good choice. Our example uses a standard 6 foot diameter mouth. Next, segment the circumference to represent the cable attachment points on the mouth. This example is a 16 gore envelope with a cable attached to the end of each gore.



Step 8: This is a side view. The basket cable attachment assembly or its model (from Step 5, figure 'b') Is mounted above the mouth circle. It is centered over the radius point of the circle (shown as a dotted line). It is mounted above the floor a distance equal to the "drop" as computed in Step 6.



Step 9: In this top view of step 8 we look down on both the basket cable model and the mouth ring below it on the floor. Here, the basket cable model has been rotated until there is symmetry with the drawing on the floor. This example has 16 mouth attachments connected to 4 basket attachments, each corner of which has 4 cables.



Step 10: In this example, each corner is symmetrical to the next, so only one corner must be measured to determine the cable lengths. Here, a tape measure is used to measure the distance from the basket to the mouth.

A Homebuilder's Tip: When sewing use ball point needles which separate the fabric threads rather than cutting though them. This results is a stronger stitch area with less tendency to "postage stamp" tear along the seam. Remember that at 2400 stitches per minutes some 50 feet of thread is moving back and forth through the needle eye every second. This creates wear and heat. At high speeds this heat can be high enough to remove the temper in the steel dulling the needles. Ensure your seam quality by replacing your needles after about 200 feet of stitching.

Is Gas for Me?

By John Kugler,

1612 Centennial Drive, McCook, NE 69001 or CompuServe 72074,1525

Ammonia has many pilots taking a second look at gas. Consider these ideas first.

I'm not really fond of articles that ask a question, but it does get me off the hook in a few situations, especially since I asked the question first. All kidding aside, I hope to bring to light a few questions that balloon pilots must ask themselves BEFORE they begin their quest of gas flight. Regardless of the gas used, there are some issues that need to be brought to light if you want to fly gas. This article will discuss issues regarding ammonia and helium as a lifting gas, including monetary and time considerations.

Gas ballooning is no big deal, but it is time consuming and takes a lot of hard work. My biggest question to the budding gas pilot is "Why do you want to fly a gas bag? What are the reasons for flight? Do you want to experience the thrill of totally quiet flight or do you ultimately want to compete in the Gordon Bennett? Is the reason because of the rich history of gas flight or just because you want to get your airborne heater restriction removed?" I became interested in gas through my father's instruction and from my understanding of its history. These early motivations have matured to my current goals which include participating in limited competition and expanding the popularity of the sport. I have found the lack of popularity discouraging. But Bruce Comstock sent me a note on Compuserve. His simple statement makes it all seem right, "*I like the fact that NH3 ballooning is more intimate, with no spectators, officials, etc. To me it is real ballooning, done for its own sake, for camaraderie, for adventure -- not as a show. Maybe we should all focus on enjoying this stuff and let it take us where it may.*" Obviously Bruce has his act together, I agree with his statement wholeheartedly.

Location is a serious factor to consider if you are really interested in gas ballooning. After going to a few away locations to fly gas, the actual cost of the gas (helium or ammonia) can be about half of the cost of the total trip. Rooms, meals, gas, and time, all become surprisingly expensive. It's even moreso when you and your crew get put on weather hold. Ideally, it is nice to be able to correctly predict the weather, make arrangements for gas and leave your own house (or a friend's) and take a nice day-long flight. Gas flying with ammonia should be limited to great open spaces. Sometimes, I feel that it could be safely flown in populated area, but there are serious flaws in these thoughts. Ammonia should only be used in areas that are acclimated to it's use. That means rural America. Reason one, the supply is readily available; and reason two, these areas are usually not highly populated. So for me, in Nebraska, it's a natural. If you live in Boston or Portland--forget it. Interestingly enough, there is an abundance of helium produced in Western Kansas and the Eastern Plains of Colorado. At one point in time helium proved to be very inexpensive. These plants have closed down or stopped public sales as a result of new marketing contracts. Sooner or later they will again become a viable supply. Yes, location is a serious matter to consider for both safety and monetary reasons.

Next, is the old issue that has kept the general public from enjoying gas ballooning, money. When the urge to get into gas balloon struck me, I turned to a veteran of the sport, walked up, introduced myself, and asked, "I'm interested in gas ballooning, what do I need to do get started?" To my surprise his answer was "you can't afford it." and he walked off. What a great way to encourage a newcomer to the sport. I have since learned that some old time gas balloonists really don't want any new blood in the sport. Maybe I'm just paranoid. At any rate, money will come into play in gas ballooning as it does in hot air ballooning. Check rides are relatively easy to get for around $800-$2000 depending on what type of gas is used and which pilot is doing the instructing. Using ammonia is an excellent first step. The budding pilot can try gas at a reasonable price. But while ammonia is an excellent training gas, but it will never replace helium. Most pilots that fly gas for the first time will be 'hooked' and want to fly more. That is until that one flight that raises "the fear of Holy God" and makes a pilot consider going on. Some come back, other's back out and become less active. This is not that much different than hot air balloon flying.

If you want to compete, you need all sorts of crap that will eventually be thrown overboard. Transponders, radios, batteries, electronic gizmos and more batteries. If you are just getting into the sport, remember the sage advice of Bruce Comstock and keep it simple. The following comment may surprise you: By building my own system and flying with ammonia, I can fly a gas balloon more cheaply, on a per hour basis, than I can my hot air balloon. Think about that for a minute. It is a function of total flying hours in a year versus equipment cost. Time must be factored into the equation since inflation time and equipment set up are bigger time factors when compared to hot air ballooning.

The current economies of gas ballooning lend themselves to forming the "Club Concept" that was used back in the days of Tony Fairbanks and the Balloon Club of America. I am an immense fan of the "Club Concept" because it really helps the camaraderie of the sport and spreads out the workload. There is a really tight bond between the pilots that regularly fly gas. We have developed a team and we recognize each member for the strength that he or she offers. This is a very important aspect of gas ballooning. This will save the potential gas pilot from "burning out" when frustration sets in-and believe me it will. From my stand point, gas ballooning has been an all consuming thing. It has taken tremendous amounts of Dennis Brown and Tim Cole's time, not to mention the unending patience on the part of our wives. You can make the sport as difficult as you want to make it. Remember that it is the simplest form of flight. Keep it that way! It is advantageous to have several people that are willing to help you crew. It can be done alone, but it's a lot of work.

Maybe I didn't really answer the question. Only you can answer the question. All I can do is point out some things you might want to consider. If you choose to fly ammonia, realize that it is a potentially dangerous gas and fly it in the great wide open spaces. Fly it first, then form you opinion. Too many people have formed opinions before trying it. That's their loss. Evaluate the reasons why you want to fly. It's OK to change your reasons after you have experienced it! I find that there are very few differences between the behavior of ammonia versus helium in a gas bag. Not everyone will agree with that statement, but I'm certainly having a lot of fun. Maybe it's time for you have a little fun too.

Goodies and Tidbits: Miscellaneous Items For the Builder

A catalog of fittings, tapes and other goodies is available for $2 from Para-Gear, 3839 W. Oakton St., Skokie, IL 60076. This company specializes in sky diving gear. Their prices on fabric and tape are based on quantities used by parachute riggers and lofts, and are a bit high. Their prices for fittings are more reasonable. There are lots of pictures for the builder looking for new applications for proven components.

Bill Gnadt is a PhD candidate at Boston University with an electrical engineering degree. Bill suggests **building an envelope temperature gauge** by using an Analog Devices AD590 circuit chip which runs $4 to $5. An additional chip which costs about $2 can be used to convert the Kelvin scale output of the AD590 to Fahrenheit degrees. Expect to see an article on this in a future issue. Bill can be reached at an Internet address of: wgnadt@park.bu.edu., or at 231 Park Drive, Apt 17, Boston, MA 02215-4722.

Bill has also created a version of *The Gore Pattern Spreadsheet* in "C" language. His compiled version of the program will run on IBM compatible computers without the use of a spreadsheet application program. His program also permits design of both vertical and horizontal patterns from one program. Contact your editor for more information.

Several readers have noted that the **North Texas Balloon Association has a computer bulletin board** at (817) 430-3968. It runs 24 hours at 9600-n-8-1.

Internet users should note that CompuServe members can be reached by using the CompuServe address. For example your editor's address is 73474,76. For Internet users, this address would be 73474.76@compuserve.com. The rule is to replace the period in the CompuServe address with a comma, and add the compuserve.com.

Letters to the Editor

Bob,

...I have a tip for the folks who are building and never really learned to roll their own cigarettes. Apply "Glue Stick" glue to fabric before turning the French fell seam to hold the two pieces together before sewing. The seams on the straight cut areas can almost be done blindfolded and the seams on the curved or bias cut areas are made much easier. ...Expect to use about 3/4 of a stick per gore. A friend in the parachute manufacturing business told me that a "folder" must be set up for the exact type of fabric you are using otherwise it will not work well. I am using the "glue stick" method and will spend much less money by using glue sticks.

..Be certain there is some form of guard to cover the motor and clutch mechanism [of your sewing machine] otherwise you may end up with fabric wrapped up in the motor...

...The Parachute Manual, by Dan Pointer has excellent instructions on sewing machine maintenance as well as information about fabric, webbing, tape, thread and other things which are related to balloon building. It can be ordered from Para Publishing, P.O. Box 4232, Santa Barbara, CA 93103-0232

For Mike Kelly, Westmark is a good fabric source. Their phone is 1-800-423-7829. They have several stock fabrics, as well as some closeout fabrics suitable for envelopes...

For anyone who is not aware, FSDO interpretations can vary on what they want you to do to prove you built the system, so a "logbook" such as a spiral notebook, detailing everything you do, along with time spend is a good idea.

Mike Glasgow
P.O. Box 431
Elk City, OK, 73648

Editor's note. Para-Gear, mentioned on page 8, is also a source for the Poynter manuals. I just purchased both of these manuals. There are two issues each of which run about $49. The first issue gives most of the basics. These manuals are best for the builder with the "long term commitment" and some experience. For the first time builder, it might be easy to get lost in all the information, only part of which is pertinent to balloon construction.

For the builder looking for a folded fell seam folder, try Tennessee Attachments, P.O. Box 188, White Bluff TN, 37187-0188. Their phone number is 1-800-251-5000. They have a series of folding attachments numbered from 773 through 779, displayed in their "Jeans Catalog." Number 778 is a "parachute lap seam." The best way to get the right attachment is to send them a sample of a completed seam.

Dear Sir:

..I am interested in seeing developed a fire resistant parachute for military ejection seats. It occurred to me that hot air balloon manufacturers might be aware of fabrics or treatments that would achieve this goal, since they deal with limited envelope temperature inside balloons. Parachutes are usually made from Nylon 6-6 which loses half its strength at about 300° and melts at about 450°....Are there any special chemical treatments that can be applied to the material to increase the melting point? Have any materials other than nylon been used in balloon construction, such as Nomex, Kevlar, glass fibers or PBZ? I would greatly appreciate any insight you can provide on this subject or any leads to someone else who might have knowledge on this aspect of design.

John Rich
16545 Loch Katrine #310
Houston, TX 77084

Editor's note. Kevlar™ parachute fabric is produced under MIL-C-87156. Cloth, Parachute Aramid. It runs 2 ounces per square yard with a tensile strength double that found on regular nylon fabric.

Bob,

I have an experimental Daedalus Aerostat, Model AX-4, Serial No. 1, Registration No. N1094, built by Darrell Sonnichsen in May 1968. My wicker basket is damaged and not airworthy anymore and I am looking to buy or have another one built. Can anyone help me find Darrell?

Fred Wujek
1216-9th. St.
LaSalle, IL 61301-1975

Bob,

I commenced building a '48' ...The Gore Pattern Spreadsheet is great, but over here in Australia I need to provide a full engineering justification of the design. Are any stress calculations available for the pattern produced by the spreadsheet?

Steve Griffin
CompuServe 100240,1725.

Editor's note: I suggested that Steve copy an exact replica of a certified balloon from a manual. I recommended the Aerostar manual. Steve sent me the following reply:

Bob,

Thank you for your note of 14/1/94. I have purchased the Aerostar Continued Airworthiness Instructions and have shown them to my local CAA Airworthiness Manager. He warmed to the idea of cloning a type certified balloon but is insistent that I use materials that qualify under the STC. I believe that Stumpf can provide mill end lots of such material but I need to be able to show the CAA man that the materials do qualify under the original STC.

Unfortunately, Aerostar balloons are fairly uncommon in Australia, to my knowledge there are only 2. One is located in Adelaide and the other in Perth which are 2000 and 5000 miles away respectively. Direct comparison may prove a little expensive. I would therefore like to take you up on your offer to send a copy of the Aerostar STC. I have a copy of FAR part 31. The Australian Ballooning Federation has shyed away from airworthiness matters much to my displeasure. I believe that this has occurred primarily because of the one person's desire to make it difficult for others to build in this country. As far as the procedures adopted for foreign balloons are concerned, the first of type imported into Australia is tested for compliance with its foreign STC and is then normally issued with an Australian type certificate. Manufacturers instructions are always followed for maintenance procedures. Thanks for your assistance

Steve Griffin
95 Dykes St.
MT Gravalt QLD4122
Australia
CompuServe 100240,1725.

Editor's Note: Any ideas to help Steve? If you don't want to send your ideas "down under," mail them to your editor. The Australian CAA is, unfortunately, applying airplane type standards to balloon construction. Manufacturers, like Aerostar, use mil spec tapes, thread and fittings for construction. Its the fabric that's proprietary. Builders know factory approved fabric is not necessary for a safe balloon. Integrity is easily monitored with pull tests. If the Australian CAA is requiring certified fabric for amateur built balloons, then that standard is extremely harsh and naive,

Dear Bob,

Greetings from Calgary Alberta, the unofficial Hot Air Balloon Capital of Canada. I found your text file in the AVSIG forum and downloaded both it and GORPAT.WKS the other day. I am a balloonist myself, crew mostly, and I am interested in refurbishing an old balloon that I know I can get fairly cheap. The envelope is shot but I think the load tapes are still air worthy so if I can get some tips on reconstruction, or even plans to make a new one, It would save me a bundle. I'm also a member of the Calgary Balloon Club and I think other members in the club might be interested in this sort of thing. I'll be posting it for the next club news letter.

Paul V. Benninger
CompuServe 73201,121

Editor's Note: While it's not been uncommon to rebuild envelopes using the old load tape, as a homebuilder I've tried to avoid this option. Old tape gets hard and dirty, making it difficult to work and not the best of material to be running through a sewing machine. If the builder actually tries to rip out the out seam work to separate the tape and old fabric, an extraordinary amount of work is required. Applying commonly used repair techniques which leave the seam intact may be inappropriate for a complete envelope rebuild. Other envelope components like fittings, pyrometer line and load rings are well worth recovering. I've been told that aircraft materials are exempt from import duties into Canada from the U.S. Do other readers have comments on reusing old load tape?

Bob

Another successful [McCook Gas] event! New pilots galore, more myths dispelled and

more fun than anyone else in the US was having! Monday, I was able to pull off a 6 hour flight in winds of 12-15 kts by being patient and using a 100 ft. tie off. Flying directly behind the high pressure, we flew through a few snow flurries (yikes) and found the warm sun and flew to 9500 ft msl on solar, rode on top of the inversion for a bit, dropped down below the inversion again with a very slack bag--then solared up over the inversion again! The bag was tight again and flying very well. *Big Dog* has good manners in the air. Down to two and a half bags of ballast--discovered that one of them was frozen...time to land. Landed with a 50-60 foot drag in 10 kt winds. Very uneventful. ... Oh by the way, it was -3 when we inflated and ranged from 0 to 35 degrees on the flight..... Let me see...that's three nice flights for about 15 hours in 2 weeks, that's a lot of take off and landings...three new people to gas ballooning!

John Kugler
Box 1748
McCook, NE 69002
CompuServe 72074,1525

Bob,

...We are currently in the process of building balloons for world record attempts and would appreciate any input you may have for lifting formulas for computers. I would be happy to answer any questions your readers may have about commercial balloons or their construction. I have been in ballooning for 13 years and have been involved in building Head balloons from Georgia.

My brother, Mike, is a much better builder than myself, although I can weave a mean basket! We also have a Singer double needle machine for our own shop. If you ever need fabric, we have had contact with most manufacturers and have ordered direct in the past. We mainly use ripstop now due to the wear resistance. One of our corporate sponsors was the "Crafted with Pride Council" and they represent all of the manufacturers who make ALL of the balloon fabric used in this country. You know how it helps to have contacts! Well, I've used enough time on the system today. I look forward to receiving your newsletter and I hope to meet you at a future balloon rally.

Roger Clark, CompuServe 72633,1023
4903 Alexis Drive
Indian Trail, NC 28079

Editor's Note: I am working up a program which displays, as a graph, the lifting power for an envelope of given size for various envelope temperature and altitude conditions. Expect to see it as a future article. Roger, how about a basket construction article?

Robert,

If any of your readers have questions that you think I can help with, I would be more than happy to reply. I would like to become a recipient of your news letter. My address is 111 Tryon St., Greer, SC, 29650. I will consider some topics for discussion and get your opinion on whether your readers would be interested. I am considering a Remote control blimp project and am looking for a material to use for the envelope. The craft will be about 16' long an 7' in diameter. Any ideas?? Think ZERO helium leakage..

Mike Clark,
CompuServe 71054,1405

Dear Bob

I publish a bibliography on LTA flight, titled *A Bibliography of Lighter-Than-Air Flight,* which currently holds some 13,000 citations from books and periodical articles.

One of the subject classifications is "Experimental and Home built Airships and Balloons."...Edition 3 was recently released and edition 4 will be out sometime mid-1994.

I am currently converting the database into a freestanding product for DOS and Windows PC users as well as for Apple users. These products will be available in the next few months.,..

LTA Press
Adrian Brookes
P.O. Box 9065
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Ontario Canada K1G3T8

Editor's Note: Adrian recently sent me an article detailing the theory and construction techniques used in Balloon Works products. Needless to say, he presents a different view of construction with considerable food for thought. Look for this article in a future issue.