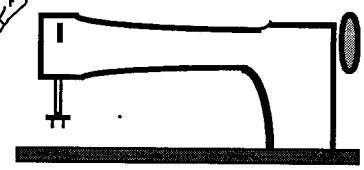
Issue #27

$3.00

Dedicated to the Sport Balloon Home-Builder



Published five times per year-$12 per year

THE BALLOON BUILDERS' JOURNAL

March-April 1998

In This Issue

Springtime in Vermont

The Fifth Annual *Experimental Balloon and Airship Association* flying weekend is scheduled for May 15-17, Friday through Sunday, in Post Mills, Vermont.

Brian Boland is the host of this annual event to which only homebuilt aircraft are invited.

There are numerous motels and guest houses in the region. Camping is free on the airfield. Make your reservations early because the local facilities fill up quickly.

Post Mills is a pleasant drive from Boston Airport with four lane highways to within a few miles of the airport.

This is one weekend which brings together people with a common interest in balloon building. Don't miss this event.

Contact Brian for details. Call him at 802-333-9254 or write to him at P.O. Box 51, Post Mills, VT 05058

The Balloon Builder's Sewing Machine: Part I

by Bob LeDoux, editor
2895 Brandi Lane, Jefferson, OR 97352

The one essential tool for the envelope builder is a sewing machine. Here, in detail, we cover the considerations for its purchase or rental.

Introduction

This is the first in a series of articles on the selection, setup, use, maintenance and adjustment of sewing machines.

I hope this material will offer something to readers of varying experience levels. There is much here for builders seeking to purchase their first sewing machine. The setup, theory and adjustment material, to be published in later issues, should prove useful to those with more sewing experience.

There's a lot of detail in this article. Some items are less important than others. I think it's worthwhile to provide this range of material, giving readers the opportunity to consider and throw aside those points they consider less important.

In the following text, I have underlined the first occurrence of terms with which you might want to become familiar. In this and coming articles, these terms will be discussed and used over and over. Most of these terms are common to home sewing machines. If you have access to a basic home sewing textbook, you can learn more about these terms. Good luck to you.

The Single Machine Concept

Balloon safety involves redundancy. If one part is adequate to do a job, a second part will often be added to ensure the system is more than adequate. This is true in envelope design. While one row of stitching may be adequate in each seam, balloons are traditionally constructed with two rows of stitching in each seam. This criteria influences our choice of sewing machines in that we want to create those two rows of stitching while making a single pass of the fabric through the machine. This means we use a double needle sewing machine.

Our intent is to generate a set of criteria so that a single sewing machine will meet all of the stitching requirements for an entire balloon system. This not as simple as it might sound. Take a look at a *Balloon Works* envelope. This construction style utilizes a number of sewing machines including a bar tacker, multi-step zigzag, and multiple needle sewing machines. This type of construction would be difficult for the amateur builder to replicate using a single machine.

If we look at envelopes constructed by *Cameron* or *Aerostar*, we see a system which can be replicated using a single sewing machine. A double needle machine can be used to create folded fell seams and to attach tapes. Within limits, this same machine can be used as a single needle machine to sew multiple tape layers and other heavier construction. Our machine will handle a couple of layers of tape, but don't expect it to do a good job on 5 or 6 tape layers at a time.

Locking Stitch and Chain Stitch Machines

In order to avoid confusion, we will limit the following discussion to locking stitch sewing machines. The lock stitch machine uses a top thread, coming from a spool or cone, and a bottom thread, fed from a bobbin. (Home sewing machines are generally this type of machine.)

A few builders, and at least one balloon manufacturer, use seam systems which employ a version of the chain stitch. The chain stitch has no bobbin. This type of sewing machine creates a stitch using a looper which chains each stitch with the next. (Home sergers are a type of chain stitch machine.) Some commercial chain stitch sewing machines use two top threads. This improves the reliability of the stitch. The principal disadvantage of the chain stitch is a somewhat higher tendency for a broken thread to unravel.

There are advantages to chain stitch machines. Because they don't use bobbins, production volume can be higher as a seamstress doesn't have to stop to replace empty bobbins. While I think such a machine has its place, I feel more comfortable encouraging the beginner to start with a lock stitch machine. In particular, the lock stitch is easier to monitor for stitch quality control. Lock stitch machines also tend to be in

greater supply and tend to be less expensive than similar chain stitch machines.

Sewing Machine Parameters

Our sewing machine should have the following characteristics:

It should be a double needle lockstitch machine with 1/4 to 3/8 inch gauge. The gauge refers to the distance between the center of the two needles. Our gauge should be no less than 1/4 inch and no more than about 3/8 inch.

In the past, it was common to use a gauge as wide as 1/2 inch for balloon construction. I would not pass over one of these wider gauge machines if it proves suitable in other ways. Typically, the wider stitch results in wider seams and requires a bit more seam allowance, which is the fabric actually sewn into the seam itself. If your intent is to sew to common factory specifications, or if you intend to use your machine in a certified repair station, 3/8 inch is the preferred gauge. The parts and installation to change a sewing machine from a gauge like 1/2 inch to a new gauge like 3/8 inch typically costs about $150 to $200.

Each needle has its own bobbin. Don't purchase a sewing machine for balloon construction unless it will take two needles, each with its own bobbin.

The sewing machine typically derives its power from a continuously running clutch motor. Pressing on a foot pedal, often called a treadle, makes it work. Toe pressure makes it go, heel pressure or no pressure at all, depending on setup, brings the machine to an abrupt stop. With subtle foot pressure, the sewing speed can be throttled (varied). Experienced sewers typically do not throttle. They run the machine either full out or stopped. Of course there are sewing situations where throttling is required, like very short seam work.

The clutch motor should have at least 1/3 horsepower. Motors of 1/2 and even 3/4 horsepower are common and acceptable. The motor speed, will either be about 1725 revolutions per minute (rpm) or 3450 rpm. For the skilled sewer, the higher speed motor makes high stitch speeds easier to come by. For the beginner, the slower speed motor is probably a better choice. In either case, the stitching speed can be adjusted through a change of motor pulley size, so motor speed is not critical.

If you are sewing at home make certain the sewing machine motor is single phase. This is the kind of current we all receive in our homes. The other type of current, called three phase, is used in industrial settings to power large motors or a large quantity of motors. Few homes have three phase current. While it is possible to run some three phase motors from single phase power, the motors produce less horsepower on single phase. The three phase motors must also have an adapter to make the motor run. The cost of this adapter can be as much as the motor itself. For more on this topic, read *BBJ* issue 19, page 11.

As part of your consideration, remember a new clutch motor can be purchased starting at about $100 plus shipping from various Internet sites. For example take a look at WWW.Sewserg.com, Look at their page on industrial machines. Because replacement motors are reasonably priced, a low cost sewing machine with three phase motor might be worth purchasing.

A sewing machine with needle feed is a feature very much worth having. Let's describe needle feed:

The typical home sewing machine has simple, sometimes called, drop feed. The sequence of stitching is the following: The needle passes down through the fabric to make a stitch then rises up above the fabric as the stitch is pulled tight. While the needle is above the fabric, the feed dog rises up under the presser foot and advances the fabric the distance between stitches so the next stitch can be made.

In needle feed the process is different. The needle passes down into the fabric. Then the feed dog and the needle advance the fabric while the stitch is being made. Then the needle rises, comes back towards you, the sewer, and then drops to make the next stitch.

Needle feed gives more consistent feeding of fabric and helps avoid the tendency of one fabric piece to advance more rapidly than the other, through the sewing machine. If you sew silicone coated fabric or multiple layers of tape, needle feed will make your sewing more consistent.

Singer calls a sewing machine with both needle feed and feed dog feed, compound feed. This is because a few specialized types of machines may use only needle feed without a feed dog. Most builders just say they have a needle feed machine.

There is another type of feed system which is overkill for our double needle machine. This is a walking foot sewing machine, typically used for upholstery and other heavy sewing. This machine has a split presser foot. Part of the foot moves back and forth, along with the feed dog, to help feed the material from the top.

Reverse: This is a lever, generally on the front of the sewing machine, but it can also be activated by a foot pedal. By activating this control the sewing machine sews backwards. This is a nice feature to have, providing it works well, and some are sensitive to adjustment. There are areas in balloon construction where stitches are made back and forth over a small area. Most builders use a single needle setup for this type of work.

Used double needle machines with reverse are expensive. They cost so much more than a machine without reverse, that for the difference, you could buy yourself a single needle sewing machine with reverse. The difference will be typically more than $1000. Take a look at the industrial sewing machine page at WWW.Sewserg.com to get an idea of single needle, new, commercial sewing machine costs.

Single needle machines are a good complement for the advanced balloon builder. They can handle heavier sewing than the double needle machine we are discussing here. If you eventually decide get serious about home building, consider the purchase of a single needle sewing machine with reverse.

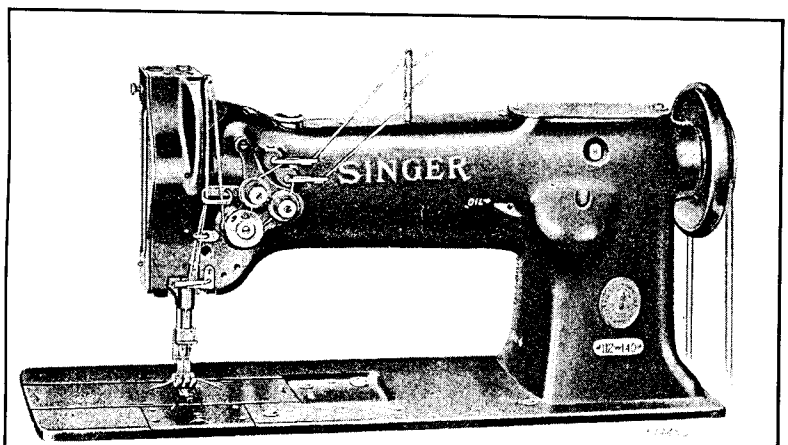
The requirements for our double needle sewing machine are not hard to meet. Sewing machines with these characteristics are common within the textile industry. When you buy a machine here are a few other items to look for:

Bobbin Winder. This device runs off the motor drive belt to automatically rewind bobbins. It should be a standard accessory on the sewing machine.

As a builder you can choose to either wind your own bobbins, or buy paper bobbins which are prewound. These are generally sold in a box of 144 bobbins. While prewound bobbins are very convenient, this convenience comes at a higher cost, than an equal amount of thread on a cone.

Your sewing machine should include a thread stand. This is a pole with positions for spools or cones of thread. You should have three positions for thread cones. Two positions are needed to feed the two needles in the sewing machine, and the third position feeds the bobbin winder.

Many sewing machine motors have a power out socket. This is typically 6 volts, intended to power a work light for better visibility. Many builders find a work light a valuable accessory. But if you plug this work light into the wall outlet, the bulb will burn out in an instant. (The 6 volt outlet on a motor is the same as a 120 volt wall outlet.) I understand replacement 6 volt bulbs are expensive.



The Singer Model 112W140 is a logical choice for the balloon builder. These machines originate from the 1940's. All these machines came with a combination needle and drop feed, but a reverse was not offered. They were rated for a maximum sewing speed of 3500 stitches per minute. The principal disadvantage to this machine was the lack of built-in oiling system. In good operating condition a model 112 costs $800 to $1200.

Other Accessories.

Issue number 15 of *BBJ* was dedicated to sewing machine accessories. Refer back to that issue for more discussion.

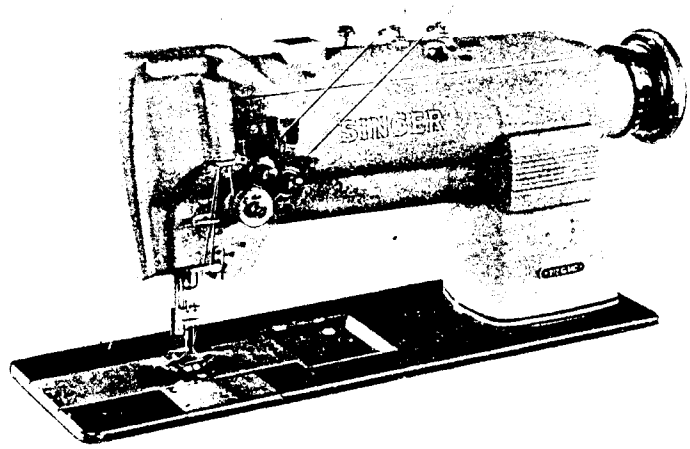
A seam folder is a device which folds the fabric into a folded fell. I recommend the first time builder hand fold seams, before spending over $100 on this attachment. While most builders prefer to hand fold their seams, there are still many who prefer the folder. If you decide to order a folder, make certain you provide a seam sample

to the vendor, so the device can be custom made for your application.

A puller is a wheel which pulls the fabric out the back of the sewing machine. Some machines, like the Singer 112W116 have a built in puller. This puller is a powered rubber wheel which runs in the surface of the sewing machine table. A second rubber wheel drops down on the first wheel, capturing the fabric between them. A puller is an expensive accessory to add to a machine. The Singer type puller can cost as much as your sewing machine. There are third party puller mechanisms like those sold under the *Swifty* name. These typically employ long metal shafts. Unfortunately, the volume of fabric we sew, for balloons, tends to jam up in this type of attachment. I can't recommend this kind of puller.

Pullers can be useful when sewing long seams. Builders using silicone fabric may find a puller an aid to handling this slippery material. But when performing short seams and most repair work, they tend to get in the way. With a proper sewing technique, a puller is not a requirement.

Tape Feeder: This is an important attachment. It feeds the tape through the sewing machine at the same time as the seam is being folded. While some builders fold seams and feed tape manually, I think the feeder is worth the money and effort. It contributes significantly to consistent seam construction. The earlier issue of *BBJ* describes building your own tape feeder.



The Singer Model 212 is a double needle machine of more recent vintage. These machines were offered in various combinations, including drop or drop with needle feed. Reverse was also an option. They are rated for a maximum sewing speed of 4000 stitches per minute. An advantage to this machine is the built in oiling system. In good operating condition a model 212 costs at least $200 to $500 more than a Singer model 112.

Other items:

Get a copy, of the users and adjusters manual for your sewing machine. It will show you how to thread the machine and make minor adjustments. It may save a long drive and expensive session with a sewing repair shop. (Singer model 112 manuals are available from *BBJ* for a cost of $2.)

Commercial machines are very simple. The mechanically inclined balloon builder can perform most of the repairs and adjustments required. However, sewing machines can be cantankerous, especially if they are showing their age and have some wear. Then, you may have to play with yours to get it working just right.

If you are so inclined to do your own adjusting and repair work get a parts manual for your machine. The simplest parts manual might be one of the thick (700 page) manuals received by commercial sewing dealers from a number of parts suppliers. See if you can get an old, or extra copy.

Don't forget two screwdrivers, one of appropriate size to replace needles and the other to remove inspection plates. Also get a good oil can. These are typically plastic with a six inch long feed tube. Buy about 4 ounces of mineral, sewing machine oil. You might find a can of lint and dust spray to be worthwhile for cleaning the hook assemblies in your machine. Computer stores sell these cans quite inexpensively.

In a nutshell, if you buy a used machine, it will probably come with the accessories you need except for the tape feeder.

Selecting your machine

If you have studied the material up to now, you have a good idea as to the requirements for a sewing machine. The most well known of American brands are the Singer model 112 and 212 double needle machines. The Japanese produce copies of American machines, by companies like Consew (model 339), and Juki (models 512 and 515). The German sewing machine industry is well known for its quality. Pfaff is probably the best known name, though Durkoff is a quality line. The German machines are typically quite expensive, even used.

Commercial sewing machines are often rated as whether they are intended to sew

light, medium, or heavy seam construction. Balloon construction falls into the light to medium categories. There are sewing machines intended to sew heavy construction, like folded fell seams in heavy canvas, vinyl or leather products. A double needle sewing machine intended for parachute construction, will typically meet our requirements.

My personal choice for the part time builder is a Singer 112W140. I would also consider the Singer 112W116, or 112W129. These are the same basic machine with different accessories. As already noted, the W116, for example, signifies a machine with a puller. These extra accessories can be removed, if desired, leaving the basic W140 machine.

A model W140 in good working condition, with needle feed, should cost between $800 and $1200. There is a disadvantage to choosing the older 112 instead of the newer 212 version. The older version relies on manual oiling and is generally a more basic machine. There are many oil points on the 112, but only a few of these points are really important. (We will discuss this in a later issue)

The 212 is a newer design which incorporates an automatic oiling system that may be worth a few hundred dollars more to some builders. It is also more complex to repair. Check the following site for an idea of the wholesale cost of used machines: Look at WWW.WMC.corp, then, "Harry's List."

The quality in the Singer 112 series sewing machines is superb. Many of these machines were produced during the Second World War. They were used primarily for construction, maintenance and repair of military supplies. They were commonly used for maintenance and repair of survival gear like parachutes. Wives and fathers, building these machines in the Singer factory, were very much aware that their sewing machines were used to keep husbands and sons alive. This concern shows in the quality of these sewing machines. A well maintained W.W.II vintage Singer is still the first choice of many builders.

This is not suggest that other quality machines aren't appropriate. But the Singer 112 series are fairly inexpensive and perform very well for the builder. They are typically hundreds of dollars less than some other machines. Any used machine is an investment. With proper care it will not lose value.

Locating Sewing Machines

There are a number of ways to buy a used sewing machine. Monitor large city newspaper classifieds. I have seen good buys on double needle machines in our local big city paper. Look in the Yellow Pages under *Sewing Machines-Industrial & Commercial.* Also monitor the *BFA Skylines* newsletter. Balloon distributor and accessory manufacturer, Paul Stumpf, also sells machines specifically set up for balloon construction. We occasionally list a machine in *BBJ* classifieds on the back cover. I've also seen good machines sold through state surplus sale auctions.

If the price is right don't be afraid to buy just the sewing machine head without the power table. A good used motor-table combination should cost $150 to $200. I recently purchased a commercial single needle *Singer 660* modern vintage power head for $75. A commercial dealer added the base for $150. I have $225 in the machine with a value of at least $400.

While I'll wander through small town home sewing machine dealers, I rarely find much worthwhile. I can't recommend that you have them 'order in' a used machine. If access is that difficult, call around to big city commercial dealers and make a day of the drive to look over a selection of machines. If you have a small car, you will have to remove the legs and maybe the motor in order to take it home. So take some tools. The table is typically 2 feet by 5 feet in size and 3 feet tall. Even with the machine head removed you still have three components (the table, clutch motor and the sewing head) each of which weigh about 50-75 pounds.

Most larger cities will have at least one commercial sewing machine dealer. With some luck you will have more than one dealer with a number of machines to chose from.

I would recommend shopping with a sample of your seam system. Get a repair station, or a local builder to sew up a sample of two seams, one plain, and one with a load tape. Take this with you when you shop. If you have it available, take a cone of sewing thread, some tape, and a scrap of balloon fabric.

Making Your Selection

Once you find a potential machine make the following basic checks.

Check the general condition of the machine. Don't be deceived by a 'new coat of paint overhaul' on an old sewing machine. The integrity of the internal parts is far more important than a pretty finish.

If the sewing machine is not threaded, raise the presser foot. Press the foot pedal, if necessary to release the brake. Rotate the balance wheel to operate the internal action. You should feel a smooth operating action. The brake is part of the clutch motor. Depending on the setup, it operates with heel pressure or by releasing toe pressure.

Open the slide plates, which cover the bobbins. Wobble the hook assemblies which surround the bobbins to check for drive gear wear. There may be a bit of slop, but it should not be excessive. Look at the hooks, they should be smooth without a lot of roughness caused by needle strikes. Wiggle the bobbin cases, in the middle of the hook assemblies. They shouldn't have a lot of slop. Grab the needle bar and push and pull. It should be tight.

Push the sewing head back to reveal the mechanism underneath. Many machines have a rest intended to support the sewing head in this position. On an open machine, like a model 112, you will have access to the entire works. The underneath mechanism should be damp with oil. There should be a metal drip protector mounted on the bottom of the sewing table. This keeps legs and clothing out of the machine works, and also collects dripping oil.

The timing belt will be visible, around a cogged pulley on the right side of the machine. Rotate the balance wheel to check the entire length of the timing belt for wear. Some belts are rubber, some are fabric with steel clamps. A cracked or torn belt should be replaced. A new belt costs about $30. With installation add another $70. Replacing the belt, and retiming the machine is within the means of the mechanically inclined builder.

Return the sewing head to regular sewing position. If the machine is threaded, place some fabric under the presser foot and attempt to sew a few stitches, without power, by rotating the balance wheel. A machine in good working condition should give an acceptable stitch. Start up the motor. It should come to speed without any grinding or rattling sound. Operate the foot pedal. The sewing machine should come up to speed smoothly, run smoothly, stop immediately when the brake is actuated. The fabric should show acceptable stitching, except perhaps for some tension adjustment.

Try the knee pedal. The presser foot should lock up and stay securely in the up position until the knee pedal is pressed. It should then drop smoothly.

If the machine has been set up for traditional tailor work, adjustment may be required before you buy. Balloon thread is typically heavier than tailor's thread. Ask the dealer to set the machine up to sew a sample of your seam construction. If your seam system uses #30 thread, use a size 18 needle. For size #24, the most common size thread, use a size 19 needle.

Run a test seam at about 8 stitches per inch. Simply take a piece of balloon fabric and double it over twice so four layers of fabric can be placed under the presser foot. Stitching, after a bit of tension adjustment, should be even and the machine should run smoothly.

Its possible to be overly critical about stitch centering. Our fabric is thin, and the thread is heavy. The stitch knot is quite large. So it may be visible from both sides of the fabric. Simple changes, like increasing sewing speed, can move the stitch position up or down slightly. Don't be overly critical about this.

Turn the motor off. It should slow down without hint of grinding or rattling sounds which suggest bearing problems. When the motor has stopped check the thread tensions. Grab each of the bobbin threads and pull out a few inches. There should be a light but consistent tension as the thread winds off the bobbins. Both bobbins should have about the same level of tension. And each tension should vary little as it is pulled. In other words, it should not get light, then heavier, as the thread is pulled.

To check the upper threads, drop the presser foot, grab each thread between the thread take-up arm and the needles. Pull down. The tension, again, should be consistent, but heavier than the lower tensions. Don't try to test the upper tensions by pulling the thread at the needle. You could bend a needle.

Varying upper tension suggests the tension discs are worn. On most machines these are inexpensive to replace, about $1 each. When properly set, the upper tension nuts should be screwed in about the same distance. Sometimes, a former owner may have

replaced one of the tension springs, with a stronger spring. Uneven lower tension may result from thread fuzz buildup under the tension spring, which is just a cleanup job. Uneven lower tensions might also require replacement of a tension spring on the side of the hook assembly.

Raise the presser foot. On most machines, the upper thread tension will release.

Some builders prefer to use larger size 16 (upholstery size) thread for some construction. *Aerostar*, for example, uses this thread for certain, very critical constructions like cable attachments in the envelope mouth. If you intend to sew with this size thread try this additional test.

Insert a size 20 needle in the machine. Rotate the balance wheel to drop the needle down. It should clear the hook assembly as evidenced by no clicking sound and no sense of the needle catching on the hook as the needle starts up from the bottom. If you do get a click, try the needle on the other side. Hopefully, one of the sides will have sufficient hook clearance for your single needle work. If not, you might have a mechanic open up the hook clearance, slightly on one side.

Sewing Machine Rental

While this article has emphasized purchase of a machine, commercial sewing machine dealers will typically rent their units.

There can be some traps to this approach. For some builders, the 'clock is always running.' For a first balloon project, one does not want to feel rushed knowing that if the project isn't finished now, there is another month's rent due.

The other trap is that first time builders often significantly underestimate the time required for a project. If rental stretches into four or five months, the rental charges will often equate to the purchase cost of a machine.

The builder with little space or limited storage may find rental a better choice. After all, few readers find a sewing machine permanently sitting in the middle of the living room to be an elegant *object de art.*

In Closing

Next time we will discuss placement and setup of the sewing machine. Safety will be discussed. We will also review some of the sewing terms we mentioned in this article.

Can I Build a Balloon with a Home Sewing Machine?

This is a common question.

First of all, do not consider a serger as part of a balloon construction seam system. I have been asked about this more than once.

If you bought your wife a brand new, and expensive *Bernina* home sewing machine for Christmas, don't 'break' it in by building a balloon. The motor will be running at full speed for an hour at a time. Home sewing machines were not intended for this type of duty cycle.

But if you have access to one of the older, mechanical, or semi-commercial quality machines like the Pfaff 130 or 200 series you can certainly try to build a balloon.

Here are some reservations:

Balloon construction will require larger thread and needles than used for most home sewing. Balloon thread is up to the size of button hole thread. A size 16 to 19 needle is typically required to sew balloon fabric. The tensions will have to be adjusted for the heavier thread. The thread is multifilament nylon or polyester. There is no cotton cover as found in home sewing threads. The smaller bobbin will require frequent filling. Each balloon seam will have to be sewn twice to complete a folded fell (French fell) seam.

Some home machines do not have the tension range to make acceptable stitching with these needle/thread combinations. The hook assembly may not clear the needle with the larger needles. So make test seams to see if the home machine will work.

Do not consider using the double needle assemblies used for some clothing work. Some home machines, most zigzag models, will take needles which give two parallel decorative lines of stitching. But both lines of stitching share a common bobbin thread. This is not an acceptable seam system for balloons.

I've known several people who have built balloons with a single needle sewing machine. It can be done. But a balloon is a big project. With even the best of equipment it requires patience. Even more patience is required when each seam must be stitched twice. Not every prospective builder has that degree of patience, or confidence. Some do.

Third Generation Instruments

by Bob LeDoux, editor

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There is a new generation of instruments soon coming to a balloon near you. We can consider the new all-electronic packages to be the third generation of balloon instrumentation.

The first generation was the all mechanical systems which were prevalent in the early 1970's. With exception of an occasional electric variometer, these packs did not require electricity.

The second generation is typified by the *Ball M55* system, which incorporated primarily electronic instruments but still used a mechanical meter readout for the variometer. Batteries were included.

The third generation instrumentation makes exclusive use of electronic instrumentation, most of which is based on digital, not analog, data.

Ball Instruments, for example, has been working on such a system for at least a couple of years. I first saw a prototype of their new package at the Albuquerque Balloon Fiesta in 1996.

While the Ball instrument is still to make its debut, one of their competitors, the Swiss company, *Flytec*, has their model 3040 instrument package available for balloon operations.

Flytec was kind enough to provide *BBJ* with technical material about their new instrument package:

The instrument pack weighs 350 grams (11 ounces) and has dimensions of 170 mm (8.6 inches) long, 90 mm or 3.6 inches wide and 50 mm or about 2 inches deep.

The unit operates off of a main and spare 9 volt battery, with a battery life of about 50 hours. It comes with a recharger for the batteries. Warranty is for one year.

The altimeter will read up to 24,000 feet in 5 foot increments. If height in meters is chosen, the resolution is to 1 meter. The altimeter setting can be adjusted for current barometric conditions. While this instrument will provide measurements in units common to U.S.A. readers, it is essentially a metric instrument which converts to English units.

The variometer has both a digital and analog display. The range is up to 10 meters per second or 2,000 feet per minute. The photo displays how the LCD presents the analog display. As the rate of climb changes, the number of elements which make up the meter reading change. The display shows a climb rate of 5.6 meters per second.

The Flytec has a feature which is common on sailplane instruments but rarely found on balloon instruments; an acoustic variometer.

The *Flytec 3040* is one of a new generation of balloon instrumentation which will be showing up in the near future. Designers are attempting to make mechanical meters a thing of the past.

The pilot can set an adjustable response point between -0.2 and -10.0 meters per second. As the balloon sinks an audio tone is created. This tone changes with the rate of descent.

Like the *Ball* M55 Aegis® which is used by Aerostar, the Flytec uses a remote sensor to read envelope temperature. The Aegis system uses an infrared transmitter and receiver, while the Flytec uses a radio signal. The advantage to the radio signal is that no external pickup unit (like on the Aegis) is required. The disadvantage is that the radio signal requires special conditioning to keep balloons in close proximity from reading each other's signal.

The temperature transmitter is mounted in the top of the envelope. It weighs about 5 ounces (150 grams) and operates for about 200 hours from a 9 volt battery. The unit turns itself on whenever there is a significant difference between the ambient and envelope temperature. The transmission distance is about 145 feet and the unit provides a 'low battery' notification on the main instrument package.

The temperature signal is digital. The temperature gauge includes an alarm which can be set to go off once a preset temperature is reached. This alarm can be set to turn off after 30 seconds, or only after the temperature falls below a preset level.

For the true technocrat, there is a wind measurement gauge. A wand is plugged into the instrument package and a jewel mounted fan, about 0.7 inches across, is held up in the wind.

Flytec is currently obtaining US certification for the unit. The current unit uses a radio transmitter frequency for European standards. Meeting US radio signal standards has required a change in the unit design. The Flytec 3040 is priced at about $1400 US. For more information contact Flytec USA, P.O. Box 561732 Miami, FL 33156 or phone 800-662-2449

While the Flytec incorporates a number of new features not found in current generation electronics, there are many other features, which are currently found in some hang glider and ultralight instrument packages that may become part of the balloon technology.

These additional features include such items as GPS interconnects which create a moving map display of aircraft path, and include an electronic barograph. In addition to 'flight time to altitude charting', there exists the technical capability to record a chart of envelope temperatures, as well as graphing of fuel use. Based on these readouts, it's then possible to create other measures such as calculated remaining flight time and perhaps display a moving map which shows the range, at current speeds, over the ground.

In the sailplane arena, pilots create instrument packages which combine various reporting capabilities to reflect their individual philosophy of flight planning and data use. Perhaps, we will see balloon pilots generating similar packages in the new generation of instrumentation.

Letters to the Editor and Other Bits of Information

Mike Emich Sets AX-5 Record

Congratulations go out to Mike, on his recent world distance record of 270 miles during a 5 hour, 5 minute flight in his 41,000 cubic foot homebuilt balloon.

This flight was officially sanctioned by the NAA. The current world record for category AX-5 is 207 statute miles. At this time the attempt is unofficial pending homologation by the NAA and FAI.

Pre-launch problems with a local security guard and warmer than forecast temperatures aloft reduced duration. Towards the end of the flight Mike was traveling at 75.5 knots at 13,800 MSL. Launch site was Peoria, IL, and landing was east of St. Marys, OH.

Phil MacNutt Flies to 25,700 Feet.

On January 16th, at about 6:30 AM, Austin, TX, pilot Phillip MacNutt launched his home built AX7 hot air balloon from Old Settler's Park in Round Rock, Texas, north of Austin. By the culmination of his flight, he had flown to an altitude of 25,700 feet.

Airship Web Site

Roland Escher has been a true pioneer in aviation related Internet web sites. You might want to check out his new Airship Resources site at http://www.hotairship.com.

Dec. 4, 1997

Bob,

I have enjoyed my subscription and all the back issues very much. I wish it were bigger and came each month but I understand the burden that would create. The content summary on the back of the renewal form has been a very beneficial tool also. I use it for quick reference and have made several copies for friends interested in *BBJ*.

I'm in the process of designing an 84,000 cubic foot envelope that I plan to put over a 1981 Colt basket that I'm reworking. I have 750 yards of 1.3 ounce fabric ordered and need to find another 300 yards before I finish my design and start cutting. Hopefully this will all come together by January 1st. I'm very fortunate to have Phil MacNutt and David Koenig as friends. It's nice to have someone to discuss ideas with and double check calculations.

The original Colt design is similar to the design used on your basket in issues #17 and #18 [of *BBJ*]. The vertical stakes were bent in a "U" shape and project up through holes in the plywood floor. After 16 years of use I found about 90% of the rattan reeds were deteriorated where they pass through the plywood floor, but the rest of the basket was in good shape.

I had a couple of ideas on how to repair the damage, but after a short phone conversation with you I decided not to reinvent the wheel. I settled on a design using 3/8" nylon rods. The photo shows the basket, upside down, with the floor removed. The original vertical stakes were doubled. One of the verticals was removed and new "U" shaped nylon rods were inserted. Most of the rods are a foot long on each side. But the center and corner rods are 15 inches long on each side.

The stakes are slightly oversize from the original rattan they replace, thus making for a tight fit. I placed 2 pieces of rod horizontally, one on each side of the new stakes, at the bottom. These were laced to the stakes with wraps of stainless steel wire. In the photo, these lacings look like silver tape around the "U's."

My plan is to lash the basket side to the floor, using steel cable, like on a Balloon Works basket.

I'll test the process out, once everything is complete. So far, I feel very good about the strength and integrity of this repair. I'll keep you informed on the progress.

K. Wayne Wooster
Rt.4, Box 531
Alvin, Texas, 77511.

You are looking at the bottom of Wayne Wooster's Colt basket. The basket floor has been removed. Wayne has replaced one, of each pair, of the vertical rattan stakes with nylon rod. Heavier nylon rods are lashed to the verticals with stainless steel wire. The wire wrap appears like silver tape in the photo. Wayne plans to lace the rattan basket to a new floor with steel cable.