A Monthly Publication of Collins Model Aviators **April 2002**

President's Corner

Spring is here! At least that is what the calendar shows. The calendar also shows the swap meets are over and some fun flys are right around the corner. The Skyhawks first fun fly is April 21st and the Hannen Lake float fly is May 17-19. The first of three CMA fun flys is June 1st. The annual Sig fly in is just a couple of short months away on June 16th. I'm sure Dave Wilson is planning a fun fly sometime early this spring but I haven't heard when it is. Time to get out to the field and start getting those rusty thumbs loosened up!

Don't forget the CMA annual beauty contest is April 18th. I hope to see some new planes there. I hope to have the $50 airplane done by then.

Several club members along with other Rockwell employees are working with ISU on their future entry for the International Aerial Robotics Competition. They have an Excel helicopter with a gas engine. The helicopter needs to autonomously fly a course and then perform some function and relay the results back to a ground station. The scenarios change for each competition, but are generally related to some sort of disaster assistance or information gathering mission. They have a huge task in front of them and are going to need a lot of help from experienced fliers and engineers.

Get those new planes finished up and take a long, hard look at last year's planes before tossing them in the car and heading out to the field. Cycle the batteries on both the transmitter and the airplane a few times or if they are getting to be a few years old get them replaced. Check the hinges to make sure none are cracked or broken and give them a tug to be sure they are still securely fastened. Check over the pushrods carefully to make sure there are no potential problems there and check all the linkages and control horns for cracks, breaks, or signs of wear and get them replaced if necessary. Also check to make sure the pushrods are securely fastened to the servos and control horns and that everything is tight. The screw holding the servo arm on is still there and tight isn't it? Inspect the wiring on the batteries, servos, and receiver for signs of damage. Also check the antenna wire to see if there are any signs of wear or fraying and make sure it is straight and not wrapped around something inside the fuselage. It also doesn't hurt to measure the antenna on the plane once in a while to make sure you haven't chopped off a piece of it. Check the tail surfaces to make sure they are still well secured to the fuselage. Check the engine out to make sure the shaft and the carburetor are not seized. Check all screws and nuts for tightness, including the mounting screws. Does the prop need replacing? If it shows any nicks or signs of wear, replace it. Be sure the prop nut is tight. Check the fuel lines carefully for holes or nicks that can become holes. Check the fuel tank. You did remember to drain the fuel, didn't you? If there is still some fuel in the tank, you might

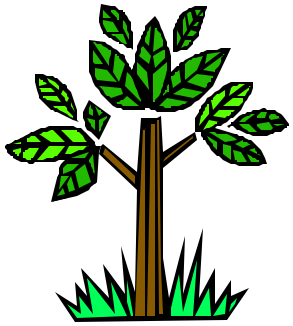
have a problem after letting it sit in there over the long winter. Check the clunk inside the tank to make sure it hasn't fallen off. I also like to bend and twist the entire wing and fuselage to check for cracks that may have gone unnoticed from that not-so-perfect landing I thought I got away with. Also check for any warpage that may have occurred. Check the covering for holes and get them patched so that you don't have to scramble around for tape when you finally do get out to the field. If you use rubber bands to hold the wing on, the ones you were using last year are probably all rotted away by now and you will need some new ones. If you use wing bolts, inspect them and replace if necessary. Check the landing gear for cracks and proper alignment and make sure the wheel collars are tight. Check anything else specific to your airplane.

Now that your airplane is ready to go, how about the flight box? Have the wife and kids figured out how to bypass the alarm system on it and been borrowing tools without your knowledge? Check to make sure all the tools are there. Make sure you have a few spare props and glow plugs. A small roll of packing tape is also handy to have. Check the batteries for the starter, glow plug driver, electric fuel pump, or whatever else you have for condition and charge them.

Now pack all your stuff into the car and go flying!

Steve Plantenberg
CMA President

BALSA - - WOOD EXTRAORDINARY



Balsa trees grow naturally in certain forests in South America. The Balsa tree resembles a Cottonwood tree with leaves as large as three feet across. The best balsa comes from plantations in Ecuador due to the ideal soil conditions, abundance of moisture, and low wind conditions. The tree grows at the amazing rate of about 40 feet the first year followed by a dozen feet annually. They are usually harvested after six to ten years, attaining a height of 90 feet and 25" in diameter. Being almost all water, after harvesting, the tree is extremely heavy. Therefore, the logs are kiln dried (inferior quality is sun dried) close to the growing site. After drying they are cut into large blocks, rough graded and shipped.

Balsa, which is really a hardwood, has one of the strongest weight to strength ratios of any wood including the heaviest, ebony. Balsa is composed of very thin, barrel shaped, air filled cells. The strength of the wood is derived from the cells as there is almost no liquid in the tissues, but the wood is pure cellulose. About 90% of the cell is space and the remainder is substance.

The hobby industry demands the highest quality balsa but accounts for only 10% of the market. The largest user is the composite marine industry. In the 1940's the U.S. Navy's PBY flying boat is an example. Over 3 million water craft have been cored with various forms of balsa. Other industries using balsa are transportation, aerospace, surf boards, and motion picture props. The supply is virtually unlimited as the trees seed themselves long before the time they are harvested.

Even though the hobby industry demands the highest quality, the quality within the industry varies greatly. Perfect, flawless wood, with exact density desired, accounts for ½of the finished hobby product. The remaining half (which is considered scrap) is plagued with defects and saw kerf loss. Some of these defects affect the integrity of the wood while others are superficial. Some defects are:

- Density variations
- Irregular Grain Pattern
- Worm Holes Discoloration
- Knot holes
- Cracks
- Wind Checks
- Warps
- Irregular Consistency
- Dents
- Splits
- Size Variations

Balsa is purchased in 20 and 40 foot containers from several plantations in Ecuador. We can specify balsa quality, width and length. Thickness varies from an inch or two to as much as 6" to 8". Specifications of grain, density, flatness, and color are usually random and up to the supplier.

After a month or two from ordering, the container of Balsa arrives at the port in Long Beach where it is sent to customs. At that point, customs decides whether or not to inspect the container, as shipments from Central and South America are suspicious of concealing drugs. If customs inspects the shipment, they can do serious damage to the Balsa, like drilling out core samples and pounding the Balsa blocks to listen for hollow sounds. This procedure causes extensive dents. Inspections could take up to six weeks, which we pay for.

After the Balsa is delivered to Superior, the raw blocks go through a series of grading and manufacturing processes. The initial grading is one of the most important steps requiring an experienced operator with considerable knowledge in the characteristics of Balsa. Each block of Balsa is separated and graded for density, quality , defects, and grain pattern. At that point one side of the block is carefully selected for certain characteristics, and then run through the joiner to provide a true surface for the next operation.

After joining, the block of wood is rough sawn into sheets varying in thickness from 1/16" to 1", on large industrial type band saws which run continuously. They generate so much saw dust, they require their own dust collection system.

The sheets of rough-cut balsa are then put through an impressive looking machine, called a double-sided, wide belt, belt sander. This machine sands the rough band-sawn cut sheets into the final thickness, as required. Tolerances are held to within a few thousandths over the length and width of the sheets which can be up to 12" wide and up to six feet in length. For this reason, the belt sander undergoes constant maintenance.

After sanding, sheets are trimmed to length and undergo another critical inspection, for density, grain, and quality. The quality of our product is not what the customer gets, it's what the customer does not get! At this intermediate grading, Balsa is separated into premium, commercial, and utility grades.

Selected sheets are cut into sticks of various sizes using specially designed slitting saws. Warped sticks are rejected. Sticks may be further processed into special shapes such as, triangles, ailerons, trailing and leading edges. This operation uses shapers and specially designed cutter blades.

WEIGHT/DENSITY - Balsa, being a product of nature, is intrinsically inconsistent. The weight range is wide, ranging from 3 to 30 pounds per cubic foot, with the average about ten pounds. (Balsa less than 4.5 lb. is difficult to manufacture) Another factor taken into account is density distribution. A block or

sheet of balsa that is light on one end may be heavy at the other end, or in the middle. There are no industry standards for density or weight groups but at Superior the following is used:

Density	Pounds per cubic foot	Use
Ultra Light	Under 4	Contest - Indoor - Extremely fragile
Very Light	4 - 6	Free Flight - Indoor Rubber Power - Contest Grade
Light to medium	6 - 8	Sticks – Tail Feathers
Medium to Heavy	8 - 12	Sticks - Die Cut - Leading & Trailing Edges – Ailerons
Heavy	12 - 15	Sticks - Die Cut - Specific customer needs
Very heavy	16 and over	Technical structures - (Should use spruce)

THE DEFECTS AND HOW THEY AFFECT QUALITY

DENTS are usually caused by improper handling, not by nature. Strapping used to hold the bundles during shipping, are a major cause for this defect. Other dents are caused by tools and rough handling (Customs) or during the process of cutting down the tree and during the manufacturing process. Balsa being so soft doesn't take much abuse!

DISCOLORATION is a grayish color in the grain ranging from a few spots to complete coverage. It's caused naturally by minerals in the water absorbed by the tree. Although there is no structural weakness, the balsa just doesn't look good. Very light balsa exhibits discoloration. Discoloration can also be caused by a tree that was lying on its side on the wet forest floor for a period of time causing rotting. In this case the rotted portion is very soft and has no structural integrity. It is unusable.

CONSISTENCY - Just because a block of balsa is light and the grain looks fairly straight, that doesn't mean every piece of balsa within the block is useable. One end of the block may be light, but the other end may be heavy. The same is true with the grain and other natural occurring irregularities. The larger the block, or the larger the final sheet or strip, the more the effect of inconsistency.

KNOT HOLES can vary in size from 1/16" diameter on up. A knot hole of any size is cause for reject. Fortunately, the sheet of wood can be recycled by cutting down the width or length of the wood eliminating the defect.

After the balsa is imported, Superior, or any of the other Balsa converters, has little to say about the quality, except to specify for the highest quality available at the time. Like fine wine, seasonal variations in the weather effect the quality of balsa. If there was a long drought, one would expect a few years afterwards when the trees are harvested, the industry would be plagued with heavy wood. On the other hand, if the rainy season was exceptionally wet, we would be inundated with very light wood. When a trailer load of wood is received from the exporter , properties range widely. Therefore, grading and sorting the wood is the most important step in the manufacturing process, which accounts for most of the labor cost.

The hobby industry uses various misleading adjectives to describe the quality of balsa. These terms or phrases are totally subjective in their meaning. Terms such as, Contest Grade, AAA Grade, Super Light, Virgin Quality, Light to Medium Weight, and Hand Selected, are only marketing oriented. There are no industry standard specific numbers placed on these terms.

GRAIN PATTERN - Balsa is usually described as A, B, or C grain. Contrary to the opinion, which says A grain is Excellent quality, C grain is bad, and B grain is average, or somewhere in-between , this is NOT TRUE. A, B, and C, grain, actually designate the grain pattern and the way in which the block was cut from the log. If the log was cut so the annular rings run across the thickness, this is termed "A" grain . The cut is made tangent to the side of the log. If the annular rings run throughout the thickness, this is "C" grain. "B" grain is a cross between "A" and "C". "B" grain accounts for most of the grain found in balsa blocks. Since we are dealing with a product of nature, "A" grain may exhibit swirls, or the grain may not run parallel to the long side.

SPECIFIC USES FOR A, B, & C GRAIN

Grain	Grain Description	Use
A	Long lines - Flexible across the sheet	Tight curves surfaces - Wing leading edges - Tube forming
B	Short grain lines - Slight flexibility cross the Grain	Fuselage sides - Trailing & leading edges - Ribs - formers - planking for slow curves
C	Mottled - Stiff across the grain – Splits easily	Straight sheeting - ribs - formers - Flat surfaces

Now, why don't kit manufacturers use the best density and grain structure for the intended purpose. The answer is an easy one; economics and availability.

Again, balsa being a product of nature, grain structure is not consistent. a sheet of balsa may contain mixed grain, that is, some of each, A, B. and C. The larger the sheet, the likelihood of mixed grain increases. Therefore, when a customer specifies 'A" grain, the likelihood of that sheet being 100% "A" is remote unless the customer is willing to pay for the sorting and selection process.

Picture this scenario. A thermal glider kit manufacturer needs 1000 - 1/16" x 4" x 48" sheets of 4 - 6 pound per cubic.. foot, clear, 'A' grain balsa to used on the wing leading edge. This would make a beautiful wing but to provide wood to those specifications would probably require sorting through 10,000 blocks. After the block is cut into sheets each sheet would again require weighing and inspection for clear "A" grain. And, still, the order may not be filled. Why? Consider this. 5% of the balsa will be 4 - 6 pounds. Of that, 25% would be true "A" grain. Also, light wood has a tendency to contain spots and stains therefore only 50% of the remaining balsa would be usable. Other reject criteria (table 1) would reduce the yield to practically zero. In other words, perhaps 200 - 300 sheets of balsa may be found in an entire boxcar load to meet that specification. And at what cost, obviously so high that the manufacturer could not be competitive.

Another problem with grain is consistency. It's rare indeed when a sheet of balsa contains one type of grain structure. The larger the sheet the more likely it will contain mixed or cross grains. So a sheet of balsa can contain A, B, and C, grain and combinations of each.

Another factor that effects quality is the uniformity of grain, that is, are the grain lines more or less equally spaced or do they have a swirled pattern. Grain uniformity effects warpage. Sticks cut from non uniform grain patterns will warp or twist. This warp is due to internal stress in the balsa. If used in a structure,
the resulting structure will eventually warp.

At Superior balsa is selected for its intended use. Long straight grain wood of medium to hard density is ideal for the smaller sticks. The larger the stick we use more of a medium weight. These properties will

insure that the stick will not warp. Sticks found in retail outlets are almost invariably bent. This bending is due in part to the internal stresses of the wood and humidity. But most likely, because the balsa manufacturer did not take the effort to select balsa of the proper characteristics.

SIZE - Balsa is purchased from the mill in blocks of wood ranging in size from 2" x 2" x 24" to 4" x 6" x 60". The larger the block, the more the cost per board foot. Example, the 2" x" 2 " block may cost $1.00 per board foot, whereas the 4" x 6" may cost $2.00 per board foot. When specifying balsa for purchase, two of the three dimensions may be specified. The third dimension is random. In most cases, the width, either 3" or 4", and the length, either 36 or 48" is specified and the width is random. This width varies from 2" to 6" or more, however wide blocks are becoming scarcer.

The 3" or 4" dimension (used for sheets of 3" & 4" wide) is controlled by the mill. If incorrect the block must be reworked and used for a smaller size. Stick sizes and sheet thickness are controlled by the manufacturing process and pose no problem as it is under the manufacturers control.

WORM HOLES - Obviously caused by nasty little creatures that like to use balsa as a home. Worm holes vary in size from tiny pin holes to holes 1/4". Sometimes the holes are not visible on the surface of the block and they only manifest themselves after the block is cut into sheets. The manufacturer has several options to deal with worm holes. The portion of the sheet containing the hole can be cut out making a smaller sheet, the wood can be sold as a factory reject, or if need be, just ignored. If there is only one small pin hole in a large sheet, the problem is sometimes ignored as the sanding process tends to fill the hole with balsa dust and the pin hole is invisible.

SPLITS - A split usually occurs at the end of an "A" grain sheet, perhaps by the manufacturing process or naturally. If the sheet is not handled, the split may not even be visible. It sometimes is found when the ultimate user it.

WIND CHECKS - When the wind blows a little too hard in the rain forest, the balsa tree may bend just enough to crack. This crack is usually healed with time but unfortunately will show up during the manufacturing process.

IN SUMMARY

But, do these defects described in the article really effect the aerodynamic or the structural integrity of models. Do we really need perfect balsa?

If you are a modeler, the answer lies in the ultimate use you have for the wood;

A. What type of model is being built?

B. Where in the structure is the balsa being used?

C. What type of builder are you targeting?

If your a kit manufacturer you would like your customers to open the box and say "WOW, look at this wood. And check out the die cutting. It's clean and straight." But manufacturers of covered ARF's generally use balsa of lower quality as the ultimate customer may see what lies underneath.

Credits – This is a reprint of an informative article on the website of Superior Balsa, located at : http://www.superiorbalsa.com/balsawood.htm

Meeting Minutes

7 March, 2002

Old Business

The meeting was called to order by CMA's President, Steve Plantenburg. Seven members were in attendance.

Larry Kerns was not present so no Treasurer's report or Minutes from the last meeting were read.

Steve Plantenburg reminded everyone of the CMA Beauty Contest coming on April 18th from 10: 00 am to 2:00 pm in the 106 auditorium. Everyone should bring their models since the restriction on previously shown aircraft was lifted and we need a good showing for the public. Please make an effort to participate!

It was also noted that the April 11 build session will be the last one until fall 2002. Come on out and let's make a club night of it!

There will be a swap meet held at the Robins Elementary School on 24 February. Gregg Lind plans to have a table at the event so see him for space.

The new members were reminded that Tuesday and Thursday nights were the designated training nights for flying lessons.

New Business

Dave Shema announced that he had fixed the Club Member Information form on the website to remove any reference to provisional (non-Rockwell) members.

Tom Gorman and Gregg Lind had plans for their HUGE OV-10 Bronco. Tom also brought his creation, Timmy, the parachutist.

Crist Rigotti described his method of installing a wing joining tube in his Encore 91.

A call was put out by our President, Steve Plantenberg, for someone to give a demonstration for the April meeting. No one at the meeting volunteered.

The meeting was adjourned.

Respectfully submitted,
David K. Shema
CMA Webmaaster

Heads Up, CMA Activities

April 2002

4 Apr 5-6 PM Meeting
11 Apr 6-9 PM Build session
18 Apr 10 AM-2 PM Beauty Contest

CMA voice bulletin board 295-8888

✍ Send your input for FlightLine to:

Larry W. Kerns
MS 107-140 x5-7157
lwkerns@collins.rockwell.com

Or at my home EMAIL

larrykerns@mcleodusa.net

AMA events web page:

http://www.modelaircraft.org/Comp/Contest.htm

For an AMA membership application:

http://modelaircraft.org/Mem/Memapp.htm

💻 Send your input for the CMA Web Page to:

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First flights of new helicopters:..... Crist Rigotti

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Flight Instructors in training: Irv Anderson
Jamie Johnson

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