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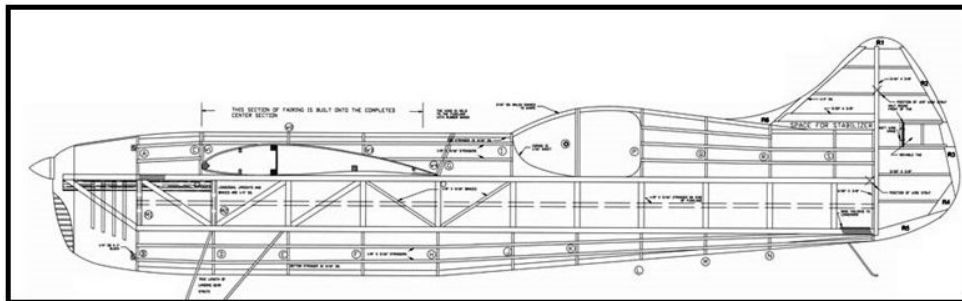
To: "Tandy Walker" <rdb435021@icloud.com>

Date: 2/17/2018 2:36:25 PM

Subject: 65 Lancer 850 - Fuselage Longerons Selection

Report No. 65
 New Cyclone Lancer 850
 February 17, 2018

Today I wanted to go through my 1/4" square balsa strips and select the four fuselage longerons for the primary structure shown below.



These four longerons must be at least 40-1/2" long as shown below.

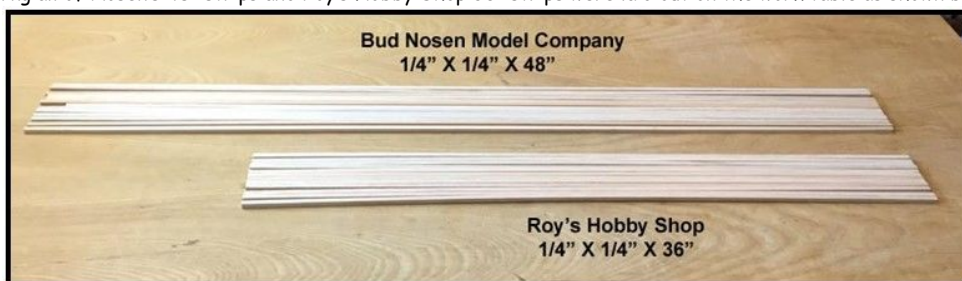


If you remember back in Report No. 8, I received the balsa order shown below from Bob Holman who had the Bud Nosen Model Company drop ship the order directly to my home address. Items No. 5 and 7 were special ordered to be medium hard 1/4" X 1/4" X 48" balsa strips for fuselage longerons and wing spars.

Lancer 850 Balsa Order for Bob Holman (11/26/17)				
No.	Item	Qty	Strip Balsa	Hardness
1	Tail Spars	3	1/4 x 3/8 x 36	Med-Hard
2	Tail LE	2	1/4 x 3/8 x 36	Med
3	Fuselage Stringers	10	1/8 x 1/4 x 48	Med
4	Wing Spars	4	1/8 x 1/4 x 48	Med-Hard
5	Fuselage Longerons	6	1/4 x 1/4 x 48	Med-Hard
6	Fuselage Frame	6	1/4 x 1/4 x 48	Med
7	Wing Spars	4	1/4 x 1/4 x 48	Med-Hard
8	Wing LE	3	3/8 x 1 x 48	Med

No.	Item	Qty	Sheet Balsa	Hardness
9	Wing LE Planking	4	1/16 x 4 x 48	Med
10	Extra Balsa	4	1/16 x 3 x 36	Med
11	Extra Balsa	2	1/8 x 3 x 36	Med
12	Wing Ribs	5	1/8 x 3 x 36	Med
13	Tail TE	1	3/16 x 3 x 36	Med
14	Tail TE Also	1	1/4 x 3 x 36	Med

This morning all of Nosen's 48" strips and Roy's Hobby Shop 36" strips were laid out on the work table as shown below.



The selection criterion I used were based on some recommended weight limits I received from Alfredo Herbon, which I feel are worth wild sharing with you.

Fuselage Longerons and Wing Spar Weight Limits

Some time ago Alfredo purchased a number of 6mm x 6mm x 36" balsa strips from one of Argentina's leading balsa wood importers & cutters. The strips were pre-selected by the supplier for typical old timer fuselage longerons and wing spars.

Alfredo weighted each one of the group of strips to define which strips had the right density for this kind of work. Then he did a selection using the subjective method of a general visual inspection, weight, and a previous idea of the strength just by tactile appreciation. Finally the old routine of shaking the strips by both ends was done like using a whip.

Next he made a correlation with the density of each strip by measuring, weighting, and calculating the balsa strip

density as there is a close dependence between balsa density and its strength. He concluded that balsa strips for fuselage longeron shouldn't have a density less 0.21 gr/cm^3 (13.0 lb./ft^3). Alfredo also concluded that the balsa strip density should not be greater than 0.25 gr/cm^3 (15.6 lb./ft^3) based on being too heavy and too stiff.

To summarize Alfredo's criteria conclusions for selecting longerons:

Upper limit: $15.6 \text{ lb./ft}^3 = 4.10 \text{ gr/in}^3$

Average: $14.3 \text{ lb./ft}^3 = 3.75 \text{ gr/in}^3$

Lower Limit: $13.0 \text{ lb./ft}^3 = 3.41 \text{ gr/in}^3$

The volume of a $1/4"$ square strip 48" long is 3.00 in^3 . Applying Alfredo's criteria, the weight limits in grams for a 48" strip are:

Upper limit: $4.10 \text{ gr/in}^3 \times 3.00 \text{ in}^3 = 12.30 \text{ gr}$

Average: $3.75 \text{ gr/in}^3 \times 3.00 \text{ in}^3 = 11.25 \text{ gr}$

Lower Limit: $3.41 \text{ gr/in}^3 \times 3.00 \text{ in}^3 = 10.23 \text{ gr}$

However after weighing all of Bud Nosen's 48" strips, typically they weighed around 6 grams as shown below with variations between 4 and 8 grams. All of the 48" strips were below the lower limit of 10.23grams and are therefore not suitable for fuselage longerons. They certainly were not medium hard balsa strips as ordered!



Next I checked the 36" strips from Roy's hobby shop. The volume of a $1/4"$ square strip 36" is 2.25 in^3 . Applying Alfredo's criteria, the weight limits in grams for a 36" strip are:

Upper limit: $4.10 \text{ gr/in}^3 \times 2.25 \text{ in}^3 = 9.23 \text{ gr}$

Average: $3.75 \text{ gr/in}^3 \times 2.25 \text{ in}^3 = 8.44 \text{ gr}$

Lower Limit: $3.41 \text{ gr/in}^3 \times 2.25 \text{ in}^3 = 7.67 \text{ gr}$

After weighing all of 36" strips from Roy's hobby Shop, typically they weighed 6 around grams with variations between 5 and 11 grams. The weights of the two top longerons selected were 9 grams and the two bottom longerons were 8 grams. These four 36" longerons will have to have a 4-1/2" strip spliced on at the rear. A single 36" strip weighing 8 grams was selected for these splices.....Tandy

