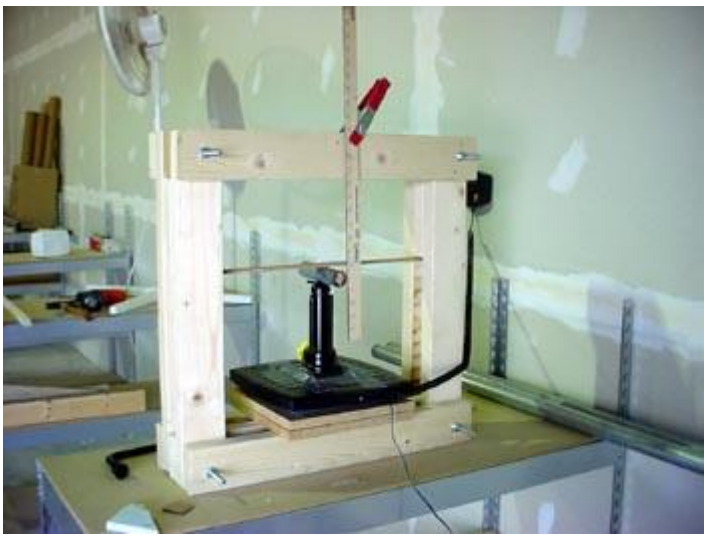
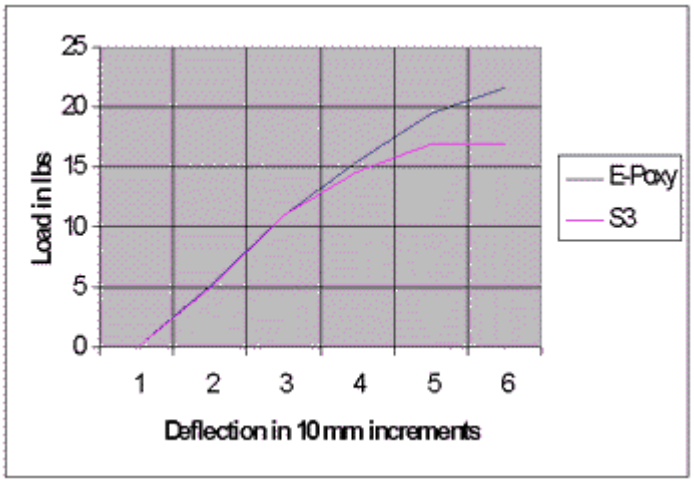
Resin Testing

We compared mechanical properties of the System Three resin with our new E-Poxy in a **fiberglass-ply-wood-epoxy** composite sandwich. While our method is not orthodox and will not become a new ASTM standard, it is sufficiently accurate for our purpose. We have used each resin to build a good number of boats and they are very close in terms of viscosity, ease of use and amine blush. The goal of this test was to compare flexural and tensile strength. In other words, stiffness and breaking strength. For this, we built a small test bench made of a frame, a commercial scale with remote reading and an automotive jack.



The jack applies pressure to a thin panel sample. We use a steel pipe to distribute the load. The pipe is fitted with a pencil that points to a ruler to measure the deflection. The pressure is measured through the load applied on the scale, all very simple.

We know the limitations of our small narrow strips (the ASTM tests should be made on 12x12" samples) but to compensate, we cut 10 samples of each and used a statistical formula to eliminate anomalies. The results were surprisingly consistent. We used our machine to compare plywood types, to compare plywood with or without fiberglass and to compare resin brands.
In this case, to compare resins, our samples were all made of the same type of plywood with one layer of the same fiberglass on each side. This is the principle of our standard sandwich in many of our designs. The sample panels were made by the same laminator, using the same fabrication method, at the same time and cured the same way. To avoid variations in resin thickness, the panels were made in a two-face mold with peel-ply, under pressure. Strips were cut from those panels and the weight of each strip was checked. Below is a graph showing the results.



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The parts of the curves to the right of 3 should not be taken in account. BTW, that 3 means a 3*10mm deflection, 1-1/4". A plywood core does not have any plasticity and the plywood core in samples failed at 1-1/2" deflection or less. At that point all the samples had failed in shear in the plywood, delamination was clearly visible, but the skins were keeping the panel together. The panels would still absorb some load until complete failure. The ends of the curves show the failure of the glass itself.

The picture here shows a deflection of 5 (2-1/2"). At that point, the plywood is completely delaminated, but the glass skins are still doing their job.

Conclusion: The E-Poxy shows a slightly better resistance to ultimate failure but the two resins perform exactly the same way in the range that interest us. Stiffness and tensile strength are the two most important factors in defining a laminate and for all practical purposes, those resins are very similar. We did not test for fatigue or impact but do not expect to see any difference there either.