

Hello Bob

I looked at some early work the cockpit group at SVERA did about 10 years ago. We then agreed that it is important to have a design that can take chock loads from impacts and we did this comparison between different materials

| Material | Thornel® Carbon Fiber P-75S 2K | Thornel® Carbon Fiber T-50 6K | Thornel® Carbon Fiber T-650/42 6K | Hexcel® Carbon Fiber IM6 | DuPont Kevlar® 49 Fiber, diam. 11.9 µm twisted yarn | Dyneema® SK60 High Strength Polyethylene Fiber | E-Glass | S-Glass | S2-Glass | Makrolon® 3103, Polycarbonate, General Purpose, UV Stabiliz ed | |
|-------------------------------------|--------------------------------------|-------------------------------------|---|--------------------------------|--|--|---------|---------|----------|---|-------------------|
| Breaking strength R_m | 1900 | 2900 | 4820 | 5450 | 3620 | 3500 | 3418 | 4585 | 4890 | 72 | MPa |
| Youngs modulus E | 520 | 390 | 290 | 276 | 123 | 110 | 72,5 | 86,2 | 86,9 | 2,4 | GPa |
| Max Strain(ϵ) | 0,37% | 0,74% | 1,66% | 1,97% | 2,94% | 3,18% | 4,71% | 5,32% | 5,63% | 125,00% | |
| Energy / volyme | 3,47 | 10,78 | 40,06 | 53,81 | 53,27 | 55,68 | 80,57 | 121,94 | 137,58 | 78,75 | J/mm ³ |
| Energy absorption relative glass | 4,3% | 13,4% | 49,7% | 66,8% | 66,1% | 69,1% | 100,0% | 151,3% | 170,8% | | |
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| | | | Information from MatWeb | | | | | | | | |
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-> Glass fibre is a way to get good impact strength

Of course we need to learn from cockpits that has failed at accidents but we do also need to look at designs that has worked good at full speed accidents, like the roll Svenne Bengtsson did landing up side down at speed about 80 knots. In that boat you can see a substructure/roll bars that are strong enough to carry the full impact load.

It seems to me that substructure and window strength are critical parts to carry the impact load and also to check for risk for buckling of windows from hydrostatic loads. The pressures that the windows have to take might be as high as 300 kPa.

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|--------------------|------------------------|
| Speed | 85 knots |
| Density | 1025 kg/m ³ |
| Angle Window | 35 degrees |
| hydraulic pressure | 322 kPa |

It has been discussins about if the polycarbonate windows shall be formed cold or hot. It is not yet clear which way is the best. Many of the boats today both cockpit and non cockpit has ballast today. I think we shall be restrictive on increasing the weight since it will end up in increase of ballast weight that might make the boat weaker.

best regards / Mikael Lundblad