

Supplementary material to the paper:

“A customised Finn dinghy rudder for optimal Olympic performance”

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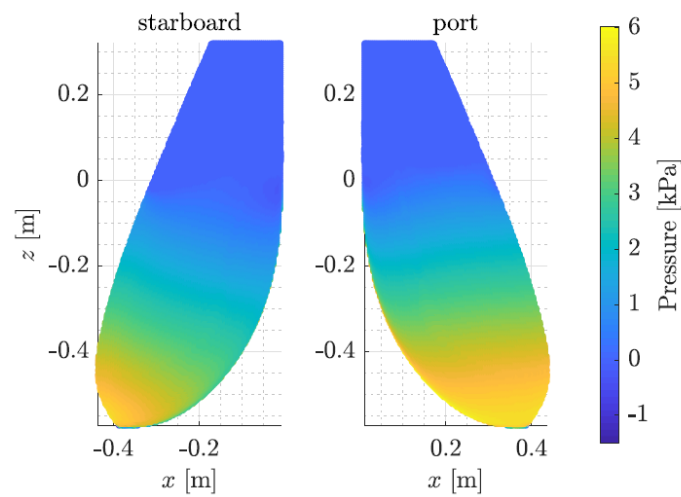


Figure S1. Pressure distribution on the rudder surface during normal sailing conditions estimated via Computational Fluid Dynamics simulations.

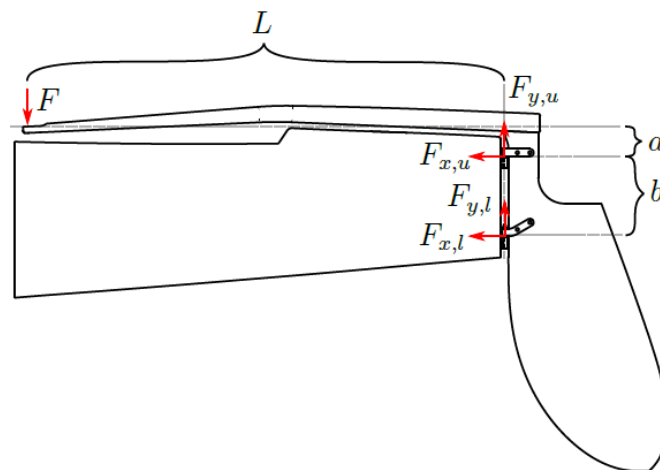


Figure S2. Illustration of the sailor supporting condition where the load of the sailor is idealised as a point force $F=1\text{kN}$ exerted at the tip of the tiller.

Table S1. Mechanical properties used for XPREG XC130 Prepreg Carbon (Toray T700S) 3K, 300 gsm.

Property	Value and unit
Areal weight (per ply, including resin)	447 g/m ²
Ply thickness	0.3 mm
Longitudinal modulus	135 GPa
Transverse modulus	8.6 ¹ GPa
Out-of-plane modulus	8.6 ¹ GPa
In-plane shear modulus	4.7 ¹ GPa
Out-of-plane shear modulus	3.1 ¹ GPa
Major in-plane Poisson's ratio	0.27 ¹
Out-of-plane Poisson's ratio	0.4
Longitudinal tensile strength	2550 MPa
Transversal tensile strength	69 MPa
Out-of-plane tensile strength	69 ¹ MPa
Longitudinal compressive strength	1470 MPa
Transversal compressive strength	100 ¹ MPa
Out-of-plane compressive strength	100 ¹ MPa
In-plane shear strength	60 ¹ MPa
Out-of-plane shear strength	32 ¹ MPa

¹ Estimated value based on similar material with data from [6].

Table S2. Mechanical properties used for XPREG XC110 Prepreg Carbon (Pyrofil TR30S) 3K, 210 gsm, 2/2 Twill.

Property	Value and unit
Areal weight (per ply, including resin)	362 g/m ²
Ply thickness	0.25 mm
Longitudinal modulus	55.1 GPa
Transverse modulus	55.1 GPa
Out-of-plane modulus	7 ¹ GPa
In-plane shear modulus	19.5 ¹ GPa
Out-of-plane shear modulus	2.7 ¹ GPa
In-plane Poisson's ratio	0.04
Out-of-plane Poisson's ratio	0.3
Longitudinal tensile strength	521 MPa
Transversal tensile strength	521 MPa
Out-of-plane tensile strength	50 ¹ MPa
Longitudinal compressive strength	483 MPa
Transversal compressive strength	483 MPa
Out-of-plane compressive strength	170 ¹ MPa
In-plane shear strength	125 ¹ MPa
Out-of-plane shear strength	65 ¹ MPa

¹ Estimated value based on similar material with data from [6].