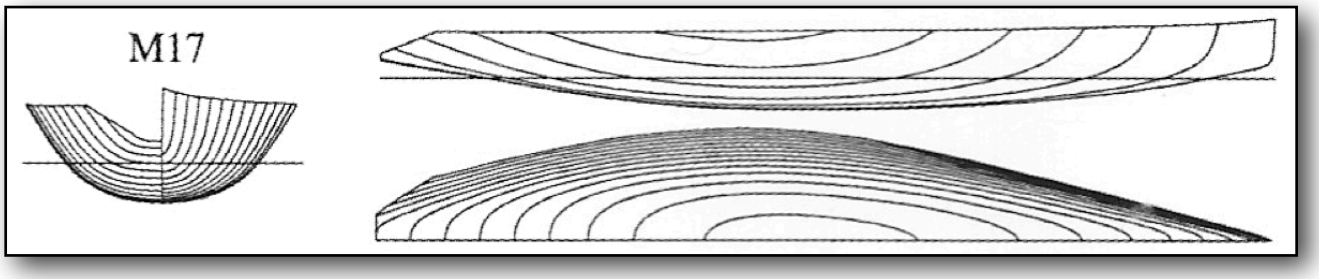
SD2706
Sailing for performance
Homework 2

Hull design

September 7, 2013 1:31 PM



In the picture you see the section plan of the canoe-body of a monohull sailing boat. You will in this exercise digitize such a drawing to create a numerical model of the hull. The numerical model will then be used to calculate stability characteristics.

Exercise 1:
On the course web page you find a set of hull section plans for the Moro di Venezia hulls. Download and digitize the M16-hull (in the file M16_hull.png) using the matlab script *digi_hull.m* (or some other suitable method). Use the lowest point on the hull as z=0. A Britfair file format specification can be found on the course website. Then load your hull geometry into the program *msy_hydrostatics* which is also available on the course web page. Using the *msy_hydrostatics* code you can then manipulate your hull. Scale the hull to be *LOA*=20m. What is the corresponding hull beam *BMAX* according to the sections plan? Do you agree with me that for even keel (trim=0°) at the design-waterline the displacement is $V \approx 19.5$ m^3, *LCB*=10.5m, waterline beam *BWL*=4.5m and prismatic coefficient *CP*=0.51. *Hints*: The scale during digitalization does not matter since you can scale x, y, and z-coordinates independently in msy_hydrostatics. Also, note that the design-waterline is given in the sections plan.

Exercise 2:
Assume a vertical center of gravity *KG*=-0.65 m (from canoe body keel). Use *msy_hydrostatics* to calculate and plot the GZ-curve. How much will the boat heel at heeling moment *MH*=65000Nm?

Exercise 3:
Vary some of the parameters, e.g. *V*, *BMAX* Bulb weight, *WK* and *KG* or *CP* systematically and redo calculations. Compare and reflect on all your results. Can you explain the differences you calculate?

Exercise 4: (not mandatory):
Assume that the keel bulb weight *WK*=5000kg of the total weight at *TK*=4.5m under the canoe body keel. Assume that the keel is free to rotate (around the x-axis) around the canoe body keel line up to 40° (canting keel). Investigate the effects on stability by comparing GZ-curves of fixed keel & canting keel.

Rules: See course program. If you aim at 2 points you have to argue and motivate in your report why you deserve 2 points :-)

Results: Present your results on max 3 A4 pages. Try to explain the fundamentals of transverse stability as reference to your VPP and the procedure to digitize a hull, set the scale etc. Use illustrative examples and comparisons. *Reflect in writing on your results and what you have learned.*