

Anchor Node Behavior

Yawing and Swinging

<http://alain.fraysse.free.fr>

AF v. 1.9 21/10/03

English

Français

Metric

Imperial

Units:

Simulation time step? 0.2 s

Dynamic data:

Boat length? 36 ft 10.9728 m
Boat mass? 18000 lb 7999.1 kg
Inertia radius? 13 ft 4 m
Anchor roller distance from CG (Center of Gravity)? 12 ft 3.6576 m

Aerodynamic data:

Forward Topsides:

Distance from CG? 13.1 ft 4 m

Aft Topsides:

Distance from CG? -9.8 ft -3 m

Hydrodynamic data:

Forward Fin:

Distance from CG? 3.3 ft 1 m
Effective area? 43.1 sqft 4 m2

Aft Fin:

Distance from CG? -3.3 ft -1 m
Effective area? 21.5 sqft 2 m2

Rode data:

Length (relaxed)? 100 ft 30.48 m
Stiffness? 137 lb/ft 2000.0 N/m

Wind data:

Initial direction? 5.0 ° 0.087 rd
Velocity? 20 kt 10.3 m/s

Instructions

This spreadsheet allows you to simulate the yawing and swinging behaviour of an anchored boat. To make things simple, the model is quite basic:

- Dynamic model: the boat is represented by its center of gravity (CG), its mass and its inertia radius.

- Aerodynamic model: the windage is represented by 2 "topsides" that act as a headsail and a mizzensail. For each topside, the effective area and orientation are automatically estimated from the boat length, so you have only to choose the algebraic position of the centroid (i.e. the point where the resulting wind force act). For example, to simulate a boat with a higher front freeboard, increase the "forward topside distance from CG".

- Hydrodynamic model: in the same way, the underwater parts (hull, keel, rudder blade) are represented by 2 "fins". Each fin is characterized by its effective area and algebraic longitudinal position. To simulate a boat with a deep keel, for example, move the fins closer to each other. For a powerboat, decrease the area of both fins.

- Rode model: the rode is represented by a "perfect spring", which is characterized by its length and stiffness (i.e. the ratio tension/extension).

You have also to choose the velocity of the wind and its initial direction relative to the boat axis.

The 3 first graphs show the variations of various parameters as functions of time.

If you click on the button "Animation", the last graph shows the motion of the boat (black bar) + the rode tension (in red).

For more details, please connect to

<http://alain.fraysse.free.fr>

Variations vs. Time:

