

Planesail Twin Genoa Design Brief

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Design Brief – Executive Summary

Planesail is 57 foot Walker Wingsail trimaran weighing 16 tons. Twin diesels give her a speed of 10 knots.

Her rigid Wingsail biplane rig broke and needs to be replaced by a Twin Genoa Rig to give her motor sailer capability.

This document (TwinGenoa.pdf), SketchUpNotes.pdf, TwinGenoaCalc.xls, and the SketchUp file TwinGenoa6.skp all form a part of this design brief.

Contact us if you are an individual or company interested in bidding or contributing.

Introduction

Four phases of Twin Genoa Rig design and build are envisaged:

- 1) Finalize this design brief;
- 2) Build and test a 1/8th scale R/C model. The model is nearly complete;
- 3) Mechanical design using CAD design tools, with drawing files in a popular electronic format, and the establishment of the vital load testing protocols to be used during construction and maintenance;
- 4) Build the Twin Genoa Rig.

We need these 4 phases to be undertaken in a transparent and professional manner, so that a trail of adequate machine readable documentation will exist for subsequent system enhancements, charter boat insurance, and certification.

Design Brief – Goals

Problems of the original rigid biplane rig were:

- 1) The boat sheared around in marinas and on a mooring because the rig could not be lowered.
- 2) The rig needed to be controlled by a computer, which put a heavy drain on the batteries.

The proposed Twin Genoa Rig is completely unconstrained and can pivot freely through 360 degrees on low friction bearings.

It is designed to overcome the disadvantages above because:

- 1) The twin genoas are roller reefing headsails so can be furled in a few seconds.
- 2) The mainsheet force is generated by a rigid tail aerofoil mounted at the rear. A linkage from a wind vane aerofoil mounted at the front controls the tail. No electricity is required.

3) The original Wingsail was very efficient for its area, which was 55 sq meters total. The Twin Genoa Rig needs 60 sq meters in each sail giving a 120 sq meter total.

4) All Wingsails are inefficient sailing directly downwind. The Twin Genoa Rig allows the two sail booms to pivot outwards, away from each other. This reverses the airflow over the sails, so the wind comes from the rear of the sails, exactly the same as a conventional sail when running. This results in the easily controlled twin headsail running downwind configuration.

5) The foot of each genoa is a spinnaker like boom attached via a wire bridle so that the center of pressure of the sail is directly above the bridle attachment point. This allows the sail to freely rotate from the going to windward configuration (both booms parallel) to the running position (booms toe in). This results in the CPs of the sails passing through the pivot bearing of the rig. Thus, small forces exerted by the tail can control the angle of attack of the sails when going to windward.

6) Planesail is 17.46 Meter LOA with a 9.54 meter beam. The rig must not overhang these dimensions when no sails are set. The turret is at the center of the boat.

7) A simple mechanical linkage, which has already been designed, gives the rig automatic tacking ability, so Planesail can be controlled by just the steering wheel.

8) Aluminium could be used for the spars, alternatively, an extensive range of composite tubes are available from Pipex, see

<http://www.pipexcompositepipes.co.uk/custom/downloads/FP918%20A%20-%202000M%20&%207000M%20GRE%20PIPE%20SYSTEMS.pdf>

9) A suitable roller bearing for the rotating rig can be found on the Jefa Rudder site:

<http://www.jefa.com/rudder.htm>



Planesail coachroof from forward.



Coachroof from aft.