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CONSULTANTS**

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## **MACHINERY DAMAGE SURVEY REPORT**



M/Y 'GULFCRAFT' – UVI: 3320198

### **'RUDDER STOCK BEARING FAILURE'**

**Date of inspection:** 4<sup>th</sup> & 5<sup>th</sup> of July 2023

**Location:** Gold Coast City Marina, Waterway Drive, Coomera, Queensland

**Sea trial:** Coomera River and Gold Coast Broadwater.

**Date of report:** 15<sup>th</sup> July 2023

Our reference: BSM3320.1

Your reference: RS332010

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## **I. EXECUTIVE SUMMARY**

This Machinery Survey Report serves to confirm that Guy Howard, of Big Sea Marine Consultants, conducted a steering machinery inspection survey on the motor yacht GULFCRAFT, on the 4<sup>th</sup> and 5<sup>th</sup> of July 2023. This is a response to the owner's written request to provide an expert opinion report. The vessel owner is Mr. John Citizen, 235 Paloma Drive Rozelle, Sydney 2000, Australia.

The primary objective of this report is to provide a factual narrative, specifically on the condition of rudder stock bearings and associated rudder stock and steering components of the vessel named GULFCRAFT with a UVI number: 3320198, at the time and on the day of the survey. Where the equipment has been inspected or tested and found to be in an unsatisfactory condition, suggestions for rectification, repair, or replacement are detailed in this report's discussion and conclusion sections. (Sections 3 & 4)

The inspection was conducted in good faith and the following report is issued without prejudice. In our opinion, the report constitutes a statement of the condition of the equipment inspected at the time of the survey. The report has been prepared specifically for Mr. John Citizen, on 15<sup>th</sup> July 2023 and is intended for his use only. Copies in whole or part should not be released to, or consulted by, other parties without the express prior written permission of Big Sea Marine Consultants and Surveyors.

## II. INTRODUCTION

GULFCRAFT was initially inspected at 0830hrs on the 4<sup>th</sup> of May 2023, whilst underway. Sea trials were conducted on the Coomera River and Gold Coast Broadwater. Vessel service speed was achieved, and the hydraulic steering system was checked for correct operation, evidence of noise, vibration, and resonance.

On a hard stand at Gold Coast City Marina, Coomera, GULFCRAFT was lifted out of the water at 0900hrs on the 5<sup>th</sup> of May 2023, for further inspection of rudders and hull appendages.

The survey was carried out in accordance with Big Sea Marine Consultants internal WOH&S and Safety Policy, vessel SOP and initial sea trial records, recorded by Gulf Craft Inc. at the time of launch.

### Persons present on board during sea trials and survey activities:

- John Citizen. Vessel Owner. 235 Paloma Drive Rozelle, Sydney 2000, Australia.
- Jack Jones. Aussie Super Yachts representative.
- Matt Morely. Master 45m NC.
- Guy Howard. Surveyor, Big Sea Marine Consultants and Surveyors.

### 1. VESSEL DETAILS

Figure 1.

Vessel Name:	M/Y GULFCRAFT
Shipyard/build:	Gulf Craft Dubai UAE
Hull Model:	Majesty Yachts 105
Build / Hull No:	100#3
Classification Society:	RINA
Flag:	Australia
UVI:	3320198
DCV Operational Classes:	1E, 1D, 2C
Vessel length:	32.98m
Engine manufacturer & model:	MAN 16V
Engine type:	4-stroke diesel 16cylinder
Engine power:	1900hp @ 2300 rpm
Service speed; Cruise speed:	25knts; 12knts

## 2. SCOPE & LIMITATIONS

- 2.1 Survey inspections were conducted on water and out of water, to replicate the operational conditions where the reported noise and vibration may be evident. On-water operations were conducted with a calm sea state, neap tide conditions, and within the main channel of the Gold Coast Broadwater.
- 2.2 Survey inspections on the hard stand were conducted with the vessel supported in accordance with factory/shipyard recommendations: Supports below all bulkheads, chines, and transom.
- 2.3 Provision was made for height allowances, to enable rudder removal.
- 2.4 Steering mechanical and hydraulic components were inspected and tested during the survey, with no other components or associated operational systems tested or inspected at the time of this survey.

## 3. DISCUSSION AND METHODOLOGY

- 3.1 **During sea trials:** We comment that vibration and excessive noise were evident from the tiller flat area and a resonance was occurring, which was found to be transferring into the hydraulic steering system.
  - Visual inspections of the steering compartment were conducted while underway.
  - Noise level tests were conducted and compared to historical records.
  - Temperature readings were normal at the hydraulic reservoir and rams.
  - Steering operation was tested at service speed, 35 degrees to 35 degrees, and found to operate freely and unimpeded, well within the required 30-second period.
- 3.2 **Out-of-water survey:** We comment that rudder bearing clearances were found to be outside acceptable tolerances when compared with 'as built' drawings; Figures 3 & 4, which are appended to this report.
  - Underwater appendages were pressure washed, followed by a visual inspection.
  - A bump test for rudder bearing clearances was conducted.
  - A visual inspection of tie rod ends and link bar.
  - Hydraulic rams checked for leakage and signs of wear.
  - The steering hydraulic pack was checked for leakage and signs of wear.
  - Security of all components and fasteners was checked and inspected.
  - Port & starboard rudders were then removed from the hull.
  - Upper and lower rudder bearings were measured using a calibrated micrometer.
  - Both upper and lower bearings were found to be outside factory specifications.

#### 4. CONCLUSION AND RECOMMENDATIONS

- 4.1 We comment that existing upper and lower rudder bearings were measured, and inside bore diameters were all found to be at least 1.5mm oversize.
- 4.2 We conclude that oversized or incorrect rudder bearings were installed during the construction of the vessel. This was confirmed via official email correspondence between Big Sea Marine Consultants Pty. Ltd and Gulf Craft Inc, United Arab Emirates. The advice provided during our communication with Gulf Craft Inc.'s technical department included an admission that at the time of build, incorrect (oversized) rudder bearings were installed on hull # 3.
- 4.3 Gulf Craft Inc. has provided approval in writing, that new bearings are required to be manufactured to the specifications for 'as-built' rudder bearing and stern tube detail. Alternatively, the bearings may be requested directly from the manufacturer, using part numbers listed on the manufacturer's drawings.
- 4.4 Refer to *drawing number: RT00077, Rudder Tube Assy*, which is appended to this report. (Page 6)
- 4.5 Refer *drawing number: RC00086MC, Cast Rudder to Suit U2016 Series*, also appended to this report. (Page 6)

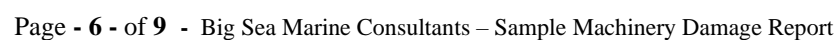
Figure 2.

Bearing	Correct I.D. Specification	I.D measured
Upper Port	Nominal bore dia. 70mm	71.55mm
Upper Stbd	Nominal bore dia. 70mm	71.63mm
Lower Port	Nominal bore dia. 90mm	91.54mm
Lower Stbd	Nominal bore dia. 90mm	91.57mm

- 4.6 Repairs must include new replacement bearings and stainless-steel cap screws. Repairs must be carried out by an established engineering firm with appropriate experience and manufacturing capability.
- 4.7 'Acetal' load-bearing material must be used for manufacturing new bearings.
- 4.8 A subsequent follow-up survey is required, upon completion of the repair. Alternatively, documented repair processes and supporting images may be supplied for this purpose.

#### 5. APPENDICES

- Drawing no: RT00077 (Figure. 3)
- Drawing no: RC00086MC (Figure. 4)
- Images: (Figure. 5)



6. **IMAGES** – Figure. 5



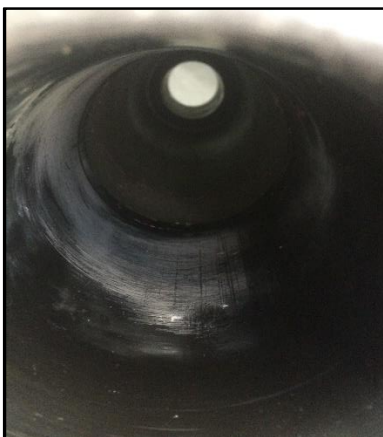
Stbd rudder blade



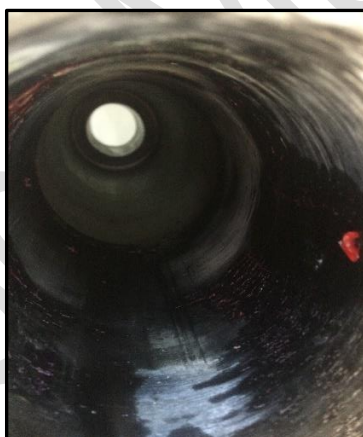
Stbd lower bearing insert



Port lower bearing insert



Stbd rudder tube from below



Port rudder tube from below



New fitted lower bearing



## 7. DISCLAIMER

The report has been prepared for the person to whom it was directed and is confidential to that person. For the purposes of the report, the steering system was visually inspected, and the vessel was sea trialed to assess the steering and rudder bearing condition. However, only a reasonable inspection was conducted and unless otherwise specified herein, no other machinery or equipment was tested, nor were any reasonably inaccessible spaces. No responsibility is accepted for latent or other defects not discovered during the survey.

This report does not constitute seaworthiness or provide a guarantee of vessel condition. No liability or responsibility is accepted for any third party who may use or rely on the information in this report, either in part or in whole. Please refer to our terms and conditions, which were provided in writing to the owner, at the time of our initial engagement.

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## 8. REFERENCES

- NSCV National Standards – *Part C Subsection 5A, Chapter 6. Steering.*
- Rudder detail drawings provided by Gulf Craft Inc, United Arab Emirates.
- Correspondence between Gulf Craft Inc. and Big Sea Marine Consultants.
- Watsons Marine Engineering, Gold Coast City Marina, Waterway Drive, Coomera, Qld.

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