



## **FINDINGS OF CONCERN**

### **Ninth Coast Guard District**

February 2, 2023  
Cleveland, OH

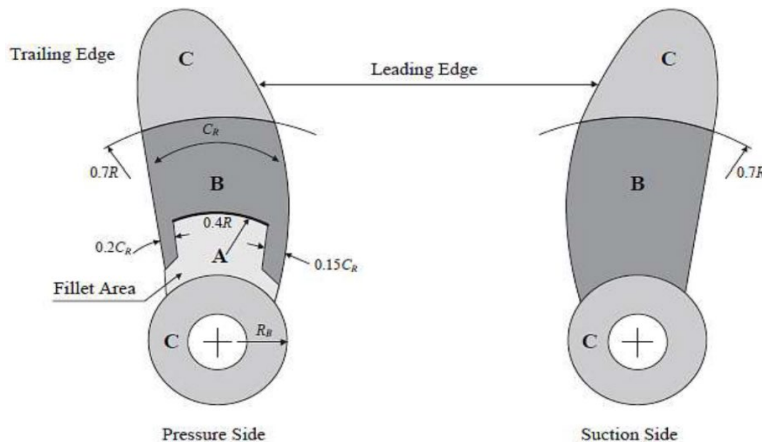
Findings of Concern 003-23

## **REPAIR HISTORY VERIFICATION OF PROPELLER BLADE(S)**

Purpose. The U.S. Coast Guard issues findings of concern to disseminate information related to unsafe conditions that were identified as causal factors in a casualty and could contribute to future incidents. Findings of concern are intended to educate the public, state, or local agencies about the conditions discovered so they may address the findings with an appropriate voluntary action or highlight existing applicable company policies or state/local regulations.

The Incident. On August 31, 2022, while underway in Lake Huron, a U.S. Flagged Freight Ship suffered a reduction in the vessel's ability to maneuver after two of the vessel's controllable pitch propeller blades fractured. One blade (Blade "1") suffered a complete brittle fracture across the blade (in a leading to trailing pattern) three feet from the tip. Investigators noted that the fracture apparently occurred within a previously repaired area, which was completed within zone A and B of the propeller blade. It is suspected that the second blade (Blade "2") fractured after the fractured tip of Blade "1" contacted Blade "2".

Propeller zones are different areas within the physical propeller blade that experience varying stresses when operating. Typically, Zone A is the region with the highest operating stresses, Zone B is a region where operating stresses may be high, and Zone C is the region where operating stresses are low.



*Figure 1: A depiction of propeller blade severity zones for low skew propellers.*

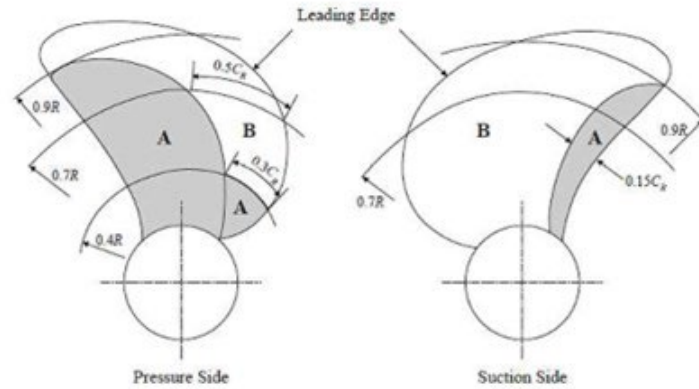


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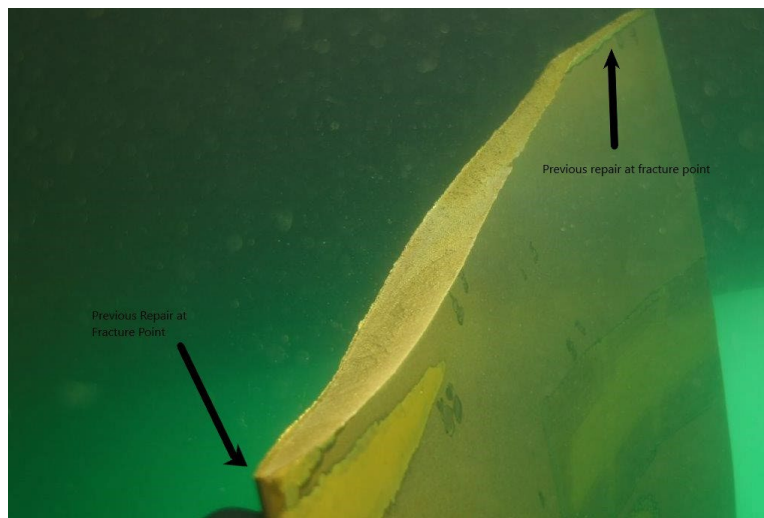
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*Figure 2: A depiction of propellor blade severity zones for high skew propellers.*

Contributing Factors and Analysis. Blade “1” was manufactured in February 1984. There is evidence that Blade “1” underwent repairs at some point in its 38-year service life; however, Blade “1” was not marked with relevant repair data, as required by Class. Further, neither Class nor the Operator/Owner had records related to Blade “1’s” repair history. Class rules generally do not permit welding repair in Zone A due to highest operational stresses and is only allowed after special consideration. Similarly, welding repair in Zone B should be avoided but may be allowed subject to prior approval. In the present case, there is no record that Class knew of or approved the repair. Further, neither the Owner/Operator nor Class were monitoring Blade “1”, as both were unaware that Blade “1” was especially vulnerable to fractures.



*Figure 3: A photo of damaged Blade 1, with approximately three feet of the tip sheared from the propeller assembly. Arrows indicate previous repair at fracture point.*



**UNITED STATES COAST GUARD**  
U.S. Department of Homeland Security

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Findings of Concern. Blade repair(s) history found to be non-existent.

- The vessel changed Owner/Operator in March of 2021 and maintenance records were not transferred with the vessel.
- It was determined that the propeller blades were being rotated on at least two, possibly three different vessels. This rotation of propeller blades amongst different vessels created tracking issues for Class, as the blade reference numbers/marks are vessel-specific.
- Class rules require repair markings “at appropriate locations” indicating the type of repair and designating Class approval. These repair markings were not found on the propeller blades. This may indicate that damaged blades are being repaired without Class or Coast Guard oversight.
- It is imperative that Coast Guard Marine Inspectors, Class Surveyors, and vessel Owners/Operators track repair histories on propeller blades and associated equipment to provide historical context and ensure repairs and vulnerable areas can be tracked, and as appropriate, monitored.

Closing. These findings of concern are provided for informational purpose only and do not relieve any domestic or international safety, operational, or material requirements. For any questions or comments, please contact the Ninth District Inspections and Investigations Division by phone at (216) 902-6050 or by email at [SMB-D9ClevelandDPI@uscg.mil](mailto:SMB-D9ClevelandDPI@uscg.mil).