

# **ANALYSIS OF FAST ATTACK CRAFT RUDDER FAILURE**

Amune Hene Gedara Pradeep Nishantha Gunarathna

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Department of Materials Science and Engineering

University of Moratuwa  
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Dissertation submitted in partial fulfillment of the requirements for the  
degree Master of Science in Material Science

Department of Materials Science and Engineering

University of Moratuwa

Sri Lanka

April 2016

## DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Name of the supervisor: Eng. S.P. Guluwita

Signature of the supervisor:

Date:

## Abstract

It is observed that frequent rudder failures of Sri Lanka Navy's fast attack craft which are equipped with conventional propulsion system. Therefore, it was unable to effectively utilize these craft for operational requirements in the Navy.

In this research it was analyzed both recently failed fast attack craft rudder and existing rudder fabrication process in order to minimize this type of rudder failures in future. Analysis of failed rudder and the existing rudder fabrication process was done through macro/micro level inspection, chemical composition analysis and micro hardness testing of relevant materials.

Analysis revealed that rudder failed from the welded joint where rudder blade connected to rudderstock and weakening of the weld joint during fabrication. The weld joint was weakened due to formation of intermetallic phases, carbide precipitation, porosities and hot cracks in the heat affected zone of the weld. Therefore, finally rudder was failed as a result of fatigue failure. Use of similar low carbon stainless steel with suitable welding electrodes to ensure final weld lies in austenite region with containing 4% to 12% ferrite in the weld could overcome this issue.

Key words: Stainless steel, intermetallic phases, carbide precipitation.



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## List of Abbreviations

<b>Abbreviation</b>		<b>Description</b>
BCC	-	Body Centered Cubic
FAC	-	Fast Attack Craft
FCC	-	Face Centered Cubic
FN	-	Ferrite Number
HAZ	-	Heat Affected Zone
ITI	-	Industrial Technological Institute
TTT	-	Time Temperature Transformation



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