ANALYSIS OF CORROSION OF AIRCRAFT FLUID PRESSURE LINES USING EDDY CURRENT

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Dissertation submitted in partial fulfillment of the requirements for the Master of Science Degree

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Declaration

I declare that this is my own work and this thesis 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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The above candidate has carried out research for the partial fulfillment of the requirement for the Degree of Master of Science in Materials Science and Engineering under my supervision.

Name of the supervisor:

Signature of the Supervisor: Date:

Acknowledgement

I owe a debt of gratitude to my supervisor, Mr V Sivahar, Senior Lecturer at the Department of Materials Science and Engineering, University of Moratuwa for the vision and foresight which inspired me to conceive this project. I am particularly in debited to my wife and parents for inspiring me to this work; this research work would not have been possible without the great assistance given by them. I further offer my sincere gratitude to the Head of the Department, lecturers and lab assistants of Department of Materials Science and Engineering of University of Moratuwa. I am also priviledged to offer my gratitude to the Head of the Department of Department of Aeronautical Engineering, the library staff at the Kotelawala Defence University and the Commanding Officers, Officers Commanding Maintenance of No.1 Flying Training Wing and No.10 Kfir Squadron of Sri Lanka Air Force for assisting me in numerous ways to make this research a success. Last but by no means least I wish to express my great gratitude to the Commander of the Air force, Commanding Officer, Engineering Officers and laboratory staff of Aircraft Engineering Wing, Sri Lanka Air Force Base Katunayake for supporting me providing the available resources.

Abstract

The metal tubes are often used in aircraft to convey fluids to one or more destinations as they are capable of withstanding high levels of internal pressure and hoop stresses. The internal surfaces of fluid carrying metal tubes are frequently corroded once the inner walls are contacted with stagnated fluid for a long period of time. Once corroded, the fluid lines are to be replaced as they become unairworthy. The detection is difficult as there is no method developed for the corrosion detection of small diameter Aluminium metal tubes. This study is to carry out eddy current inspections on small diameter metal tubes and to carry out a qualitative analyze on eddy current impedance plane displays, building up a relationship on the resultant signals. It is also to distinguish the different characteristics of impedance plane displays of internal corrosion and crack signals. A qualitative analysis is the objective in this study as detection of corrosion is the prime objective for the aircraft fluid pressure lines. Since, neither the aircraft manufacturer nor pressure lines manufacturer has given any tolerances for corrosion, irrespective of the depth and the spread of corrosion, the fluid lines are to be replaced with new lines, if the corrosion is detected. Therefore, this study is limited only for a qualitative analysis and will be an eye opener for another study for a quantitative analysis.

Key Words: Hoop stress, eddy current, impedance plane display, unairworthy, quantitative analysis

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LIST OF ABBREVIATIONS

Abbreviation	Description
SLAF	Sri Lanka Air Force
ID	Internal Diameter
NDT	Non Destructive Testing
NDI	Non Destructive Inspection
DBTT	Ductile to Brittle Transition Temperature
AC	Alternating Current
DC	Direct Current
ILI	In Line Inspection
MFL	Magnetic Flux Leakage
RFET	Remote Field Eddy Current Technique
PET	Pulsed Eddy Current Testing
SLOFEC	Saturated Low Frequency Eddy Current
PT-6	Primary Trainer-6
IACS	International Annealed Copper Standard