

**DESIGN PARAMETERS FOR THE DEVELOPMENT OF
WING TEST RIG FOR STATIC TEST EXPERIMENT**

BY:

**RAMZYKAN RAMLY
WAHYU KUNTJORO
WIRACHMAN WISNOE
RIZAL EFFENDY M NASIR**

OCTOBER 2010

PROJECT TEAM MEMBERS

RAMZYKAN RAMLY

Project Leader



.....

PROFESSOR DR. IR. WAHYU KUNTJORO

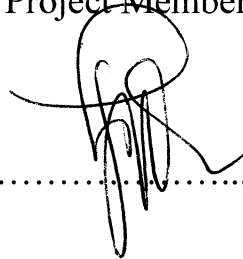
Project Member



.....

ASSOCIATE PROFESSOR DR. WIRACHMAN WISNOE

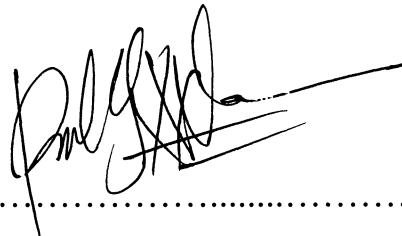
Project Member



.....

RIZAL EFFENDY M. NASIR

Project Member



.....

CONTENTS

Letter of Research Acceptance	ii
Letter of Date Correction	v
Letter of Report Submission	vi
Team Members	vii
Acknowledgment	viii
Contents	ix
List of Illustrations	xi
List of Tables	xiii
Abstract	xiv
CHAPTER 1. INTRODUCTION	1
1.1 Introduction	1
1.2 Problem Statement	2
1.4 The objectives of the research:	2
1.5 Significance of the project	3
1.6 The scope of the research	3
CHAPTER 2. LITERATURE STUDY	4
CHAPTER 3: RESEARCH METHODOLOGY	6
3.1 Basic Dimension of Test Rig	6
3.2 Internal Forces of the Test Rig	6
3.3 Material Selection	9
3.4 2D Frame Design	14
3.5 3D Frame design	15

CHAPTER 4. RESULTS AND DISCUSSIONS	18
4.1 Result of Single Beam Deflection Analysis	18
4.2 Results of Combination of Frame Analysis	19
4.3 Results of 2D Frame Analysis	23
4.4 Results of 3D Design Analysis	25
4.5 Final Design Proposal	27
4.6 Prototype Development	28
CHAPTER 5: CONCLUSION	31
5.1 Overall Conclusion	31
5.2 Recommendation	32
5.3 Recommendations for the Future Research	32
REFERENCES	33
APPENDICES	35
1. Paper Conference “Finite Element Analysis of Frame Profiles for the Development of Static Wing Box Test Rig” presented at the International Conference on Advances in Mechanical Engineering 2010 (ICAME 2010), Shah Alam, Malaysia, December 2010.	
2. Paper Conference “Design and Analysis for Development of a Wing Box Static Test Rig” presented at the Conference on Scientific and Social Science Research 2010, CSSR 2010, Kuala Lumpur, Malaysia, December 2010.	

ABSTRACT

Airplanes are designed to stay aloft with the help of wings on both sides. In operation at cruising speed, the wings are subjected to load as much as the weight of the whole aircraft. However during maneuver, the wings are subjected much higher load and stress and this stress should be sustained by the wings within its limit load without causing permanent deformation to the structure. In order to assess how much stress the wings are subjected to, the wings should be tested on ground which is called static test. To prove that a design is good, a numerical analysis should be verified by experimental analysis. The static test can be done in a test rig. The test rig however should be much stronger than the object to be tested. Therefore, the design parameters such as materials selection, design configuration, mounting types, points of load application, boundary conditions are among the parameters to be studied in the development of the test rig. From the research, the simulation was done using CATIA software and the numerical tests was done using ANSYS software. The results from the simulation provided a good picture of the test rig and a prototype was developed using a 40% scale of the actual size being studied.