PREDICTION OF AN AEROENGINE PERFORMANCE ANALYSIS AND THERMODYNAMIC PARAMETRIC STUDY (FAN PRESSURE RATIO)

AHMAD SHAUQI BIN MUSA

(2006127101)

A thesis submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering (Hons) Mechanical

Faculty of Mechanical Engineering

Universiti Teknologi MARA (UiTM)

MALAYSIA

NOVEMBER 2009

ACKNOWLEDGEMENT

Alhamdulillah....In the name of Allah S.W.T. Lord of Universe who has given me strength and ability to complete this study and thesis. All perfect praises belong to Allah S.W.T. May His bless and peace be upon the prophet Muhammad S.A.W and members of his family and companies.

I would like to dedicate my special gratitude and appreciation to my study supervisor who is Mr. Mohd Hafiz Bin Mohd Noh for his continuous support, generous guidance, help, patience and encouragement in the duration of the thesis preparation until its completion.

Not forgetting to express this appreciation to all staff and lecturer that have contributed their knowledge and experience to teach me and completion of this thesis. Special thanks to my parents who have given their moral support and advice.

Last but not least, special thank to my friends and any party who has contributed directly or indirectly into this completion of this study. These contributions are really meaning to me. For all of you, I really appreciate your contributions. Thank you very much and May Allah S.W.T. blesses you all.

ABSTRACT

The gas turbine is a device that converts heat into work and also called as a combustion turbine which is a rotary engine. A simple gas turbine is based on the three main components: a compressor, a combustor and a turbine. This study covers on the gas turbine behavior and technology which are focuses on the effect of fan pressure ratio and altitude on overall performance of aero gas turbine. The whole idea of aero gas turbine such as turbofan and turbojet will be describe since the FPR value will be taken 1.3 up to 2.0 and the margin altitude value from 0 up to high altitude (11000km). Basically the manual analysis or calculation need more time and required high level understanding of gas turbine operation so we have developed a software by using MATLAB Simulink and graphical user interface (GUI) and the result will represent the prediction of gas turbine performance. The study method required and used to avoid the mistake occurs during the manual analysis and make a systematic data output accurately compare to manuals.The software of MATLAB simulink is represented in block diagram or model that will create a flow of aircraft gas turbine from the intake until the exhaust nozzle. Meanwhile, the significant of this study can make the student and society to get ease understanding the trend occurs for the selected margins. The main task of overall of the program is to gain the total thrust (FN) and specific fuel consumption (SFC) from the MATLAB simulink and GUI program. Then the study and analyzing is done on both final results in some conditions based on the correlation between fuel flow, thrust and SFC. The results for the fixed Mach number and altitude selected, an increasing of the pressure ratio (FPR) decreased the specific fuel consumption (SFC) and the small range given from specific thrust.

TABLE OF CONTENTS

CONTENTS		PAGE
ACKNOWLEGDEMENT		V
ABSTRACT		VI
TABLE OF CONTENTS		VII
LIST OF TABLE		X
LIST OF FIGURES		XI
LIST OF GRAPH		XIII
LIST OF ABBREVIATIONS		XIV
DEFIN ATIONS		XV
CHAPTER I	**INTRODUCTION**	
1.0	Introduction of Project	1
1.1	Objective of Project	2
1.2	Scope of the Project	3
1.3	Significant of Project	3
1.4	Methodology of Project	3

CHAPTER II LITERATURE REVIEW

2.0	Introduction to Gas Turbine engine and Technology	5
2.1	Gas Turbine Engine	6
2.2	Fan Pressure Ratio	8
2.3	Effect of Altitude	9
2.4	Program Development	9
2.5	Engine Performance	10
2.6	Current Software Available	13

CHAPTER III METHODOLOGY

3.0	Parametric Study	15
3.1	Theory Calculation	16
3.2	Simulink Development	17
3.3	GUI Development	29
3.4	Test and Debug	33
3.5	Analysis	33

CHAPTER 1V RESULT AND DISCUSSION

4.1	Result for Altitude at 2 Spool Turbofan (Unmixed)	34
4.2	Result for Altitude at 3 Spool Turbofan (Unmixed)	35
4.3	Result for FPR at 2 Spool Turbofan (Unmixed)	37
4.4	Result for FPR at 3 Spool Turbofan (Unmixed)	38
4.5	Result for Altitude at 1 Spool Turbojet	40
4.6	Result for Altitude at 2 Spool Turbojet	41
4.7	Result for Altitude at 3 Spool Turbojet	41