

**DESIGN AND ANALYSIS OF THIN WALLED ALUMINIUM 7075  
AIRCRAFT PARTS**

**MOHAMAD AZUAN BIN MOHD ZIN  
B051010053**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA  
2014**



# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Design and Analysis of Thin Walled Aluminium 7075 Aircraft Parts

SESI PENGAJIAN: 2013/14 Semester 2

Saya MOHAMAD AZUAN BIN MOHD ZIN

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. \*\*Sila tandakan (√)

- SULIT (Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysiasebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)
- TERHAD (Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
- TIDAK TERHAD

Disahkan oleh:

Cop Rasmi:

Alamat Tetap:  
NO.29, LORONG 7,  
TONGKANG PECHAH,  
BATU PAHAT, JOHOR

Tarikh: \_\_\_\_\_

Tarikh: \_\_\_\_\_

\*\* Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

## DECLARATION

I hereby, declared this report entitled “Design and Analysis of Thin Walled Aluminium 7075 Aircraft Parts” is the results of my own research except as cited in references.

Signature : .....

Author's Name : Mohamad Azuan Bin Mohd Zin

**Date : 23 June 2013**

## **APPROVAL**

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design) (Hons.). The members of the supervisory committee are as follow:

.....  
(Principal Supervisor)

## **DEDICATION**

*Specially dedicated to my family,  
Academic Supervisor,  
All my friends as well who have  
Encouraged, guided, and inspired me throughout my journey of education.*

## ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful

Alhamdulillah, all praises to Allah for the strength and His blessing in this completing this project. Special appreciation goes to my supervisor, En Baharudin b. Abu Bakar, for his supervision and support. His invaluable help of constructive comment and suggestion throughout the project research work have contributed to the success of this research. I'm most grateful to Dr Suriati bt. Akmal for proving me suggestion, ideas and for taking their precious time to consider my work. I also would like to express my deepest gratitude to technician, En Mohd Raduan who conduct a CNC milling machine for his patient, excellent guidance, caring and support my project. Special thank also like to extend thank to the technician of laboratory of the manufacturing department for their help in offering me the resources in running. All the members, Muhammad Nur azuan bin Kamaruddin, Mohamad Amran bin Ibrahim and Affendy Bin Salleh had contributed a lot of their times and effort to help me during my research project. Finally, I would also to express my gratitude to any other individual or group whom have not mention that has also play an important role in this report. Sincere thank to entire friend especially from BMFR student for their kindness and moral support that have been valuable on both an academic and personal level, for which I'm are extremely grateful.

Most grateful to my parents, because they have always loved and supported me every choice. As we know, they are the happiest and the most proud when seeing their son gets this Degree, I dedicate this project to them.

Thank You.



## **UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

### **DESIGN AND ANALYSIS OF THIN WALLED ALUMINIUM 7075 AIRCRAFT PARTS**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Engineering Design) with Honours.

by

**MOHAMAD AZUAN BIN MOHD ZIN**

**B051010053**

**880915235659**

FACULTY OF MANUFACTURING ENGINEERING

2014

## **ABSTRACT**

7000 series aluminum alloys are widely used because of its advantages of high strength but low density. It is widely used in the aircraft manufacturing industry which is becoming particularly important basic component of aluminum alloy 7075 (Al 7075) series. Al 7075 has been used at the aircraft rib for Boeing 737. The objective of this project is to investigate and identify the minimum thickness that the material can be machined. This project was carried out by analysis using SolidWork and by experiment using CNC machine. To ensure data is more reliable, this project was conducted together with another two materials, general purpose aluminium (GPAI) and mild steel (AISI 1018). All of them were tested under the same procedure but different in parameter of machining and force applied during analysis. This is due to the different properties of the material. From the experiment it is identified that the minimum thickness that Al 7075 can be machined by experiment is 1 mm while in analysis using SolidWork software is 0.80 mm thick. A different between two results is 2%. For GPAI and AISI 1018 material it found that the minimum thickness can be machined in theoretically is 5 mm and 2 mm respective, but for experimental result is 5 and 3 mm.



## **ABSTRAK**

Siri 7000 aloi aluminium digunakan secara meluas kerana kelebihan yang mempunyai kekuatan tinggi tetapi berkepadatan rendah. Ia digunakan secara meluas dalam industri pembuatan pesawat yang menjadi komponen asas penting untuk siri aloi aluminium 7075 (Al 7075 ). Al 7075 telah digunakan di rusuk pesawat untuk pesawat Boeing 737. Objektif projek ini adalah untuk menyiasat dan mengenal pasti ketebalan minimum bahan ini yang boleh dimesin. Projek ini telah dijalankan melalui analisis menggunakan SolidWork dan eksperimen menggunakan mesin CNC. Untuk memastikan data yang boleh dipercayai, projek ini telah dijalankan gabungan bahan lain dua, aluminium kegunaan umum( GPA1 ) dan aloi keluli(AISI 1018) . Kesemuanya telah diuji dengan prosedur yang sama tetapi berbeza dari segi parameter pemesinan dan daya yang dikenakan semasa analisis. Ini adalah kerana sifat-sifat yang berbeza bahan tersebut. Daripada ujikaji tersebut ia dikenal pasti bahawa ketebalan minimum yang Al 7075 boleh dimesin dalam keputusan eksperimen adalah 1 mm manakala di analisis menggunakan perisian SolidWork adalah 0.80 mm tebal. Perbezaan antara dua keputusan ialah 2%. Untuk bahan GPA1 dan AISI 1018 didapati bahawa ketebalan minimum boleh dimesin secara analisis ialah 5 mm dan 2 mm masing-masing, tetapi untuk keputusan eksperimen adalah 4 dan 3 mm.

# TABLE OF CONTENTS

Abstract	i
Abstrak	ii
Dedication	iii
Acknowledgement	iv
Table of Content	v
List of Table	ix
List of Figure	xi
List of Abbreviations, Symbols and Nomenclatures	xiv

## CHAPTER 1: INTRODUCTION

1.1	Background of project	1
1.2	Problem Statement	2
1.3	Objective	3
1.4	Scope of Work	3
1.5	Important of Study	4

## CHAPTER 2: LITERATURE REVIEW

2.1	Introduction	5
2.2	Aircraft	5
2.3	Aircraft Parts	6
	2.3.1 Fuselage	7
	2.3.2 Wing, Flaps and Aileron	7
	2.3.2.1 Wing Rib	8
2.4	Material Uses in Aircraft Part	9
	2.4.1 Metal	11
	2.4.2 Composite	11
	2.4.3 Metal Matrix Composite (MMC)	13

2.4.4	Aluminium Matrix Composite (AMC)	14
2.5	Aluminum Alloy	14
2.5.1	Alloy Designation System – Wrought Alloys	15
2.5.2	Tempers Designation System	17
2.5.3	Heat Treating T Temper Codes	18
2.5.4	H Temper Strain Hardening Codes	19
2.6	Aerospace Aluminum	19
2.7	Aluminium 7 series	21
2.8	Aluminium 7075	23
2.8.1	7075 Temper Designations and Definitions	24
2.8.2	Aluminium 7075 properties	25
2.9	Mild steel	26
2.9.1	Mild Steel Properties	26
2.10	Milling Machine	28
2.10.1	Milling Process	28
2.10.2	Milling Machining Operation	28
2.10.2.1	Face Milling	29
2.10.2.2	End Mill	30
2.10.3	Milling Parameter	31
2.10.3.1	Spindle Speed	31
2.10.3.2	Feed Rate	31
2.10.3.3	Depth of Cut	32
2.10.4	Cutting Parameter	32
2.11	Computer Numerical Control (CNC) Machine	34
2.12	Airplane Part Analysis	35
2.12.1	Solid Work	35
2.12.1.2	SolidWork SimulationXpress	36

## **CHAPTER 3: METHODOLOGY**

3.1	Introduction	38
3.2	Research Project Flow Chart	39
	3.2.1 Problem Identification, Objective and Scope of Project	40
	3.2.2 Literature Survey	40
	3.2.3 Data Collection	40
3.3	PSM 2 Planning Strategies	41
	3.3.1 Detail Drawing for Workpiece	41
	3.3.2 Design Analysis	42
	3.3.3 Experimental (Machining)	43
	3.3.4 Result	44
	3.3.5 Process Flow Chart for analysis	44
	3.3.6 Discussion and Conclusion	46

## **CHAPTER 4: EXPERIMENT PROCEDURE**

4.1	Introduction	47
4.2	Design of Experiment	47
4.3	Workpiece Material	48
4.4	3 Dimension (D) Drawing	49
	4.4.1 Analysis	50
	4.4.2 Analysis Procedure	52
	4.4.2.1 Force Calculation	55
4.5	Experimental (Machining)	61
	4.5.1.1 Machine	61
	4.5.1.2 End Mills Cutting Tool	62
	4.5.1.3 Cutting Fluid	62
	4.5.1.4 Experimental Apparatus	63
	4.5.1.5 Measurement of Surface	63
	4.5.1.6 Machining Parameter	64
	4.5.2 Experimental Procedure	66

## **CHAPTER 5: RESULT AND DISCUSSION**

5.1	Introduction	71
5.2	Solid Work Analysis	71
	5.2.1.1 Analysis Result (Al 7075)	72
	5.2.1.2 Experiment Result (Al 7075)	80
	5.2.2.1 Analysis Result (GPAI)	87
	5.2.2.2 Experiment Result (GPAI)	89
	5.2.3.1 Analysis Result (AISI 1018)	93
	5.2.3.2 Experiment Result (AISI 1018)	97
5.3	Comparison Result from the Analysis and Experiment	102
	5.3.1 Comparison of Aluminium Alloy 7075	102
	5.3.2 Comparison of Pure Aluminium	103
	5.3.3 Comparison of Mild Steel	103
	5.3.4 Comparison of all Material (Analysis)	104
	5.3.5 Comparison of all Material (Experiment)	105
5.4	The Factors That Cause Results From the Experiment Irregularities	109

## **CHAPTER 6: CONCLUSION AND RECOMMENDATION**

6.1	Conclusion	110
6.2	Recommendation	111

<b>REFERENCES</b>	114
-------------------	-----

## **APPENDICES**

A	Gantt Chart
B	Workpiece Detail Design
C	Jig Detail Design

## LIST OF TABLE

2.1	Wrought Alloy Designation System	15
2.2	Basic Temper Designation	17
2.3	Heat Treating T Temper Codes	18
2.4	H Temper Strain Hardening Codes	19
2.5	Aerospace Aluminium Alloy	20
2.6	Composition (Wt. %) of 7XXX Series Alloys	22
2.7	Chemical Composition of AA7075 alloy	23
2.8	7075 Temper Designations and Definitions	24
2.9	Mechanical Properties of Aluminum 7075	25
2.10	Chemical Composition of AISI 1018 Mild Steel	27
2.11	Mechanical Properties of AISI 1018 Mild Steel	27
2.12	Factor Effecting Surface Roughness (Benardos and Vosniakos 2003)	32
2.13	Effect of Cutting Parameter on the Surface Finish on the Surface Machined of Aluminium Workpiece.	33
4.1	Composition and Mechanical Properties of Workpiece Materials	48
4.2	Workpiece Specification	49
4.3	Cutting speeds for Various Materials Using a Plain Carbon Steel Cutter	56
4.4	Result of Cutting Force	58
4.5	Specification of Deckel Maho DMF 250 Linear Travelling Column Vertical CNC Machining Center	61
4.6	Machining parameter	64
5.1	Cutting Force Use for Analysis	72
5.2	Data Parameter Specification (Al 7075 at 5mm)	73
5.3	Data Parameter Specification (Al 7075 at 4mm)	74

5.4	Data Parameter Specification (Al 7075 at 3mm)	75
5.5	Data Parameter Specification (Al 7075 at 2mm)	76
5.6	Data Parameter Specification (Al 7075 at 1mm)	77
5.7	Data Parameter Specification (Al 7075 at 0.9mm)	78
5.8	Data Parameter Specification (Al 7075 at 0.8mm)	79
5.9	Result from Experiment for 5 mm Thickness (Al 7075)	81
5.10	Result from Experiment for 4 mm Thickness (Al 7075)	82
5.11	Result from Experiment for 3 mm Thickness (Al 7075)	83
5.12	Result from Experiment for 2 mm Thickness (Al 7075)	84
5.13	Result from Experiment for 1 mm Thickness (Al 7075)	85
5.14	Data Parameter Specification (GPAI at 5mm)	87
5.15	Data Parameter Specification (GPAI 4.5mm)	88
5.16	Result from Experiment for 5mm (GPAI)	89
5.17	Result from Experiment for 4mm (GPAI)	90
5.18	Result from Experiment for 3mm (GPAI)	91
5.19	Data Parameter Specification (AISI 1018 at 5mm)	93
5.20	Data Parameter Specification (AISI 1018 at 4mm)	94
5.21	Data Parameter Specification (AISI 1018 at 2.5mm)	95
5.22	Data Parameter Specification (AISI 1018 at 2mm)	96
5.23	Result from Experiment for 5mm Thickness (AISI 1018)	97
5.24	Result from Experiment for 4mm Thickness (AISI 1018)	98
5.25	Result from Experiment for 3mm Thickness (AISI 1018)	99
5.26	Result from Experiment for 2mm Thickness (AISI 1018)	100
5.27	Comparison between Analysis and Experiment for Al 7075	102
5.28	Comparison between Analysis and Experiment for GPAI	103
5.29	Comparison between Analysis and Experiment for AISI 1018	103
5.30	Comparison Analysis Result for all Material	104
5.31	Comparison Experiment Result for All Material	108

## LIST OF FIGURE

2.1	Basic Airplane Parts	6
2.2	The Component of Wing	8
2.3	Wing Ribs for Airbus 380 Model	9
2.4	Airbus A380 Material Composition	10
2.5	767 Exterior Composite Parts	12
2.6	Nominal Compositions of Wrought Aluminum Alloys	16
2.7	Application of Aluminium in Boeing 777	21
2.8	Mild steel plates	26
2.9	Face mill process	29
2.10	End milling process	30
2.11	CNC Machine Model DECKEL MAHO DMG DMF 250 Linear	34
2.12	Example of Analysis using SolidWorks SimulationXpress	36
3.1	Flowchart of This Project	39
3.2	Detail drawing for the workpiece	42
3.3	Example of Simulation Xpress when force subjected at the analysis surface	43
3.4	Process Flow Chart for a Part of workpiece Analysis	44
3.5	Process Flow Chart for a Part of workpiece Experiment	45
4.1	3-D Modeling for This Project	49
4.2	Example of Linear Analysis in SolidWork	51
4.3	Flow Chart of Analysis Procedure	52
4.4	Flow Chart of SolidWork Simulation Express	53
4.5	Fixture Surface	54
4.6	A simple Formula to Estimate the Magnitude of Cutting Forces on the Workpiece.	55



4.7	Force Applies Surface	58
4.8	Sample of Stress Analysis Result of a Simulation Using Plain Carbon Steel	59
4.9	Sample of FOS Analysis Result of a Simulation Using Al 7075 as a Workpiece Material	60
4.10	10 mm End Mill Solid Carbide Cutting Tool	62
4.11	Aluminium 200 x 200 mm Jig	63
4.12	Dial Gauge with Magnetic Stand	63
4.13	Specific Point Surface Seasure	64
4.14	Point to be Measured by a Dial Gauge (with specific number)	65
4.15	End Milling Operation	66
4.16	Process Flow of Machining Analysis	70
5.1	Analysis Result of 5 mm Thickness	73
5.2	Analysis Result of 4 mm Thickness	74
5.3	Analysis Result of 3 mm Thickness	75
5.4	Analysis Result of 2 mm Thickness	76
5.5	Analysis Result of 1 mm Thickness	77
5.6	Analysis Result of 0.9 mm Thickness	78
5.7	Analysis Result of 0.8 mm Thickness	79
5.8	Point to be Measured by a Dial Gauge (with specific number)	80
5.9	Experiment Workpiece (Al 7075)	81
5.10	Graph of Location Reading vs Surface Height for Al 7075	86
5.11	Analysis Result of 5 mm Thickness	87
5.12	Analysis Result of 4.5 mm Thickness	88
5.13	Graft Point Reading vs Surface Height for GPAI	92
5.14	Analysis Result of 5 mm Thickness	93
5.15	Analysis Result of 4 mm Thickness	94
5.16	Analysis Result of 2.5 mm Thickness	95
5.17	Analysis Result of 2 mm Thickness	96
5.18	Graph Ooint Reading vs Surface Height for AISI 1018	101

5.19	Graph Point of Location vs Deflection for all Material (5 mm)	105
5.20	Graph Point of Location vs Deflection for all Material (4 mm)	106
5.21	Graph Point of Location vs Deflection for all Material (3 mm)	107
5.22	Graph Point of Location vs Deflection for all Material (2 mm)	108

## LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURES

AA	-	Aluminium Association
AC	-	Alternative Current
AMC	-	Aluminium Matrix Composite
CAD	-	Computer Aided Design
CAE	-	Computer Aided Engineering
CATIA	-	Computer Aided Three-dimensional Interactive Application
CAM	-	Computer Aided Manufacturing
DC	-	Direct Current
EST	-	Elfini Structural Analysis 2 (CATIA software)
F	-	Fahrenheit
FEA	-	Finite Element Analysis
FMS	-	FEM Surface 2 (CATIA software)
FSW	-	Friction-Stir Welding
GAS	-	Generative Assembly Structural Analysis 2
GMAW	-	Gas Metal Arc Welding
GP1	-	Generative Part Structural Analysis 1 (CATIA software)
GPS	-	Generative Part Structural Analysis 2 (CATIA software)
MMC	-	Material Matrix Composite
MIG	-	Metal Inert Gas
RAP	-	Partial Melting Route
SSP	-	Semi-Solid Forming
SSM	-	Semi-Solid Metal
TAA	-	Tolerance Analysis of Deformable Assembly 3 (CATIA Software)
VS	-	Versus

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Project

For 70 years, aluminium alloys have been the materials of choice for both military and commercial aircraft structures. Aluminum alloys are divided into two general categories, namely heat-treatable and non-heat treatable (Jasim M. Salman, 2013). The 7xxx series is one of the heat treatable by solution and aging, considered as the high strength aircraft alloy family. Due to their attractive, comprehensive properties, such as low density, high strength, ductility, toughness and resistance to fatigue it have been widely used as structural material (Brian Smith, 2003). The 7075 aluminium (Al 7075) alloy also knows as aerospace aluminium is one of the important engineering alloys and has been utilized extensively in aircraft structures because of its high strength-to-density ratio.

The 7075 wrought aluminum alloy is an Al-Zn-Mg-Cu alloy, has one of the highest attainable strengths of all aluminum alloys. There are many applications using this material especial in the aircraft manufacturing industry since it was introduced in 1944. On commercial airplane part, aluminium typically uses at the frames, stringers, floor beams and wing ribs (Staley, 1993). In Boeing 737, the application of aluminium 7075 is used as a material for wing ribs (Chris Brady, 2013). Aircraft wing is a crucial and most critical component of an aircraft not only from an aerodynamics point of view but also from a structural point of view.

To make a wing rib structure, that material must undergo a series of machining process. In this project, the investigation to find the minimum thickness of that material can machined, is done by analysis and experimentation. Analysis is performed using SolidWork 2010 software while for experiment it is done with a CNC milling machine. To get accurate and reliable data, other materials are used in this research namely the general purpose aluminum (GPAI) and ANSI 1018 mild steel for comparison between them. Results of both will be analyzed to make the final conclusion if there have any improvement in terms of the thickness of the selected material.

## **1.2 Problem Statement**

Market pressure for a reducing airplane transportation cost continues to increase year by year. Increasingly, not only commercial airplane manufacturers needing to account for high technological barriers, but growing financial, economic, environmental, and government concerns as well (Ashford, 1985; Esposito, 2004; Gillett and Stekler, 1995). The overall weight effect the fuel consumption of the aircraft and it will make the transportation cost using aircraft is high. Metallic material used, especially aluminium is one of the factors that contribute to the weight. For example, 70 percent of aircraft model Boeing 777 is made from aluminium including the wing box and fuselage (Advance Material and Process, 2003). Due to that problem, many parts originally made from aluminium are replaced by composite material. Growth, congestion, economic and environmental factors are driving the need to develop new solutions. Another possible solution is by reducing the minimum thickness of thin walled without reducing their performance and have same desired properties for the particular part. Due to the manufacturing process for wing rib which require the machining process, the need to know the minimum thickness for the purpose of machining process is highly important for material Al 7075.

### **1.3 Objective**

The objective of this project is:

- I. To investigate the use of Al 7075 in aircraft part.
- II. To identify the properties of Al 7075.
- III. Identify the minimum thickness of Al 7075 grades for aircraft wing rib structure can be machined.
- IV. To make comparisons between different materials (GPAI and AISI 1018 mild steel) with Al 7075 in terms of ability of machining.

### **1.4 Scope of Work**

The studies of this paper cover the analysis and experiment of different thickness of Al 7075, GPAI and AISI 1018 mild steel material. The research will focus on the wing ribs structure in commercial aircraft part. The research is done using SolidWork 2010 simulation express to analyze the given thickness and specific forces apply at that specific location. Force apply is calculated using cutting force formula where every material have different cutting force. For experimental, it's done by using CNC machining center, where these machines can produce high precision cutting. A dial gauge is used to analyze the machined surface behavior after workpiece have been machine. The size of workpiece is 150 mm x 130 mm and analysis surface is 100 mm x 100 mm for both analysis and experiment.

## **1.5 Important of Study**

This project is an idea to analyze and identify the minimum thickness of the thin walled used in aircraft parts. The investigation will focus on the metal material Al 7075 used in the commercial wing ribs aircraft and other two materials (GPAI and AISI 1018 mild steel). The analysis is conducted using SolidWork CAD software on the important aspect that influences the thickness of wing ribs had been studied in detail. For the experiment, it conducted using a CNC milling machine by analysis the surface finish after it is machine by 1 mm each layer. By undertaking this project, the minimum thickness of material can be identified and from the resulting data it helps a designer to reduce the thickness of existing wing rib design.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter will discuss the literature review on application and properties of aluminum 7 series using in wing ribs aircraft part. Is basically an assessment of to find the minimum thickness of thin walled Al 7075 can be machined, that be used in producing wing ribs part for airplane Boeing 737. The GPAI and mild steel properties also included.

#### **2.2 Aircraft**

The aircraft is a transportation device that typically uses to transport people, animal or cargo from one location to another by air. The idea that human can fly is coming when they saw a bird fly. The first attempt was an effort to fly like a bird by attaching feathers to their arms and flapping. This attempt was unsuccessful. Since then, many inventors have thought, a way to fly by designing a device or thing that looks like a bird and fly. On December 17 1903, after facing many failures the Wright Brothers finally become the first people to successfully fly and descended without damage with a person in it. They named a powered airplane as “flyer”. The plane that had a 12 horse powered engine and build by themselves (Rick Young, 2001).

Now, the aircraft come in with a variety of sizes, shapes and wings depending on the application and mission. There are many applications of airplane and commonly use as