CHAPTER ONE

(INTRODUCTION)

1.1. Introduction:

The major focus of structural design in the early development and manufacturing of flight vehicles was strength. Nowadays the use of lighter structures in aerospace structural design is becoming an important issue.

In modeling an aircraft wing, structural idealizations are often employed in hand calculations to simplify the structural analysis. In real applications of structural design and analysis, finite element methods are used because of the complexity of the geometry, combined and complex loading conditions.

In recent years, structural optimization has been combined with finite element analysis to determine component gauges that may minimize weight subjected to a number of constraints.

This work is a part of ongoing research and development in the field of light aircrafts conducted at LADRAC_Sudan Khartoum.HYAT-13 is a light aircraft being designed to satisfy certain requirements. The aim of this study is to perform structural design and analysis of the aircraft wing. In doing the following objective should be achieved.

1.2. Statement of the Problem:

A light weight A/C wing is to be analyzed to find the best possible combination of the wing.

1.3. Proposed Solution:

In order to overcome the issues stated at the problem statement, Proposed create wing material and analyzed wing by the Advanced MSC.NASTRAN software packages.

1.4. Objectives:

The priority of this project is to design a light and strong wing and to develop and document valuable information and data that provide a design base for the aircraft under consideration and eventually aid in further development and modification. In doing so, the following objectives have to be identified and taken-up:

1. To develop a detailed design tool for the wing structure.

2. To determine the type of materials, number of spars, ribs, and their locations in order to build the wing.

3. To determine the aerodynamics loads acting on the wing structure at different flight conditions.

4. To analyze a representative structural model of the wing and determine its strength and stiffness characteristics.

1.5. Methodology:

1. A structural design methodology for a light aircraft wing is to be addressed.

2. Developing and building a computer program to calculate the aerodynamic loadings act on the wing structure at different flight regimes.

3. Developing and processing detailed numerical models of the wing using MSC/NASTRAN software to ensure the design integrity, and quality.

4. The static response of the wing under simulated loading conditions is to be determined.

5. The strain and deflection predictions from the model simulations are to be compared with the statistically analyzed and published observations.

1.6. Thesis Outlines:

The Thesis is arranged as follows:
Chapter Two, summarizes the present state of knowledge pertaining to the wings, structural analysis and finite element .Literature review associated with design and analysis of wing, finite elements field is also presented.
Chapter Three, reviews the current issues in wing structural design and aerodynamic analysis using MATLAB.
Chapter Four, Includes finite element analysis process.
Chapter Five, deals with the discussion of results.
Finally, Chapter Six, gives a general conclusion followed by recommendations for future work.