VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Belgaum – 590010, Karnataka

A PROJECT REPORT

On

"DESIGN AND ANALYSIS OF METALLIC WING OF TRANSPORT AIRCRAFT"

As partial fulfillment of the curriculum for the award of the degree
Bachelor of Engineering in Mechanical Engineering
For the academic year 2009-10

Submitted by

Mr. PRADEEP.K	**[USN: 1II07ME402]**
Mr. PRASHANTHA.R	**[USN: 1II07ME403]**
Mr. RENUKA	**[USN: 1II07ME404]**
Miss. DIVYA.R	**[USN: 1II05ME017]**

Under the guidance of

Mr. MOHAMMAD KASHFUDDOJA
B.E. (Mech. Engg), M.Tech (Machine Design)

DEPARTMENT OF MECHANICAL ENGINEERING
ISLAMIAH INSTITUTE OF TECHNOLOGY
N.P. ROAD, BANGALORE – 560 076
KARNATAKA, INDIA

ABSTRACT

An airframe is one of the best examples of a high performance structural design. In aerospace structures minimum weight is a very strong design driver. At the same time the structure must not suffer any permanent deformation under the design limit load and the structure must carry the design ultimate load without failure.

Wing and fuselage are the two typical units of an airframe that need to be designed. Other structural units like flaps and control surfaces, H.T. and V.T are essentially mini-wings. This project deals with the wing-design.

The wing (for that matter all components) must be designed to fail when subjected to the design ultimate load otherwise the wing is over-designed.

A variety of loading scenario is considered for wing design. Each of these load cases will subject the wing to the simultaneous action of bending moments, shear forces and torsional moment. The wing will be designed to be safe under each one of these load cases.

In this project work, one load case will be considered for the wing design which results in a specified set of Vz, Vx, Mx, Mz and My. We will consider the design process under the combined action of these shear forces (Vz, Vx), bending moment, (Mz and Mx) and twisting moment (My).

Typical wing structure is of cantilever type where the S.F, B.M and Torsion vary from section to section. Wing design, then, will consist of the design of a sufficient number of typical wing sections and the design of skin coverings that connect wing sections.

This project will primarily focus on the design of one typical wing section. The procedure for designing the statically indeterminate structure is used in the design process. A set of design values for (Vz, Vx), (Mx, Mz) and My will be selected for which the wing section is designed

The nonlinear post-buckling response will be captured using the linear beam bending theory by bringing in the concept of "effective skin area" and "stringer effectiveness factors". Being a statically indeterminate structure, it will require few iteration to complete the design process.

Finite element analysis will be carried out to verify the results obtained from the design process. MSC PATRAN and MSC NASTRAN software are used for carrying out the stress analysis.