

FINITE ELEMENT ANALYSIS OF DROP TEST EQUIPMENT FOR-NOSE  
LANDING GEAR CONFIGURATION AND ITS APPLICATION TO AIRCRAFT  
CRASHWORTHINESS AND OCCUPANT SAFETY

By

Vinoj M Aaron Jeyasingh

Spring 2001

ABSTRACT

As per Federal Aviation Regulations, the landing gears of the aircrafts should be tested for their strength requirement before installed into the aircraft. Different types of testing equipment have been developed for different testing conditions. NASA, in its NASA-Langley Research Center conducts drop tests for testing nose landing gear. The National Institute for Aviation Research conducts drop tests for main landing gear. This research describes the stages involved in the development of drop test equipment for testing nose landing gear. This thesis deals with the finite element analysis of the drop test equipment. Finite element analysis is performed in MSC/Nastran software. The modeling of the drop test carriage and the tower is performed using MSC/Patran software. Individual analysis of the drop test carriage components namely channels, brackets and bolts have been performed to verify their strength requirement. Optimum design of the drop test carriage and the tower has been discussed. The maximum testing weight in the drop testing using this drop test equipment has been discussed clearly. This report also deals with the design and finite element analysis of the arresting mechanism. The proposed model of the arresting mechanism helps in preventing the damage of the load cells below the platform, in the event of failure of the landing gear during the drop tests. The individual components of the fabricated drop test equipment for NLG configuration has been discussed.

Finally the response of the occupant during the landing of the aircraft is analyzed by using MADYMO software considering the acceleration developed during the impact of the landing gear carriage model on the arresting mechanism model. In these types of crash impact, the most important injury parameter is the lumbar load. As per the- Federal Aviation Regulations, for an occupant safety, the lumbar load should not exceed 1500 pounds.