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**Title of the Thesis : "Modelling and Simulation of Eddy Current Braking System for Aircraft Arrester Barrier System"**

# ABSTRACT

The Aircraft Arrester Barrier Systems (AABS) are installed at the end of the run ways for the purpose of arresting combat aircrafts overshooting runways length during aborted take-off and emergency landings. Two stanchion systems one at each end of the net are required in a system to support and to provide electrical controlled correction of the net.

The net is kept in the lowered position when it is not required i.e. under normal conditions and can be erected within 3 to 5 seconds with the help of stanchion system when there is an emergency.

The net assembly is attached with the special nylon tape which is used as the driver member. Equal length of the tape is bound on each Energy absorber drum. There is two hydraulic Energy Absorbing Systems, installed at both ends of the aircraft arrester barrier system. The velocity of the arrested aircraft causes to break the shear pin and to rotate the drum. The shaft of the drum drives the rotor inside the hydraulic energy absorber which is filled with fluid. The drag is produced on the rotor which causes the resultant braking torque causing tape tension which slows down and stops the aircraft within the nominal run-out distance. The aircraft is disengaged from the barricade and the tapes are rewound on the drum. The net is again attached with shear off coupling with the replaced shear pin.

The latest requirement of the Indian Air Force is to have an aircraft arrester barrier system which is capable to arrest all types of combat aircrafts.

Presently there are different types of arrester barrier systems for engagement of different types of aircraft for their regular use. There is no single type of aircraft arrester barrier system available which can be used for arresting the different types of aircrafts.

To overcome this problem, in the present work, the combination of existing hydraulic energy absorbing system and controlled eddy current energy absorbing system is proposed. When eddy current varies then brake torque changes provide controlled characteristic of energy absorbing system. In present system only hydraulic absorbers are used which are

uncontrolled. If, we will use both the systems i.e. hydraulic system and eddy current system then the braking torque will be highly controllable. This will help in stopping any aircraft of different weight categories.

Eddy current energy absorber works on the principle of the eddy currents. The braking torque is produced when the rotor (aluminium disc) turns in the magnetic field and cuts the magnetic lines. The eddy current EAS in AABS along with the conventional, which makes it more reliable and controlled one. The EAS of an AABS is undoubtedly one of its more important components. The aim of eddy current EAS is to create a better braking system. The purpose is to supplement existing hydraulic EAS with an eddy current EAS to improve its performance, controllability and to provide a more environmental friendly. In this thesis different types of combination of energy absorbing systems are discussed and a prototype model is developed. The braking torque of eddy current energy absorbing system is dependent on the magnitude of applied voltage (A.C. / D.C.), speed, thickness, material and diameter of disc, number of turns of electromagnet, position and number of magnetic poles. To study the effect of these factors a physical prototype model of eddy current energy absorbing system has been developed and the results are discussed in the laboratory and the results are obtained and discussed.

The optimal thickness and diameter of disc is optimally decided at the time of system design. Speed of disc depends upon the velocity and mass of aircraft (i.e. kinetic energy stored in aircraft) which is to be arrested. The same conventional hydraulic drum type energy absorbing system can not be used for all types of aircraft. Another important drawback is that there is no control on the rate of retardation. To overcome these drawbacks, a controlled eddy current energy absorbing system is proposed in this work. This controlled eddy current energy absorbing system can be used in addition to the conventional hydraulic energy absorbing system to increase system reliability and controllability.

The intelligent control system is developed for controlling the rate of retardation (i.e. energy absorption) using eddy current energy absorbing system. The ANN, fuzzy and neuro-fuzzy system controllers are designed and developed in the lab using MATLAB/SIMULINK. The results of conventional hydraulic energy absorbing system and controlled EAS have been compared.