

# DEVELOPMENT OF SCRAMJET ENGINE AIR INTAKE COWL OPENING MECHANISM WITH DAMPED PYRO ACTUATOR AND ITS FLIGHT PERFORMANCE

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## Abstract

The intake of the scramjet engines is kept normally closed by the cowl, which is to be opened when scramjet test conditions are reached. Air intake cowl opening mechanism is designed for this purpose which should not have any protrusions in the flow field as well as provide high initial torque. The mechanism consists of a coupling of slider crank mechanism and twin four bar linkage actuated by integrating a pyro actuator with hydraulic damper. This paper describes the configuration, challenges, design and development aspects of air intake cowl opening mechanism, designed and flown in ISRO's scramjet demonstration flight. An extensive mathematical model is developed inculcating the kinetics and kinematics of the mechanism, damper characteristics and actuator profile for simulating the flight conditions. Qualification test results are used to fine tune the mathematical model which is used for prediction of flight performance parameters. The flight performance analysis demonstrates that the intended objective is precisely achieved.

**Keywords:** Air Intake Cowl Opening Mechanism, Scramjet, Combustor, Flow Duct, Pyro Energized Actuator, Qualification Test, Functional Test