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Design and Testing of a Solid divert and Attitude Control System (S-DACS)

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There are many ways to destroy the incoming ballistic destructive vehicles. Mostly the aerospace vehicle is engaged on a predicted path in terms of position, velocity and time. In most cases, the flight path is divided into three mainly distributed phases: the launch, the mid course and the end game. The End game for a kill vehicle of Hit-to-Kill aerospace vehicle is very critical, as it depends on its divert and attitude correction capabilities. A solid DACS ensures the engagement for hitting the target through the proportionally controlled thruster technology [1].

The Solid Divert and Attitude Control systems, which provides pitch, yaw and roll control and divert propulsion for the kill vehicle maneuvering, these thrusters uses variable throat are through Pintle Valve controls to modulate the thrust from min to max of 0-100% and from 0-360 degrees of thrust vectoring [2]. The four divert thrusters provide short/ long pulses to quickly and accurately position the aerospace vehicle for a collision with target.

A motor has been designed to operate for divert thrust and attitude control for initial few seconds and to have a second pulse the motor will be operated with a gap of 50 to 100seconds after first motor operation. The propellant gases flow from the motor nozzles can be used to divert and attitude control operations.

The four thrusters on one side of the motor are used for the Divert application are proportionally controlled to adjust thrust to require level between zero to maximum thrust in any direction. The throat areas are controlled by Pintle valves. A separate Pintle valve is used for each thruster. The Attitude Control System (ACS) has six nozzles on the other side of the motor hardware which are been provided to attain the required pitch, yaw and roll control for the kill vehicle.

The paper deals with the criticality of the design for the Pintle valves, the motor casing hardware and the nozzle throats which have to be thermally designed to withstand the time of the motor operation. The design involves selection of materials for motor, divert thrusters and the igniter. Initial ballistics performance has been carried out for propellant grain design to meet the requirement for the thrust modulations and the continuous attitude control system

Biography:

Ms Sunitha is a Scientist DRDO & Ph.D Scholar, Hyderabad, India. Larry West and Russell Carton, "Solid Divert Breakthroughs that enable mission flexible TMD interceptors", GenCorp Aerojet, Sacramento, California.

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