Fundamental Experiment on Actuators for Two-Axis Pintle Thrusters

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Abstract

A pintle thruster based on a solid propulsion system is a technology that can overcome the difficulty of thrust control, which is a disadvantage of a solid rocket motor. The pintle structure is driven forward or backward to control the nozzle throat area. Since the thrust and the pressure performance are changed by the control of the nozzle throat area depending on the movement of the pintle, a complicated device is not needed and the thrust can be controlled immediately.

The pintle thrusters to perform certain role of the vehicle depend on the number of pintle nozzles equipped in the combustion chamber. When the number of pintle nozzles shared in the combustion chamber is one, the pintle affects a single chamber and affects thrust and pressure. Unlike a single pintle nozzle, when multiple pintle nozzles are equipped on the same plane, the position of each pintle affects the thrust on each thruster. The pressure of the combustion chamber is determined by the total of the nozzle throat areas of all pintle thrusters.

The position of each pintle is a key variable that can perform the role of the vehicle. The pintle thruster system requires a corresponding number of actuators to drive each pintle. In this paper, a hydraulic system for driving a two-axis pintle thruster system is proposed. A hydraulic system was designed from the viewpoint of aerodynamic load and robust control by pintle thrusters. The mechanism consisting of the hydraulic system confirmed the role of the counterbalance valve to control the flow of the fluid and the actuators as a basic test to confirm the motion of the piston.

Keywords: *Two-axis Pintle Thrusters, Divert Control System, Actuator*

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Biography

Jaecheong Lee is Ph.D. candidate in Aerospace Engineering at Chungnam National University. His research interests include counterflow jets related to both aerodynamics and propulsion system, as well as variable thrust technology for solid propulsion system. Currently he is working on projects examining the possibility of drag reduction for a high speed vehicle using counterflow jets with air and plasma.