

SIGN CONVENTION VERIFICATION OF AERO CONTROL SURFACES OF RLV-TD THROUGH END TO END SIGN CHECKS

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Abstract

RLV-TD was designed as a two stage vehicle for demonstrating the hypersonic flight of a winged body vehicle at Mach No.5. This vehicle had different control systems comprising of elevons, rudders, Fins in base shroud, SITVC (Secondary Injection Thrust Vector Control) and RCS (Reaction Control System). The usage of these control systems is called during different phases of the flight to correct the pitch yaw and roll errors developed during flight. The sign convention of each control surface is defined to act in a particular direction to correct the vehicle attitude. The commands to control surfaces are generated by Mission Management Computer (MMC), which gets vehicle attitude information from inertial sensors. Being a distributed computing system there are multiple elements involved in the control system chain of the vehicle. Therefore, it was necessary to test the end to end chain of all these flight elements for their proper functioning with correct sign. For the verification of sign and functionality of control surfaces, sign check cases were evolved by simulating pseudo flight conditions on ground. This paper discusses how the sign checks were conducted for RLV-TD flight to ensure the correct functioning of aero control system elements (viz. BS FINS, Elevon and Rudders).

Keywords: RLV-TD, Sign Checks, Control Surfaces, Elevon, Rudder