# SCRAMJET FUEL FEED SYSTEM MODELLING FOR FLIGHT AND GROUND EXPULSION TRIALS

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**Abstract**

ISRO's scramjet characterization flight uses gaseous hydrogen ($GH_2$), as fuel and atmospheric air as oxidizer. Fuel Feed System (FFS) is one of the major sub-systems in the scramjet characterization flight which ensures injection of required quantity of fuel towards two scramjet engines. FFS consists of two $GH_2$ bottles, pressure regulator and orifices, connected using feedlines. Hydrogen is supplied to the engine through choked orifices, so that any fluctuation in the engine chamber pressure may not affect the flow rates. A detailed transient flow and thermal model is developed to determine the pressure at orifice inlet and flow rate during ground flow qualification test. Subsequently, the model is used to determine the evolution of gas bottle pressure, flow rate and regulated flow duration through FFS for ground $GH_2$ expulsion test as well as for scramjet characterization flight. The model is able to capture the flow physics and pressure evolution obtained during the ground expulsion trials and flight.

**Keywords**: Fuel Feed System, Orifice, $GH_2$, Choked Flow, Gas Bottle