

IAF SPACE PROPULSION SYMPOSIUM (C4)  
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## DEVELOPMENT OF LOW-COST HYPERGOLIC PROPULSION SYSTEMS IN IHI AEROSPACE

**Abstract**

Cost reduction of space systems become more important than the past even for government programs. To live up this expectation, IHI Aerospace has been developing low-cost hypergolic propulsion systems for launch vehicles and a future cargo transfer vehicle to International Space Station. This paper describes recent development of these propulsion systems in IHI Aerospace.

For the world smallest orbital launch vehicle SS-520-5, which was successfully launched in February 2018, IHI Aerospace has developed cold-gas propulsion system equipped with 4 thrusters. Each thruster can generate the thrust up to 25N which is the highest thrust cold gas thruster ever in Japan. The propulsion system uses commercially off-the-shelf and small enough components to meet challenging envelop requirement.

For the new Japan's workhorse launch vehicle H3, which will debut in FY2020, IHI Aerospace has been developing low-cost hydrazine monopropellant Reaction Control System (RCS). The primary requirement is to lower cost more than half from current same system of used for H2A launch vehicle. To achieve the cost target, almost of all components including a low-cost diaphragm tank and a low-cost 50N thruster were newly developed. To reduce the operation cost, the tank will be lorded with hydrazine prior to shipment to launch site.

As a low-cost manufacturing technic, Super Plastic Forming is used for the tank hemi-spherical shells. For the thruster, the challenging cost target was achieved by reducing number of components such as injector and catalyst, and simplifying support structure. As well as cost reduction, performance is enhanced by increasing chamber pressure.

All propulsion components for H3 RCS had been successfully developed. Manufacturing of first flight system will be completed this autumn. IHI Aerospace is currently in development of bi-propellant propulsion system for a future cargo transfer vehicle to International Space Station, by reflecting the experience in current cargo transfer vehicle. IHI Aerospace continues to provide high-reliable propulsion systems.