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CRYOGENIC PROPELLANT STORAGE FOR HIGH POWER PLASMA SPACE PROPULSION

Abstract

Space exploration beyond low earth orbit will require a breakthrough in propulsion technology. Recent emergence of electric propulsion for earth orbiting satellite shows the potential of this technology, but sending humans to the moon or mars will require much more powerful motors.

Such missions will require a very high amount of energy to be transformed by the motor, thus high amounts of propellants. Large electric or plasma propulsion motors will represent a very big asset and in orbit reusability will be required. This will imply the capability to refuel spacecraft.

An extremely interesting way to optimize propellant system is to adopt cryogenic storage, liquid or solid. Such storage technologies have been studied by Air Liquide, with trade off performed between propellant to be used (Xenon, krypton or argon) and liquid or solid state. Moreover, challenges posed by on ground and in orbit operations have been addressed.

The paper will present main trade offs, cryogenic storage concepts and main challenges addressed.