

# **Throttling Bipropellant System for Terminal Descent Propulsion**

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## **ABSTRACT**

This talk will focus on filling a major technology gap by developing a deep throttling N<sub>2</sub>H<sub>4</sub>/N<sub>2</sub>O<sub>4</sub> rocket engine to enable large robotic landers with hazard avoidance and pinpoint landing capabilities.

The MSL descent stage propulsion system is near the limit for delivered impulse and thrust capability. Future landers, including robotic precursors and manned vehicles, will require a substantial increase in performance. The tremendous efficiency advantage of bipropellant systems over monopropellant hydrazine systems will enable large robotic landers with high impulse requirements, in particular for hazard avoidance, pinpoint landing, or high altitude landings. There currently exists no throttled bipropellant engine in this size class (3,000-10,000N max thrust).

This talk will provide a brief history of throttled propulsion systems for landing spacecraft and a roadmap for new technology investment to enable high performance landing spacecraft.