

DEVELOPMENT AND TESTING OF THE EUROPA MISSION'S VENTURI FLOW METER

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ABSTRACT

NASA's Marshall Space Flight Center (MSFC), in collaboration with NASA's Goddard Space Flight Center (GSFC), Fox Valve Development Corp. and Oxford Lasers, is developing a set of venturi flow meters for use on the Europa Mission's propulsion subsystem. The requirement for the venturi flow meters' throat diameters is approximately 0.040". An early risk reduction activity conducted by MSFC revealed that a venturi flow meter produced by FOX with a throat diameter near 0.040" had much higher pressure loss than venturi flow meters with larger throat diameters and venturis of similar throat diameter size but with no pressure taps (i.e. venturis with a throat length to diameter ratio of zero). In response, a series of venturi flow meters was fabricated and flow tested to gain insight into pressure recovery as it is affected by pressure port diameter, throat length and diffuser angle in an effort to improve the performance of a venturi flow meter. This presentation provides a summary of the venturi flow meter development activity including: a description of the test's objectives, a detailed description of each venturi configuration, a description of the manufacturing processes of the venturis, and observations from the test data. A summary of the current development activities will also be given, as well as the current development path forward. Ultimately, the knowledge gained through the fabrication and testing of these venturis provides guidance to design a flight venturi flow meters with pressure recoveries that is acceptable for the Europa flight application.

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