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## **CHAMP Turbopump Gas-Generator Successfully Tested**

P3 Technologies has conducted testing on a low mixture ratio liquid oxygen / gaseous methane gas-generator (G-G) specifically developed for its CHAMP turbopump. The G-G has demonstrated low pressure ignition as well as steady-state performance. Testing was conducted by Luke Humphreys and Daniel Stubbs at the Auburn University Combustion Physics Laboratory under the direction of Dr. David Scarborough.

The low mixture ratio ensures a low turbine inlet temperature for long-life, says Brandon Demski, Vice President of Research & Development. The testing included a turbine inlet simulator that duplicates the flow entering the torus and splitting into opposing directions, hence the two exhausts. This arrangement allows for detailed temperature profile measurements, evaluation of mixing effectiveness, and ensuring there are no adverse pattern factors.

The CHAMP turbopump is available in both reaction and impulse turbine configurations, according to Robert Sanders, Vice President of Operations. With the addition of the G-G, we can now offer customers turn-key solutions to integrate into their engines and products. Additionally, we have both LOX/LCH<sub>4</sub> as well as LOX/RP configurations. The first G-G and CHAMP impulse turbine configuration will be used on the Masten Space Systems Xogdor rocket. Xogdor is Masten's sixth vertical takeoff and vertical landing rocket that will be used as a state-of-the-art test vehicle for critical Artemis and commercial space technologies.

The CHAMP turbopump is a single-shaft, LOX/Methane turbopump that can be used as a stand-alone turbopump for small engines or combined with additional turbopumps in parallel for increased thrust-class engines. It utilizes a state-of-the-art flow path design, along with a combination of additive manufacturing and conventional machining to minimize cost. P3 Technologies manufactures, assembles, and performs check-out testing of the CHAMP turbopumps at its facilities in Jupiter, Florida.

