

JHU APL Commercial Launch Program: Finally getting off the ground

HT Smith¹, R Hacala¹, E Hohlfeld¹, W Edens¹, CA Hibbitts, L.J Paxton¹, MJ Shelhamer², SP Arnold¹

¹ The Johns Hopkins University Applied Physics Laboratory, Laurel, MD; ² The Johns Hopkins University Medical School, Baltimore, MD

The Johns Hopkins University/Applied Physics Laboratory's (JHU/APL) is actively exploring the scientific, engineering and educational applications for commercial reusable spacecraft. These burgeoning capabilities will offer unprecedented opportunities regarding access to space with frequent low-cost access to the region of space from the ground to the boundary



Figure 1. JANUS 2.0.

of near-Earth space at ~110 km. In situ research of this upper region (often referred to as the "ignorosphere") is difficult because it is too high for aircraft and balloons and yet too low for orbital satellites and spacecraft. However, this region is very significant because it represents the tenuous boundary of Earth's Atmosphere and Space. It contains a critical

portion of the atmosphere where the regime transitions from collisional to non-collisional physics and includes complex charged and neutral particle interactions. A detailed understanding of this region is required to understand the Earth's atmosphere and serves as an analog to other planetary atmospheres.

The primary focus of our program is establishing the JANUS platform which supports future experiments and technology demonstrations by providing power, data, control and ambient condition monitoring. Here we report the first JANUS flight test results from Blue Origin New Shepard flights as well as a low altitude Masten Space System Xodiac test vehicle risk reduction flight. We also report on current plans for flying the JANUS system in 2018 on Blue Origin and Virgin Galactic spacecraft for progressive JANUS-supported flights that involve various technology demonstrations.



Figure 2. Masten Space Systems Xodiac risk-reduction flight.



Figure 3. Blue Origin New Shepard Escape test flight (top) and payload recovery (bottom).