

## Press Release: Orbit Logic Explores Machine Learning for Lunar Gateway Fault Management

**GREENBELT, MD (August 5th, 2021)** – Orbit Logic has been awarded a Phase I Small Business Technology Transfer (STTR) contract by NASA to develop its proof of concept for Lunar Fault Learning Agent for Prediction, Protection and Early Response (Lunar FLAPPER) – an onboard software solution that would automate routine tasks and perform rapid and intelligent responses to degradation or failures of spacecraft systems, resulting in improved mission results and safer crew environments. The solution could be relevant to systems such as NASA's planned Lunar Gateway, a multi-purpose outpost orbiting the Moon, which will be uninhabited for periods of up to nine months. When the spacecraft is not occupied by crew, robust autonomy would significantly ease (or even eliminate) mission control operator workload and safely maintain systems until astronauts return; Lunar FLAPPER is being developed in collaboration with the University of Maryland, College Park (UMD). 0020

Traditionally, spacecraft have implemented hard-coded, rules-based fault trees and sometimes require operators to be in-the-loop. These types of approaches are rigid and are not adaptive to evolving conditions or emerging fault types. Lunar FLAPPER will employ machine learning (ML) approaches in its autonomous fault management – supporting two modes: 1) fully autonomous operations monitoring mode, which includes fault detection, correction and reporting to be utilized when the Lunar Gateway is uninhabited, and 2) semi-autonomous mode, using ground operator inputs to learn ideal operating conditions through positive re-enforcement of resolution selections.

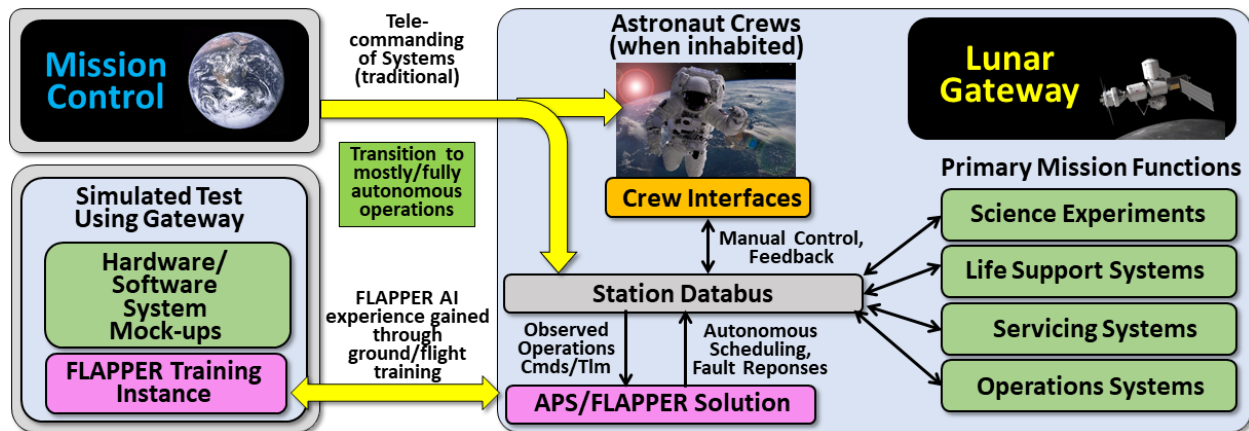


Figure 1: Diagram showing how Lunar FLAPPER could be applied to NASA's Lunar Gateway

Lunar FLAPPER's architecture is designed to be extensible. Beyond fault management, it will be capable of guiding science experiments, orchestrating inter/extra-vehicular robotic servicing tasks, and controlling/troubleshooting station core subsystems.

Lunar FLAPPER will leverage Orbit Logic's Autonomous Planning System (APS)<sup>1</sup> onboard planning/response framework and existing work on autonomous fault management. The Orbit Logic/UMD team will use the Space Systems Laboratory facilities at UMD to refine and test the solution. The Ranger Dexterous Servicing System robotic arm is envisioned as the primary hardware testbed, but other options (such as the UMD Space Habitat) are also available and may be used for testing and maturation in future program phases.

<sup>1</sup> Autonomous Planning System (APS)  
<http://orbitlogic.com/autonomous-planning-system.html>

## **About Orbit Logic**

Orbit Logic ([www.orbitlogic.com](http://www.orbitlogic.com)) specializes in mission planning and scheduling solutions for aerospace and geospatial intelligence. Orbit Logic's operationally proven COTS products create better plans faster with fewer resources for all mission phases. Orbit Logic services are available to configure, customize, and integrate Orbit Logic's mobile, web-based, desktop, and flight software applications to provide turn-key operational solutions that leverage the latest available technologies to meet customer goals and exceed their expectations.