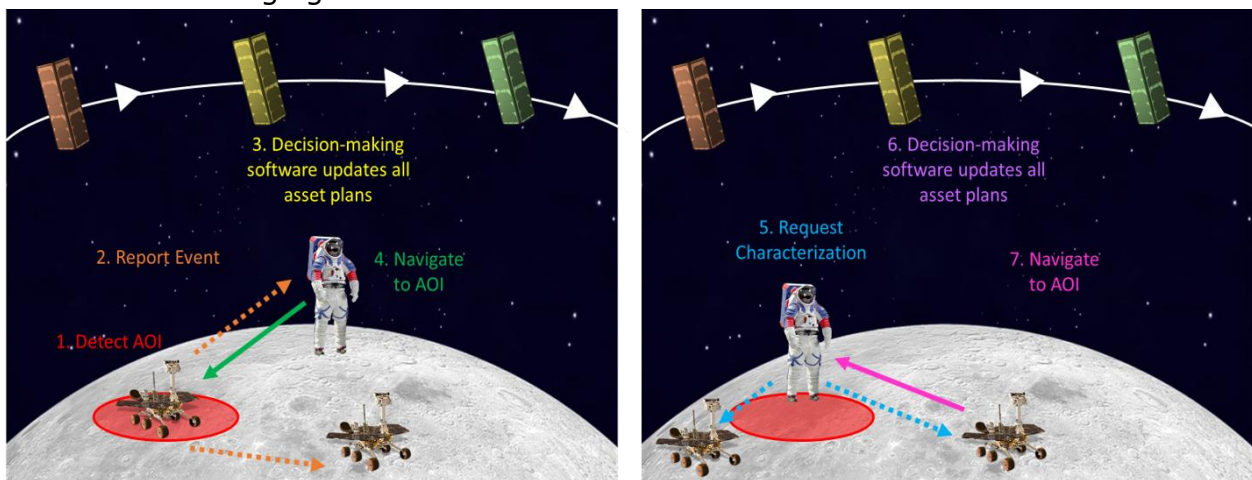


## Press Release: Orbit Logic Tackles Autonomous Lunar Exploration with Robotic Swarms

**GREENBELT, MD (February 8, 2021)** – Orbit Logic has been awarded a Phase I Small Business Technology Transfer (STTR) contract sponsored by NASA to develop the Intelligent Navigation, Planning, and Awareness for Swarm Systems (IN-PASS) solution – an autonomous planning architecture supporting collaborative Lunar exploration with teams of humans cooperating with heterogeneous swarms of orbital (satellite) and surface (rover) assets. IN-PASS is being developed in partnership with the University of Colorado Boulder (CU).

Orbit Logic’s existing Autonomous Planning System (APS) is the foundation of the IN-PASS architecture. An instance of APS will operate onboard each swarm asset to provide asset level resource planning and independence as well as to enable autonomous cooperation between assets over intermittently available communication links. Under this effort, Orbit Logic will develop the human-robot teaming in APS so that astronauts or mission operators can interact as “humans-on-the-loop” with IN-PASS to provide guidance, shape mission objectives, and directly participate by handling tasks that are uniquely suited to human dexterity or cognition. The net result will be that humans will be able to leverage the full capabilities of a heterogeneous robotic swarm without micromanaging the actions of each individual asset.



**IN-PASS Example Mission Concept with Autonomous Swarm and an Astronaut-in-the-Loop**

CU’s Event-Triggered Decentralized Data Fusion (ET-DDF) algorithm will maintain a common relevant operations picture (CROP) with minimal data exchange. Specialized communication models will be developed to simulate this data exchange accurately. Finally, Linear Temporal Logic (LTL) will be used for task specification and multi-objective control policies will be designed to tradeoff navigation performance and resource use onboard rovers. In addition, CU’s ASPEN lab will provide an environment for mixed-mode hardware testing with real wheeled robots.

APS is a powerful technology that can be leveraged for autonomous planning in *any* domain. The breadth of its applications proves its flexibility; beyond robotic Lunar exploration, Orbit Logic has utilized APS for the autonomous operation of heterogeneous constellations of [Low Earth Orbit \(LEO\) satellites](#)<sup>1</sup> with DARPA and AFRL, heterogeneous swarms of [unmanned underwater/surface/aerial vehicles \(UUVs/USVs/UAVs\) with the Navy](#)<sup>2</sup>, and heterogeneous swarms of [rovers, satellites, and atmospheric vehicles for robotic Mars exploration](#)<sup>3</sup> with NASA.

<sup>1</sup> Orbit Logic’s Autonomous Planning System for the DARPA Blackjack Pitboss Program  
<http://orbitlogic.com/uploads/5/7/8/8/57881343/20200206%20Blackjack%20Press%20Release%20Final.pdf>

<sup>2</sup> Orbit Logic’s Navy Phase II SBIR, Robust Cooperative Autonomy with Minimal Information Exchange (MinAu)  
<http://orbitlogic.com/uploads/5/7/8/8/57881343/20190709%20MinAu%20Navy%20Phase%20I%20Press%20Release%20Final.pdf>

<sup>3</sup> Orbit Logic’s NASA STTR, Mars/Interplanetary Swarm Design and Evaluation Framework (MISDEF)  
<http://orbitlogic.com/uploads/5/7/8/8/57881343/20200416%20MISDEF%20Phase%20I%20Press%20Release.pdf>

## **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.