ADVANCING OPERATIONAL AND TRAINING TECHNIQUES FOR ARTEMIS MISSIONS. I. J. Howley, and M. K. Byars[1], [1]Marshall Space Flight Center Ian.Howley@nasa.gov

In the more than 50 years since the Apollo missions, thousands of scientists, operators, engineers, and managers have spent an enumerable amount of time and effort on a wide variety of missions to advance the boundaries of human knowledge, technology, and presence in our solar system. We stand on the cusp of the next giant leap in the story of humanity's endless exploration of our world. In the next five years, we will establish a permanent presence on the moon by demonstrating the operational and scientific mission integration concepts required to do so. Space science operations specialists at NASA's Marshall Space Flight Center (MSFC) in Huntsville Alabama, have spent those 50 plus years developing and evolving the methods necessary to accomplish this lofty goal.

NASA's space science community has gathered essential lessons learned from the human and robotic missions to the Moon, Mars and beyond. Of preeminent importance from these, is the necessity to have well trained crews, scientist and operators who understand not only the scientific goals but also the operational methods that maximize the scientific returns. Over the past 20 years the Payload Operations and Integration Center (POIC) at MSFC has worked with the community of astronauts, scientists, international partners, commercial companies, and governmental representatives to train, integrate, operate and communicate the immense amount of information necessary to achieve innovative science aboard the International Space Station (ISS).

To accomplish the aspirational scientific goals of the Artemis missions, new methods for training crews, scientists, and operators are being developed that ensure efficient operations on the Moon that especially incorporate real-time feedback, high fidelity data, changes to science priorities, and in situ measurements. Having crews and operators who understand the science goals and scientists who understand the operational constraints is critical to the success of early Artemis missions.

In comparison to Apollo, Shuttle, Martian rover and ISS missions, the complex Artemis flight plans will require new and innovative integration techniques to be successful. Artemis science operations will span multiple programs, include international partners, various commercial interests and an exceedingly dispersed and diverse science team. In order to maximize science return and discovery potential, using a proven integration and operation model like that developed within MSFC's Payload and Mission Operations Division (PMOD) will be crucial to overall mission success.

PMOD developed the following key tenants, called the Pillars of Payload Mission Operations to build upon NASA's Foundation of Flight Operations. These attributes are necessary to maintain a permanent human presence in space and are indispensable to operating the scientific payloads essential to human spaceflight. Through these Pillars, NASA will help advance knowledge for the benefit of the world and all humanity.

Preparation: Understanding that total preparation is only possible when we embrace the highly dynamic and uncertain environment of conducting science off the Earth
Proactivity: Remaining passionately curious, we create our best advantage: anticipating issues before they arise
Attentiveness: Scientific investigations require the diligent application of awareness, as the payloads caretaker we are dedicated to their constant monitoring
Rigor: No detail is too small, no efficiency gained is insignificant, through persistent and exhaustive verification we create the potential for further discovery
Collaboration: We recognize and trust the inputs and expertise of our team members, especially the scientists we represent and the commercial partners we support
Agility: Never changing compulsively but creatively and consistently innovating in the pursuit of perfection; to achieve perfection we must embrace change
Humility: Seeking always first to serve so as to empower those around us to succeed