The Gandalf Staff: A Mobile Tool for Lunar Exploration (2nd year of development)

M. E. Evans – NASA JSC, J. Bacon – NASA JSC, L. D. Graham – NASA JSC, M. Leonard – T STAR, M. Zanetti – NASA MSFC

The Gandalf Staff is a mobile tool designed to be a flexible device supporting crewed and uncrewed operations on the lunar surface. The core of the device is a 24v battery with communications and data storage systems supporting multiple optional components. Initial components targeted to support crewed Extra-Vehicular Activity (EVA) include a LiDAR and 360° camera to provide 3D mapping of the traverse, external lighting for field site illumination in the south polar region low sun angle environment, and navigation instruments to support crew position determination for Lunar Search and Rescue (LunaSAR). The staff itself can be used as a walking aid or a rigid tool for Incapacitated Crew Rescue (ICR). As a stand-alone device, the Gandalf Staff operates as a science platform supporting a variety of observational, geochemical and geophysical instruments collecting environmental data over extended periods of time. The stand-alone mode requires connection to an auxiliary power source (e.g. solar array) and energy storage system (e.g. battery). This platform could also be used a a remote recharging station. The staff collects instrument and systems data and transmits to a base station on the lunar surface.

In the 1st year of prototype development (FY'21), student teams at Texas A&M University (TAMU) developed the power system and demonstrated successful integration of LiDAR, WiFi communications, and external lighting subsystems. A support tripod to hold the staff upright was also developed. For the 2nd year (FY'22), additional student teams at TAMU will prototype enhanced power and lighting concepts. They will also add new capability for LunaSAR and geophysical science instrumentation using a heat probe.

Components of the Gandalf Staff can be developed, tested, and deployed independently, or on the integrated staff, rovers, or utility trailers. The project supports crew safety, lunar sample curation, mission science, and public outreach goals of NASA.

