

**DRAPER'S VISION-BASED NAVIGATION ENHANCED LUNAR LANDER AND OPPORTUNITIES FOR ISRU.** F. E. Meyen<sup>1</sup>, A. Campbell<sup>1</sup>, T. J. Steiner<sup>1</sup>, B. J. Streetman<sup>1</sup>, C. E. Mario<sup>1</sup>, S. R. Steffes<sup>1</sup>, K. R. Duda<sup>1</sup>, <sup>1</sup>Draper, 555 Technology Square, Cambridge, MA 02141, clps@draper.com.

**Introduction:** Draper (Cambridge, MA), the company that developed the guidance, navigation, and control algorithms that made NASA's Apollo landing possible, is returning to the moon. Draper was selected as a provider for NASA's Commercial Lunar Payload Services.

**Enabling Lunar ISRU:** NASA's Lunar Surface Instrument and Technology Payloads opportunity will be used to select lunar experiments to address strategic knowledge gaps for technologies needed to support human lunar missions and scientific exploration. Draper's NASA CLPS offering is ideal for enabling lunar ISRU missions to identify, characterize, extract, and process lunar resources. Technologies onboard the lander open new landing site opportunities and will enable direct deployment to lunar resources to reduce traverse time for rovers and locating lander-fixed instruments closer to scientific points of interest.

**Vision Based Navigation:** Advanced vision-based navigation and hazard avoidance systems enable Draper to deliver CLPS payloads with exceptional accuracy to areas that are too dangerous for blind landers to attempt. This system looks for hazards that become visible during descent and updates guidance as needed. Feature detection algorithms developed from decades of Draper expertise in vision systems are used to enhance the navigation solution to further improve landing accuracy. This presentation will discuss these methods and explain they reduce time to areas of interest for ISRU and science objectives.

**Additional Information:** If you have questions about our payload capability related to NASA CLPS and NASA LSITP, please contact Draper at clps@draper.com.

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