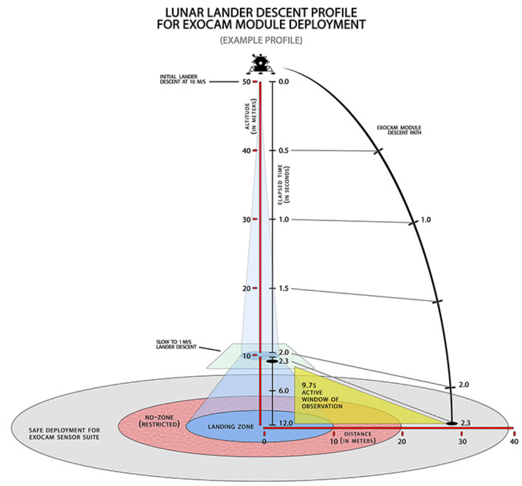
**LUNAR EXOCAM: CAMERA AND SENSOR PAYLOAD SYSTEM FOR REMOTE CAPTURE OF LUNAR LANDER DESCENT AND LANDING.** Jason A. Mezilis[1], Rex W. Ridenoure[2], Kris Zacny[3], Steve Indyk[3]; [1]Zandef Deksit Inc., Los Angeles, CA jmezilis@gmail.com; [2]Ecliptic Enterprises Corporation, Pasadena, CA rridenoure@eclipticenterprises.com; [3]Honeybee Robotics, Pasadena, CA kazacny@honeybeerobotics.com

**Introduction:** This poster presents an overview of the design and operations for the *Lunar ExoCam* remote imaging/sensor pod concept, expected instrumentation and an overview of the general science/engineering value of returned data. The system is an example of the overall *ExoCam* payload series, which will premiere with *Lunar ExoCam* developed specifically for recipients of the NASA-funded CLPS [Commercial Lunar Payload Services] lunar lander program contracts. The concepts and development contained herein were initially presented orally at the 2019 Microsymposium 60 [1].

**Lunar Payload:** Direct, in situ imaging of a lunar landing from the lunar surface has never been attempted, nor has direct measurement of the regolith dispersion caused by a landing. Such data will inform the design and operation of future lunar landers and emplaced lunar surface base/outpost infrastructure. An approach for capturing these unique data types involves deployment of one or more small *Lunar ExoCam* imaging/sensor pods carried to the Moon by the proposed commercial lunar landers. The pods eject from the host lander at ~50 m above the surface, immediately after the lander transitions from the high-speed descent phase to slow-speed/hover phase. The pods fall to the lunar surface under the influence of lunar gravity, whereas the lander typically descends at a slower, fixed pace, resulting in approximately 10-15 seconds for the pod to initialize and begin data capture from the lunar surface as the lander executes its final descent and landing sequence (see figure).

The notional *Lunar ExoCam* system design includes a 360$^{o}$ color video camera, a microphone tailored to detect fine regolith particle impacts, a battery-based power subsystem, sequencing and control avionics, near-field RF subsystem to support data transfer back to the lander, and rugged mechanical packaging approach to accommodate deployment from the lander, lunar surface impact, sensor suite deployment and overall thermal balance. The design approach seeks to meet all requirements with low mass, low cost and with straightforward lander interfaces so that on any given lander more than one *Lunar ExoCam* system might be accommodated to enhance mission robustness and reliability, data capture and overall value. Early proof-of-concept demonstrations will likely involve only one or two *Lunar ExoCam* modules per lander.




**Mars and other solar system bodies:** The *Lunar ExoCam* payload will provide a benchmark from which future *ExoCam* systems designs for the Martian surface and other solar system bodies will be informed. The overall *ExoCam* system is modeled from the ground up to be an iterative and fluid design concept which will tailor to the specifics of each mission application. Parameters such as propulsive vs. non-propulsive delivery, complement of the onboard sensor suite, design accommodations for extreme temperature and space-radiation effects, and even direct-landing vs. hover-mode operations all will adjust according to destination atmospheric and surface conditions, host lander designs and science requirements of each mission. Notional designs also include options for extended surface usage; for example, the external visualization of human egress from lunar or Martian landers, surface operations and ascent stage departure of lunar or Mars sampling systems, surface science payload operations, infrastructure emplacement operations, etc.

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**References:**

[1] Microsymposium 60: Forward to the Moon to Stay -- Undertaking Transformative Lunar Science with Commercial Partners; A workshop held 2019 Mar 16-17, Woodlands, TX; Organized by Dr. Jim Head and Dr. Carle Peters, Brown University.