LUNAR EXOCAM – REMOTELY DEPLOYABLE IN-SITU SENSOR SUITE TO INFORM LUNAR PSI

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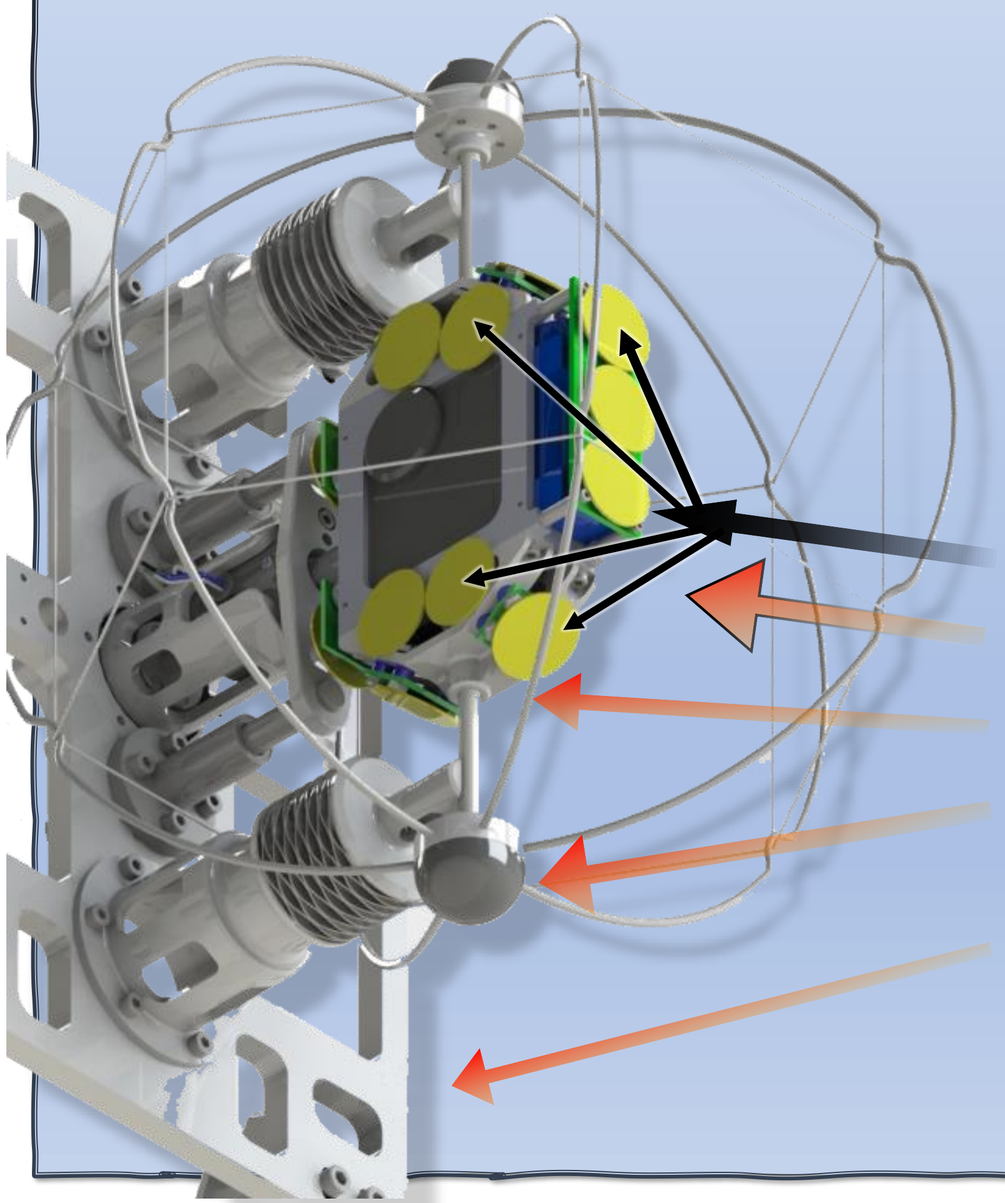
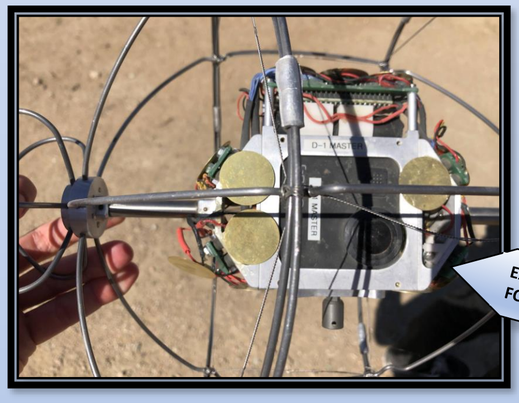
Lunar ExoCam flight and support team, following first successful ejection of a remote payload from an in-flight terrestrial rocket!

Photo by Evan Rodaniche, Masten Space Systems, Mojave CA.

OVERVIEW

- Lunar ExoCam is a remotely deployed lunar sensor suite payload that can land within an operable ranged distance of approx. 5 – 20 m to lander. The sensor suite will enable a fully immersive 360° environmental characterization of regolith dispersion captured during the final descent of the landing craft.
- Ejecting and reaching the lunar surface prior to the descending vehicle, the ExoCam sensor suite is then poised to gather in-situ measurements throughout the full cycle of plume-surface interaction (PSI), utilizing various onboard instrumentation to capture and relay synchronous data over time.
- Following completion of the landing cycle and brief surface activity, these data are relayed via Wi-Fi back to the lander for subsequent transmission to Earth.

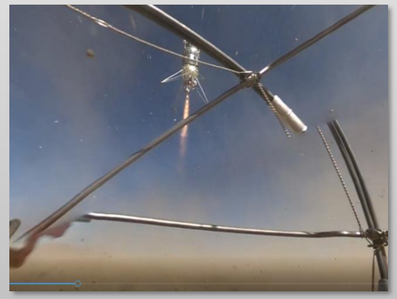




EXOCAM CAMERA MODULE FOLLOWING FREE FLIGHT TEST

TECH DEMO – FLIGHT VALIDATION

PRE-FLIGHT SIMULATION



ACTUAL FOOTAGE

Following a 2020 NASA Flight Opportunities grant, a successful live test of Lunar ExoCam camera module deployment was carried out with Masten Space Systems 'Xodiac' suborbital test vehicle.

Prior to the flight, a computer simulation was programmed to incorporate real-world physics with notional flight telemetry, providing a previsualization representation of the ejection profile.

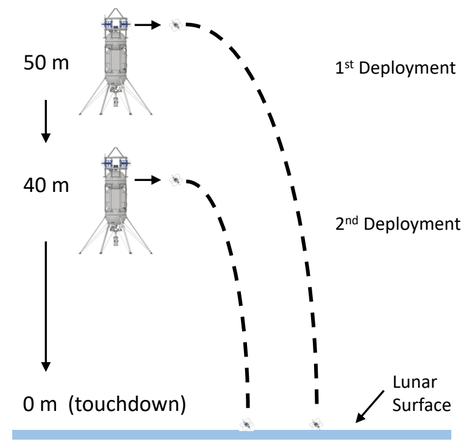
A side-by-side comparison of computer pre-viz and actual in-camera flight footage demonstrates the dependability of the ejection system. Such performance assurance will be required as NASA and/or potential commercial partners look to employ ExoCam technology for future lunar missions, as well as on Mars or other planetary bodies.

INSTRUMENTATION POTENTIAL (PARTIAL LISTING)

Due to the ruggedized simplicity of the design (ie. no moving parts) all ExoCam sensor instrumentation is required to operate in a 360° environmental field-of-view. A partial list of notional instrumentation includes:

- **PARTICLE SENSOR SUITE** — 360° multiple piezo sensor arrangement
- **HD VIDEO CAMERA** — 360° fully spherical field-of-view; 30 or 60 FPS
- **ACCELEROMETER** — Surface density measurements during point(s) of impact
- **COUPONS** — Attached to the inner surface of the protective cage housing, affixed coupons will directly impact the lunar surface and may subsequently be measured by camera for lunar dust adhesion properties of various materials
- **LIGHT BEACON** — Integrated with the hard-mounted ExoCam payload ejection system. This beacon will be oriented in fixed position pointing from the lander to final predicted resting position of the camera module. As lunar dust is excited by the final descent, this source light will provide a known quantity through which the light-dimming effects of the ejected regolith passing between camera may be later evaluated as plume density measurement

NOTIONAL DEPLOYMENT PROFILE



First Deployment launches as lander enters final vertical descent phase, at a height of **~50 m** with a target distance of **15 m** from the lander

Second Deployment initiates a few seconds later at a height of **~40 m** to a target distance of **5 m**, offset by 90° to provide a secondary angle / point of observation

Development of Lunar ExoCam is led by Zandef Deksit Inc. Made possible through initial investment funding by Honeybee Robotics, and by a grant from the NASA Flight Opportunities program.

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