MISSION CRITICAL

Project Artemis, Imaging from the Moon and Deep Space

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Many people consider this image, the Earthrise from Apollo 8, to be the most significant photograph ever taken. Taken at the end of a tumultuous year, 1968, it reminded everyone on Earth that we were all on this rock in space together....
When Michael Collins took this photograph, everyone who currently lived, and had ever lived, were present in the frame, except for Michael Collins. Neil Armstrong and Buzz Aldrin were in the Lunar Lander, the rest of us were on Earth.
The most significant live television broadcast of all time was an afterthought!
Bruce McCandless, who was CapCom for the moonwalk on Apollo 11, later would become his own spacecraft and fly untethered in space on Shuttle Mission 41-B in 1984.
During the early days of human space flight, NASA had to invent everything, including cameras. This is the television camera used for the Apollo 11 mission.

Today, we can fly commercial off-the-shelf cameras and components, using industry standards for compression and transmission.
The ISS is a great Lab for testing and flying different types of cameras.

- An IMAX Canon camera rig used for their last space-themed film
- A 3D Virtual Reality Camera
- A new internal vehicle robot free floater called ASTROBEE
We’ve even modified a Nikon camera to put an HD camera on the outside of the ISS.
Human Landing System
NASA will solicit development from U.S. industry

Power and Propulsion Element
provided by Maxar Technologies

Small, pressurized crew cabin
NASA will solicit from U.S. industry

Logistics module
NASA will solicit U.S. industry for cargo deliveries

Orion
The environment around and on the Moon is very challenging: Extremes in heat and cold; vacuum; radiation; lunar dust.
Imaging in the space around the Moon, on the lunar surface, and on Mars presents all kinds of challenges. Radiation is one of the most challenging. This is a shot from a Red Digital Cinema camera with the lens cap on after being on ISS for over two years. Those aren’t stars....
In a well lit scene like this damaged pixels may not be so apparent, but they are there.
Each one of these dead pixels is caused by ionizing radiation that has penetrated the vehicle and damaged the camera’s sensors. This means the cameras we fly to the Moon will need to be easily replaced. Trying to radiation harden a HD or UHD video camera would be cost prohibitive.
NASA will need some help! NASA and its partners could use help with a Pan/Tilt system with no moving parts. Maybe a VR camera or extract HD out of 8K?
How could we get a third person view of the first steps on the Moon? Maybe a small robotic camera the crew member throws out after landing?
A “follow in real-time” site for the public using real imagery, audio and telemetry like “apolloinrealtime.org” web site would be incredible.
Dropping in on Mars in High-Res
Technologies NASA and its Industry partners will likely need help with:

Minimizing affects of radiation
Lunar Dust resilience
Autonomous operations/Artificial Intelligence
Pan/Tilt/Zoom capability without moving parts
Robotic cameras for lunar surface

Anything else you can imagine!
Links and more information

- https://www.nasa.gov/topics/moon-to-mars
- https://images.nasa.gov/
- https://www.nasa.gov/nextstep/humanlander2
- https://www.nasa.gov/multimedia/nasatv/index.html#public
  - Downloadable 4K videos
- https://youtu.be/rgBKFEeXfww
  - Music video featuring ISS 4K imagery & updated rendition of “Sounds of Silence”
- https://youtu.be/lil_I_-7aOM
  - VR 360° video shot inside Neutral Buoyancy Lab
- https://youtu.be/7k2uKb9vCOI
  - First 8K from space
  - Downloadable here, https://images-assets.nasa.gov/video/First-8K-Video-from-Space/First-8K-Video-from-Space~orig.mp4

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