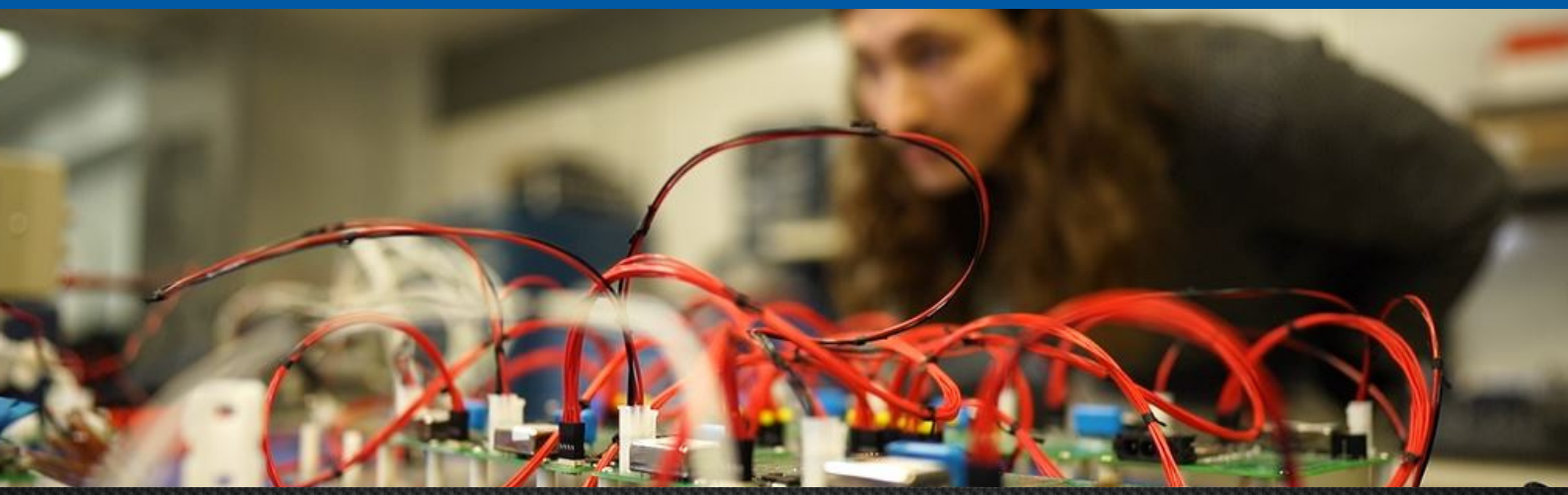
FEBRUARY 2021 | VOL. 4

INTUITIVE MACHINES

COMMERCIAL LUNAR PAYLOAD SERVICES INITIATIVE UPDATE



COMING TOGETHER

A Message From Steve Altemus

We have three spacecraft going to the Moon in the next 24 months, that's incredible. Where other companies and organizations may see a daunting task, I hope you share my sentiment in seeing a great challenge and an even greater opportunity for all of us.

IM-1's major power components have all been manufactured, all of NASA's payloads have excelled in our FlatSat 1.0 testing, and our lunar telemetry and tracking network is complete.

Each piece of our mission is coming together. Now that we are inside 1 year from launch, we will be laser focused on getting these assembly integration and test sequences right.

FEBRUARY COMPANY HIGHLIGHTS

- AVIONICS INTEGRATION
- FLIGHT BATTERY ARRIVAL
- NASA PAYLOAD TESTING
- REMOTE HOT FIRE #41
- IM-2 PROGRESS

President & CEO

SUCCESSFUL AVIONICS HARDWARE INTEGRATION

Vendor-supplied and IM-manufactured avionics components are undergoing rigorous integration testing to refine all flight designs prior to manufacturing and receiving flight-rated hardware.

INTEGRATED POWER SYSTEM FLAWLESSLY CHARGES AND DISCHARGES

- Charged batteries until Power Control Distrubution Unit (PCDU) turned on
- Discharged to find lower limit threshold for PCDU operation

ONBOARD COMPUTER (OBC) COMMANDS REACTION CONTROL SYSTEM

- OBC successfully commanded each channel to turn on and off
- Verified channels turn on with specified timing parameters

THALES RADIO COMMUNICATES WITH IM GROUND STATION

- Sent data stream from ground station to Thales
- Confirmed carrier and data lock

IM-1 FLIGHT BATTERIES EXCEL IN TESTING AND ARRIVE AT IM

IM's ABSL-supplied batteries underwent thermal vacuum tests to simulate flight-like conditions while the flight batteries charged and discharged according to the mission profile. A residual gas analyzer did not detect any electrolyte leakage during testing.

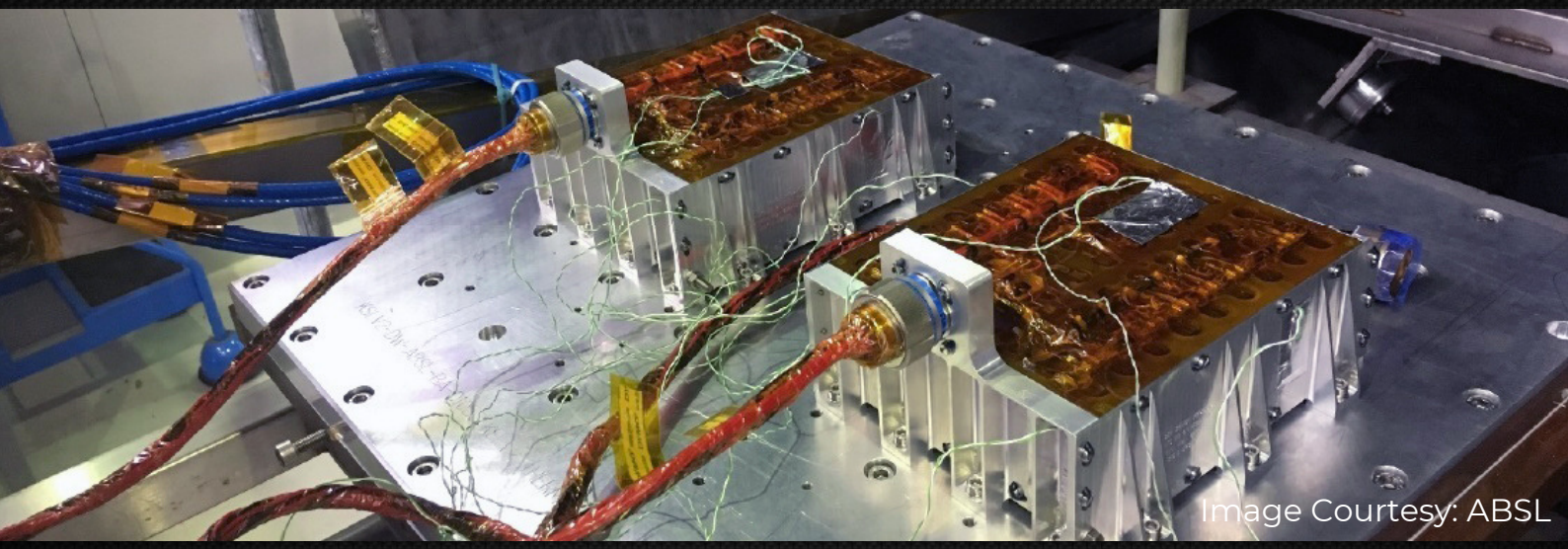


Image Courtesy: ABSL

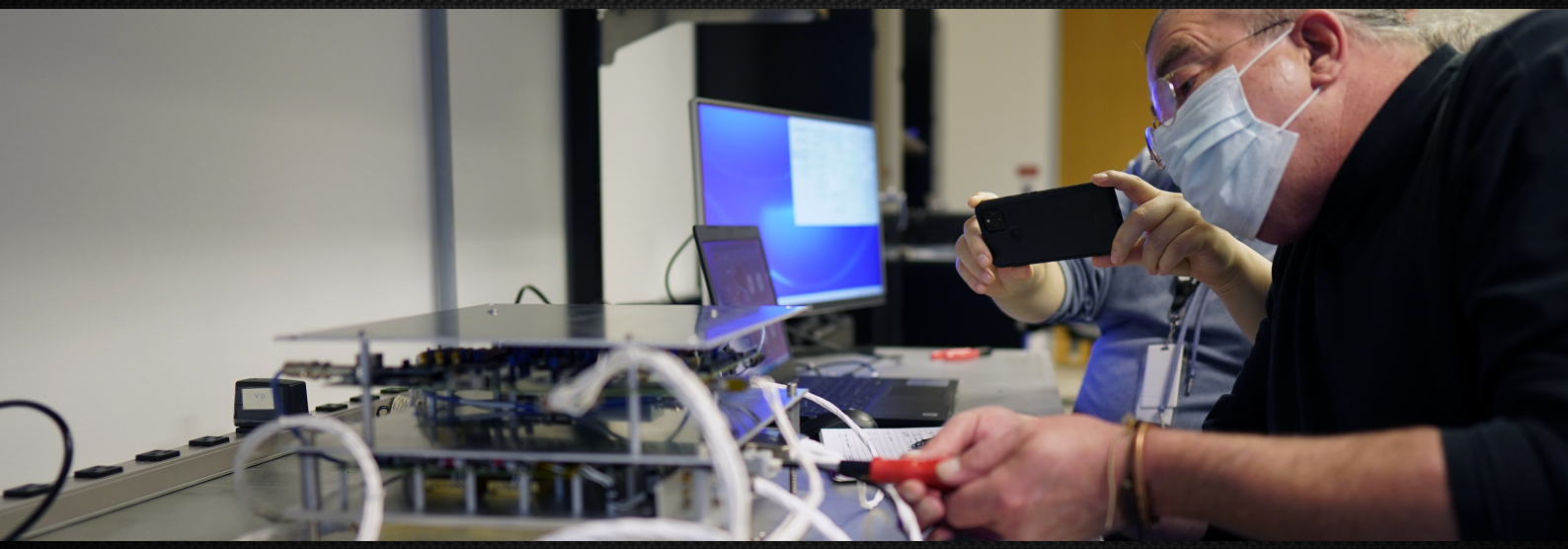
Vibration tests consisted of subjecting each flight battery to vibrations in each orthogonal axis while discharging. The discharge behavior was continuous and smooth through all vibration testing indicating nominal performance.

IM has received and stored the IM-1 flight batteries at Houston's Spaceport.

ALL COMPLEX NASA PAYLOADS COMPLETE C&DH

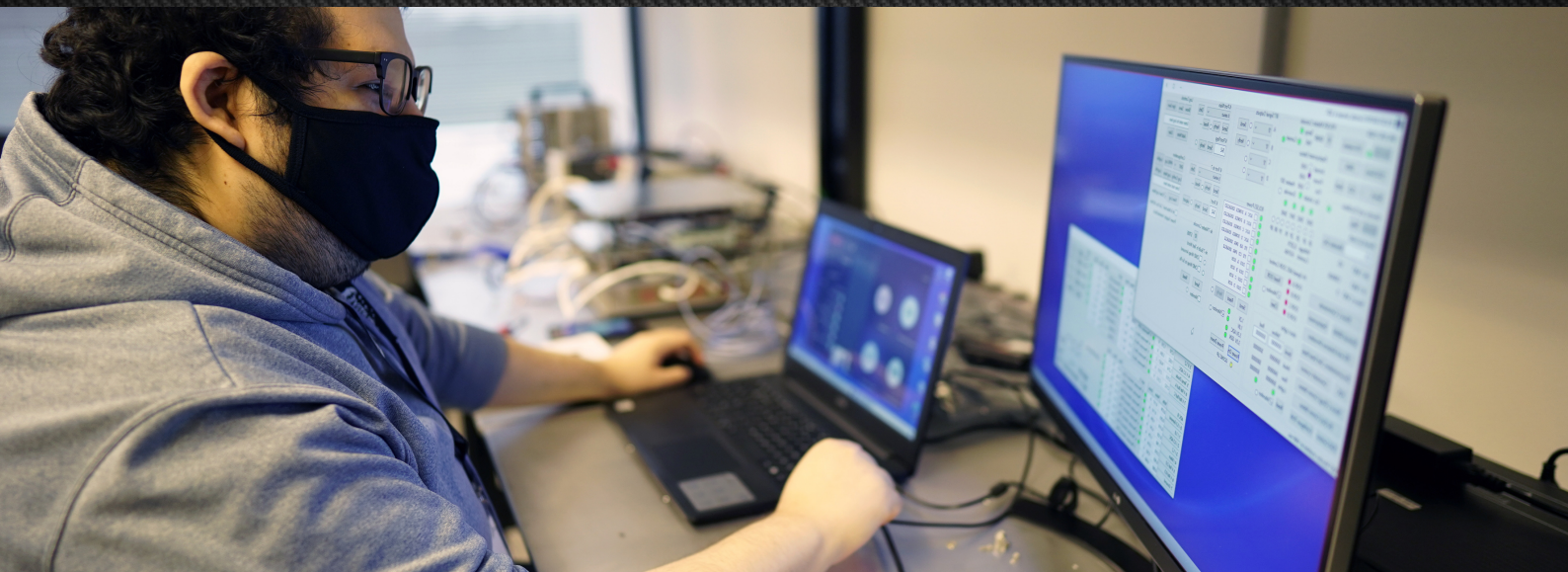
Payloads from NASA Marshall, Goddard and Langley Research Center excelled in IM's FlatSat 1.0 initial payload testing.

Radio wave Observations at the Lunar Surface of the photo-Electron Sheath (ROLSES)



ROLSES ENGINEERING UNIT C&DH COMPLETED VIRTUALLY WITH GSFC

- Sent pre-defined command packets from Nova Core ground software (SW) to the ROLSES payload
- Streamed command responses and science data from ROLSES to Nova Core ground SW
- Stored science data to the Nova-C OBS and provided data files for analysis
- Verified that Nova-C flight SW sent the periodic time sync and health request commands
- Confirmed that a valid Pulse Per Second (PPS) signal was received from the Nova-C flight computer

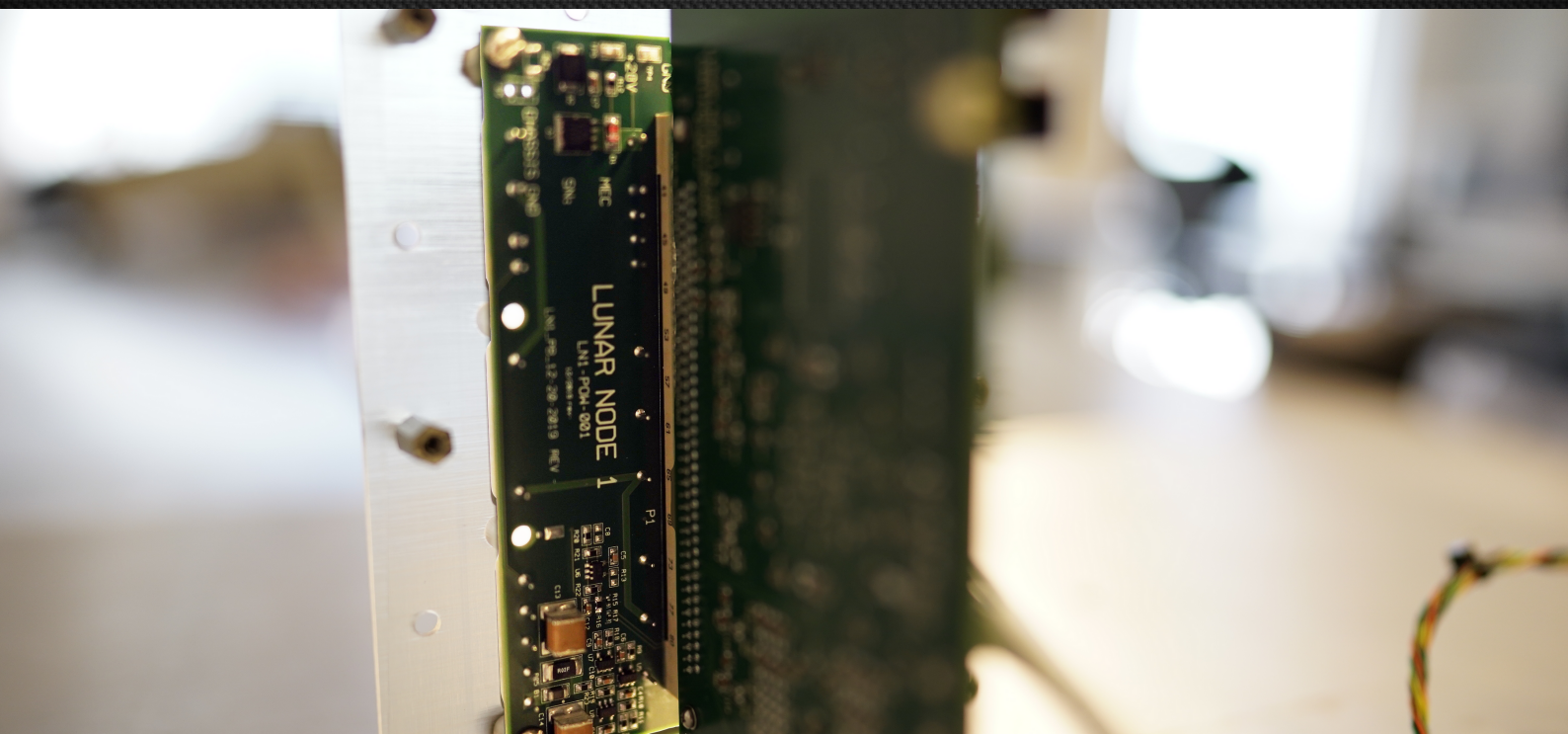


ALL COMPLEX NASA PAYLOADS COMPLETE C&DH

Lunar Node 1 (LN-1)

LN-1 ENGINEERING UNIT

- Forwarded commands from the LN-1 ground SW to the Nova Core ground SW, which then sent the command to the Nova-C flight computer and finally sent to the LN-1 payload
- Streamed LN-1 command responses and telemetry from the payload to the LN-1 ground SW via the Nova-C flight computer and Nova Core ground SW
- Verified the Nova-C flight computer PPS was received correctly
- Verified the Nova-C flight SW sent properly formed sync clock, sync state, and spacecraft ID commands to the LN-1 payload



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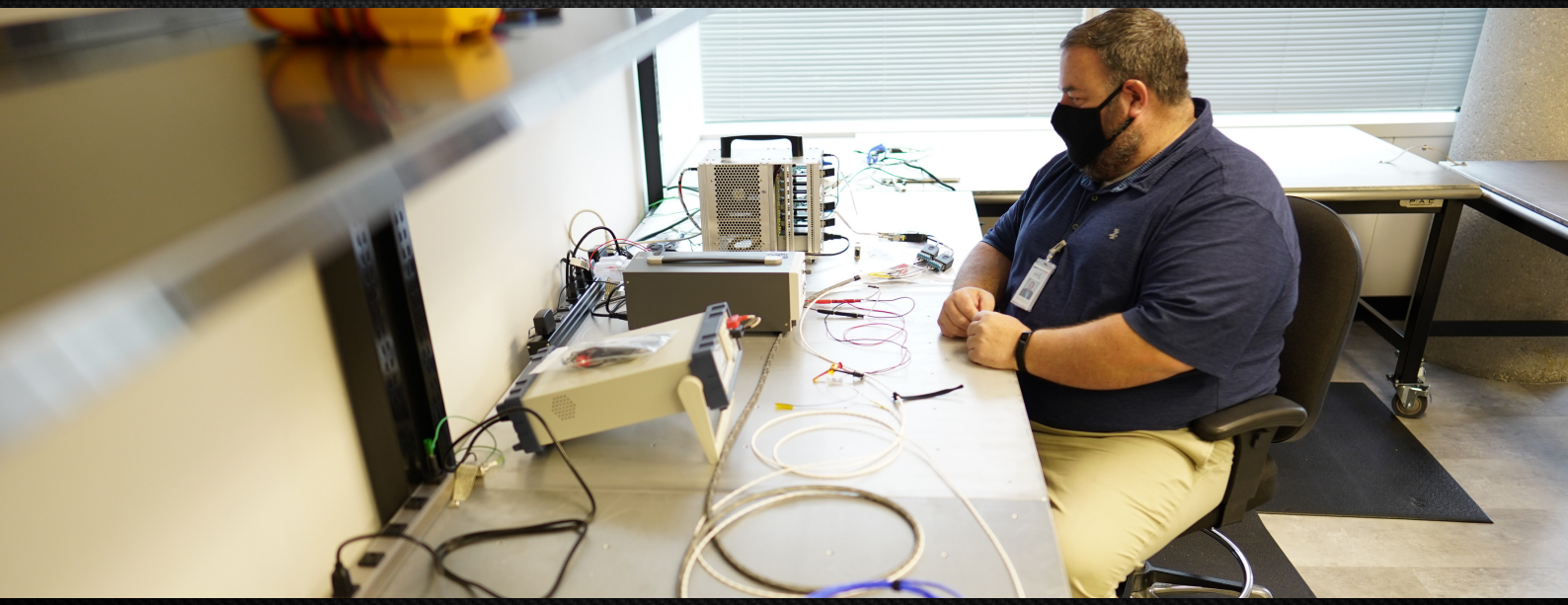
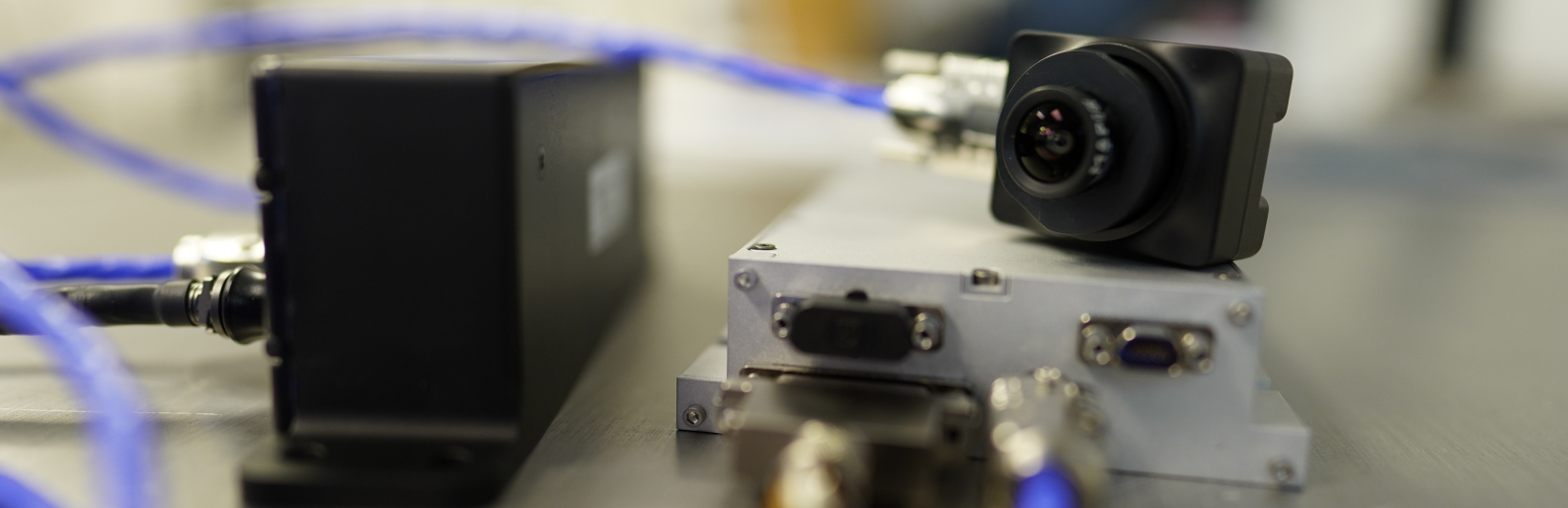
ALL COMPLEX NASA PAYLOADS COMPLETE C&DH

Stereo Cameras for Lunar Plume-Surface Studies (SCALPSS)



SCALPSS ENGINEERING UNIT C&DH COMPLETED VIRTUALLY WITH LARC

- Sent pre-defined byte string command packets from Nova Core ground SW to SCALPSS
- Streamed messages from SCALPSS to Nova Core ground SW
- Stored image data to the Nova-C on-board storage and provided data files for analysis
- Verified Nova-C flight software sent to the lander info message and confirmed time was received correctly
- Received SCALPSS messages for power down and sent onboard quit command
- Parsed SCALPSS info messages including internal camera temperature
- Tested all three phases of SCALPSS operations including transit checkout, descent, and surface operations



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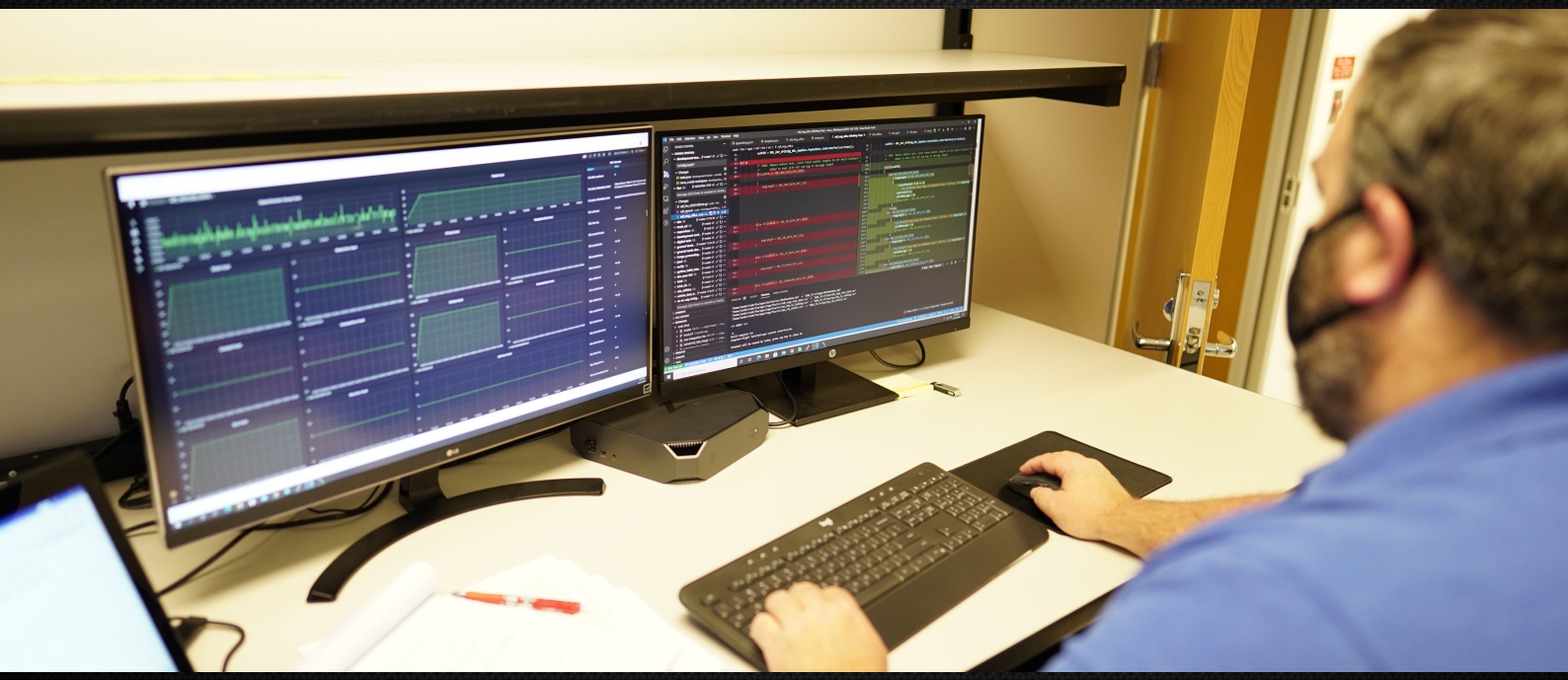
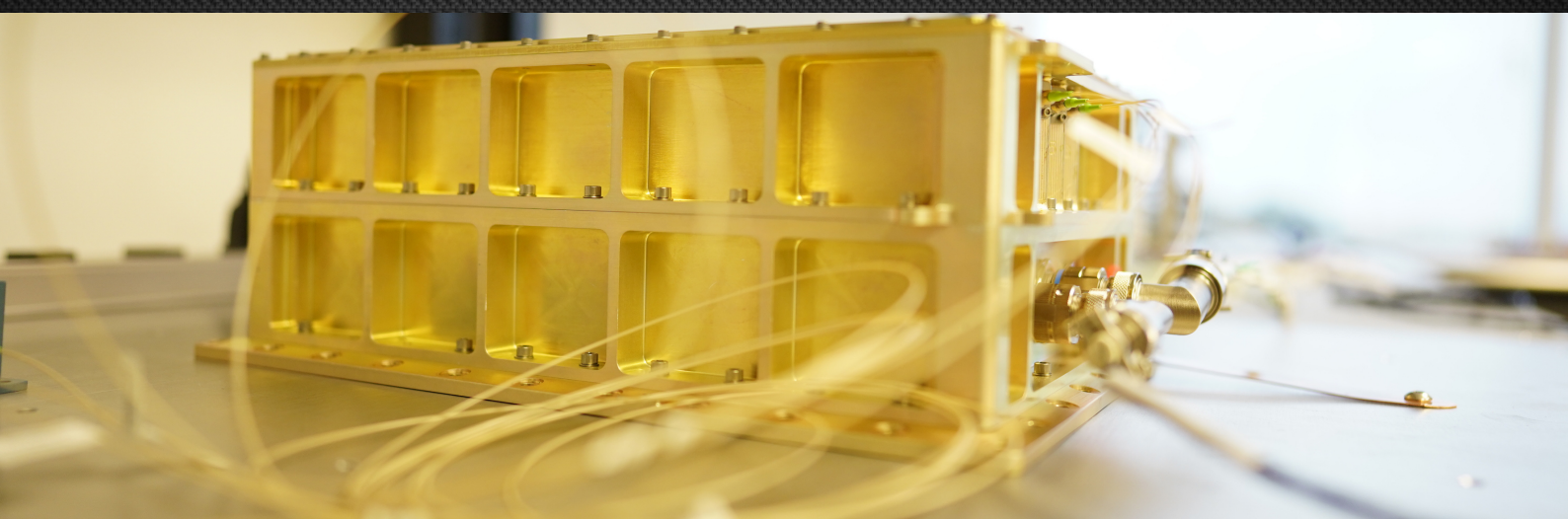
ALL COMPLEX NASA PAYLOADS COMPLETE C&DH

Navigation Doppler Lidar for Precise Velocity and Range Sensing (NDL)



NDL FLIGHT UNIT

- Streamed NDL real time packets to Nova Core ground SW
- Confirmed NDL received valid streaming packets into the YAMCS ground SW
- Stored download data packets and housekeeping data packets to the Nova-C file system
- Provided stored files to NDL and data analysis
- Verified all Nova-C NDL application data was received
- Confirmed with NDL that time sync command from Nova-C NDL application to the NDL payload is received and contains time sync data

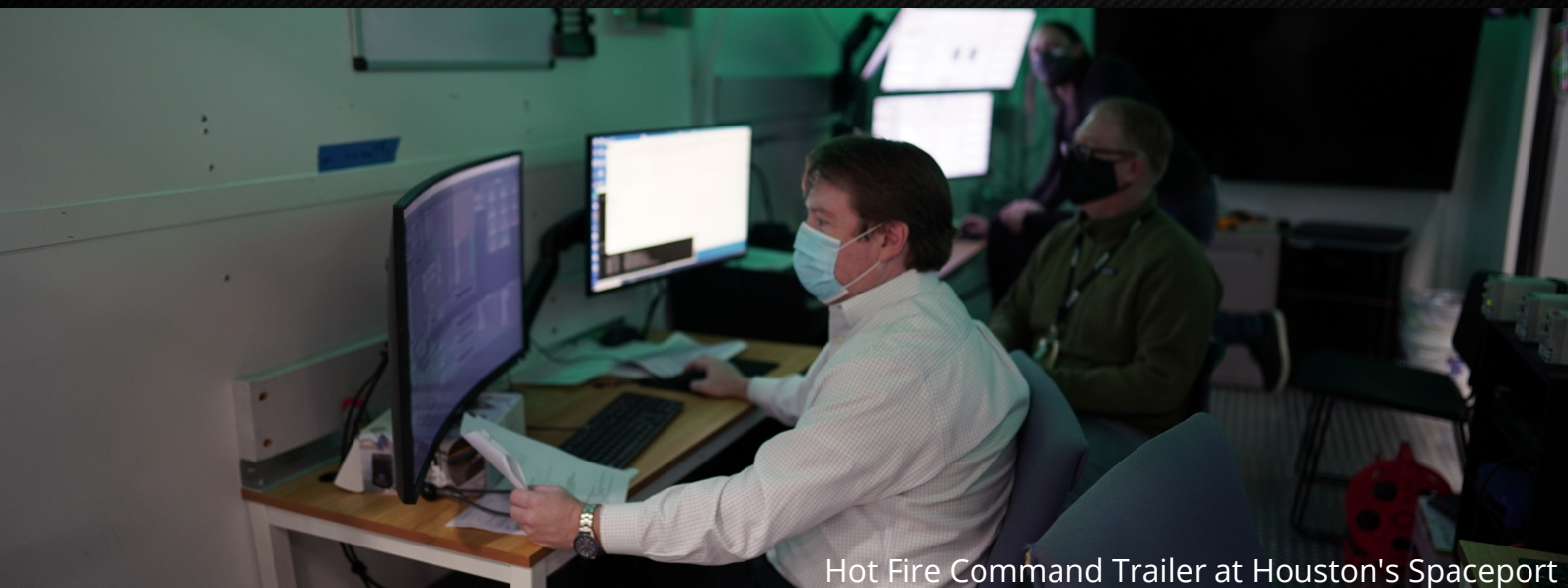


MOBILE TEST STAND HOT FIRE #41 INTERFACES WITH NOVA CONTROL

IM succeeded in a first run evaluation of remotely and securely telemetering live data from the hot fire rig at Houston's Spaceport back to HQ's Nova Control.

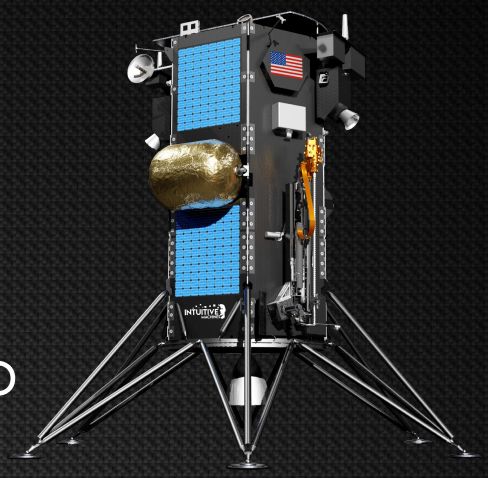
Nova Control at IM HQ

- Set up a VPN tunnel between the Hot Fire Command Trailer and one of our AWS Govcloud Virtual Private Clouds (VPC) with the StrongSwan VPN
- Established a server-to-server connection between a Nova Core instance on the Mobile Test Stand (MTS) and a second instance on the Nova Core Network at IM HQ through that tunnel
- Successfully demonstrated the data ingest process we will use with our Lunar Telemetry and Tracking Network (LTN) ground station providers



Hot Fire Command Trailer at Houston's Spaceport

GO FOR IM-2 POLAR MISSION

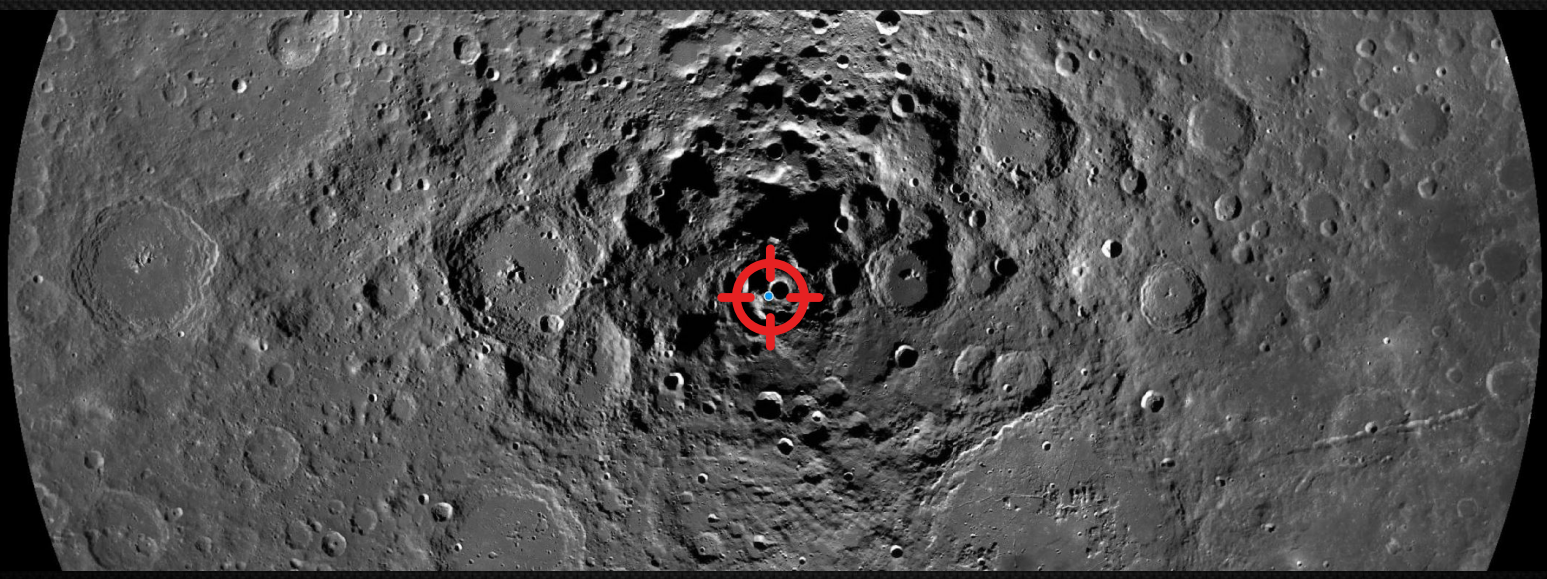


PRELIMINARY DESIGN REVIEW (PDR) COMPLETE

- All vehicle subsystems reviewed and ready to proceed with detailed design

LAUNCH SERVICE PROVIDER AGREEMENT SIGNED

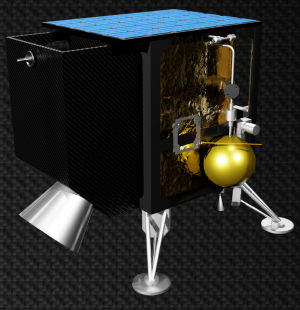
- SpaceX Falcon 9 Rocket



BASELINE LANDING SITE SELECTED

- Shackleton Connecting Ridge
  - Balanced requirements for
    - Sunlight
    - Communication with Earth
    - Payload science objectives
  - Flight dynamics staff is building trajectory using optical navigation and LIDAR
  - Engineers are continuing to explore a range of options with 6 degrees of the Lunar South Pole

BASELINE PAYLOAD MANIFEST



- NASA PRIME-1 Ice Prospecting Equipment
  - Trident Drill
  - Mass Spectrometer Observing Lunar Operations (MSOLO)
- NOKIA LTE Rover (Lunar Surface Innovation Initiative)
- IM Micro-Nova Hopper (Lunar Surface Innovation Initiative)

CONTACT: JOSH MARSHALL
JMARSHALL@INTUITIVEMACHINES.COM