01. Introduction
Helios-Lune Tranquillus (HLT) is a commercial-government partnership Artemis III lunar exploration mission to the Mare Tranquillitatis pit crater.

02. Solar Activity Record (SolAR) Data
• The solar surface has been exposed to the space environment for billions of years and solar activity records have accumulated over this timeframe.
• The HLT mission allows the Artemis III crew to obtain samples of palaeosol, which could provide an undisturbed solar record that greatly surpasses the record we can obtain on Earth.

The mission aligns with the Artemis program’s objectives through:
• Revealing ancient SolAR data
• Luna studies that provide insight into past lunar planetary processes

SolARs imprinted on the long dormant Moon can provide critical data about solar behavior over geological time that is vital to building a reliable Climate Change model for Earth.

03. Mission Objectives
1. Observation and scientific exploration of the lunar pit crater
2. To obtain samples for Earth return and analysis
3. The mission location and sampling strategy allows for solar activity record (SolAR) data to be analyzed from the sample layers upon return to Earth.

04. Mission Stages
Stage 1: Lunar Lander Touchdown
• Touchdown location safe distance from pit and accessible within a day

Stage 2: Pressurized Rover Deployment
• Once deployed, the pressurized rover is driven by the crew from the landing site to rim of the pit crater
• The rover is a mobile habitat

Stage 3: Axel Rover Deployment
• Mission specific version of the JPL Moon Diver Axel rover concept
• Samples gathered automatically by rappelling into the pit crater
• Axel is controlled by the crew using real-time tele robotic systems

Stage 4: Axel Rover Rappel
• Axel has two tether anchor points for redundancy (TBD)
• Slow descent to clear debris
• Wide-angle narrow lens camera imaging with crew obtaining imaging live feed

Stage 5: Talus Pile Sampling
• Confirmation of touchdown to crew and two samples acquired

Stage 6: Scientific Observation
• Scientific payloads utilized (see Section 05 below)

05. Onboard Scientific Payload
• Spectrometer
In situ spectral analysis of samples. Amount and type of chemical elements in top layer of obtained samples
• Light-weight ground penetrating radar (GPR)
To visualize any underground structures and formations
• 3D laser scanning capabilities (OPAL)
Lava tube scanning capabilities to provide preliminary data on lava tubes as a sustained lunar habitat

06. Commercial Human Spaceflight Exploration (CHASE)
• Mission stage development open to worldwide space agencies and companies
• International scientific collaboration for missions to the moon
• Research proposals for sample analysis
• Data analysis to be globally available

07. Future Research
• Sample retrieval without disrupting layers
• Maximum yield SolAR retrieval method
• Avalanche risk
• Moon gravity ravel
• Below lava layer drilling equipment
• Additional sampling locations
• Lava tube exploration for human habitation (LAVA-T)

08. References

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