



International Moon Day Tele-Robotics

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Exploration Analogues Working Group

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International Moon Day



**United
Nations**

**International Moon Day
20 July**

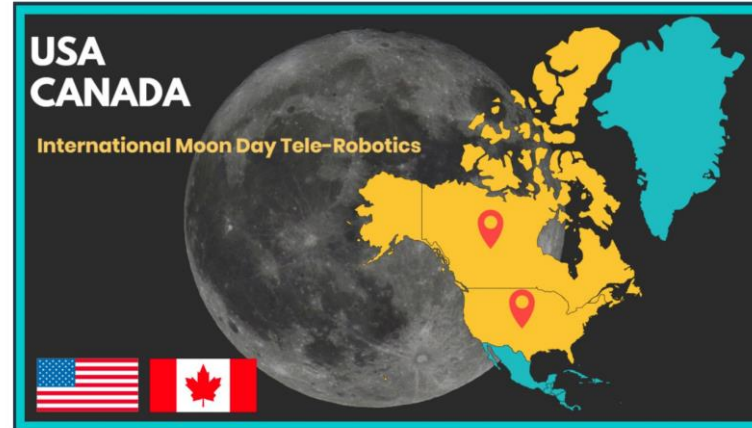
- The United Nations approved the creation of the International Moon Day (IMD) as an annual educational, cultural and scientific event.
- The International Moon Day is to be observed annually on 20 July to raise awareness among the public and generate support for sustainable Moon Exploration and Utilization.
- The International Moon Day encourages and promotes events around the globe on 20 July, including community panel discussion, lectures, webinar, concerts exhibits and screening of educational videos.

Moon Village Association



- The Moon Village Analogue (MVA) Working Group provides a forum for identifying and coordinating activities related to terrestrial analogues for the Moon Village.
- It also addresses the associated topic of the use of the Moon as an analogue/testbed for future exploration of Mars and other destinations.
- The Working Group supports the creation of Analogues around the world as a tool to contribute to capacity building in space developing countries and in general as outreach to the public.

Moon Village Association Working Group



- In order to support the International Moon Day (IMD) and demonstrate the leadership of the MVA, the Moon Village Analogue (MVA) Working Group organized a Tele-Robotics Collaboration Event for the International Moon Day on July 20, 2022
- Two collaborators volunteered to provide unmanned ground vehicles (UGV) robots for tele-operations:



Pacific International
Space Center for
Exploration Systems



MISSION CONTROL

Hawai'i Collaboration



Pacific International
Space Center for
Exploration Systems

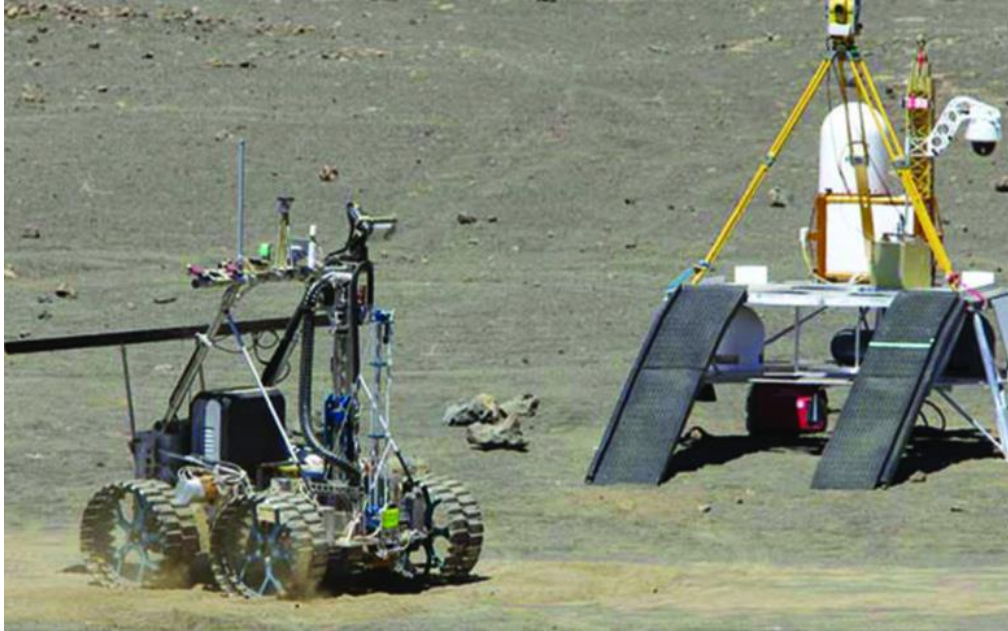
- The International MoonBase Alliance (IMA) is an association comprised of leading scientists, educators, and entrepreneurs from space agencies and industries worldwide to advance the development and implementation of an international base on the Moon.

<https://moonbasealliance.com/>

- We are an aerospace research center at the University of Hawai'i at Hilo (UHH) developing sustainable technologies and industries that benefit Hawai'i and space exploration. Through STEM programs, internships and community outreach, we offer hands-on learning experiences to future scientists, coders, engineers and explorers—encouraging them to dream big and pursue space-related careers.

<https://pacificspacecenter.com/>

PISCES Helelani Rover



Specifications

Manufacturer: Ontario Drive and Gear (ODG)

Model: Alpha Argo

Weight: 726 lbs (without avionics and additional equipment)

Power: 48V main system provided by two 24V battery systems

Additional Power Systems: 12V electronics, 12V payload

NASA's RESOLVE (Regolith and Environment Science and Oxygen Lunar Volatile Extraction) ISRU test in 2012 at a Hawai'i planetary analog site. Credit: NASA

Canada Collaboration



Mission Control empowers explorers by innovating to make advanced mission control software viable for use in space. Using our software, customers can simplify mission development and operations while unlocking the potential of new scientific and commercial opportunities on the Earth, Moon, Mars, and beyond.

Mission Control's end-to-end solution supports any mission with:

- An advanced ground control platform

- Autonomous onboard intelligence

- Turnkey applications supporting specific mission goals

Our software is used by mission controllers, scientists, and software developers who seek faster deployments, lower-cost mission development, and valuable data returns.

Canada Collaboration



Technical specification of the Husky A200 UGV mobile base

Dimensions and weight

- External dimensions (L x W x H): 990 x 670 x 390 mm (39 x 26.4 x 14.6 in)
- Internal dimensions: 296 x 411 x 155 mm (11.7 x 16.2 x 6.1 in)
- Weight: 50 kg (110 lb)
- Wheels: 330 mm (13 in) Lug tread
- Ground clearance: 130 mm (5 in)

Speed and performance

- Max. payload: 75 kg (165 lb)
- All-terrain payload: 20 kg (44 lb)
- Max. speed: 1.0 m/s (2.3 mph)
- Drive power: 4 x 4 wheels with no maintenance
- Max. climb grade: 45° (100% slope)
- Max. traversal grade: 30° (58% slope)

Mission Control Husky UGV Robot in lunar test bed in Montreal, Canada

International Teams

Moon Village Association				
International Moon Day: Tele-Robotics				
July 20, 2022				
Institution	Country	Robot	Time Slot	
1 Mars University	USA	Mission Control - Husky	08:00 - 09:00 EST Toronto, Canada	
2 Sirius Astro-Club Bénin	Bénin	Mission Control - Husky	09:30 - 10:30 EST Toronto, Canada	
3 Saudi Electronic University	Saudi Arabia	Mission Control - Husky	11:00 - 12:00 EST Toronto, Canada	
4 LunáTicos	Costa Rica	Mission Control - Husky	13:00 - 14:00 EST Toronto, Canada	
5 McMaster University	Canada	Mission Control - Husky	14:30 - 15:30 EST Toronto, Canada	
6 Cosmic Tribe	Pakistan	Mission Control - Husky	TBD Rescheduled Toronto, Canada	
1 Costa Rica Institute of Technology	Costa Rica	PISCES - Heleilani	09:30 - 10:30 HST, Hawaii	
2 Sishu Griha	India	PISCES - Heleilani	11:00 - 12:00 HST, Hawaii	
3 Science Academy SPACE TU Wien	Austria	PISCES - Heleilani	13:00 - 14:00 HST, Hawaii	

Global Reach

Students from 8 Countries, 5 continents participated

Canada – Mission Control Husky



Hawaii - PISCES



August 2013

Any policy representation is not necessarily authoritative.

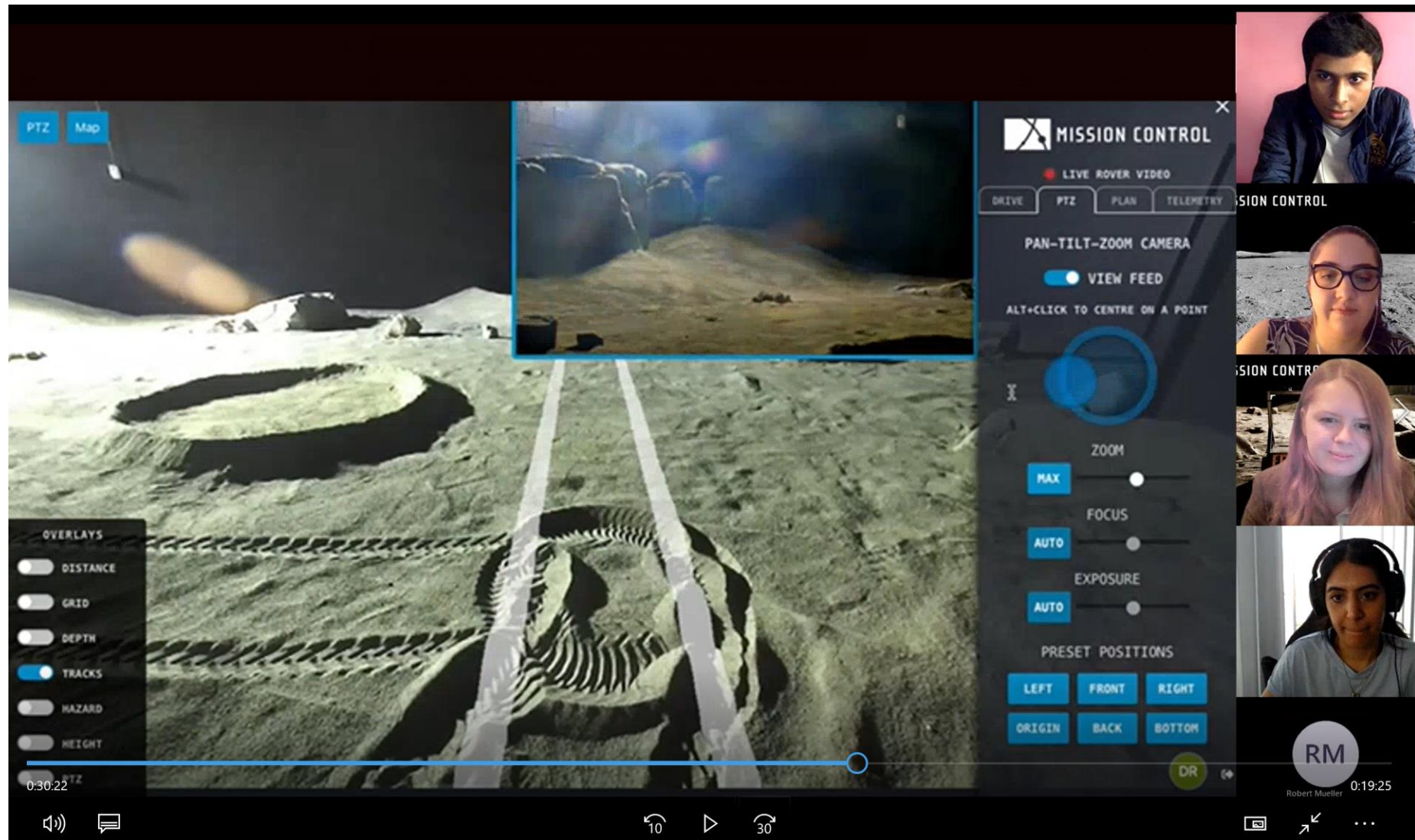
Tele-Robotics Video: PISCES Helelani

The screenshot displays a tele-robotics interface for the PISCES Helelani mission. The interface is divided into several sections:

- Top Bar:** Shows the URL <https://remotedesktop.google.com/support> and the time Wed 13:12.
- Activities Panel:** Displays icons for various applications, including a terminal and a file manager.
- Full Nav - rqt:** A window showing the robot's navigation status. It includes a "Your desktop is currently shared with gerrit.graser@gmx.at" notification and a "Stop Sharing" button. Below this, there are fields for 12V, 12A, 48V, 24A, LA, RA, LT, RT, BT, and a "Start" button.
- Helelani Mission Control:** A section with a table of commands and a "Start" button.
- Helelani Command:** A table listing commands and their execution times.
- Helelani Camera Control:** A section with two circular gauges for "Situation Cam" and "Stereo Cam", showing heading and pitch values. It also includes a "Capture" button.
- Helelani Throttle Trackpad:** A section with a "Capture" button and a "Helelani Joystic..." label.
- Live view - AXIS M3114 Network Camera:** A window showing a live video feed of a robot in a field. The feed is labeled "AXIS M3114 Network Camera" and "Stream profile: Motion JPEG".
- Video Call:** A vertical stack of video feeds on the right side of the screen. The top feed shows a person labeled "Christian Andersen". Below it are two feeds showing a group of people, labeled "Emily Ugobodu" and "Ugobodu Sonja". The bottom feed is labeled "Taylan".

The bottom of the screen shows a system tray with various icons, including a clock displaying 0:14:08 and a date of 21.07.2022.

Tele-Robotics Video: Mission Control Husky



Summary

- The Moon Village Association (MVA) Exploration Analogues Working Group successfully hosted an International Moon Day Tele-Robotics event for students across the globe.
- Two organizations donated their time and expertise to teach students how to tele-operate an unmanned ground vehicle (UGV) robot in a simulated lunar environment:
 - PISCES in Hawai'i
 - Mission Control in Canada
- Students from 8 countries and 5 continents were able to experience tele-operating a lunar rover prototype in simulated lunar terrain
- The event required logistical coordination which was successfully accomplished with just an internet connection
- Some software issues for remote operation were encountered in Hawai'i but ultimately they were resolved
- The students indicated that they had a good experience