

# 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**

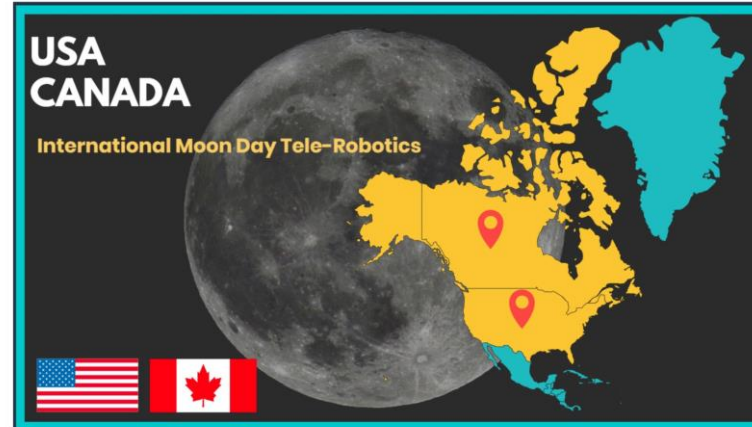
- The United Nations approved the creation of the International Moon Day (IMD) as an annual educational, cultural and scientific event.
- The International Moon Day is to be observed annually on 20 July to raise awareness among the public and generate support for sustainable Moon Exploration and Utilization.
- 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

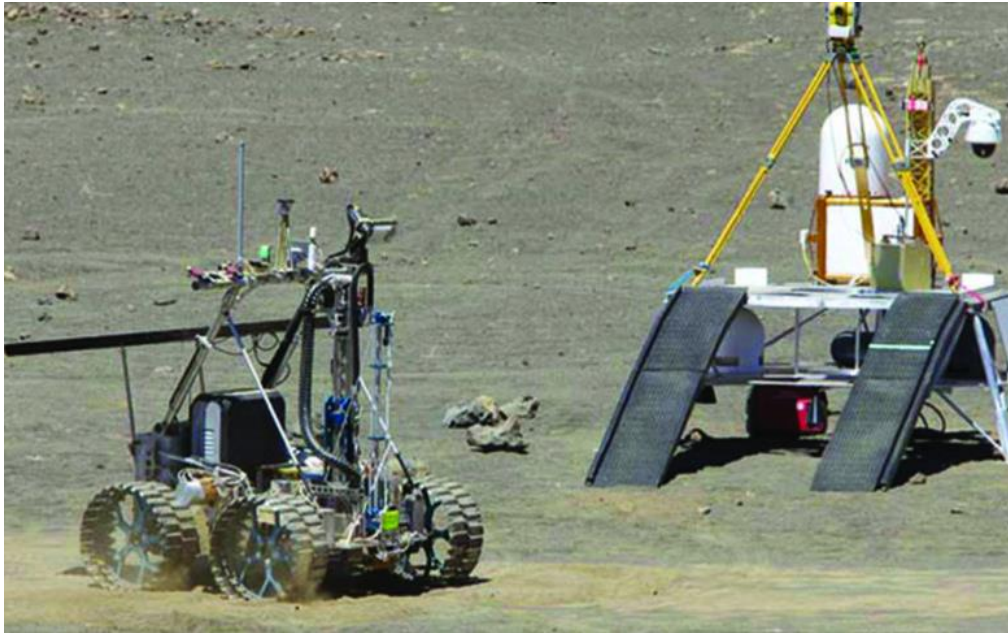
- The International MoonBase Alliance (IMA) is an association comprised of leading scientists, educators, and entrepreneurs from space agencies and industries worldwide to advance the development and implementation of an international base on the Moon.

<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

<b>Moon Village Association</b>			
<b>International Moon Day: Tele-Robotics</b>			
<b>July 20, 2022</b>			
<b>Institution</b>	<b>Country</b>	<b>Robot</b>	<b>Time Slot</b>
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

# Tele-Robotics Video: PISCES Helelani

The screenshot shows a remote desktop session with the following components:

- Browser:** A Google Chrome browser window displaying a support page for remote desktop.
- Activities Panel:** A sidebar on the left with application icons for Firefox, Files, Terminal, and Chrome.
- Full Nav - rqt:** A navigation window showing the robot's status, including a timer at 02:56:57, coordinates (Lat: 0, Lon: 0), and various sensor data.
- Helelani Mission Control:** A panel with a 'Start' button and an 'End' button.
- Helelani Command:** A table listing commands:

Type	Time	Comm Timer	Information
Command	+00:00:00	0.0	drive forward 30 meters
Command	+00:00:00	0.0	turn right 41 degrees
Command	+00:00:00	0.0	drive forward 8 meters
Command	+00:00:00	0.0	drive forward 5 meters
- Helelani Camera Control:** Two circular gauges for 'Situation Cam' (Heading: -38.8, Pitch: -9) and 'Stereo Cam' (Heading: 0.0, Pitch: 0). A 'Capture' button is visible below the Stereo Cam gauge.
- Helelani Throttle Trackpad:** A control panel for the robot's movement, showing 'Heading: 233.3', 'Speed (m/s): 0.00', 'Distance (m): 66.74', and 'Rotations: 35405'.
- Live View - AXIS M3114 Network Camera:** A video feed showing a horse in a field. The stream profile is 'Motion JPEG' and the bitrate is 21.295 kbps.
- Video Conference:** A Zoom meeting window on the right side of the screen with participants: Christian Andersen, Emily Ugboodu, Ugboodu Sonja, and Taylan.
- System Tray:** The bottom of the screen shows the system tray with a search bar, application icons, and system information (24°C, 21.07.2022, 0:14:08).



# Tele-Robotics Video: Mission Control Husky

The image displays a tele-robotics interface for Mission Control Husky. The main view is a first-person perspective from the rover, showing a rocky, cratered landscape under a dark sky. A large, circular crater is prominent in the foreground. The interface includes several control panels and overlays:

- PTZ (Pan-Tilt-Zoom) Camera:** A circular control panel on the right side of the main view, with a blue indicator. Below it are sliders for ZOOM (set to MAX), FOCUS (set to AUTO), and EXPOSURE (set to AUTO). Preset positions are listed as LEFT, FRONT, RIGHT, ORIGIN, BACK, and BOTTOM.
- MISSION CONTROL Panel:** Located on the right side, it features a title bar with a close button (X), a "LIVE ROVER VIDEO" indicator, and tabs for DRIVE, PTZ, PLAN, and TELEMETRY. Below the tabs are the camera control options.
- OVERLAYS Panel:** Located in the bottom-left corner, it contains a list of overlays with toggle switches: DISTANCE, GRID, DEPTH, TRACKS (checked), HAZARD, and HEIGHT.
- Video Call Overlay:** On the right side, there is a vertical stack of three video feeds. The top feed shows a man (Robert Mueller) with the name "RM" and "Robert Mueller" below it. The middle and bottom feeds show two women. A timer at the bottom right of the video call area indicates "0:19:25".
- Video Player Controls:** At the bottom of the interface, there is a video player with a progress bar, a play button, and a volume icon.

# 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