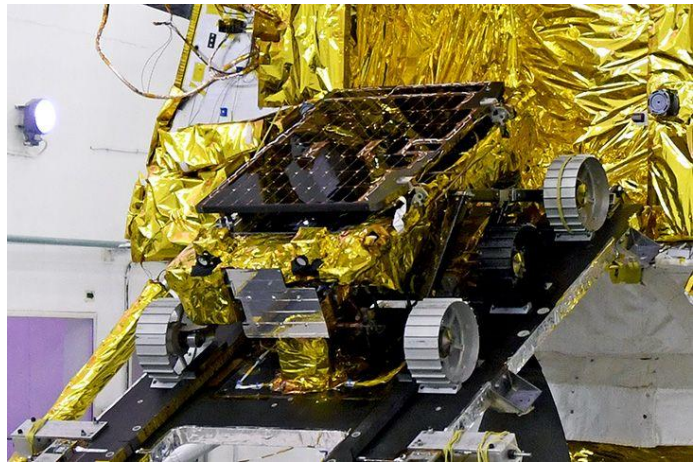
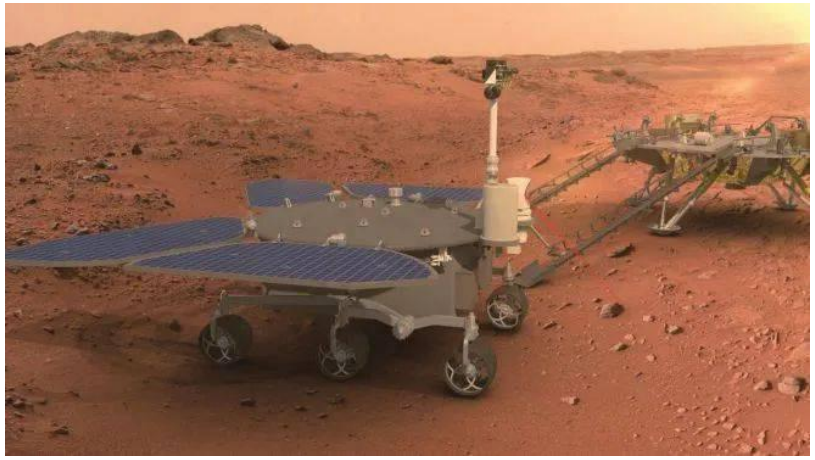
An Introduction to Planetary Micro-Rovers

Samuel Ong

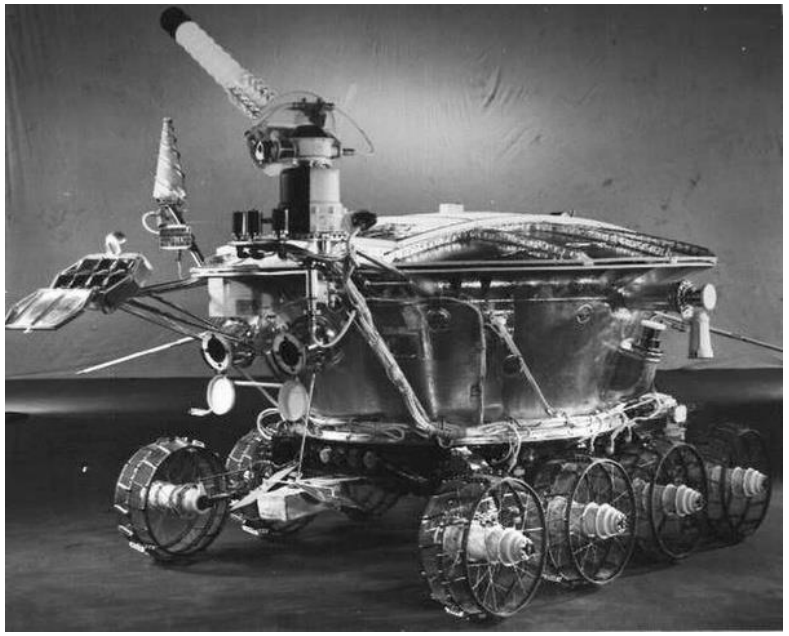
A Brief History of Planetary Rover

Pragyan (2019)

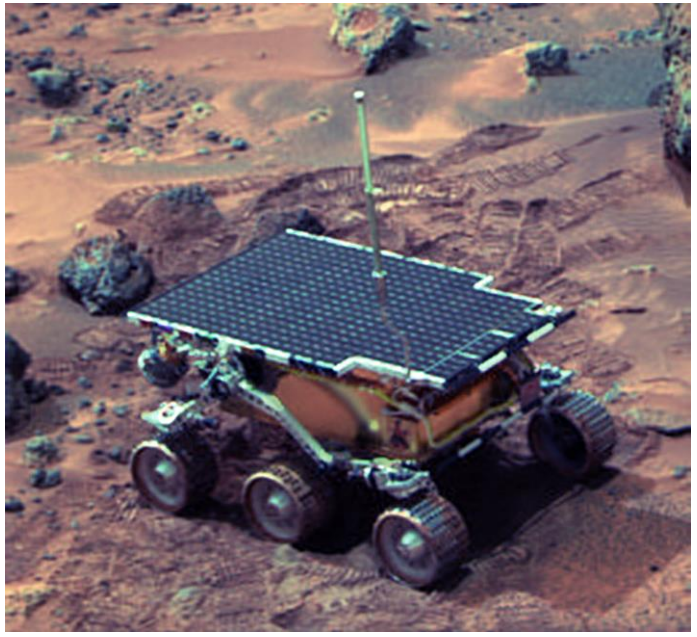




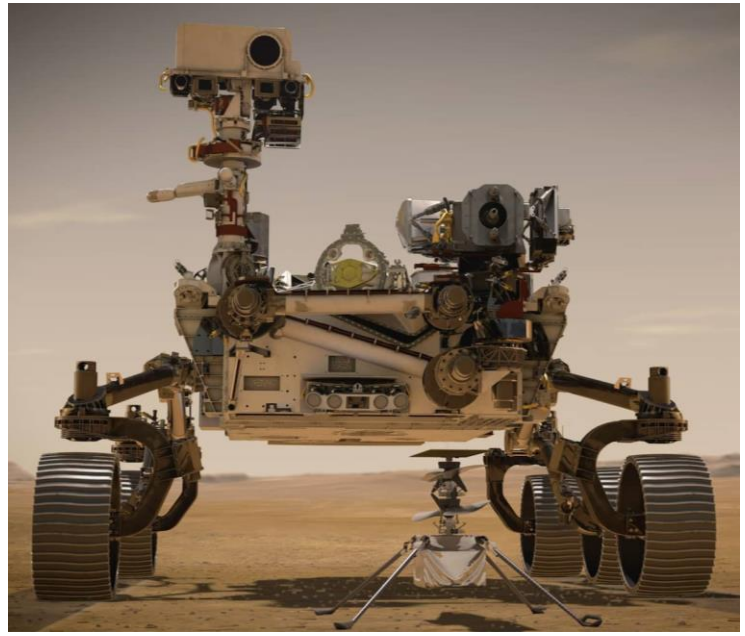
Zhurong (2021)



Lunokhod 1 (1970)



Sojourner (1997)

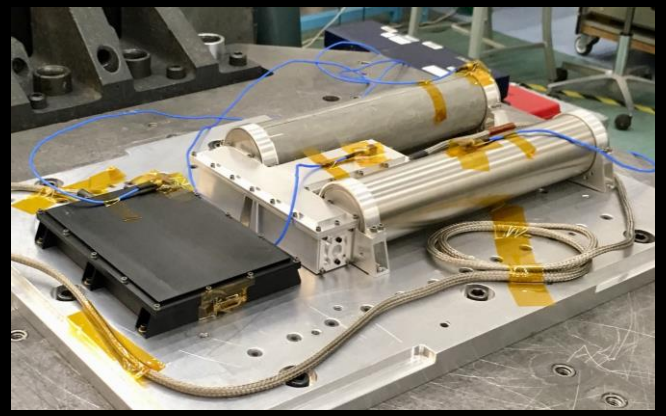


Perseverance (2020)

MOONRANGER

Purpose

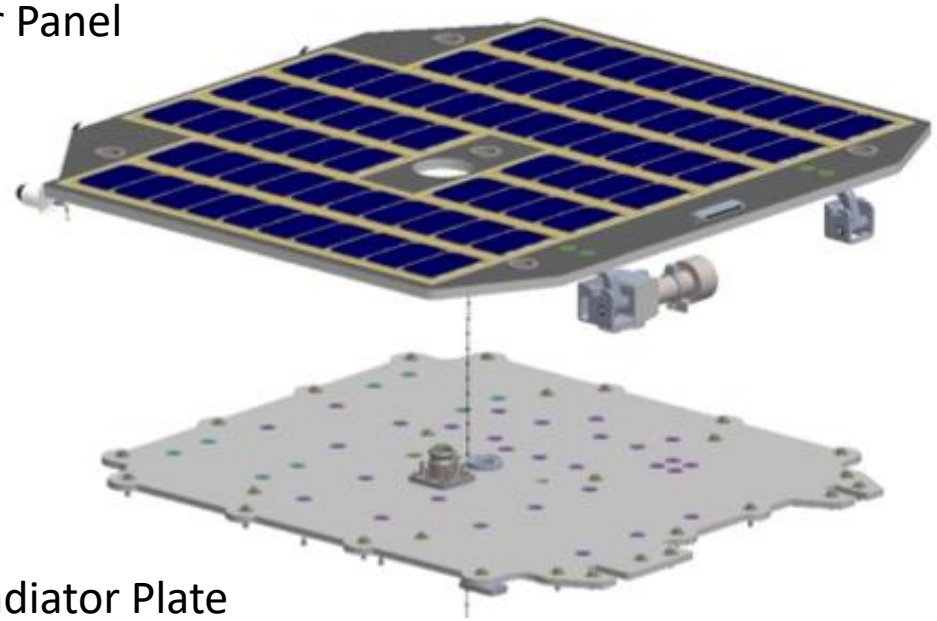
To **characterize hydrogenous volatiles** while demonstrating autonomous micro-rover capabilities during lunar polar exploration.



Neutron Spectrometer System (NSS)

Mechanical Design

Solar Panel

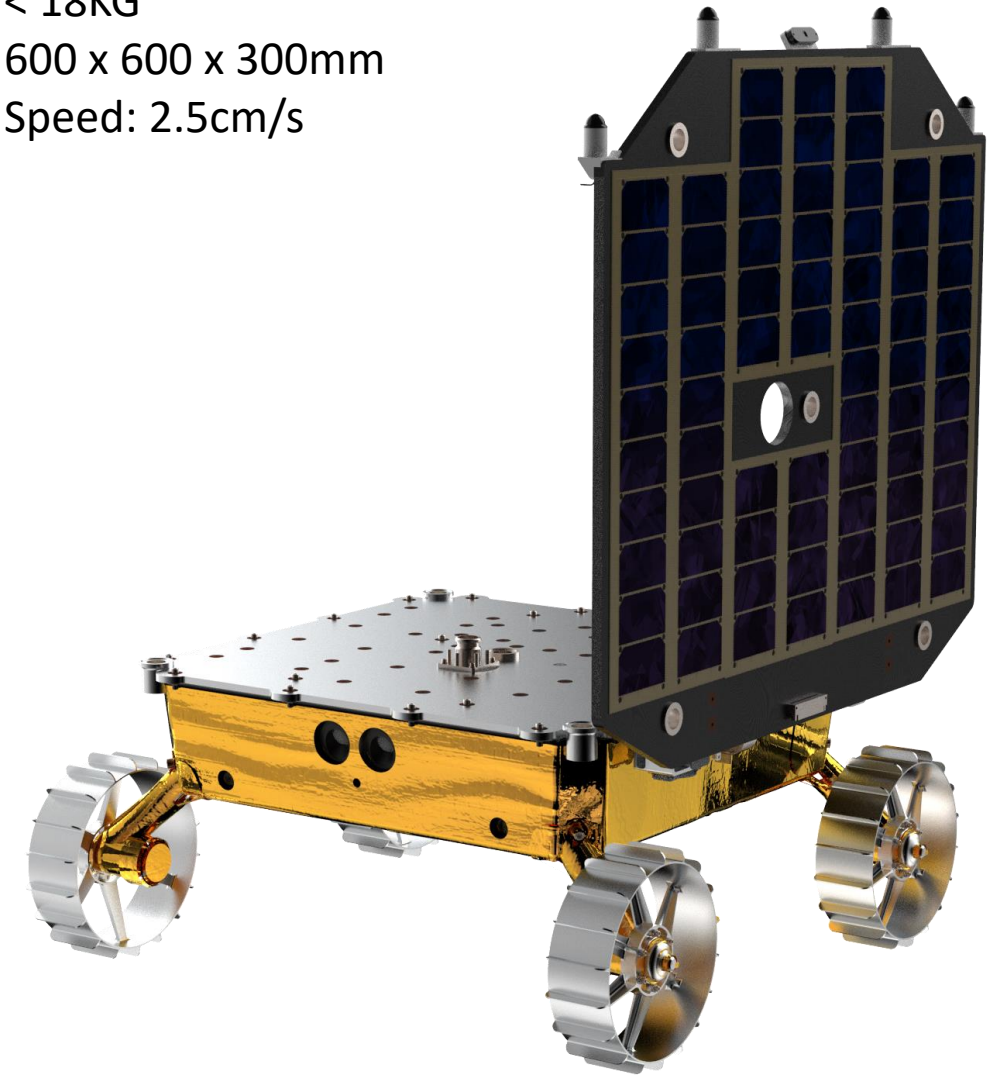


Radiator Plate

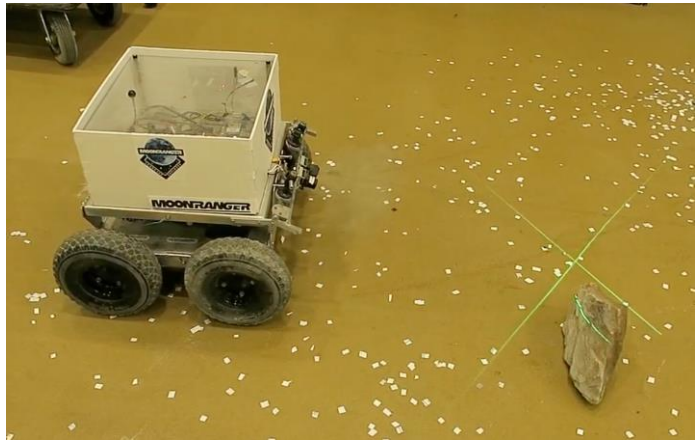
Carbon Fibre Chassis

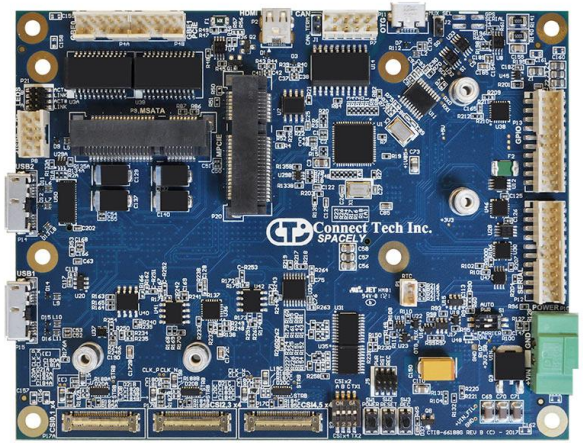
Wheel Module

< 18KG
600 x 600 x 300mm
Speed: 2.5cm/s



Avionics



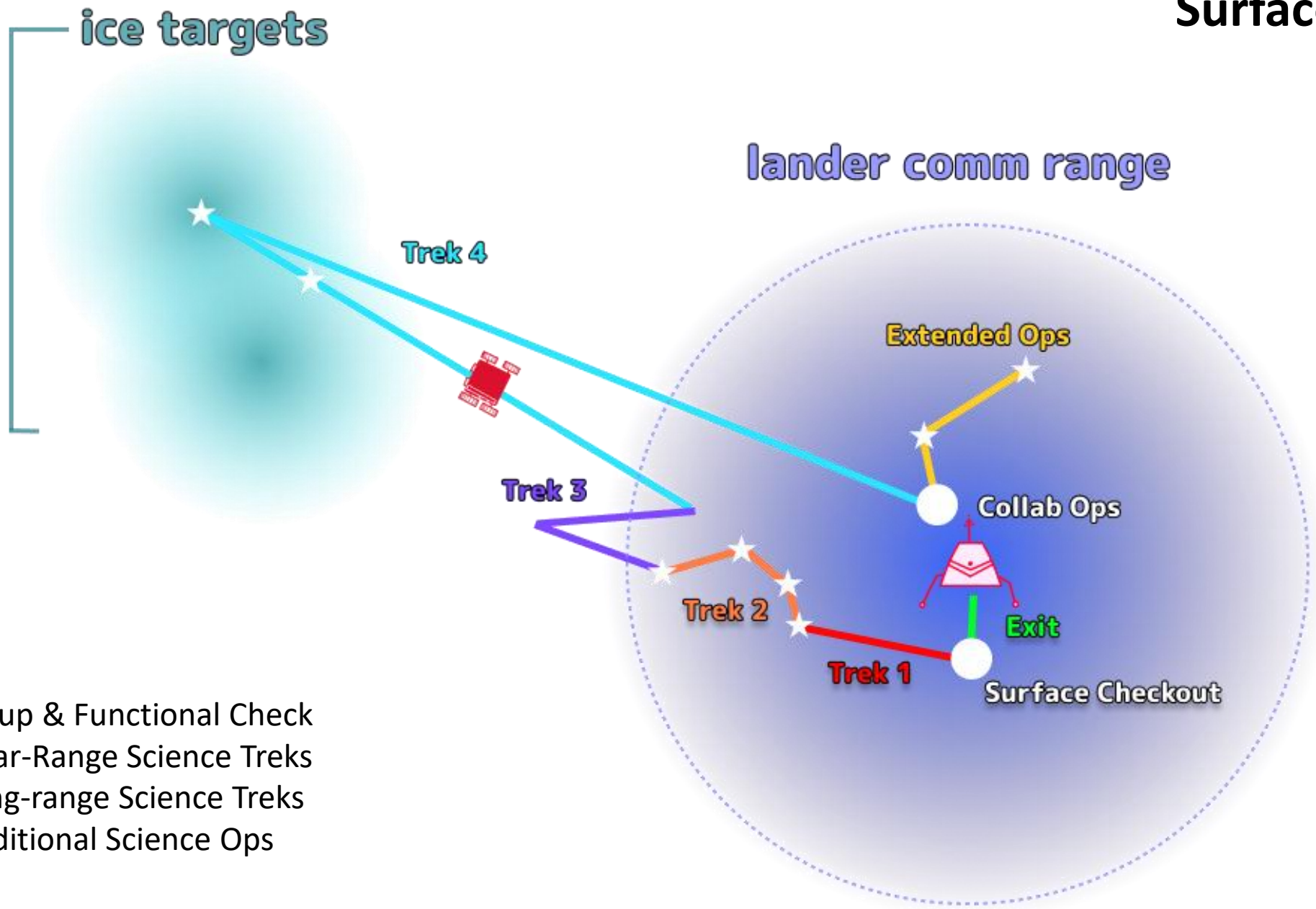


Jetson TX2i + Carrier Board

ISIS OBC (IOBC)

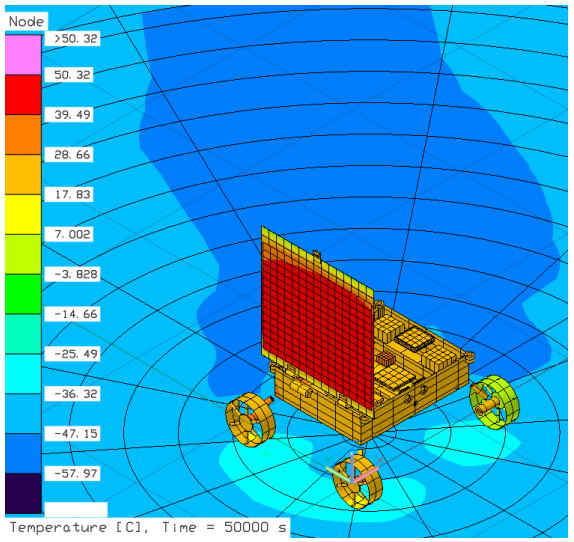
Sensors

Surface Operations

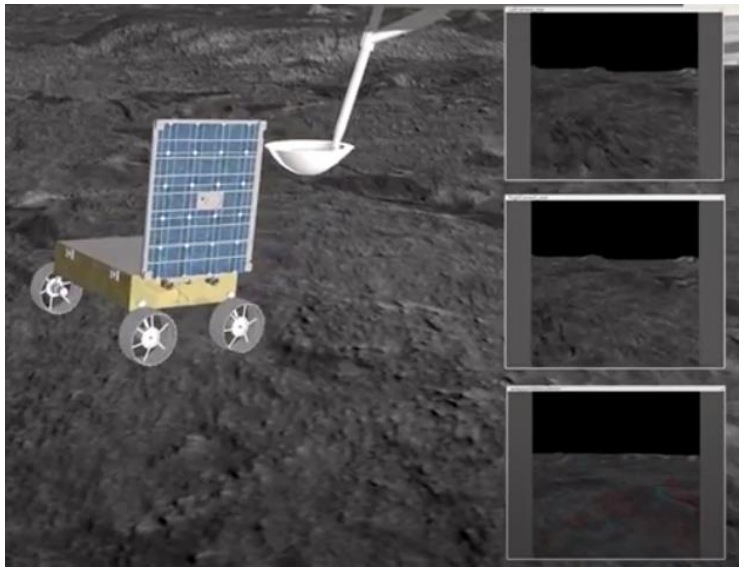


1. Setup & Functional Check
2. Near-Range Science Treks
3. Long-range Science Treks
4. Additional Science Ops

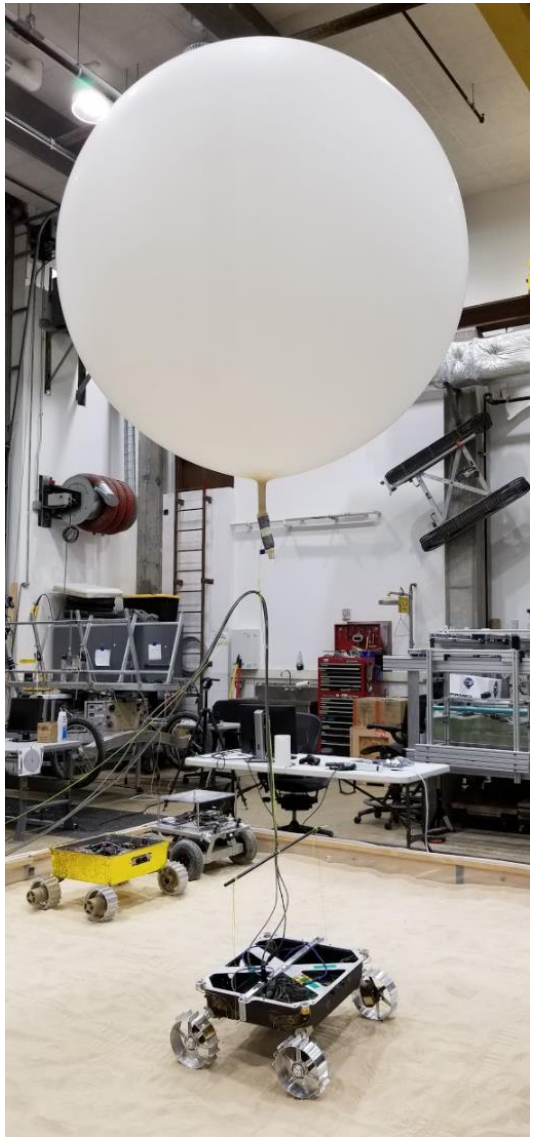
Test & Simulations



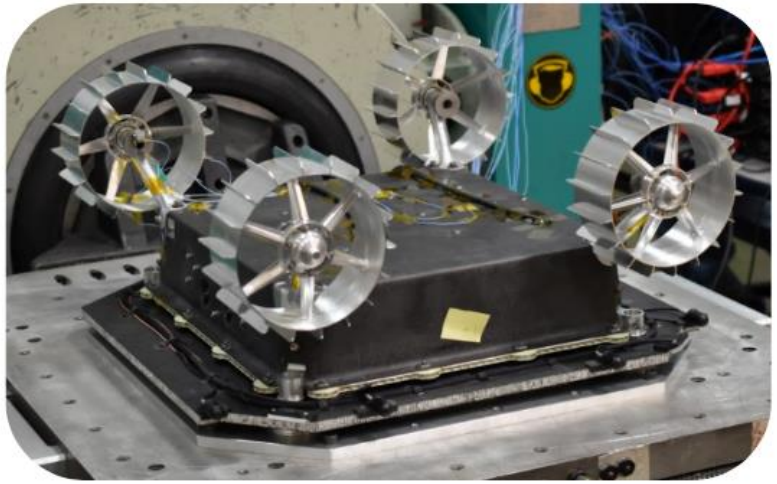
Thermal Sim



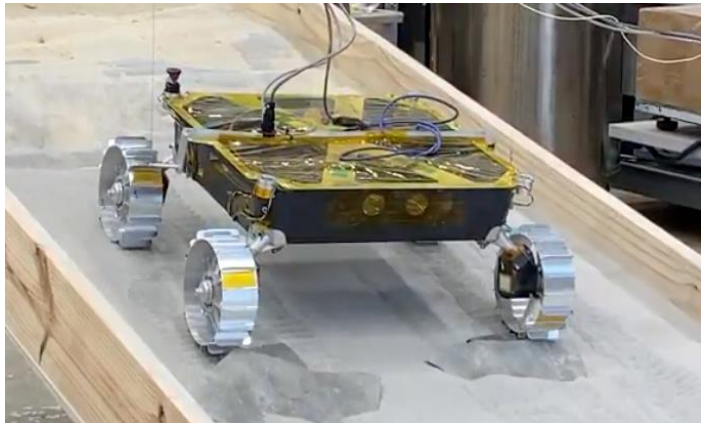
Dynamics Sim



Gravity Offload

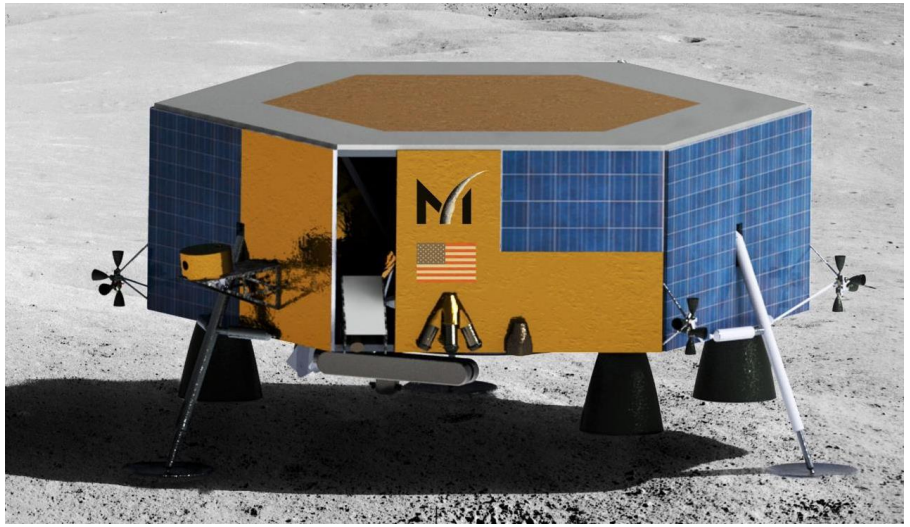


Vibe Test



Mobility Test

Programmatic Risk Management



Masten Lander & Falcon 9

Risk Definitions				
Rating	Likelihood	Consequence		
		Cost	Schedule Impact	Technical/Safety Impact
5	Near Certainty (~90% Chance)	>5% of the project budget	Cannot meet lander delivery or launch date	No science return. Potential for loss of life or disabling injury.
4	Highly Likely (~50% Chance)	Between 3% and 5% of the project budget	Delivery to lander or instrument readiness for launch impacted, but still possible	Very limited science return will be accomplished.
3	Moderately Likely (~25% Chance)	Between 2% and 3% of the project budget	Major milestone is impacted but delivery to lander or instrument ability to meet launch not impacted	Impacts some science but majority of science return can be accomplished. Potential for injury.
2	Somewhat Likely (~10% Chance)	Between 1% and 2% of the project budget	Schedule is impacted, but major milestones are met	Impact to performance or redundancy, but all science can be accomplished.
1	Not Likely (~5% Chance)	<1% of the project budget	No impact to schedule	No impact to performance

Space Robotics Challenges

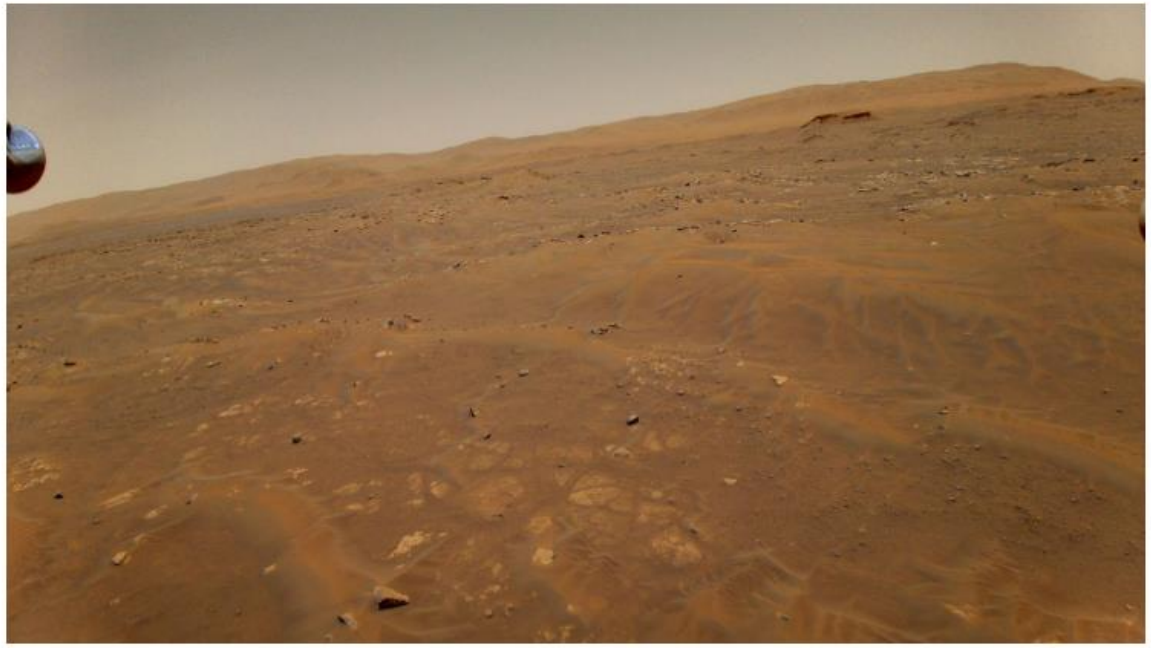
Courtesy of NASA

Ingenuity

STATUS UPDATES | May 27, 2021

Surviving an In-Flight Anomaly: What Happened on Ingenuity's Sixth Flight

Written by Håvard Grip, Ingenuity Mars Helicopter Chief Pilot at NASA's Jet Propulsion Laboratory



This image of Mars was taken from the height of 33 feet (10 meters) by NASA's Ingenuity Mars helicopter during its sixth flight on May 22, 2021. Credit: NASA/JPL-Caltech. Download image ›

Thank You!

And shout out to the MoonRanger Team (Pictures are courtesy of them!)