



ASTROLAB  
VENTURI

# Flexible Logistics and Exploration: The FLEX Lunar Rover

June 2022





# ASTROLAB VENTURI

- Astrolab is a Hawthorne, CA-based aerospace technology startup pioneering novel planetary systems
- Experienced and driven engineering and leadership team from SpaceX, NASA, JPL, and Kittyhawk



# The Multi-Planet Future

NASA is looking to commercial industry for help in the exploration and settlement of the Moon & Mars

Investments in fully-reusable rockets and landers will soon open an era of unprecedented access

Humanity's transition from a one-planet species to a multi-planet species has begun and it is an extraordinary scientific and economic opportunity





# FLEX ROVER

## Flexible Logistics & Exploration

### Versatility

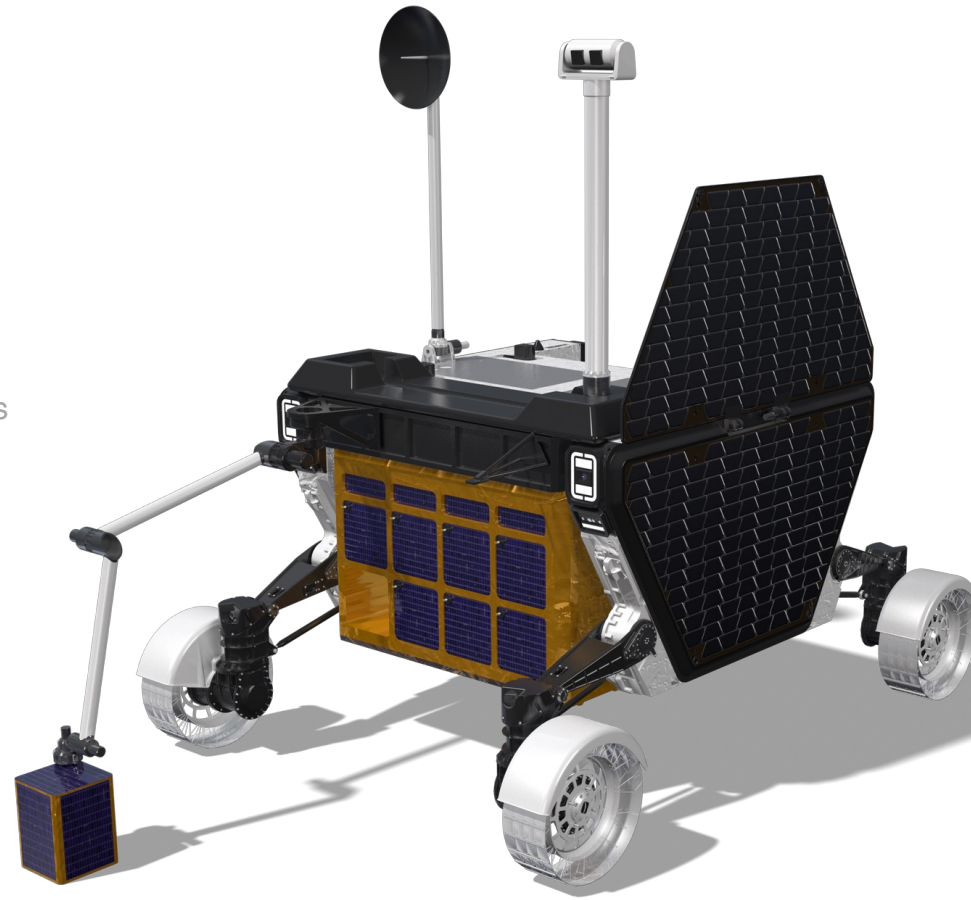
3 modular interfaces support a wide variety of payloads and attachments

### Longevity

System redundancy, robust dust mitigation, & lunar night survival give FLEX a 10-year life

### Capability

FLEX transports payloads up to 3m<sup>3</sup> in volume and 1500kg mass over rough terrain and slopes more than 20°



1500kg of payload



15kph top speed



Semi-autonomous operability



Exploration  
& Discovery



Crew  
Support



Logistics



Robotic  
Science



Construction



Resource  
Utilization





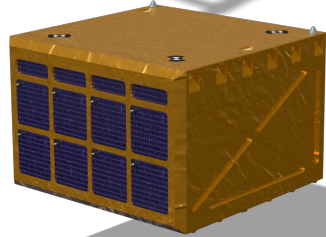




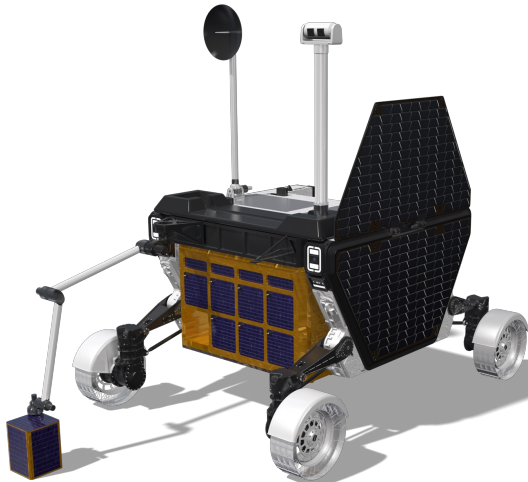
# Adaptive Utility



+ Robotic Arm & Camera Mast Module

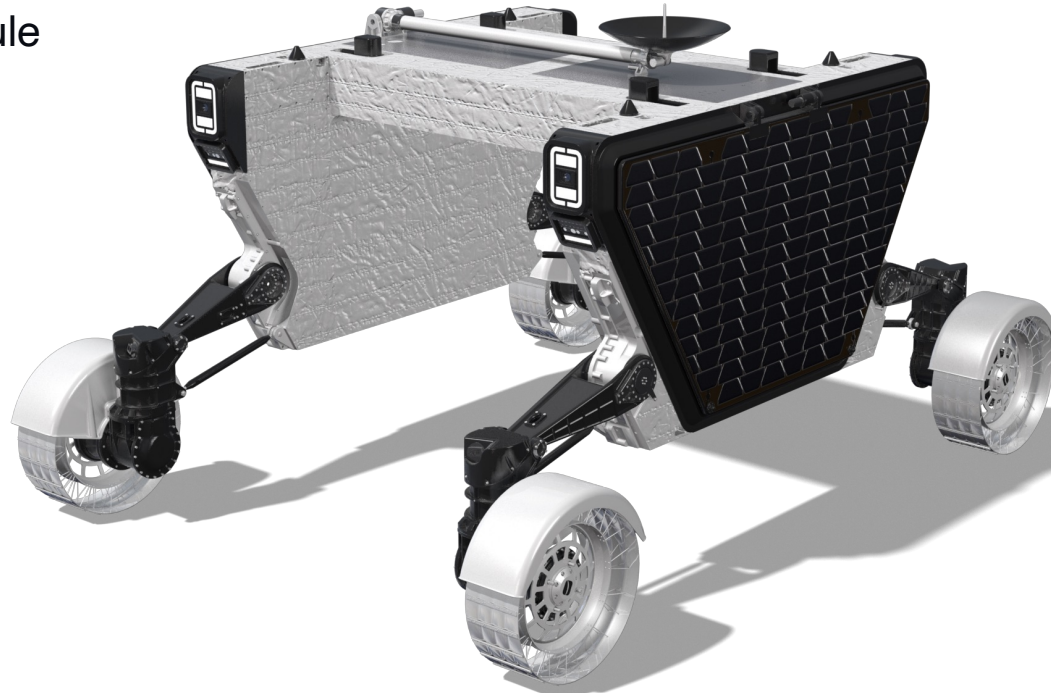


+ Payload Module



= Lunar Science  
Rover

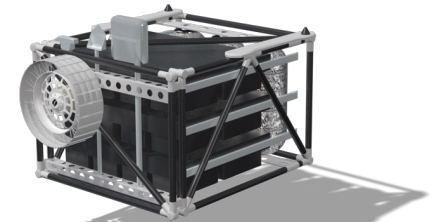
Core FLEX Rover



- Mobility system
- Navigation
- Comms
- Power
- Command & Data Handling
- Payload services (power & data)



+ Crew Stand & Interface



+ EVA Kit



= Lunar Terrain  
Vehicle





# Lunar Development

Transportation & Data → Energy & Communications → Resources → Settlement

1

Create a robotic logistics platform to enable large-scale infrastructure deployment & data collection

2

Develop communications and energy collection, storage, & distribution network

3

Enable resource extraction and processing and other energy-intensive activities

4

Establish permanent human presence





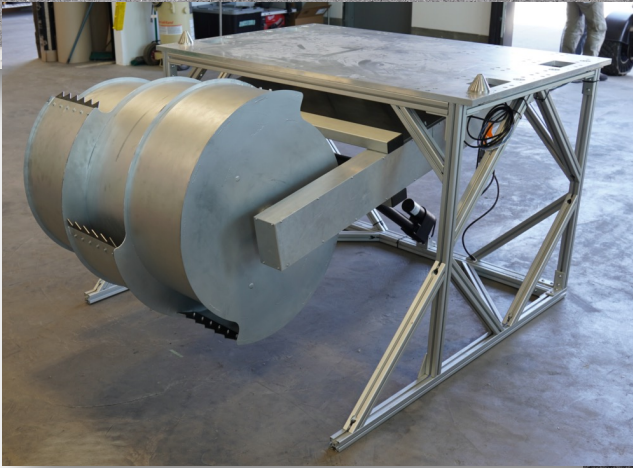


# Field Testing

- Astrolab has a strong culture of fast design, build, and test iteration.
- Field testing in analog environments is an essential part of our development process.
- We invite payload developers to participate in our regular (~quarterly) field test campaign







# Bucket Drum Payload

- Astrolab collaborated with a student team at U.C. Santa Barbara to produce an active FLEX payload
- Integration and preliminary testing was completed at Astrolab's on-site test yard
- Planning additional testing in unprepared terrain late June







# Bucket Drum Payload

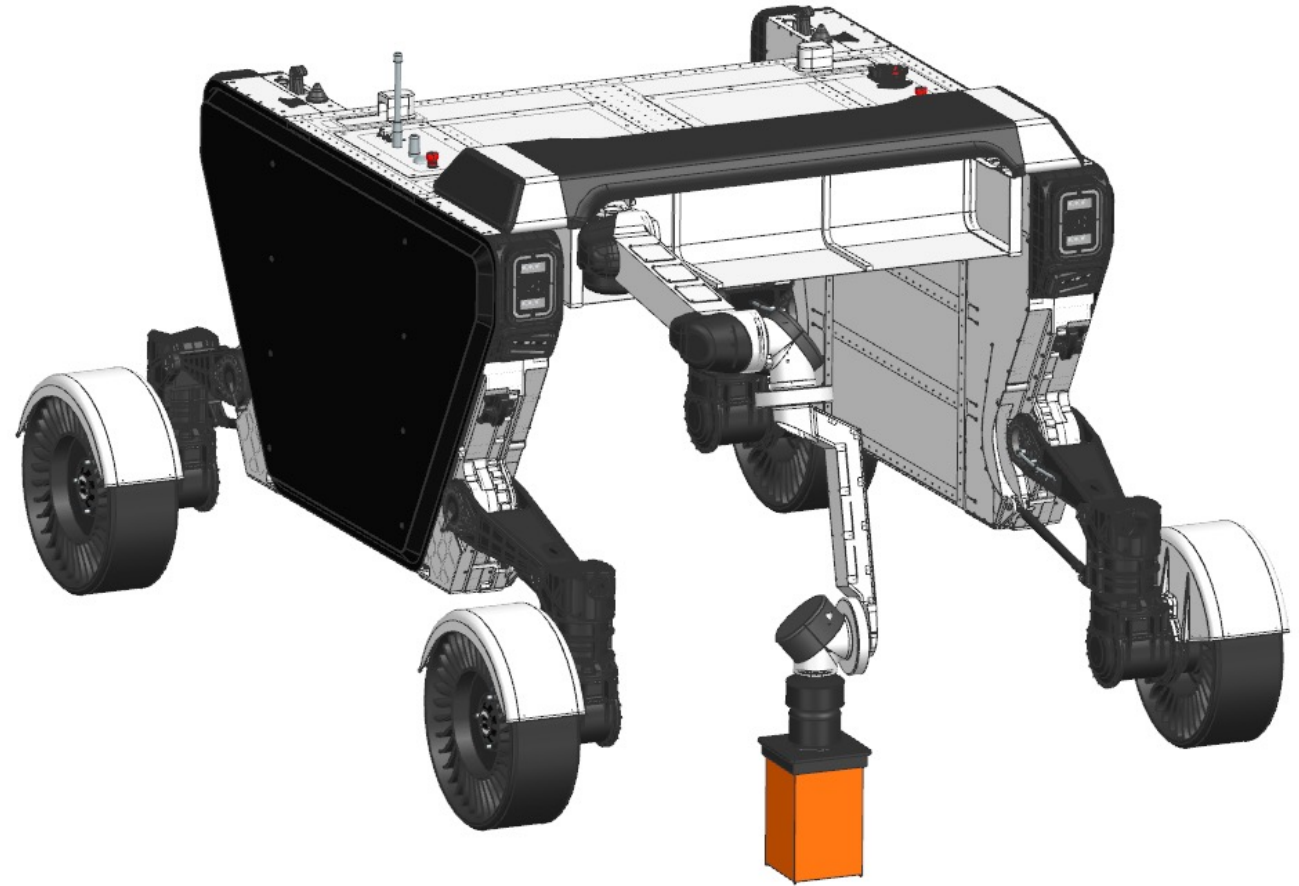
- 2 degree-of-freedom actuated system
- Works in tandem with FLEX's mobility system and active suspension
- Holds up to 180 kg of regolith/simulant
- Tested with crushed volcanic aggregate, soil classification SP
- Peak excavation rate of ~1800kg/hr





# Robotic Manipulation

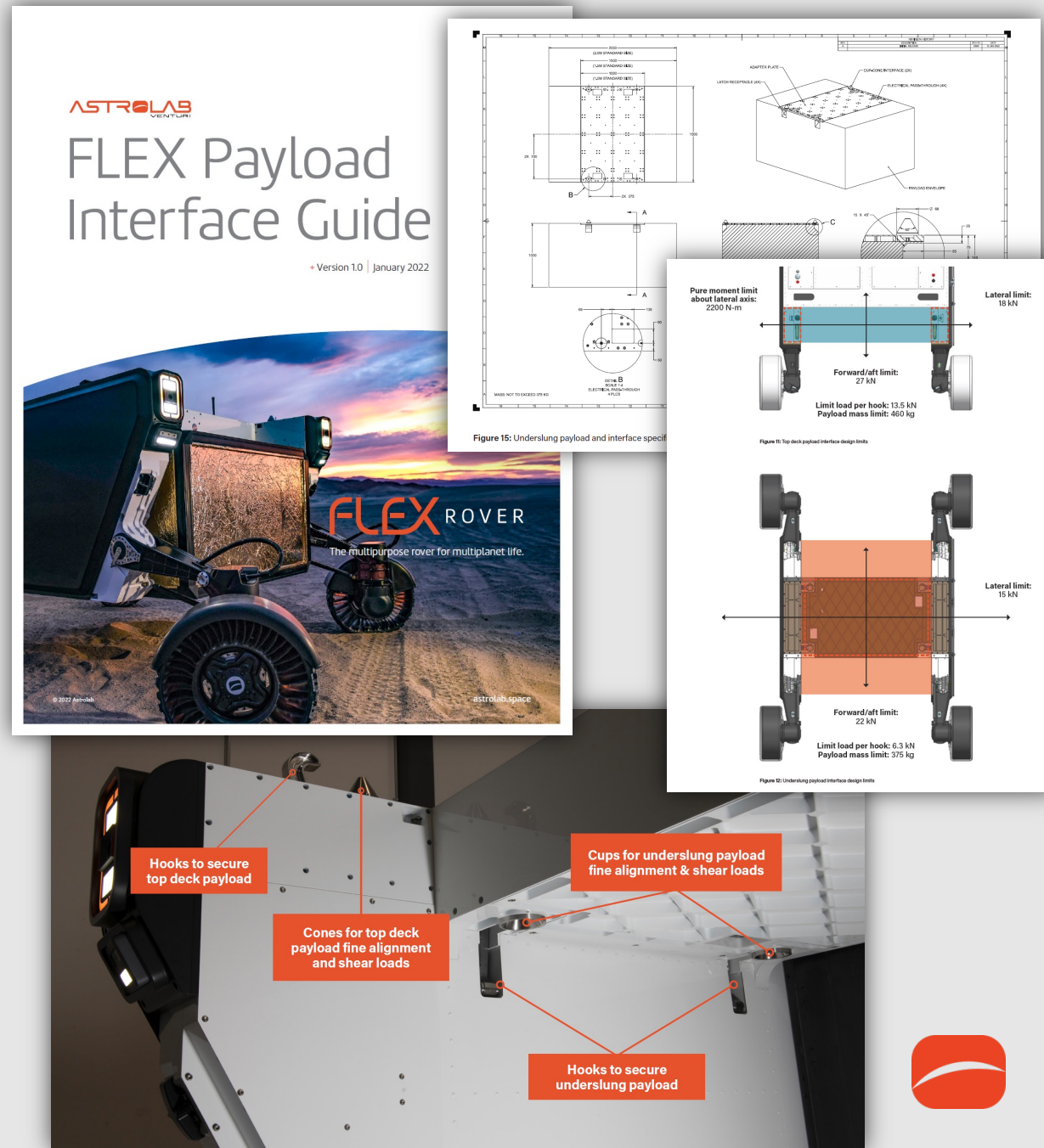
- Astrolab is developing a 6-degree-of-freedom robotic arm with 1g operational capability intended for use in the field
- Can carry 25+ kg payloads at 2m extension
- Will demonstrate deploying multiple smaller payloads, operating tools, and interacting with payloads remotely and autonomously





# Payload Interface Guide

- Astrolab has published a guide that captures all the info needed to develop FLEX-compatible payloads
- We are working with several companies and universities on payloads for:
  - Excavation
  - Construction
  - Power Infrastructure
- Can partner on proposal efforts (SBIR, STTR, LuSTR, etc.) and provide engineering and test support





**ASTROLAB**  
VENTURI



Andrew Welter  
andrew@astrolab.space  
+1.323.675.0792  
astrolab.space







