

Lunar Rover Solar Panel Mount

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Client Need

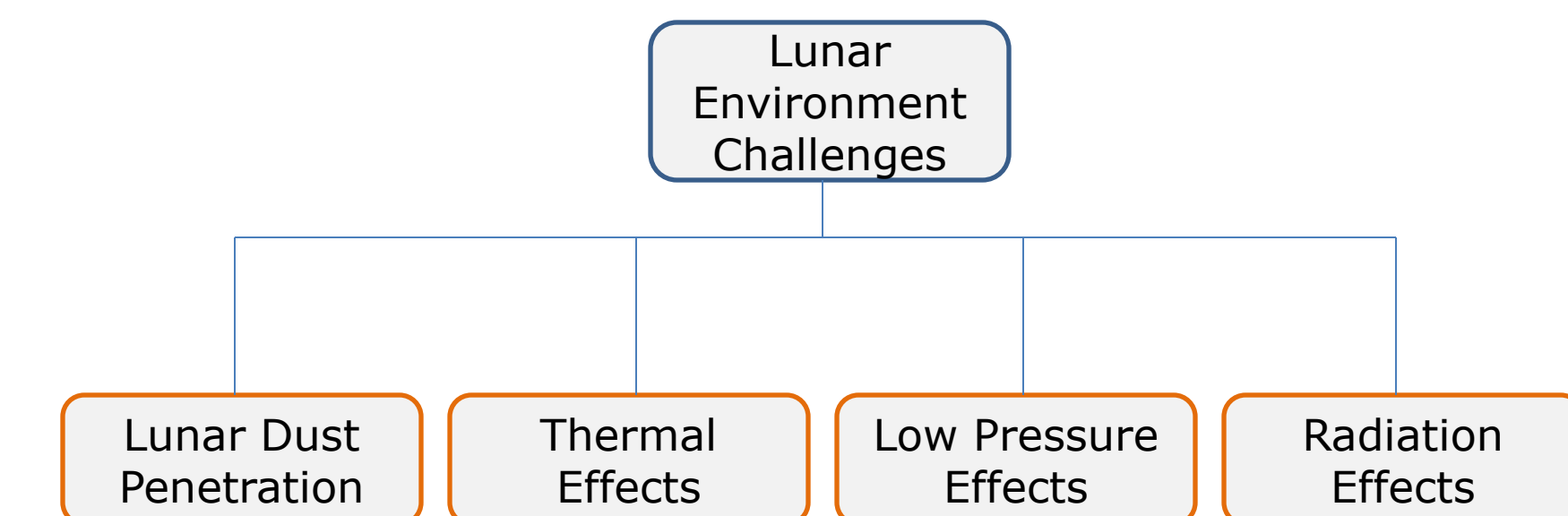
To develop a mechanized mount for a solar panel to be mounted on a lunar rover. Must be:

- capable of orienting panel towards sun
- reside on mast extending vertically from rover
- capable of unfurling solar panel

Prototype should focus on achieving required motion but consider adaptability to the lunar environment.

Problem Definition

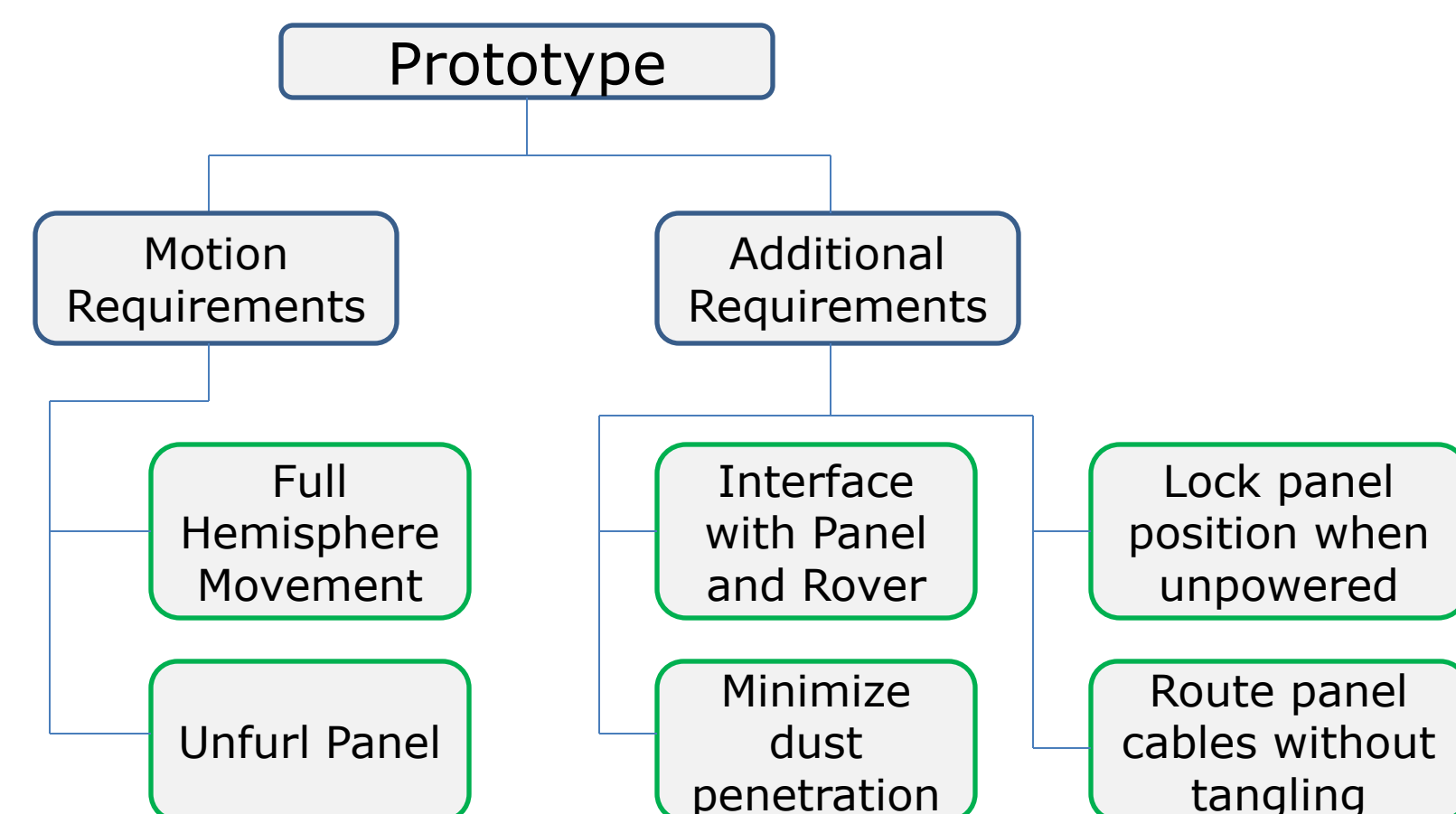
Lunar Environment poses four major challenges:



Research and discussion with client identified **Lunar Dust Penetration** as a critical, design driving, factor.

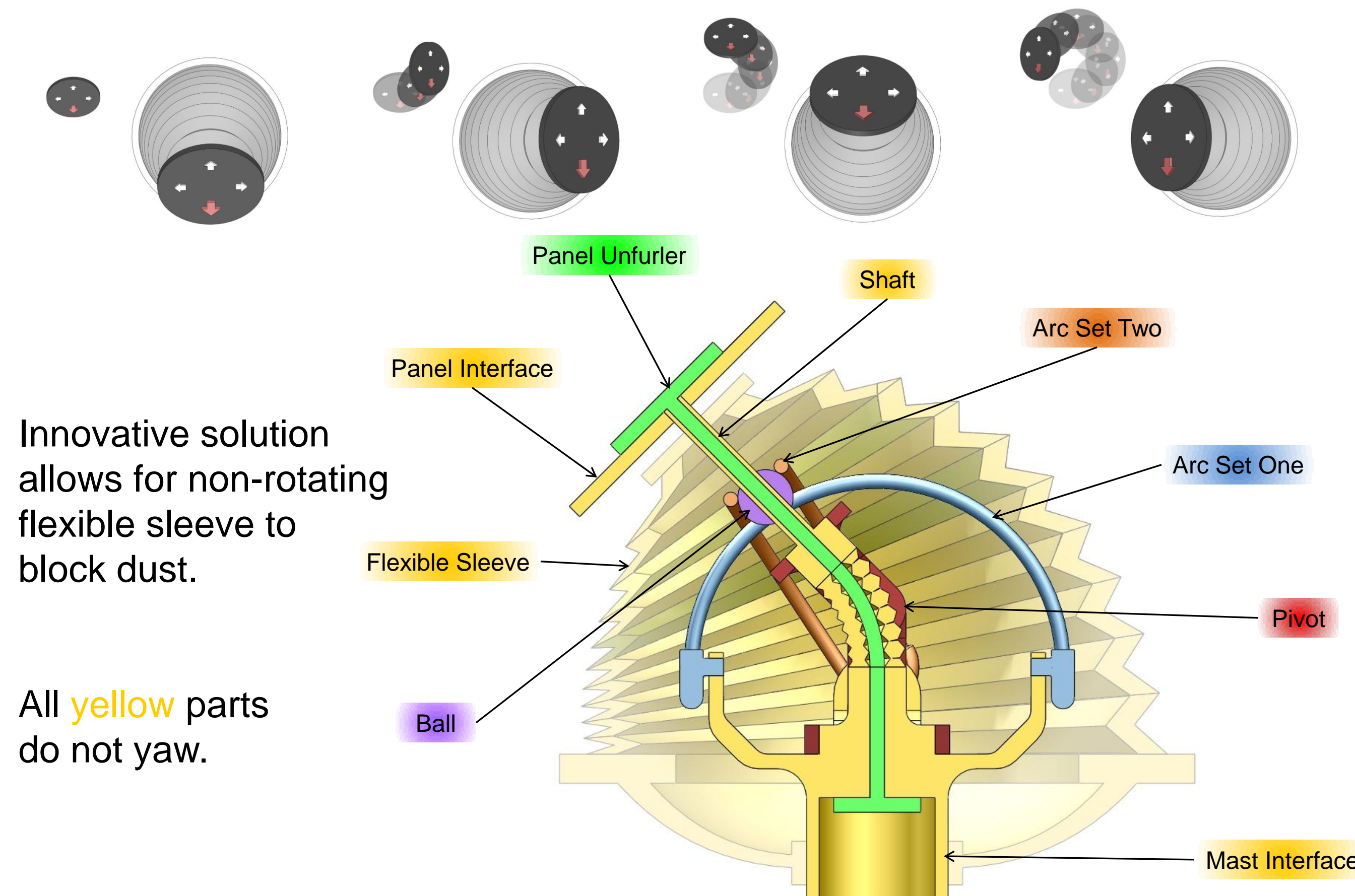
- Main deliverable is a prototype that focuses on allowing minimal dust penetration while attaining required motion

The resulting prototype **technical requirements** are:



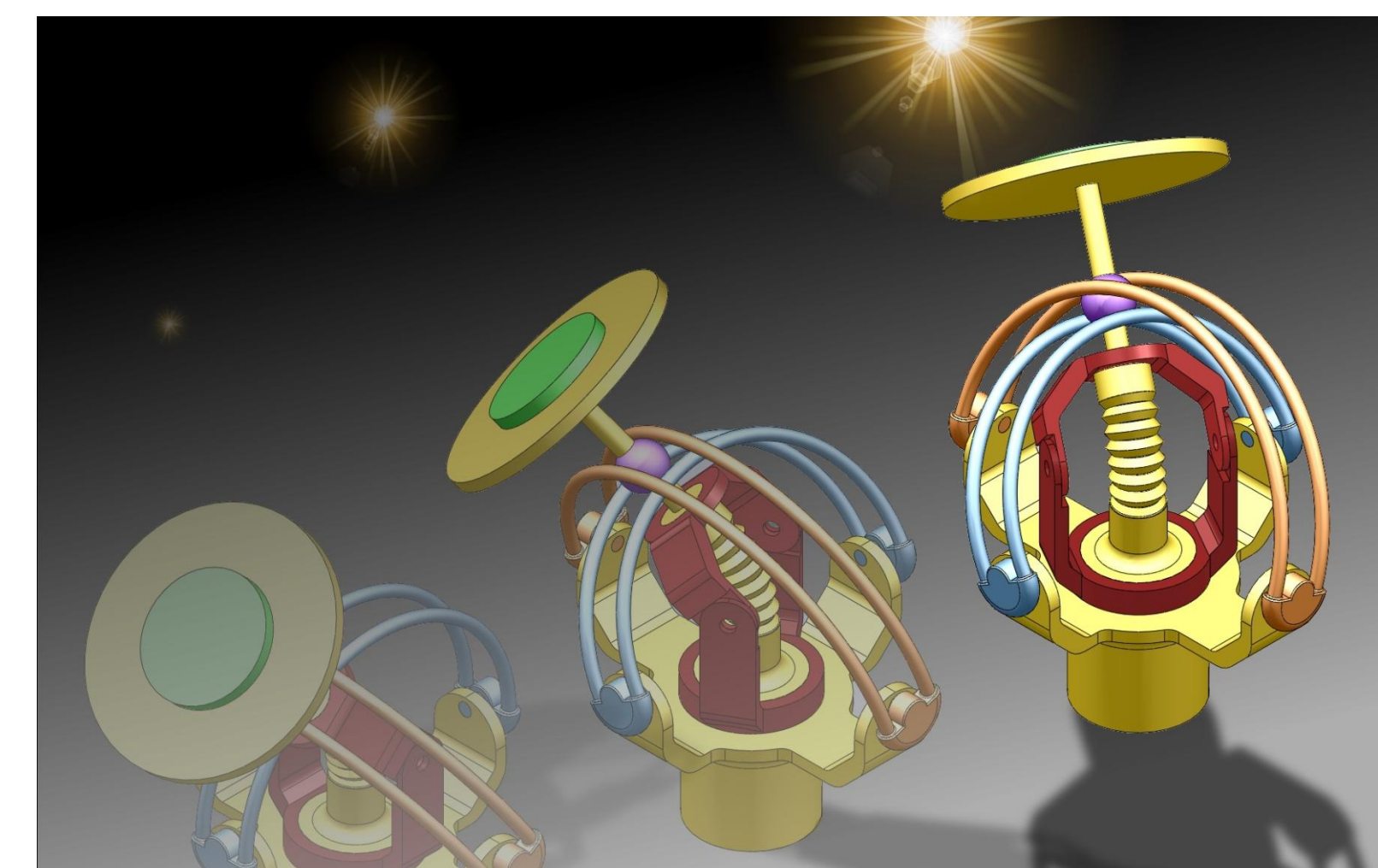
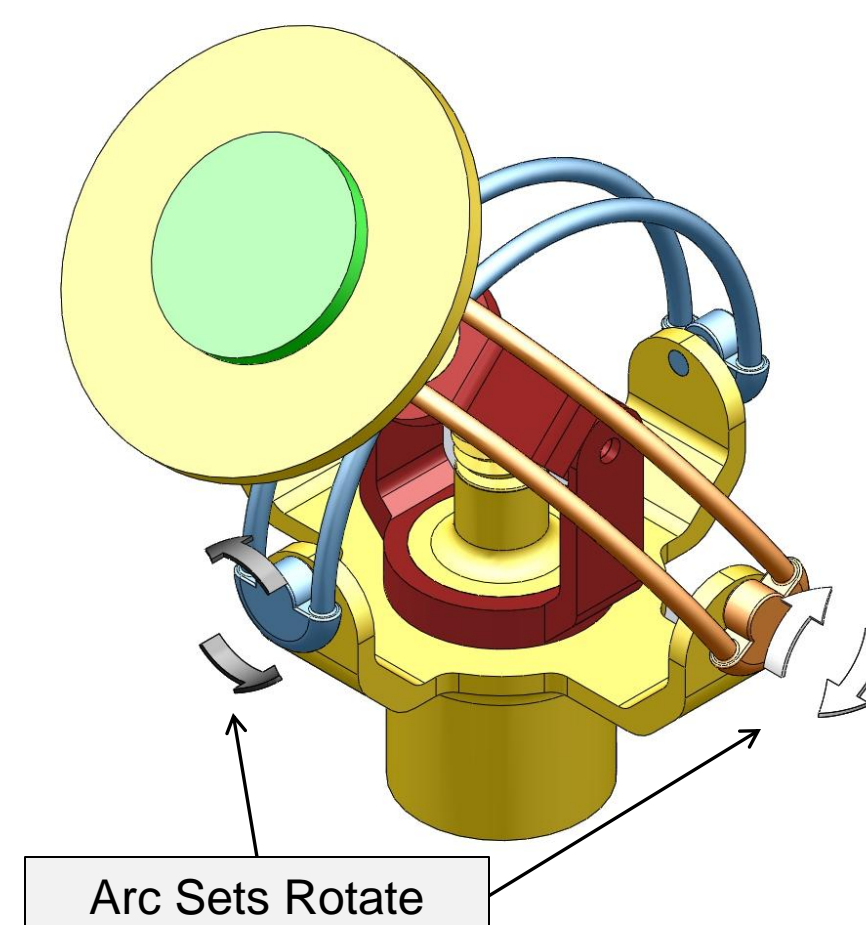
Design Concept

To minimize dust penetration, seals at locations of relative movement are replaced with static, non rotating, seals by eliminating a degree of freedom from the panel motion. **As the panel moves, it does not yaw:**



Mechanism operation:

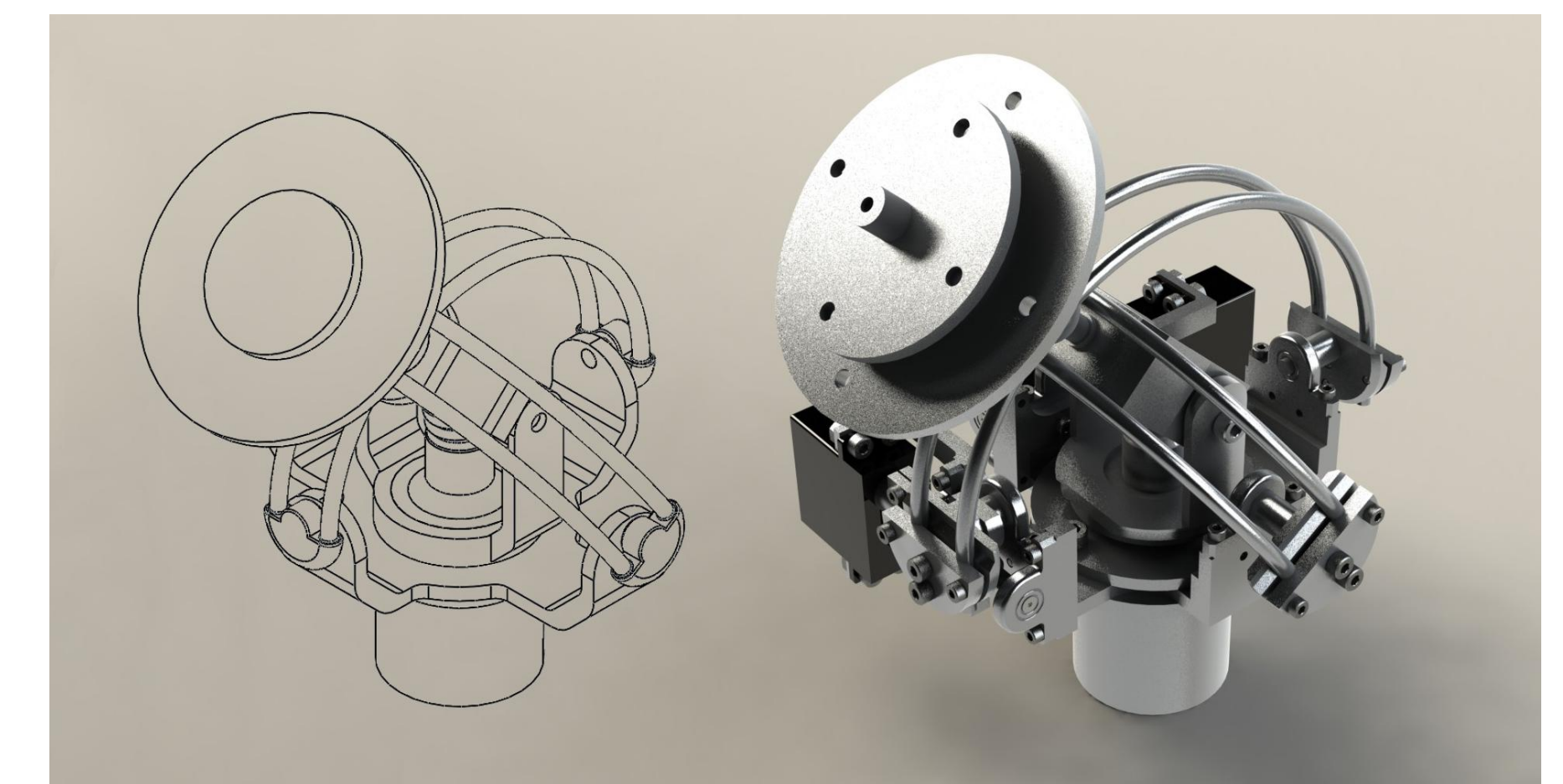
- Arc Sets One and Two rotate, dictating the position of the captive Ball
- Ball slides on Shaft, orienting top of Shaft; bottom of Shaft is held by Pivot
- As top of Shaft moves due to Arc Set One and/or Two rotation, the panel angle changes
- Pivot elevates pivot point of bottom of Shaft, ensuring that 90° pitch movement is achieved



Functional Prototype

The prototype is tested to ensure that its technical requirements are met:

- Arc Sets rotated and panel angle is measured
- Panel Unfurler tested for appropriate torque
- Force applied to panel while turned off, and change in panel angle measured



Conclusions

The design is an innovative and novel solution that can be adapted to the lunar environment. Testing is underway.

Areas for improvement have been realized:

- Approaching horizontal panel angles results in rough mechanism motion
- Arc Set drivetrains experience high loads
- Unfurling mechanism has backlash

Future Work

The prototype must be iterated towards a space-worthy design:

- Modify Pivot for smoother motion
- Relocate driving motors to reduce loads
- Account for remaining lunar environment challenges by material choice, use of heaters, etc
- Specify details of statically sealing sleeve