Material Release request number OTR202300392, entitled "Overcoming the Tyranny of Water Using Electrical Power to Replace Rocket Fuel in Moon-wide Operations" has received OTR approval for Public Release by the Office of Technical Relations. February 10, 2023

Overcoming the "Tyranny of Water" in Moon-wide Robotic Operations



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The Aerospace Corporation
Space Power Workshop
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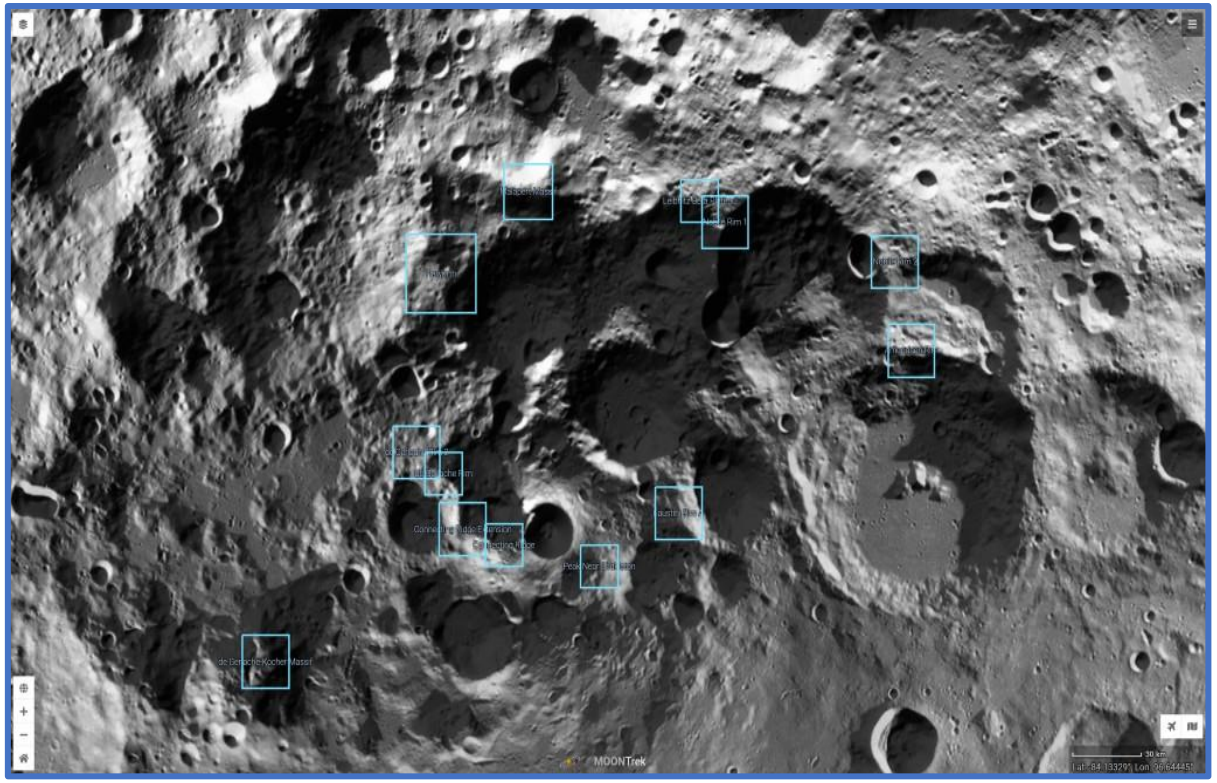
LunEx - Providing Transport and Power for Moon-Wide Robotic Operations.

The Tyranny of Water

- The progress of future lunar operations will be paced by supply of water
  - either transported to the moon or
  - on site mining and processing (for rocket fuel)
  - either option involves high cost and daunting logistics.
- Ice may be present if there are perpetually shadowed craters (near the South Pole)
  - a small fraction of the total area of the moon.
- For moon-wide robotic transport and operations, we need to an infrastructure without water dependance.

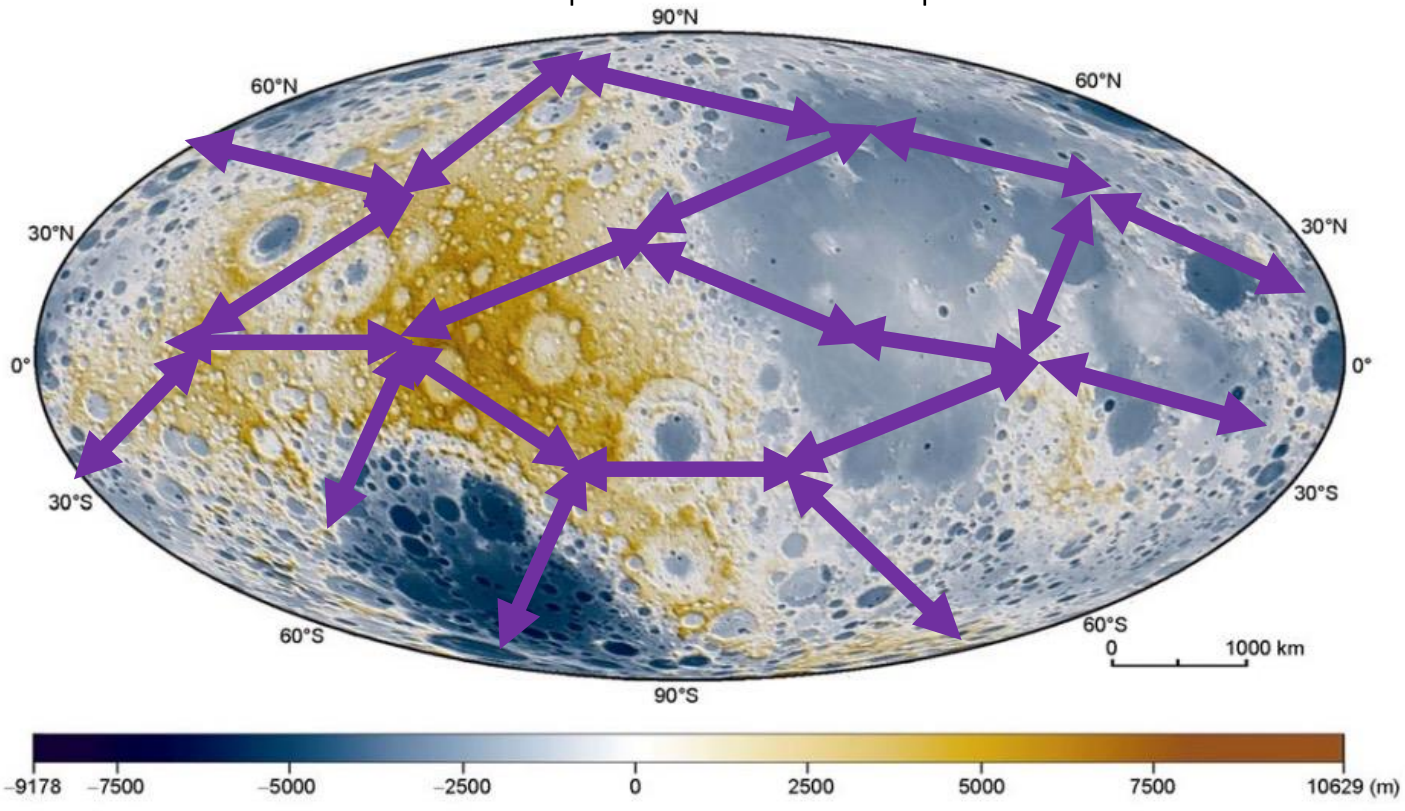


Today - Lunar exploration is constrained by scarcity of water.

LunEx - Transport and Power for Moon-Wide Robotic Operations

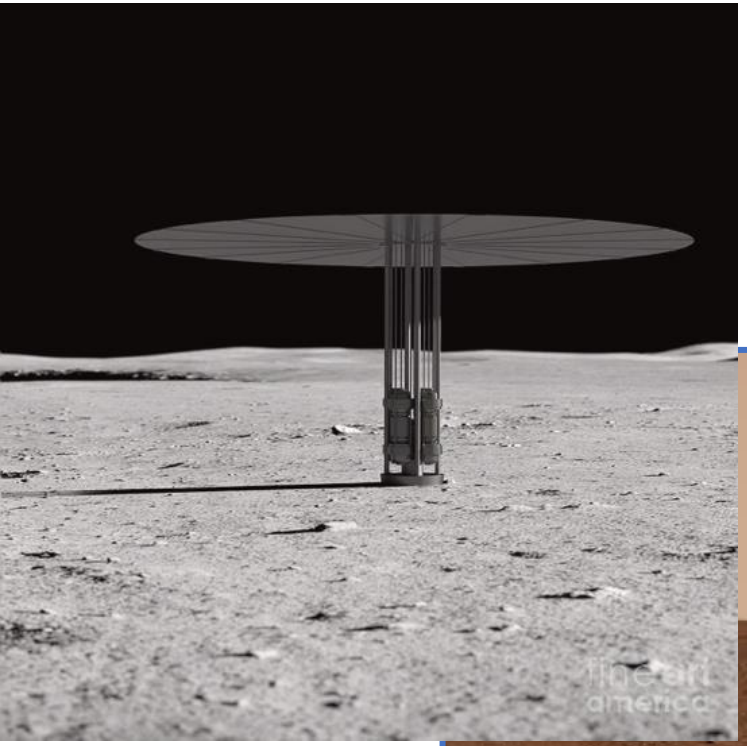
- LunEx – a network of stations to enable robotic operations by providing power and transport without water or fuel.
- We accomplish this by applying sustainable electrical power to centrifugal machines.
- The centrifugal approach does not constrain the location of a node to a source of water
  - Each node operates autonomously
  - at any location on the front or back face of the moon.
- LunEx can transfer cargo anywhere across the network within a day.

Example of the Lunar Express

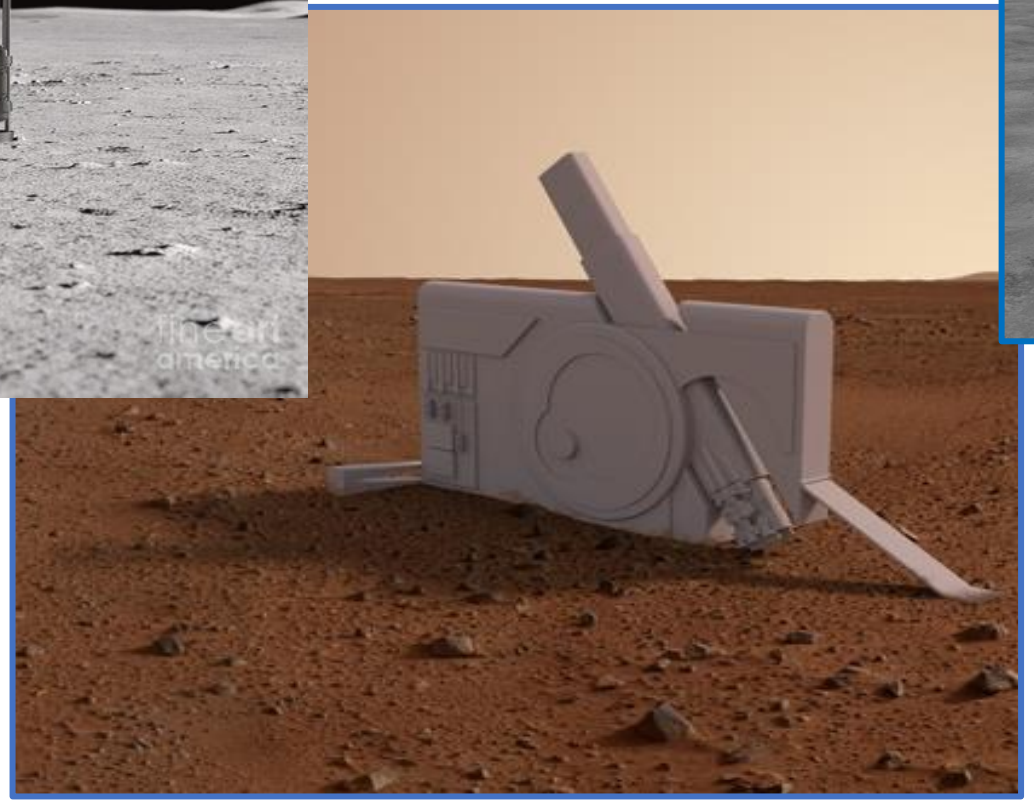


Typical Major Hubs with ~1,500 km spacing are shown – they may be connected to minor hubs as needed

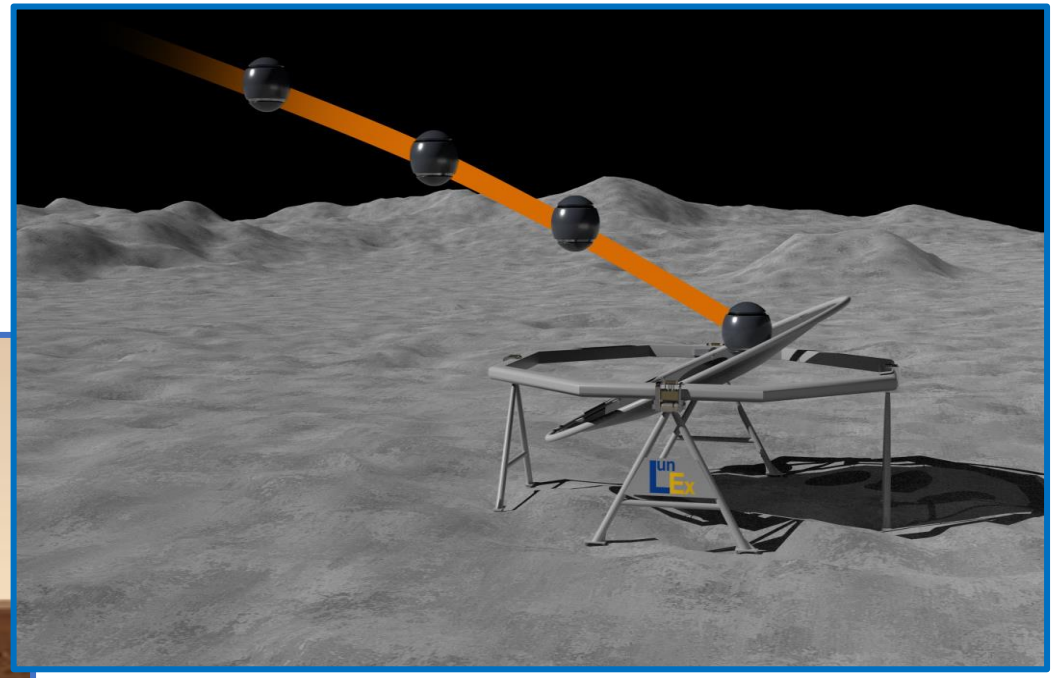
Artist Concept of the Three Elements of Each LunEx Node



Power for network and plug in for visiting robotic devices

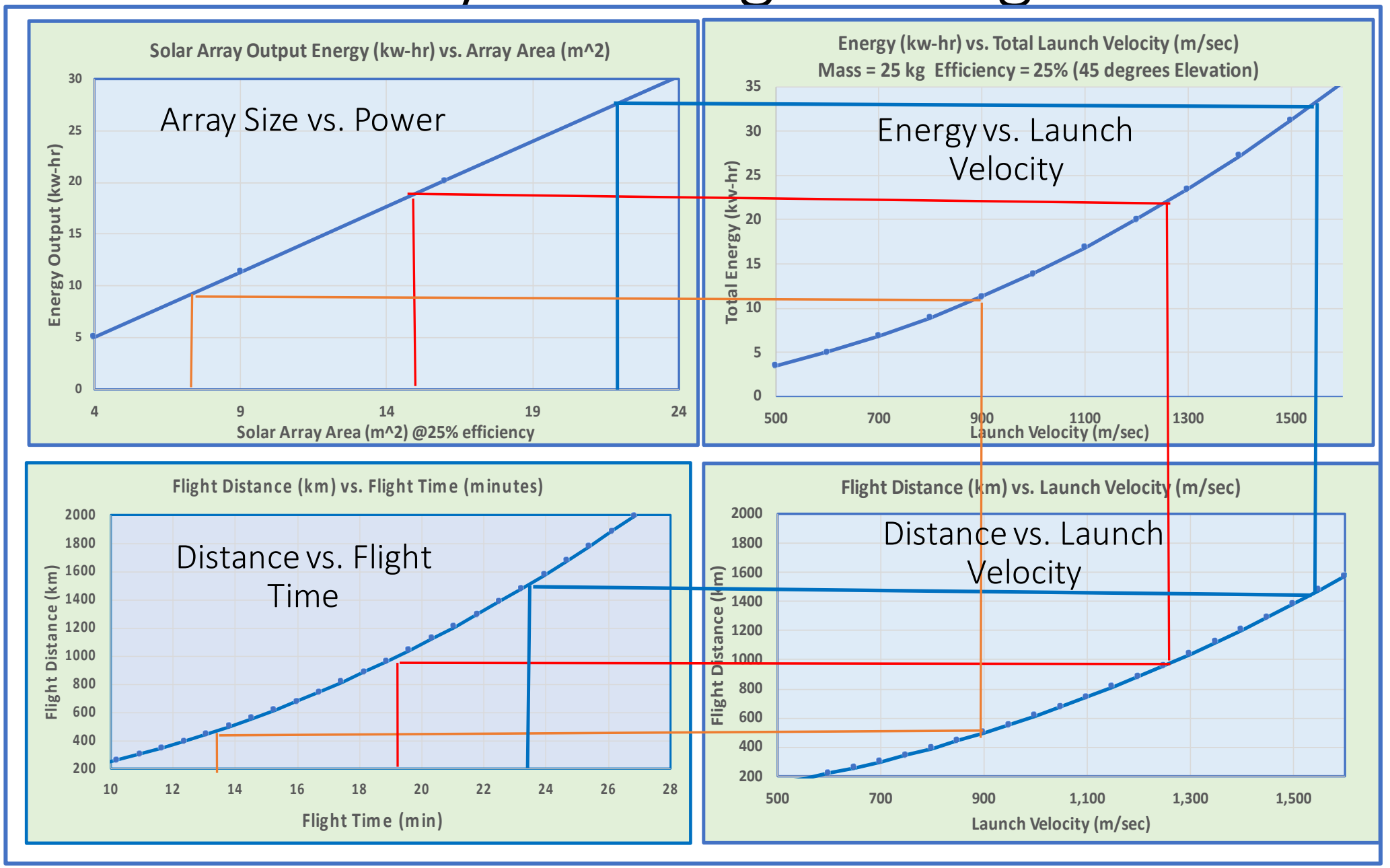


Launcher can propel cargo 1,500 km with hourly reload



Catcher can transfer incoming cargo to launcher for journey to other network nodes

Notional System Engineering Trades



SpinLaunch Prototype Could be the Pathfinder



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Conclusions

- Robotic missions will want access anywhere on the Moon
  - Exploration
  - Exploitation
- Providing a distributed source of power and transport will drive down robotic costs and risks
- This makes the entire moon accessible