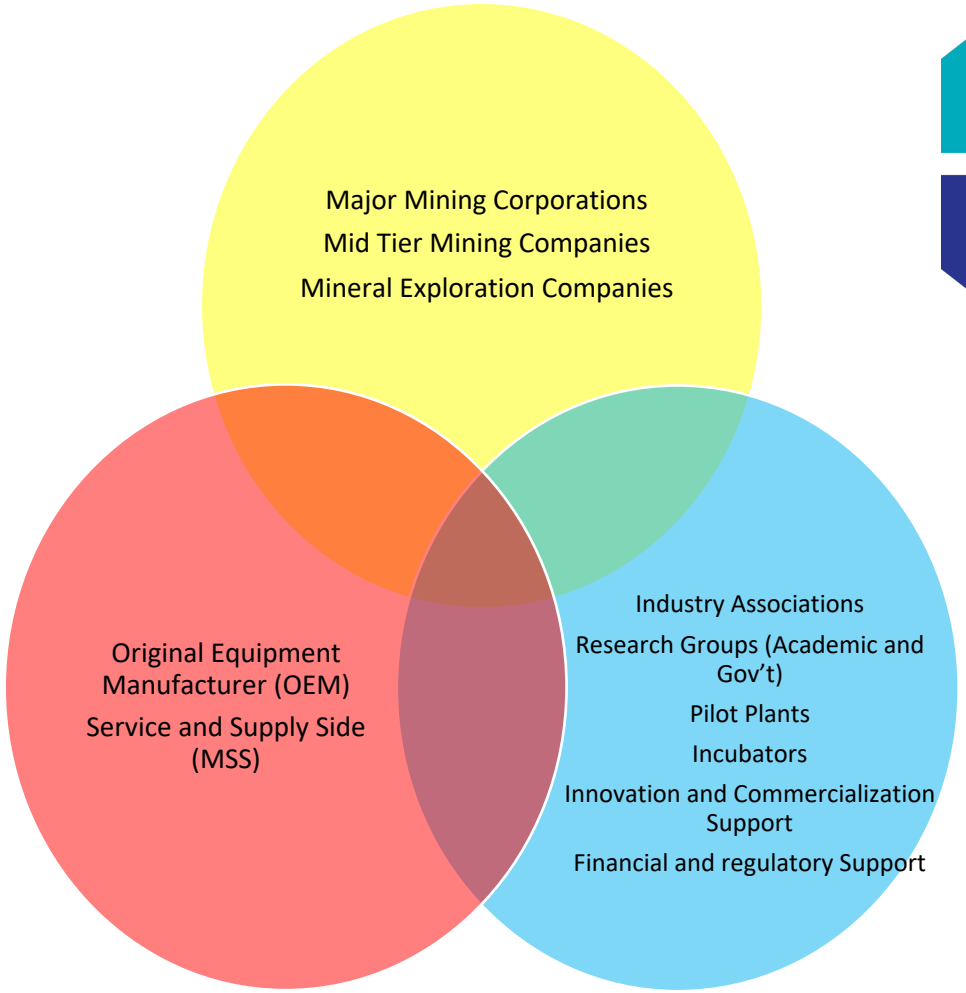
MICA
Mining Innovation
Commercialization Accelerator

ACIM
Accélérateur de Commercialisation
d'Innovation Minière

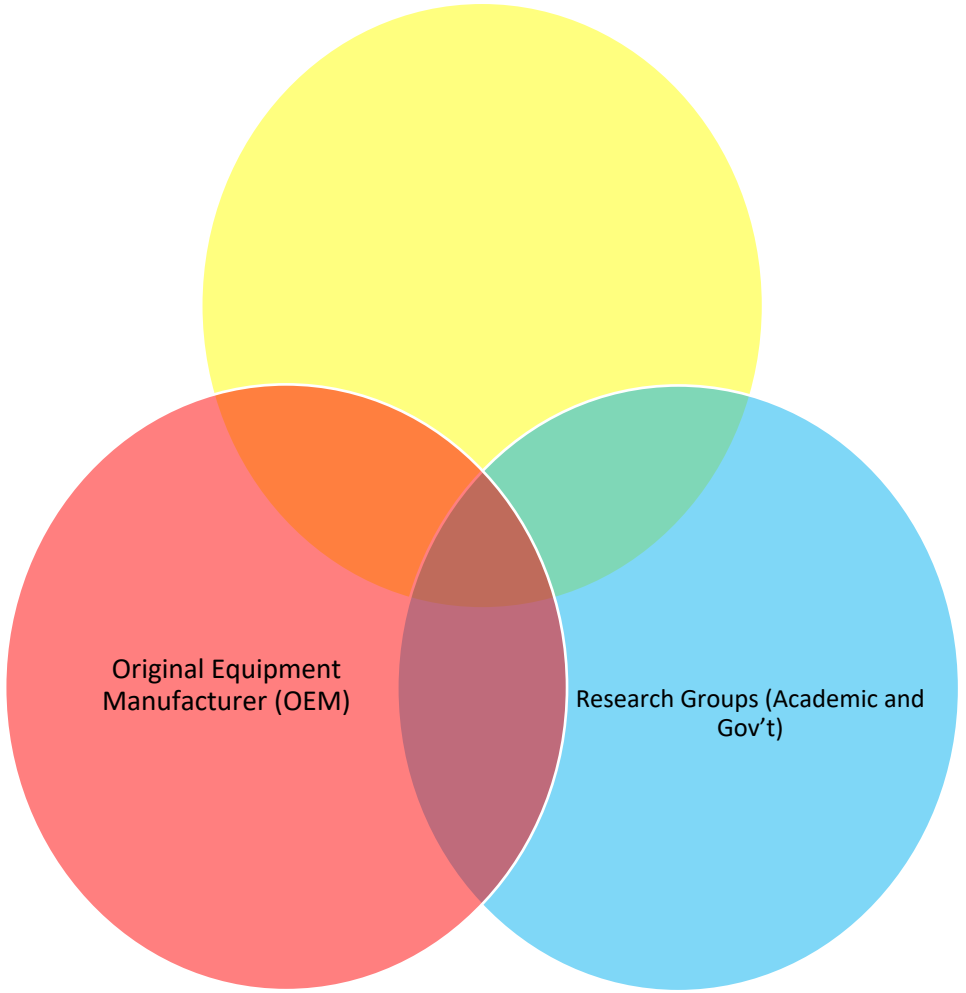
Presented by: Dale Boucher & Douglas Morrison, CEMI-MICA
Presented to: Space Resource Roundtable, CSM, Golden, Colorado, June 4-7, 2024.

Mining Industry Ecosystem

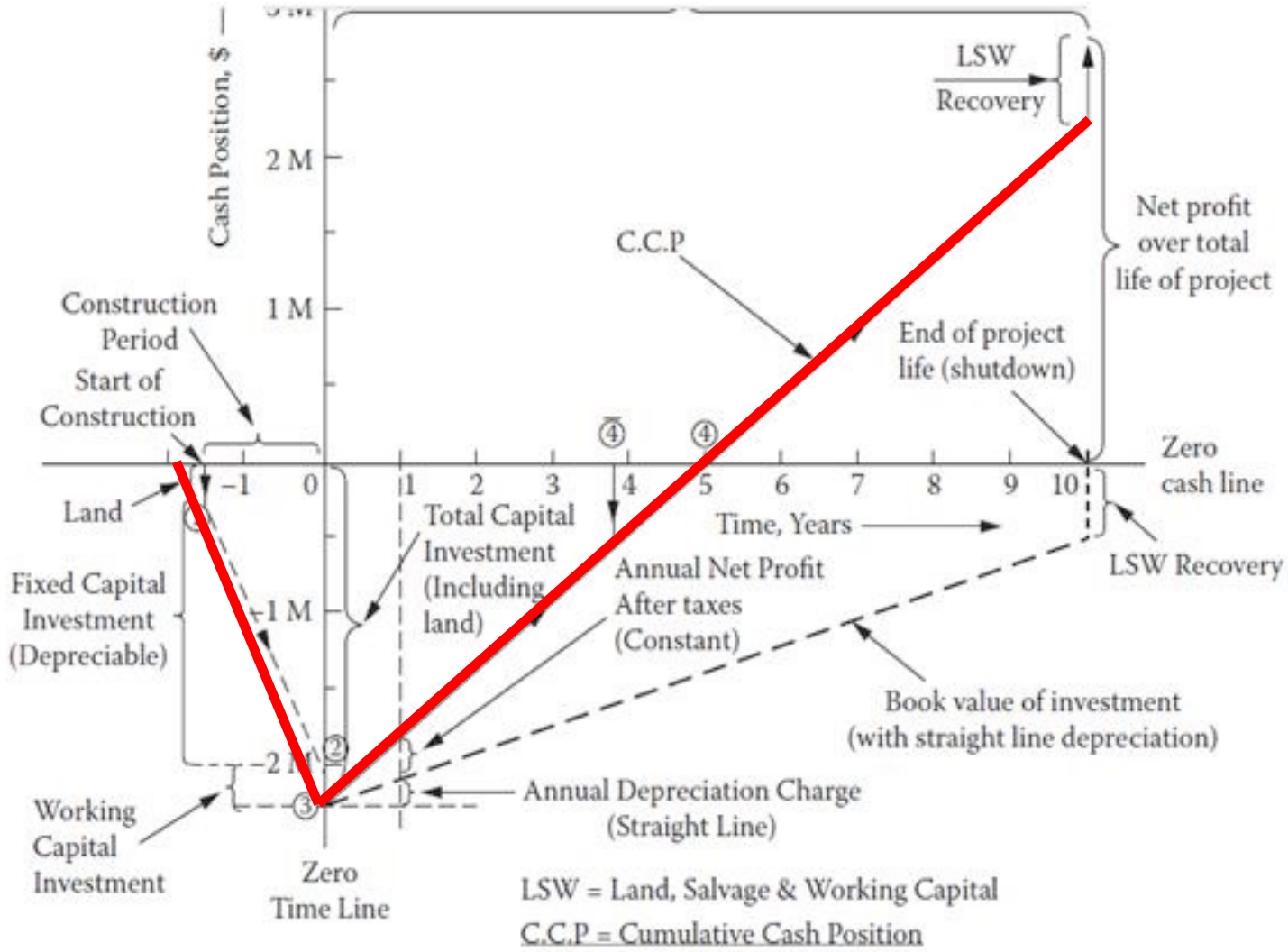
1. Mining Companies are underpinned and supported by a suite of OEM's, Service and Supply and a large group of ancillary supports such as academia, incubators and industry associations.
   - The Mining Majors-large global corporations involved in multi-commodity operations
   - The Mid-tier Mining Companies -focus on a more limited number of distinct commodities over a more limited geographic distribution
   - MSS Supply chain is dominated by large global OEMs
2. Mining Service and Supply
   - provide smaller equipment systems, consumables and a variety of engineering and technical services,
   - only a few are included in the global supply chain in international markets.
3. MSS companies (METS in Australia) have a significant reach into global markets.
   - major players in the innovation space within the mining sector.
4. Innovative SMEs in MSS
   - the best source of the technologies that will improve the economic and environmental performance of the mining industry – as well as the practical solutions that will advance the objectives to the Moon and beyond



ISRU Ecosystem



ROI- Hockey Stick Curve for Mining Companies



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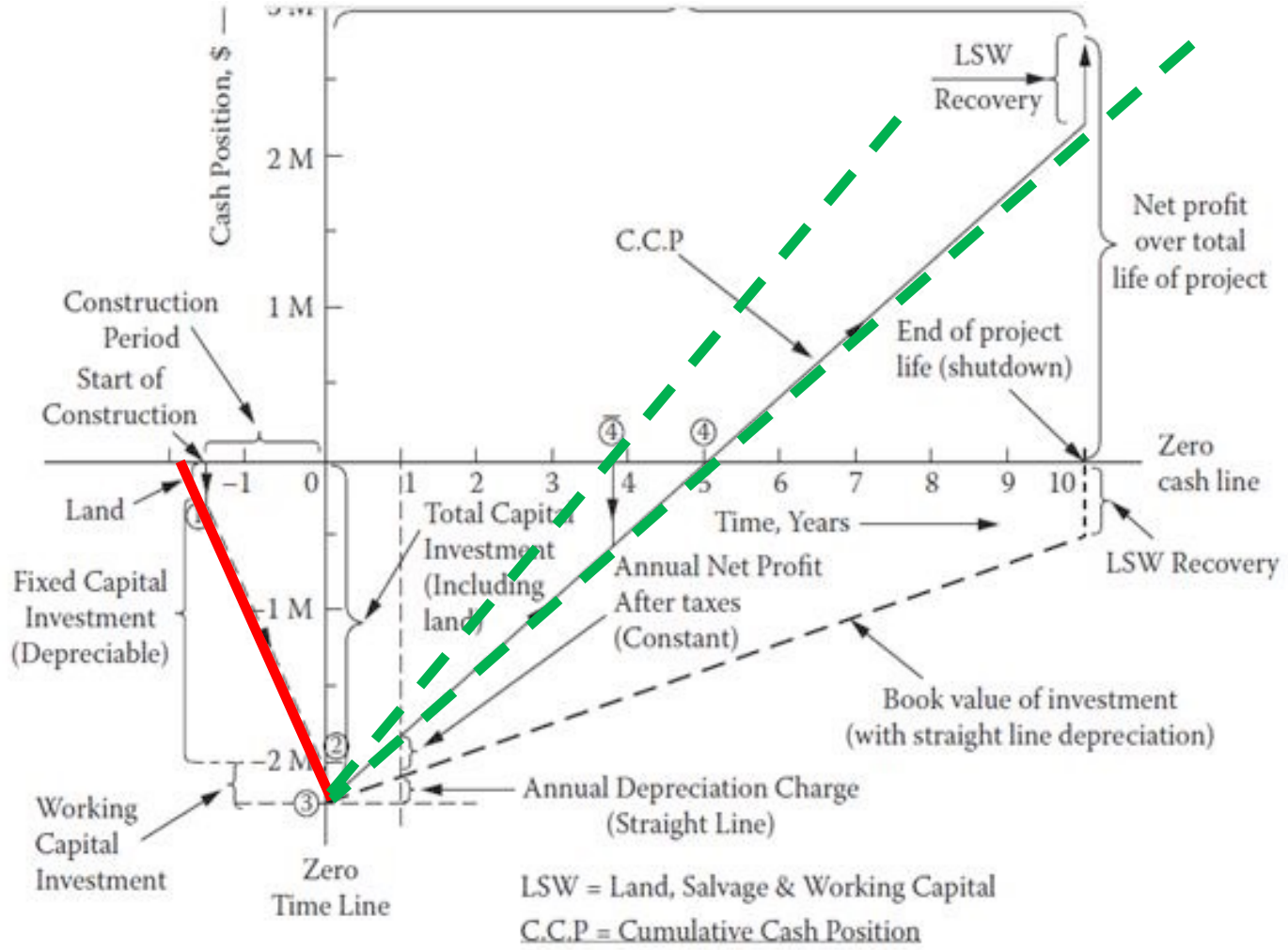
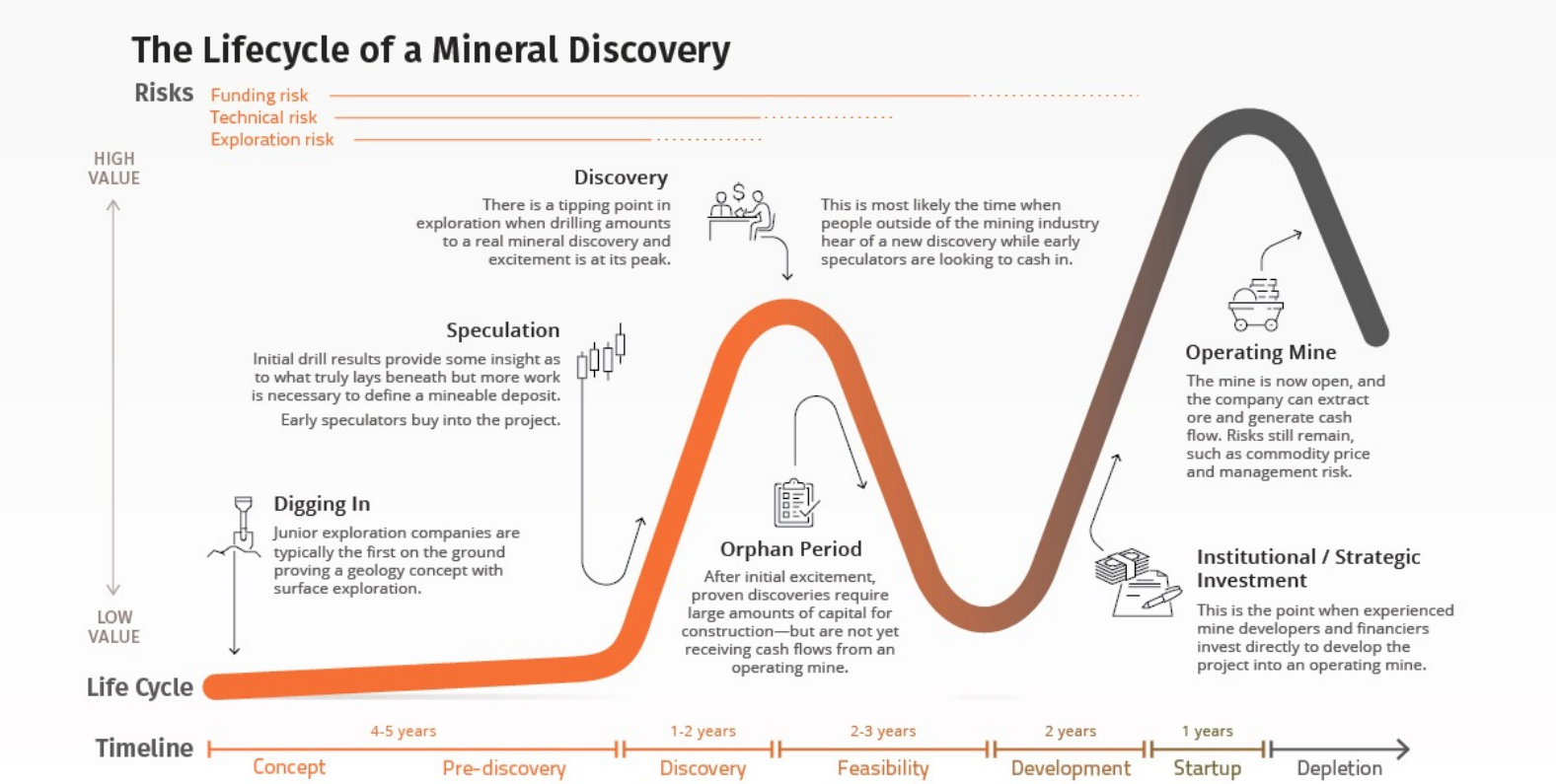


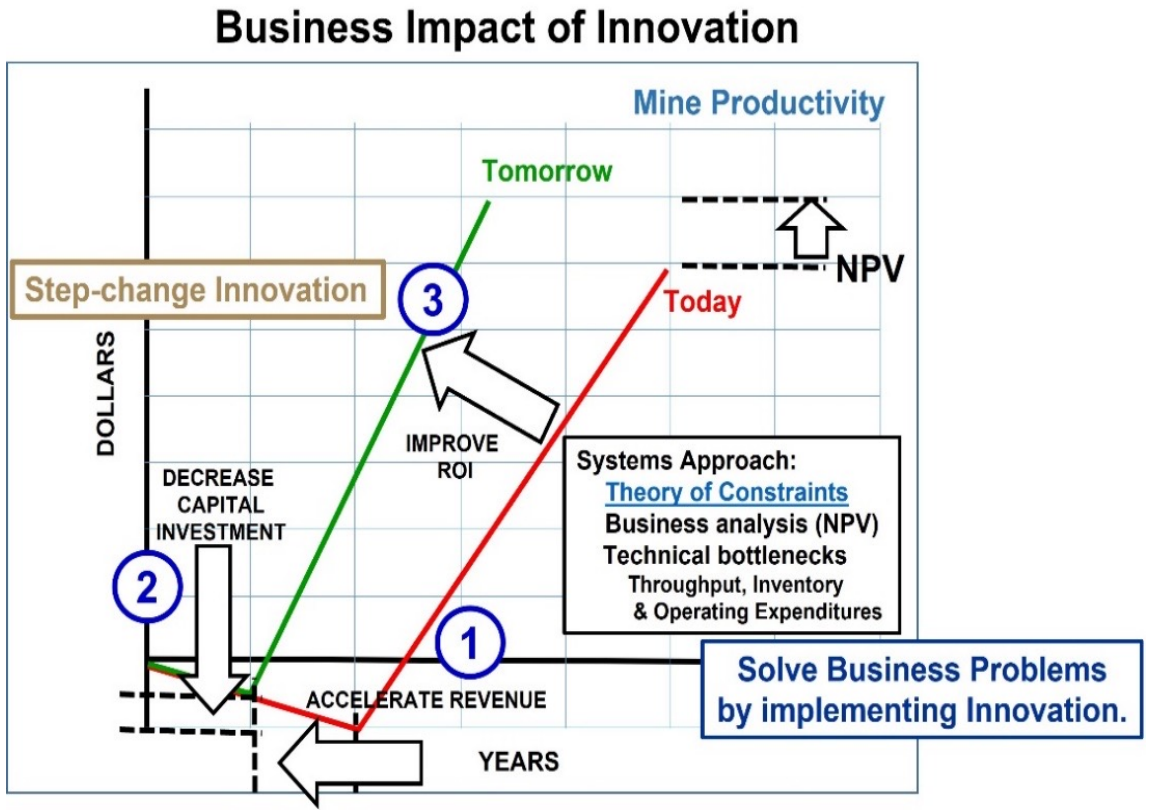
Barriers

1. There is a critical misunderstanding about planning, development and operations cycle.
   - limited citable documents explicitly relate the mining ecosystem to the ISRU ecosystem
   - focus on specific ISRU technologies
   - ecosystem as a whole, and the step wise approach to mine development, is largely ignored



Barriers

2. MSS
   - agile and driven by short term market opportunities
   - “follows the money” for high volumes
   - custom work and potential orphaned capabilities
   - long time lines and unstable financing
   - shops at capacity shops
3. Mining companies want to be first to be second,
   - avoid **any risk** to the planned ROI of their mining operation.
   - Looking for positive net improvement in the ROI within one or two quarters
4. Regulatory and policy induced barriers
   - CGP/ITAR,
   - testing opportunities in real mines,
   - clean rooms,
   - foreign purchasing
   - investor reluctance.



How to Engage the Terrestrial Mining Industry in Sustainable ISRU

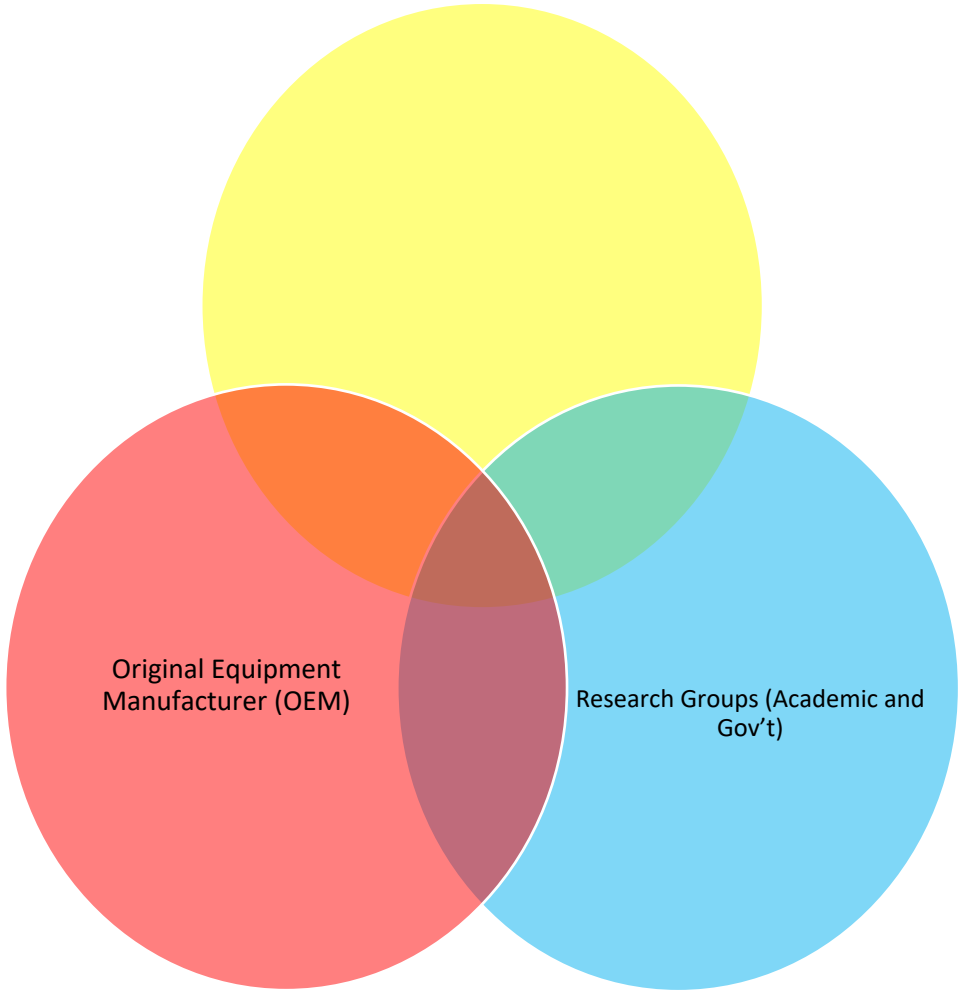
Develop an Operational Roadmap for Lunar ISRU that will address the priorities, timelines and gaps that exist between real and assumed capability. The existing ISECG Functional Roadmap encourages higher-level resource utilization topics to be investigated while the basic engineering capabilities that would make them possible have largely been ignored.

Respond to the Ecosystem Interest by scheduling a program of engagement events specific to the Mining Industry. Mining innovators are not researchers, they are commercial enterprises with techniques and technologies that they intend to use to grow their businesses.

Establish a Commercial Model for Mining & Space Innovation. There must be a clear pathway that illustrates how investments in technologies designed for applications in ISRU can be translated to versions of these technological solutions that have application to terrestrial mining operations.

Stimulate cross-sector investment for Mining and Space Innovators. Both sectors need to attract greater involvement from private sector investors. As an example, the Canadian mining sector already has the flow-through share program which, if used as an **Investment Model** for the Lunar ISRU, would accelerate private investment in ISRU.

ISRU Ecosystem



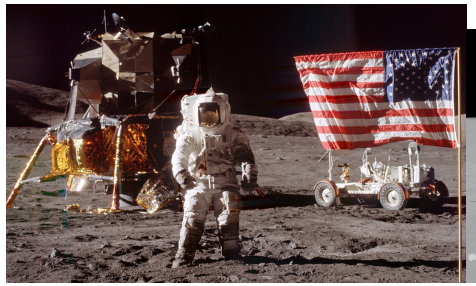
Antarctic Adventures

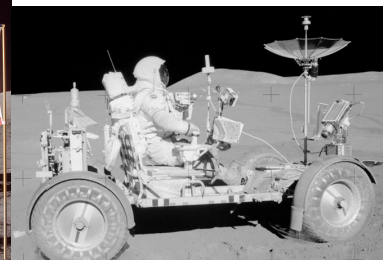
Minimal Logistics 1901-1922

Antarctic Infrastructure

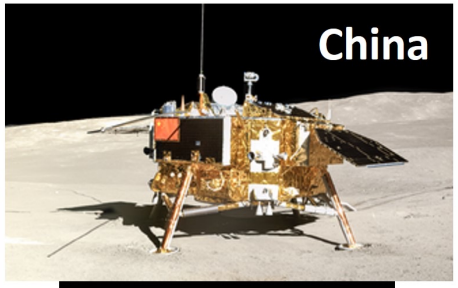
Systemized Logistics 1955-2015 (60 years)

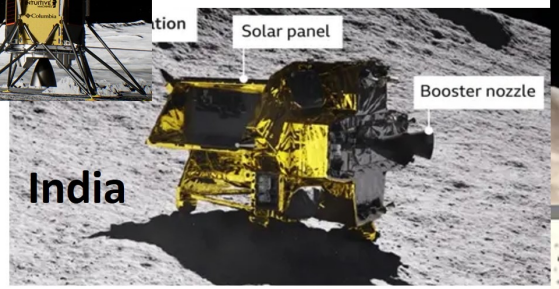
Lunar Adventures
Minimal Logistics 1962-1972

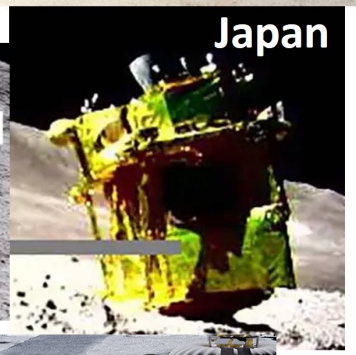




1994-2024 (30yrs)







2014-2024 (10yrs)

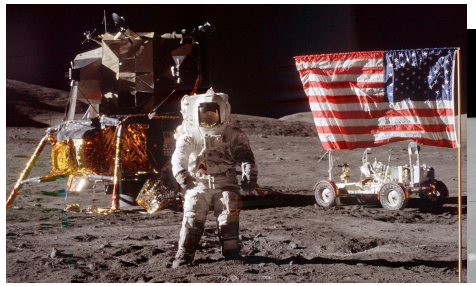
Lunar Infrastructure?
Systemized Logistics 1962-2024

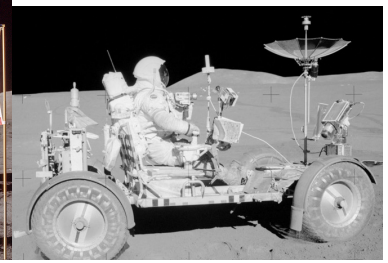
Planned Infrastructure?

Lunar Station Built Infrastructure?

Aitken Basin Base? (Lunar S. Pole)

Lunar Adventures
Minimal Logistics 1962-1972





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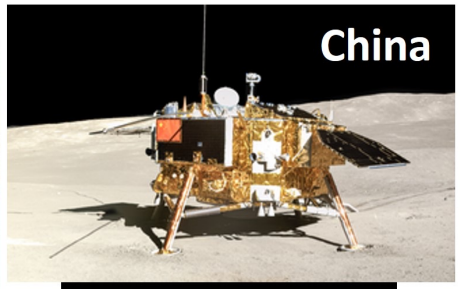
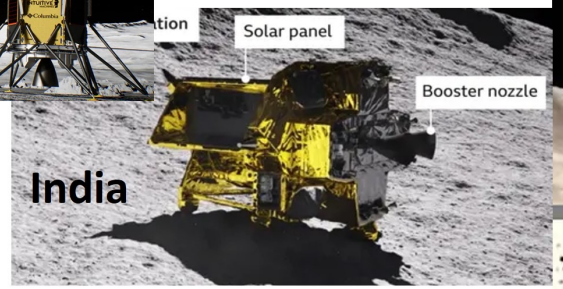
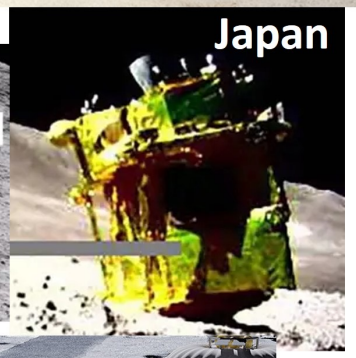
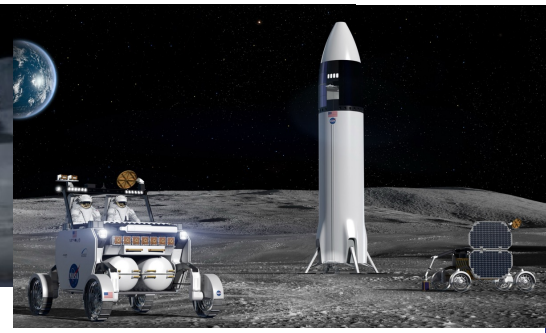






2014-2024 (10yrs)

Lunar Infrastructure?
Systemized Logistics 2024-2034?



Operational Target:

1. Re-usable Land/TO Facility (RLTO) - lunar bedrock.

Auto. Units
- **A. Clear Regolith: Capture, Sort & Package Regolith**
- **B. Regolith Storage & Barrier Deployment**
- **C. Groom Bedrock Surface + Capture/Store Debris**
- **D. Site Stockpile & Transport Facility.**

CEMI-MICA & Client Approach: (LAIRD)

Lunar Autonomous Infrastructure & Resource Development (LAIRD)

1. **Regolith/Ice Capture, Sort & Package**
2. **Recovery Drill System (RDS): any diam., length & orientation**
3. **Bedrock Grooming, Trenching & Tunneling Systems (GTTS)**
5. **Sub-surface Habitation, Refuge Facility & Vehicle Storage (SHRF)**
6. **Overland Alternative Transport System (OATS)**