

Space Exploration Logistics Workshop

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Omni Shoreham Hotel, Washington, DC



Group I

Spaceport and Earth-to-Orbit Logistics

Group Leader

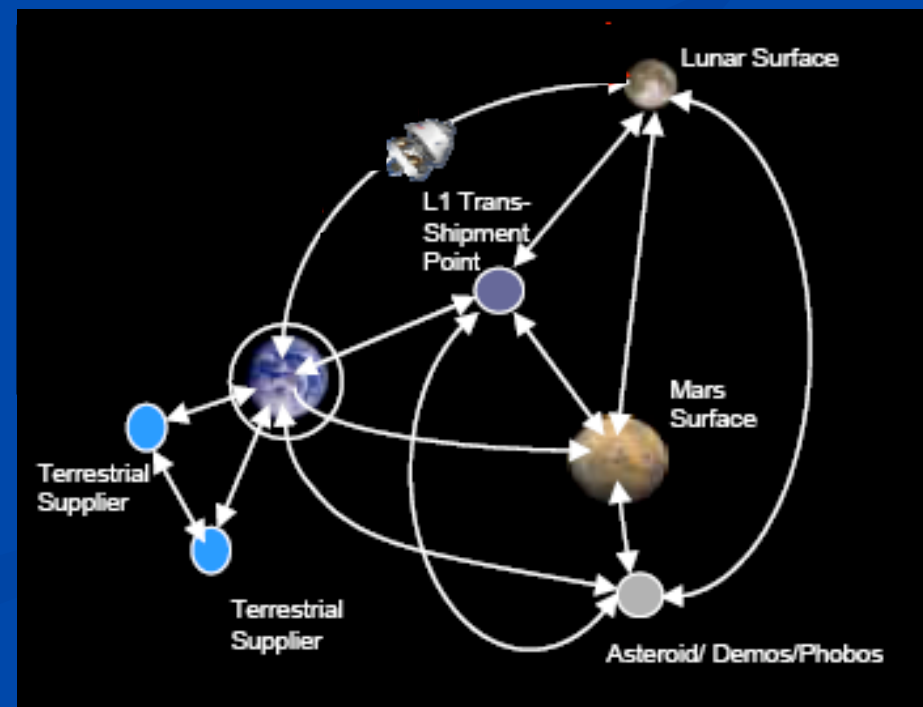
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Spaceport Logistics is Fun!!!

Session Overview



- Spaceport and Earth-to-Orbit Logistics
- Goals
 - Discuss the issues/topics related to Spaceport and Earth-to-Orbit Logistics for the three different exploration mission types
- Organization
 - Identify the important issues (starter list + attendee participation)
 - Pick the “top 3” issues/topics relevant to each exploration mission type
 - Discuss potential impacts, mitigations and opportunities, early tests/demonstrations, and interfaces to other systems




Discussion Points



- Improved hardware reliability
- Level of Repair (LRU vs. SRU)
- Modular Open System Architecture
- Automated Health Monitoring
- Universal (Flexible) Test Equipment - on-orbit
- Commonality Across Systems (or Extensibility)
- Cost per Pound (Kg) to orbit
- Refurbishment of CEV location (launch site vs. manufacturer)
- Verification tasks/equipment for Reusable CEV (location / portability of equipment)
- Spares Quantity vs. Cannibalization
- Automated Item Tracking (e.g., RFID)

The Top 3 Issues



-  Lack of robustness in getting supplies from Earth to orbit
-  Inadequate operations considerations in design
-  Lack of lean design in current processes

Issues – Common to all Missions



- 1. Issue:** Lack of robustness in getting supplies from Earth to orbit
Predicted Impact: Loss of **mission** effectiveness
Potential Mitigation: Vehicle health monitoring IVHM (integrated vehicle health management),
Flexibility for the unknown-unknowns,
Ability to “move” payloads between vehicles (U.S. and others),
Material commonality,
Universal (Flexible) Test Equipment,
Responsive manifesting and lead-time/ Just-in-time manifesting
Testing Methods: Organization KPIs, Analysis, Modeling, Demo flights and early use of CEV to ISS
Impact on Other Systems: Standard system interfaces, Commonality, Improved business processes and IT

Details for #1



- Robustness and reliability
 - Vehicle health monitoring, IVHM (integrated vehicle health management)
 - Flexibility for the unknown-unknowns
 - Ability to “move” payloads between vehicles, U.S. and others
 - Material commonality
 - Universal (Flexible) Test Equipment, on-orbit. Risk of loss with one LRU.
 - Responsive manifesting and lead-time/ Just-in-time manifesting

Issues – Common to all Missions Cont.



2. Issue: Inadequate operations considerations in design

Predicted Impact: Risk of lack of sustainability

Potential Mitigation: Early operations costing/modeling –
quantifying and implementing,

Understanding the impact of design decisions on
operations,

Partnering of Design Personnel with Ops Personnel

Testing Methods: KPIs, develop operability measures

Impact on Other Systems: extensive impacts on
multiple systems

Details for #2



- Early operations costing/modeling – quantifying and implementing
 - Establishing the hardware flow, GEM FLO
 - Understanding all the manifesting models that exist today
- Launch turn-around logistics (spaceport processing)
 - CEV Refurbishment location (launch site vs. manufacturer)
 - Minimize refurb at remote locations like the landing site

Issues – Common to all Missions Cont.



3. Issue: Lack of lean design in current processes

Predicted Impact: inefficiencies (in cost, time, etc.)

Potential Mitigation: Implement lean design as a top-down process,

Education on the importance of global optimization,
Clearly document and define processes

Testing Methods: simulations, lessons learned from similar systems, lean team exercises

Impact on Other Systems: lessons learned and process improvements will be exportable to other systems, may force other systems to support the lean process

Details for #3



- Integration of logistics needs and requirements
- Lean design/supply chain optimization including business processes
- Cost to Orbit (Launch Site to LEO)

Points Not Yet Developed



- Capturing the whereabouts of supplies,
 - use one RFID tag/number for end to end inventory tracking
 - Real-time information
 - Define where logistics warehouses/control points should be
- Carrier integration for exploration
- Spares Quantity vs. Cannibalization