The existing in-space medical suction system (used on ISS) provides insufficient medical suction capability. Medical suction clears the airway, empties the stomach, decompresses the chest, and keeps the operative field clear. The existing design provides limited operational flexibility in providing airway management support, oropharyngeal suction, and chest tube drainage during an exploration mission due to limitations in suction performance, usability, patient interfaces, and reusability. It is restricted for use by a trained medical doctor and has several design limitations including:

- It can only be used to clear the airway. It would be insufficient/incapable to perform other types of medical suction.
- Device consists of several pieces that are only held together by a friction fit/seal and may come apart unless handled carefully.
- Device does not meet flow rate requirement since it is limited by operator speed.
- Device can only collect about 1 liter total volume. This volume includes volume of air since there is no gas separator.

The Phase I technology developed under this SBIR should demonstrate proof of concept medical suction capability in a space operational environment and should focus on the following aspects:

- Phase separation.
- Range of flow rates.
- Range of applied vacuum pressure.
- Continuous and intermittent operation.
- Variety of operational conditions including micro, partial and normal gravity; and in-space and post-landing usage.
• Minimize mass, volume, and power usage.

Minimum specifications that should be in the design:

• Airway Management and Oropharyngeal Suction:
  ◦ Suction pressure - at least 500 mmHg
  ◦ Flow rate - at least 25 liters per minute
  ◦ Duration - at least 30 minutes

• Chest tube drainage:
  ◦ Suction pressure - between 150-180 mmHg
  ◦ Duration - at least 24 hours

• Biological waste cleanup:
  ◦ Suction pressure - at least 500 mmHg
  ◦ Flow rate - at least 35 liters per minute
  ◦ Duration - at least 30 minutes

*NASA Deliverable* - Prototype functional system in a proof of concept demonstration

*HRP IRP Risk* - Inability to Adequately Recognize or Treat an Ill or Injured Crew Member

Technology Readiness Levels (TRL) of 3 or higher are sought.

Potential NASA Customers include:

• Exploration Medical Capability Element in Human Research Program: