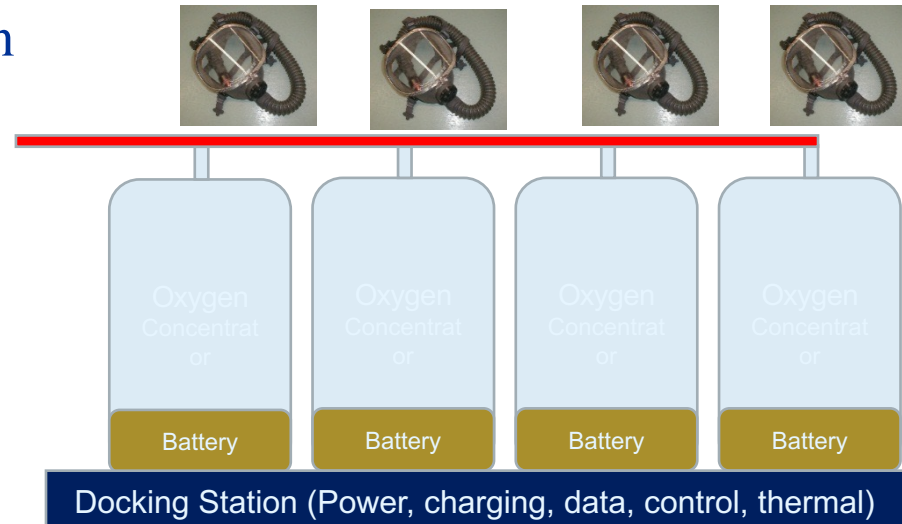




Parallel Architecture

- Future space missions will take astronauts beyond Earth's orbit. These exploration missions may be long in duration (e.g. 36 months) and will have limited resources. **It is vital that each piece of equipment serve as many functions as possible, with built in redundancy.**
- An oxygen concentrator for crew medical support is considered vital to provide an ill crewmember with ventilation with oxygen.
- Providing a method of oxygen therapy that uses cabin air keeps the oxygen levels stable and avoids ECLSS intervention required to maintain the cabin oxygen levels.





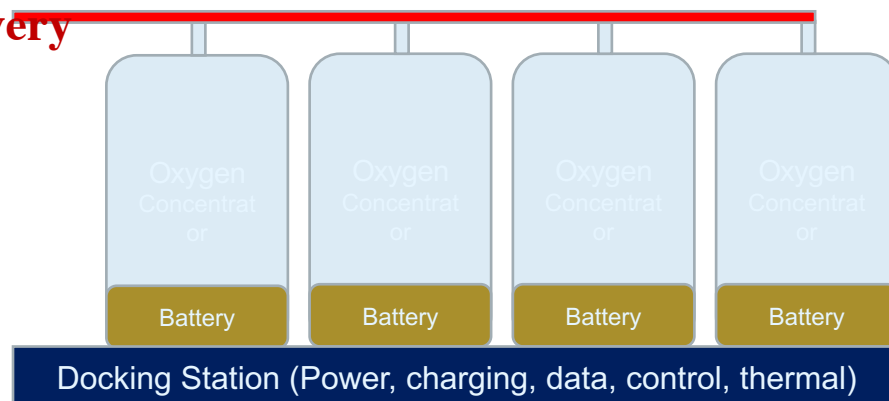
Medical Emergency

- A very ill crewmember requires a significant flow of oxygen, **up to 15 LPM**, but lower flow rates can be adequate for less ill crewmembers or as respiratory supply of healthy crew.
- To address these multiple flow ranges, a redundant set of lower flow concentrators is envisioned that could be used separately as needed (at 3-4 LPM), or combined for the high flow need. The lower flow modules can be run off batteries for a reasonable period of time, or plugged in if the crew is relatively stationary.

O₂ delivery



Image credit: CNES-E.Grimault, 2013





Pre-EVA Pre-Breathing

- The oxygen concentrator could be used in a portable mode at 3-4 LPM as an option for pre-breathing protocol by the crew in preparation for Extravehicular Activities (EVA).
- The portability of the system could allow the astronaut the ability to move around and perform other activities while completing the pre-breathing protocol.
- This may be needed during the long transit to Mars, where the spacecraft cabin is still normal atmospheric air, for example.

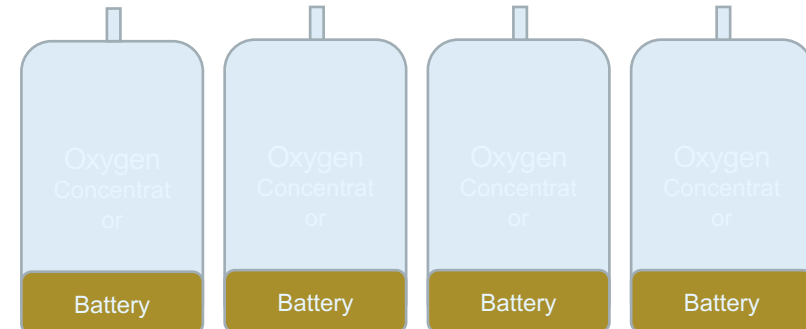
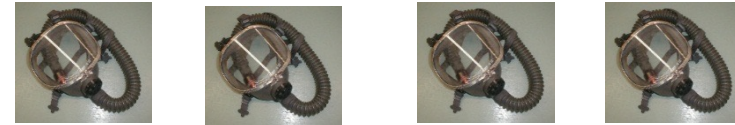


Docking Station (Power, charging, data, control, thermal)



Atmospheric Contamination or Leak

- The portable, distributed oxygen concentrator could also be used to protect healthy crewmembers if there is an atmospheric contamination event such as a toxic spill or a fire, to avoid toxic gas or smoke inhalation.
- A replaceable inlet filter on the unit would remove toxic gases from the oxygen delivery stream, allowing the user to breathe in the enriched ambient oxygen free of smoke, dust, or other contaminants.
- The concentrator could also be used to provide an adequate partial pressure of oxygen in the event of an emergency leak, allowing the crew to find and stop the leak while ensuring an adequate oxygen supply as the spacecraft pressure drops.



Docking Station (Power, charging, data, control, thermal)