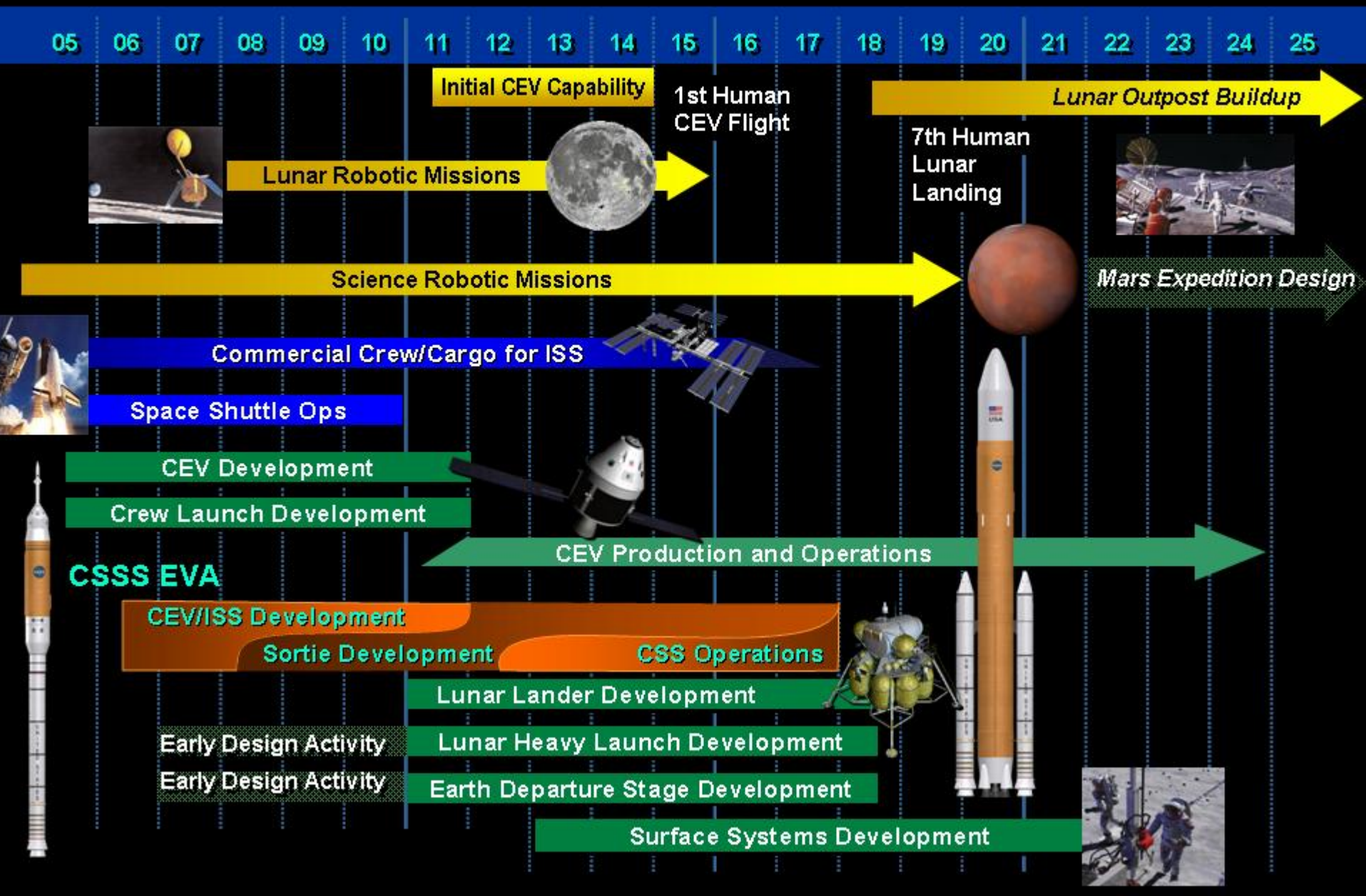
Space Exploration Life Support

December 6, 2006

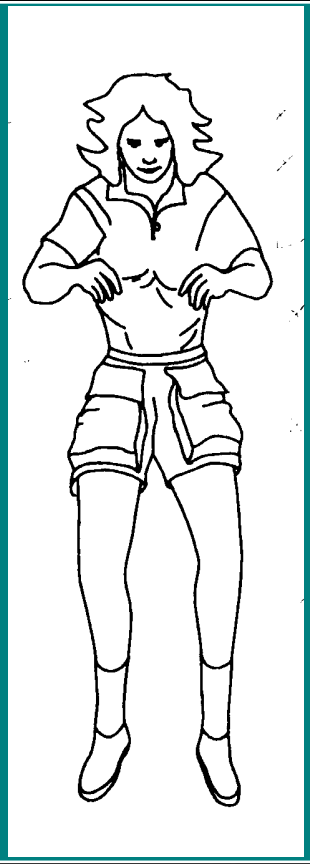
Hamilton Sundstrand Space Land & Sea
Patti O'Donnell

NASA's Exploration Roadmap



Human Life Support Needs and Effluents

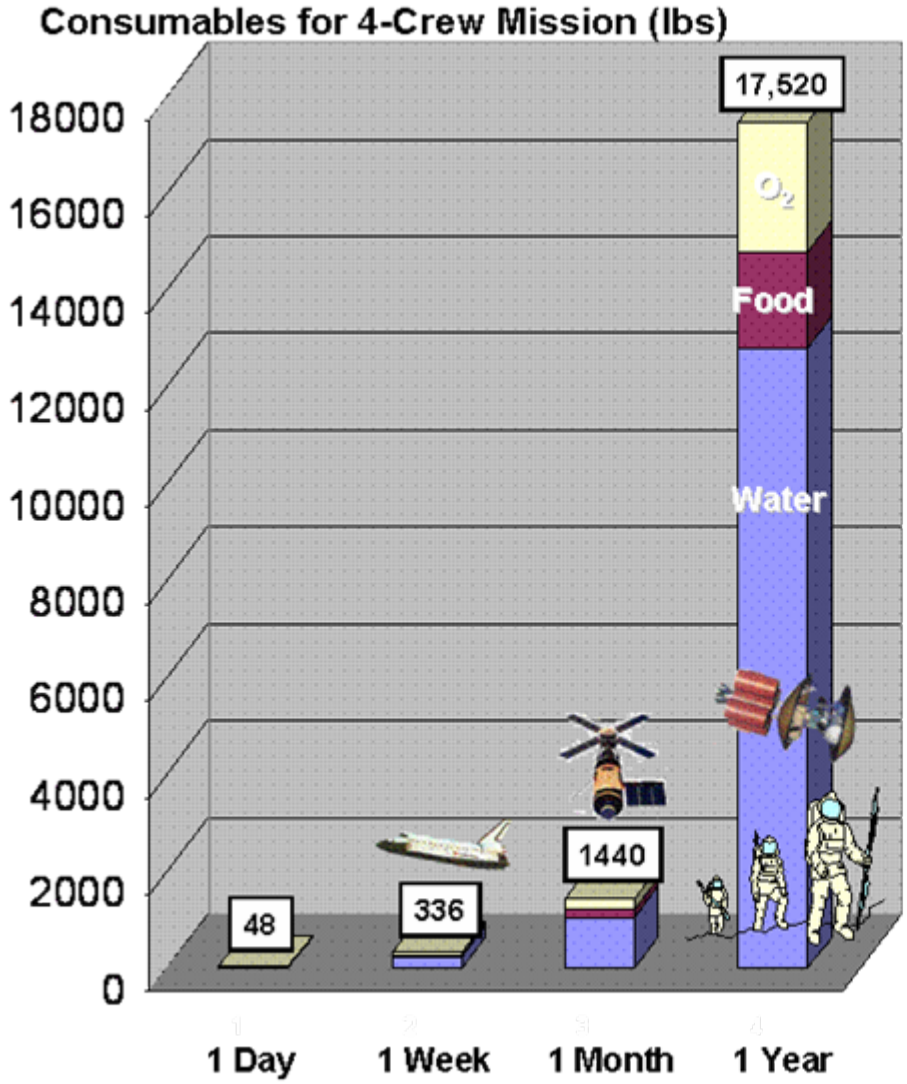
Oxygen	1.84 lbs
Food:	
solids content	1.36 lbs
water content	2.54 lbs
Food prep water	1.59 lbs
Drink	3.56 lbs
Hygiene water:	
Hand/Face Wash	9.00 lbs
Shower	6.00 lbs
Urinal Flush	1.09 lbs
Total	27 lbs

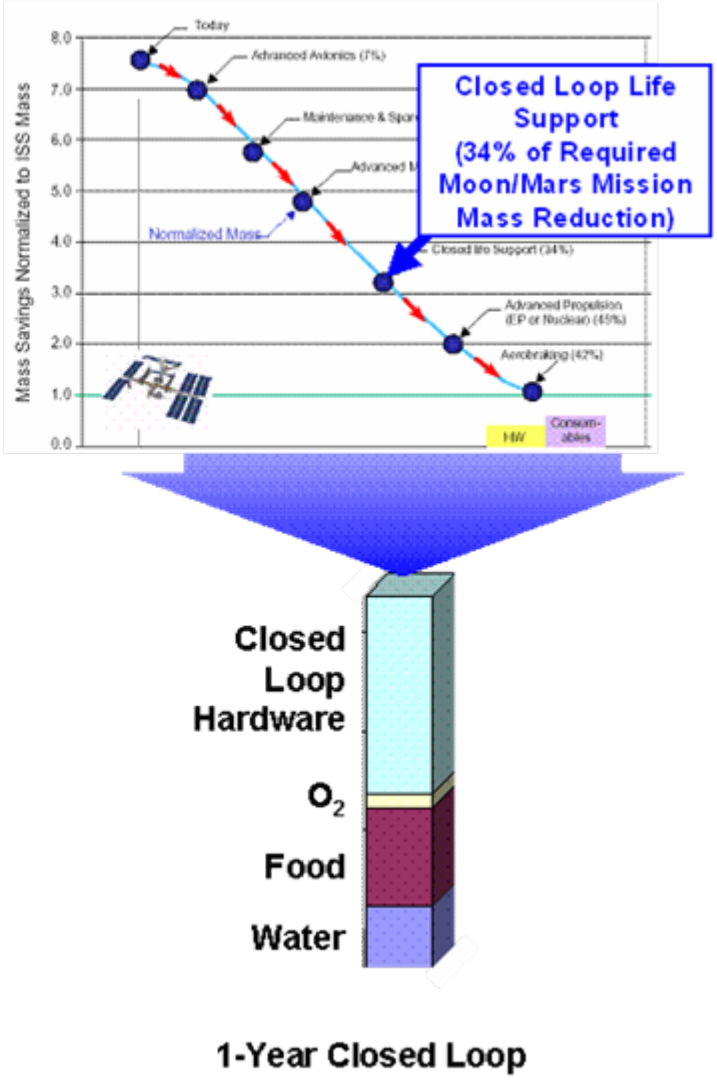


Carbon Dioxide	2.20 lbs
Respiration & Perspiration	
Water	5.02 lbs
Urine (water)	3.31 lbs
Urinal Flush	1.09 lbs
Urine solids	0.13 lbs
Sweat solids	0.04 lbs
Feces solids	0.07 lbs
Feces water	0.20 lbs
Hygiene water	15.00 lbs
Total	27 lbs

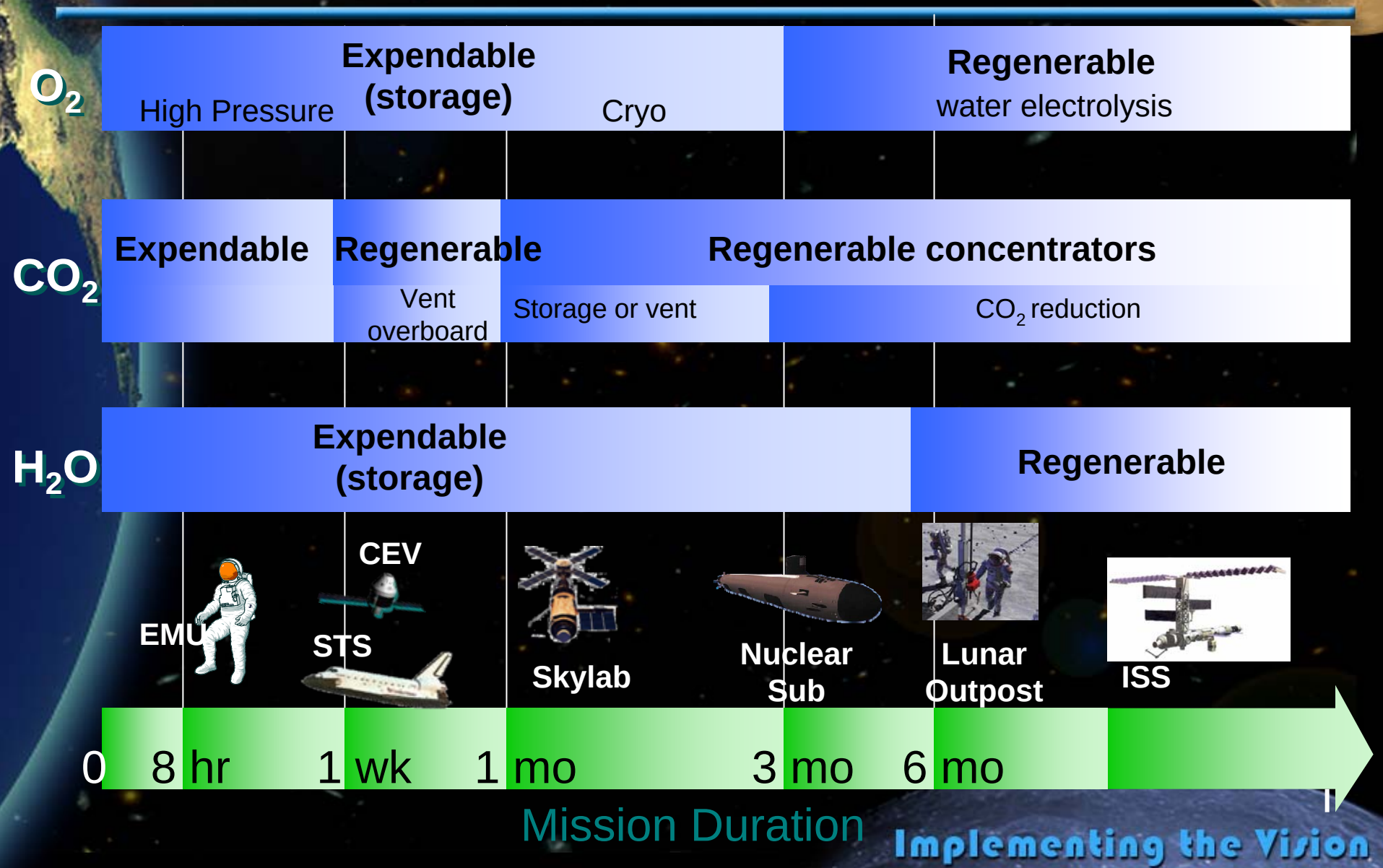
Metabolic Rate = 11,200 Btu/person/day

Crew Needs Increase with Mission Duration

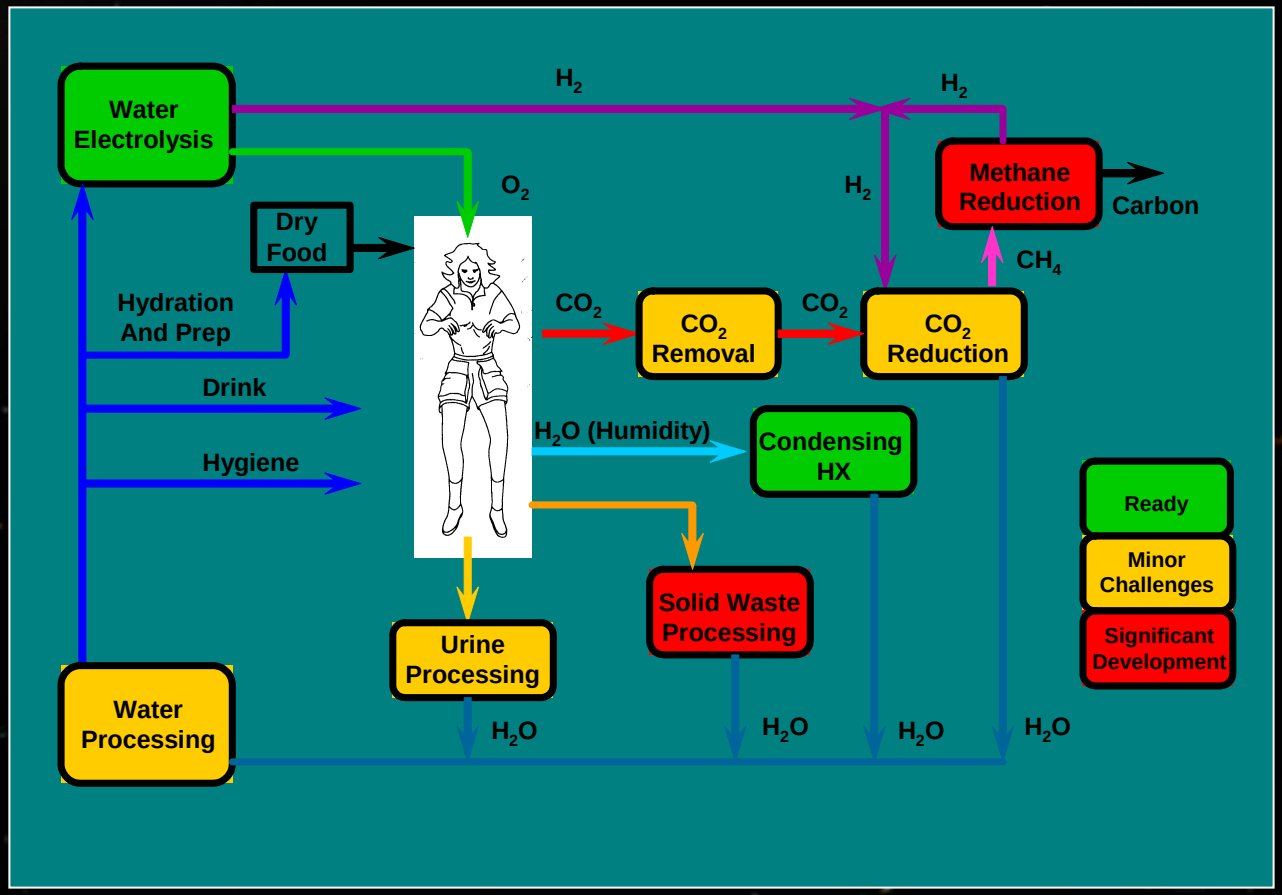


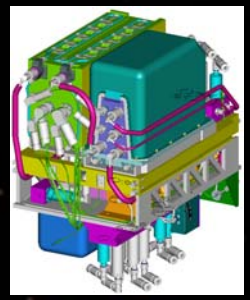


Life Support Technology Solutions Vary with Mission Length



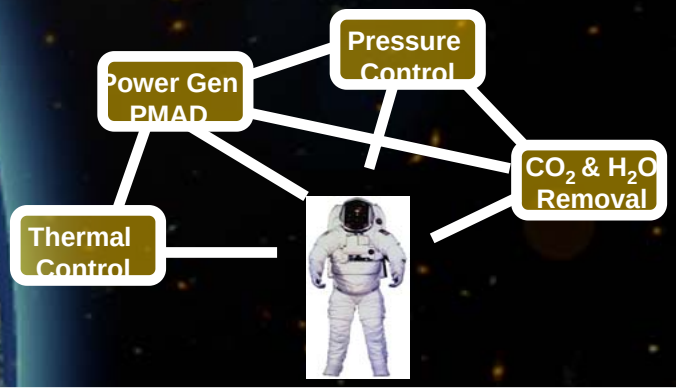
Closed-Loop Life Support Technology Readiness



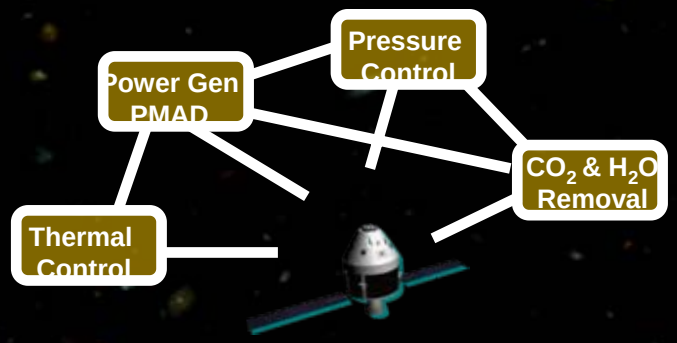


System Integration and Cross Platform Commonality

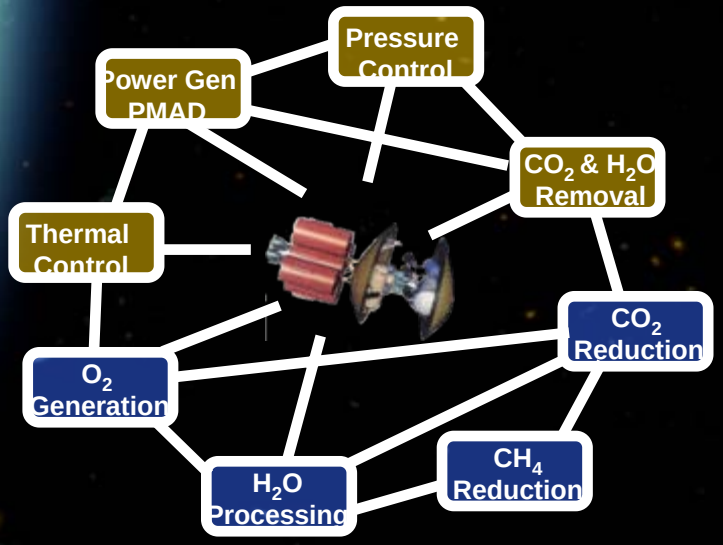
EVA



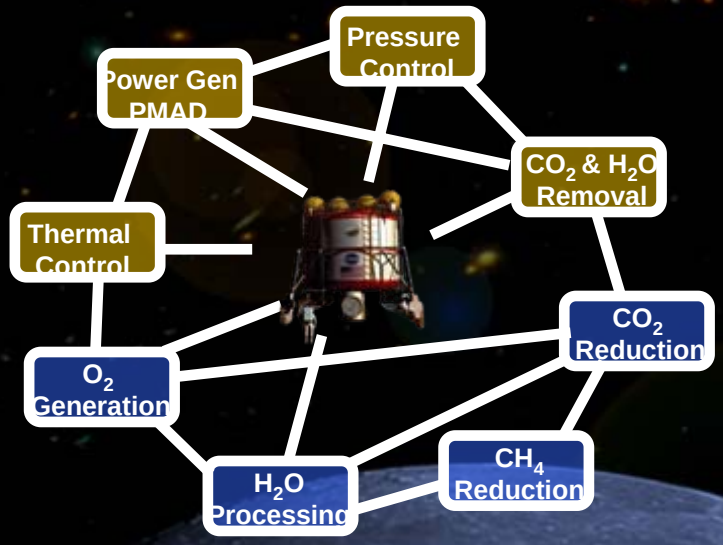
Short-Duration Transit



Long-Duration Transit

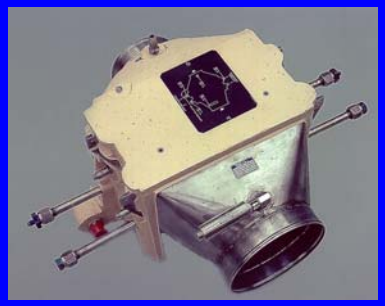


Moon or Mars Base

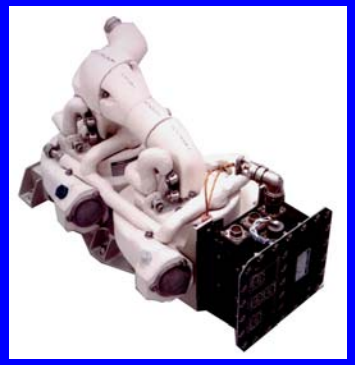


Systems integration reduces overall system complexity

Shuttle LiOH canister and storage



Condensing Heat Exchanger



Fan/pump Separator

CO_2 and Moisture Removal Amine Swing-bed

Integrating CO_2 and H_2O Removal

- *Decreases component count*
- *Decreases radiator size*

Next Steps

- Continue Investing in Enabling Technology
- Identify and Develop Parallel Technology Off-Ramps
- Focus on Integration across Systems and Platforms
  - Concept in Concert to Ensure Minimum Equivalent System Mass
  - Use Multi-Functional/Modular Approaches Wherever Possible
- Use Ground & Space Based Assets (ISS, Shuttle & EMU) as Test Beds

the
journey
continues...
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