National Aeronautics and Space Administration

ECLSS Lighting Talk

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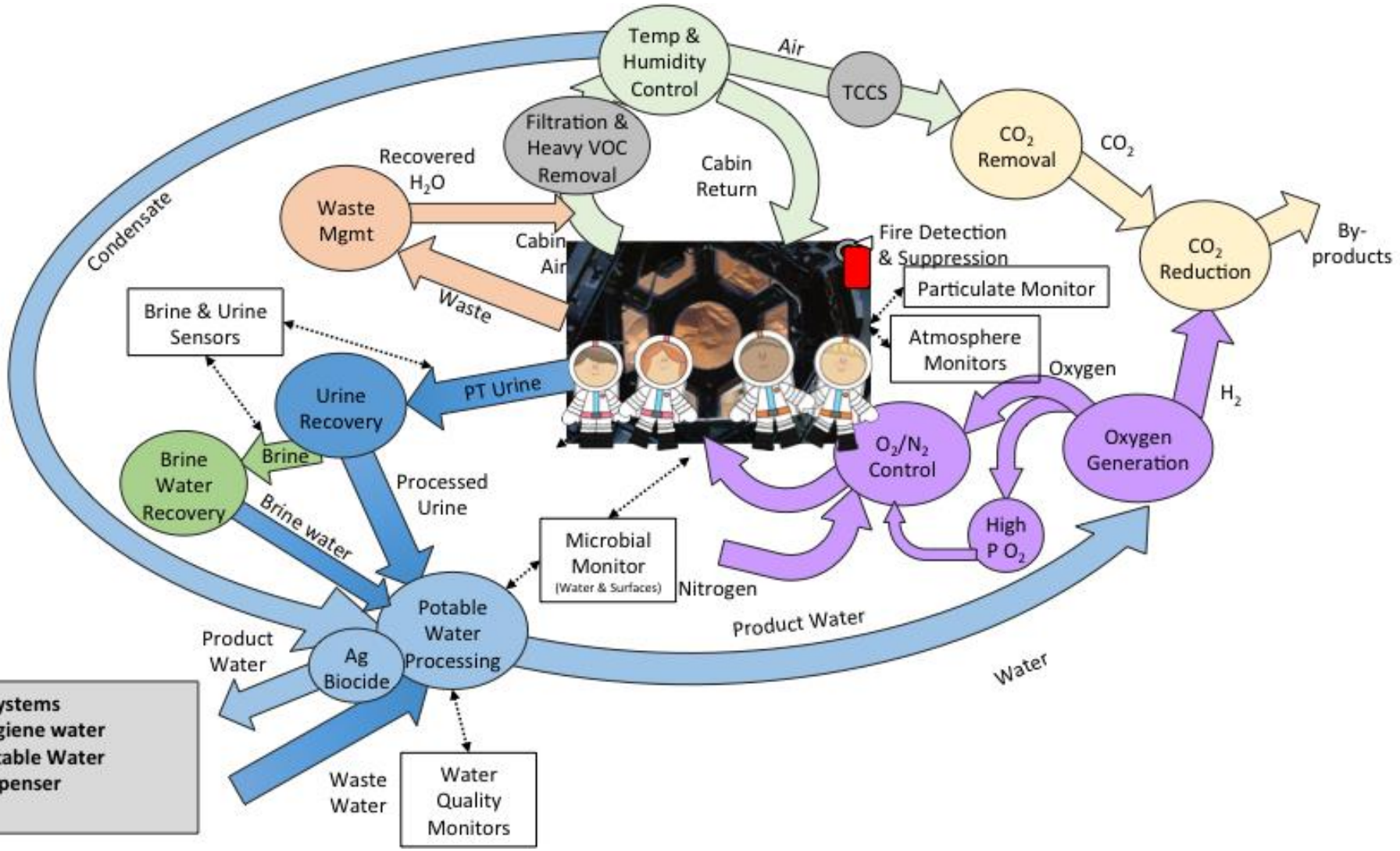
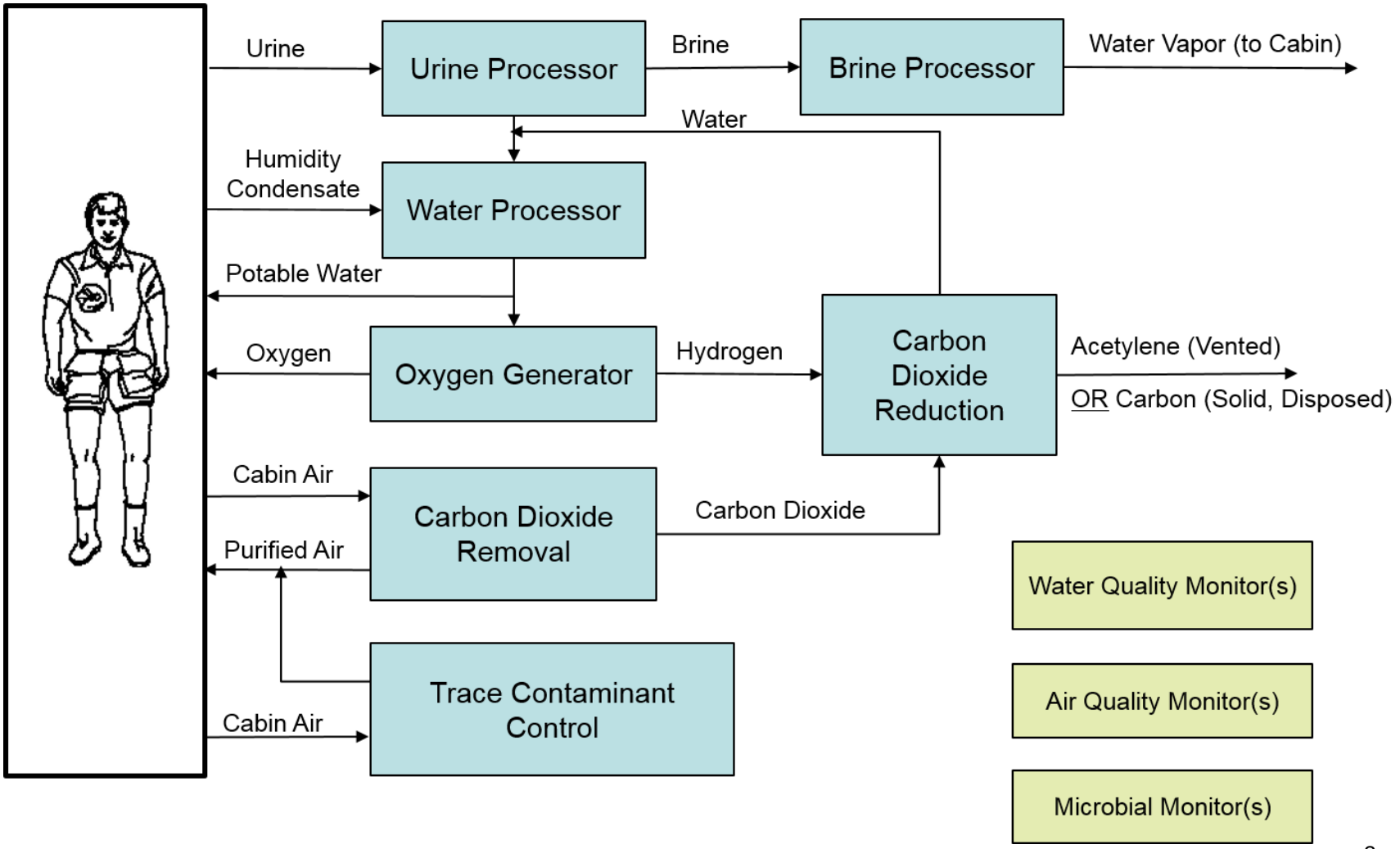
ECLSS is Complex



ISS State of the Art



Mars is Hard(er) for ECLSS

Today on ISS

- Regular resupplies of makeup consumables, spare parts
  - 42% air loop closure
  - 90% water loop closure
  - 6 months of spares
- Return, analyze samples on Earth
- Emergency crew return capability
- Trash disposal

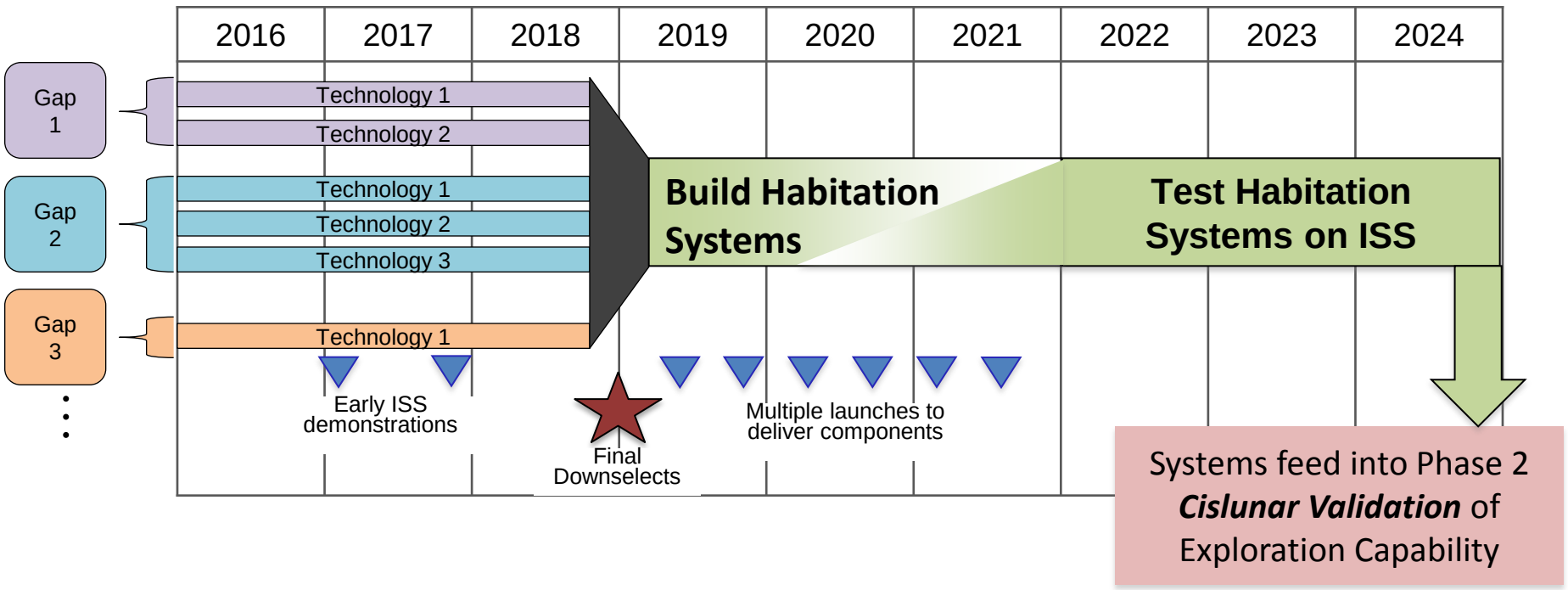
At Mars

- No resupply
  - 75% air loop closure
  - 98% water loop closure
  - 3 years of spares
- On orbit monitoring
- No emergency crew return
- No trash disposal

Identified ECLSS Capability Gaps for Exploration

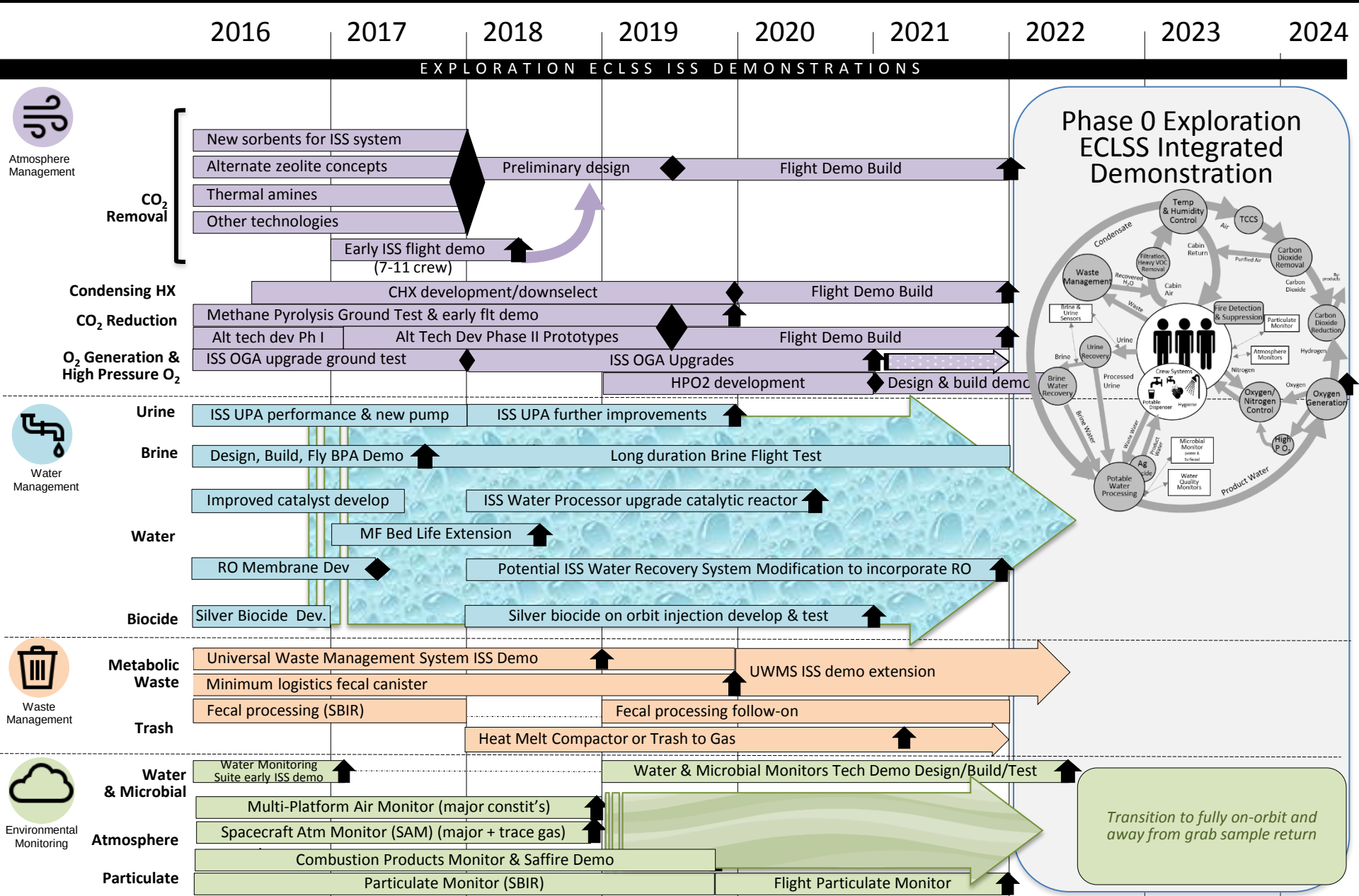
Function	Capability Gaps	Long Duration µg Hab	Planetary Surface
CO_2 Removal	Bed and valve reliability; $ppCO_2$ <4800 mg/m^3 (<2 mmHg)	X	X
Trace Contaminant Control	Replace obsolete sorbents w/ higher capacity; siloxane removal	X	X
Particulate Filtration	Surface dust pre-filter		X
Condensing Heat Exchanger	Durable, chemically-inert hydrophilic surfaces with antimicrobial properties	X	X
O_2 recovery from CO_2	Recover >75% O_2 from CO_2	X	X
O_2 generation	Smaller, reduced complexity	X	X
High pressure O_2	Replenish 3000 psi O_2 for EVA; provide medical O_2	X	X
Water microbial control	Common silver biocide with on-orbit re-dosing	X	X
Wastewater processing	Increased water recovery from urine (>85%), reliability, reduced expendables, dormancy survival	X	X
Urine brine processing	Water recovery from urine brine >90%	X	X
Atmosphere monitoring	Smaller, more reliable major constituent analyzer, in-flight trace gas monitor (no ground samples), targeted gas (event) monitor	X	X
Water monitoring	In-flight identification & quantification of species in water	X	X
Microbial monitoring	Non-culture based in-flight monitor with species identification & quantification	X	X
Particulate monitoring	On-board measurement of particulate hazards	X	X

The Plan to Test Exploration Systems on ISS



We are also always on the lookout for the revolutionary technology – the 10X improvement!

The Specifics



Other Considerations

- **Use of performance measures, roadmaps, and demonstration plans to drive:**
  - ISS technology demonstration planning and prioritization
  - Specific Cis-Lunar objectives
- **Ongoing refinement of roadmaps as specific Exploration mission architectures evolve**
- **Coordination through International team to potentially incorporate partner contributions**
- **Development of standards (e.g. performance, common interfaces) to support interoperability between various commercial and international partner systems and components**
- **Seeking improvements in autonomy for ECLSS systems and ability to withstand extended periods of dormancy**
- **Continued integration across programs and projects/funding sources to advocate for funding of priorities and additional collaborations**

Any Questions?