Research Needs & Directions - ISS Perspective

Spring 2019 Meeting of the Committee on Biological & Physical Sciences

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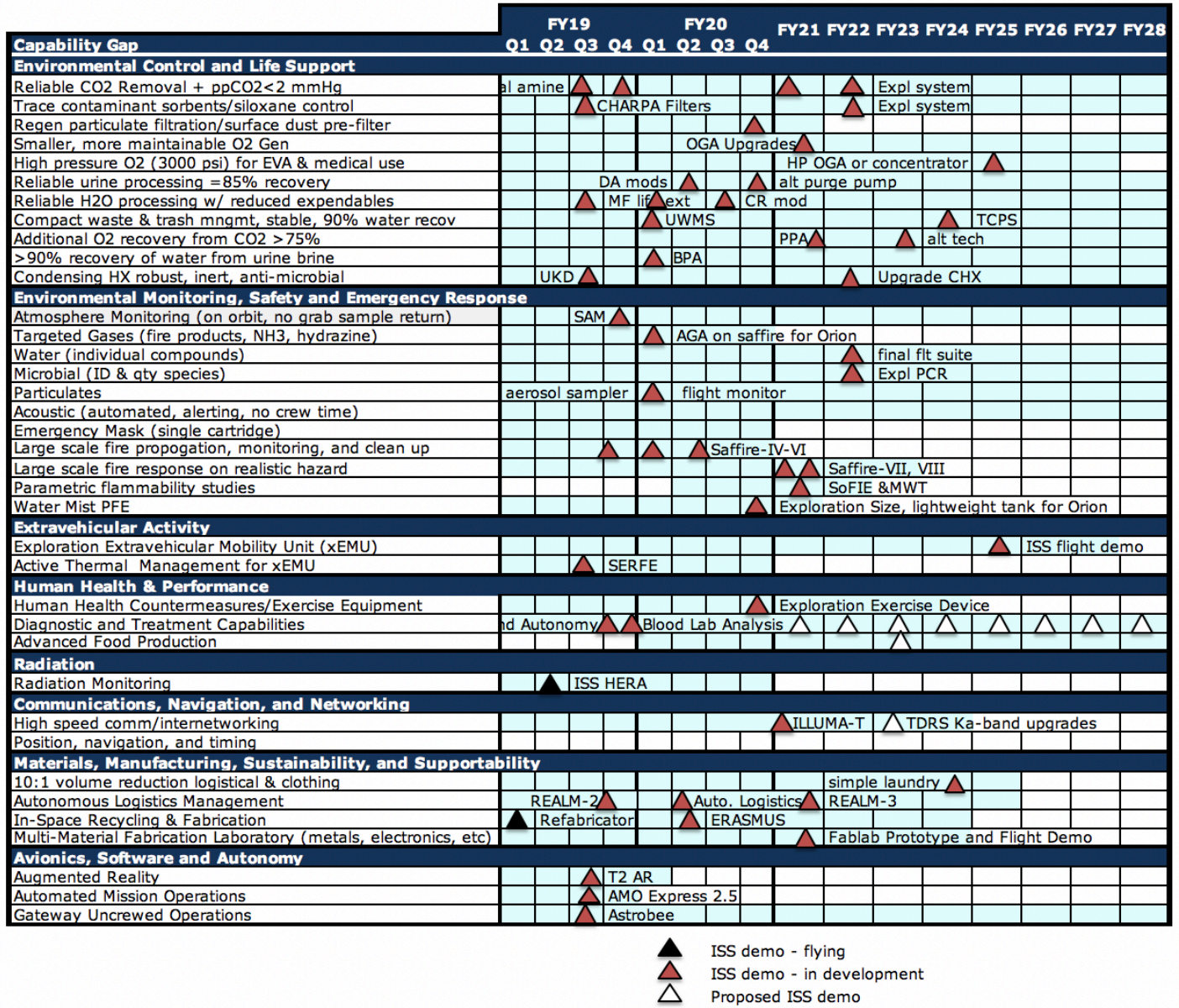
NASA HQ

ISS Technology Demonstration Fly-Off Plan

- NASA has ongoing exploration technology development needs that require continuous human presence in LEO.
  - Transition period from ISS to commercial destinations
  - Purchase of services from commercial LEO destinations to continue technology development post-ISS



Key Ongoing Challenges

- Life support system long-term reliability & loop closure
- Ability to test new technologies with system in ug before relying on them for deep space missions
- Reliance on on-orbit environmental monitoring with no sample return
- Partial gravity behavior - can we simplify ug systems?
- Dormancy/intermittent crew considerations
- Dust mitigation
- Food production, long-duration stability/viability
- Designing for in-space manufacturing/maintainability
- Autonomous operations

EVOLVING ECLSS FOR EXPLORATION

National Aeronautics and Space Administration

NASA

Evolution of ISS ECLSS Into Exploration ECLSS

Continue ECLSS Fleet Leader Testbed in LEO

Initial Short-duration ECLSS Evolving to Full Regenerative ECLSS

ISS

Notional Commercial Platform

Gateway

DST

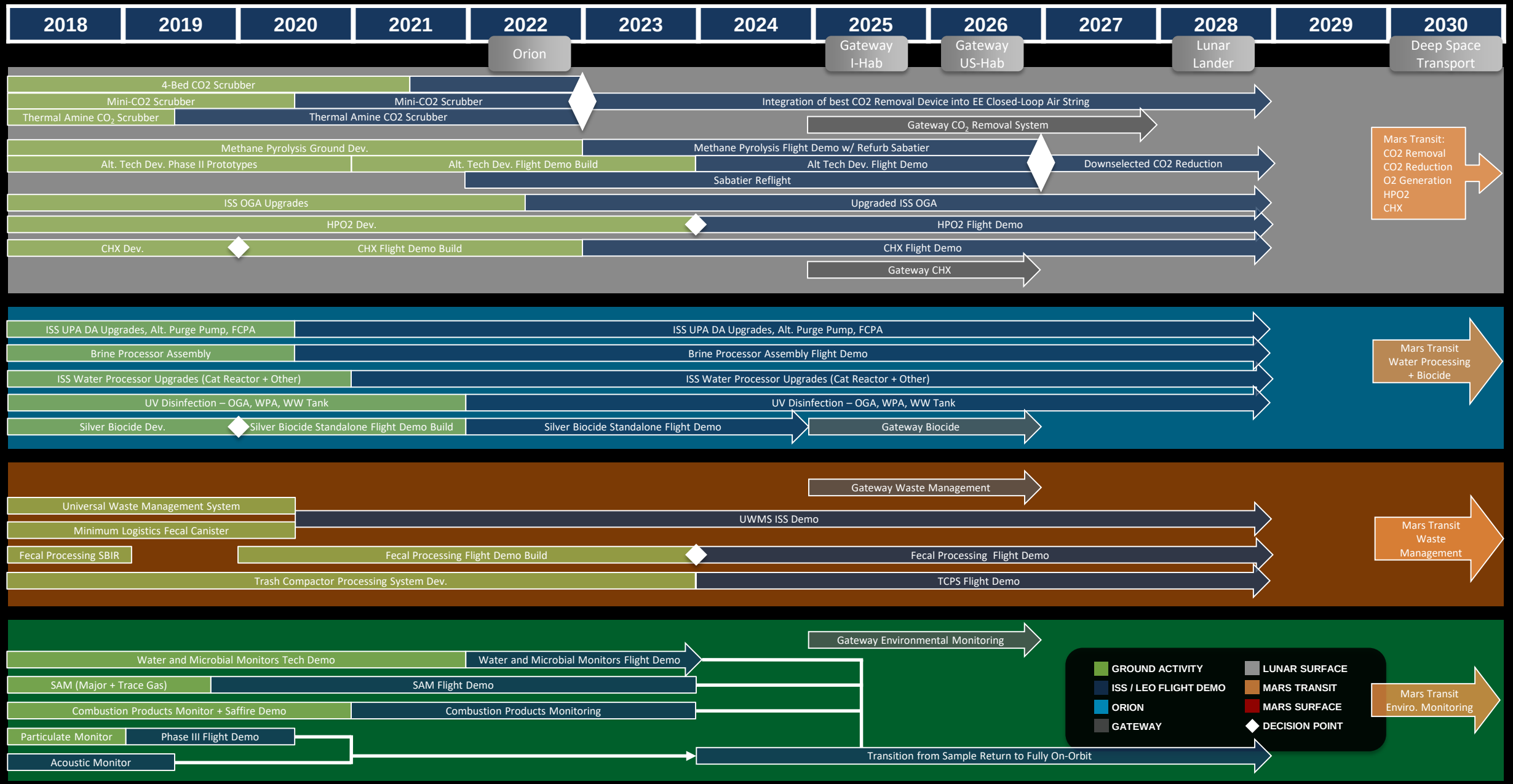
Surface Systems Ground Test

Lunar Surface ECLSS: Excursion – Short Duration | Base – Regenerative

Mars Surface Regenerative ECLSS

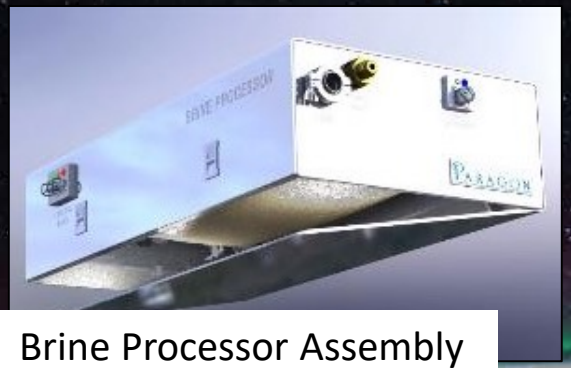
Exploration ECLSS Roadmap

Revised: 03/26/2019



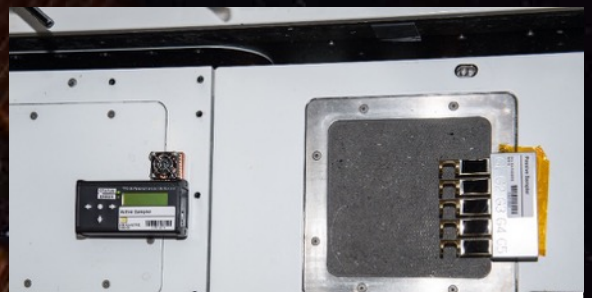
Recent and Upcoming ISS Demonstrations

Universal Waste Management System and Toilet Stall



Brine Processor Assembly

Min-Ion DNA Sequencer

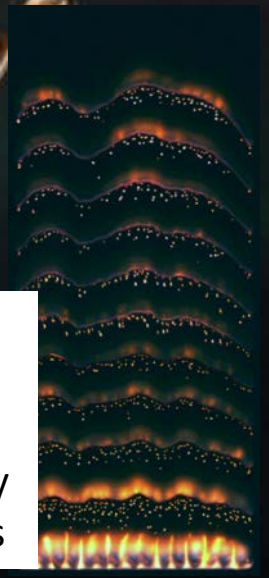


Aerosol Sampler (Particulates)
Active Sampler (left) and Passive Sampler (right) deployed in Node 3

Thermal Amine CO2 Scrubber

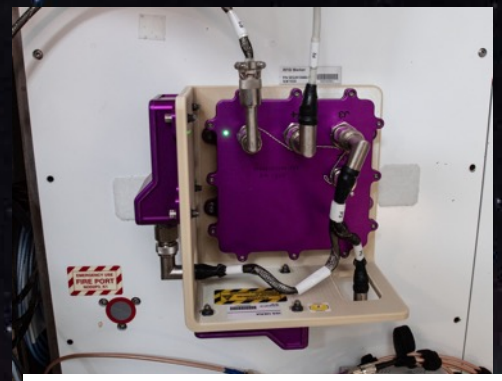
Acoustic Monitor

Spacecraft Atmosphere Monitor

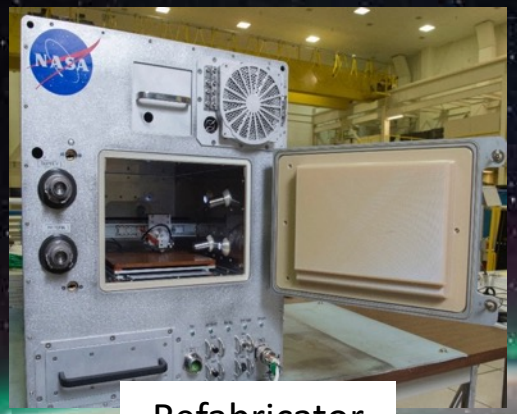


Spacecraft Fire Safety (Saffire) Flammability Experiments

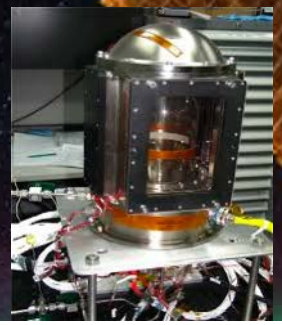
Recent and Upcoming ISS Demonstrations



Hybrid Electronic Radiation Assessor (HERA)



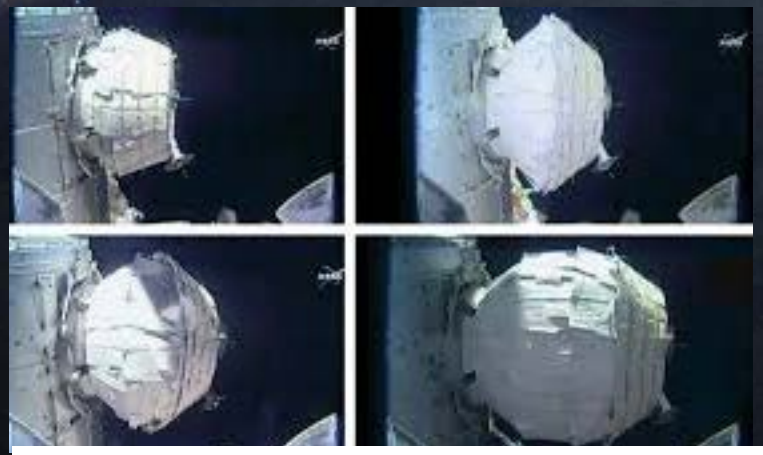
Refabricator



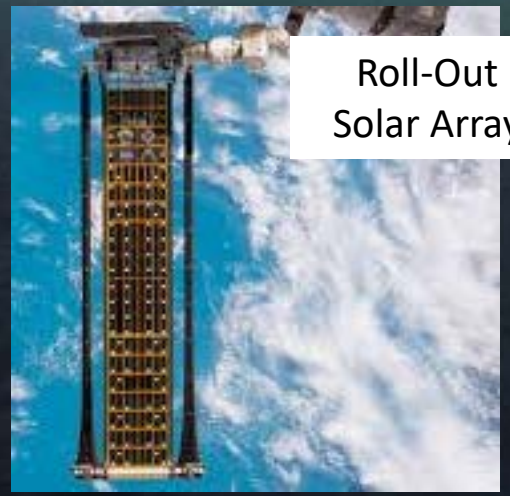
Zero Boil-Off Tank

Phase Change Material Heat Exchanger

Miniature Exercise Device



Bigelow Expandable Activity Module (BEAM)



Roll-Out Solar Array

RFID-Enabled Automated Logistics Management (REALM)