



Water Innovations and Lessons Learned From Water Recycling in Space

Michael Flynn
NASA Ames Research Center





Advanced Life Support

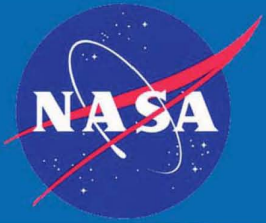


Objective:

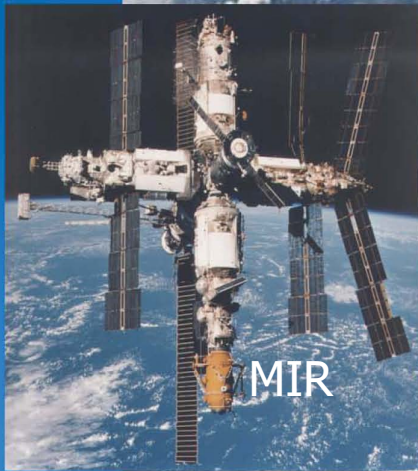
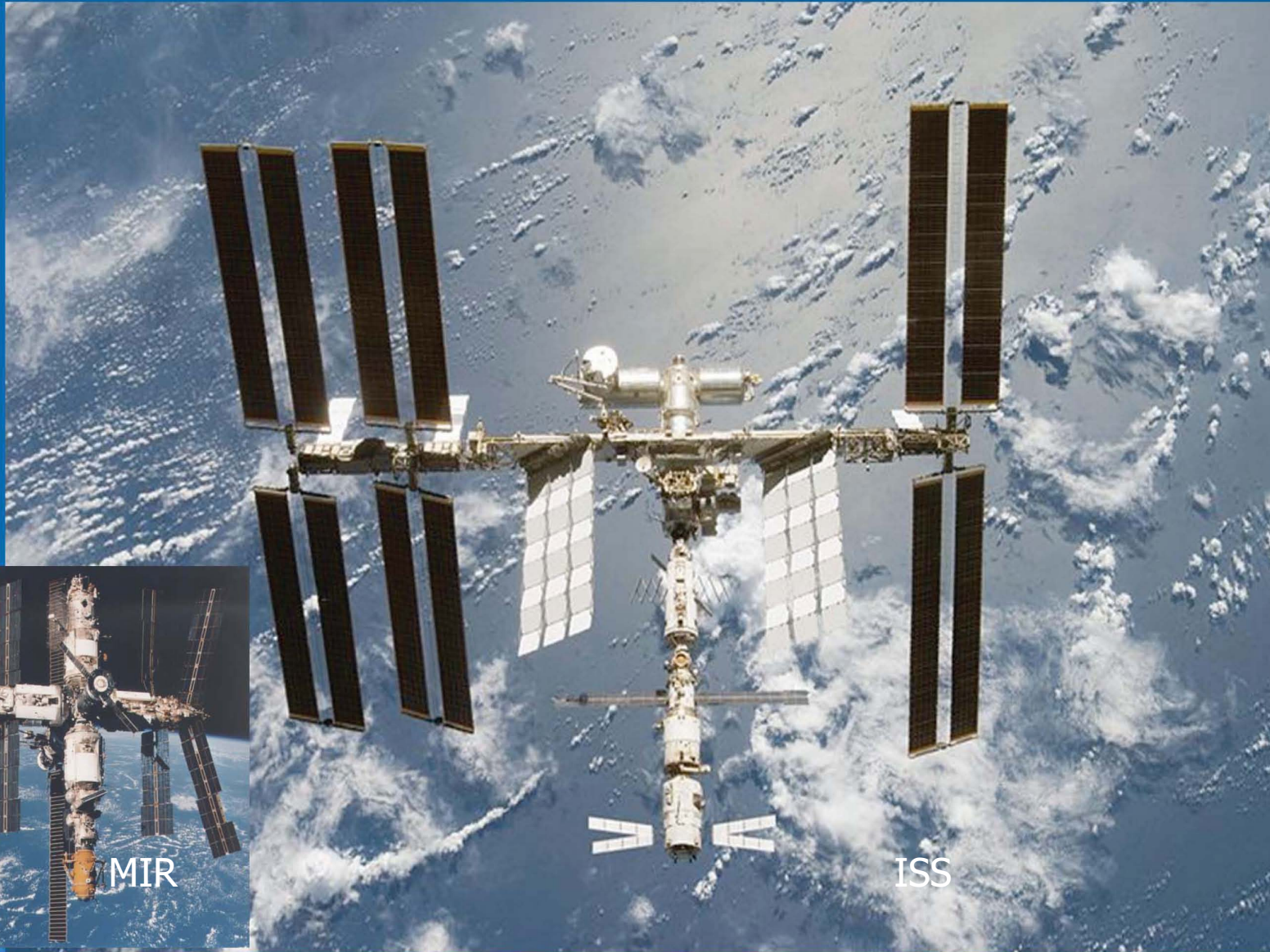
Keep Astronaut alive

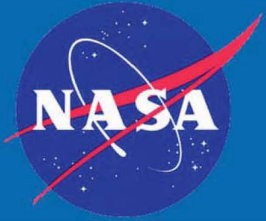
Provide habitable environment

Reduce Cost



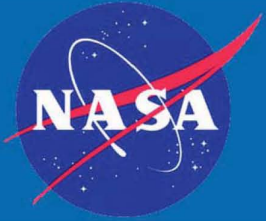
International Space Station





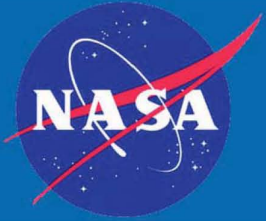
Mars





Commercial Space





Commercial Space



Inputs

Water

Oxygen

Waste
Collection

Temperature
Control

Pressurized
Environment

Energy



Outputs

Waste
Water

Carbon
Dioxide

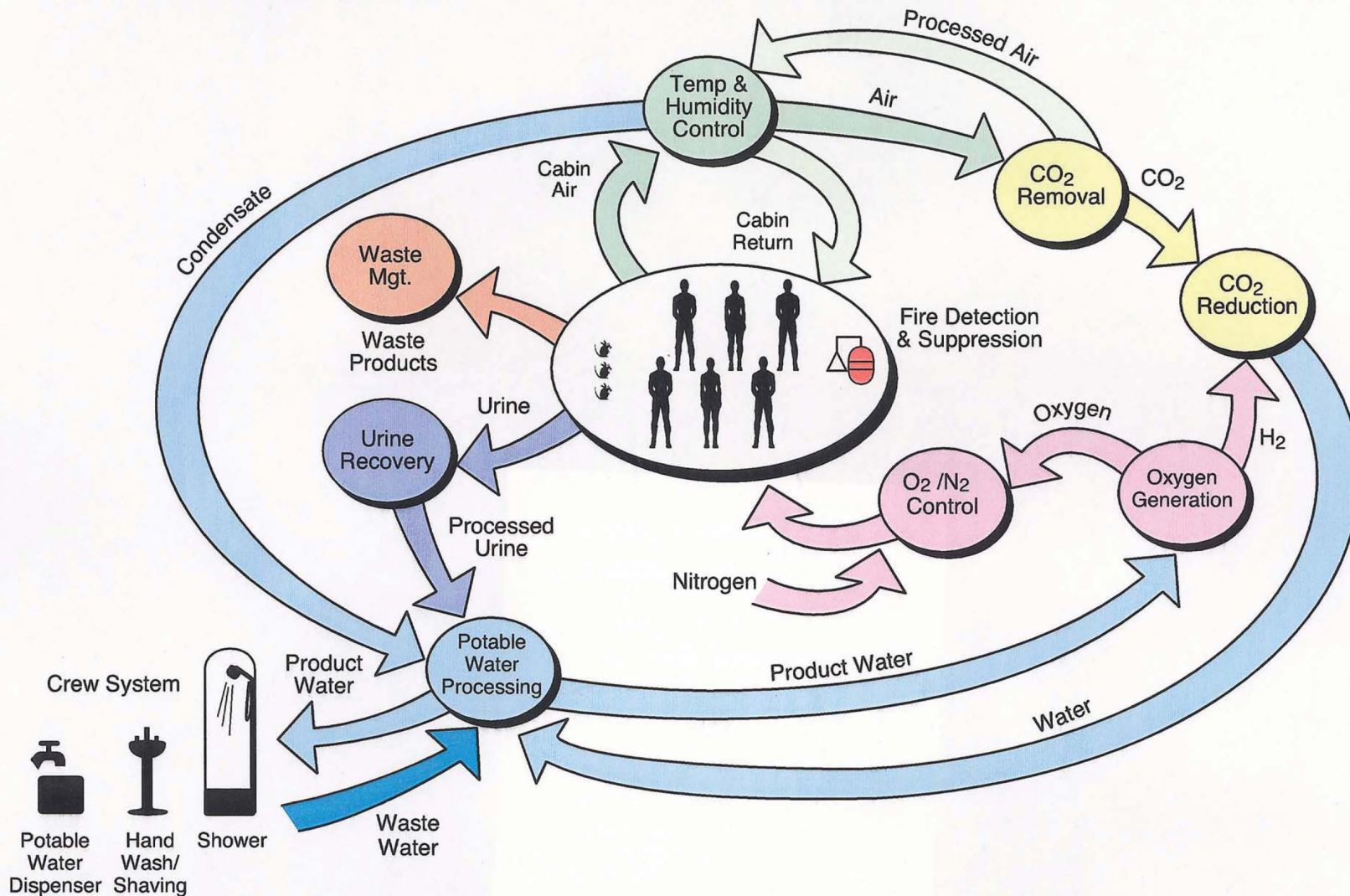
Volatile
Organics

Solid
Wastes

Heat



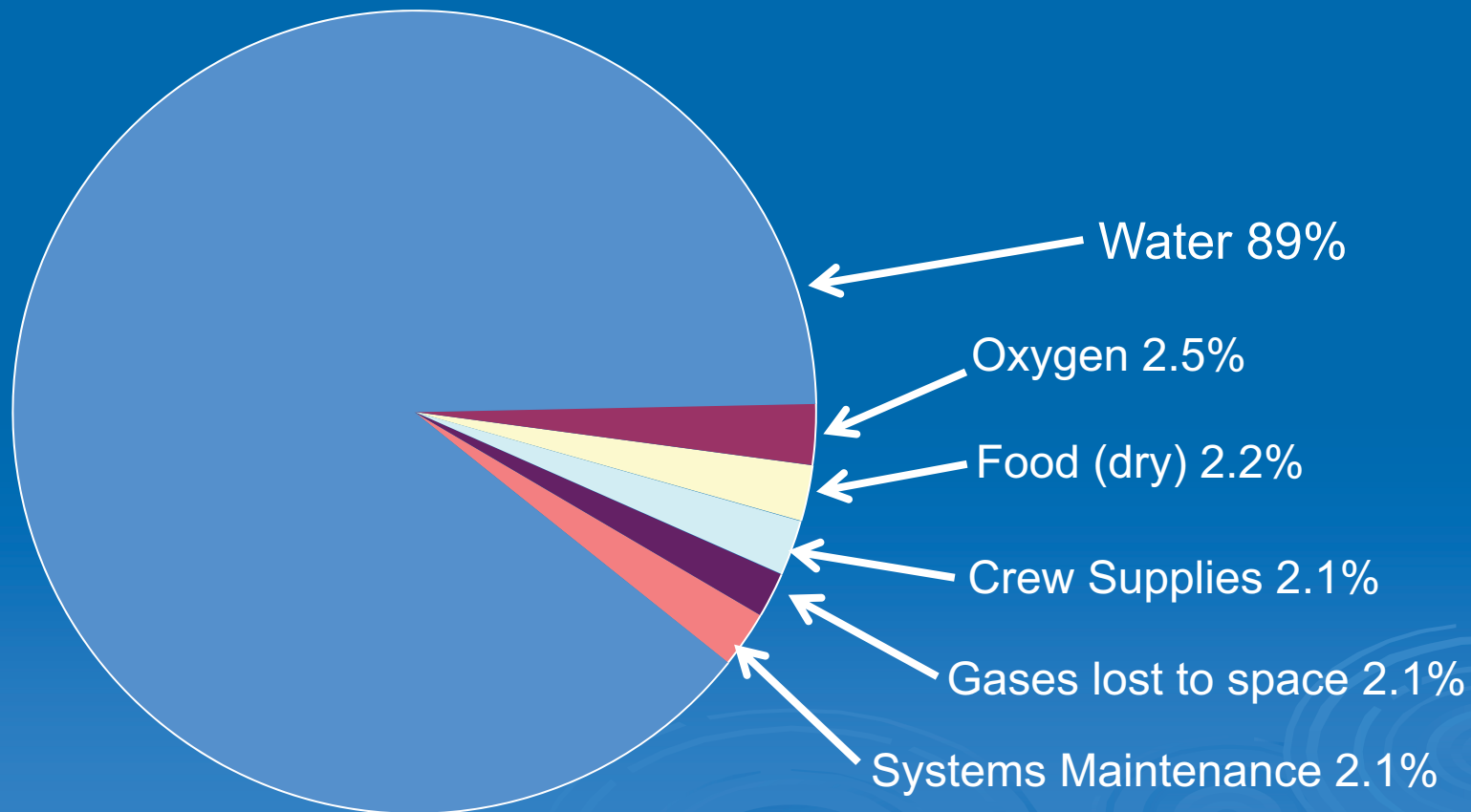
Space Station Regenerative ECLSS Flow Diagram (Baseline and Scarring)

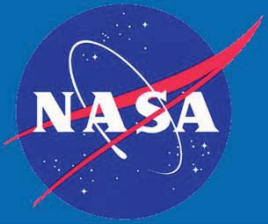




Life Support Requirements

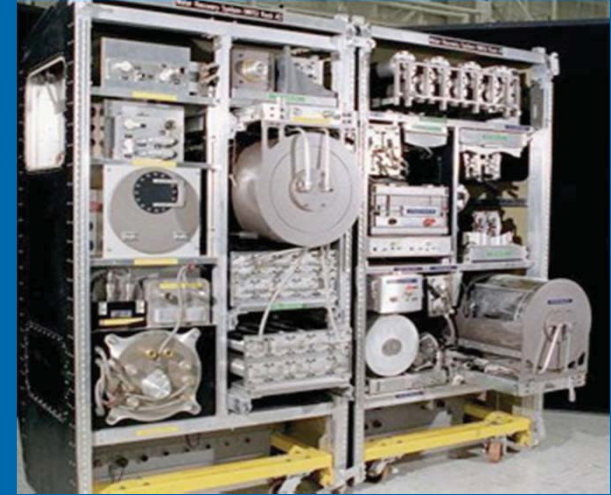
Open-loop life support system re-supply mass





ISS US Water Processing Assembly

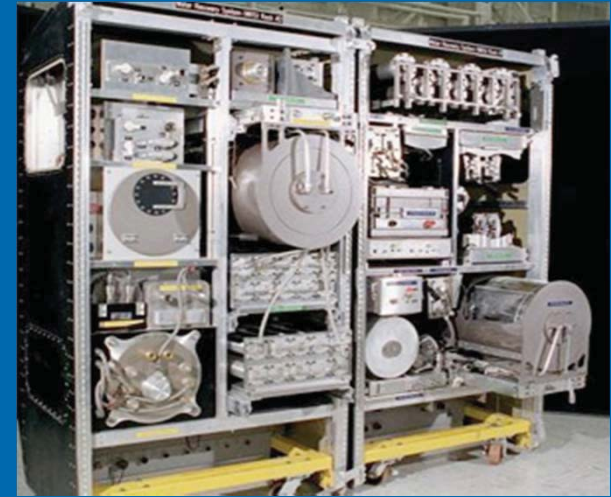
- Urine and condensate are recycled to drinking water.
- Wastewater is recycled using distillation, adsorption, and oxidation.





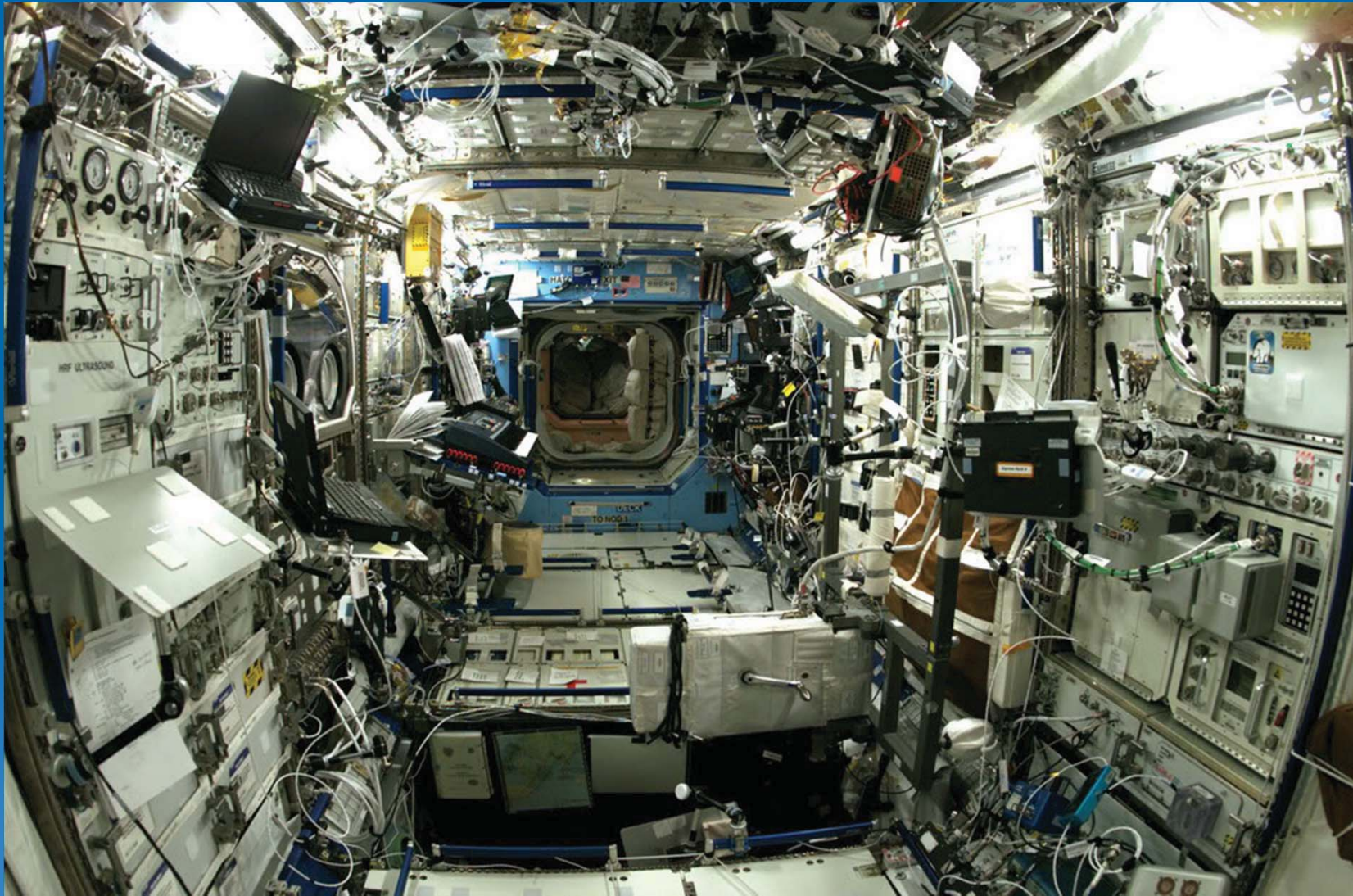
ISS US Water Processing Assembly

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Concept to Practice

It is one thing to talk about what could be done but entirely another to make it work





Lessons Learned From 3 Years Operation of ISS WPA

- Formation of calcium scale determines maximum recovery ratio.
- Trace contaminants build up.
- Maintenance requirements are high.
- Reliability matters. Especially for future long duration missions.