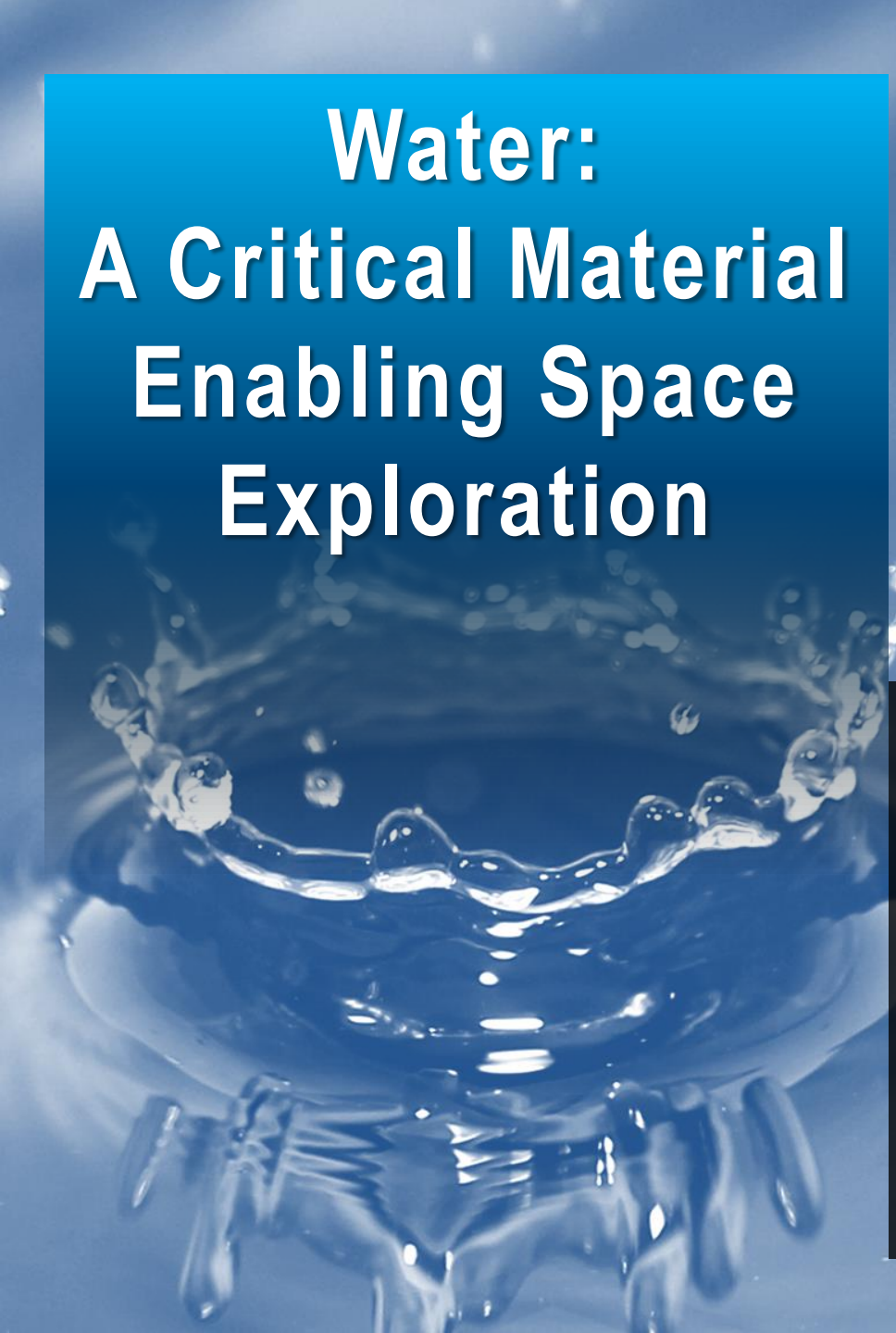
Water: A Critical Material Enabling Space Exploration



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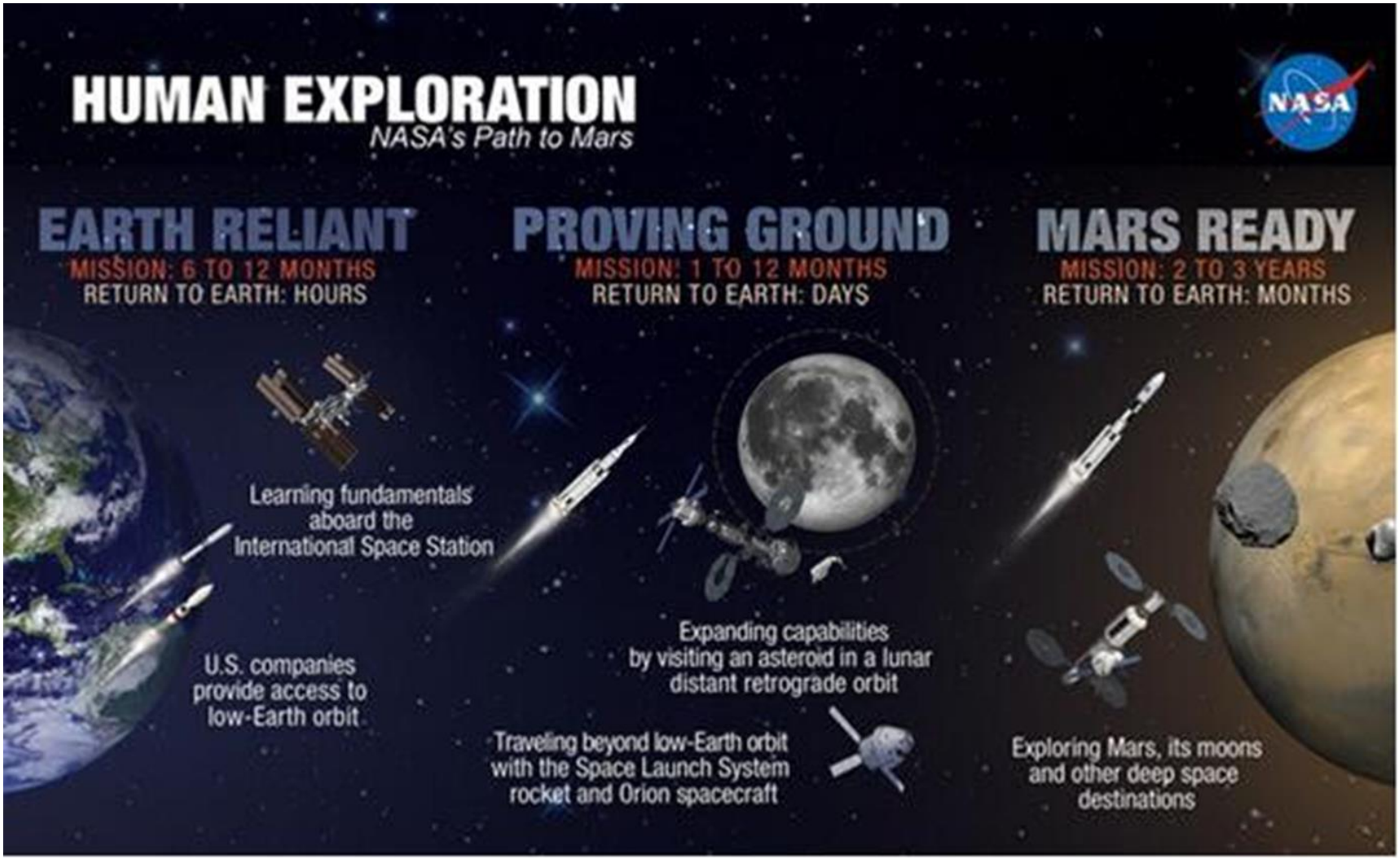
Presentation Outline

- **Where is NASA going?**
- **Why is water critical to NASA's mission?**
- **Recovering water from wastewater**
- **Water quality for humans and hardware**
- **Technology needs for exploration**

Acronym Primer

- **ISS = International Space Station**
- **WRS = Water recovery system**
- **EVA = Extravehicular activity**

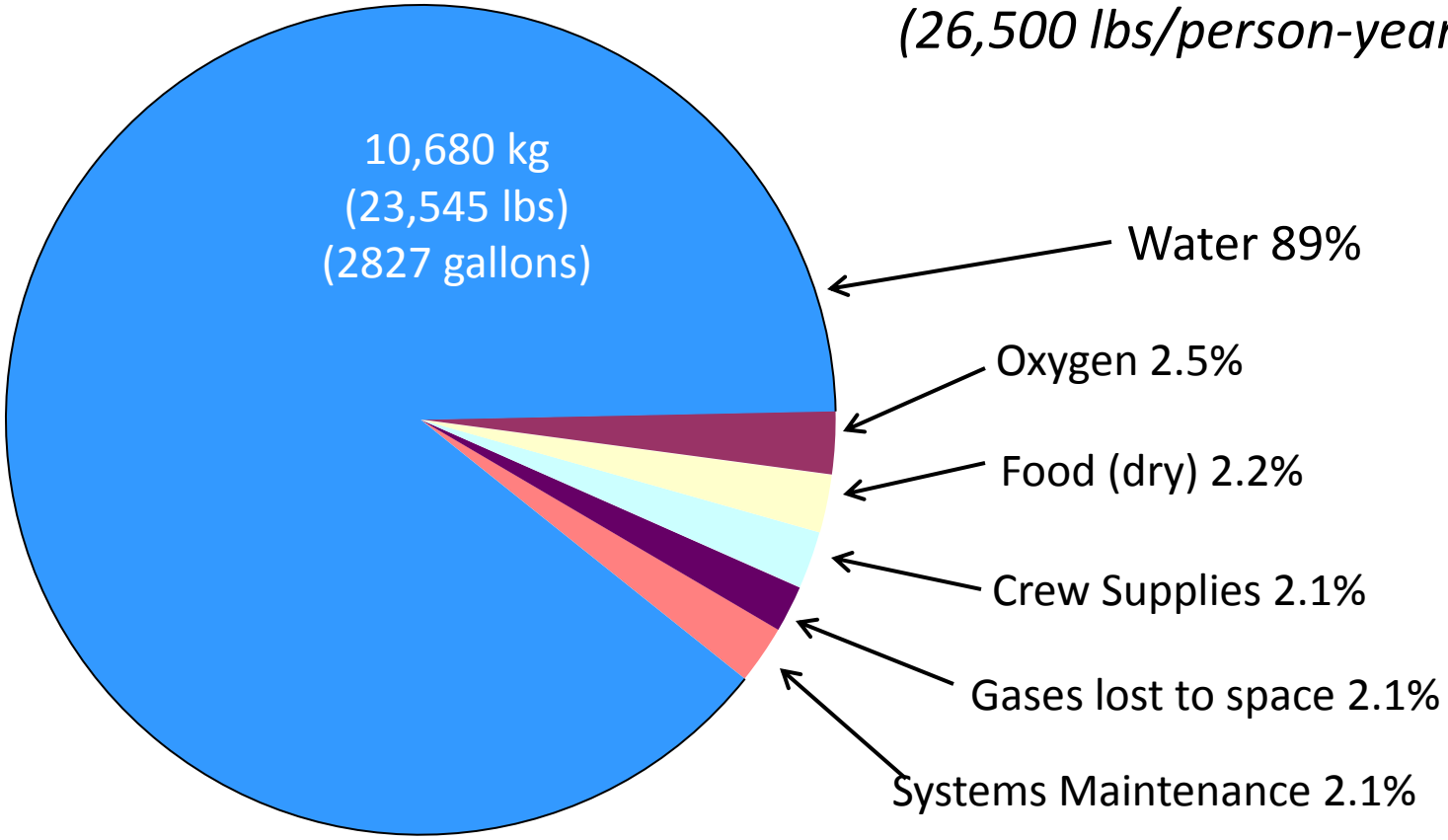
So what is NASA really doing?



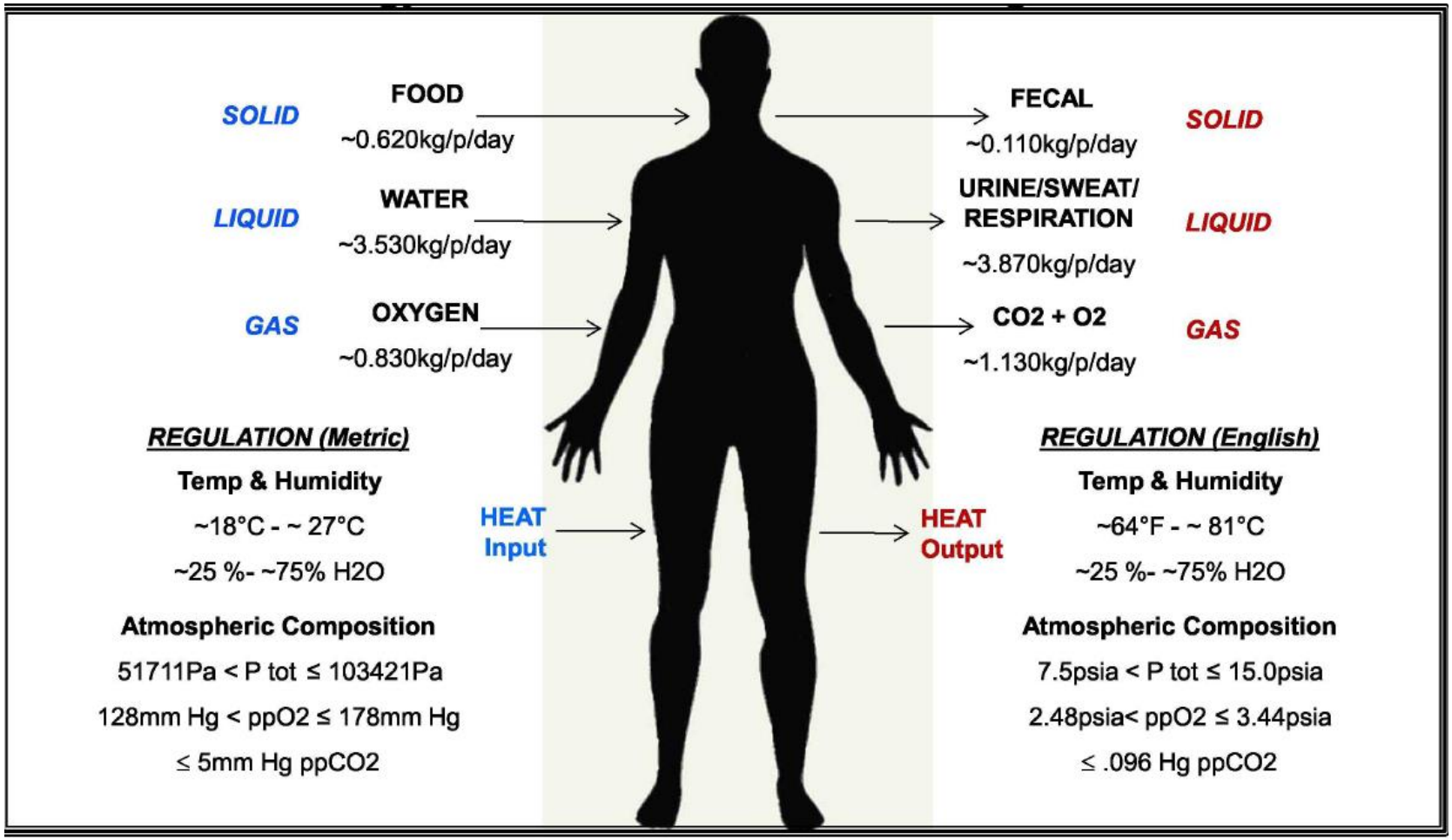
Recovery of water from wastewater is an enabling technology to explore beyond low Earth orbit

Human life support requirements

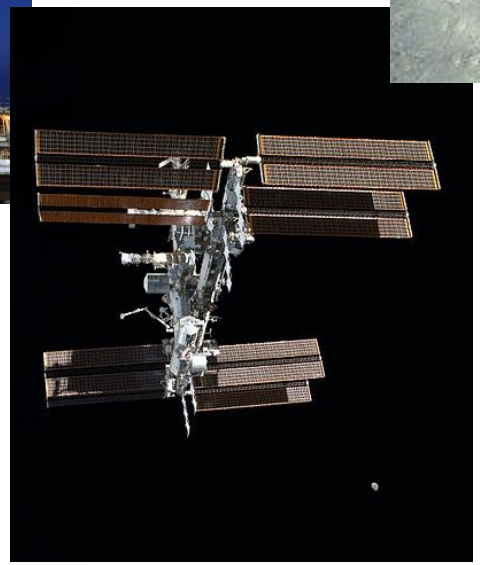
Open-loop life support system resupply mass
12,000 kg/person-year
(26,500 lbs/person-year)

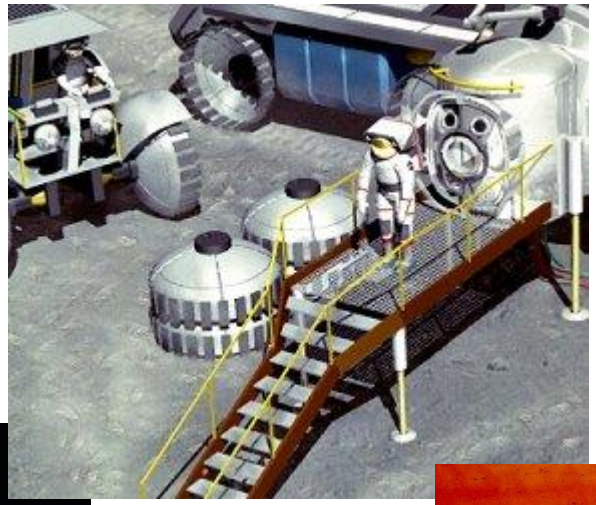


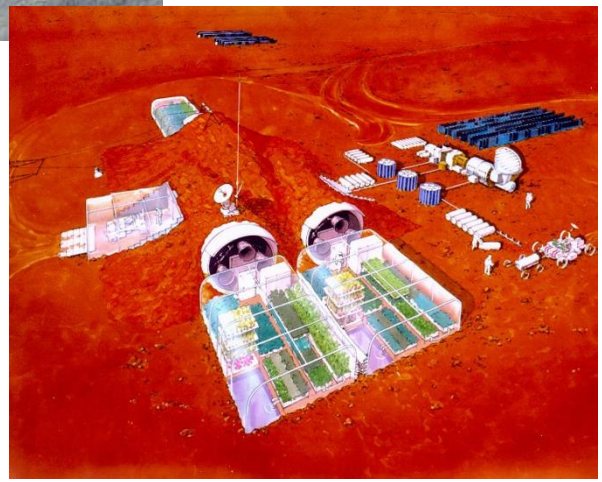
Human mass balance



Water requirements change as mission matures



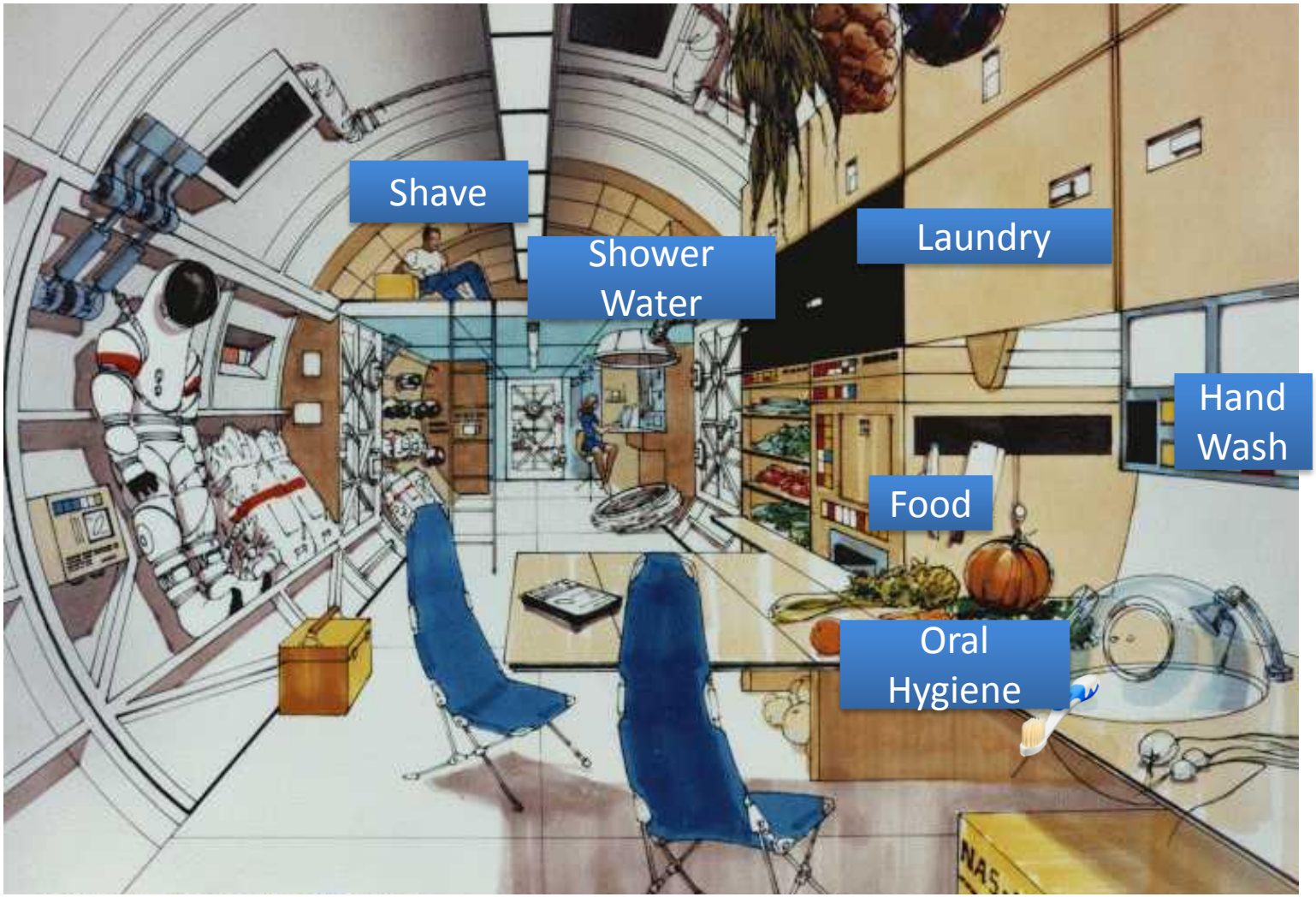




Wastewater on ISS

International Space Station Recovered Wastewater

Wastewater on a planetary surface



RECOVERING WATER FROM WASTEWATER

International Space Station

- **Recycle urine and humidity condensate**
  - Distillation
  - Adsorption
  - Ion exchange
  - Catalytic oxidation
  - Disinfection

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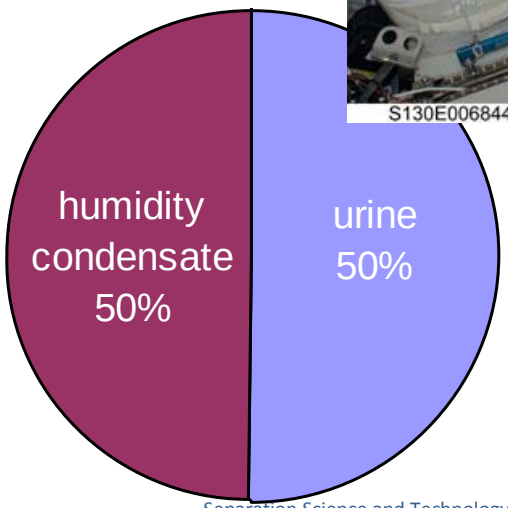
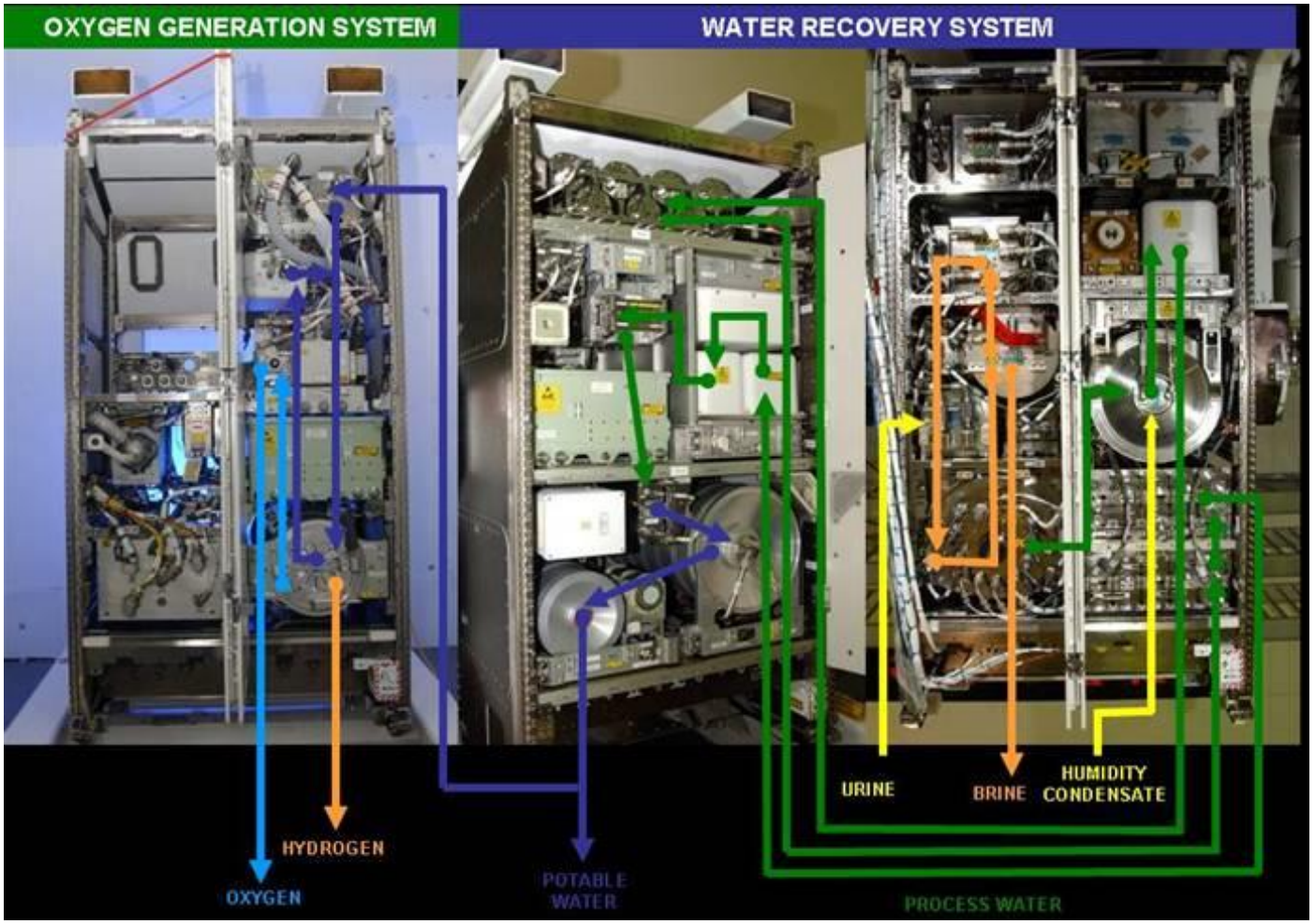


ISS Life Support Systems



Stored Water

On-orbit work with water containers

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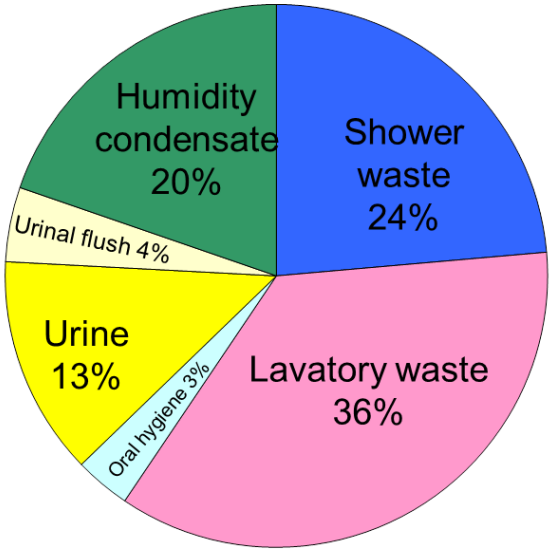
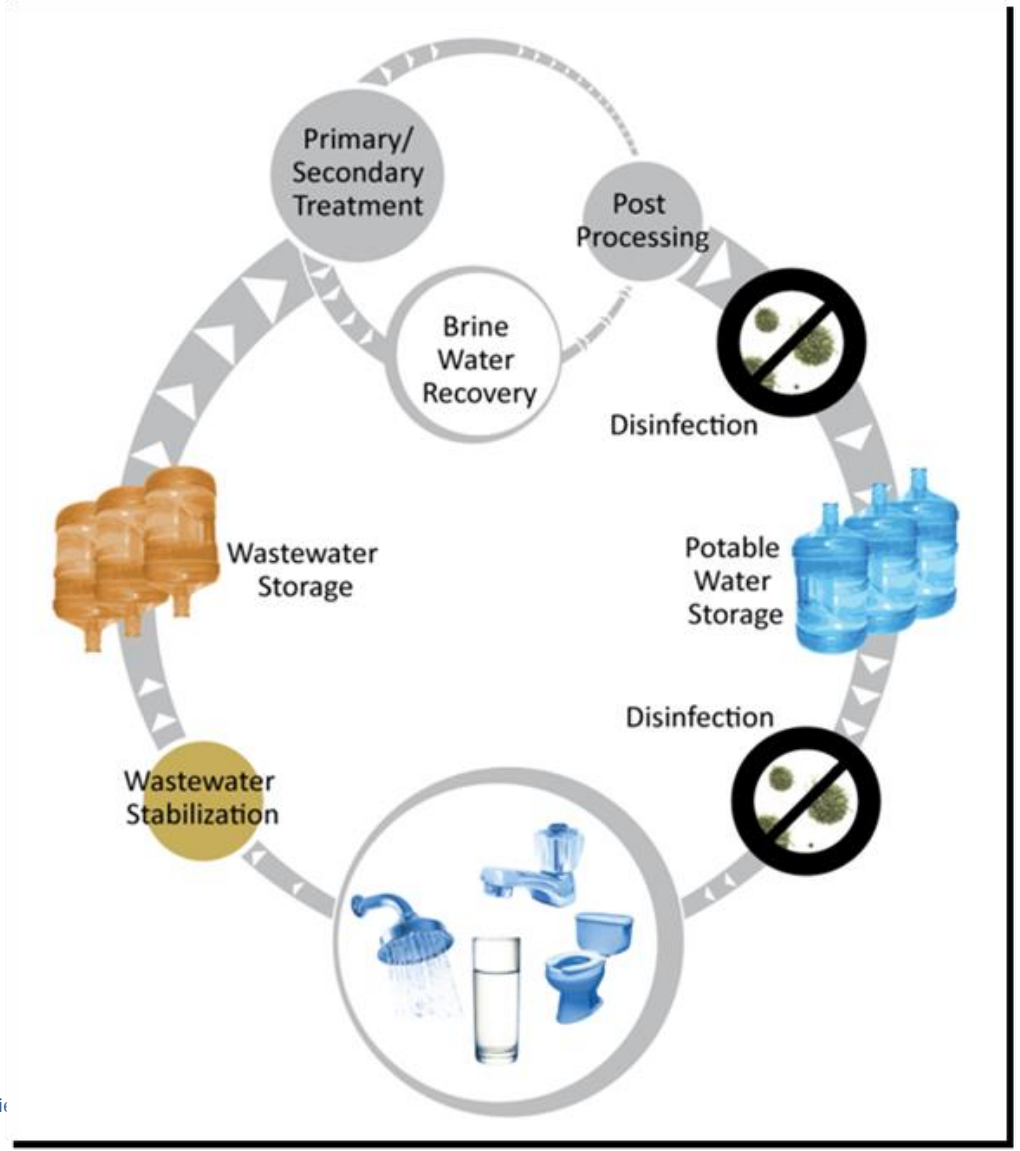
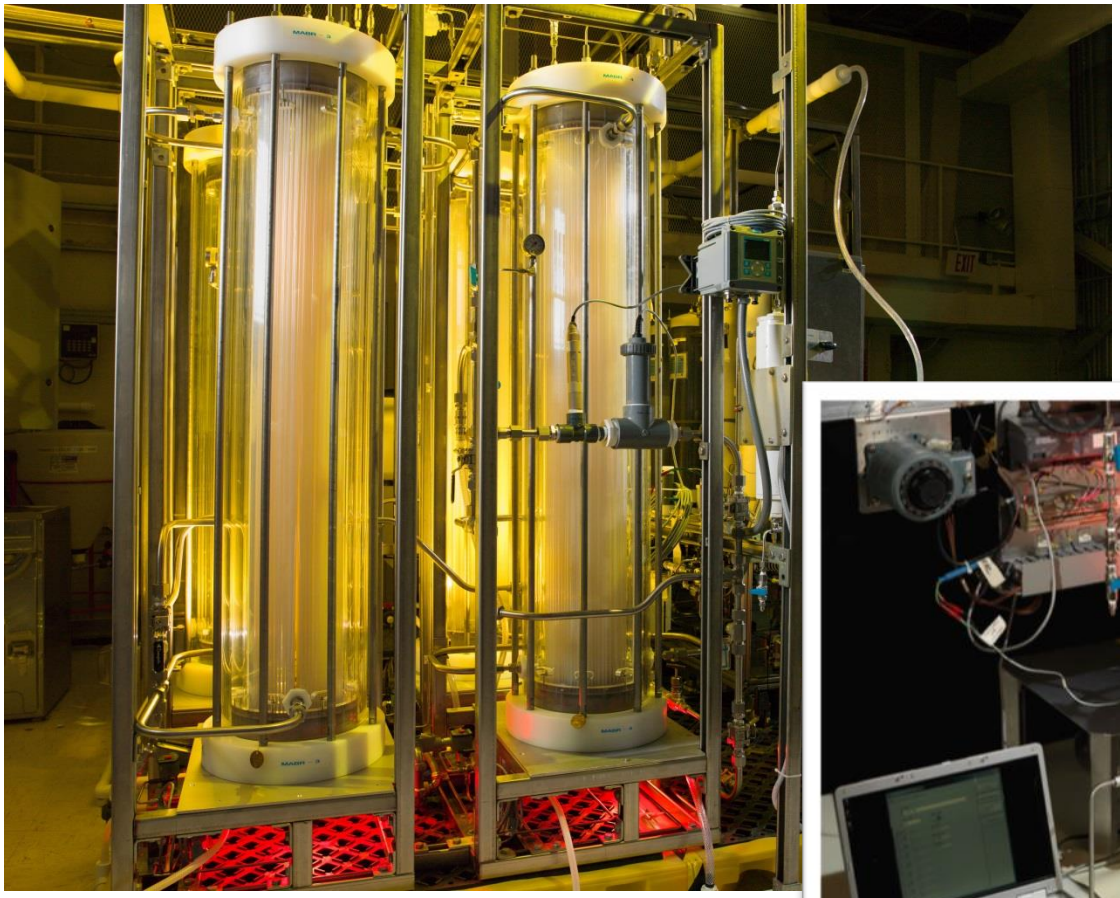
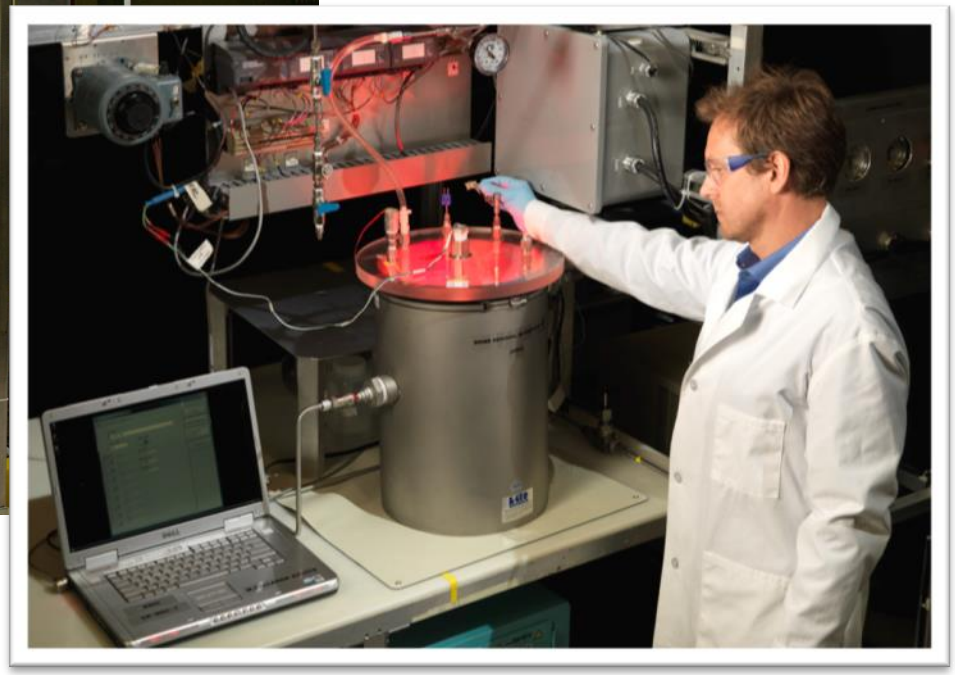
Exploration Systems





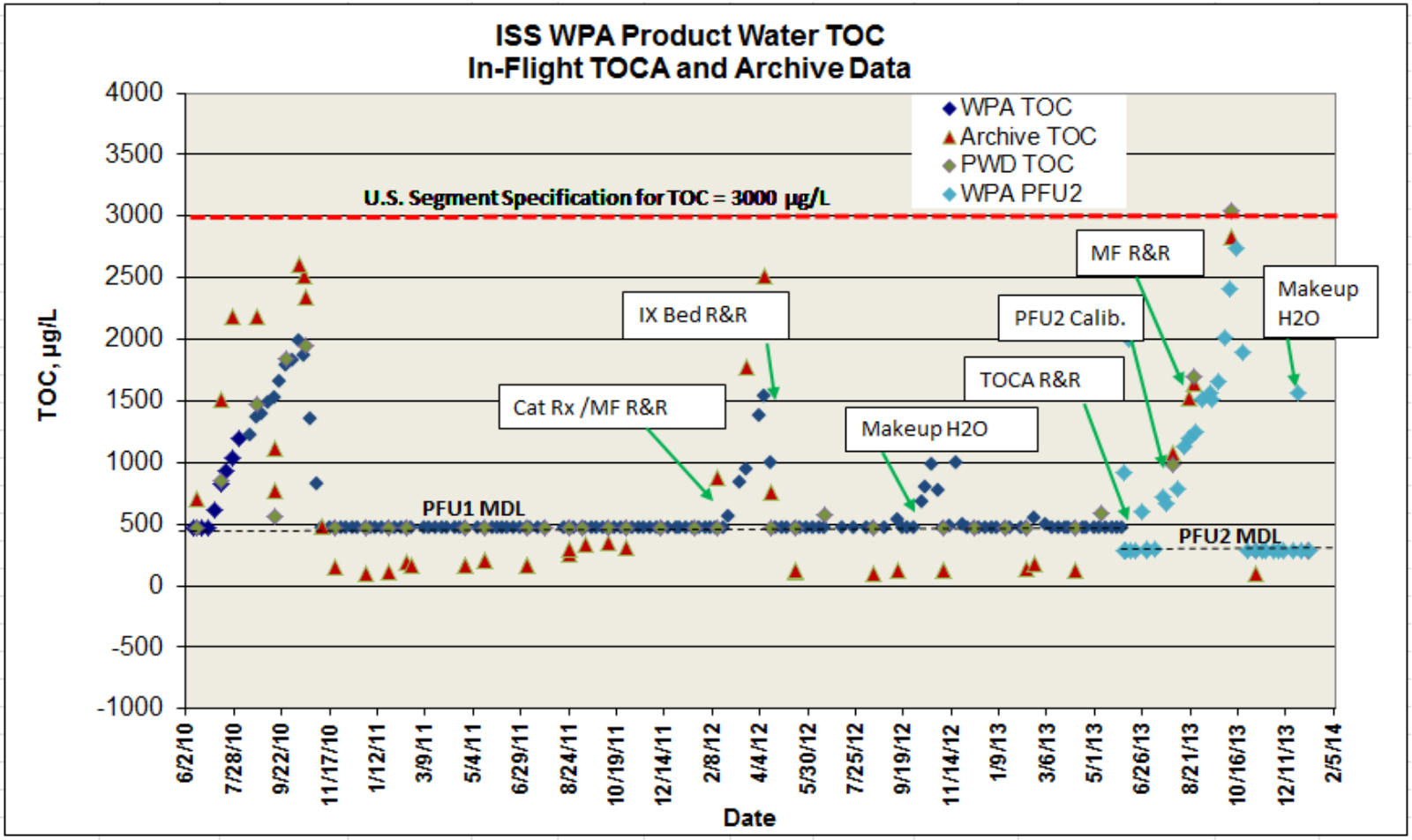
Technology for Exploration





WATER QUALITY FOR HUMANS AND HARDWARE

Drinking Water Quality on ISS

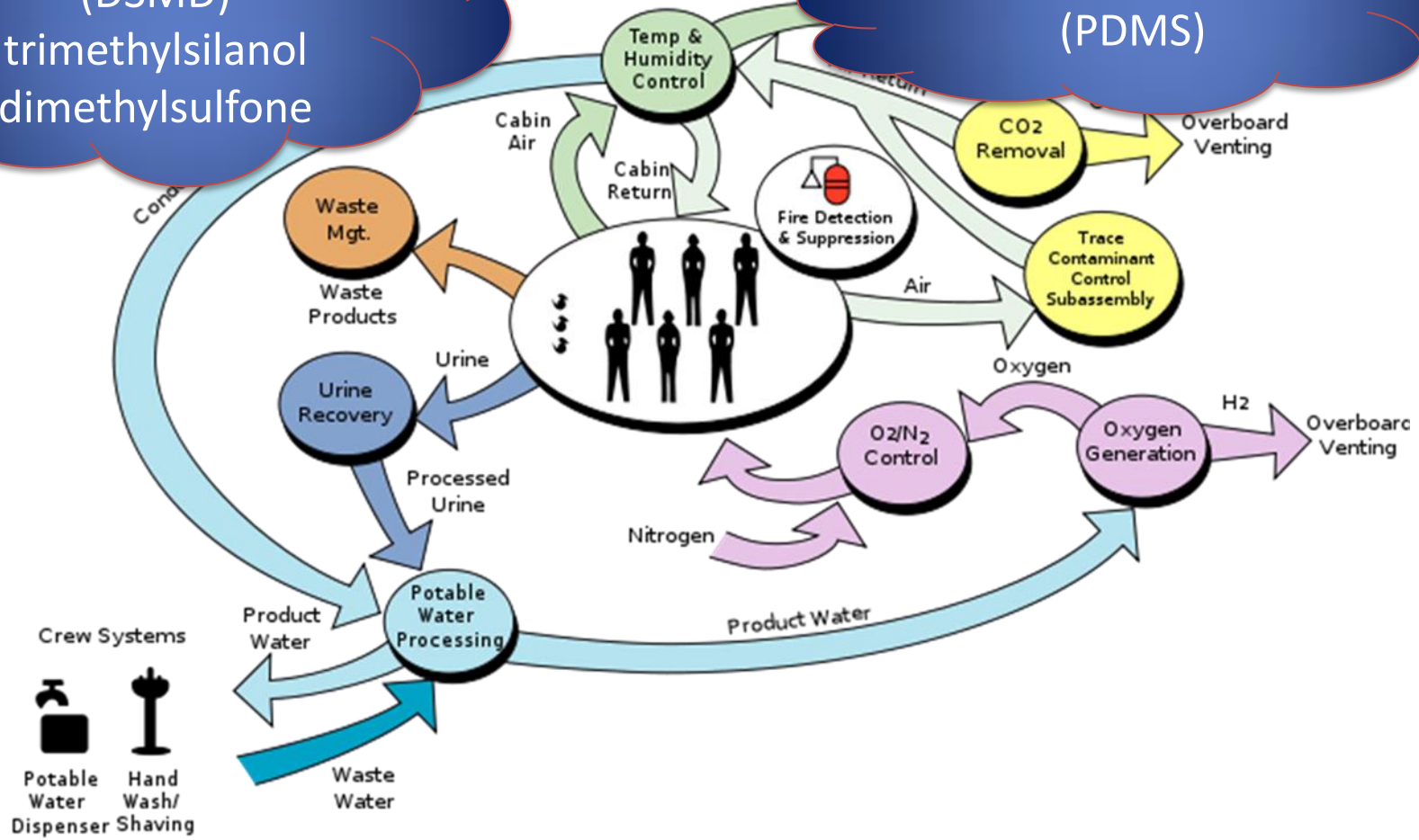


Contaminant identification

Dimethylsilanediol (DSMD)
trimethylsilanol
dimethylsulfone

Metal silicate coating

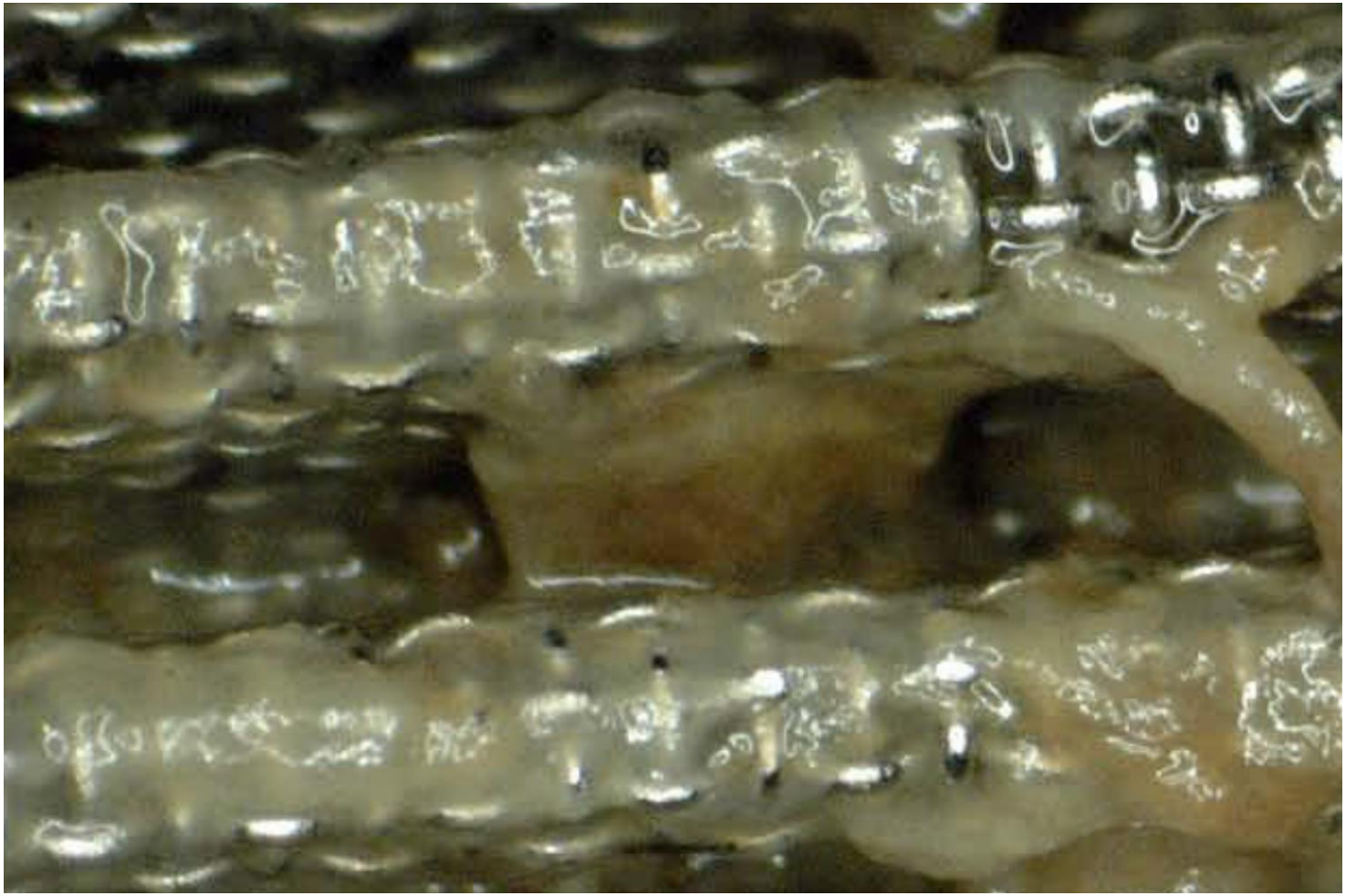
Polydimethylsiloxane (PDMS)



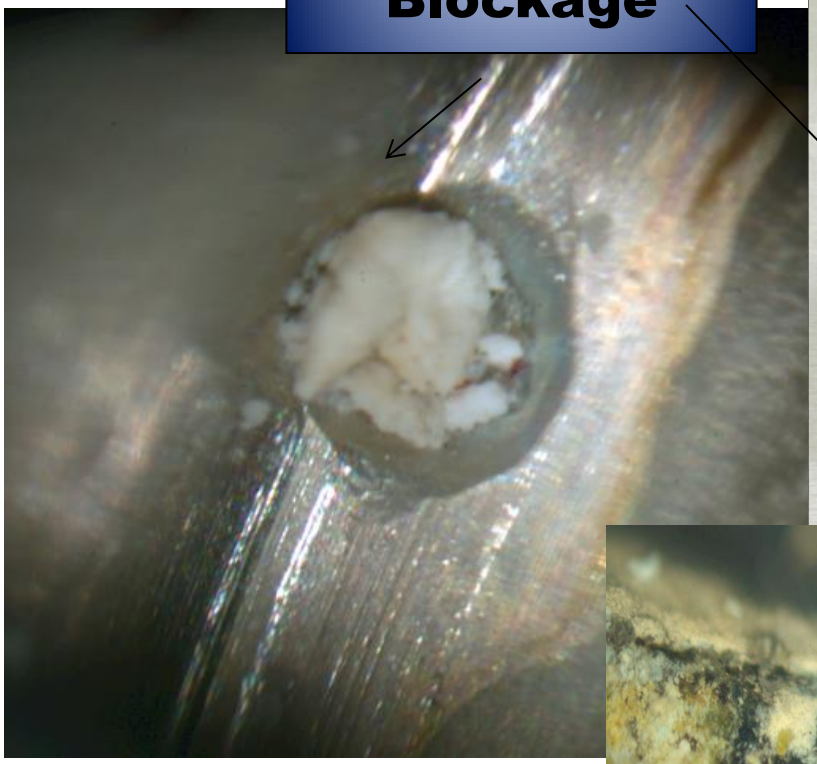
Urine and solubility

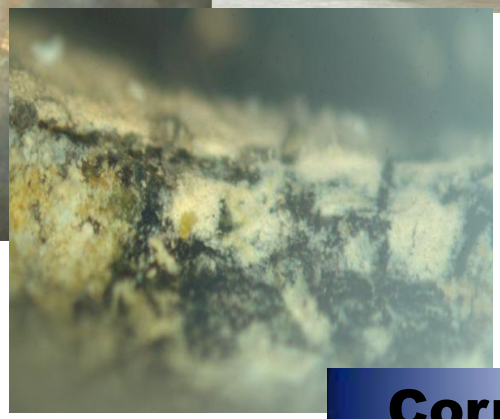
Urine solids on orbit

What happens when you DON'T stabilize



Tear Down and Inspection





Conclusions

- **Water impacts human health and safety in space**
- **Hardware developers need help defining WHAT water quality is required for their hardware**
- **Water recovery enables American's future space exploration**

Thank you

QUESTIONS