

Identification and Significance of Innovation

- Membrane water vapor exchanger (WVX)
- Keeps cabin humidity out of amine CO₂ absorber beds to prevent water loss during bed regeneration
- Very low pressure drop
- Passive process adds no load to thermal control system
- Innovative core design enables very high water recovery

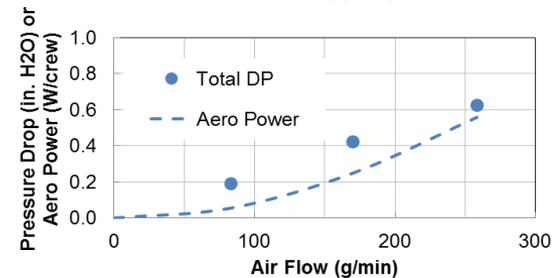
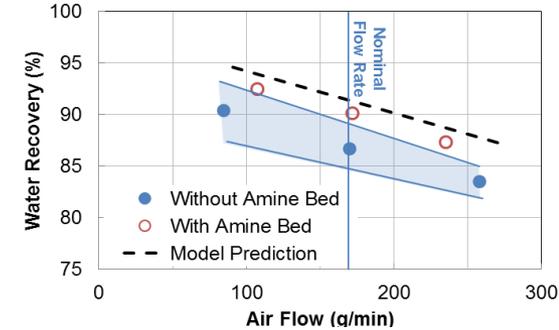
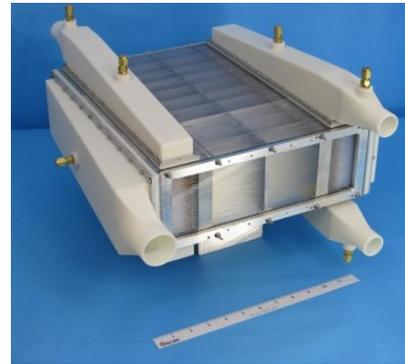
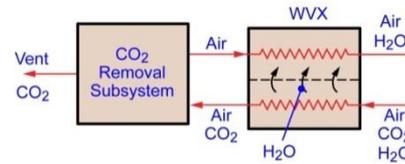
Phase II Research Carried Out

- Developed fabrication methods for high-efficiency WVX
- Assembled prototype WVXs
- Generated performance maps, with and without amine beds in loop
- Demonstrated durability of critical components

TRL at the end of Phase II: 6

Phase II Technical Objectives Achieved

- High water recovery: 88% at nominal design point (5 ACFM/crew, 21°C, 65% RH)
- Low pressure drop: < 0.5 in. H₂O total
- Negligible CO₂ leakage
- Prototypical materials and manufacturing methods
- Successful operation in loop with solid amine beds
- Large water savings (4,000 lb_m for six month mission with six crew)
- Validated design methods
- Quantified ammonia sensitivity



NASA and Non-NASA Applications

- NASA: Environmental control and life support systems for exploration spacecraft
 - Potential for very large water savings
 - Minimal impact on other life support system functions
- Non-NASA: Fuel cell water management
 - Humidify dry reactants using water produced by fuel cell
 - Simplifies system design by enabling water-balanced operation

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