AIAA Houston Technical Symposium
The Advanced Exploration Systems Water Recovery Project: Innovation on 2 Fronts

As NASA looks forward to sending humans farther away from Earth, we will have to develop a transportation architecture that is highly reliable and that can sustain life for long durations without the benefit of Earth's proximity for continuous resupply or even operational guidance. NASA has consistently been challenged with performing great feats of innovation, but particularly in this time of economic stress, we are challenged to go farther with less. The Advanced Exploration Systems (AES) projects were implemented to address both of these needs by not only developing innovative technologies, but by incorporating innovative management styles and processes that foster the needed technical innovation given a small amount of resources. This presentation explains how the AES Water Recovery Project is exhibiting innovation on both fronts; technical and process.

The AES Water Recovery Project (WRP) is actively engineering innovative technologies in order to maximize the efficiency of water recovery. The development of reliable, energy-efficient, and low-mass spacecraft systems to provide environmental control and life support (ECLS) is critical to enable long-duration human missions outside of low-Earth orbit. Recycling of life support consumables is necessary to reduce resupply mass and provide for vehicle autonomy. To address this, the WRP is working on a rotary distiller that has shown enhanced performance over the state-of-the-art (SOA). Additionally, the WRP is looking at innovative ways to address issues present in the state-of-the-art (SOA) systems pertaining to toxicity and calcium scale buildup.

As an AES project, the WRP has a more streamlined Skunk Works® like approach to technology development intended to reduce overhead but achieve a more refined end product. The project has incorporated key partnerships between NASA centers as well as between NASA and industry. A minimal project management style has been implemented such that risks are managed and milestones tracked without overburdening the team with reporting demands that take them away from their work. A lean Systems Engineering (SE) approach has been implemented where project objectives are defined and vetted early without overprescribing the process or limiting the ability to innovate. Finally, we are working with existing flight hardware support organizations like operations, safety, materials and others to impact the system design at the breadboard level. This type of early input is a key to ensuring that the technologies are developed on the right track to becoming space flight worthy.