

Continued Water-Based Phase Change Material Heat Exchanger Development

In a cyclical heat load environment such as low Lunar orbit, a spacecraft's radiators are not sized to reject the full heat load requirement. Traditionally, a supplemental heat rejection device (SHReD) such as an evaporator or sublimator is used to act as a "topper" to meet the additional heat rejection demands. Utilizing a Phase Change Material (PCM) heat exchanger (HX) as a SHReD provides an attractive alternative to evaporators and sublimators as PCM HXs do not use a consumable, thereby leading to reduced launch mass and volume requirements. In continued pursuit of water PCM HX development two full-scale, Orion sized water-based PCM HX's were constructed by Mezzo Technologies. These HX's were designed by applying prior research and experimentation to the full scale design. Design options considered included bladder restraint and clamping mechanisms, bladder manufacturing, tube patterns, fill/drain methods, manifold dimensions, weight optimization, and midplate designs. Design and construction of these HX's led to successful testing of both PCM HX's.