

# NASA SBIR/STTR Technologies

## Lattice Regenerative Cooling Methods (LRCM)

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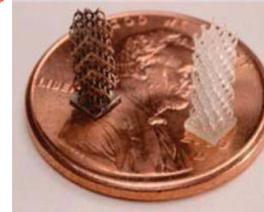
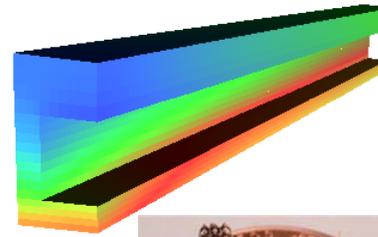
Proposal No.: X2.02-9698



### Identification and Significance of Innovation

ORBITEC is developing novel cooling concepts collectively called LRCM for use in future high thrust in-space propulsion systems. Incorporation of the innovative LRCM structures in thrust chambers for expander cycle engine systems will maximize the heat transfer into the coolant fluid, expand design options, enable substantial cost savings, and reduce lead times for component fabrication. Using rapid prototyping technology, the LRCM hybrid fabrication approach allows for the rapid casting of near-net shape metallic thrust chamber components.

Estimated TRL : (Beginning: 2 End of Phase 1: 3)



### Technical Objectives and Work Plan

During the Phase 1 effort, ORBITEC demonstrated the feasibility of the LRCM fabrication techniques through the following accomplishments:

- Two different LRCM lattice structures designed.
- Attempts were made to fabricate functional prototypes of both LRCM structures, and a conventional chamber.
- Preliminary assessments of fabrication cost and system level performance were completed.
- Modeling showed the most effective LRCM structures offer a significant increase in heat transfer efficiency with pressure drops similar to conventional coolant channels.
- LRCM fabrication technique demonstrated the ability to create high fidelity near net shape castings of structures that cannot be manufactured using conventional techniques.

### NASA and Non-NASA Applications

The mature LRCM technology and manufacturing methods will find broad application to the SLS and other launch vehicle platforms in the areas of upper stage LOX/LH<sub>2</sub> engines, booster engines, RCS, ACS, OMS, and other propulsion systems. Other commercial applications for this cooling technology include industrial burners and large-scale, power-generating gas turbines.

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