



NASA ARC Innovation Fund/IPP 2010

Materials Research and Design of a Novel Solar Thermal Energy System
Using Inflatable Collector Panels, Philip Hammer, ARC code SGE

Project Description and Objectives

Objectives: Demonstrate a prototype solar thermal energy system with inflatable collector structures

Applications: Meet NASA's energy needs for both future space missions and current building infrastructure

Products: Light weight, easily installable solar thermal energy systems with advantages over current technologies

Specific Tasks and Significance

Solar thermal panel design and demonstration - includes advanced thermal insulation inserts

Environmental monitoring of the building; control of the solar-thermal and heat recovery system (enables "intelligent" operation of system)

Engineering model (for evaluating system performance, guiding operation)

Thermal reservoir – (enhances operation under variable weather and seasonal conditions)

Summary of Results

Inflatable collector panel detailed design (materials, geometry, swappable parts)

Integrated system design (thermal reservoir, manifold, evacuated aerogel insulation)

Engineering model of solar panel - calculations

Start of experimental measurements of system pending completion of construction

Deliverables and Milestones

Inflatable solar panels with roof-top mounting, conduits and air handling sub-systems

Environmental sensor system for building

Monitor, control, and performance logging systems supporting solar-thermal system

Thermal reservoir with evac aerogel insulation

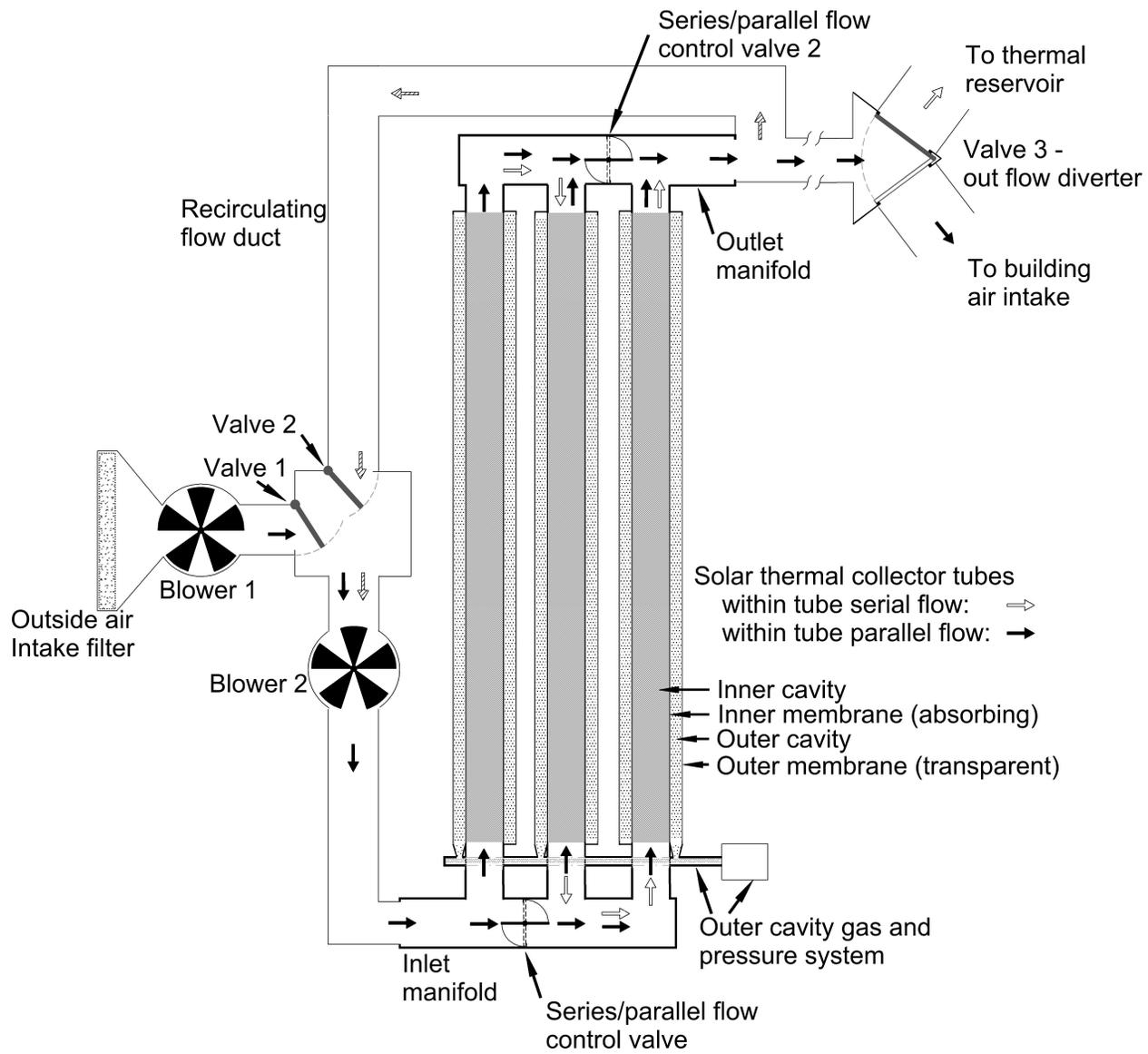
Participants:

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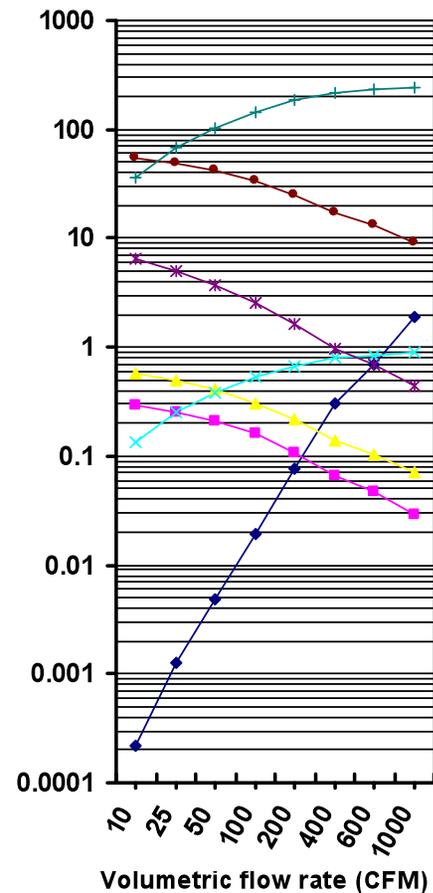
John Lin, ILC Dover LP, Frederica DE (partner)

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System overview of inflatable solar absorber



Tube thermal performance calculations



- ◆ P drop (inches H2O)
- Fract convective loss
- ▲ Fract radiative loss
- ✦ Collector efficiency
- ✱ T rise of air flow (C)
- T(wall)-T(center) (C)
- + Output heat power (W)

Integrated system overview

