

Satellite Thermal Control

Application Challenge:

- Spacecraft Thermal Control for TacSat-4
- Flown in a highly elliptical orbit
- Power levels are in the 200 - 700 Watt range
- Near zero gravity
- Parallel condensers routed to outer skin of spacecraft to reject the heat to space
- Passive thermal switching between radiators to maintain operation through sun and space
- Heat pipe embedded deck plate for electronics mounting

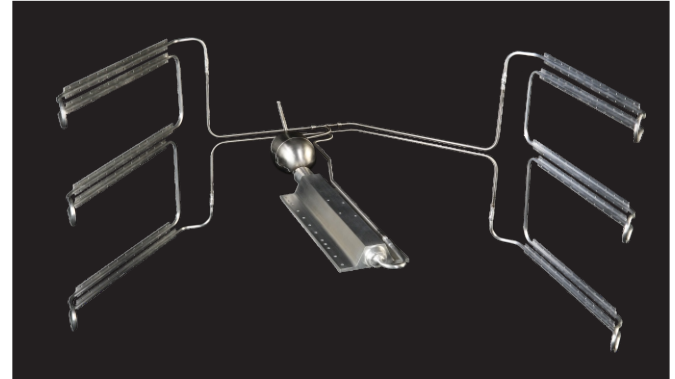


Photo 1: Loop Heat Pipe thermal cooling assembly

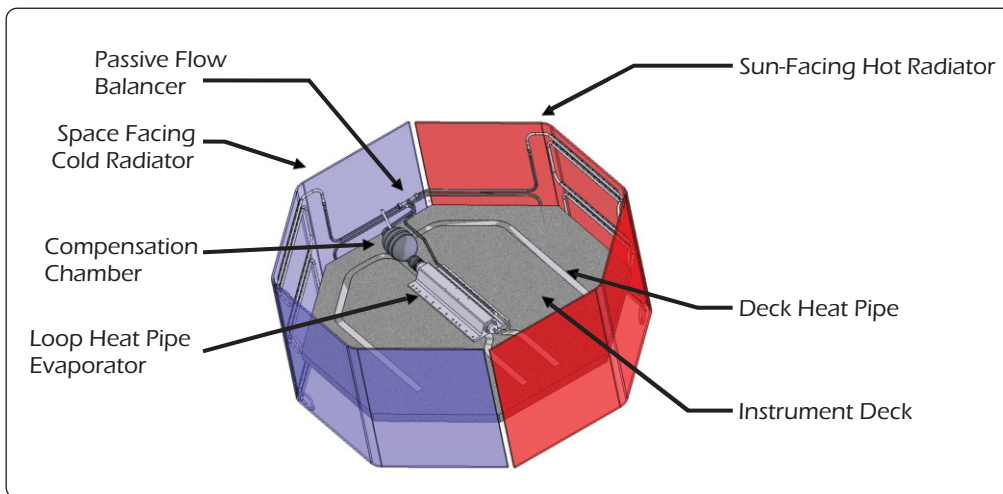


Illustration 1: Loop Heat Pipe thermal cooling assembly mounted inside of mission package



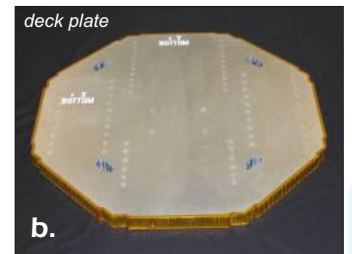
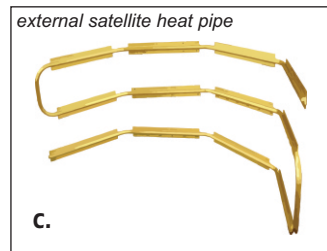
Photo 2: TacSat-4 module assembly with integrated ACT loop heat pipe system

Environmental Challenges:

TacSat-4 is a complex thermal management challenge due to its slowly tumbling elliptical orbit. The satellite tumbles through its orbit changing its orientation with the sun. This requires a special loop heat pipe design to route cooling to where it's needed most. ACT met this challenge by coupling external heat sinks with a dual condenser loop heat pipe and a passive flow balancer.

Mission Results:

ACT successfully manufactured, tested and delivered the thermal control system that exceeded the requirements and specifications by the Naval Research Laboratory. Launch is scheduled for late 2011.



a. Embedded Heat pipes for electronics waste heat collection
 b. Loop heat pipe (photo 1) is mounted to the deck plate (b.)
 c. External skin heat pipes attach to central loop heat pipe condensers in (photo 1).
 The entire assembly is shown in illustration 1.