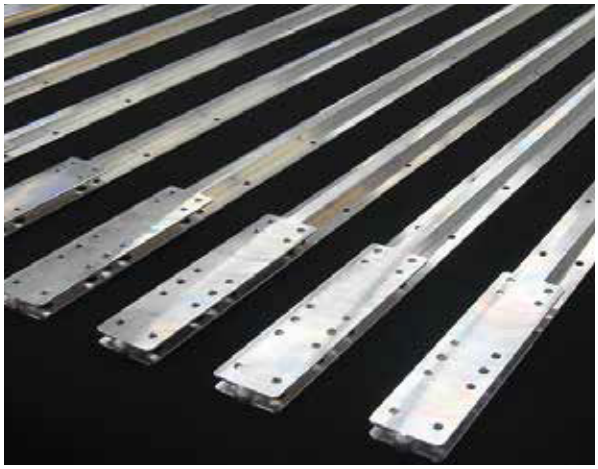
AEROSPACE PRODUCTS

Overview

With trusted expertise in engineering and manufacturing aerospace thermal control systems, ACT consistently delivers innovative solutions to meet the most demanding performance requirements. Our aerospace products group offers cost-effective heat pipe and loop heat pipe products for aerospace thermal control applications.



Constant Conductance Heat Pipes (CCHPS)

Our CCHPs have millions of space flight hours!

Products

CONSTANT CONDUCTANCE HEAT PIPES (CCHPS)

ACT's CCHP's use axially groove wick structures to provide large capacity of heat transport for spacecraft and satellite thermal control. Working fluids include ammonia, propylene, and ethane for different operating temperatures. Applications range from heat transport from satellite payloads to isothermalization of radiator panels. We routinely manufacture 2-D and 3-D CCHPs with single and dual bore designs.

VARIABLE CONDUCTANCE HEAT PIPES (VCHPS)

ACT's VCHPs use specially designed gas reservoirs to provide passive temperature control over a wide variety of heat inputs, sink temperatures and other operating conditions. Applications include heat transport and temperature control of spacecraft electronics in varying thermal radiation environments.

LOOP HEAT PIPES

ACT's LHPs use fine pore, inverted meniscus wicks to transport large amounts of heat (multiple kW) over long distances (10's of meters). Applications include transporting waste heat to large spacecraft radiators, aircraft anti-icing, and aircraft avionics and actuator cooling.

SPACE COPPER-WATER HEAT PIPES (SCWHP) AND HIK™ PLATES FOR SPACE

Use similar operating and design principles as traditional copper-water pipes. However, SCWHPs are uniquely manufactured to survive the severities of spaceflight operation. SCWHPs experience extreme temperature swings during start-up and expansion of the water during freezing cycles. Combined with mission power profiles, this leads to water adversily exposing the microscopic defects in traditional manufactured (terrestrial) water heat pipes. Therefore, ACT has developed precision processing and sealing techniques in order to pass numerous space qualification programs.

With increasing component power in space electronics boxes, the need for enhanced heat transfer at the component level is becoming more and more critical to satellite operation. The qualification of SCWHPs provides the space industry with additional options to use more capable chips in future designs.

ADVANCED PRODUCTS

- CCHPs, VCHPs, and LHPS (20 to 250°C)
- Intermediate temperature heat pipes (250 to 500°C)
- Pressure Controlled Heat Pipes for Milli-Kelvin Thermal Control
- High temperature VCHPs for radioisotope Stirling cooling
- Oxygen production from Lunar regolith (850 to 1050°C)

Processes

Understanding that thermal management, weight, size and structural integrity are all critical aspects to system performance, ACT's aerospace products are designed and manufactured under strict AS9100:2009 certified quality systems and stringent manufacturing and quality control processes.

Examples of the steps in these processes include

- Material certification
- Multi-stage cleaning process with bath monitoring
- Working fluid triple distillation and processing
- Aerospace (AWS D17.1) certified welders
- Helium mass spectrometry leak detection
- Proof and burst pressure verification
- Accelerated aging and thermal cycling

Life Testing

ACT maintains an ongoing life test program of aluminum/ammonia CCHPs to demonstrate that our manufacturing processes meet stringent reliability requirements. Each new extrusion profile is manufactured in a standard configuration, thermally characterized, and placed into life testing at an elevated operating temperature. Periodically, the heat pipes are operated in a performance test fixture and operated at very cold temperatures to look for signs of non-condensable gas (NCG).

Reliability is of paramount importance for all aerospace heat pipes and LHPs. Many satellite applications require the heat pipes and LHPs to operate without any degradation for more than ten years. ACT combines state-of-the-art facilities with world-class engineering to meet or exceed these requirements while paying strict attention to cost and delivery requirements.