

# NASA TECH BRIEF

## Marshall Space Flight Center



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### Compound Heat Pipe Operates Over Broad Temperature Range

#### The problem:

In common heat-pipe applications a single heat pipe is used in transferring heat from one area to another. This arrangement restricts the working-temperature at which the pipe delivers heat, depending on the capability of its working fluid. Standard working fluids do not have very wide working-temperature range. When the input temperature is too low the fluid freezes at the condenser, and no heat is delivered. On the other hand, when the input temperature is too high, the heat capacities of the fluid may not be sufficient to carry the desired heat loads.

#### The solution:

A compound heat pipe operates over broader working-temperature ranges.

#### How it's done:

The new pipe is a combination of two or more heat pipes running adjacent to each other (see figure).

Each pipe carries a different working fluid. In a typical arrangement two pipes are run through one material, or they are connected mechanically, or bonded as two separate units.

One pipe carries a high-temperature working fluid, and the other, a low-temperature working fluid. The temperature range is extended by the fact that at least one pipe is constantly operating, depending on the input temperature. When the temperature is low the heat is conducted by the low-temperature pipe. As the temperature is increased the fluid in the high-temperature pipe melts and begins to conduct heat. At high temperatures most of the heat is conducted by the high-temperature pipe.

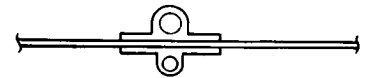
A typical working-temperature range in one two-pipe system is 107° to -135° C (225° to -211° F). The system uses water as its high-temperature fluid and Freon (F-21), or equivalent, as its low-temperature fluid.



(a)



(b)



(c)

- Different Compound Heat-Pipe Configurations:
- Separate Heat Pipes in Alternating Locations
  - Single Extrusion
  - Separate Heat Pipes Positioned Opposite

(continued overleaf)

**Note:**

Requests for further information may be made in writing to:

Technology Utilization Officer  
Marshall Space Flight Center  
Code AT01  
Marshall Space Flight Center, Alabama 35812  
Reference: B75-10313

**Patent status:**

Inquiries concerning rights for the commercial use of this invention should be addressed to:

Patent Counsel  
Marshall Space Flight Center  
Code CC01  
Marshall Space Flight Center, Alabama 35812

Source: H. B. McKee of  
McDonnell Douglas Corp.  
(MFS-23329)