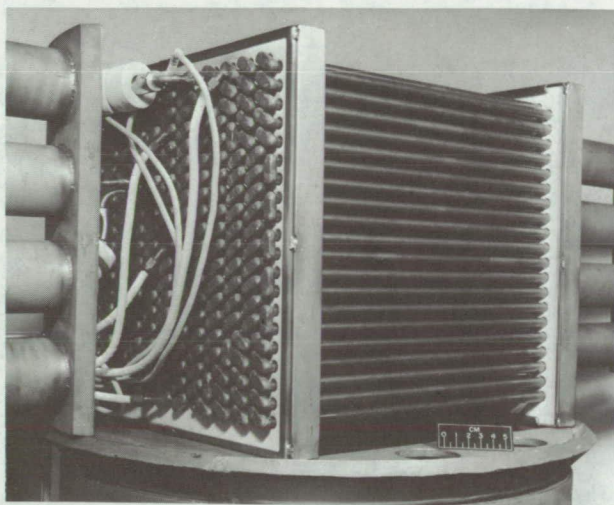


NASA TECH BRIEF



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Compact Electric Heater



A compact forced-convection electric heat source heats inert gas flows to temperatures of from 1250 to 1650°F. This heater was specifically designed to overcome limitations and problems encountered with other heaters used in testing Brayton power systems for advanced spacecraft. Two test systems using commercial resistance heaters of the forced-convection type were too large and required additional amounts of gas in the test system. Thermal response of these units was limited due to the large mass of the heaters and associated piping. A radiant-type heat source designed for testing the Brayton system in a vacuum environment deteriorated during use.

This heater has two basic components: the heat exchanger core and the containment vessel. The

heater core is a staggered tube bank of 500 Inconel tubes which are heated by passing current directly through the tube wall. (Conventional heaters utilize insulated nichrome wire inside the tube.) Each tube has a 3/8-inch outer diameter and a 0.065-inch wall thickness (see fig.). The tubes are 12.5 inches long and are supported on each end by a ceramic header. Nickel pins are brazed into the ends of each tube to serve as electrical connectors. Gas flow is across and normal to the electrically heated tubes. The core occupies about one cubic foot and stands freely within a 21-in.-diameter cylindrical containment vessel constructed of 1/2-inch Inconel plate.

When used with a 208 V 3-phase electrical supply; the heater will provide up to 90 kW of thermal power to the gas. The heat source core is designed to operate with a low Reynolds number (500 to 2500) and low static pressure loss. At a krypton gas flow of 1.7 lb/sec, the pressure drop was 0.20% of the heat source inlet absolute pressure.

Notes:

1. The following documentation may be obtained from:

National Technical Information Service
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.65)

Reference:

NASA-TM-X-52778 (N70-25868), A Compact 90 Kilowatt Electric Heat Source for Heating Inert Gases to 1700°F.

(continued overleaf)

2. Technical questions may be directed to:

Technology Utilization Officer
Lewis Research Center
21000 Brookpark Road
Cleveland; Ohio 44135
Reference: TSP70-10677

Patent status:

No patent action is contemplated by NASA.
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Lewis Research Center
(LEW-11172)