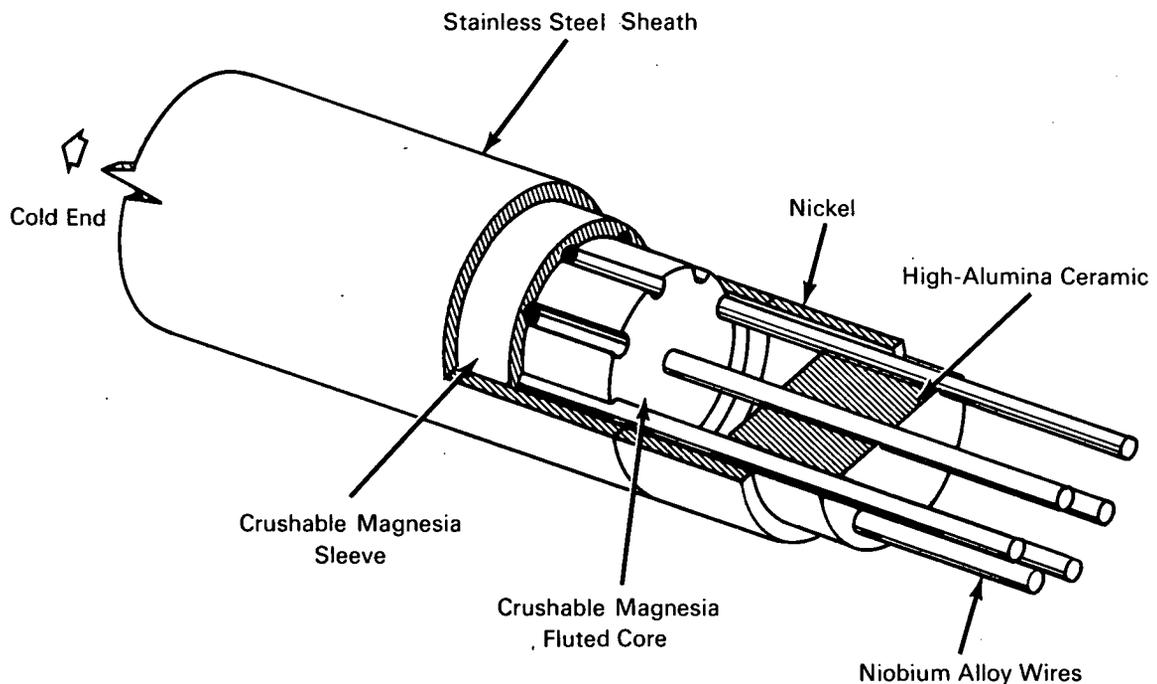


# NASA TECH BRIEF



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## Protected, High-Temperature Connecting Cable



### The problem:

To design a cable that will admit electrical leads into an 1800°F air-environment test chamber. One terminal of the cable must operate at 1800°F. The other terminal, some two feet away, must operate at about 200°F. The cable should have some bending capability for one or two flexures not exceeding 60 degrees. The cable must provide for nine niobium alloy conductors, each 0.017 inch in diameter; the outside diameter of the cable must not exceed 0.375 inch.

### The solution:

A ceramic insulated, swaged stainless steel, sheathed, protective atmosphere cable.

### How it's done:

The internal insulation of the cable is a two-piece crushable magnesia ceramic. One piece is a sleeve that fits over the other, a fluted piece in which wires are positioned. The ceramic-wire assembly is placed in the stainless steel sheath. High-alumina ceramic plugs are brazed to each of the nine wire leads. Short nickel sleeves are brazed to the alumina ceramic plugs at the same time. The assembly is pressure purged with argon, and the nickel sleeve is then TIG welded to the stainless steel sheath. This process is carried out sequentially on each end of the cable. A miniature multipin connector at the cold end of the cable allows connection to a standard flexible cable.

(continued overleaf)

**Notes:**

1. The internal wires are protected from oxidation and embrittlement by the argon purge used during the TIG weld closure.
2. The niobium alloy wires have considerable ductility and elasticity. The thermal expansion mismatch caused by heating is partially absorbed by excess length between the alumina ceramic plugs and by the yielding of the wires.
3. Inquiries concerning this cable may be directed to:

Technology Utilization Officer  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio 44135  
Reference: B67-10461

**Patent status:**

No patent action is contemplated by NASA.

Source: R. E. Engdahl, et al,  
of Consolidated Controls Corporation  
under contract to  
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