https://ntrs.nasa.gov/search.jsp?R=19700000245 2020-03-17T00:14:33+00:00Z

September 1970

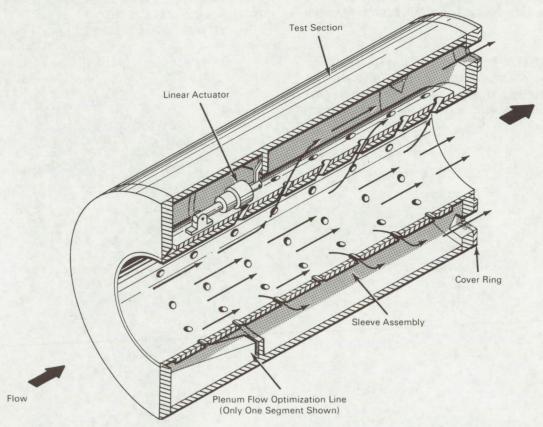
Brief 70 10256

NASA TECH BRIEF



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Division, NASA, Code UT, Washington, D.C. 20546.

Short-Duration, Transonic Flow, Variable-Porosity Test Section



A relatively inexpensive short-duration test facility has been constructed in which extremely high Reynolds number flows are obtained in the subsonic, transonic, and supersonic speed ranges. This device, a section of which is illustrated, has been found useful in solving a number of Reynolds number-dependent aerodynamic and thermodynamic problems in the design and testing of large, high speed vehicles.

Basically, the method employs a type of blowdown wind tunnel in which the usual air storage vessels have

been replaced by a long tube filled with highly pressurized gas. Upon bursting of a diaphragm, a shortduration steady flow on the order of 500 ms is achieved behind a centered rarefaction fan, which propagates into the gas supply tube. Useful testing has been accomplished during this period by expanding the gas to the desired test condition.

Action of the rarefaction fan sets the gas in motion and results in a reduction of its pressure and temperature. The lowered pressure causes flow to pass (continued overleaf)

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government nor any person acting on behalf of the United States Government assumes any liability resulting from the use of the information contained in this document, or warrants that such use will be free from privately owned rights. through the inclined holes in the sleeve assembly, through the plenum chamber, and out the covering.

In conventional chambers, at any given mach number larger then 1, shock and expansion waves, orginating at the test model, travel to the chamber wall, reflect back to the model and confuse the data. This design, employing a sleeve assembly composed of an inner and an outer wall, each with an identical inclined hole pattern with a maximum of 10 percent open area, avoids this problem. By translating the outer wall with respect to the inner wall, the percent open area can be changed from zero to 10 percent, allowing optimum transient wave cancellation at any mach number in the range of interest. Inclined holes restrict outflow from the plenum chamber back to the free stream and a plenum flow optimization liner maintains uniform flow conditions at all points in the test region.

Notes:

1. This equipment has produced Reynolds number flows 4 to 6 times larger than existing long-duration facilities. It also avoids the aerodynamic noise associated with conventional valve diffusers and turbines. 2. The following documentation may be obtained from:

Clearinghouse for Federal Scientific and Technical Information Springfield, Virginia 22151 Single document price \$3.00 (or microfiche \$0.65)

Reference:

NASA-TM-X-53571 (N68-18190) Feasibility Studies of a Short Duration High Reynolds Number Tube Wind Tunnel

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: John W. Davis and Olen E. Hill Marshall Space Flight Center (MFS-20509)