

# NASA TECH BRIEF



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## Experimental Program to Investigate Transonic Flow Around Protuberances

A report is available on a proposed extension of a research program to investigate the transient and steady state aerodynamic flow of turbulent boundary layers around protuberances.

Previous work included a search of the available literature and a small-scale test program. The literature search produced considerable data on steady-state supersonic flow around protuberances, little data on transient state supersonic flow, and no data at all on transonic flow. Thus, in the velocity region in which a vehicle experiences maximum dynamic pressure and aerodynamic loading, the designer had no data on which to predict steady or fluctuating loads in the vicinity of a protuberance.

As an initial attempt to remedy this deficiency, a small-scale test program was conducted using a 14 by 14-in. transonic wind tunnel to investigate the flow around generalized (cylindrical) projections, and also around several specific configurations used on the Saturn V launch vehicle. At best, these tests revealed only qualitative information, since the small size of the model limited the amount of instrumentation and the measurement accuracy. The data from these tests are currently being analyzed.

The experimental design for a large-scale test to obtain more detailed data is the primary subject of this report. A 16-ft square transonic wind tunnel will be used to test both generalized and special-shaped protuberances.

The second section of the report presents a theoretical discussion of the experiment, the construction of the experimental apparatus, and the instrumentation design.

The third section outlines the computing facilities and the various programs needed for data reduction and analysis.

The final section gives many references to direct the interested reader to more detailed information on the background and prior experimentation.

### Notes:

1. This report may be useful to persons involved in aerodynamics research. Also, although no specific results or engineering criteria are given, it may interest those who are engaged in aerodynamic design in the transonic region.
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 CR-61985 (N68-36382), An Experimental Program for the Investigation of Shock-Turbulence Interaction Phenomena.

### Patent status:

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

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