WYLE LABORATORIES - RESEARCH STAFF

QUARTERLY PROGRESS REPORT

FOR JANUARY, FEBRUARY, MARCH, 1966

CONTRACT NO. NAS8-11308

Aerodynamic Noise Research Support

For

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GEORGE C. MARSHALL SPACE FLIGHT CENTER

HUNTSVILLE, ALABAMA

ATTENTION: PR-EC

April 8, 1966

As a result of work at Wyle Laboratories during this quarter, the following two technical reports have been transmitted to the Marshall Space Flight Center Staff.

WR 66-8	"The Acoustic Environment due to Separated Flows and Oscillating Shocks", March 1966
WR 66-23	"Flow Visualization Experiments with Supersonic Separated Turbulent Flow", April 1966

This last report is enclosed.

WR 66-8 gave an analysis of the available information on surface pressure fluctuations caused by supersonic, transonic, and subsonic separated flows and oscillating shocks. Preliminary methods for the prediction of the acoustic environments were presented. It was shown how the steady separated supersonic flow could be regarded as a constant angle wedge of about 12.5^{o}, and the steady separated flows were shown to fall into three broad classes dependent on the reattachment process. It was shown that Reynolds number had a marked effect, and it was suggested that results taken at Reynolds number based on body diameter, less than 5×10^{6} could not be applied with

confidence to the full scale case. This report was a revised and improved version of work presented as Appendix A to the quarterly progress report for April, May, and June, 1965, on this contract.

WR 66-23 (enclosed) reports the experiments on supersonic separated turbulent flow carried out in the Marshall Space Flight Center seven inch supersonic tunnel. These experiments have confirmed the broad features of the supersonic separated flow discussed in WR 66-8. In addition, it is shown that the reattachment shock complex is unsteady and must be expected to generate high levels of fluctuating pressure on the flare surface. The mean reattachment position was shown to move up the flare with increase in flare angle, and the reattachment height was shown to be an approximately constant proportion of the step height for the larger angle flares. Experimental work on the unsteady aspects of the separated flows is continuing and is expected to be the subject of a further report.

Additional work during the present quarter has included refinement of the theoretical work on surface pressure fluctuations due to shock turbulence interaction. Preliminary results on this problem were presented as an Appendix to the last quarterly progress report. The further work on this problem is not yet complete, but it is expected that a final report on the subject will be prepared during the next quarter.

The experimental work on subsonic separated flows at Wyle Laboratories has recently begun. During the present quarter, the experimental rig for this investigation has been modified and improved, and a photograph of the improved separated flow section is attached to this progress report. Experimental work on this program will continue during the coming quarter, but is not expected to be completed until the end of the contract period.

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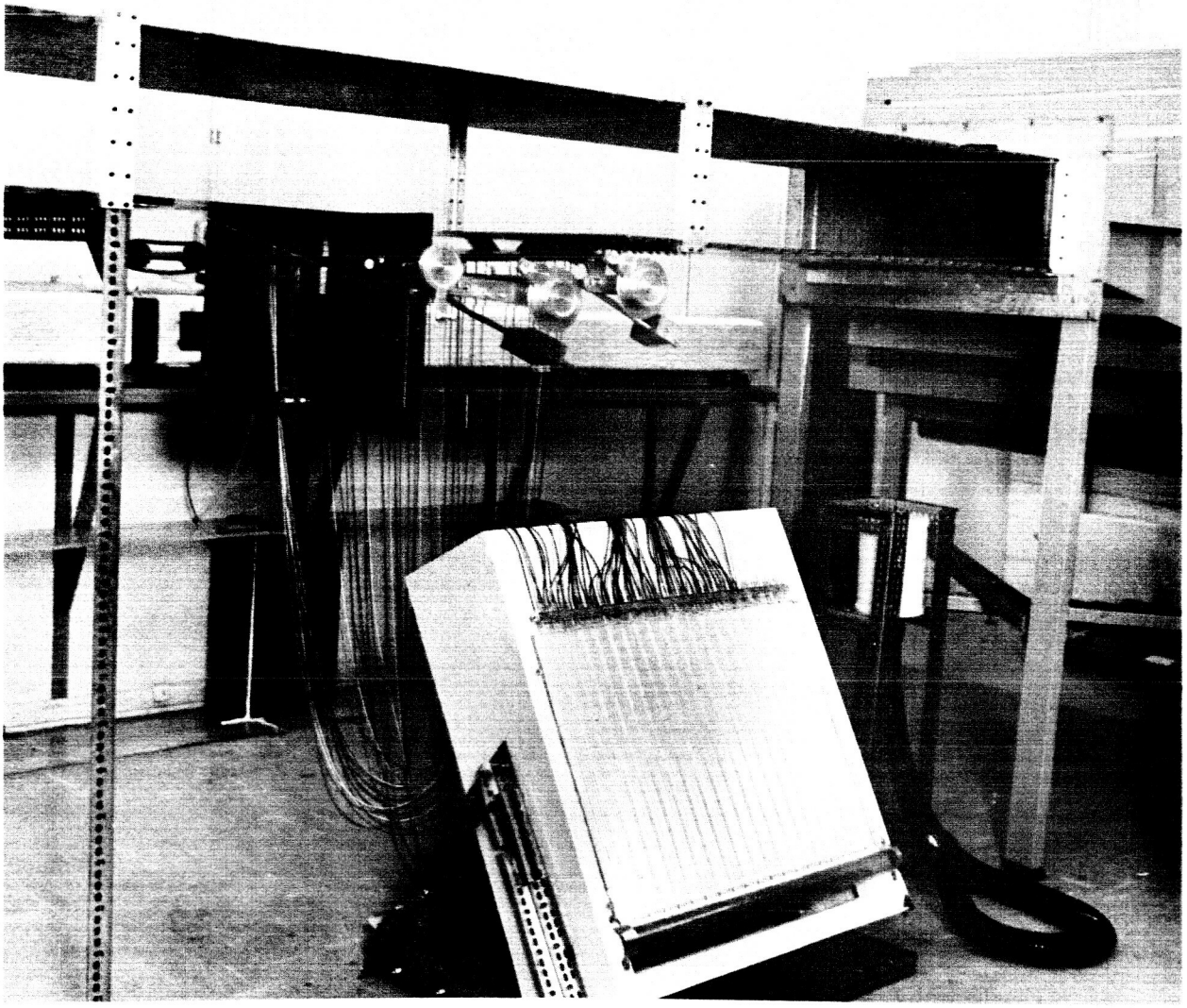
Approved by K. McKeldred for
Kenneth McK. Eldred
Director of Research



The Special Separated Flow Section Installed in Wyle Laboratories Low Speed Wind Tunnel