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SECOND MONTHLY PROGRESS REPORT

CONTRACT NAS 2-1460

N64-27912

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This report summarizes the work accomplished under NASA Contract NAS 2-1460 during the time period from July 1 to July 31, 1963. The effort was concentrated in two basic areas: the assembly of the various numerical techniques, and the start of the programming of the solution on the IBM 7094 computer.

During the month of July the various numerical procedures for solving the inviscid external and internal flow field by the Method of Characteristics were completed and forwarded to the Mathematical Analysis Department. Those procedures forwarded include the routine for shock and expansion corners, shock reflections, and the routines for the determination of external focused isentropic compression surfaces, for both real and ideal gases. The routines for shock intersection, shock-vortex intersection, and shock-boundary layer interaction have, as yet, not been completely assembled. It is estimated that these latter routines will be completed and forwarded to Math Analysis by August 16.

The numerical procedures for the laminar and turbulent boundary layer solutions were also assembled, however only preliminary solutions for the turbulent cases have, to date, been forwarded to the Mathematical Analysis Department for programming. As mentioned in the last progress report both a modified discontinuity analogy solution, references 1 and 2, and a classical solution, reference 3, of the turbulent boundary layer were developed. A comparison of results obtained from these preliminary solutions indicates that they are quite similar, see figure 1. This figure shows the form factor, H, obtained on a isentropic axially symmetric compression surface at Mach 8.0. Comparisons are currently being made in an attempt to compare these solutions with UAC test data. These will be reported in the next progress report.

The programming of the external inviscid flow solution was completed during July along with about half of the remaining routines associated with the inviscid core flow. These latter routines are expected to be programmed by August 9 at which time a test case will be submitted for program checkout. The programming

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of the viscous-inviscid integrated solution is scheduled to start August 14 for the laminar boundary layer case. No date has yet been set for the integration and programming of the turbulent boundary layer solution and the shock intersection-interaction solution.

No major problems have been encountered in the program. Some uncertainity still exists as to the type of turbulent boundary layer solution to use and whether or not to include the centrifugal force term in the boundary layer equations. These problems are however expected to be resolved in the near future.

John L. Benson
Program Technical Director

JLB:js

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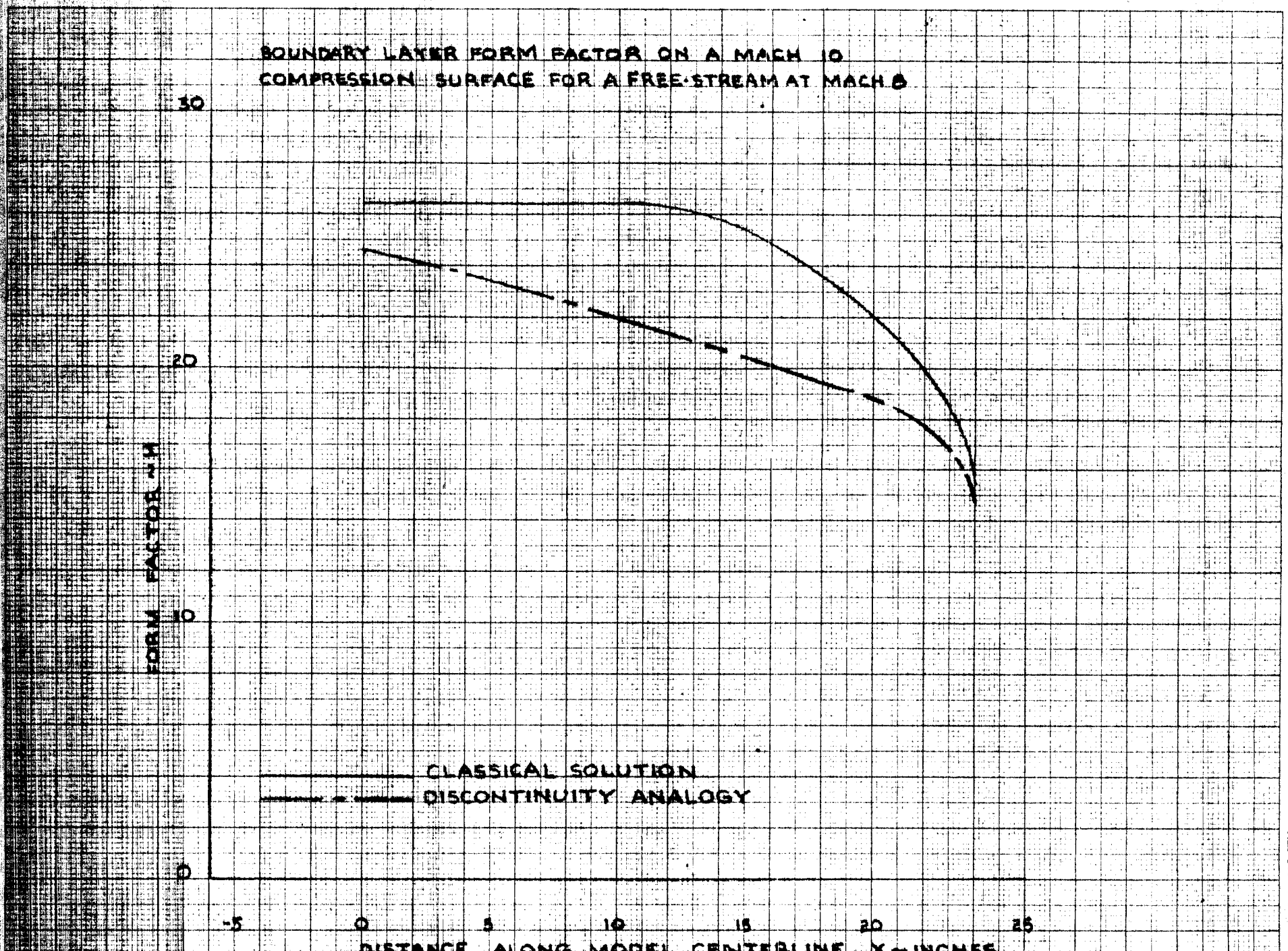

FIG. 1

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