

QUARTERLY PROGRESS REPORT NOS. 2 AND 3
CHARACTERISTIC SYSTEMS FOR ROTATIONAL
FLOWS OF A COMPRESSIBLE GAS

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CHARACTERISTIC SYSTEMS FOR ROTATIONAL
FLOWS OF A COMPRESSIBLE GASQUARTERLY PROGRESS REPORT NO. 2Work Done by Mr. J. Klein from January 1, 1954 to April 1, 1954

The basic relations for straight line bicharacteristics in irrotational axial symmetric flows have been determined. These relations are of the form

$$\frac{\partial C}{\partial \alpha} = H(\alpha, \beta, C, B, r), \quad \frac{\partial C}{\partial \beta} = K(\alpha, \beta, C, B, r), \quad (1)$$

where B and r are linear functions of β and H and K are specified functions of their arguments. Thus, the necessary and sufficient condition for simple waves of this type is that

$$\frac{dH}{d\beta} = \frac{dK}{d\alpha} \quad (2)$$

If this last relation is solved for C, the sound speed, then Equation 1 furnishes two consistency relations. It is shown that C cannot be constant along any such simple wave.

QUARTERLY PROGRESS REPORT NO. 3Work Done by Mr. J. Klein from April 1, 1954 to July 1, 1954

Present computations indicate that no irrotational axial symmetric flows with straight line bicharacteristics exist. However, one class of

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rotational axial symmetric flows with straight line bicharacteristics does exist. The properties of these flows will be studied in the future.

Work Done by Mr. N. Coburn from June 15, 1954 to July 1, 1954

It is shown that the vortex flows previously described (see Quarterly Progress Report No. 1) are the only plane rotational flows with straight line bicharacteristics (simple waves). Future plans are to study those plane rotational flows for which the Mach number is constant along a bicharacteristic (simple waves of type two).

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