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Doctoral Thesis

N. L. Arora: **A Unified Theory for Linearized Shock-on-Shock Interaction Problems***, Thesis Delft University of Technology 1969, 152 pages.

Author's Summary

In this dissertation a linearized theory is proposed in a unified fashion to treat the problem of interaction of a moving plane shock of arbitrary strength which encounters supersonically moving obstacles like two-dimensional thin aerofoils, axisymmetric slender bodies and three-dimensional thin wings.

The problem has been posed generally in terms of initial and boundary values for the perturbation pressure of the non-uniform flow field produced behind the shock as a result of the interaction. The closed form analytic solutions are obtained by using the method of integral transforms to the initial-boundary-value problems. The density field and the shape of the shock are also deduced.

In Chapter 1 of the thesis the problem is introduced by surveying the literature and the basic assumptions made in the theory are discussed.

In Chapter 2, firstly the linearization of the equations of motion of the unsteady rotational flow is carried out. Secondly the shock relations are deduced connecting the unknown downstream perturbations with the known upstream perturbations at the disturbed shock. Finally, the expressions for the upstream disturbance field are presented.

In Chapters 3, 4, 5 and 6 the general theory of shock-on-shock interaction is deduced for thin two-dimensional aerofoils, axisymmetric slender bodies, three-dimensional thin wings, and aerofoils at yaw. As detailed examples the results of the theory are applied to the interaction with a thin wedge, a slender conical projectile, a symmetric delta wing at zero incidence, a flat plate delta wing with supersonic leading edges, and a thin wedge at yaw.

Finally in Chapter 7 the various numerical results are presented for the examples considered in the preceding chapters and a discussion follows.

Journal of Engineering Math., Vol. 4 (1970) 186

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