Pressure And Entropy Variations Across The Weak Shock Wave Due To Heat Conductivity Effects

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Abstract : *The nonlinear ordinary differential equations describing the normal shock wave structure problem are reduced to a system of two coupled nonlinear differential equations. An approximate analytical solution for this problem is obtained and investigated. Using this solution, all other flow variables are then given as explicit functions of the dimensionless coordinate x. The effects of heat conductivity on the distributions of velocity, pressure and entropy are discussed.*

Key-words:- Pressure, Entropy, Shock wave, Heat, Fluid

1.Introduction

The structure of one-dimensional shock waves is one of the important problems in gas dynamics. This problem interested many authors [1]-[10] for some years, and the search for solutions of Navier -Stokes equations has always been their main concern .

Rankine [5] obtained an explicit solution of the Navier- Stockes equation by assuming the heat conductivity to be constant while the viscosity being neglected. Hamad [11] gave a solution for the case when heat conductivity is temperature dependent, and again the viscosity being neglected. Solutions in both cases are given in the form x = x (u), where x is the dimensionless distance coordinate and u is the dimensionless velocity. In these calculations, the other flow variables are then obtained as explicit functions of u, and hence implicit functions in x.

In this paper we shall seek solutions to the shock wave structure
problem by assuming the heat conductivity to be temperature dependent and the viscosity being neglected. In the mean time, no rigorous procedure seems to exist for obtaining the exact solution which gives the flow variables as explicit functions of x.

The aim of the present work is to give an approximate analytical solution to the basic