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Regular Refraction of an Oblique Shock Wave at the Tangential Discontinuity

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Abstract

This article is devoted to the regular refraction of an oblique shock wave at the tangential discontinuity. The calculations were performed for an ideal gas model using the numerical and analytical methods for solving the equations called the dynamic compatibility conditions at the tangential discontinuity. Basic equations are given. This article examines the domains of shock wave configurations with various types of reflected discontinuities within them, including characteristic refraction (induced by the change in char), and refraction patterns with a reflected shock and a reflected rarefaction wave. Each refraction domain was mapped by type with regard to the Mach number, adiabatic exponents of two flows, and the intensity of a refracted oblique shock wave. The boundary between the regular and irregular refractions was found. Research results can be applied to simulate the shock waves processes that occur in rotating detonation engines, as well as in stationary detonation engines.

Key words: shock wave, refraction, reflected discontinuity, discontinuity along characteristic surface (char), rarefaction wave.

1. Introduction