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Abstract. Since the beginning of the 1990s, the advent and success of US “cruise-missile diplomacy”¹ has resulted in the emergence of cruise missiles as a coercive political tool and a versatile military weapon. During the initial phase of the last two decades, cruise missiles were predominantly deployed by a select group of advanced industrial countries, in particular the United States.

Winner of the Summerfield Book Award. The next great leap for jet propulsion will be to power-sustained, efficient flight through the atmosphere.

A modern treatment of hypersonic aerothermodynamics for students, engineers,

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scientists, and program managers involved in the study and application of hypersonic flight. It assumes an understanding of the basic principles of fluid mechanics, thermodynamics, compressible flow, and heat transfer. Ten chapters address: general characterization of hypersonic flows; basic equations of motion; defining the aerothermodynamic environment; experimental measurements of hypersonic flows; stagnation-region flowfield; the pressure distribution; the boundary layer and convective heat transfer; aerodynamic forces and moments; viscous interactions; and aerothermodynamics and design considerations. Includes sample exercises and homework problems. Annotation copyright by Book News, Inc., Portland, OR

This book is a self-contained text for those students and readers interested in learning hypersonic flow and high-temperature gas dynamics. It assumes no prior familiarity with either subject on the part of the reader. If you have never studied hypersonic and/or high-temperature gas dynamics before, and if you have never worked extensively in the area, then this book is for you. On the other hand, if you have worked and/or are working in these areas, and you want a cohesive presentation of the fundamentals, a development of important theory and techniques, a discussion of the salient results with emphasis on the physical aspects, and a presentation of modern thinking in these areas, then this book is also for you. In other words, this book is designed for two roles: 1) as an effective classroom text that can be used with ease by the instructor, and understood with ease by the student; and 2) as a viable, professional working tool for engineers, scientists, and managers who have any contact in their jobs with hypersonic and/or high-temperature flow.

The prospects for realizing a magnetohydrodynamic (MHD) bypass hypersonic airbreathing engine are examined from the standpoint of fundamental thermodynamic feasibility. The MHD-bypass engine, first proposed as part of the Russian AJAX vehicle concept, is based on the idea of redistributing energy between various stages of the propulsion system flow train. The system uses an MHD generator to extract a portion of the aerodynamic heating energy from the inlet and an MHD accelerator to reintroduce this power as kinetic energy in the exhaust stream. In this way, the combustor entrance Mach number can be limited to a specified value even as the flight Mach number increases. Thus, the fuel and air can be efficiently mixed and burned within a practical combustor length, and the flight Mach number operating envelope can be extended. In this paper, we quantitatively assess the performance potential and scientific feasibility of MHD-bypass engines using a simplified thermodynamic analysis. This cycle analysis, based on a thermally and calorically perfect gas, incorporates a coupled MHD generator-accelerator system and accounts for aerodynamic losses and thermodynamic process efficiencies in the various engine components. It is found that the flight Mach number range can be significantly extended; however, overall performance is hampered by non-isentropic losses in the MHD devices.

Demand for high-speed propulsion has renewed development of the supersonic combustion ramjet engine (Scramjet engine) for hypersonic flight applications.

The renewed interest in high-speed propulsion has led to increased activity in the

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development of the supersonic combustion ramjet engine for hypersonic flight applications. In the hypersonic regime the scramjet engine's specific thrust exceeds that of other propulsion systems. This book, written by a leading researcher, describes the processes and characteristics of the scramjet engine in a unified manner, reviewing both theoretical and experimental research. The focus is on the phenomena that dictate the thermo-aerodynamic processes encountered in the scramjet engine, including component analyses and flowpath considerations; fundamental theoretical topics related to internal flow with chemical reactions and non-equilibrium effects, high-temperature gas dynamics, and hypersonic effects are included. Cycle and component analyses are further described, followed by flowpath examination. Finally, the book reviews experimental and theoretical capabilities and describes ground testing facilities and computational fluid dynamics facilities developed for the study of time-accurate, high-temperature aerodynamics.

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