"Numerical Computation in Magnetofluid Dynamics"

Abstract:
The equations of magnetofluid dynamics are not homogeneous of degree one with respect to the state vector and cannot therefore be directly flux vector split. They are usually solved in nonconservation form. Last year a method was presented that first modifies these equations into “homogeneous of degree one” conservation form and then uses a modified Steger-Warming Flux Splitting algorithm for their solution. This algorithm is extended herein and applied to solve a problem of significant current interest - potential drag reduction for a hypersonic flight vehicle through the interaction of an applied magnetic field with the surrounding flow field. Specifically, real gas flow at Mach 10.6 about a sphere-cone body with a magnetic dipole placed at the sphere center is numerically simulated with varying dipole strength. The results are in agreement with the experimental observations of Ziemer and the theoretical results of Bush forty years ago in that the bow shock standoff distance increased, flow gradients within the shock layer decreased and pressure fell off more rapidly from the stagnation point with increased imposed magnetic field strength. Contrary to speculation, the drag actually increased with magnetic dipole strength. Heat transfer, however, did decrease substantially.

Friday, November 3, 2000
3:00 PM in 335 Jabara Hall

Please come join us for refreshments before the lecture
at 2:30 p.m. in room 353 Jabara Hall.