962-35-845 **Sunčica Čanić**, **Barbara L Keyfitz** and **Eun Heui Kim*** (ehkim@math.uh.edu), 4800 Calhoun Rd, Department of Mathematics, University of Houston, Houston, TX 77204. *A free boundary problem for a quasilinear degenerate elliptic equation: weak shock reflection in the UTSD equation.*

We present the existence result for the subsonic flow for the unsteady transonic small disturbance equation where the equation becomes degenerate elliptic on part of the boundary and part of the (nondegenerate) boundary is a free boundary problem. This is a joint work with Čanić and Keyfitz. Our problem is the case when the state behind the reflected shock is supersonic and constant, and becomes subsonic further downstream. The reflected shock becomes transonic, is adjacent to the sonic line (the degenerate boundary), and is curved. Using the Rankine-Hugoniot conditions along the reflected shock, we derive a free boundary problem for the transonic shock, and the governing equation has an oblique derivative boundary condition there. Hence the problem has a mixed boundary conditions in the domain bounded by the degenerate boundary, the free boundary, a cut off boundary (a far-field condition), and a wall. We prove the existence of a solution by approximating regularized problems. From the sequence of solutions of regularized problems, constructing a local lower barrier uniformly, we apply local compactness arguments to extract a limit which solves the problem. We show that the solution is smooth and continuous up to the degenerate boundary. (Received September 27, 2000)

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