

## TURBULENT FLOW MODELING OF NONIDEAL AIRBLAST

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The largely inviscid nature of ideal blast waves is quantitatively understood and well represented by current blast wave computations. However, for nonideal blast waves the situation is considerably more complicated both in its inviscid and turbulent viscous structures. The application of inviscid techniques to their study can be seriously misleading. In fact the non ideal blast is in many ways a fully merged flow field in that the near surface vertical flow region is intimately coupled to the inviscid precursed shock- Thus the usual boundary layer approximation, applicable to ideal blast wave study, is not possible.

Assuming turbulent viscous effects are critical for accurately predicting nonideal airblast structure, the sophistication level necessary to achieve the required fidelity must be addressed. The inherent unsteadiness of the flow, and the complexity of the phenomena lead to the expectation that turbulence will be in a highly nonequilibrium, and for a wide variation in turbulent conditions. A dynamic second order closure model is the minimum level of turbulence modeling which possesses these features. Such a model is included in the MAGIC code developed at SIAC. Turbulent closure is achieved via additional transport equations for turbulent energy and dissipation rate. These parameters are used to define an eddy diffusivity which under the assumption of gradient diffusion results in an approximation to the turbulent airblast flow. The model has been applied extensively to the study of ideal and nonideal shocks for real environments and laboratory scale shock tubes. Model details will be discussed and a nonideal airblast application will be compared with experimental data. It will be shown that inviscid predictions of nonideal flow overpredict the nonideal airblast threat due to their exclusion of turbulence effects.