

**EXAMPLES OF TESTING AND IMPLEMENTATION OF NUMERICAL CONCEPTS IN  
GENERAL PURPOSE CFD PROGRAM**

Milorad B. Dzodzo

\*Westinghouse Electric Company, Cranberry, PA 16066, USA

\*\*CFD Unit, ME Building, Imperial College, Exhibition Road, London, UK

Fax: +1 724 720 0909 Email: dzodzomb@westinghouse.com

**ABSTRACT**

The MAC pressure and velocity based numerical algorithm by Harlow and Welch [1965], developed in early 1950s in Los Alamos Laboratory allowed latter more general approaches and development of various algorithms for turbulent and two-phase flows. However, at that time, due to the limited computational capabilities and numerical stability issues, the implementations were restricted to two dimensional transient cases. In early 1970s SIMPLE, Patankar and Spalding [1972], and other algorithms were developed at Imperial College (IC) by a number of Prof. Spalding's students allowing three dimensional steady state implementations for parabolic and later on elliptic flows which utilized limited hardware. This was followed by the development and benchmarking of various turbulence and multi-phase models and algorithms and resulted in the first general purpose and commercial CFD program PHOENICS in 1981. Further improvements of numerical algorithms, testing of the implementation of various numerical schemes and boundary conditions for arbitrary shaped domains continued at IC with PHOENICS as a platform. Implementation of numerical concepts without having access to the entire source code features specific challenges and requires preplanning program organization and capabilities in order to accept user scripts. Two examples documented in Dzodzo [1987] and Dzodzo and Spalding [1986] are presented in this paper.

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\* Current author address

\*\* Address where presented work had been performed