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FSWAVE

FSWAVE is a computer program that calculates the non-linear free surface characteristics of a free surface distributed by an arbitrary hull configuration. The hull configuration can be either completely submerged or surface piercing. Multiple hulls may also be modeled. The program is written as a “plug-in” module, which couples with the VSAERO panel code. VSAERO patches on the ship hull provide the pressure and skin friction distributions and the hydrodynamic forces. Special FSWAVE patches constructed with desingularized panels above the free water surface can satisfy the non-linear boundary condition on the free surface. The procedure can predict the wave forms produced by and the wave resistance of floating or submerged bodies traveling through calm water with a constant forward speed. The flow past a ship performing a steady circular turn on the free surface may also be modeled.

Recent Successful Applications of VSAERO/FSWAVE

- A detailed study of the wake wash generated by a series of high speed catamaran ferries
- An examination of free surface effects on tank measurements of submarine models

Current Features and Capabilities

- VSAERO (source and dipole) panels on the ship hull surface
- Desingularized source panels above the free surface
- Non-linear free surface boundary condition satisfied by an iterative process
- Dynamic sinkage and trim are determined during the iterative process
- Open and Radiation conditions are fulfilled using “staggered grids”
- Shallow water effects can be modeled using images to represent the ocean bottom
- Fully separated transom sterns can be modeled
- Lifting flows (rudders, hydrofoils, etc.) can be modeled

Documentation

The input and output structure is identical to that used for the VSAERO program. Two additional input records are required to provide several additional parameters such as the Froude Number, water depth, etc. A special FSWAVE supplement to the VSAERO User’s Manual describes the underlying theory and the input structure. A sample-input case is included.