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SEMI-ANNUAL PROGRESS REPORT

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COMPUTATION OF BROADBAND MIXING NOISE FROM TUBOMACHINERY

PERIOD COVERED BY THIS REPORT

SEPTEMBER 1, 1991 TO FEBRUARY 29, 1992

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Papers (supported by the grant) published or submitted for publications are:

1. "Discretization errors inherent in finite difference solution of propeller noise problems," *AIAA Journal*, Vol. 30, 608-615, 1992.

2. "Radiation boundary condition and anisotropy correction for the Helmholtz equation," submitted to the Journal of Computational Physics.

3. "Dispersion-Relation-Preserving finite difference scheme for computational acoustics," AIAA paper 92-02-033 (submitted for *Journal* publication).

RESEARCH RESULTS

Time dependent CFD solutions are often contaminated by parasite waves. These waves consist of high frequency grid to grid oscillations. They are known to propagate with unusually high speed. The parasite waves are extremely undesirable creations of finite difference schemes. They degrade the quality of the solution. They introduce spurious nonlinear effects into the computed solutions. During the last six months we initiated and carried out a study of these waves. The scope of the study covers the generation of these waves and their propagation characteristics. Most important of all we have developed a way to selectively damp out these waves without affecting the main wave components. The effectiveness of the selective damping is demonstrated by a number of examples including wave solutions with discontinuities: Part of this work was presented at the recent ICASE/NASA Langley Research Center Computational Aeroacoustics Workshop. This work will appear in print in the workshop preceding.

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