PACKAGE ID - 000644AL00000 DELTAE+

KWIC TITLE - Design Environment for Low-Amplitude Thermoacoustic Engines

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LIMITATION CODE -UNL **AUDIENCE CODE -** UNL

COMPLETION DATE - 10/01/1993 **PUBLICATION DATE -** 10/01/1993

DESCRIPTION - In thermoacoustic engines and refrigerators, and in many simple acoustic systems, a one dimensional wave equation determines the spatial dependence of the acoustic pressure and velocity. DELTAE numerically integrates such wave equations in the acoustic approximation, in gases or liquids, in user-defined geometries. Boundary conditions can include conventional acoustic boundary conditions of geometry and impedance, as well as temperature and thermal power in thermoacoustic systems. DELTAE can be used easily for apparatus ranging from simple duct networks and resonators to thermoacoustic engines refrigerators and combinations thereof. It can predict how a given apparatus will perform, or can allow the user to design an apparatus to achieve desired performance. DELTAE views systems as a series of segments; twenty segment types are supported. The purely acoustic segments include ducts and cones, and lumped impedances including compliances, series impedances, and endcaps. Electroacoustics tranducer segments can be defined using either frequency-independent coefficients or the conventional parameters of loudspeaker-style drivers: mass, spring constant, magnetic field strength, etc. Tranducers can be current driven, voltage driven, or connected to an electrical load impedance. Thermoacoustic segment geometries include parallel plates, circular and rectangular pores, and pin arrays. Side branches can be defined with fixed impedances, frequency-dependent radiation impedances, or as an auxiliary series of segments of any types. The user can select working fluids from among air, helium, neon, argon, hydrogen, deuterium, carbon dioxide, nitrogen, helium-argon mixtures, helium-xenon mixtures, liquid sodium, and eutectic sodium-potassium. Additional fluids and solids can be defined by the user.

PACKAGE CONTENTS - Media Directory; Software Abstract; LA-CC-93-8; Media Includes Executable Module, Sample Problem Input;

SOURCE CODE INCLUDED? - No

MEDIA QUANTITY - 1 3.5 Diskette

METHOD OF SOLUTION - Numerical integration of coupled ordinary differential equations for (complex) pressure, (complex) velocity,

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METHOD OF SOLUTION -(CONT) and (real) temperature using a shooting method.

COMPUTER - APPLE MACINTOSH

OPERATING SYSTEMS - Off the Shelf Requires Math Co-Processor

PROGRAMMING LANGUAGES - FORTRAN IV

SOFTWARE LIMITATIONS - Minimal

SOURCE CODE AVAILABLE (Y/N) - N

UNIQUE FEATURES - This is the only thermoacoustics software package available

OTHER PROG/OPER SYS INFO - Requires Math Co-Processor

HARDWARE REQS - DELTAE runs comfortably on anything at least as sophisticated as a 286 personal computer with math coprocessor and 300 kilobytes of free RAM. Requires Math Co-Processor.

TIME REQUIREMENTS - Simple cases such as the examples provided run in about a second.

REFERENCES - Ward, W.C and Swift, G., Design Environment for Low-Amplitude ThermoAcoustic Engines, LA-CC-93-8, November 1993.

ABSTRACT STATUS - Submitted December 1993. Released AS-IS January 7, 1994. Contains no source code. Re-released AS-IS April 1994.

SUBJECT CLASS CODE - MT

KEYWORDS -
COMPUTER PROGRAM DOCUMENTATION
D CODES
HEAT ENGINES
REFRIGERATORS
COMPUTER-AIDED DESIGN

EDB SUBJECT CATEGORIES -
990200 420400 330100 421000 420200

SPONSOR - DOE/ER

PACKAGE TYPE - AS - IS