

**PACKAGE ID** - 001129UNIXW00 TAOS

**KWIC TITLE** - Trajectory Analysis and Optimization System

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**LIMITATION CODE** -COPY                   **AUDIENCE CODE** - LIM

**COMPLETION DATE** - 01/01/1996   **PUBLICATION DATE** - 12/09/1995

**DESCRIPTION** - TAOS is a general-purpose software tool capable of analyzing nearly any type of three degree-of-freedom point-mass, high-speed trajectory. Input files contain aerodynamic coefficients, propulsion data, and a trajectory description. The trajectory description divides the trajectory into segments, and within each segment, guidance rules provided by the user describe how the trajectory is computed. Output files contain tabulated trajectory information such as position, velocity, and acceleration. Parametric optimization provides a powerful method for satisfying mission-planning constraints, and trajectories involving more than one vehicle can be computed within a single problem.

**PACKAGE CONTENTS** - Media Directory; Software Abstract; README for TAOS; SAND95-1652; Media Includes Source Code, Executable for PC, Compilation Instructions, Linking Instructions, Sample Problem Input Data;

**SOURCE CODE INCLUDED?** - Yes

**MEDIA QUANTITY** - 2 3.5 Diskettes

**METHOD OF SOLUTION** - TAOS numerically integrates a set of point-mass equations of motion representing each vehicle's center-of-gravity position and velocity. The vehicle's body attitude is determined from guidance rules, and TAOS assumes the vehicle has some type of control system that lets it maintain the body attitude. TAOS contains several atmosphere and earth models, and atmospheric winds can be specified. Trajectory information can be obtained in many different coordinate systems including inertial, earth fixed, geocentric, and geodetic. Nonlinear, parametric optimization can be used to vary trajectory parameters to minimize an objective function subject to equality and inequality constraints. Details on the method of solution are in SAND95-1652.

**COMPUTER** - UNIX WORKSTATIN

**OPERATING SYSTEMS** - Windows-95 or Windows-NT, Silicon Graphics IRIX 5.3 (UNIX)

**PROGRAMMING LANGUAGES** - C++

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**SOFTWARE LIMITATIONS** - TAOS is a batch program where the user provides input files and TAOS creates output files. No user interaction occurs during execution. No graphical user interface is provided. On IBM PC's TAOS is run from a DOS window by typing a command, and on the Silicon Graphics workstations, TAOS is run from a shell window by typing a similar command. TAOS does not provide a plotting capability. Output trajectory files contain columns of numbers which can be plotted with a variety of plot packages or spreadsheets.

**SOURCE CODE AVAILABLE (Y/N)** - Y

**UNIQUE FEATURES** - TAOS is designed to provide the user flexibility to solve many trajectory problems, and at the same time be easier to use than other similar codes. Aerodynamic and propulsion data is given in tables where the user controls the functional relationships with a simplified programming language. New variables can be defined to control options in the tables from the trajectory description. Similarly, new trajectory output variables can be defined that are functions of the standard output variables. Any number of trajectories, each representing a vehicle, can be computed within a single problem. The motion of one vehicle relative to others can be computed and intercept trajectories can be flown. Optimization is an integral part of TAOS and is used to satisfy trajectory constraints.

**RELATED SOFTWARE** - TAOS does not require any additional software to run.

**OTHER PROG/OPER SYS INFO** - TAOS supersedes the Trajectory Simulation and Analysis Program (TSAP) used at Sandia for trajectory analysis from 1988-1995 and the Point-Mass Simulation Tool (PMAST) used from 1985-1988. Neither of these trajectory codes were officially released to ESTSC. Although TAOS is officially designed for Silicon Graphics workstations and IBM PC's, it has been compiled and executed successfully on Hewlett-Packard and Sun workstations and on Cray supercomputers.

**HARDWARE REQS** - IBM PC's should have at least 16Mb of memory and at least a 486/66 processor. Approximately 5Mb of disk space is required. Silicon Graphics Indigo workstations should have at least 32Mb of memory and an R4000 processor. Approximately 5 Mb of disk space is required.

**TIME REQUIREMENTS** - Run time requirements depend highly on the complexity of the trajectory. They can vary from a few seconds for a simple ballistic trajectory to several hours for a complex maneuvering trajectory with optimization.

**REFERENCES** - David E. Salguero, Trajectory Analysis and Optimization System (TAOS) User's Manual, SAND95-1652, December 1995.

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**REFERENCES - (CONT)**

**ABSTRACT STATUS** - Submitted 12/4/96. Released AS-IS 12/19/96.

**SUBJECT CLASS CODE** - P

**KEYWORDS -**

COMPUTER PROGRAM DOCUMENTATION  
T CODES  
MANUALS  
TRAJECTORIES  
REENTRY  
REENTRY VEHICLES  
AIRCRAFT  
MISSILES  
COMPUTERIZED SIMULATION  
COMPUTER CALCULATIONS  
DATA ANALYSIS

**EDB SUBJECT CATEGORIES -**

990200 450500

**SPONSOR** - DOE/DP

**PACKAGE TYPE** - AS - IS