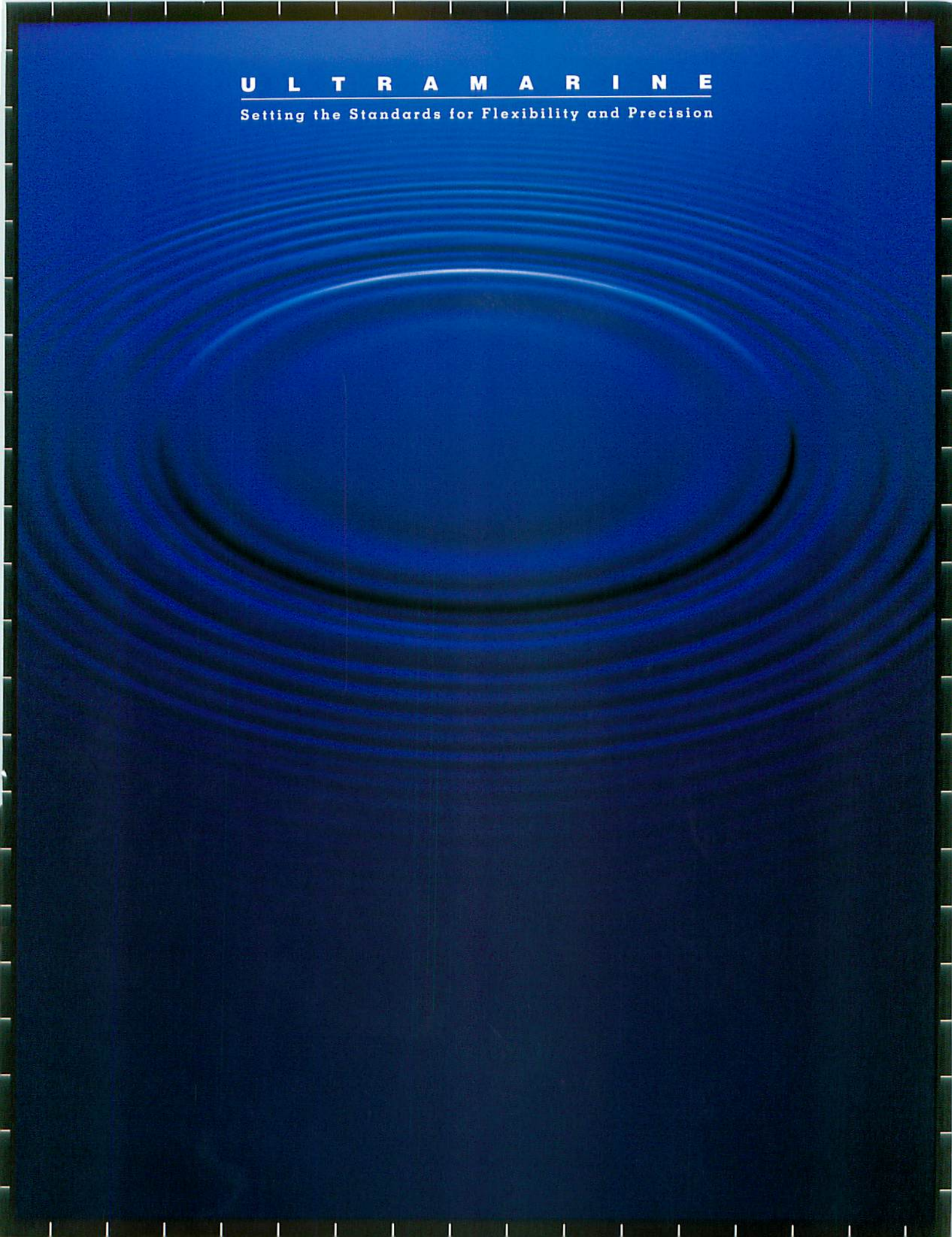
U L T R A M A R I N E

Setting the Standards for Flexibility and Precision



Ultramarine's innovative scientific software provides the tools necessary to design and analyze marine structures and operations of the offshore engineering industry. Since our inception in 1977, we have established a reputation as creators of software tools that set industry standards for flexibility and precision.

We're innovators and we strive to maintain a position on the forefront of technical achievement. That means software development is a constant and on-going process for Ultramarine. We anticipate rather than react to the increasingly sophisticated analysis the offshore engineering environment requires.

Quite frankly, we're the best. We're honest and we work hard to create software that not only serves the needs of the offshore engineer, but also solves problems in the simplest way possible.

SEMI DIFFRACTION MESH

AN EVOLUTION OF ENGINEERING SOFTWARE SOLUTIONS

Ultramarine's OSCAR has been the world-wide industry standard for design and analysis of all types of structures which float on the ocean. Since its introduction in the late '70s most deep water structures employed OSCAR in some facet of the analysis, design, fabrication or installation process.

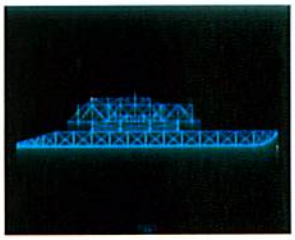
Recently we recognized that the industry would require more sophisticated analyses. The expanding computational power means the traditional methods of problem solving using several different models is now obsolete. The old approach was highly inefficient and error-prone, requiring substantial quality assurance efforts to reconcile differences between models.

In addition, it was nearly impossible to obtain a proper analysis of the complete picture by only viewing selected parts of it. The solution? Productivity tools that addressed the evolving needs of the offshore industry and integrated all aspects of a problem.

MOSES: A MODERN ENGINEERING LANGUAGE

MOSES, a new language that is an integrated approach to modeling, simulating and analyzing the stresses in marine environments, was the next step in the evolution of a family of software products that serve the industry. This new language is a complete offshore engineer's toolbox. It offers the flexibility to create new models, document them, and assess their validity—all with a single program. It also recognizes that temporally-sensitive operations require flexibility and that complex problems don't have a single path of solution.

In addition to specialized capabilities, the MOSES language is rich in general utilities which address these issues, simplifying even the most complex projects. Most results of a MOSES simulation are available for interactive reporting, graphing, viewing in three dimensions, and statistical interpretation. And, you can specify precisely the data items you want written, rather than examining lengthy general reports, in a search of a specific block of data.



MOSES also provides all the elements you'd expect to find in a high-level language, including:

- **Looping Options** Blocks of data can be entered automatically, rather than manually.
- **Conditional Execution** Routines that execute only when data changes.
- **Variable Definition** Specific data can be defined as a variable which can then be plugged into other models or used in later operations.
- **Macro Capability** User-defined macros mean commands don't have to be repeated.

The MOSES language is built upon a proprietary database manager specifically designed for the storage and retrieval of scientific models and the results of their simulations. By storing all data in a database, MOSES is totally restartable. You can perform some tasks interactively, stop, then seamlessly restart the program to perform other tasks in the background. The database even allows different types of simulation with

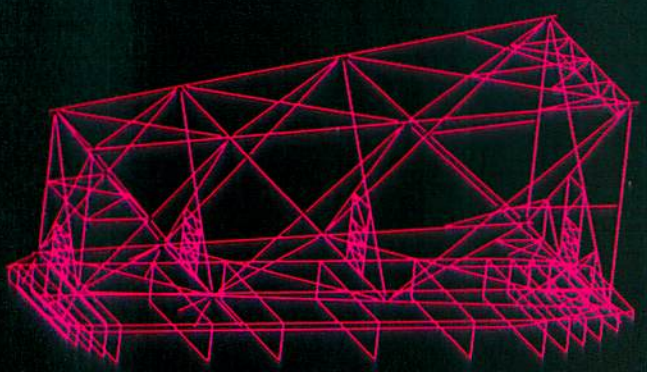
the same model and the ability to perform a stress analysis for all types concurrently.

Users of conventional software must consider marine problems in two steps: a simulation followed by a stress analysis. This two-pass approach requires two different programs. In contrast, MOSES performs both of these analyses and investigates all aspects of the problem. This database architecture also eliminates the agony of transferring files and learning the idiosyncrasies of several programs.

MODELING

The richness of the MOSES modeling language gives it the power and flexibility to perform both simulation and stress analysis. A MOSES stress analysis model consists of a set of beams, plates and connectors which can also model load generating attributes. Special constructs allow the user to model other types of loads as well as define areas and masses. This architecture means MOSES can compute hydrodynamic forces on a system using three hydrodynamic theories: Morrison's equation, two dimensional diffraction theory, or three dimensional diffraction theory.

MOSES also provides sophisticated conventions for modeling structural components. Connectors are not simply "restraints" to MOSES, but rather a method of connecting different bodies. Options include: catenary mooring lines; tension-only and compression-only nonlinear springs; rigid connectors such as pins and



Installation of 4-Pile Jacket
TRANSPORTATION ANALYSIS

launch ways; and even true nonlinear rod elements. A stress analysis of several connected bodies can be correctly performed because the connectors are automatically applied during the process.

MOSES does not simply analyze a given situation, it provides a menu to aid in the design of mooring lines and lifting slings. With minimal effort, special commands automatically alter connectors and present different scenarios, such as the effect of inertia and damping, for assessment.

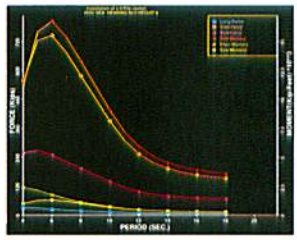
Models for other programs can be converted to MOSES models with minimal effort. Specific interfaces are available for several programs, and we can quickly develop any others you might require.

BASIC HYDROSTATICS

MOSES performs the basic calculations usually done by a naval architect. These include computing the curves of form, the intact or damage stability, and the longitudinal strength of a vessel. It also provides an interactive environment in which the engineer can specify the ballast in any or all of the vessel's tanks and immediately find the resulting condition. MOSES can compute a ballast plan which will simulate a specified condition and then alter it as directed. As a final step MOSES will perform a detailed stress analysis of the condition. The program takes care of all of the details of computing the correct inertia, loads, and restraints.

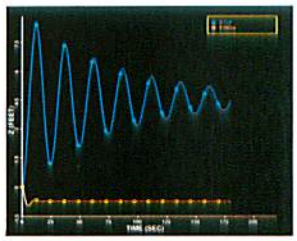
FREQUENCY DOMAIN ANALYSIS

You can perform a traditional sea-keeping study with MOSES by issuing a single command. MOSES will then use a hydrodynamic theory selected from the three available to compute the response operators of both the motions of each body and the connector forces. An entire menu of commands is available to post-process these response operators. You can easily find the statistical results for specified sea conditions and create time domain samples of the results to assess phasing. All results can be graphed or reported. Only four additional commands are necessary to produce a detailed stress analysis of the system in the frequency domain.



TIME DOMAIN

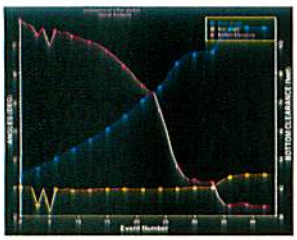
A time domain simulation of the current system can be performed at any point. This is accomplished by issuing one command to define the environment, and a second to initiate the time domain simulation. MOSES then takes the hydrodynamic forces computed via the proper hydrodynamic theory, combines them with the other forces which act on the system, and integrates the nonlinear equations of motion in the time domain. At the conclusion, a menu of post-processing commands are available to assist you in deciphering the results such as trajectories of points,



forces on elements, connector forces, etc. As before, a stress analysis of events during the simulation requires only a few additional commands.

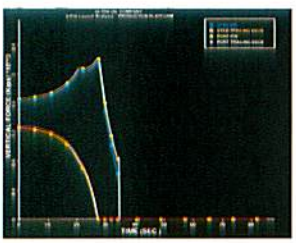
LIFTING AND UPENDING

MOSES offers a menu of alternatives to simulate the process of lifting a structure off of a barge, lowering it into the water, and bringing it upright. Compartments can be interactively ballasted and the hook moved up or down to assess the results of any field action. Results are stored by event so that they can be reviewed and the action changed, until you attain the desired outcome. As with other simulations, the results can be post-processed and used for a stress analysis at the conclusion.



JACKET LAUNCHING

A jacket launch is a specialized type of time domain simulation where a single body is moved until it comes free of other bodies upon which it has been towed to location. Traditionally, a jacket is launched from a single barge. In anticipation of such an operation, MOSES can also simulate a launch from several barges which may be connected.

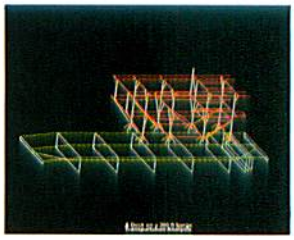


PIPE LAYING

Pipe laying, either from a stinger or from davits, can be simulated by combining a non-linear rod element with other connectors. The lay vessel and the stinger can be modeled as separate bodies connected via the pipe, hinges, tensioners, and rollers. Whatever the combination, MOSES models all aspects of the problem. Static, time, or frequency domain simulations of the laying process can be performed once the system is assembled.

STRESS ANALYSIS

MOSES can perform a detailed stress analysis for events during a time domain simulation, a static process, or a frequency domain process. There are no essential limits on either the model size, the number of bodies which can be analyzed or the number of load cases. The solution algorithms are state-of-the-art and the structural post-processing is superior. MOSES can consider not only linear but also spectral combinations of basic load cases. Performing a stress analysis in the frequency domain means member and joint checks can be considered spectrally. Spectral fatigue can also be calculated in beams, plates, and tubular joints.



MODULAR STRUCTURE

To bring MOSES' power to users who need only a portion of the capabilities, each function can be purchased separately. In addition, there are three prepackaged subsets of MOSES: OSCAR II, ISAAC, and SAUL.

OSCAR II is an updated OSCAR with many more capabilities.

ISAAC analyzes hydrostatics and motions of a single vessel.

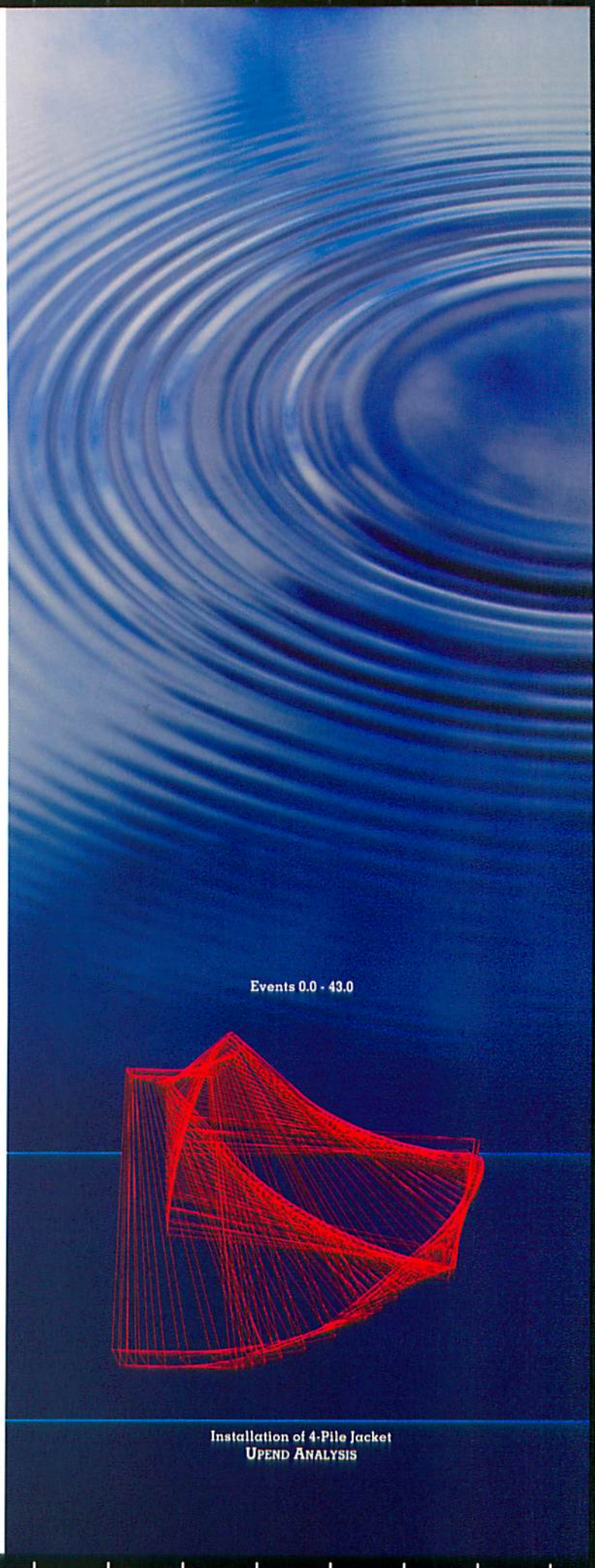
• SAUL is a traditional stress analysis program with load generation capabilities, making it suitable for analysis of offshore structures.

Portions of each subset may be purchased separately and the top-down design of MOSES means the less powerful programs are true subsets, each totally compatible with the others. Your knowledge of a subset such as ISAAC will be applicable to the other more powerful programs and you can interchange data with anyone who has a superset. This means several groups can work together on different aspects of a problem without recoding the data.

All of Ultramarine's software is written for a wide range of hardware, the bottom level being a "workstation". You can run on almost any system with the capabilities of an Apollo, Sun, or any 386 PC-type computer.

TECHNICAL SUPPORT, UPDATE AND CONSULTING SERVICE

Ultramarine provides a complete maintenance, support and update service. We can usually solve most problems over the phone. In addition we have a staff of highly capable engineers to assist our customers, and work on a consulting basis to provide specialized assistance. Ultramarine has years of experience working with the best engineers in the business so we can offer our expertise and give an accurate and honest assessment of how best to solve any problem you present.



Installation of 4-Pile Jacket
UPEND ANALYSIS

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