

MINUTE ITEM

This Calendar Item No. ~~C74~~ was approved as
Minute Item No. 74 by the California State Lands
Commission by a vote of 2 to ~~0~~ at its
2/27/96 meeting.

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Schaefer
Meier

**CONSIDER AUTHORIZING STATE LANDS COMMISSION STAFF
TO HELP ESTABLISH AND PARTICIPATE IN THE FLAIM
(FIRE AND LIFE ASSESSMENT INDEXING METHODOLOGY)
JOINT GOVERNMENT-INDUSTRY PROJECT
FOR EVALUATION OF MARINE TERMINAL SAFETY**

APPLICANT:

The Staff of the State Lands Commission

PROPOSAL:

The Staff of the State Lands Commission proposes that the Commission participate in the FLAIM Project for Evaluating the Safety of Marine Terminals and Offshore Platforms. The objective of the program is to carry out further development, testing and verification of a practical computer-based methodology that will enable the user, whether an operator or regulator, to evaluate the safety of marine operations and facilities.

STATUTORY AND OTHER REFERENCES:

- A. Public Resources Code Sections 8750 through 8760, inclusive
- B. Public Resources Code Section 21065
- C. 14 Cal. Code Regs. 15061 and 15378

AB 884:

N/A

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CEQA APPLICATION:

Pursuant to the Commission's delegation of authority and the State CEQA Guidelines (14 Cal. Code Regs. 15061), the Staff has determined that this activity is exempt from the requirements of CEQA because the activity is not a "project" as defined by CEQA and the State CEQA Guidelines. See Public Resources Code Section 21065 and 14 Cal. Code Regs. 15378.

EXHIBIT:

- A. Prospectus - Development and Testing of the FLAIM (Fire and Life Safety Assessment Indexing Methodology) for Evaluating the Safety of Offshore Platforms and Marine Loading Terminals

OTHER PERTINENT INFORMATION:

Pursuant to the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act (the Act), the Staff of the Commission's Marine Facilities Division (MFD) has been evaluating all factors contributing to the incident rates of oil spills from marine terminal operations. The Act requires the Commission to adopt and implement regulations providing the best achievable protection of the environment and public health and safety. MFD must therefore propose requirements and policies that are directed effectively toward the greatest threats from oil transfers. To that end, MFD has assisted the University of California at Berkeley (UCB) in research into this area. Those studies have indicated that approximately 80% of all maritime-related safety and pollution incidents are the result of human and organizational error, a conclusion supported by information gathered during MFD's own inspection and monitoring activities. MFD therefore seeks a greater understanding of this problem and how to address it fully and appropriately.

The proposal presented here offers MFD substantial opportunities in this endeavor. UCB has been developing the Fire and Life Assessment Indexing Methodology (FLAIM), a computer-based system for evaluating the safety of marine facilities and operations. However, this methodology has not yet been

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fully tested. The three-year project currently proposed would carry the research into the next stage, applying it in the field in order to evaluate and refine it further. The research and software developed would then be used by MFD in reviewing human and organizational error, as well as other safety considerations, at marine terminals.

The current participants in the program are from government, industry and academia. They include the U.S. Minerals Management Service, the United Kingdom's Health and Safety Executive, the American Bureau of Shipping, Chevron Petroleum Technology Company and Texaco Incorporated. The Co-Project Managers are UCB's Department of Civil Engineering and Paragon Engineering Services in Houston, Texas, with whom the contract for participation would be made.

Because of the high contribution human and organizational error makes to the threat of oil pollution incidents, MFD Staff believes that the FLAIM project, if approved, would result in a system which can be used to identify specifically how such error can become manifest and may best be prevented. At the same time, it would allow the Commission to tailor its regulations to those subjects presenting the greatest risk, while avoiding unnecessary or inappropriate burdens on those aspects of marine facility operations which do not pose such a threat.

Under the terms of the participation agreement, the Commission would provide \$60,000 toward the overall project costs of \$420,000, applied over the three-year life of the program. Funds for such purposes are included in the Commission's baseline budget from the Oil Spill Prevention and Administration Fund for system safety research and contracts as they relate to marine facilities. A sole source contract award has been authorized by the Department of General Services.

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IT IS RECOMMENDED THAT THE COMMISSION:

1. FIND THAT THE ACTIVITY IS EXEMPT FROM THE REQUIREMENTS OF CEQA PURSUANT TO 14 CAL. CODE REGS. 15061 BECAUSE THE ACTIVITY IS NOT A PROJECT AS DEFINED BY PUBLIC RESOURCES CODE SECTION 21065 AND 14 CAL. CODE REGS. 15378.
2. AUTHORIZE THE STAFF OF THE STATE LANDS COMMISSION TO ENTER INTO A CONTRACT WITH PARAGON ENGINEERING SERVICES INC., NOT TO EXCEED \$60,000, TO PARTICIPATE IN THE FLAIM JOINT INDUSTRY PROJECT TO EVALUATE THE SAFETY OF MARINE TERMINALS (THE PROJECT).
3. AUTHORIZE THE STAFF OF THE COMMISSION TO PARTICIPATE IN THE TECHNICAL ADVISORY COMMITTEE ESTABLISHED TO MONITOR AND REVIEW THE PROJECT AND TO PARTICIPATE OTHERWISE, WHERE APPROPRIATE, IN THE PROJECT.

PROSPECTUS

Development and Testing of the FLAIM (Fire and Life safety Assessment Indexing Methodology) for Evaluating the Safety of Offshore Platforms and Marine Loading Terminals

PURPOSE OF THE PROSPECTUS

The purpose of this prospectus is to provide advance notice of the intent to offer this project for joint industry participation, together with information regarding the project's proposed content, anticipated cost, and time schedule. This information may be of value to potential participants for budgetary planning purposes. It is anticipated that the formal proposal will be mailed to potential participants the week of June 19, 1995. Both industry and governmental entities will be offered participation in this project. Additional information may be obtained by contacting Owen Tibbetts or John Van Meter at Paragon Engineering, area code 713/462-8828.

OBJECTIVE

The objective of this proposed joint industry project (JIP) is to further develop, test, and verify a practical computer-based methodology that will enable the user (whether owner, operator, or regulator) to evaluate the safety of marine systems.

Sufficient preliminary work has been done under the auspices of industry and government to demonstrate the validity of the approach and to assure a high degree of success in developing a tool that will achieve the desired results. Field testing of this methodology on a variety of marine systems during the proposed project will help further develop this approach and demonstrate its validity.

The work that has been completed has clearly shown that the primary hazards to safety of marine systems are not due to the systems themselves (structure, equipment and the interconnecting hardware). Rather, the primary hazards are associated with the interactions of operating personnel and organizations with these systems. Accordingly, a significant portion of this project will be directed toward the human aspects of marine systems and the development of tools to help evaluate the safety related elements of the human aspects. These developments will be in concert with the Safety and Environmental Management Program (SEMP) guidelines set forth in API RP 75 and encouraged by the U. S. Minerals Management Service, and the International Maritime Organization's International Safety Management (ISM) Code.

Exhibit A

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The techniques and software to be developed will permit a structured evaluation of the marine system under investigation, and will enable the information gathered to be integrated into an inspection report and an overall evaluation of the system, and assimilated into a data base, if desired. The procedure used will provide means to evaluate the physical structure, the facilities installed thereon, and the human and organizational factors (HOF) involved in their operation. Algorithms already developed will be modified as necessary and tested. This use of algorithms will produce *quantified* results. The assessments thus made represent an intermediate approach between a hazard analysis technique such as hazard and operability study (HAZOP), and a Quantified Risk Assessment (QRA) based on probabilistic analysis. The methodology to be developed is intended to serve as a tool in the safety assessment of existing offshore platforms and marine terminals which are currently in operation, as well as new designs of platforms and terminals. This methodology will utilize and build on the results of research work conducted at the University of California, Berkeley (UCB), over the past six years.

BACKGROUND

A wide variety of guidelines has been developed that relate to the development of safety systems for marine installations. These guidelines also provide direction on evaluating such safety systems to help assure the safety of the marine installations to which they pertain. Examples include the following:

- API (American Petroleum Institute) RP (Recommended Practice) 75: Recommended Practices for Development of a Safety and Environmental Management Program for Outer Continental Shelf (OCS) Operations and Facilities
- API RP 14J: Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities
- California State Land Commission (CSLC): Marine Terminal Audit Guidelines
- International Maritime Organization (IMO): International Safety Management (ISM) Code

Many other codes and guidelines have been developed by industrial and governmental organizations.

During the past six years, through a series of research projects conducted at UCB, 'safety indexing procedures' have been developed that address fire and life safety aspects of marine systems. These procedures have been designated as FLAIM (Fire and Life safety Assessment and Indexing Methodology) and HSIM (Human Safety Indexing Methodology). They permit practical quantitative evaluations of structures, facilities, and HOF in a structured and disciplined environment. Field testing of these procedures has been and is currently being conducted.

APPROACH

The approach will be to develop an evaluation methodology which will utilize software modules. These modules will be developed as part of this project and will emphasize the human aspects in the safety of platforms and marine loading terminals. The software modules will address the following:

1. The structure
2. Hardware - equipment, vessels, piping, electrical
3. Operating and crisis management procedures
4. Operating teams
5. Managing organizations
6. Integrated safety assessments
7. Reporting and identification of alternate safety improvements

Five primary categories of factors will be used in the development of these modules. These categories are as follows:

1. Facility Operating Teams
2. Facility Operating Organizations
3. Facility Operating Procedures, including Crisis Management
4. The Physical Plant (structure and facility systems)
5. The Environments (internal, external)

Experience with marine systems indicates that the primary hazards to safety are not the structure and the hardware/equipment. The procedures followed (or not followed), mistakes made on the part of the operating personnel, and influences from the managing organization are the primary factors affecting safety. Thus, a major part of this project will be directed toward development of evaluation methodologies that will address the HOF aspects of marine systems as implied above.

Experience also indicates that the primary hazards encountered in marine systems are fire and explosion. Fires and explosions may occur when loss of containment results from blowouts or the loss of integrity in piping, vessels, or equipment containing flammable fluids. Ignition, propagation, and escalation of fire can be limited by ignition prevention, detection and suppression methods, and by fire fighting and life/property saving procedures. Thus the second major part of this project will be directed towards the fire and explosion hazards to marine systems and the measures, equipment and procedures that can be utilized to limit their effects.

As a result, the project will consist of two complementary and parallel areas of activity. The first area of activity will be focused on extending, detailing, and documenting FLAIM and the associated HISM techniques which will be integrated into the evaluation

methods, procedures, and software that will be used to assess the facility and the human organization. This work will address the structural aspects as well as the facilities aspects of the marine system and will be applicable to platforms as well as marine terminals. Guidelines such as API RP 14C, and recently published guidance documents such as API RP 14J, and API RP 75, together with CSLC Guidelines and the ISM Code will be integrated into this effort. Of particular importance will be 'crisis management' (emergency preparedness and response) and assessment of organization influences. Computer based software will be developed that can be used to perform the foregoing assessments in the field.

The second area of activity will be the testing and verification of FLAIM. Experienced individuals will apply the FLAIM methodology and software to a variety of platforms and marine terminals. This will constitute a test phase during which the methodology and the software can be evaluated and needed improvements can be identified. In this regard the project sponsors will be instrumental in identifying specific marine facilities to be evaluated and providing access to these facilities during the testing and verification phase of the project.

DELIVERABLES

The deliverables from this project will consist of the following:

- Biannual project meeting and meeting notes
- Project reports detailing FLAIM
- FLAIM software and documentation

It is proposed that the deliverables of the project, including software, will be kept confidential for a period of ten years beyond the completion of the project, or as determined by the participants.

PROJECT TEAM

The project team will consist of four primary components. The first component will be the project sponsors. Each project sponsor will be invited to provide a representative to be a member of the project's Technical Advisory Committee.

The second component will be the project contractor, Paragon Engineering Services (PES) Inc., located in Houston, Texas. PES will be responsible for the administrative tasks and the management of the project. PES will also be responsible for the field testing of the FLAIM methodology and software. The PES project manager will be Mr. John Van Meter. PES has had extensive experience with safety management systems on marine structures and facilities.

The third component will be the University of California at Berkeley. This component will be responsible for updating, extending, detailing, and documenting FLAIM. In charge of the Berkeley effort will be Professor Robert Bea (35 years offshore industry experience). Assisting Professor Bea will be Professor Brady Williamson (fire and materials expert), Professor Karlene Roberts (organization reliability expert) and Graduate Student Researcher Derek Hee. Mr. Hee has extensive marine experience. Additionally, for the past year he has performed research on crisis management on offshore platforms. This project will form the primary basis for Mr. Hee's doctoral research.

Serving as consultants to the project will be Dr. William Gale (developer of FLAIM), Dr. William Moore (developer of HISM), and Mr. Robert Visser (Belmar Engineering). These consultants will constitute the fourth component of the project team.

PROJECT SCHEDULE

The project will take two years to complete. It is proposed that the program will be initiated on September 1, 1995 and completed on October 1, 1997.

PROJECT COST

It is estimated that the project will cost a total of \$420,000.00 and will require a minimum of seven participants, or \$60,000.00 per participant. Should the project attract more than seven participants, the cost per participant will be reduced accordingly. The projected expenditure per participant per calendar year, based on seven participants, is as follows:

- 1995 \$10,000.00
- 1996 \$30,000.00
- 1997 \$20,000.00

PROJECT TASKS

Paragon Project Tasks

Year 1 (Sept. 1, 1995 - Sept. 15, 1996)

Task 1 - Field test existing version of FLAIM on several Gulf of Mexico platforms. Field test newly developed versions of the Operating Teams and Organizations Safety Assessment Modules. Document results.

Task 2 - In light of the above field testing, review the following FLAIM modules:

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- Structure System Safety Assessment
- Equipment/Hardware System Safety Assessment
- Procedures Safety Assessment

Define and document required revisions.

Task 3 - Work with UCB on field testing of the following modules when they are developed:

- Operating Teams Safety Assessment
- Organization Safety Assessment

Task 4 - Meetings with UCB and Consultants: Two meetings in Berkeley

Task 5 - Meetings with Participants: Three in Houston/New Orleans

Task 6 - Reports:

- Meeting Notes
- Quarterly Progress Reports
- Year 1 Report

Year 2 (Sept. 16, 1996 - Oct. 1, 1997)

Task 1 - Revise documentation for field use, based on results of the first year's work.

Task 2 - Field test FLAIM, as revised, on one Cook Inlet platform. Document results.

Task 3 - Field test FLAIM on one marine terminal. Document results.

Task 4 - Review the following FLAIM modules as revised:

- Structure System Safety Assessment
- Equipment/Hardware System Safety Assessment
- Procedures System Safety Assessment

Define and document required revisions.

Task 5 - Meetings with UCB and Consultants (two in Berkeley)

Task 6 - Meetings with Participants (two in Houston/New Orleans)

Task 7 - Reports:

- Meeting Notes
- Quarterly Progress Reports
- Final Project Report

UCB Project Tasks

Year 1

Task 1 - Develop further the following modules:

- Operating Teams Safety Assessment
- Organizations Safety Assessment

Task 2 - Code, test, and document the revised Operating Teams and Organizations Safety Assessment modules

Task 3 - Assist Paragon with field testing

Task 4 - Meetings with Participants - three in Houston/New Orleans

Task 5 - Reports:

- Quarterly Progress Reports
- Year 1 Report

Year 2

Task 1 - Based on direction provided by Paragon (Year 1 Tasks 2,3,4), develop further the following modules:

- Structure System Safety Assessment
- Equipment/ Hardware System Assessment
- Procedures System Safety Assessment

Task 2 - Code, test, and document the foregoing revised modules

Task 3 - Revise, test, and document the following modules based on results of Year 1 field testing:

- Operating Teams Safety Assessment
- Organizations Safety Assessment

Task 4 - Assist Paragon with field testing

Task 5 - Meetings with Participants - two in Houston/New Orleans

Task 6 - Reports:

- Quarterly Reports
- Final Project Report

Consultants' Project Tasks

Year 1

Task 1 -Meetings:

- Two at UCB
- Two in Houston/New Orleans

Task 2 - Project Consulting (as needed basis)

Year 2

Task 1 - Meetings:

- Two at UCB
- One in Houston/New Orleans

Task 2 - Project Consulting (as needed basis)