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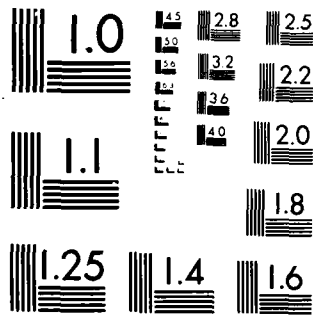
ACOUSTIC MODEL PRE-ASSESSMENT AND SURVEY PLANNING
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FINAL REPORT FOR CONTRACT
N00014-85-C-0084, TASK 3:
ACOUSTIC MODEL PRE-ASSESSMENT
AND
SURVEY PLANNING ASSESSMENT

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FINAL REPORT FOR CONTRACT N00014-85-C-0084, TASK 3: ACOUSTIC
MODEL PRE-ASSESSMENT AND SURVEY PLANNING ASSESSMENT

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27 November 1985

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FINAL REPORT FOR CONTRACT N00014-85-C-0084, TASK 3:
ACOUSTIC MODEL PRE-ASSESSMENT AND
SURVEY PLANNING

1. INTRODUCTION

This document is the final report for Office of Naval Research Contract Number N00014-85-C-0084, Task 3. The work under this contract was conducted by Science Applications International Corporation (SAIC) during the period from 3 December 1984 through 1 October 1985.

2. TASK 3 - ACOUSTIC MODEL PRE-ASSESSMENT AND SURVEY
PLANNING ASSESSMENT

2.1 Statement of Work:

2.1.1 Modeling Review. The contractor shall review the existing under-ice acoustic modeling capability and sufficiency of requisite environmental and acoustic data bases to provide an objective assessment of acoustic modeling support.

2.1.2 Defining Mechanisms. The Contractor shall assist the AEAS Project in defining the mechanisms involved that affect the physics of current acoustics models that are likely candidates for measurement efforts during the arctic experiment.

2.1.3 AEAS draft measurement plan. The Contractor shall provide an assessment of the applicability of the AEAS draft measurements plan to enhance the understanding of existing models' capabilities and provide significant data base contributions and acoustic measurements to assist in the evolution of a more sophisticated arctic modeling capability. The contractor shall provide 'forecast' acoustic model runs where practical.

2.2 Background. The three subtasks in this task represent three of the early steps in the logical development of a credible modeling capability. The overall development process is an iterative, coordinated effort involving principals concerned with system performance-prediction requirements, model development, and acoustical/environmental measurements. The three subtasks of concern here relate to the input from the modeling community to the measurement

planning process so that the measurement plan will meet modeling needs. In brief, the results of the three subtasks must answer the questions:

- (a) How well can we model the relevant acoustics now? Are the models adequate? Are the supporting environmental data bases adequate?
- (b) In light of the answers from the first subtask, what specific model-physics issues need to be addressed by the measurement?
- (c) Having provided the answers from the second subtask to those responsible for designing the measurements, how well does the resulting draft measurement plan meet the modeling needs for both acoustical and environmental data? Also, to assist the measurement design process, what is our best estimate of the expected acoustical environment?

2.2.1 Model capabilities and requirements. Proper answers to questions of model capabilities and requirements depend on an understanding of the models which spans the spectrum from fundamental propagation-physics issues to model applicability for system-specific questions. A major AEAS product is its models, and those models are judged by the AEAS customers on their ability to provide accurate, representative answers to systems-related questions. Because the models are used essentially to interpolate between and extrapolate beyond what is always an extremely sparse acoustical data base, a premise of the program has been that the best models will be those which have a strong foundation in physics. Alternatively, if there is no demonstrated, satisfactory model based on first principles, AEAS may be required to provide its best collective empirical estimate for a particular phenomenon based on available data.

2.2.2 Developing responses. In developing responses to the questions raised by the above subtasks, it is essential that the competing and sometimes conflicting needs for sound physical models and accurate best estimates be balanced, and of course tempered with the realities of conducting a difficult measurement with limited assets in a hostile environment.

2.3 Deliverables. SAIC reviewed the existing under-ice acoustic modeling capability and environmental and acoustic

data bases and assessed that the major deficiencies in acoustic modeling support are associated with scattering from arctic sea ice.

2.3.1 Mechanisms of sea-ice scattering. SAIC assisted the AEAS project in defining the mechanisms of sea-ice scattering that affect the physics of current acoustic models. These mechanisms are documented in SAIC Report No. SAIC-85/1748. Candidates for measurement efforts during the arctic experiment were identified by SAIC. These candidate measurements were documented in the working paper provided to Ed Gough of Planning Systems Incorporated.

2.3.2 First phase development. The candidate measurements were developed as the first phase of an overall assessment of the applicability of the AEAS draft measurements plan to enhance the understanding of existing models' capabilities and provide significant data base contributions and acoustic measurements to assist in the evolution of a more sophisticated arctic modeling capability. SAIC recommendations led to the inclusion of acoustic experiments at higher frequencies which better resolve the effects of the arctic environment on system performance.

2.3.3 Second phase development. As the second phase of assessment of the AEAS measurement plan, SAIC recommended a modification of the configuration of the acoustic measurement array (documented in SAIC Report No. SAIC-85/ 1077). SAIC provided 'forecast' acoustic model runs to assess array positioning requirements, appropriate source levels, and source waveforms.

3. CONCLUSION

SAIC participated in the design of the 1985 AEAS Program Arctic experiment, representing the point-of-view of requirements for modeling and data bases. Important physical mechanisms were identified which affect the development of model and data base support for fleet requirements. The overall AEAS measurement plan was assessed against modeling issues requirements and the recommendations were documented. SAIC supported the implementation of these recommendations by a demonstration of feasibility using 'forecast' model runs.

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