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TASDA FOR THE NOVA, P-2186.(U)
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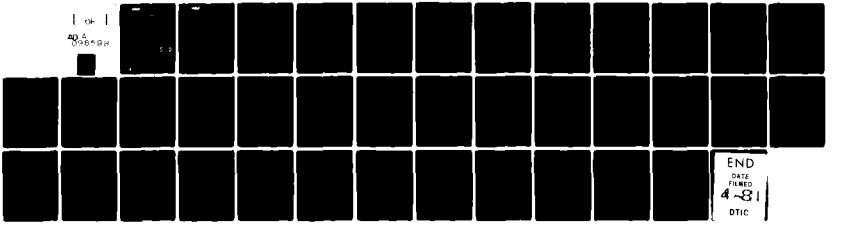

OCEAN DATA SYSTEMS, INC.
6000 EXECUTIVE BLVD. ROCKVILLE MARYLAND 20852 • 301/881-3031

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(15) N00014-73-C-0131

Submitted By

OCEAN DATA SYSTEMS, INC.
ROCKVILLE, MARYLAND

(11) 15 March ~~15, 1974~~

Prepared For

OFFICE OF NAVAL RESEARCH
ARLINGTON, VIRGINIA

390329 dm

NAVOCEANO BRIDGE

OCEAN DATA SYSTEMS, INC.
6000 EXECUTIVE BLVD. ROCKVILLE, MARYLAND 20852 • 301/881-3031

March 15, 1974

LCDR T. J. McCloskey, USN
Manager, Acoustic Prediction
Long Range Acoustic Propagation Project
Office of Naval Research
Code 102-OS
Department of the Navy
Arlington, Virginia 22217

Dear LCDR McCloskey:

Ocean Data Systems, Inc. is pleased to submit this unsolicited proposal No. P-2186 to the Office of Naval Research to adapt the TASDA model for the NOVA 800 computer. This single task ($8,958) should be completed in two months after contract award.

This offer may be considered valid for a period of 90 days. We will be happy to discuss any aspect of this proposal and provide any additional information you may require.

Sincerely,

OCEAN DATA SYSTEMS, INC.

Edward Morenoff, Sc.D.
Vice President

EM:cgm

Attachment

Title:
TASDA FOR THE NOVA

Ordered 4/7/80

NOTICE

"This data furnished in Ocean Data Systems, Inc. unsolicited proposal No. P-2186 to the Long Range Acoustic Propagation Project, Office of Naval Research for the adaptation of TASDA for the NOVA computer shall not be disclosed outside the Government or be duplicated, used or disclosed in whole or in part for any purpose other than to evaluate this proposal; provided, that if a contract is awarded to this offeror as a result of or in connection with the the submission of such data, the Government shall have the right to duplicate, use, or disclose this data, to the extent provided in the contract. The restriction does not limit the Government's right to use information contained in such data if it is obtained from another source without restriction."

This restriction applies to the entire proposal submitted herein by Ocean Data Systems, Inc.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

I. INTRODUCTION

Ocean Data Systems, Inc. is pleased to submit this unsolicited proposal No. P-2186 to the Office of Naval Research for the adaptation of the TASDA Model for the NOVA Computer. The objective is to get an operational version of TASDA on the NOVA 800 computer in time for the Sea Control exercise on the U.S.S. Guam.

ODSI is uniquely qualified to perform the work of this tasks because of its extensive prior experience in building, modifying and documenting acoustic modeling systems for the Office of Naval Research. In particular, ODSI has participated in the development, modification and application of the following acoustic models and systems: TASDA, TASSRAP, SHARPS, ASRAP, FACT, RP70, SUBRAP, SURVRAP, IOMEDX, ASW Assessment and NEAT.

Dr. Edward Morenoff, Vice President, Computer Systems, has been selected to direct the proposed effort. Dr. Morenoff's comprehensive knowledge of acoustic models is based, in part, on the work he performed under Contract No. N66314-70-C-2089 requiring the analysis of the execution of all oceanographic models at the U. S. Navy Fleet Numerical Weather Central and how this might be improved. Dr. Morenoff was project director of work performed under Contract No. N66314-71-C-0778 leading towards improving the operating efficiency and performance characteristics of the Long Range Propagation Loss Model (RP70), and Contract No. N66314-71-C-2817 for the analysis of

ambient noise computations in three existing underwater acoustic propagation loss models and the synthesis of the most desirable features of each into a new combined model. Finally, Dr. Morenoff was project leader of work performed under Contract No. N00014-72-C-0291 which led to substantive improvements to the SHARPS, ASRAP, and SUBRAP models, the development of the TASSRAP model and the implementation of programs in support of Navy requirements such as those defined for NEAT, ASW Assessment and SURVRAP. Dr. Morenoff is currently project leader for Contract No. N00014-73-C-0131 providing LRAPP model development and support functions for the Office of Naval Research. Dr. Morenoff will be aided in the performance of the proposed work by Messrs. Edward VerHoef, Charles Baker, Gilbert Jacobs and William Earley.

Mr. VerHoef was the technical task leader responsible for the innovations which led to the reduction of the SHARPS II Range Prediction model per point computation rate from 30 seconds to little over 5 seconds under Contract No. N00014-72-C-0147. Under Contract No. N00014-72-C-2091, he was principally responsible for the development and integration of the TASSRAP model. Under Contract No. N00014-73-C-0131, Mr. VerHoef has been engaged in the generalization of the TASSRAP model to operate on a worldwide basis in addition to just the Mediterranean Sea. Mr. VerHoef also brings to the project an extensive

knowledge of the CDC 6000 series computer system operating environment and its interrelationship to operational acoustic models to be executed therein. This knowledge was gained, in part, through the development of techniques for the measurement of vital FNWC operating system utilization statistics under Contract No. N66314-70-C-4146 and in the development of a system resource allocation and measurement and report system for FNWC under Contract No. N66314-71-C-1653.

Mr. Baker's experience with acoustic models includes the adaptation of the SHARPS model for the CP642 computer system under Contract No. N00014-72-C-2091. Under Contract No. N00014-73-C-0131, he modified the TASSRAP system to replace ASRAP by FACT and adapted the FACT transmission loss model for operation on the CDC 6700 and 6500 computers for execution at the U. S. Navy Fleet Numerical Weather Central. He also participated in the installation of TASDA on the U.S.S. Kitty Hawk.

Mr. Jacobs has worked on the Multiple Profile transmission loss model and the NISSM active model. In particular, he has adapted the Multiple Profile model to accept an arbitrarily large number of sound speed profiles and using those profiles, has built a sound speed field for use in ray tracing.

Mr. William Earley's experience with acoustic models includes his efforts under Contract No. N00014-73-C-0131 in

which he developed programs to produce a series of plots of vertical and horizontal ambient noise at specified receiver depths along with transmission loss and arrival structure for various source depths at each receiver depth. In addition, he has worked on portions of the Multiple Profile transmission loss model and supported the NISSM II and SASS efforts under the same contract.

Section II, Technical Approach, describes how ODSI intends to realize the goals of the proposed effort. Section III, Project Management, presents proposed manpower, performance and cost schedules for the contractual effort. Sections IV and V discuss Relevant Corporate Experience and Corporate Capabilities, respectively. Finally, Section VI, Personnel Resumes, elaborates on the background and experience of project personnel.

II. TECHNICAL APPROACH

The TASDA model was adapted for the UNIVAC 642 computer by Ocean Data Systems and installed on the U. S. S. Kitty Hawk. It would be fruitful to adapt that model for the NOVA 800 computer for use on the U. S. S. Guam for the Sea Control exercise. Ocean Data Systems proposes to build an operational model for the NOVA 800 computer as described below:

There already exists a NOVA 800 version of the FACT transmission loss model. This model will provide transmission loss input to TASDA. The geometry tape writing program will be adapted for the NOVA to provide geometry inputs to TASDA. The TASDA model, itself, will be revised to accept its card input data from the keyboard rather than from the card reader. The UNIVAC 642 random number generator will be simulated to supply random number input to TASDA.

Samples will be obtained from the Naval Air Development Center (NADC) and run on the UNIVAC 642 computer. The outputs obtained will be used to determine the accuracy of the NOVA 800 version. Checkout will take place at the U. S. Naval Oceanographic Office (NAVOCEANO) NOVA computer installation at Suitland, Maryland, and on the U. S. S. Guam. Computer time will be Government Furnished Equipment.

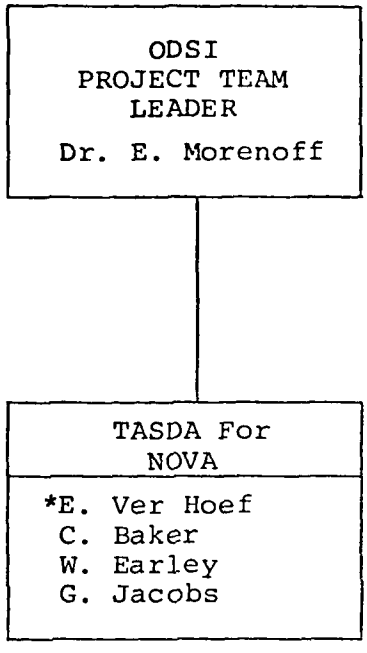
III. PROJECT MANAGEMENT

The proposed ODSI Project Team, under the direction of Dr. Edward Morenoff, is identified in Figure III-1. Mr. Edward Ver Hoef will lead the effort as shown in the figure.

Figure III-2 is an exhibit of the projected allocation of professional and technical manpower during the contractual effort. This effort is shown as task man-months for the duration of the project. Figure III-3 is an exhibit of the major project milestones. Completion dates are determined from start of contract.

The cost schedule is shown in Figure III-4. Each task is separately priced on the same basis as the task efforts being performed under Contract No. N00014-73-C-0131. Messrs. Ver Hoef and Baker are shown as Senior Systems Analysts. Messrs. Jacobs and Earley are shown as Senior Systems Programmers.

The cost schedule is based on the assumption that computer time as required for the performance of each of the tasks will be made available to ODSI as Government Furnished Equipment (GFE).



*Denotes task team leader

FIGURE III-1: ODSI PROJECT TEAM

TASK \ MONTH	1	2
TASDA For NOVA	1.25	.75

FIGURE III-2: MANPOWER ALLOCATION BY TASK
(IN Man-Months)

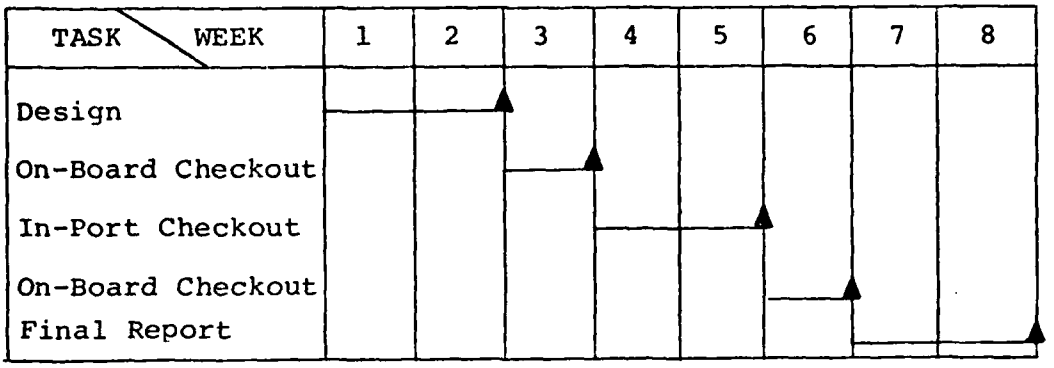


FIGURE III-3: PROJECT MILESTONES

FIGURE III-4: COST SCHEDULE

TASDA For The NOVA

A. Personnel

Sr. Systems Analyst.....	1.0mm @ $4,333.33/mm....	$4,333
Sr. Systems Programmer..	1.0mm @ $3,900.00/mm....	3,900
	Subtotal.....	$8,233

B. Travel

1 R/T Coach - D.C./Norfolk.....	$47.27	
1 R/T Coach - D.C./Jacksonville....	197.27	
Per Diem - 10 days @ $30/day.....	300.00	
Car Rental - 10 days @ $18/day.....	180.00	
	$724.54	725
	TASK TOTAL.....	$8,958

Each man-month is comprised of 173.3 man-hours.

The hourly rates for each labor category shown are:

Sr. Systems Scientist.....	$28/hr.
Sr. Systems Analyst.....	$25/hr.
Sr. Systems Programmer.....	$22.50/hr.

IV. RELEVANT CORPORATE EXPERIENCE

As a corporation, ODSI has established a solid record of achievement in the successful completion of projects which have been undertaken. Many of these projects are relevant to the subject procurement, as a consequence of the nature of the work involved. In this Section examples are cited, together with a brief description of the work performed and points of contact within the client's organization who can provide information to permit evaluation of the quality of the work performed.

U. S. Navy Office of Naval Research
(Contact: LCDR T. McCloskey, U. S. N., Manager LRAPP Acoustic Prediction Program, Telephone No. 301/767-2843).
Under Contract N00014-72-C-0147, ODSI restructured and partially recoded the SHARPS II Range Prediction Model to facilitate its operational utilization. The effort resulted in an 83% reduction in the elapsed time on a per location basis from approximately 30 seconds to 5.1 seconds. A Counter Detection (CD) prediction capability identifying the maximum range at which a target could hear the searching of designated Sonars was devised for the model. Finally, the sensitivity of the operational Automated Ambient Noise Model was investigated with respect to variations of selected loss values and specified distances.

U. S. Navy Office of Naval Research
(Contact: LCDR T. McCloskey, U. S. N., Manager LRAPP Acoustic Prediction Program, Telephone No. 301/767-2843).
Under Contract N00014-72-C-0291, ODSI has performed a number of tasks. These have included, but are not limited, to the following: modifications to the ASRAP model to include the quarter ray trace and quarter ray recursion capability, the use of critical angles for starting rays and for special bottom rays,

and the variation of range increments as a function of distance from the source; the development of TASSRAP, a model to provide range prediction for the ITASS towed array, including modifications to ASRAP and the FNWC automated ambient noise model; the adaptation of ASRAP to the UNIVAC 642 computer system; the provision of plot programs for the NISSM reverberation and propagation loss models and the BELL transmission loss ambient noise models in connection with an ASW assessment requirement; and the model modifications and operation in connection with the SURVRAP requirements.

U. S. Navy Office of Naval Research
(Contact: LCDR T. McCloskey U. S. N., Manager LRAPP Acoustic Prediction Program, Telephone No. 301/767-2843).
Under Contract N00014-73-C-0131, ODSI performed a number of tasks. These have included but are not limited to the: aided in the establishment of computational and remote terminal requirements for the Acoustic Environmental Support Detachment; adapted and upgraded the FACT Transmission Loss, Noise and Arrival Models to operate on the CDC 6000 series computers, developed a worldwide version of the TASSRAP Model; continued support work on SURVRAP and AWS assessment; and installation of ICAPS/TASDA on the U. S. S. Kitty Hawk.

U. S. Navy Fleet Numerical Weather Central
(Contact: Captain Samuel Houston, U.S.N., Commanding Officer, Telephone No. 408/646-2141).
Under Contract N66314-70-C-5156, ODSI performed three distinct tasks. The first task dealt with improving the accuracy of an anti-submarine warfare forecast model and involved the modification of existing computer programs and the design and implementation of new programs. All programs were developed in FORTRAN for operation on the CDC 6500 under the SCOPE operating system. New programs implemented included special plot programs to produce computer drawn plots of expendable bathythermograph data on a Varian Plotter connected to the CDC 6500. Task Two dealt with SCOPE level investigations and modifications. First, analytic programs were developed for use in obtaining information concerning the usage of certain CDC 6500

system components (namely, peripheral processors, extended core storage and central memory) and the interactions associated with their concurrent usage. Second, the CDC 6500 disk input/output facility was modified with the goal of making it more efficient, capable of further upgrading with reasonable ease, and to pave the way for ultimate development of a full-tract driver. This effort included splitting the Stack Processor into 2 programs capable of operation in separate peripheral processors. Task Three was concerned with incorporating a restart capability in the FNWC Atmospheric Primitive Equation Prediction Model which limited the real time loss in the event of any type failure to an operationally acceptable upper bound of 10 minutes and rewriting selected frequently used subroutines in very efficient COMPASS level code to take full advantage of the CDC 6500 hardware environment.

U. S. Navy Fleet Numerical Weather Central

(Contact: Captain Samuel Houston, U.S.N., Commanding Officer, Telephone No. 408/646-2141). Under Contract N66314-70-C-0778, ODSI developed and implemented techniques leading to the improvement of the operating efficiency and performance characteristics of the existing FNWC Acoustic Propagation Loss Model. As part of this effort, a new mechanism was formulated for computing the sine of an angle, which when implemented in COMPASS, was significantly faster than the standard CDC library square root routine. Also, programs were developed to generalize the Model's output chart generation mechanisms with respect to plotting, scaling and grid line construction.

U. S. Navy Fleet Numerical Weather Central

(Contact: Captain Samuel Houston, U.S.N., Commanding Officer, Telephone No. 408/646-2141). Under Contract N66314-71-C-1653, Task 2, ODSI participated in the design and implementation of procedures for monitoring and controlling the use and allocation of computer resources by the FNWC CDC66500 computer users. In particular, ODSI supplied the programs which generate the authorized allocation rate table, analyze SCOPE generated Dayfile records to determine resource usage, compare actual to authorized resource usage, and present the results in tabular and histogram form. Programs were written in FORTRAN and COMPASS. Under Task 1 of the same contract, ODSI repartitioned an existing four processor version of the FNWC atmospheric prediction model on the basis of

horizontal domain, rather than computational burden considerations. The repartitioning of the model resulted in a reduction of elapsed execution time for a seventy-two hour prediction run from two hours to approximately seventy-two minutes.

U. S. Navy Fleet Numerical Weather Central
(Contact: Captain Samuel Houston, U.S.N., Commanding Officer, Telephone No. 408/646-2141). Under Contract N66314-72-C-1372, ODSI developed a two processor version of the Navy Atmospheric Primitive Equation Model, partitioned on the basis of horizontal domain equations. The two processor version of the Model is employed principally to provide operational back-up for the operational four processor version of the Model at FNWC and as a research and development tool.

V. CORPORATE CAPABILITIES

Ocean Data Systems, Inc. (ODSI) was initially formed in 1969 to meet the spiraling data and information needs of the ocean science community. The scope of ODSI activities has been significantly extended through the formulation of wholly-owned subsidiaries and the addition of a highly skilled inter-disciplinary professional staff. ODSI is now also providing advanced management and information services to meet human, social and economic needs in fields ranging from ecological analysis and environmental planning to drug abuse control and the development of information systems for financial institutions such as insurance companies and stock brokers.

The Company has gained recognition as a profit-oriented "high technology" corporation, blending together a unique corps of specialists in such diverse fields as computer science, ocean technology, resource management, systems analysis and jurisprudence with the primary goal of offering a broad spectrum of services to organize information accurately, rapidly, and in useful form to satisfy the requirements of a wide variety of public and private interests. Corporate strategy has been to assemble and bring to bear a concentration of expert talent to solve problems either conceptually difficult or requiring resolution within severe time constraints.

The President of ODSI is Dr. Jerome Morenoff. Dr. Morenoff has a distinguished record of achievement in both computer science and international legal affairs. He has

served in the executive Office of the President as a computer specialist and his experience includes executive positions with several data processing companies. Dr. Morenoff is responsible for establishing corporate policy and directing all corporate operations. The Executive Vice President is Donald L. Roth, Esquire. Mr. Roth served as Trail Attorney for the Securities and Exchange Commission and thereafter was engaged in a prominent practice in financial and corporate law. At ODSI, Mr. Roth is responsible for financial, administrative and legal affairs and those of its subsidiaries. In addition, he directs the Company's programs of growth by both internally funded expansion into new business areas and the merger or acquisition of other firms. Dr. Edward Morenoff is Vice President, Computer Systems. He is recognized as an expert in the field of data base file management systems, computer program transferability and standardization, and modular programming. Dr. Morenoff has primary management responsibility for the application of computer hardware and software systems to meet the needs of ODSI's government and industrial clients.

ODSI has established an enviable record of success during its five years of operations and has increased its staff from the three initial founders to more than eighty professional employees. Revenues for ODSI's fiscal year ending June 30, 1973 were approximately 2 million dollars with a pre-tax profit of $200,000 representing an increase of more

than 100% in both volume and profit from the preceding year. ODSI expects to do in excess of 3 million dollars in sales during the current fiscal year.

The Company's books have been audited since inception by Messrs. Coopers and Lybrand. ODSI's accounting records have also frequently been examined by the Federal Government both in connection with pre-award surveys and the approval of invoices for payment. No difficulties have ever been experienced in connection with such examinations.

On the basis of the technical and management strengths of ODSI's founding principals, substantial equity financing has been obtained through the agency of a leading investment banking firm. Among the prominent institutional investors owning substantial amounts of ODSI common stock are Bankers Trust Company of New York and State Farm Mutual Automobile Insurance Company. As of June 30, 1973, ODSI's stockholder equity was in excess of $750,000. Further, an unsecured line of credit in the amount of $250,000 has been extended to ODSI by First National Bank of Maryland. However, due to ODSI's ample cash resources and satisfactory performance and collection experience, borrowing has not been necessary to any great extent to finance performance.

VI. PERSONNEL RESUMES

EDWARD W. VER HOEF

CHARLES L. BAKER

GILBERT V. JACOBS

WILLIAM D. EARLEY

EDWARD W. VER HOEF
Director of Advanced Information Technology

EDUCATION

Master of Science, Mathematics
De Paul University, Chicago, Illinois 1960

Bachelor of Arts, Mathematics and Physics
Central College, Pella, Iowa 1954

PROFESSIONAL EXPERIENCE

Mr. Ver Hoef is a computer software specialist with over 17 years experience. He has considerable background in design and implementation of business and scientific applications and batch and time-sharing operating systems. His primary areas of specialization are information storage and retrieval and underwater acoustics.

Ocean Data Systems, Inc., Rockville, Maryland 1970 - Present

Mr. Ver Hoef is Director of Advanced Information Technology. In this capacity he is primarily responsible for the development of advanced information storage and retrieval techniques and their application to data management problems for the scientific and industrial communities.

He investigated system utilization/performance factors on the Fleet Numerical Weather Central's dual processor CDC 6500 computer system and has developed programs for their measurement. He has worked on the development of system programs designed to bring disk input/output into better balance with the internal processing speeds and main memory cycle sharing for the CDC 6500. Mr. Ver Hoef has also developed programs to measure and compare allocated vs. expended system resources on a per user basis for the CDC 6500. The above programs were implemented in FORTRAN and COMPASS (where appropriate).

In the area of underwater acoustics for the Office of Naval Research, he modified a range prediction system so as to reduce its running time by 85%. This system, implemented on a CDC 6000 series computer predicts detection ranges for various types of sonars under differing conditions. He also designed and implemented the TASSRAP (Towed Array Ship Surveillance Range Prediction) model. This model, implemented on the CDC 6000 series computer, predicts detection ranges for a new type of sonar recently delivered to the Navy. He

participated in the analysis phase of a naval exercise to evaluate the sonar and the various methods for predicting detection ranges for this sonar.

He has designed and implemented for the Bureau of Narcotics and Dangerous Drugs both a Laboratory Analysis Reports Query System and a Defendant Reporting System. The former system provides an ad hoc interrogation capability to drug analysis reports. The latter system provides for an automated data base of drug defendants from which reports can be produced for use in analyzing the prosecution of drug cases. Mr. Ver Hoef is also responsible for the Controlled Substance Act automation project involving the development of a large data base system in which all persons and firms in the U.S. engaged in the handling of specified drugs will be registered. The system will be used to issue certificates to all registrants and control the issuance of forms for ordering drugs. The above systems are implemented on the IBM System 360/25 and 360/50 computers.

Informatics, Inc., 1965 - 1970

As Manager of Programming Systems, Mr. Ver Hoef directed the Programming Research and Development Group for Informatics. He was principal investigator and lead designer for several data management projects including:

- The Block File System for the management and control of all auxiliary storage devices used by a data management system developed for the Department of the Air Force Integrated Information Processing System. This system allowed for the symbolic addressing of all data and permitted the dynamic movement of data among different storage devices without user intervention or concern.

- A storage and retrieval system for the Civil Aeronautics Board for use in maintaining and accessing financial and traffic information submitted by all the certified U.S. air carriers. The data base was comprised of approximately 36 million characters on-line plus a similar amount in a history file. The system was implemented using the Mark IV File Management System, an Informatics proprietary generalized data management system.

- The Physics Literature Retrieval System for the American Institute of Physics. This system enables physicists to prepare near-English queries to search a file consisting of descriptions of physics journal articles and receive desired portions of all records satisfying the query.

- A survey of several file management systems, conducted for a major computer manufacturer. The report compared each of the systems on approximately 90 parameters.

Mr. Ver Hoef also developed and implemented a test bed for the comparison of automatic program segmentation algorithms and designed two such algorithms. This work included the development of a special JOVIAL compiler able to produce re-entrant object code on the GE 645 computer system.

Defense Communications Agency, 1964 - 1965

Mr. Ver Hoef was a systems analyst, responsible for the coordination of the activities of Mitre Corporation on behalf of the Joint Chiefs of Staff. He was specifically involved in the determination of information requirements of the National Military Command System and the ensuing file design process.

Radio Corporation of America, 1960 - 1964

As a programming staff leader in the RCA Data Systems Division, Mr. Ver Hoef was assigned to the ACSI-MATIC project, an information storage, retrieval and collation system for the Department of the Army. The data base for this system was approximately 72 million characters. He designed and supervised the implementation of the information processing subsystem input phase and the entire query and retrieval subsystem. He developed a capability which allowed the specification of an irregular shaped polygon as a search parameter of the query and retrieval subsystem using geographic coordinates as the vertices of the polygon. He also performed feasibility investigations on supplementary system features.

Commonwealth Edison Company, 1957 - 1960

As a member of the staff of the Vice President for Operations and Engineering, Mr. Ver Hoef's responsibilities included engineering programming and operations research tasks. Prediction of hourly loads on specified generation systems was a primary activity. He also evaluated techniques for automatic economic control of remote generators from a central station and researched methods for automatic commitment of generators.

University of Illinois, 1956 - 1957

While a graduate student, Mr. Ver Hoef worked as an assistant to Dr. James Bartlett of the Physics Department in the investigation of the minimum energy levels of the

hydrogen atom and its deuterium isotope. This involved the solution of partial non-linear differential equations. The solution was achieved by programming the University's ILLIAC-I Computer.

White Sands Proving Ground, New Mexico, 1955 - 1956

While in the U.S. Army Signal Corps Mr. Ver Hoef developed the formulae for automatically correcting radar derived missile tracking data for curvature of the earth.

PUBLICATIONS

"Automatic Program Segmentation based on Boolean Connectivity", Proceedings of AFIPS 1971 Spring Joint Computer Conference, AFIPS Press, May 1971, pp. 581-592.

" A Compact Finite State Machine for Program Control", Software Age, October 1968, Vol. 2, No. 8, 8-12

"Design of a Multilevel File Management System", Proceedings of the 21st National Conference of the ACM, Thompson Book Co., Washington, D. C., 1966, 75-86

Commentary on "An Approach to Peak Load Economics", Proceedings of AIEE, 1968 (Co-authored with H. Brown)

PROFESSIONAL AFFILIATIONS

Association for Computing Machinery

CHARLES L. BAKER
Technical Director

EDUCATION

Bachelor of Science, Physics 1951
Massachusetts Institute of Technology

PROFESSIONAL EXPERIENCE

Mr. Baker's 21 years experience as a computer software specialist includes significant contributions to the development of compiler, operating systems and modeling technologies for both engineering and data processing applications. He has been closely associated with the design and implementation of pioneering interactive, man-machine programming systems and languages.

Ocean Data Systems, Inc., Rockville, Maryland, 1972 - Present

Mr. Baker is a member of the senior technical staff. In this capacity, he is primarily responsible for development of programming languages for both "batched" and "interactive" modes of operation. He also contributes to the development of Program Budgeting, Cost Structure and Force Application Models.

Mr. Baker was the principal investigator in the analysis of the processing, storage and retrieval requirements for the I/TOS-D meteorological satellite data and developed the design specifications for a system capable of satisfying these requirements. Mr. Baker was also responsible for the implementation of the SHARPS acoustic range prediction model on the CP-642 computer and the FACT transmission loss model on the CDC 6600 computer.

International Computing Co., Bethesda, Maryland, 1968 - 1972

As Director of Systems Programming Development, Mr. Baker was responsible for the design, development, and implementation of ABLE, ICC's proprietary business teleprocessing service. He specified the data management and information retrieval techniques required to manage a large, multi-level, on-line data base; specified the high-level, machine-independent language features required; supervised the programming and check-out of the system in IBM System/360 machine language. He also reviewed planning, development, and marketing plans for a wide variety of application programs, including Financial Accounting, Order Processing and Inventory Control, Professional Timekeeping and Billing, Cost Account and Control, Payroll, etc. As Director of the ICC Data Center (IBM 360/50), Mr. Baker provided traditional commercial and scientific computational support (service bureau operation) to the business community.

IBM Federal Systems Center, Gaithersburg, Maryland, 1967 - 1968

As Manager, On-Line Time-Shared Systems, Mr. Baker was responsible for the introduction of time-sharing techniques into the Center with the specific goal of increasing programmer productivity. A research task, Investigation into Programming Cost Factors, required the development of principles and techniques necessary to analyze the programming development process along with the derivation of cost estimating relationships and productivity measures. This resulted in the creation of a large, computer-maintained base of information relevant to the programming process, and associated file processing programs. A second task provided estimates of the capabilities of existing and planned (IBM) time-sharing research projects, and the introduction of time-sharing systems into the FSC programming environment. Papers published by department personnel included an in-depth comparison of conversational systems, and a design proposal for a computer utility tailored to the FSC programming environment. He served as member of technical review boards for internal IBM R&D programming projects and lectured at IBM R&D centers on principles of system design. He participated in and contributed to a number of internal IBM symposia on man-machine interaction and time-sharing systems.

RAND Corporation, Santa Monica, California, 1956 - 1967

Mr. Baker served in a number of capacities during his tenure at RAND, performing a wide variety of tasks including:

-- Mr. Baker was project leader for JOSS, an on-line computer service designed for scientists and engineers. This project was part of RAND's continuing research into advanced applications of computer technology for scientific problem-solving. He coordinated with RAND researchers in all disciplines to determine the nature and extent of computer problem-solving support required. He had system management responsibility for all phases of the project, including justification and planning of system objectives; preparation of bidders' material, contractor proposal evaluation, and selection; system configuration; software and hardware design; system installation and checkout; user training and documentation. Specific technical activities included design and specification of the JOSS remote typewriter console, interfaced to the computer through a unique private-wire installation which distributes "JOSS computer power" automatically to any of 300 different wall outlets within the RAND complex, and over leased and dial-up networks to remote installations throughout

the country. Additional technical duties included responsibility for all software implementation of the JOSS language, including specification thereof. He supervised personnel orientation, training, and the installation of JOSS consoles at McClellan AFB; at the Air Force Academy; for the Directorate of Studies and Analysis, Air Force Deputy Chief of Staff; the Advanced Research Projects Agency; and the Assistance Secretary of Defense for Systems Analysis. He is the author of three, and editor of more than fifteen Rand Reports describing and documenting the JOSS system. During this period, Mr. Baker was an invited speaker on time-sharing techniques at numerous university, industrial and professional seminars in topics on Computer Science Research.

-- During 1963, Mr. Baker was responsible for operational evaluation of the systems' predecessor, implemented on RAND's JOHNNIAC computer. As part of this evaluation, he supervised production of, wrote script for, and appeared as narrator in a 22 minute 16mm. color, sound film JOSS. This film has been circulated widely since 1964 in universities and research organizations both in this country and abroad.

-- During 1961-1963, Mr. Baker was Leader, Automatic Data Processing Group (Bethesda, Md.). In 1961 the DOD Comptroller requested RAND to aid in the establishment of a Defense-Department-wide Planning and Program Budgeting System; the Bethesda Office of RAND was established for this purpose. Specific duties in this position were two-fold: one, to advise the DOD of its data processing requirements in establishing the Five Year Force Structure and Financial Plan (Program Budgeting) reporting system; second, to design and implement a Force Structure Planning Model to permit examining the cost and other resource requirement implications of proposed force structure changes in defense posture. He supervised the design, specification and development of the Army Cost Model, which was implemented on the IBM 7090 (in machine language) and transferred, in operational status, to the Department of the Army in 1963. This model uses advanced list processing and interpretive techniques to insure applicability to a wide range of force structure problems. A modification of this model was also developed for the Navy.

-- During 1959-1961 Mr. Baker was a Systems Programmer. He programmed the Information Processing Language Five (IPL-V) system for the IBM 704-709-7090-7044 series of machines, specified many features of the final, complete system, and participated in the pre-

paration of the IPL-V users' Manual. This system is still widely used in many research establishments, both in the U.S. and abroad, and the system has been subsequently implemented on a wide variety of computers of many different makes.

-- During 1958-1959 Mr. Baker was the RAND Representative and Liaison to the Control Division, Directorate of Operations, Headquarters, Strategic Air Command, Omaha, Nebraska. He consulted in preparing critiques of proposed system specifications, and in determining operational specifications for both hardware and software of the SAC Control System 465L. He aided SAC Control Division personnel in coordinating activities between SAC, the hardware contractor (IBM) and the software contractor (SDC), and helped transfer SAC war planning and control procedures from manual methods to a newly installed IBM 704. The later included both specification of machine techniques and procedures, and training of Air Force personnel in programming techniques.

-- During 1956-1958 Mr. Baker was a Systems and Application Programmer. He designed and programmed a large-scale force structure cost planning model, PROM, for the IBM 704. This model was the forerunner of many of Program Budgeting and Planning techniques later introduced into DOD and, eventually, into all government departments. He planned and programmed software systems for the IBM 704. As first acting secretary, he organized the SHARE Operating System working group which was to produce the first large scale operating system, SOS, for the IBM 709. He submitted to this committee the initial proposal for the Modify and Load concept which was adopted as the basis for the SHARE Assembler, Compiler and Translator, and is incorporated into all current computer operating systems.

Douglas Aircraft Co., Los Angeles, California, 1951 - 1956

As a Computer Specialist, Mr. Baker performed several functions including:

-- In 1955 he became Douglas' delegate to the Project for the Advancement of Coding Techniques (PACT), a cooperative group of Southern California IBM 701 users, to develop a compiler for that machine. He helped specify this compiler, and programmed the input-output routines for the system. The PACT committee, working at the RAND Corporation, produced the first working compiler, and as a result of this success, became the precursor of SHARE and subsequent user groups.

-- In 1954, as programming coordinator, he supervised programmers working on engineering problems in addition to systems and applications programming duties.

-- In 1953 he installed the Douglas IBM 701 system, including software; began writing, collecting, and editing material for the Douglas Computing Engineering Manual. He programmed aircraft and missile engineering problems for the IBM 701.

-- In 1952 he programmed engineering computations for the CPC, including both aircraft design and missile engineering problems. He designed and programmed the Douglas Assembly System for the IBM 701, and checked out system programs on the prototype machine.

-- In 1951 he participated in the solution of engineering problems on IBM E.A.M. equipment. He designed, wired, and tested Douglas' general purpose boards for the Cards Programmed Calculators, Models I and II.

PUBLICATIONS

"JOSS: Console Design", RAND Memorandum RM-5218-PR, February 1967

"JOSS: Introduction to a Helpful Assistant", RAND Memorandum RM-5058-PR, July 1966. Invited Paper, presented at the 11th Annual Data Processing Conference, University of Alabama, Birmingham Center, May 1966

"JOSS: Scenario of a Filmed Report", RAND Memorandum RM-4162-PR, June 1964

"Army Cost Model Programmer's Reference Manual", RAND Memorandum RM-3721-ASDC, July, 1963

"The RAND-SHARE Operating System Manual for the IBM 7090" (co-author), RAND Memorandum RM-3327-PR, September 1962

"Army Cost Model Preliminary Report", RAND Memorandum RM-3250-ASDC, August 1962

"Information Processing Language-V Manual" (co-author), Prentice Hall, Inc., Englewood Cliffs, N.J., 1961

"The First Six Million Prime Numbers" (co-author), July 1957, The Microcard Foundation, Madison, Wisconsin, 1959

"Digital Computer Programming by D.D. McCracken", An invited review; published in Mathematical Tables and other Aids to Computation, Vol. XI, October 1957, No. 60, pages 298-305, (National Academy of Sciences)

"Computing Engineering Handbook" (Editor; with others) Douglas Aircraft Co., Inc. Report SM-19232, January 1956

"The PACT I Coding System for the IBM Type 701", Journal Assoc. for Computing Machinery V.3, No. 4, October 1956. Presented at the Annual Meeting of the A.C.M., Philadelphia, Pa., September 15, 1955

GILBERT JACOBS

EDUCATION

Completed all requirements except thesis towards Ph.D. in Mathematics University of Maryland	1971
Master of Arts, Mathematics University of Maryland	1970
Bachelor of Arts, Mathematics Temple University	1967

Ocean Data Systems, Inc., Rockville, Maryland 1973-Present

Mr. Jacobs is involved in performing physical and mathematical studies and investigations. He is currently concerned with the determination of sound speed fields in two-dimensional ocean planes.

National Security Agency (NSA), Fort Meade, Maryland 1967-1973

While at NSA, Mr. Jacobs was involved in four different projects.

From April 1973 through November 1973, Mr. Jacobs was concerned with a large scale information storage and retrieval system. This system was implemented on the Burroughs 6700 in the ALGOL language and used file inversion and hashing techniques to store and retrieve data. Mr. Jacobs was responsible for maintainance and documentation of the system and to make necessary modifications and additions in response to customer requests. His main contribution to this project was the design and implementation of a "local data base" and file structure which allowed the user to retrieve data before it had been edited by the data editors and entered into the formal data base. This made highly critical intelligence information available to the user almost 24 hours sooner than had previously been the case.

From September 1970 through April 1973, Mr. Jacobs worked on the compiler optimization of an NSA developed language similar to FORTRAN but with additional features to simplify character string manipulations. This optimization was to take place within entire flow blocks as well as within individual statements and was implemented using BCPL, an ALGOL-like language developed by M.I.T. Mr. Jacobs was responsible for designing a machine independent register allocation algorithm and then modifying and implementing this algorithm on the Univac 1108 and IBM 370. This algorithm treats registers as both computational and memory areas and attempts to reduce the number of core memory fetches and stores required by the object code. Mr. Jacobs also designed and implemented other optimization

techniques such as common subsegment analysis and source-to-source translation of source code. He also investigated the properties of the IBM 370 Cache memory and as a result of this investigation, he defined data allocation methods and program structures which would best accommodate its characteristics. In addition, he designed and implemented an algorithm that performs semantic analysis of source level constructs in order to make better use of the MVC instruction on the IBM 370 and to effect the linearization of array references.

From January 1969 through August 1970, Mr. Jacobs worked for a signals analysis group. He developed software techniques for performing fast Fourier transforms and digital filtering. This work was done using a special purpose Sylvania computer (ACP) in a real time environment. He also designed and implemented the software interface between the ACP and the SDS 930. Mr. Jacobs performed liaison with outside contractors and monitored contract specifications and he modified and converted contractor programs to run on the Univac 1108.

Finally, from October 1968 through January 1969, Mr. Jacobs worked for a signals conversion group. He designed and implemented a system on the CDC 3300 in FORTRAN and assembly language to track and plot the probable location of a satellite whose size, weight and other variables were not exactly known. He also wrote several utility programs that become part of the operating system on the CDC 3300.

General Electric, Space and Technology Center, King of Prussia, Pennsylvania June 1966-September 1967

During this period, Mr. Jacobs was a programmer for a flight dynamics group. He maintained and documented a large FORTRAN program on the IBM 7090 that calculated and plotted the characteristics of a nose cone as it passed through the earth's atmosphere. He also formulated and solved mathematical problems relating to repentry vehicles.

AWARDS AND HONORS

Steinberg Mathematics Award - Temple University, 1967

Pi Mu Epsilon (Mathematics Honor Society)

WILLIAM D. EARLEY
Member, Technical Staff

EDUCATION

Graduate Studies Catholic University American University	1960-1966
Bachelor of Science Bluffton College	1960

PROFESSIONAL EXPERIENCE

Mr. Earley has had extensive experience in the analysis, design, programming and management of systems in the area of orbit determination, air traffic control, and telephone network routing. Also associated with these systems, Mr. Earley is very familiar with data base formation and maintenance.

Ocean Data Systems, Inc., Rockville, Maryland, 1972-Present

Mr. Earley is a member of the technical staff. In this capacity he participates in the implementation of meteorological and oceanographic scientific models. He is also involved in the development of information storage and retrieval systems for commercial and government application and the design of communications systems.

Consultants and Designers, College Park, Maryland, 1971-1972

As Senior Analyst, Mr. Earley served as task leader in charge of eight persons in the area of systems analysis and design of a large satellite orbit determination system. Specifically, the major tasks he worked on involved: (1) the incorporation of the Minitract Error Model into the system regression analysis; (2) the design of the Applications Technology Satellite (ATS) System. Both these tasks involved simulation studies to check out the final system; and (3) writing technical proposals in the area of orbit determination.

Computer Usage Corp., Bethesda, Maryland, 1970-1971

As Senior Staff Analyst, Mr. Earley supervised a team of 5 analysts and programmers responsible for the design of a system to automate the routing of all telephone circuits billed through GSA. This system (Automatic Telpak Maintenance System (ATMS)), replaced the GSA manual system, and will provide considerable cost saving to the government for all DOD and GSA telephone circuits.

Mr. Earley was also responsible for a major programming and documentation contract at the NASA/Goddard Space Flight Center. The project required system verification and documentation of a library of 33 main programs and 114 subroutines

involving astronomy, celestial mechanics, orbital mechanics and statistics. He was also responsible for format consistency, technical reliability, grammatical precision and final editing of each document. For this task Mr. Earley supervised a team of 15 analysts, programmers and documentation specialists.

Also, Mr. Earley used a proprietary Fourier analysis program to perform an error analysis study for the GSFC ERTS program. This study involved the spectral analysis of the characteristic frequencies of a set of project Apollo spacecraft data.

IBM, Gaithersburg, Maryland, 1969-1970

As a staff programmer for IBM, Mr. Earley participated in the study and analysis of the Air Traffic Control problem for the Federal Aviation Agency/Washington Office. Specific duties involved the task to design and program a system to simulate the real time radar tracking functions in the NAS real time air traffic control system.

Computer Sciences Corp., Silver Spring, Maryland, 1966-1969

As a Senior Member of the Technical Staff, Mr. Earley was involved in math analysis and process programming in the areas of least-squares statistical techniques, orbit determination, celestial mechanics, data evaluation and satellite attitude determination.

The major tasks were as follows: performed modifications and checkout of the OSO-E Satellite attitude determination program, which encompassed the utilization of the GSFC/NTRAN package; responsible for the design, coding and checkout of the OSO-D Satellite correlated data program utilizing the MAP capability of the UNIVAC 1108 to overlay the various program modules.

Army Geodetic Institute - Ft. Belvoir, Virginia, 1965-1966

As a Research Mathematician, Mr. Earley was engaged in an area of math analysis and technical management, which included application of various types of satellite data to the solution of a variety of geodetic parameters, such as the gravitational coefficients of the earth and the position of a satellite-receiving station on the earth's surface. Mr. Earley was responsible for accumulating satellite data tapes, method documentation and solution formulation. He also served as the Government Technical Monitor for the contract to develop the computer program to recover these parameters (GEOPS). Mr. Earley develoepd a math algorithm for the selection of a set of satellite elements that would best recover a selected set of resonant gravitational harmonic coefficients.

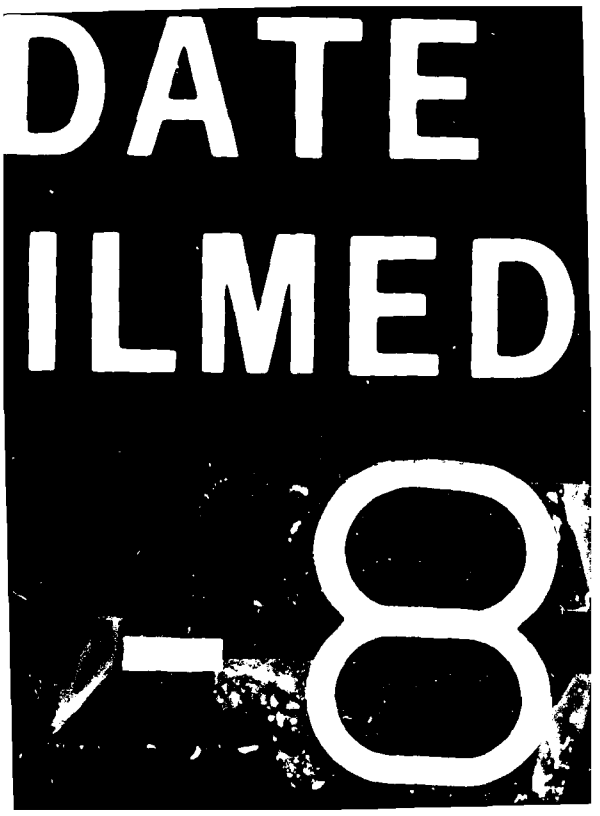
Naval Weapons Laboratory, Dahlgren, Virginia, 1960-1965

As a mathematician, Mr. Earley assisted in the application of the Navy Doppler data to the solution of a variety of geodetic parameters, such as the gravitational coefficients of the earth and the position of satellite data-receiving stations on the earth's surface, and to the solution of the various transit satellite orbital parameters. Mr. Earley's responsibilities were divided into five general categories: (1) implementing and documenting all required changes to existing formulation, (2) implementing and documenting new supervisory-suggested formulations, (3) consulting with programmers in the checkout of programs, implementing these formulations, (4) submitting computer program runs, analyzing and forming conclusions from the output, and (5) documenting the output and conclusions in the form of internal technical memoranda.

PUBLICATIONS

The Application of Naval Georeceiver Data to the Solution for Ship Positions - Naval Weapons Lap Tech. Memo (Classified) 1965.

The Computation of Satellite Radar Cross Section Area Using Reflecteral Power Measurements - Naval Weapons Lab. Tech. Memo - 1964.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